On the determinants of life insurance development in Sub-Saharan Africa: the role of the institutions quality in the effect of economic development

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Abstract

This paper analyzes the determinants of life insurance development on a panel of 20 countries in sub-Saharan Africa over the period 1996-2011. It also highlights the role of the institutions quality on the effect of economic development on the life insurance. Controlling for the presence of a possible endogeneity bias using the instrumental variable technique, we find evidence that increased of per capita income leads to an increase in life insurance premiums. We show that the life insurance is a luxury good in SSA. The demographic variables such as life expectancy and the young dependency ratio influence negatively the life insurance development while the old dependency ratio has a positive effect. We also find that the protection of property rights and the government stability are positively associated to life insurance. The results are robust to the introduction of more variables. Furthermore, the marginal impact of the income per capita on the life insurance varies according to the quality of the legal and political environment. Finally, the marginal effect of the economic development on life insurance is less for french legal system countries compared to non-french legal system countries.

Key words: Life insurance, economic development, institutional quality, instrumental variable

JEL codes: G22, 011, L60, C26

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1. Introduction

Deepening of the financial systems requires not only an increase in the quantity of the services offered, but also an improvement in the "quality" of services offered, in order to better meet the different needs of economic agents. This is at a time to extend the duration of credits, to improve access for households and small and small enterprises (financial inclusion) and diversify the supply of financial services, including insurance services. The development of insurance services contributes to stimulate the growth in developing countries (Arena, 2008). In this context, the life insurance plays a special role because it allows at a time the supply of insurance service and long-term saving mobilization.

Life insurance is one that covers the risks relating to the length of human life. There are two categories of life insurance products: *the insurance against the premature death of the insured and the rent contract (old-age insurance) which provides for the periodic payment of income to the insured for a specified period of time or more often during the life of the insured (Vaughan and Vaughan, 2003)*. While the most important function of life insurance is to provide financial assistance to beneficiaries' in case of premature death of the insured, the aim of the rent is to assure the continuity of incomes for the insured during the period of inactivity (retirement). Thus, the life insurance plays an important role in the financial planning of individuals because it can be used as a hedge against the financial uncertainty resulting from the mortality risks incurred.

Life insurance is also an important mean by which the individuals with relatively low incomes can save and invest efficiently in the long run. Indeed, the life insurance is a saving contract relatively simple that can be freely bought and regularly by small amounts. With the regular character or contractual of premiums payment by the policyholders, the life insurance companies arrive to mobilize the significant saving and stable compared to other financial systems. Thus, in pooling the saving of small and large investors, the life insurance companies accumulate stable resources that can be used for heavy and risky investments that are beneficial to the economy (Dickinson, 2000). In this way, the life insurance is an important instrument for economic development.

Life insurance companies' activities have experienced an important development over the recent years. Indeed, the life insurance penetration (total life insurance premiums as a percentage of

GDP) at the world level rose from 3.8% in 1996 to 4.6 % in 2000 and decrease to 3.6% in 2011 following at the financial crisis. According to the life insurance density (life insurance premiums per capita), it increased from 207$ US per capita in 1996 to about 367$ US in 2011 (Swiss Re, 2013). In Sub-Saharan Africa, the life insurance sector is not yet well developed as in the others areas economics. Indeed, in 2011, the share of Africa in the world market of the life insurance was only 1.79% against 35.9% in Europe, 35.28% in Asia, 22.75% in North America and 2.49% in Latin America and Caribbean. Moreover, we note that, the countries of OECD detain approximately 83.24% of the market in 2011 and 13.97% for the emerging countries and 2.79% for the rest of developing countries. However, despite the marginal share of Africa in the world life insurance market, we observe an important evolution of the sector. Direct life insurance premiums in Africa increased from 16.444 trillion $ US in 1996 to 46.261trillion $ US in 2011, which shows that the turnover of life insurance companies has been doubled in less than twenty years. In Sub-Saharan Africa, the life insurance penetration rose from 0.1505% in 1996 to 0.252% in 2011, whether a growth of life insurance premiums of about 67.44% over the period. Regarding the life insurance density, it rose from 0.856 $ US per capita to 4,092 $ US over the same period. This shows that the life insurance sector is increasing in the financial sphere and constitutes an important potential source of mobilization of long-term resources and financing of enterprises. Thus, it appears therefore necessary to identify the factors likely to influence the life insurance sector development in the Sub-Saharan Africa countries.

The previous researches on the determinants of life insurance sector development have not devoted more attention to the role of institutional factors. Indeed, the studies such as those of La Porta et al. (1997) and La Porta et al. (1998) showed that the legal system's affect the development of the financial system. Thus, the fact that the life insurance is a contractual relationship implies that the quality of the legal and policy environment could have a significant effect on the development of the sector, including strengthening the credibility of life insurance contracts. The authors such as Ward and Zurbruegg (2002), Beck and Webb (2003); Esho and al; (2004), Chang and Lee (2012) and Dragos and Dragos (2013) analyzed the effects of the quality of institutions on the life insurance penetration and its density. It appears from these studies that institutional factors such as the civil liberties, the political stability, and the protection of property

rights and the regulatory quality and the obligations of both parties to the contract, the rule of law and the control of corruption have a positive effect on the life insurance development.

However, most of previous research (Beck and Webb, 2003; Feyen and al, 2011; Lee and Chiu, 2012; Chang and Lee, 2012) were more focused in developed and emerging countries and there have been a few studies that have examined the factors that determine the life insurance sector development in Sub-Saharan African countries. Furthermore, most of the empirical researches have less examined the effects of institutional factors that influence the life insurance demand and supply. Our study therefore seeks to identify the determinants of life insurance development the one hand and other hand to analyze the role of the institutions quality in the economic development effect on life insurance activities in Sub-Saharan Africa.

We contribute to the literature on many levels. First, at best our knowledge, this study represents one of the first to analyze the determinants of the life insurance sector, taking into account the role of institutional factors in a sample of 20 countries in sub-Saharan Africa[1]. Thus, we examine the heterogeneity in the economic development effect according to the institutions quality. Second, the paper takes advantage of a recently released database that allow taking into account both demand and supply factors of life insurance over the period from 1996 to 2011. Thirdly, contrary to previous studies (Outreville, 1996; Beck and Webb, 2003; Feyen and al, 2011), this study estimates the fixed effect panel model with the heteroskedastic-efficient two-step generalized method of moments (IV-GMM) estimator which generates efficient coefficients as well as consistent standard errors estimates.

The rest of the paper is organized as follows: the next section highlights the literature on economic, demographic and institutional determinants of life insurance development; the third section presents the variables and the stylized facts in Sub-Saharan Africa, the econometric methodology and the estimation technique are discussed in section fourth; the empirical results and the discussions following in section fifth and a conclusion is presented in the last section.

2. The arguments of the determinants of life insurance consumption

[1] Were excluded South Africa from our study because its insurance sector is well developed as some developed countries and represents more than 80% market share of the Sub-Saharan region.

In this section we propose a review of the theoretical and empirical literature on the determinants of life insurance sector development.

Theoretical models on the life insurance consumption were mainly developed by Yarri (1965), Hakansson (1969), Fisher (1973) and Lewis (1989). Indeed, Yaari (1965) have developed a theoretical model to study the problem of the uncertain life time. In this context, the life insurance demand is attributed to a person's desire to bequeath funds to his dependents and provide income for retirement. It is derived from the maximization of an individual utility function (Beck and Webb, 2003). Thus, this model assumes that the life insurance demand to be a function of wealth, expected income over an individual's lifetime, the level of interest rates, the cost of life insurance policies (administrative costs), assumed subjective discount rate for current and future consumption.

