1. Introduction

In the course of recent years, insurance sector in particular its life branch, in developing countries knows an increase even if the level of development of this one remains low comparatively to developed countries. Indeed, life insurance penetration in economy (life insurance premiums total volume as a percentage of GDP) of low and middle income countries rose from 0.19% of GDP in 1996 to 0.30% in 2011, while at the world level, it rose from 0.43% to 0.70 and this one of high-income countries 2.01 percent to 2.20 in the course of the same period[1].Thus, life insurance premiums have increased by 60.21% in low and middle income countries, while it has increased that 9.43% in high-income countries for period 1996 to 2011. This shows that the relative share of life insurance sector in domestic economy increases faster in developing countries than at the world level and at developed countries level.

Development of life insurance sector like all the financial intermediaries has a significant training effects on economy. Life insurance companies all as the contractual savings institutions, in addition to offer a social protection to economic agents, are specialized in mobilization of domestic savings from many small investors; and to channel it to productive investment opportunities (Dickinson, 2000). In addition, the insurance companies all as mutual fund companies of investment and retirement are the largest institutional investors on the stock, bond and real estate markets (Haiss and Sümegi, 2008). For example, life insurance companies as investment vehicle, incite to a higher level of specialization and professionalism of the part of financial market participants (enterprises and financial institutions). This allows to finance the projects that are more daring, to exploit the economies of scale by reducing the transaction costs and to encourage the financial innovation (Catalan et al., 2000; Impavido et al., 2003). In this context, it is interesting to know if the development of life insurance sector contributes to economic growth in developing countries.

Furthermore, since first session in 1964, UNCTAD formally acknowledged that *"a sound national insurance and reinsurance market is an essential characteristic of economic growth[2]".* In the stride, the economic literature (Ward and Zurbruegg, 2000; Webb et al., 2002; Kugler and Ofoghi, 2005) has shown that the economic growth and the development of

[1] Martin Čihák, Aslı Demirgüç-Kunt, Erik Feyen, and Ross Levine, 2012. "Benchmarking Financial Systems Around the World." World Bank Policy Research Working Paper 6175, World Bank, Washington, D.C.
[2] Proceedings of the United Nations Conference on Trade and Development (1964), Final Act and Report, p.55, annex A.IV.23.

insurance sector are interdependent and that an economy without insurance services would be much less developed and stable. Indeed, a sector of insurance more developed and in particular life insurance provides long and stable maturity funds for development of public infrastructure and at the same time, reinforce the country's financing capacity (Dickinson, 2000).

However, until now, most of the empirical works on financial sector have focused more on effect of banking sector and stock market on economic growth (Beck and Levine, 2004). Although, the literature (Skipper, 1997) has highlighted the contribution to life insurance sector on economic growth, it has hardly been studied empirically especially in developing countries and those with low-income. The empirical studies on impact of the development of life insurance sector on growth are more focused on developed and emerging countries (Ward and Zurbruegg, 2000; Webb et al., 2002; Arena, 2008; Avram et al. 2010; Chen et al. 2012; Lee et al, 2013; etc.).

In this context, the goal of this paper is to contribute to literature, by assessing the empirical effect of the development of life insurance on economic growth and to highlight heterogeneity of life insurance effect among countries. Thus, the sample is constituted of 86 developing and emerging countries[3] over the period 1996-2011. Firstly, we use a linear model to analyze the direct effect of life insurance premiums on real GDP per capita growth and secondly, we test the presence of non-linearity in impact of life insurance penetration. To accomplish this task, the regressions are realized by the method of instrumental variables developed by Baum et al. (2007) in order to overcome at best the endogeneity bias that arise from reverse causality and / or omitted variables. Thus, we used the percentage of the Muslim population and life insurance penetration lagged two periods as instruments of the development of life insurance. In addition, the legal origin code is used as instrument for banking and stock market variables in non-linearity model.

The contribution of this study to empirical literature is at two levels. Firstly, this study provides empirical evidence to literature on the relationship between life insurance and economic growth by using a much larger sample of developing countries compared to previous studies (Webb et al., 2002; Arena, 2008 and Chen et al, 2012). Secondly, we highlight the presence of heterogeneity in impact of the development of life insurance on growth by including interaction variables. This allows us to go beyond the direct effect and to

[3]The choice of the sample size has been driven by the availability of the data over a long period.

analyze the conditional effects of impact of the development of life insurance on the economic growth in developing countries. These conditional variables are financial, income, regional and institutional. Thus, the conditional coefficients will allow also to know if life insurance effect is mitigated (negative coefficient) or magnified (positive coefficient) by these conditional variables.

The rest of the paper is organized as follows. Section 2 provides a brief review of empirical literature on the relationship between the development of life insurance market activity and economic growth. The section 3 presents the methodology of estimation and the different variables of this study. Section 4 presents and discusses our main results, while Section 4 concludes and draws some policy implications.

2. Review of the relationship between life insurance and economic growth literature.

In this section we shed light on the role of life insurance and its contribution to economic development and we do an overview of the main empirical conclusions by having analyzed the relationship between the development of life insurance and economic growth. A more detailed listing can be found in Appendix A-1.

Regarding to the life insurance supply, the existing studies (Skipper, 1997; Skipper and Kwon, 2007; Arena, 2008) have showed that the insurance industry contributes to economic growth. Indeed, insurance activity encourages the economic development through various channels: it reduces the costs of the necessary financing for firms, stimulates the investments and innovation by creating an economic environment that is more certain; insurers are strong partners in development of a social protection system of workers, in particular in the retirement and health coverage and as institutional investors, the insurers also contribute to the modernization of the financial markets and facilitate the accumulation of new capital by firms (Skipper, 1997; Dickinson, 2000; Skipper and Kwon, 2007; Njegomir and Stojić, 2010).

The empirical literature on the relationship between financial development and economic growth is more focused on banking development and financial market (Levine, 1998 and 1999; Levine and Zervos, 1998; Levine et al., 2000; Beck and Levine, 2004). Some research on the link between the economic growth and life insurance development are more concerned by the effects of growth on the consumption of life insurance rather than the inverse relationship (Outreville, 1996; Enz, 2000; Beck and Webb, 2003; Chang and Lee, 2012).

The literature has analyzed the role of life insurance on economic growth from several angles. First, there are studies which properly are concerned with the causality between life insurance premiums and economic growth. Thus, Ward and Zurbruegg (2000) indicate that in long run, there is a bidirectional causal relationship between real insurance premiums and real GDP for Australia, Canada, Italy, and Japan, whereas a unidirectional causality exist from real GDP to real insurance premiums for France. In interpreting the findings, the authors refer to cultural predispositions towards uncertainty avoidance (Hofstede, 1995; Fukuyama, 1995) and resulting propensity for insurance and the effects of regulation for explain this situation. Kugler and Ofoghi (2005) analyzed also the causality between insurance premiums and economic growth on the period 1966-2003 for United Kingdom. Through the Johansen cointegration test, they highlight a causality running from insurance to economic growth. Then, Webb et al. (2005) also found a bidirectional causality between life insurance and economic growth for a sample of 55 developed and emerging countries. By using a vector error correction model (VECM), Vadlamannati (2008) analyzed the short-run causality between life and non-life insurance and economic growth in India and indicated there is a bidirectional causality between life insurance sector and economic growth. In contrast, Adams et al. (2009) provided evidence of unidirectional causality running from insurance to economic growth, but with no reverse effect, in the case of Sweden. Finally, Lee et al. (2013) have used the cointegration technique to examine the relationship between life insurance premiums and growth in 41 countries according to their economic development level during the course of the period 1979-2007. The results show that there is a relationship of long-term equilibrium between real GDP per capita and life insurance demand. Thus, the estimated long-term results indicate that life insurance demand contributes positively to real GDP growth. Then, they also show the presence of bidirectional causality between life insurance premiums and economic growth at short-term and long-term.