Lewis (1989) extends the model developed by Yaari by explicitly incorporating the preferences of other family member's dependents and beneficiaries. Specifically, he derives the life insurance demand as a maximization problem of the beneficiaries, the spouse and the offspring of the life insurance policyholder. Deriving utility maximization by both spouse and offspring separately and assuming no bequest by the policyholder and an isoelastic utility function, Lewis shows that the total life insurance demand can be written as follows:

$$(1 - lp)F = Max\left\{[(1 - lp)/l(1 - p)]^{1/\delta}TC - W, 0\right\}$$

Where l is the policy loading factor (the ratio of the life insurance costs its actuarial value), p the probability of the primary wage earner's death, F the face value of all life insurance written on the primary wage earner's life, δ a measure of the beneficiaries' relative risk aversion, TC the present value of consumption of each offspring until he/she leaves the household and of the spouse over his/her predicted remaining life time and W the household's net wealth (Beck and Webb, 2003). However, Lewis noted that the life insurance consumption is not only motived by consumer's demand. The price is probably the decisive factor in the life insurance consumption. Several important factors such as the urbanization level, the monetary stability, the bureaucratic quality, the rule of law, the control of corruption and banking sector development all impact the insurer's ability to provide cost-effective insurance. In the model of Lewis, described above, these factors can be represented by the policy loading factors.

In summary, the theoretical studies identify the variables such as the income, the interest rate, the current consumption and the wealth as variables that influence the life insurance consumption. Demographic and social variables were also included in the theoretical models and their potential impact on individual's decision to use life insurance has been investigated. Thus, the life insurance consumption increases with the probability of death of the main breadwinner in the family like the head of the family, the level of current consumption of the family and the degree of risk aversion. However, there is no presentation of the mechanisms by which other economic and non-economic variables affect the life insurance activities.

In what follows, we highlight the results of some studies on the effects of macroeconomic, demographic and institutional factors on the life insurance development.

At the level of the macroeconomic determinants of the life insurance premiums, most of the previous studies showed that income per capita measuring the economic development level is the main determinant. The income is an essential variable in the life insurance consumption and this is justified by the necessity to maintain an income level to his descendants in the case of premature death. The studies of Fortune (1973), Beenstock and al. (1986), Browne and Kim (1993) and Outreville (1996) have shown that the life insurance development is positively influenced by the income per capita.

However, many of those studies have shown that the effect of income on the life insurance depends of economic development level. Indeed, Truett and Truett (1990) have compared the life insurance demand in Mexico and United States during the period 1964-1984. They found that the income elasticity of life insurance consumption is higher in Mexico than in the US and conclude that life insurance is a necessity good. Then, Enz (2000) have developed a logistic model to identify the factors of supply and demand that are likely to influence the life insurance penetration (90 countries) over the period 1970-1998. He showed that the income elasticities of life insurance penetration are not constant and that the relationship between the life insurance penetration and real GDP per capita has a form "*S*" called "*S-curve Model*». Thus, the income elasticity of life insurance penetration is near unity both for the high and low levels of income, but very high for middle- income level. Feyen and al. (2011) also found that the life insurance consumption generally varies with the income. They showed that the very wealthy groups of

individuals may not need the life insurance because they have excess financial assets while those very poor have not the means to purchase the life insurance products. In addition, they find that the life insurance is a luxury good for the poor family. Lee and Chiu (2012) used a PSTR (Panel Smooth Threshold Regression) model to examine the nonlinear relationship between life insurance penetration and income. Firstly, they fund that there is a nonlinear relationship between the life insurance premiums and income per capita and this relationship following a curve "*J*". Then, the income elasticity of life insurance premiums is inferior to unity. This means that life insurance is a necessity good. Finally, they found that the income elasticity of life insurance premiums vary according to country and that is due to the heterogeneity of economic development of different countries in their sample.

Although, the income is the main determinant of life insurance consumption, the literature has also analyzed the role of the quality of institutions. The life insurance is being primarily a contract linking the insurer and the policyholder and constituting one of the great investments on the stock markets, the quality of the institutional environment appears as an important variable in the promotion the life insurance activities (Lee and Chang, 2012). For example, an inability to appeal the violation of life insurance contracts by insurers reduced the value of these contracts for consumers and can deter them to subscribe of important sums for life insurance products (Beck and Webb, 2003). Thus, the lack of property protection and contract enforcement impedes life insurers' ability to invest efficiently and control the price of their products. Knack and Keefer (1995 and 2002) have shown that, the strengthening of property rights can generate a motivation to subscribe to a life insurance. This is justified by the fact that the effective enforcement of legal rules relating to property rights helps to protect life insurance policyholders against the losses or the damages. Esho and al. (2004) also showed that a favorable legal environment and protection of property rights favor the life insurance market development by reducing the risk transfer transaction costs. Avram and al. (2010) found that the quality of the legal system and the protection of property rights exert a significant effect on the life insurance development.

Furthermore, the lack of political stability can shorten the economic horizon for potential purchasers and suppliers of life insurance products and thus may discouraged the life insurance market development (Beck and Webb, 2003). Ward and Zurbruegg (2002) have shown that the political stability has a positive effect on the life insurance business development at a time in

developed and developing economies. Moreover, Dragos and Dragos (2013) analyzed the role of institutional factors in the promotion of life insurance activities on a sample of 31 European countries. According to them, for that the life insurance sector emerges, it is necessary to have a favorable legal environment. Then, the results show that, the freedom to undertake influences positively the life insurance density, the easing of the tax burden stimulates the life insurance penetration and finally, a low level of corruption increases the life insurance density.

Following the studies on the effects of economic development on the life insurance sector development, Chang and Lee (2012)[2] have analyzed the role of institutional factors on the relationship between economic development and life insurance development from a dynamic panel threshold effect (PTR). They show that the income per capita influences positively the life insurance activities development and the effect is more important in high-income countries than in low-income countries. They also find that the legal and political indicators have a positive effect on life insurance in low-income countries, but the effect is marginal in high-income countries which means that the role of institutions on the life insurance development decreases with the economic development level.

In addition to indicators of economic and institutional development, the literature has also identified other factors that influence the life insurance development. Outreville (1996), Beck and Webb (2003) found that in addition to income, the level of financial development positively affects the life insurance consumption while inflation negatively influences this one in developed and developing countries. Regarding the socio-demographic determinants, the variables such as the school enrollment, the life expectancy at birth, the young and old dependency ratios, the size of social security system, the share of public health expenditure were used in the literature as determinants of life insurance development. Indeed, Browne and Kim (1993) found that the life expectancy is not an important factor of life insurance consumption. However, some of the previous studies have shown that the life expectancy positively affects the life insurance penetration (Beenstock and al.; 1986, Outreville; 1996). Truett and Truett (1990) and Browne and Kim (1993) found a positive relationship between the life insurance consumption and level of

[2]However, their sample takes into account that only three countries in Sub-Saharan Africa that are South Africa, Côte d'Ivoire and Zimbabwe.

schooling. They explain this result by the fact that a higher level of education increases the ability of agents to understand the benefits in risk management and long-term saving (life insurance). However, Beck and Webb (2003) showed that the school enrollment rate, the life expectancy, the young dependency ratio and the size of the social security system did not have strong link with the life insurance consumption in 68 countries from 1960 to 2000. Table A-1 in appendix summarizes the potential determinants of the life insurance and their expected sign.

However, despite that, these studies showed that the economic and institutional factors influence the life insurance sector development; they are not exempt of some shortcomings. Indeed, the most previous studies have not analyzed the effect of the institutional quality both on the life insurance penetration and density. Moreover, they have taken into account that developed and emerging countries and were not interested in Sub-Saharan Africa countries, where the legal environment is less solid. In this context, our study tries to fill this gap and contribute to the previous literature by identifying the determinants of life insurance sector development and analyzing the role of the quality of institutions on the relationship between economic development and life insurance development on a sample of 20 countries in sub-Saharan Africa. In this way, we highlight the heterogeneity of the effect of the economic development level on the life insurance according to the quality of the legal and political environment.