In addition to the studies on the causality between life insurance premiums and economic growth, there are those which have analyzed the empirical impact of the development of life insurance on economic growth. Thus, Avram et al. (2010) have examined the relationship between insurance and economic growth over the 1980-2006 period using both Ordinary Least Squares (OLS) on cross-sectional data and Generalized Method of Moments (GMM) estimations on panel data. They found a positive effect of the insurance (life and non-life) on growth. They also show that at the disaggregated level, life insurance and non-life premiums per capita have a positively influence on economic growth. Then, Hou et al. (2012) have

studied the impact of financial institutions on economic growth on a panel of 12 European countries during the period 1980-2009. They use a fixed effects model and find that life insurance development and banking activity are important determinants of economic development. Finally, Keke and Houedokou (2013) have analyzed the contribution of insurance (life and non-life insurance) to economic growth in WAEMU[1] countries during the period 1999-2009. They also made a comparative analysis between the results of WAEMU countries and those of CEMAC[2]. The estimation of a dynamic panel grouping all the countries of the African Franc Zone did not provide clear results on the contribution of insurance sector to economic growth. Furthermore, the results conclude that there is no significant effect of life insurance on economic growth in the WAEMU and CEMAC zone, while the non-life[3] insurance has a significant effect.

Regarding the empirical analysis of nonlinear effects of life insurance on economic growth, Arena (2008) has showed that life insurance positively influences economic growth in 56 countries (both developed and developing). More specifically, he establishes that impact of life insurance on economic growth is driven by high-income countries only. Furthermore, the results indicate that the financial development and insurance sector have complementary effects on economic growth. In other terms, life insurance has a bigger impact on economic growth in country with stock market development deeper, particularly for intermediate and high stages of stock market development. As regards Chen et al. (2012), they have analyzed life insurance effect on economic growth and the conditions factors that affect the relationship between life insurance market and economic growth. Thus, the insurance-growth nexus varies across countries with different conditions. For example, the positive impact on economic growth is mitigated in middle-income countries, but amplified in low-income countries. Moreover, both the development of stock market and life insurance market are substitutes rather than complements.

Our study is in continuity of two previous studies (Arena, 2008 and Chen et al., 2012) by adopting the same methodology but differs in several levels. First, this study goes beyond that of Chen et al. (2012) by introducing the variables of the institutions quality and legal environment to analyze the heterogeneities. Indeed, the taking into account of the institutions

[1] WAEMU: West Africa Economic and Monetary Union includes Benin, Burkina Faso, Ivory Coast, Mali, Niger, Senegal, Togo and Guinea-Bissau.
[2] CEMAC: Central African Economic and Monetary Community includes Cameroon, Congo, Gabon, Equatorial Guinea, Central African Republic and Chad.
[3] Or IARD: Fire, Accident and Risk Various

quality as conditional factors is justified by the fact that the effect of institutional environment on the development of life insurance in high-income economies is not as significant as those in low-income economies (Outreville, 2008). Thus, according Outreville (2008), the quality of institutions has more effect in developing countries than in developed countries. Hence, the interaction variable between life insurance premiums and institutions quality also allows to capture to what extent the marginal effect of life insurance premiums is influenced by the quality of institutional environment. Secondly, unlike studies of Arena (2008) and Chen et al (2012) we use a larger sample of developing countries and a relatively long period (1996-2011) to take advantage on maximum information contained in the data. Finally, at the estimation method level, we use technique of instrumental variables (IV/GMM) developed by Baum et al (2007) that is robust in the presence of heteroscedasticity of the errors.

3. The econometric strategy and data

3.1. The econometric model and estimation method

Our empirical strategy to test the effect of the development of life insurance on economic growth, uses the methodology by Beck and Levine (2004) to analyze the empirical relationship between banks, stock markets and economic growth. Thus, our regression equation of growth is defined as follows:

$$Y_{i,t} - Y_{i,t-1} = \alpha * Y_{i,t-1} + \beta * INS_{i,t} + \delta' * X_{i,t} + \eta_t + \varepsilon_{i,t} \quad (1)$$

Where $(Y_{i,t} - Y_{i,t-1})$ is real GDP per capita growth[4], X represents a vector of control variables (population growth[5], index of human capital, domestic investment, inflation, government consumption, openness to trade and terms of trade), $Y_{i,t-1}$, the logarithm of initial GDP per capita to control the conditional convergence effect of the standard Solow-Swan growth theory and INS is life insurance penetration[6] defined as ratio of life insurance premiums to GDP. η_i is time fixed effects, $\varepsilon_{i,t}$ is the idiosyncratic error term and the subscripts i= 1,…, N

[4] We use the following approximation to calculate the real GDP per capita growth between t et $t-1$: $\frac{y_t - y_{t-1}}{y_t} = \frac{\Delta y_t}{y_t} \cong Ln(y_t) - Ln(y_{t-1})$.

[5] According to literature on growth regressions to Solow, authors such as Mankiw et al. (2002), Caselli et al. (1996) or Hoeffler (2002) make assuming of a rate of technical progress and of a depreciation rate of the physical capital constants, the sum of which is $\rho + d = 0.05$. This is why the variable of population used in the regressions is actually the logarithm of the sum of the population growth rate and 0.05.

[6] We also study an alternative measure of insurance development commonly used in the literature, life insurance density, to test the robustness of our results.

and t= 1,…, T represent country and time period, respectively. In equation (1), β is our coefficient of interest and allows to determine the direct effect of life insurance premiums on economic growth. We anticipate a positive sign for β. Furthermore, the convergence hypothesis between the economies studied suggests that the coefficient (α) of $Y_{i,t-1}$ is negative and significant in our growth model, ie $0 < 1 + \alpha < 1$.

To examine the heterogeneity for the effect of life insurance on economic growth, we specify an augmented version of equation (1) as follows:

$$Y_{i,t} - Y_{i,t-1} = \alpha' * Y_{i,t-1} + \beta' * INS_{i,t} + \rho * [INS_{i,t} * M_{i,t}] + \gamma * M_{i,t} + \theta' * X_{i,t} + \eta'_t + \varepsilon_{i,t} \quad (2)$$

Where $M_{i,t}$ represents the conditional variables of country-specific structural characteristics which are financial, economic development level, region and institutions quality and legal system.