3. Variables and stylized facts

3.1. The variables and their sources

According to literature (Beck and Webb; 2003, Arena; 2008, Avram and al, 2010, etc.), the two indicators usually used to measure the life insurance development are the life insurance penetration and life insurance density. Indeed, the life insurance penetration defined as the ratio of premium volume to GDP. It measures the importance of insurance activity relative to the size of the economy. As for life insurance density is measured by premiums per capita, expressed in US dollars. This measure shows how much each inhabitant of the country spends on average on life insurance (Beck and Webb, 2003).Unlike previous studies which have used the one or the other of its indicators in their analyzes (Arena; 2008, Haiss and Sümegi; 2008, Han and al., 2010, etc.), we employ two alternative measures (insurance penetration and insurance density) of life

insurance activities development. The life insurance penetration and density[3] are obtained from *Financial Structure and Economic Development Database of Beck and Al-Hussainy Ed (2013).*

The indicators of the institutions quality are coming from diverse sources. These variables were mainly used in the previous empirical studies on the life insurance sector. First, we selected two indicators from the database of *Economic Freedom Heritage Foundation (2014)*. Thus, we have *Property_Rights* that is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state. They also measure the quality of the legal system of the country to protect individuals and their financial assets. The second indicator is *Fiscal freedom* which measures the tax burden imposed by Government. It includes both the direct tax burden in terms of the top tax rates on individual and corporate incomes and the overall amount of tax revenue as a percentage of GDP. In scoring fiscal freedom, the underlined numerical variables are weighted equally as one-third of the component. We anticipate an increase in the burden of the tax has a negative effect on the premiums and the benefits of life insurance companies, so a reduction of life insurance sector development. The last two indicators of the quality of institutions come from the *International Country Risk Guide (ICRG) database*. *LawOrder* measures the strength and independence of the judicial system, the degree to which citizens of a country are able to use legal systems to mediate disputes and enforce contracts. Thus, with the improvement of the rule of law in a country, we expect that the protection and enforcement of property rights derive facilitate the transaction of life insurance. The last is *Government_stability*. It measures the ability of governments to realize the programs they have planned and to remain in place. Thus, the lack of political stability shortens the economic horizon of life insurance potential purchasers and suppliers and reduces life insurance market development. Before to submit our indicators of the quality of institutions in the econometric estimations, we normalize by the following formula:

$INST_i = \frac{Max\,(INST) - INST_i}{Max(INST) - Min(INST)}$, where $Max\,(INST)$and $Min(INST)$ represent the minimum and maximum of each indicator of the quality of institutions. This transformation permits to have a

[3] Density was calculated from indicators of life insurance penetration , the total population and GDP

range between 0 and 1. The higher values indicate better quality of institutions. Thus, the standardization facilitates direct comparison across different equations.

The different variables used are those analyzed in the theoretical literature as potential determinants of life insurance activities development. Thus, we have the economic development level, measured by the real GDP per capita. In addition to the income per capita, one have identified two economic and financial indicators that include, the real interest rate and the index of financial development measured by the liquidity ratio in the economy. According to the demographic elements we have, the life expectancy at birth, the young dependency ratio (ratio of the population under age 15 to the population ages 15-65) and old dependency ratio (ratio of the population over age 65 to the population ages 15-65). As mentioned in the empirical literature, this study also divides the dependency ratio into young and old dependency because the life insurance products provide indemnity for two risks: mortality and longevity risk (Chang and Lee, 2012). This leaves consider the different age groups demand different types of indemnities, where the divergent effects of demographic factors on life insurance development. All these variables are extracted in the database of *World Development Indicators (WDI, 2014)*. Table A-2 in the appendix shows the list of Sub-Saharan African countries selected.

3.2. Stylized facts

Figure 1 shows the evolution of life insurance penetration in the different economic regions over the period 1996 to 2011. We remark out in the Euro zone, the life insurance penetration in the other regions is inferior to 1% of GDP. Indeed, the life insurance contributes weakly to domestic income in developing countries (Sub-Saharan Africa, Middle East and North Africa, Europe Central and Asia). The life insurance development seems to be related the economic development level and this is confirmed by the curve of the Euro zone and the East Asia and Pacific.

Figure 1. Life insurance penetration in the economic regions, 1996-2011

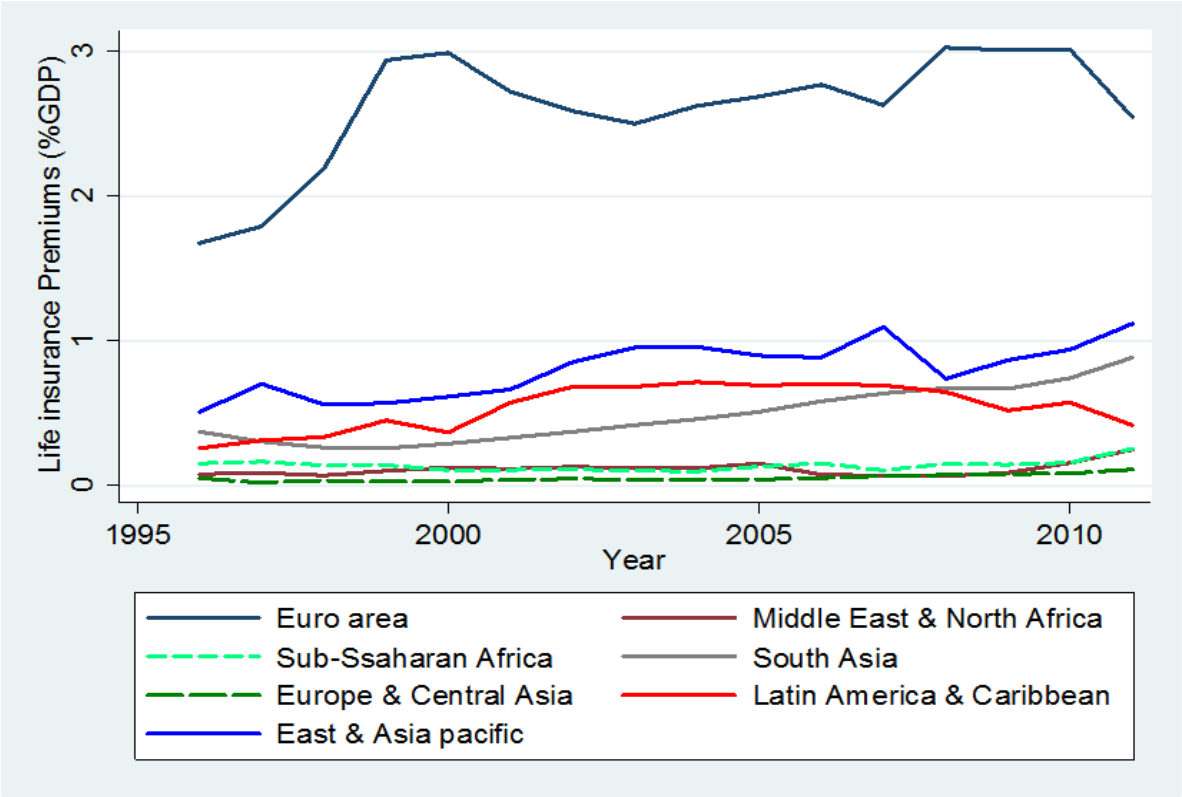
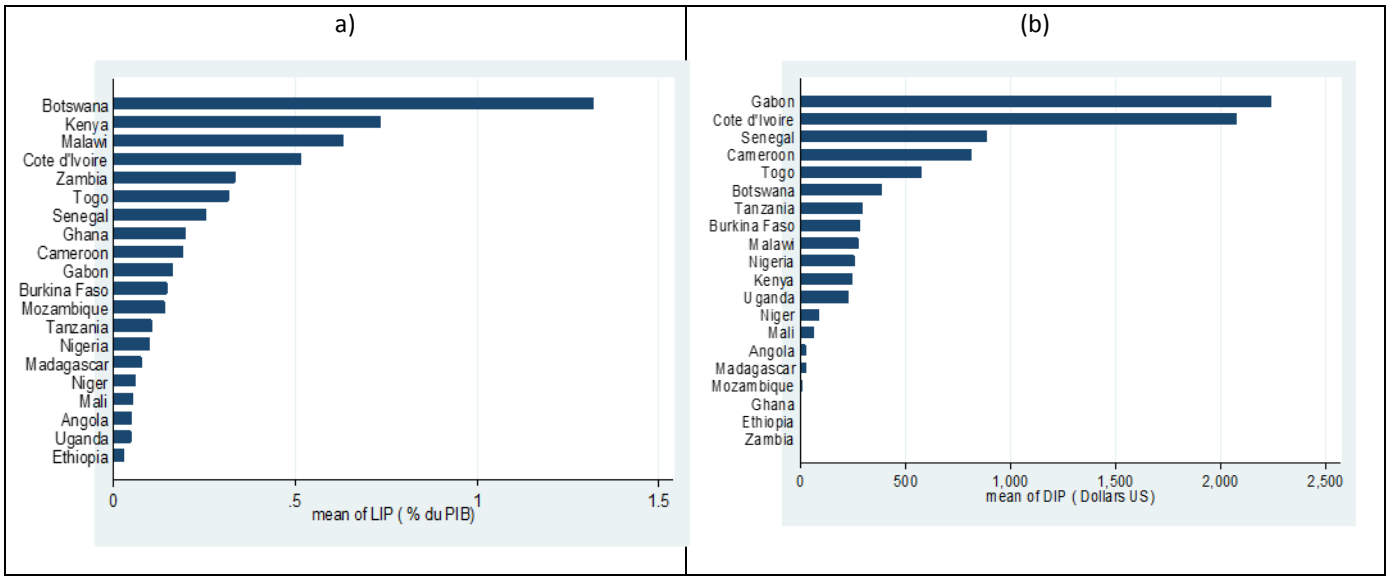