The four categories of conditional variables defined above include variables described as follows: first, to determine whether the effect of life insurance demand on growth is influenced by the development of local financial institutions, we retain the private credit by deposit money banks to GDP, interest rate of bank deposits and stock market total value traded to GDP. Indeed, insurance market activity cannot only contribute directly to economic growth, by itself but also through complementarities with banking sector and stock market. Thus, by reducing information and transaction costs, pooling risk, enhancing financial intermediation through the channeling of savings to domestic investment, and fostering a more efficient capital allocation through the gathering of substantial firm information, insurance activity may contribute to reinforcing the process of resource allocation done by banks and capital markets (Arena, 2008). In contrast, life insurance sector activity may have a substitution effect with banking sector in the mobilization of savings by reducing the market shares of other financial systems particularly in developing countries (Allen and Santomero, 2001). Then, heterogeneity related to the economic development level is proxied by income per capita of country. Thus, we introduce dummies for Low and Middle income (LMY) and for Upper Middle income (UMC). Regional condition variables are defined by the dummies of Sub-Saharan Africa (SSA), Europe and Central Asia (ECA), Latin America and Caribbean (LAC), Middle East and North Africa (MNA), South Asia (SAS) and East Asia and Pacific (EAP). Finally, last category of conditional variable measures the institutions quality that are bureaucratic quality, control of corruption and Law and order. In addition to these institutional

indicators, we capture the overall effect of the institutions quality by the average of these three indicators (IQ). But before introducing these indicators in econometric estimates, we normalize them on a scale of 0-1 in order to facilitate the calculation of the composite index of the institutions quality (IQ) and comparisons of the different equations. A higher score represents a better institutional quality. We also analyze the effect of legal environment, by introducing the dummies for British legal system (British) and french (French).

From the equations (1) and (2), the marginal effect of life insurance premiums on economic growth can be determined as follows:

$$\frac{\partial(Y_{i,t} - Y_{i,t-1})}{\partial INS_{i,t}} = \beta \quad (3)$$

$$\frac{\partial(Y_{i,t} - Y_{i,t-1})}{\partial INS_{i,t}} = \beta' + \rho M_{i,t} \quad (4)$$

Equation (3) is obtained from equation (1) and aims at measuring the direct effect of life insurance premiums on growth (β). Equation (4) result of the equation (2); the term ($\rho M_{i,t}$) represents the indirect effect and ($\beta' + \rho M_{i,t}$) is the marginal effect of the development of life insurance on economic growth. More specifically, if $\beta' > 0$ and $\rho < 0$ then life insurance development has a positive link with economic growth and a negative coefficient for the variable $M_{i,t}$ apparently reduces positive impact of the particular life insurance development on economic growth. On the other hand, if $\beta' > 0$ and $\rho > 0$, then the conditional variable $M_{i,t}$ favorably affects that positive impact of the development of life insurance.

The estimate of the influence of life insurance premiums on growth (equation 1 and 2) by OLS estimator raises a number of problems of which the most important constitutes the endogeneity bias. Indeed, this problem may originate from a number of sources. The existence of a correlation between the dependent variable lagged and individual effects leads OLS estimators biased and not convergent. Also in the case of reverse causality or omission of variables, OLS estimator is inconsistent and biased. To face these problems, we draw on instrumental variables techniques and thus on several instruments to estimate the impact of the life insurance activity on economic growth. Thus, we instrument the development of life insurance by the percentage of the Muslim population and the value of life insurance premiums lagged two years. Indeed, previous studies have shown that Muslims believe that the purchase of life insurance is inconsistent with the Koran. Thus, they have found that the proportion of Muslim population has a negative and significant effect on the demand for life

insurance (Browne and Kim, 1993; Webb et al. 2002; Ward and Zurbruegg, 2002; Beck and Webb, 2003; Feyen et al, 2011).

However, even whether there are mechanisms to circumventing to formal assurance in the Muslims countries through the creation of Islamic insurance as Takaful insurance, we always note that in these countries a low consumption of life insurance. Thus, we think that the instrument is relevant. Then, by basing on work of Laporta et al. (1998), we use legal origin system dummy (English or French) as instruments of banking and stock market variables in our equation (2). In addition, life insurance indicator lagged two years and conditional variable is also used as instrument in our augmented equation (2). Thus, the equations (1) and (2) are estimated with the heteroskedastic-efficient two-step generalized method of moments (IV-GMM) estimator developed by Baum et al (2007), which generates efficient coefficients as well as consistent standard errors estimates. Indeed, the advantages of IV-GMM over IV are clear: if heteroskedasticity is present, the IV-GMM estimator is more efficient than the simple IV estimator, whereas if heteroskedasticity is not present, IV-GMM estimator is no worse asymptotically than the IV estimator (Baum et al. 2007).

3.2. Definition of data sources and statistical analyses

The data used in this study are annual data from 1996 to 2011 for 86 developing countries (see Appendix A-4 for countries list). Our main variable of interest, life insurance premiums total value to GDP measures the penetration of insurance activity in economy, and is obtained from the database «*Benchmarking Financial Systems Around the World*» of Čihák et al. (2012). To test, the robustness of our results, we have recourse to life insurance premiums per capita (life insurance density)[7] as an alternative measure of the consumption of life insurance. The financial condition variables such as the bank credit to private sector and rate of stock market transaction and bank deposit interest rate, also come from Čihák et al. (2012). Real GDP per capita growth defined by the logarithm difference of real GDP per capita is extracted from *World Development Indicators (2014)* compiled by the World Bank. Similarly, population growth, inflation rate, government consumption, openness to trade, terms of trade, dummies of the economic development level (Low and Middle income = LMY and Upper Middle income = UMC) and regional dummies (Sub-Saharan Africa, Europe and Central

[7] Life insurance density is calculated starting from the penetration of life insurance and real GDP per capita.

Asia, Latin America and Caribbean, Middle East and North Africa, South Asia and East Asia and Pacific) all taken from *World Development Indicators*. The human capital index is derived from *Penn World Table 8.0*. Finally, the variables of the institutions quality condition are extracted from *International Country Risk Guide (CGRI) database, (2013)* Appendix A-2 presents full definitions and sources of the different variables.

The table 1 presents descriptive statistics of our variables in basic model. There is considerable variation in share of life insurance premiums in GDP across countries, ranging from 0.001% in Albania (average 1996-2011) to 15.784% in South Africa (average 1996-2011). Real GDP per capita growth also shows variation, ranging from -0.165 in Madagascar to 0.2854 in Azerbaijan (both for 1996-2011). Most of the control variables also presents disparities between countries in the period.

Table 1: Summary statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
GDP per capita growth	1273	0.02496	0.0417	-0.1658	0.2854
Life insurance premiums (%GDP)	1286	0.76992	1.6402	0.001	15.784
Log(Initial GDP per capita)	1278	7.6326	1.3157	4.8638	12.556
Log (Population growth)	1237	0.5206	0.7726	-6.1170	2.8544
Index of Human capital	1087	2.2926	0.4877	1.1355	3.2680
Domestic Investment (%GDP)	1357	23.368	7.2737	4.142	57.991
Log (1+Inflation)	1299	2.8481	0.5252	-1.5977	8.332
Log (Government consumption)	1254	3.2229	0.3677	-0.5942	4.0631
Log (Degree of openness)	1334	4.2722	0.4702	2.7035	5.3954
Log (Terms of trade)	1315	4.6233	0.3292	3.3044	6.2480

4. Results of the estimates and discussions

4.1. Results of the basic model

Our results show that the development of life insurance activity is an important determinant of economic growth on the sample of 86 developing countries over the period 1996-2011[8]. The diagnostic tests on the efficient of IV-GMM estimator are presented in table 2 below. The quality of the instruments is validated by the statistics of Fisher and Hansen over-identification test of the first stage estimation results. Thus, the diagnostic test validates the instruments used.