Figure 2 shows a ranking of life insurance penetration and density in 20 countries in Sub-Saharan Africa. As we can see, life insurance development has very little to do with the size of a country. Nigeria which has the largest economy by far among these countries of the sample, has a smaller life insurance penetration and density countries than Botswana, Kenya, Malawi, and Côte d'Ivoire. Indeed, if we consider the life insurance penetration (Figure 2.a), the countries whose life insurance sector is more developed are Botswana, Malawi and Kenya. The countries with the highest life insurance density (Figure 2b) are Gabon, Côte d'Ivoire and Sénégal. Moreover, we see that the countries like Ghana and Zambia occupy the last place in terms of density while they are well classified at the life insurance penetration.

Figure 2: Ranking of countries according to the life insurance penetration (a) and density (b) on the average for the period 1996-2011.



Source: Beck T. et Al-Hussainy Ed. (2013) and author's calculations

If we use the Table 1 below, we note that on the average, Gabon is the country that spends much money per capita (2239.516 $ US) for life insurance consumption during the period 1996-2011, it is followed by Côte d'Ivoire (2071.566 $ US) and Sénégal (886.572$ US). However, Zambia is the country that spends less than 1$ US per capita for life insurance consumption. She is preceded by Ethiopia and Ghana whose the life insurance density is to 1.035 $ US and US 1.616 $ US respectively. In summary, the statistical analyzes show that the measure of the life insurance development varies according to the indicator used; hence the need to take into account the two measures in our econometric analysis, to identify the factors that influence the life insurance premiums development.

Table 1: Life insurance penetration and density over the period 1996 to 2011

Countries	Life insurance penetration	Life insurance density	Countries	Life insurance penetration	Life insurance density
Angola	0.049	23.143	Malawi	0.631	272.335
Botswana	1.319	386.079	Mali	0.052	59.613
Burkina Faso	0.146	279.208	Mozambique	0.138	8.282
Cameroon	0.189	811.644	Niger	0.058	82.926
Côte d'Ivoire	0.515	2071.566	Nigeria	0.098	253.840
Ethiopia	0.028	1.035	Sénégal	0.251	886.572
Gabon	0.160	2239.516	Tanzania	0.103	294.175
Ghana	0.195	1.616	Togo	0.314	573.184
Kenya	0.732	243.720	Uganda	0.045	227.432
Madagascar	0.075	21.853	Zambia	0.332	0.9160

Source: Beck T. et Al-Hussainy Ed. (2013) and author's calculations

4. Econometric Methodology and estimation technique

The definition of a structural model for the life insurance development is not easy. Beck and Webb (2003) have indicated that the life insurance premium reflects both the demand and supply and highlighted the difficulties to distinguish between supply and demand for life insurance. Nevertheless, we can follow Outreville (1996), who defines a reduced model of life insurance two models of life insurance demand and supply. Indeed, according to Outreville, the life insurance demand is a function of the competitive structure of the domestic market and of the country's level of financial development and supply is also related to the commercial price of insurance, interest rates and other factors relating to market structure (Outreville, 1996). Thus, as life insurance premiums bought at the market is equal to the average price of one unit of insurance coverage (PI) multiplied by the quantity of insurance protection needed in life (Q), the reduced-form can be defined by:

$$Premiums\ income = PI * Q = F(D, E, I)^4 \quad (1)$$

Where D is a vector of demographic variables, E represents the vector of macroeconomic variables and financial variables and I the vector of indicators of the institutions quality that can to influence the life insurance demand and supply. After transformation, the linear model of life insurance development can be written again in the following form:

$$y_{it} = \alpha + \beta_1 * D_{it} + \beta_2 * E_{it} + \beta_3 * I_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (2)$$

[4] We tried to modify the basic model of Outreville (1996), for example, we have replaced the market structure in the supply level by the quality of institutions.

Where y_{it}measures the indicator of the life insurance sector development (Life insurance penetration or density), D_{it} vector of the demographic variables (Life expectancy, Young and old dependency ratio), E_{it} is a vector of economic and financial variables (GDP per capita, real interest rate and financial development) and I_{it} the vector of indicators of the institutions quality (Property Rights, Fiscal Freedom, Law order and Government stability) for the country i in period t. α, β_1, β_2 and β_3 are unknown parameters to be estimated. μ, γ and ε country fixed effects, time fixed effects, and the idiosyncratic error term, respectively.

The estimation of factors that influence the life insurance premiums (equation 2) raises a number of issues that the endogeneity bias is most important problem. This problem may originate form a number of sources. Firstly, the endogeneity bias can arise from measurement errors in the regressor variables. Secondly, our measure of income per capita for example, could be correlated with other relevant determinants of life insurance premiums omitted. Finally, the most important problem, especially in this case may come mainly from the reverse causality between income per capita and life insurance premiums. Indeed, the literature has shown that there is a double causality between the life insurance development and real income per capita (Ward and Zurbruegg, 2000). Then, other studies have shown that the life insurance premiums have a positive effect on GDP per capita (Arena; 2008, Avram and al.; 2010, Lee and al.; 2013, etc.). These problems above could lead to a statistical bias in the estimated on regressors, with Ordinary Least Squares (OLS), estimates exaggerating its impact of GDP per capita for example. In order to control this eventual simultaneity bias, we estimate equation (2) with the heteroskedastic-efficient two-step generalized method of moments (IV-GMM) estimator which generates efficient coefficients as well as consistent standard errors estimates. Indeed, the efficiency gains of this estimator relative to the traditional IV/2SLS estimator derive from the use of the optimal weighting matrix, the over-identifying restrictions of the model, and the relaxation of the independently and identically distributed (i.i.d.) assumption. For an exactly-identified model, the efficient GMM and traditional IV/2SLS estimators coincide, and under the assumptions of conditional homoskedasticity and independence, the efficient GMM estimator is the traditional IV/2SLS estimator (Baum et al. 2007). This technique requires the identification of variables that best explain the proxy of economic development (real GDP per capita) and which have not of the direct impact on the life insurance premiums. Thus, in our econometric estimates,

we choose the rainfall[5] lagged one year as an instrument of income per capita. Indeed, the rainfall has been used by Brückner (2011) as an instrument of income per capita to analyze the impact of economic growth and the size of the agricultural sector on the urbanization rate. In addition to rainfall, we use the income per capita and the domestic saving rate lagged two years as an instrument of income per capita. The underlying assumption is that these instruments do not have direct impact on the life insurance premiums, their only impact being indirect through the channel of income per capita.

5. Results

5.1. Baseline estimate results

Tables 2 and 3 show the results of econometric estimates the determinants of life insurance penetration and density over the period from 1996 to 2011. As we treat the endogeneity problem, the validity of our results depends on the quality of the instruments which are submitted to diagnostic tests that are the over-identification test of Hansen and the weak instruments of Cragg-Donald. The first stage estimation results of all the regressions show that our instruments are valid and this is confirmed by the statistics of the over-identification test of Hansen that is robust to heteroscedasticity and whose probability not allow to reject the hypothesis that the instruments are exogenous. Moreover, the comparison of Cragg-Donald statistics to critical values calculated by Stock and Yogo (2004) indicates the absence of the weak instruments problem because the Cragg-Donald statistics are higher.

The column (1) of table 2 take into account the income per capita and demographic indicators only. The results show that the income per capita is a significant determinant of life insurance penetration. For example, an increase by one standard deviation of GDP per capita leads to an increase the life insurance penetration of 37.716% (column 1). The life insurance penetration increases with the economic development level in the Sub-Saharan African (SSA). The life

[5]The data on year-to-year variations in rainfall are from the National Aeronautics and Space Administration (NASA) Global Precipitation Climatology Project (GPCP), version 2.1 (Adler et al., 2003). These data are available from 1979 and to 2009. The rainfall data come at a high resolution (0.5°x0.5° latitude-longitude grid) and each rainfall observation in a given grid is constructed by interpolation of rainfall observed by all stations operating in that grid. Rainfall data are then aggregated to the country level by assigning grids to the geographic borders of countries (Bruckner, 2011).

expectancy and the young dependency ratio have a negative effects while the old dependency ratio positively influences the life insurance penetration. This result is more robust to including other variables in the regression (column 2 to 6). The positive effect of income in the SSA region is identical of previous studies with different samples and also show that as income increases, the life insurance penetration also increases (Fortune; 1973, Beenstock and al.; 1986, Browne and Kim; 1993, Outreville; 1996 and Beck and Webb; 2003). The negative effect of life expectancy is explained by the decrease of the mortality risk following the increase of life expectancy driving to reducing in the life insurance consumption. As for the negative effect of the young dependency ratio, it is explained by the fact that with a young dependency ratio high in a context of low income (ASS), the households are not able to satisfy their current needs to think about old-age insurance subscription and this leads to a decrease of life insurance consumption. Indeed, Chang and Lee (2012) showed that the life expectancy and to the young dependency ratio have negative effects on the life insurance penetration in countries where the income level is low, which is true with our results. Then, Beck and Webb (2003) and Feyen and al (2011) also found a negative relationship between the young dependency ratio and the life insurance penetration. However, the positive effect of the old dependency ratio on the life insurance penetration indicates that the demand for life insurance products increases with the aging population; which is verified by the development of the life insurance in developed countries. Furthermore, the different effects of young and old dependency ratios reinforce our choice to use them separately in our estimates. As for the other economic variables namely the real interest rate ant financial development, they have no significant effect on the life insurance penetration in our sample.

Table 2: The determinants of life insurance penetration, in a Panel 1996-2011

	Insurance premiums (%GDP): IV-GMM					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	0.2257***	0.224***	0.223***	0.225***	0.252***	0.225***
	(0.07570)	(0.0777)	(0.0800)	(0.0799)	(0.0792)	(0.0769)
Life expectancy	-0.0313***	-0.0315***	-0.0368***	-0.0318***	-0.0327***	-0.0316***
	(0.007462)	(0.00941)	(0.0103)	(0.00968)	(0.00949)	(0.00936)
Young Dependency	-0.0160***	-0.0174***	-0.0175***	-0.0173***	-0.0154***	-0.0174***
	(0.004222)	(0.00487)	(0.00507)	(0.00496)	(0.00517)	(0.00489)
Old Dependency	0.10031***	0.115***	0.134***	0.113***	0.101***	0.113***
	(0 .02978)	(0.0347)	(0.0420)	(0.0355)	(0.0314)	(0.0364)
Real Interest rate		-0.000757	-0.000998	-0.000787	-0.000943	-0.000764
		(0.000610)	(0.000792)	(0.000645)	(0.000716)	(0.000600)
Financial_depth		-0.00131	-0.000683	-0.00138	-0.00127	-0.00124
		(0.00380)	(0.00390)	(0.00407)	(0.00406)	(0.00387)
Property_Rights			0.156*			
			(0.0904)			
LawOrder				-0.0758		
				(0.162)		
Fiscal_Freedom					-0.123*	
					(0.0674)	
Government_stability						0.0202
						(0.0789)
	First stage estimation					
Log (Rainfall) lagged one year	-0.10639*	-0.09585*	-0.09601*	-0.09513*	-0.09561	-0.09668*
	(0.0562)	(0.0548)	(0.05589)	(0.05729)	(0.0588)	(0.0557)
Real per capita GDP lagged two years	0.74773***	0.76625***	0.76687***	0.7668***	0.73529***	0.7669***
	(0.09410)	(0.09188)	(0.09139)	(0.09139)	(0.0928)	(0.09281)
Year dummies	Yes	yes	yes	yes	yes	yes
Observations	257	246	240	246	240	246
Centered R2	0.457	0.467	0.490	0.469	0.487	0.467
Number of id	20	20	20	20	20	20
Hansen J-OID test p-value	0.2838	0.3043	0.3025	0.2837	0.3095	0.3085
Cragg-Donald Wald F statistic	212.511	225.041	195.287	221.777	223.538	223.66
Kleibergen-Paap rk Wald F statistic	32.615	36.732	28.925	37.068	32.557	35.80
Critical value of Stock and Yogo (10%)	19.93	19.93	19.93	19.93	19.93	19.93

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To correct the effects of scale, we have divided GDP per capita by 1000. For the first stage estimation results, we have presented only the coefficients of the instruments, but all the exogenous variables are included in the regressions.

The third group of results (column 3-6 of Table 2) that is to say with the legal and political variables also confirm that the real income per capita and demographic variables are significantly correlated with the life insurance penetration. The quality of the judicial system (LawOrder) and political stability (Government_stability) have not significant effect on the life insurance penetration. In contrast, the property rights (Property_Rights) positively influences the life insurance penetration at 10% level of significativity and fiscal freedom is a measure of the tax burden imposed by Government is proved to be negatively significant for the life insurance

penetration. Thus, the life insurance penetration is higher if the government relaxes the taxes for this sector. This result corroborates the work of Dragos and Dragos (2013) in a sample of 31 European countries.