Columns 1 to 4 of the table 2 indicate the results of life insurance penetration effect by controlling the other determinants of economic growth. We note that whatever the specifications, life insurance penetration has a positive and significant effect on real GDP per capita growth. This result suggests that life insurance demand contributes to economic growth in our sample of developing countries. Indeed, in terms of impact, the coefficient is between 0.0011 and 0.0017. Thus, on the basis of results of complete empirical model (column 4), an increase in one standard deviation in life insurance premiums to GDP, *ceteris paribus*, would imply an increase of 0.2132% in economic growth. This result is consistent with the theoretical of financial development of Patrick (1966) based "*supply-leading*" which stipulates that the financial development improves the economic growth. Thus, the insurance companies as well as mutual fund investment and pensions constitute one of main institutional investors in the stock, bond and real estate market that induce the economic growth. The results also confirm empirical studies that found that the development of life insurance significantly influences economic growth (Outreville, 1996; Webb et al., 2002; Arena, 2008; Haiss and Sümegi, 2008; 2008; Han et al. 2010; Lee, 2010; Chiu and Lee, 2012; Lee et al., 2013; etc.).

Regarding the control variables, real GDP per capita initial, population growth, inflation, degree of openness and terms of trade have negative effects on economic growth while the human capital and domestic investment positively influence the economic growth. Thus, the negative effect of the population is in conformity with the growth theory of Solow (1956) which stipulates that population growth reduced the quantity of capital per capita and

[8] We do not test the stationarity of variables because the time dimension is small (16 years) and according to Hurlin and Mignon (2006) for that the problematic of stationarity presents an interest, the time dimension of the panel must exceed 20 years.

therefore the product per capita. Moreover, the positive effect of human capital is in conformity with that found by Barro (1997) and suggests that an increase of investment in human capital is a growth stimulating factor. However, negative effect of Degree of openness and the terms of trade is against intuitive and which may be explained by the fact that the developing countries are more dependents of the imports.

Table 2: Base line: Two-step IV/GMM estimation of life insurance penetration impact on Economic growth

	Dependent Variable: GDP per capita growth			
VARIABLES	(1)	(2)	(3)	(4)
Life insurance premiums (%GDP)	0.00128***	0.00119***	0.00173***	0.00136***
	(0.000418)	(0.000410)	(0.000572)	(0.000453)
Log (Initial GDP per capita)	-0.00669***	-0.00688***	-0.00685***	-0.00657***
	(0.00124)	(0.00119)	(0.00131)	(0.00133)
Log (Population Growth)[9]	-0.00731***	-0.00753***	-0.00765***	-0.00707***
	(0.00158)	(0.00156)	(0.00163)	(0.00150)
Index of Human capital	0.0129***	0.0131***	0.0136***	0.0135***
	(0.00338)	(0.00329)	(0.00354)	(0.00351)
Domestic Investment (%GDP)	0.00169***	0.00166***	0.00179***	0.00166***
	(0.000205)	(0.000200)	(0.000209)	(0.000194)
Log (1+ Inflation)		-0.00987**	-0.00801*	-0.00995**
		(0.00398)	(0.00467)	(0.00450)
Log (Government consumption)			-0.00430	-0.00459
			(0.00366)	(0.00346)
Log (Degree of openness)				-0.00552**
				(0.00253)
Log (Terms of trade)				-0.0101**
				(0.00469)
Constant	0.00751	0.0373**	0.0417***	0.106***
	(0.0113)	(0.0152)	(0.0156)	(0.0280)
Year FE	Yes	Yes	No	Yes
Observations	795	771	736	702
R^2 Centered	0.318	0.332	0.228	0.352
Hansen J, p-value	0.3748	0.5120	0.3983	0.8281
First-stage F-statistic	477.601	589.089	666.607	640.773
(p-value)	0.0000	0.0000	0.0000	0.0000

Note: Life insurance variable is instrumented by percentage of the Muslim papulations and life insurance penetration lagged two period. Robust standard errors are in parentheses. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level.

In terms of robustness, we replace life insurance penetration by life insurance density as an alternative measure of indicator of the development of life insurance. The results are reported in table 3 below. As previously, we include the control variables to test the stability of the life insurance density effect on economic growth (columns 1 to 4). Column 4 integrates

[9] Referring to Mankiw et al. (1992), Caselli et al. (1996) and Hoeffler (2002), population growth rate has been adjusted for capital depreciation and growth rate of technical progress, the sum of which worth conventionally 0.05.

simultaneously all explanatory model as variables previously. We observe that the tests of diagnostic associated to the specification gives the satisfying results. For example, the statistic of Fisher Hansen J overidentification test (which is robust to heteroskedasticity) does not reject the validity of instrumental variables.

Table 3: **Robustness: Two-step IV/GMM estimation of life insurance density impact on Economic growth**

	Dependent Variable: GDP per capita growth			
VARIABLES	(1)	(2)	(3)	(4)
Log (1+life insurance per capita)	0.00216**	0.00215*	0.00253**	0.00196*
	(0.00104)	(0.00118)	(0.00123)	(0.00107)
Log (initial GDP per capita)	-0.00841***	-0.00874***	-0.00890***	-0.00821***
	(0.00165)	(0.00172)	(0.00173)	(0.00173)
Log (Population Growth)	-0.00672***	-0.00734***	-0.00710***	-0.00648***
	(0.00157)	(0.00167)	(0.00165)	(0.00149)
Index of Human capital	0.0124***	0.0132***	0.0136***	0.0137***
	(0.00339)	(0.00355)	(0.00359)	(0.00354)
Domestic Investment (%GDP)	0.00165***	0.00178***	0.00175***	0.00161***
	(0.000203)	(0.000204)	(0.000207)	(0.000193)
Log (1+ Inflation)		-0.00873**	-0.00796*	-0.00980**
		(0.00437)	(0.00467)	(0.00452)
Log (Government consumption)			-0.00382	-0.00409
			(0.00366)	(0.00346)
Log (Degree of Openness)				-0.00592**
				(0.00249)
Log (Terms of trade)				-0.00909*
				(0.00479)
Constant	0.00778	0.0417***	0.0518***	0.129***
	(0.0131)	(0.0147)	(0.0167)	(0.0306)
Year FE	Yes	No	No	Yes
Observations	792	768	733	699
R^2 Centered	0.318	0.226	0.226	0.351
Hansen J, p-value	0.2879	0.2803	0.2592	0.7002
First-stage F-statistic	65.906	68.791	26.076	83.277
(p-value)	0.0000	0.0000	0.0000	0.0000

Note: Life insurance variable is instrumented by percentage of the Muslim papulations and life insurance density lagged two period. Robust standard errors are in parentheses. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level

We generally find the same results as above with life insurance penetration. Indeed, in all the equations, life insurance density has a positive and significant effect on growth. Thus, in terms of impact, the logarithm of life insurance density coefficient is between 0.0019 and 0.0025. From column (4), a one standard deviation increase in the logarithm of the life premiums per capita would increase real GDP per capita growth by 0.3374%. Hence, we show that the positive impact of life insurance density on growth is conform to previous studies that have also used the life insurance density, such as those of Avram et al. (2010),

Lee (2010), Han et al. (2010), Lee and Chiu (2012), Lee et al. (2013), etc. The control variables also keep their sign as previously which confirms the robustness of our results. Similarly, initial GDP per capita is also significant.

4.2. Testing for heterogeneity in the life insurance-growth nexus

As shown in the previous analysis, the development of life insurance increases real GDP per capita growth. In this sub-section, we examined whether the relationship between the development of life insurance sector and economic growth could be influenced by different structural characteristics of the country. Thus, in addition to variables of the basic model (equation (1)), we include the conditional variables (M) and interaction variables (INS x M) by highlighting the simultaneous effect of life insurance penetration and conditional variables.