Table 3: The determinants of life insurance density in a Panel 1996-2011

	Log (Insurance premiums per capita) : IV-GMM					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Log (GDP per capita)	1.023**	0.835*	1.162**	0.866**	1.037**	0.804*
	(0.445)	(0.439)	(0.503)	(0.436)	(0.465)	(0.452)
Life expectancy	-0.0886***	-0.0807***	-0.0823***	-0.0834***	-0.0858***	-0.0794***
	(0.0203)	(0.0258)	(0.0252)	(0.0261)	(0.0253)	(0.0262)
Young Dependency	0.0355**	0.0328*	0.0352*	0.0337*	0.0314*	0.0328*
	(0.0152)	(0.0183)	(0.0186)	(0.0185)	(0.0178)	(0.0183)
Old Dependency	0.159	0.136	0.0681	0.130	0.113	0.155
	(0.115)	(0.126)	(0.151)	(0.127)	(0.128)	(0.138)
Real interest rate		0.00315	0.00237	0.00301	0.00158	0.00324
		(0.00257)	(0.00254)	(0.00259)	(0.00246)	(0.00260)
Financial_depth		0.00287	0.00299	0.00196	0.00457	0.00224
		(0.00617)	(0.00614)	(0.00609)	(0.00643)	(0.00608)
Property_Rights			0.533*			
			(0.295)			
LawOrder				-0.263		
				(0.373)		
Fiscal_Freedom					-0.407**	
					(0.202)	
Government_stability						0.313*
						(0.175)
	First stage estimation					
Log (Rainfall) lagged one year	-0.07796*	-0.0602	0.05538	-0.05655	-0.0539	-0.05402
	(0.04025)	(0.03981)	(0.0396)	(0.03991)	(0.04133)	(0.03812)
Real per capita GDP lagged two years	0.2252***	0.2388***	0.2078***	0.24194***	0.21798***	0.23383***
	(0.0368)	(0.0374)	(0.03772)	(0.0371)	(0.0338)	(0.0363)
Year dummies	yes	Yes	Yes	Yes	Yes	Yes
Observations	257	246	240	246	240	246
Centered R2	0.527	0.520	0.557	0.522	0.563	0.521
Number of id	20	20	20	20	20	20
Hansen J-OID test p-value	0.9175	0.9613	0.9223	0.9975	0.9346	0.9784
Cragg-Donald Wald F statistic	44.33	44.30	31.90	44.889	38.700	44.458
Kleibergen-Paap rk Wald F statistic	22.32	23.62	17.77	24.380	23.959	22.890
Critical value of Stock and Yogo (10%)	19.93	19.93	19.93	19.93	19.93	19.93

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. For the first stage estimation results, we have presented only the coefficients of the instruments, but all the exogenous variables are included in the regressions.

The estimations on life insurance penetration are replicated with the logarithm of the life insurance density and are reported in Table 3. The results indicate that the income level in logarithm explain the variation in life insurance density in all the regressions. We observe that the

income elasticity of life insurance demand is greater than unity: which signify that a variation income per capita leads to a greater variation of life insurance density (column 1, 3, and 5). Thus, the results show that the life insurance is a luxury good in our sample of SSA countries. This result was also found by Ward and Zurbruegg (2002) indicating that the estimated effect of income on the life insurance development is higher for developing economies in Asia than for developed countries in OECD. The effect of life expectancy remains negative while the effect of the young dependency ratio becomes positive with the life insurance density. Thus, we can say that the impact of demographic factors on life insurance depends on the measure of life insurance. As for the old age dependency ratio, its effect on the life insurance density is not significant but remains positive sign. The effect of financial development and real interest on the life insurance density remains not significant. Furthermore, the effect of the quality of the judicial system (LawOrder) on the life insurance density remains insignificant as in the case of the life insurance penetration while the property rights (Property_Rights) is also significant. This result confirms that of Avram et al. (2010) which showed that the property rights influence positively the life insurance density. Finally, the political stability has a positive effect on the life insurance density. Thus, we confirm the results of Ward and Zurbruegg (2002) which showed that the political stability exerts a significant impact on life insurance demand both in developed and developing countries. As for fiscal freedom, its sign remains negative and significant on the life insurance density as above with the life insurance penetration.

5.2. Robustness checks

In this subsection, we conducted additional analyzes to confirm the robustness of our findings above. We add the variables identified in the literature likely to affect the life insurance premiums. These additional variables are enrollment rate at the secondary (Education), foreign direct investment inflows (FDI), remittances inflows and the mandatory contribution rate for social security (Social_Security) as a proxy for the size of the social security. We replace the young and old dependency ratios by the dependency ratio (ratio of people younger than 15 or older than 64 to population ages 15-64) in order to capture the overall effect as it has been done in one of the previous studies (Chang and Lee, 2012). These variables are also from the database of the World Bank.

The results of estimation to instrumental variable (IV) with heteroscedasticity correction are reported in Tables 4 and 5. The diagnostic statistics are favorable because the over-identification test of Hansen and the weak instruments of Cragg-Donald show that all our instruments are valid.

The results are qualitatively the same; which confirms the robustness of our results. The income per capita remains a significant determinant of life insurance penetration, as well as demographic factors preserve their signs (Table 4). The size of the social security negatively influences the life insurance penetration (column 2), while foreign direct investment exert a positive effect. The negative impact of social security suggests that a social security system well-developed reduces incentives and the need to buy pension products of the life insurance sector. The work of Ward and Zurbruegg (2002) and Feyen and al (2011) also found a negative effect of social security on the life insurance consumption which reinforces our results. The positive effect of foreign direct investment was also found by Carson et al (2014). The remittances reduce the insurance penetration (column 1) and that is justified to the extent that the funds received from migrants constitute a sort of life insurance for other family members stayed in the country. According to the institutional indicators, they retain all their sign but only the governmental stability has a significant positive effect on the life insurance penetration.

Tableau 4: Additional variables on the determinants of life insurance penetration

	Insurance premiums (%GDP): IV-GMM							
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP per capita	0.4537***	0.3899***	0.4434***	0.5110***	0.4480***	0.5191***	0.4478***	0.5173***
	(0.1152)	(0.0946)	(0.1504)	(0.1541)	(0.1233)	(0.1564)	(0.168)	(0.1431)
Life expectancy	-0.0259***	-0.0256	0.0122	0.00184	-0.0193	0.00386	0.0154	-0.00534
	(0.00992)	(0.0201)	(0.0160)	(0.0155)	(0.0179)	(0.0141)	(0.0169)	(0.0145)
Dependency_age	-0.0128***	-0.0221***	-0.0277***	-0.0207***	-0.0185***	-0.0204***	-0.0259**	-0.0196***
	(0.00419)	(0.00603)	(0.00997)	(0.00717)	(0.00692)	(0.00713)	(0.0107)	(0.00710)
Realint	0.00103	-7.65e-05	-8.19e-05	0.000157	-0.000238	0.000153	-0.000603	0.000229
	(0.00107)	(0.00138)	(0.00243)	(0.00160)	(0.00128)	(0.00155)	(0.00273)	(0.00144)
Financial_depth	-0.00474	-0.00361	-0.00122	-0.00348	-0.00948	-0.00366	-0.00156	-0.00440
	(0.00532)	(0.00609)	(0.00754)	(0.00583)	(0.00668)	(0.00573)	(0.00786)	(0.00563)
Social_Security		-0.00389*	-0.00190				-0.00169	
		(0.00197)	(0.00201)				(0.00232)	
FDI		0.0106***	0.0151***	0.0144***	0.0118***	0.0142***	0.0142***	0.0142***
		(0.00315)	(0.00424)	(0.00331)	(0.00363)	(0.00347)	(0.00458)	(0.00365)
Remittance	-0.0126**							
	(0.00517)							
Education			-0.00270	-0.00213	-0.0102**	-0.00211	-0.00284	-0.00123
			(0.00506)	(0.00425)	(0.00490)	(0.00425)	(0.00510)	(0.00418)
Property_Rights				0.0324				
				(0.125)				
LawOrder					-0.399			
					(0.258)			
Fiscal_Freedom						-0.0234	-0.0209	
						(0.0783)	(0.143)	
Government_stability								0.208***
								(0.0701)
Year dummies	Yes	Yes	No	No	Yes	No	No	No
Observations	218	144	109	153	155	153	107	155
Centered R2	0.525	0.531	0.427	0.412	0.503	0.410	0.428	0.421
Number of countries	20	12	12	17	17	17	12	17
Hansen J-OID test p-value	0.9003	0.9623	0.4736	0.7556	0.7051	0.7502	0.4048	0.8843
Cragg–Donald stat	118.840	50.927	145.002	213.497	166.652	217.463	117.914	238.612
Critical value (10%)	19.93	9.08	9.08	9.08	9.08	9.08	9.08	9.08

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To correct the effects of scale, we have divided GDP per capita by 1000. For the first stage estimation results, we have presented only the coefficients of the instruments, but all the exogenous variables are included in the regressions.

The results of estimation on the life insurance density with added variables (Table 5) also confirm the effects of different variables on the life insurance density. Thus, the life insurance remains a luxury good in SSA because income elasticities are all greater than unity. However, the social security, the education and the remittance have not significant impact on the life insurance density. In addition, the institutional variables such as the tax burden (Fiscal) and the governmental stability (Government_stability) have significant effects and retain their sign on the

life insurance density. The effect of property rights (Property_Rights) on the life insurance density remains also significant while that of the rule of law (LawOrder) is not significant.

Tableau 5: Additional variables on the determinants of life insurance density

	Log (Insurance premiums per capita) : IV-GMM							
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (GDP per capita)	1.248**	2.02723**	2.369***	1.988***	1.627**	2.543***	2.3538***	2.821***
	(0.576)	(0.5521)	(0.531)	(0.613)	(0.623)	(0.545)	(0.6717)	(0.505)
Life expectancy	-0.076***	-0.050***	0.00180	-0.074*	-0.094**	-0.0296	-0.01646	-0.0308
	(0.0246)	(0.01802)	(0.0354)	(0.0404)	(0.0402)	(0.0281)	(0.0325)	(0.0311)
Dependency_age	0.0439***	-0.00697	0.0186	0.0550**	0.0596**	0.0226	0.0098	0.0290
	(0.0166)	(0.01328)	(0.0319)	(0.0265)	(0.0269)	(0.0222)	(0.0329)	(0.0240)
Real interest rate	0.00478	0.00496	0.00290	0.00192	0.00207	0.00196	0.00109	0.00261
	(0.00353)	(0.00345)	(0.00373)	(0.00291)	(0.00299)	(0.00282)	(0.0042)	(0.00276)
Financial_depth	0.00438	0.03125***	0.0243***	0.00502	0.00392	0.0185**	0.0220**	0.0171**
	(0.00666)	(0.00847)	(0.00897)	(0.00844)	(0.00755)	(0.00806)	(0.0111)	(0.0080)
Social_Security		0.006813	0.00297				-0.00009	
		(0.0074)	(0.00720)				(0.0075)	
FDI (% GDP)		0.029252***	0.0300***	0.0165*	0.0134	0.0344***	0.0353***	0.0294***
		(0.01032)	(0.00887)	(0.00893)	(0.00920)	(0.00797)	(0.0095)	(0.00761)
Remittance (%GDP)	-0.0204							
	(0.0136)							
Education			0.0128	0.00668	0.00433	0.0131	0.011763	0.0124
			(0.0151)	(0.0107)	(0.0112)	(0.0124)	(0.0142)	(0.0130)
Property_Rights				0.702**				
				(0.342)				
LawOrder					0.739*			
					(0.428)			
Fiscal_Freedom						-0.611**	-0.71694	
						(0.237)	(0.48567)	
Government_stability								0.555***
								(0.177)
	First stage estimation							
Log (Rainfall) lagged one year	-0.06351	-0.08844*	-0.02789	-0.01795	-0.02382	-0.03114	-0.03454	-0.03331
	(0.03992)	(0.05118)	(0.0437)	(0.04328)	(0.04350)	(0.04113)	(0.04334)	(0.03965)
Real per capita GDP lagged two years	0.1753***	0.18978***	0.27392***	0.26195***	0.2682***	0.2764***	0.2566***	0.2886***
	(0.02933)	(0.03593)	(0.0381)	(0.04644)	(0.04552)	(0.03631)	(0.0412)	(0.03920)
Year dummies	yes	no	no	yes	yes	no	no	no
Observations	222	147	114	159	161	159	110	161
Centered R2	0.556	0.5398	0.546	0.610	0.620	0.569	0.5653	0.558
Number of id	20	12	12	17	17	17	12	17
Hansen J-OID test p-value	0.7563	0.7319	0.8285	0.5325	0.4474	0.8457	0.9206	0.8807
Cragg-Donald Wald F stat.	23.672	24.508	47.811	26.344	29.887	41.331	28.220	48.121
Kleibergen-Paap rk Wald F stat.	19.987	16.671	27.473	16.203	17.885	30.219	20.241	28.406
Critical value of Stock and Yogo (10%)	19.93	19.93	19.93	19.93	19.93	19.93	19.93	19.93

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. For the first stage estimation results, we have presented only the coefficients of the instruments, but all the exogenous variables are included in the regressions.

5.3. Exploring of role of the institutions quality in the economic development effect

Even though the developing countries share some common characteristics, there are some differences between them, including, their socio-political and institutional contexts. Furthermore, even though our results above show that the income per capita is a significant determinant of life insurance development, we believe that the heterogeneity in terms of the quality of the legal and policy environment can affect the life insurance level but also on the impact of the economic development level on the life insurance penetration. In this context, we test five possible sources of heterogeneity: the property rights, the rule of law, the fiscal freedom, the government stability and the colonization proxies by legal system. Indeed, the literature has shown that the financial sector is generally more developed in the British legal system countries where the judicial system stresses on the private rights of individuals including their property rights (La Porta and al. 1998). In return, in the legal system of French origin, the government plays an important role in the financial sector particularly in the insurance sector by the presence of social security companies that may be competitors of the life insurance companies.

To capture the role of the quality of the judicial and political system in the relationship between income per capita and the life insurance penetration, we define the following equation:

$$y_{it} = \alpha' + \beta_1' * GDP_{it} + \beta_2' * I_{it} + \beta_3' * GDP_{it} * I_{it} + \beta_4' * X_{it} + \mu_i' + \gamma_t' + \varepsilon_{it} \qquad (3)$$

Where y_{it} is life insurance penetration and I_{it} represents the institutional indicators that measures the strength of the domestic institutions for the country i in period t. Here, we empirically test that, $\beta_3' = 0$, the coefficient on the interaction term between GDP per capita and institutional variable is statistically significant. The underlying assumption is that the quality of institutions is likely to improve or reduce the impact of income per capita on the life insurance premiums. Thus, if $\beta_3' < 0$, the effect of income per capita on the life insurance penetration is weak in countries where high-quality institutions. And, if $\beta_3' > 0$, the effect of GDP per capita on life insurance penetration increases with the quality of institutions. In summary, the total marginal effect of real income on the life insurance penetration measured by: $\delta = \beta_1' + \beta_3' * I_{it}$ means that the reactivity of the life insurance penetration that result to the variation of income depends on the quality of institutions (I_{it}).

We estimate the equation (3) by always using the heteroskedastic-efficient two-step generalized method of moments (IV-GMM) estimator developed by Baum and al (2007). In addition to the instruments used in estimate equation (2) above, the variable of interaction between the institutions quality and rainfall lagged two years is also used as an instrument. The estimation results of the fixed effect panel with instrumental variable are reported in Table 6. The diagnostics tests of the first stage show that our estimates are robust because in all regressions, the over-identification test of Hansen and weak instruments of Cragg-Donald are valid.

In column (1), the estimated coefficient of the interaction between the protection of property rights and real GDP per capita is negative and significantly different from zero. Thus, there is an unfavourable effect of property rights on the impact of GDP per capita on life insurance penetration. Indeed, the impact of economic development is weak in the countries whose private property rights are high. All countries in the sample that are below the threshold, the effect of income on life insurance penetration is weak while it is high for countries at above the threshold.

Columns (2), (3) and (4) indicate that the quality of the judicial system (rule of law), the fiscal freedom and the political stability not significantly influence the impact of income on the life insurance penetration because the interaction coefficients are not significant. Furthermore, we observe that the effect of income per capita differs widely between the French and British legal system countries. The coefficient of interaction with the French legal system (column 5) is significantly negative which suggests that the marginal effect of income per capita on the life insurance penetration is low for French legal system countries. Specifically, a 1% increase in GDP per capita leads to a 0.5366% increase in life insurance penetration for non-French legal country. This compares with a 0.0071% increase for a country in French legal system ceteris paribus. This situation is explained by the strong presence of the state in the economic system of the French legal system countries through the creation of social security companies for employees of public and private sector.