4.2.1. Financial development and life insurance effect on growth

Table 4 presents the results of estimation (IV-GMM) in cross-section, by using financial indicators such as conditional variables. These indicators are private credit by deposit money banks to GDP (Private credit), stock market total value traded to GDP (Stocktra) and bank deposit interest rate to measure the financial structure. The coefficients of the interaction term between life insurance development and financial variables are significant and negative; suggesting that life insurance development is positively related to economic growth, but the positive effect is moderated by the private credit and stock market transaction and deposit interest rate. Indeed, as illustrated in column 1 of Table 4 below, a country in our sample that sees its deposit interest rate increased by 5 to 10%, the marginal impact of its life insurance activity on growth decreases from 0.00737 to 0.00730[10]. Thus, the mitigating effect of interest rate on the relationship between life insurance and growth is due to the fact that high interest rates encourage economic agents to do banking investment rather than to subscribe to contractual savings (life insurance). Furthermore, private credit (column 2) or stock market transaction (column 3) reduces the positive effect of life insurance penetration on economic growth. In other words, the results suggest that the development of banking sector or stock market restrain the marginal impact of life insurance activity on economic growth until it is neutralized from a certain threshold. For example, regarding the banking system, the threshold of private credit to GDP from which the marginal impact of life insurance on growth

[10] $\frac{\partial(Y_{i,t}-Y_{i,t-1})}{\partial INS_{i,t}} = 0.00738 - 0.00709 * (\text{Deposit interest rate})$.

neutralizes is 72%[11]. For the stock market transaction, the threshold is 79.678%. The substitution effect between life insurance development and other financial segments (banks and stock market) is not intuitive to the theoretical literature which stipulate a complementary effect between those financial systems. Moreover, this result is not going towards the same sense as Webb et al. (2005) and Arena (2008) who have found a complementarity effect between bank, stock market and life insurance development in a samples of 55 developed and developing countries. However, unlike developed economies where insurance companies play an important role in the financial sectors and their importance as providers of financial services and investment funds in capital markets is very pronounced, there are striking differences in many developing countries where insurance premiums remain low (Lee, Huang, et al 2013; Lee et al., 2013). Thus, the situation of low development of life insurance can explain our findings of substitution effect between life insurance activity and banking credit in developing countries. In addition, our results confirm the study of Chen et al. (2012) who have also found the substitution effect between the development of the stock market and life insurance on the growth process. Then, our results can be also supported by, Haiss and Sümegi (2008) who have indicated that the life insurance sector expansion can weaken the banking sector effect on economic growth by reducing the market share of the banking sector in the mobilization of savings (Allen and Santomero, 2001).

Furthermore, to analyze the direct effect of the three financial segments (insurance, banks and stock market) on economic growth, we have introduced in addition to life insurance premiums, other financial indicators in our basic model (equation 5.1 above). Thus, we are trying to check the previous studies as Webb et al. (2002), Beck and Levine (2004) and Lee (2010) who also have analyzed the effect of the different financial services on economic growth. Results show that the development of life insurance sector and stock market has a positive and significant effect on income per capita growth while bank credit has not significant impact (column 4 and 5). The results are going to the same direction as the results of previous empirical studies (Beck and Levine, 2004 and Arena, 2008) who have also found that life insurance development and stock market have a positive effect on economic growth. However, bank credit to private sector has a not significant effect on economic growth and is not conform to Beck and Levine (2004).

[11]The marginal effect of life insurance is determined by $\frac{\partial(Y_{i,t}-Y_{i,t-1})}{\partial INS_{i,t}} = \beta + \rho * M_{i,t}$, if β and ρ have opposite signs, a threshold level arises $\frac{\partial(Y_{i,t}-Y_{i,t-1})}{\partial INS_{i,t}} = \beta + \rho * M_{i,t} = 0$ and we have ${M_{i,t}}^* = \frac{\beta}{\rho}$ with ${M_{i,t}}^*$ measures the minimum conditional variables required for a full absorption of the life insurance effect.

Table 4: Life insurance and growth, and interaction with financial condition variables

	Dependent Variable: GDP per capita growth				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Life insurance premiums	0.00738***	0.00828***	0.00396***	0.00114**	0.000579
(%GDP)	(0.00260)	(0.00296)	(0.00113)	(0.000549)	(0.000508)
Deposit interest rate (%)	-0.000610*				
	(0.000341)				
Life insurance*Deposit interest rate	-0.000709**				
	(0.000296)				
Private credit by bank (% GDP)		0.000203**		5.52e-05	
		(8.89e-05)		(7.90e-05)	
Life insurance*Private credit		-0.000115***			
		(4.38e-05)			
Stock market total value traded			0.000136***		8.08e-05**
(% GDP)			(4.60e-05)		(4.03e-05)
Life insurance*Stocktra			-4.97e-05***		
			(1.32e-05)		
Log (initial GDP per capita)	-0.00620***	-0.00745***	-0.00713***	-0.0067***	-0.00660***
	(0.00149)	(0.00137)	(0.00143)	(0.00133)	(0.00145)
Log (Population growth)	-0.00704***	-0.00739***	-0.00571***	-0.0074***	-0.00718***
	(0.00161)	(0.00211)	(0.00149)	(0.00151)	(0.00211)
Index of Human capital	0.0115***	0.0134***	0.0159***	0.0126***	0.0115***
	(0.00384)	(0.00346)	(0.00419)	(0.00354)	(0.00410)
Domestic Investment (%GDP)	0.00168***	0.00134***	0.00170***	0.00145***	0.00162***
	(0.000217)	(0.000220)	(0.000170)	(0.000221)	(0.000168)
Log (1+ Inflation)	0.00348	-0.00572	-0.0158***	-0.00535	-0.0126***
	(0.00528)	(0.00500)	(0.00515)	(0.00453)	(0.00443)
Log (Government consumption)	-0.00352	-0.0118***	-0.0105**	-0.0092***	-0.0109***
	(0.00415)	(0.00371)	(0.00416)	(0.00344)	(0.00405)
Log (Degree of openness)	-0.00554*	-0.00567**	-0.00724**	-0.00455*	-0.00339
	(0.00311)	(0.00250)	(0.00285)	(0.00249)	(0.00250)
Log (Terms of trade)	-0.0143***	-0.00515	-0.00971*	-0.00755	-0.00769
	(0.00541)	(0.00491)	(0.00533)	(0.00485)	(0.00529)
Constant	0.103***	0.103***	0.160***	0.117***	0.118***
	(0.0311)	(0.0285)	(0.0364)	(0.0296)	(0.0328)
Year FE	No	Yes	Yes	Yes	Yes
Observations	622	658	514	680	506
R^2 Centered	0.253	0.360	0.450	0.351	0.431
Hansen J, p-value	0.6064	0.2008	0.2171	0.1594	0.3277
First-stage F-statistic	63.822	32.214	35.428	33.560	88.021
(p-value)	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Life insurance variable is instrumented by percentage of the Muslim papulations and life insurance lagged two period. In addition, banking and stock market variables are instrumented by legal origin. Robust standard errors are in parentheses. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level.

4.2.2. A country's stage development and the life insurance-growth relationship

To answer to the question whether the different stages of economic development influence the relationship between life insurance and growth. Our sample of 86 developing countries

include Low and middle income countries (LMY) and Upper middle income countries (UMC). The results of income group[12] effect are presented in table 5.