Tableau 6: Heterogeneity in the economic development effect on life insurance penetration.

	Insurance premiums (%GDP): IV-GMM				
VARIABLES	(1)	(2)	(3)	(4)	(5)
GDP per capita	0.345***	0.627**	0.202**	0.285***	0.53663***
	(0.100)	(0.313)	(0.0923)	(0.0942)	(0.13910)
GDP per capita*Property_Rights	-0.327***				
	(0.119)				
Property_Rights	0.258***				
	(0.0819)				
Life expectancy	-0.0273***	-0.0426***	-0.0407***	-0.00651	-0.0240***
	(0.00968)	(0.0104)	(0.00852)	(0.00487)	(0.00679)
Young Dependency	-0.0152***	-0.0155***	-0.0111**	-0.0296***	-0.0081**
	(0.00464)	(0.00469)	(0.00439)	(0.00530)	(0.00369)
Old Dependency	0.0640	0.121***	0.0758**	0.0965***	0.04904*
	(0.0403)	(0.0347)	(0.0324)	(0.0361)	(0.02549)
Real interest rate	0.000367	-0.000770	-0.000775	-0.000892	0.000392
	(0.000690)	(0.000584)	(0.000724)	(0.000574)	(0.00042)
Financial_depth	-0.000461	-0.00106	-0.00332	0.00548**	-0.003648
	(0.00365)	(0.00363)	(0.00375)	(0.00257)	(0.00326)
GDP per Capita*LawOrder		-0.751			
		(0.517)			
LawOrder		0.406			
		(0.297)			
GDP per capita*Fiscal_Freedom			0.0777		
			(0.0630)		
Fiscal_Freedom			0.127		
			(0.0966)		
GDP*Government_stability				-0.116	
				(0.0992)	
Government_stability				0.159**	
				(0.0774)	
GDP per capita*French					-0.5295***
					(0.1400)
	First stage estimation				
Log (Rainfall) lagged one year	-0.10288**	-0.07937*	-0.07957	0.08997**	-0.06361
	(0.05124)	(0.04593)	(0.04868)	(0.03777)	(0.05391)
Rainfall*Institutions indicators lagged two years	0.023407	-0.1220***	-0.14017*	-0.004281	-0.07708
	(0.02871)	(0.04960)	(0.07340)	(0.00396)	(0.08816)
Real per capita GDP lagged two years	0.58626***	0.41410***	0.67453***	0.7350***	0.53198***
	(0.08779)	(0.12589)	(0.09894)	(0.07824)	(0.0886)
Year dummies	yes	yes	yes	no	yes
Observations	236	246	236	246	246
R-squared	0.514	0.491	0.482	0.411	0.506
Number of id	20	20	20	20	20
Hansen J-OID test p-value	0.3827	0.3052	0.0940	0.7137	0.3762
Cragg-Donald Wald F stat.	117.929	47.772	110.430	195.388	80.596
Kleibergen-Paap rk Wald F stat.	18.058	6.986	31.707	48.476	18.908
Critical value of Stock and Yogo (5%)	13.91	13.91	13.91	13.91	13.91

Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. To correct the effects of scale, we have divided GDP per capita by 1000. For the first stage estimation results, we have presented only the coefficients of the instruments, but all the exogenous variables are included in the regressions.

6. Conclusions and Policy Implications

In this paper we explored the main factors that drive the development of the life insurance sector and the role of the institutions quality in development economic effect on life insurance penetration in 20 countries of Sub-Saharan Africa from 1996 to 2011. Our work contributes to the empirical literature by using at a time the life insurance penetration and density as a measure of the life insurance sector development and adding explanatory variables such as the quality of the legal and political system.

The results of the life insurance regressions confirm some of the findings of previous empirical research on life insurance and add some additional findings. We find that income per capita is an important determinant of life insurance and that life insurance is a luxury good in Sub-Saharan African country. The impact of economic development on the life insurance depends on socio-political and institutional contexts. The demographic factors such as the life expectancy and the young dependency ratio have a negative and significant influence on the life insurance penetration and insurance density. In return, when the old dependency ratio increases, the life insurance penetration increases. Finally, the results show that the quality of the legal and political environment improves the emergence of the life insurance sector. In addition, an increase in the size of the social security system hinders the life insurance sector development, by partly reducing the need for insurance but also by reducing the level of disposable income net of taxes and contributions.

Generally, these results provide a number of important policy implications. The positive effect of private property rights on life insurance suggests that a better legal system with improved private property rights would facilitate rapid development of the life insurance sector. Then, the positive effect of political stability recommends the pursuit of reforms in the political environment in order to strengthen investor confidence in the insurance sector, particularly the life insurance.

However despite the contribution of this work, it has some limits that the future research could take into account the factors that influence the insurance sector development. For example, the future studies could include the variables such as population density, structure and regulation of the life insurance market. In addition the study could be expanded to non-life insurance sector.

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Appendix

Table A-1: Determinants of life insurance and their expected sign

Variables	Expected sign	Justifications
Economic variables		
Income	+	The increase in income per capita should lead to an increase in life insurance consumption because individuals will have enough means to subscribe to an insurance with the aim to maintain their income in case of death.
Real interest rate	+/-	The increase in real interest rate increase the profitability of insurer's placements who in turn will provide the strong financial assessment and to attract the potential life insurance applicants (Beck and Webb, 2003). But an increase in interest rate can leads to a substitution of the life insurance to bank deposits
Financial development	+	The financial development contributes to strengthening the confidence of the life insurance consumer's
Social Security	-	The increase in government spending in the social security reduces the need for individuals to acquire a protection through the life insurance
Institutional variables		
Property Rights	+	A strengthening of property rights makes it more favorable legal and regulatory framework for the insurance industry development
Rule of Law	+	An improvement of Rule of Law in a country reinforce the protection and the application of the property right for to facilitate the life insurance transaction
Fiscal Freedom	-	An increase of the tax burden have a negative effect on the premiums and the profits of life insurance companies, thus a reduction of the insurance industry development.
Government stability	+	The political instability shackle the financial development and consequently a stable political environment stimulates the life insurance development.
Demographic variables		
Life expectancy	+/-	A high life expectancy leads to an increase of the savings component through life insurance especially the annuity component and / or decrease the mortality risk component
Young dependency ratio	+/-	Increasing the mortality risk component and/or decreasing the savings component
Old dependency ratio	+/-	Increasing the saving component and/or the mortality risk component

Table A-2: List of countries

Angola, Angola, Botswana, Burkina, Cameroon, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Sénégal, Tanzania, Togo, Uganda, Zambia.

Table A-3: Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Life insurance penetration	288	0.2722882	0.3521372	0.011	2.645
Life insurance density	288	456.0538	665.5353	0.427174	2885.916
GDP per capita	320	1082.384	1671.193	129.5231	7628.723
Life expectancy	320	52.64017	5.153914	40.77578	63.7989
Young Dependency Ratio	320	5.836393	1.176905	4.7655	11.24931
Old Dependency Ratio	320	85.32202	9.746554	54.42328	105.1271
Dependency ratio	320	91.15841	9.552795	60.07084	110.5901
Real interest rate	298	8.330733	14.28889	-94.21996	93.91508
Financial development	317	23.66522	8.712524	6.914201	54.03433
Property_Rights	312	0.6209207	0.2276376	0	1
LawOder	300	0.4904445	0.2323199	0	1
Fiscal_Freedom	312	0.4304792	0.2672678	-7.27e-08	1
Government_stability	300	0.3503111	0.195411	-3.98e-07	1
Social Security	189	3.985979	6.855506	0	33.61
FDI	320	3.399121	4.392516	-8.589433	40.16725
Education	196	29.80096	17.37159	5.16489	81.70265
Remittance	285	2.259679	2.855364	0.000197	13.0426
French	320	0.4	0.4906652	0	1