Table 5: Economic development level on life insurance-growth relationship

	Dependent Variable: GDP per capita growth	
VARIABLES	(1)	(2)
Life insurance premiums (%GDP)	0.00109**	0.00581*
	(0.000435)	(0.00301)
Low & middle income dummy (LMY)	-0.0107***	
	(0.00400)	
Life insurance premiums*LMY	0.00324	
	(0.00303)	
Upper middle income dummy (UMC)		0.0118***
		(0.00402)
Life insurance premiums*UMC		-0.00476
		(0.00307)
Log (initial GDP per capita)	-0.00949***	-0.00931***
	(0.00167)	(0.00167)
Log (Population growth)	-0.00714***	-0.00698***
	(0.00150)	(0.00149)
Index of Human capital	0.0116***	0.0108***
	(0.00355)	(0.00355)
Domestic Investment (%GDP)	0.00150***	0.00150***
	(0.000218)	(0.000217)
Log (1+ Inflation)	-0.00807*	-0.00874*
	(0.00450)	(0.00451)
Log (Government consumption)	-0.00597*	-0.00639*
	(0.00337)	(0.00338)
Log (Degree of openness)	-0.00285	-0.00315
	(0.00255)	(0.00256)
Log (Terms of trade)	-0.00741	-0.00876*
	(0.00463)	(0.00469)
Constant	0.119***	0.134***
	(0.0292)	(0.0313)
Year FE	Yes	Yes
Observations	702	702
R^2 Centered	0.356	0.357
Hansen J, p-value	0.1217	0.5548
First-stage F-statistic	41.614	42.748
(p-value)	0.0000	0.0000

Note: Life insurance variable is instrumented by percentage of the Muslim papulations, life insurance lagged two period and interaction between life insurance and dummy of development level lagged two years. Robust standard errors are in parentheses. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level.

The results show that the income group does not influence the marginal effect of life insurance on the economic growth in low and middle income countries (column 1) and upper-middle income countries (column 2). Thus, our results are in the same direction as those of

[12] The analysis is done by interacting a dummy variable, which takes the value of 1 when the country is in the category of income group, with the insurance variables. The sample is not divided into two groups to perform the analysis.

Arena (2008) and Chen et al. (2012) who have found the same results for developing countries. However, we note a negative effect of the coefficient of dummy for low and middle income countries on growth (column 1) and a positive effect for upper- middle income countries (column 2). Thus, the negative effect for low and middle income countries can be explained by the lack of the necessary structure and framework to promote economic growth via the financial sector (Avram et al., 2010).

4.2.3. Life insurance development and economic growth: role of regional specificities.

Table 6 reports the results using regional dummies. We observe that the dummy of Sub-Saharan Africa (SSA) region has a negative and significant effect and negatively influences the impact of life insurance on economic growth (column 1). Other regions do not significantly influence the effect of insurance on growth (column 2 to 6). Thus, the marginal effect of life insurance on economic growth is less for SSA countries compared to non-SSA countries. Specifically, a percentage point increase of life insurance premiums to GDP induces a 0.153 percentage points increase in real GDP per capita growth for SSA countries[13]. This compares with a 0.580 percentage points increase for a comparable country in non-SSA (either 0.427 percentage points lower for SSA countries). The negative and significant effect of the Sub-Saharan Africa region dummy can be explained by the socio-political situation in the region characterized by the political instabilities that do not favor the growth and play unfavorable on the development of life insurance sector.

[13] (0.0058- 0.00427*Sub-Saharan Africa)*100

Table 6: **Regional effect and life insurance-growth relationship**

	Dependent Variable: GDP per capita growth					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Life insurance premiums	0.0058***	0.00171***	0.00137***	0.00149***	0.00135***	0.00144***
(%GDP)	(0.00191)	(0.000463)	(0.000474)	(0.000458)	(0.000440)	(0.000457)
Sub-Saharan Africa (SSA)	-0.00513*					
	(0.00294)					
Life insurance premiums	-0.00427**					
(%GDP)*SSA	(0.00194)					
Europe & Central Asia (ECA)		0.0115				
		(0.00830)				
Life insurance premiums		0.100				
(%GDP)*ECA		(0.0709)				
Latin America & Caribbean			-0.00402			
(LAC)			(0.00360)			
Life insurance premiums			0.00403			
(%GDP)*LAC			(0.00585)			
Middle East & North Africa				0.00156		
(MNA)				(0.00392)		
Life insurance premiums				0.00143		
(%GDP)*MNA				(0.0101)		
South Asia (SAS)					0.00359	
					(0.00373)	
Life insurance premiums					0.00307	
(%GDP)*SAS					(0.00357)	
East Asia & Pacific (EAP)						0.00411
						(0.00552)
Life insurance premiums						-0.00107
(%GDP)*EAP						(0.00291)
Log (initial GDP per capita)	-0.0070***	-0.0066***	-0.00624***	-0.0062***	-0.0059***	-0.0061***
	(0.00135)	(0.00133)	(0.00145)	(0.00130)	(0.00138)	(0.00137)
Log (Population growth)	-0.0062***	-0.0073***	-0.00719***	-0.0073***	-0.0073***	-0.0073***
	(0.00145)	(0.00148)	(0.00147)	(0.00148)	(0.00149)	(0.00149)
Index of Human capital	0.0113***	0.0131***	0.0145***	0.0136***	0.0130***	0.0131***
	(0.00355)	(0.00357)	(0.00334)	(0.00354)	(0.00364)	(0.00350)
Domestic Investment (%GDP)	0.00141***	0.00155***	0.00151***	0.00153***	0.00151***	0.00153***
	(0.000185)	(0.000182)	(0.000187)	(0.000188)	(0.000192)	(0.000196)
Log (1+ inflation)	-0.00533	-0.00835**	-0.00662	-0.00749*	-0.00758*	-0.00803*
	(0.00453)	(0.00421)	(0.00452)	(0.00447)	(0.00429)	(0.00441)
Log (Government	-0.00483	-0.00697**	-0.00660*	-0.00577	-0.00503	-0.00484
consumption)	(0.00343)	(0.00337)	(0.00350)	(0.00371)	(0.00357)	(0.00346)
Log (Degree of openness)	-0.00359	-0.00270	-0.00399	-0.00387*	-0.00247	-0.00441*
	(0.00239)	(0.00233)	(0.00250)	(0.00235)	(0.00245)	(0.00242)
Log (Terms of trade)	-0.00786*	-0.00913*	-0.00971**	-0.00972**	-0.00939**	-0.0100**
	(0.00475)	(0.00467)	(0.00468)	(0.00476)	(0.00468)	(0.00469)
Constant	0.0956***	0.104***	0.100***	0.101***	0.0912***	0.103***
	(0.0284)	(0.0272)	(0.0277)	(0.0278)	(0.0283)	(0.0278)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	702	702	702	702	702	702
R^2 Centered	0.359	0.362	0.348	0.348	0.350	0.348
Hansen J, p-value	0.2081	0.3264	0.4929	0.3486	0.1945	0.3028
First-stage F-statistic	64.215	31.055	85.393	67.520	38.740	94.180
(p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Life insurance variable is instrumented by percentage of the Muslim papulations, life insurance lagged two period and interaction between life insurance and dummy of region lagged two years. Robust standard errors are in parentheses. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level

4.2.4. Life insurance and economic growth: role of the institutions quality and legal environment

In this section we discuss the hypothesis on which the responsiveness of economic growth to life insurance development depends, in a linear fashion, upon institutional quality and legal origin. The regression results from the estimation of Equation (2) are reported in Table 7. Each institutional variable is included along with its interaction with life insurance penetration. Diagnostic tests of Fisher and Hansen are favorable to the validity of our instruments. Our results support the prediction that the responsiveness of economic growth to life insurance development depends on the level of institutional quality and legal environment.

The interaction terms of life insurance and the quality of bureaucracy (BQ), control of corruption (COR) and the composite index of the institutions quality (IQ) are positive and significant with coefficients equal to 0.0204, 0.0284 and 0.0206, respectively (column 1, 2 and 4). Thus, the improvement of the institutions quality contributes to improve the marginal positive effect of life insurance premiums on economic growth. Indeed, the positive signs of interactive terms suggest that the positive effect of the development of life insurance on economic growth is more pronounced for countries with high-quality institutions. These results imply an important economically effect of institutions on the responsiveness of economic growth to life insurance development. In terms of impact, *ceteris paribus*, when the index of the institutions quality increases from 0.25 to 0.75 percentage points (column 4), the marginal impact of life insurance growth increases by 0.0179 to 0.0282. As for quality of the bureaucracy and control of corruption, the responsiveness of economic growth to the life insurance development increases from 0.0102 and 0.0142, respectively (column 1 and 2).

Regarding the role of the legal environment, we note that British legal system dummy positively and significantly influences the economic growth while the interaction term with life insurance is negative (column 5). In other words, life insurance development positively influence the economic growth, but its marginal impact is less for British colonial countries. In contrary, French legal system has a negative effect on growth but does not influences the marginal effect of life insurance (column 6). This result can be explained by the fact that life insurance is most developed in English legal system countries while in French legal system, there is an obligatory social security system for public and private sector workers.

Table 7: Life insurance and institutions quality and legal environment

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Life insurance premiums (%GDP)	0.0113**	0.0131*	0.00434*	0.0128**	0.00630***	0.00094*
	(0.00469)	(0.00737)	(0.00234)	(0.00586)	(0.00231)	(0.00056)
Bureaucracy quality (BQ)	0.00356					
	(0.0102)					
Life insurance premiums*BQ	0.0204**					
	(0.00938)					
Control of Corruption (COR)		0.0299**				
		(0.0123)				
Life insurance premiums*COR		0.0284**				
		(0.0143)				
Law and order (LO)			0.0168***			
			(0.00609)			
Life insurance premiums*LO			-0.00401			
			(0.00321)			
Index of the institutions quality (IQ)				0.0330**		
				(0.0145)		
Life insurance premiums (%GDP)*IQ				0.0206**		
				(0.0102)		
British Colony					0.00635**	
					(0.00263)	
Life insurance premiums*British					-0.00555**	
					(0.00233)	
French Colony						-0.0070***
						(0.00286)
Life insurance premiums*French						0.00245
						(0.00237)
Log (initial GDP per capita)	-0.00689***	-0.0069***	-0.0071***	-0.0069***	-0.00609***	-0.0056***
	(0.00132)	(0.00133)	(0.00125)	(0.00125)	(0.00135)	(0.00148)
Log (Population growth)	-0.00731***	-0.0066***	-0.0072***	-0.0069***	-0.00841***	-0.0095***
	(0.00168)	(0.00168)	(0.00174)	(0.00168)	(0.00178)	(0.00198)
Index of Human capital	0.0140***	0.0150***	0.0152***	0.0127***	0.0126***	0.0117***
	(0.00376)	(0.00337)	(0.00345)	(0.00331)	(0.00370)	(0.00394)
Domestic Investment (%GDP)	0.00141***	0.00140***	0.00127***	0.00122***	0.00149***	0.00154***
	(0.00017)	(0.000178)	(0.00019)	(0.000191)	(0.000184)	(0.000196)
Log (1+ Inflation)	-0.00713*	-0.00721*	-0.00438	-0.00426	-0.00830*	-0.006419
	(0.00427)	(0.00417)	(0.00387)	(0.00409)	(0.00445)	(0.004604)
Log (Government consumption)	-0.00598*	-0.00558	-0.00766**	-0.0096***	-0.00398	-0.006555
	(0.00354)	(0.00355)	(0.00345)	(0.00343)	(0.00366)	(0.00402)
Log (Degree of openness)	-0.00521**	-0.00522**	-0.00551**	-0.00512**	-0.00373	0.0000301
	(0.00255)	(0.00244)	(0.00249)	(0.00239)	(0.00235)	(0.00255)
Log (Terms of trade)	-0.00868*	-0.00866*	-0.00740	-0.00707	-0.00844*	-0.00648
	(0.00486)	(0.00483)	(0.00454)	(0.00453)	(0.00474)	(0.0049)
Constant	0.0997***	0.118***	0.112***	0.121***	0.0900***	0.08209***
	(0.0286)	(0.0294)	(0.0279)	(0.0296)	(0.0283)	(0.02877)
Year FE	Yes	Yes	Yes	Yes	Yes	No
Observations	672	670	672	672	687	687
R^2 Centered	0.353	0.351	0.354	0.356	0.358	0.359
Hansen J, p-value	0.2750	0.4590	0.2327	0.4603	0.2823	0.2628
First-stage F-statistic	53.241	55.142	104.184	27.566	63.391	34.056
(p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Life insurance variable is instrumented by percentage of the Muslim papulations, life insurance lagged two period and interaction between life insurance and indicators of institution quality lagged two years. Robust standard errors are in parentheses. *Significantly different from zero at the 10 percent significance level, ** 5 percent significance level, *** 1 percent significance level.

5. Conclusion

This paper has examined the effect of life insurance activity on economic growth and heterogeneity of insurance effect. Using a sample of 86 developing countries over the period 1996-2011 and controlling for endogeneity of life insurance premiums, the econometric results suggest that countries with better-developed life insurance activity have to higher level of economic growth. This result is robust to the addition of other determinants of growth and other specifications with alternative measure of the development of life insurance. However, the results highlight some important heterogeneities on life insurance effect among countries. Thus, the marginal positive impact of life insurance on economic growth decreases with the levels of deposit interest rate, bank credit to private sector and stock market traded. In addition, the marginal positive impact of insurance on economic growth is lower in the countries of the Sub-Saharan African region and in British legal system countries. Finally, the development of life insurance has a greater effect on economic growth in presence of high quality institutions.

This work provides an empirical justification to reinforce the promotion of life insurance market in developing countries. Thus, it will be judicious to continue the reforms aimed at developing the financial sector in particular life insurance sector, which may be a captive source of long term financing alternative of the economy to boost economic growth. This is particularly the case in countries with high-quality institutions.

In this study, we have analyzed the effect of insurance on growth. This does not allow us to analyze life insurance development on the development of banking sector and stock market. However, a growing body of research emphasizes the importance of insurance sector in the development of stock and bond markets (Dickinson, 2000; Catalan et al, 2000 and Impavido et al., 2003.).

Future work could deepen those things by analyzing the effects of the development of insurance on the development of banking and stock market sector; which will identify the effects of the transmission channels of insurance development on economic growth. Future work needs to deepen these findings by analyzing the insurance effect on banking and stock market; that will allow to identify the channels of transmission of the insurance effect on economic growth.

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Appendices

Table A -1: Review of previous studies on the relationship between insurance and growth

Authors	Year	Sample of countries	Study period	Dependent variables	Explanatory variables	Methodology used
Ward & Zurbruegg	2000	9 OECD countries	1961-1996	Total real premiums, real GDP	Real GDP, total premiums	Bi-variate VAR Granger causality
Webb, Grace and Skipper	2002	55 countries	1980-1996	GDP& GDI per capita	Bank credit, property liability premiums/GDP, life premiums/GDP	3SLS
Kugler and Ofoghi	2005	United Kingdom	1966-2003	Real GDP per capita	General insurance premium, long-term insurance premiums (life +pension)	VAR, Granger causality, cointegration
Arena	2008	55 countries	1976-2004	Real GDP per capita growth	Private credit/GDP, stock market turnover, life premiums/GDP, non-life premiums/GDP	GMM system estimator (dynamic panel)
Haiss and Sümegi	2008	29 European countries	1992-2004	Real GDP per capita	Physical capital stock, human capital stock, life and non-life premiums, yearly insurance total investment	Panel least square
Avram, Nguyen and Skully	2010	93 countries	1980-2006	Real GDP per capita growth	Life , non-life and insurance premiums/GDP and per capita	OLS and GMM system
Han, Li, Moshirian and Tian	2010	77 countries	1994-2005	Real GDP per capita	Life , non-life and insurance premiums/GDP and per capita	GMM (dynamic panel)
Han, Cheng and Yu	2012	12 European countries	1980-2009	Real GDP	Life and non-life premiums/GD¨P, Private credit/GDP, liquid liabilities of the financial intermediary to GDP.	Cross-section and fixed effect Panel
Chen, Lee and Lee	2012	60 countries	1976-2005	Real GDP per capita	Life , non-life and insurance premiums/GDP and per capita	GMM-system (dynamic Panel)
Lee, Lee, and Chiu	2013	41 countries	1979-2007	Real GDP per capita	Life , non-life and insurance premiums/GDP and per capita	Cointegration and causality in panel

Adapted with modification form Avram and al (2010).

Table A-2: Definition and source of variables

Variables	Definition and construction	Source
Real GDP per capita	Ratio of GDP to population. GDP is in constant 2005 US$	World Bank (WDI)
Real GDP per capita growth	Log difference or real GDP per capita	Author's calculation using WDI
Initial GDP per capita	Real GDP per capita in beginning of period	Author's calculation using WDI
Life insurance penetration	Life premiums to GDP	Čihák et al. (2012)
life insurance density	(Life premiums to GDP x Ratio of GDP to population)/100	Author's calculation using WDI and Čihák et al. (2012)
Population growth	Population growth (annual %) is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage.	
Inflation rate	Annual change in CPI (%)	WDI
Government consumption	ratio of government consumption to GDP	
Degree of openness	(Imports + Exports) / GDP	
Changes in terms of trade	Terms of trade of goods and services	World Bank's Database of Political Institutions
Domestic investment rate	Gross fixed capital formation (% of GDP)	WDI
Human capital	Index of human capital per person, based on years of schooling (Barro /Lee, 2012) and returns to education (Psacharopoulos, 1994)	Penn World Table, Version 8.0
Deposit interest rate	Deposit interest rate (%)	WDI, 2014
Private credit by bank	Private credit by deposit money banks to GDP	
Stock market total value traded (% GDP)	Total shares traded on the stock exchange to GDP	Čihák et al. (2012)
Low & middle income	Low & middle income =1 others =0	
Upper middle income	Upper middle income=1 others =0	
Sub-Saharan Africa	Sub-Saharan Africa =1 others=0	
Europe & Central Asia	Europe & Central Asia=1 others =0	
Latin America & Caribbean	Latin America & Caribbean=1 others =0	
Middle East & North Africa	Middle East & North Africa=1 others =0	World Bank Atlas
South Asia	South Asia=1 others=0	
East Asia & Pacific	East Asia & Pacific=1 others =0	
French	Dummy variable that is equal to 1 if the country uses French's legal system and zero otherwise	
British	Dummy variable that is equal to 1 if the country uses British's legal system and zero otherwise	
Control of corruption	Index assessing the control of corruption within the political system. It ranges from 0 to 6, with a higher value of the index reflecting a better control of corruption	
Law and Order	Index assessing the strength and the impartiality of the legal system, as well as the popular observance of the law. The index ranges from 0 to 6, with a higher value of the index reflecting a higher institutional quality.	Authors' calculations based on International Country Risk Guide (ICRG, 2012) data
Bureaucracy Quality	Index of the institutional strength and quality of the bureaucracy, ranging from 0 to 4. The higher the index, the stronger the quality of the bureaucracy	
index of Institutional Quality	Synthetic index of Institutional Quality: arithmetic mean of ICRG indices of Bureaucracy Quality, Law and Order, and Control of Corruption. The higher the index, the higher the institutional quality.	

Table A-3: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP per capita growth	1273	0.024967	0.0417028	-0.1658664	0.285408
Life insurance premiums (%GDP)	1286	0.7699246	1.640257	0.001	15.784
Log (1+life insurance per capita)	1273	2.190132	1.772696	0.0158299	8.577292
Log(Initial GDP per capita)	1278	7.63264	1.315799	4.863859	12.55699
Log (Population growth)	1237	0.5206107	0.7726027	-6.117022	2.854452
Index of Human capital	1087	2.292636	0.4877972	1.135571	3.268062
Domestic Investment (%GDP)	1357	23.36869	7.273782	4.142	57.991
Log (1+Inflation)	1299	2.848138	0.5252723	-1.597744	8.332093
Log (Government consumption)	1254	3.222975	0.3677855	-0.594207	4.063129
Log (Degree of openness)	1334	4.272271	0.4702486	2.703563	5.395478
Log (Terms of trade)	1315	4.623377	0.3292781	3.304411	6.248037
Deposit interest rate (%)	1240	9.334478	9.885214	0.8541667	147.125
Private credit by bank	1282	30.29233	25.40346	1.049314	165.8018
Stock market total value traded (% GDP)	822	14.5298	30.64491	0.0022657	349.2441
Bureaucracy quality	1301	0.54702	0.1882262	0	1
Control of Corruption	1301	0.53175	0.1624121	0	1
Law and order	1301	0.52664	0.2150418	0	1
Index of the institutions quality	1301	0.53514	0.1288538	0	1
British Colony :	1343	0.32166	0.4672903	0	1
French Colony	1343	0.53536	0.4989333	0	1

Table A- 4: Countries grouped by region

Sub-Saharan Africa (SSA)	Europe & Central Asia (ECA)	Latin America & Caribbean (LAC)	Middle East & North Africa (MNA)	South Asia (SAS)	East Asia & Pacific (EAP)
Angola	Albania	Argentina	Algeria	Bangladesh	China
Botswana	Azerbaijan	Bolivia	Egypt	India	Indonesia
Burkina Faso	Belarus	Brazil	Islamic Republic of Iran	Nepal	Malaysia
Cameroon	Bulgaria	Colombia	Jordan	Pakistan	Papua New Guinea
Côte d'Ivoire	Hungary	Costa Rica	Lebanon	Sri Lanka	Philippines
Ethiopia	Kazakhstan	Dominican Republic	Libya		Thailand
Gabon	Moldova	Ecuador	Morocco		Vietnam
Ghana	Serbia	El Salvador	Tunisia		
Kenya	Turkey	Guatemala	Yemen		
Madagascar	Ukraine	Guyana			
Malawi		Honduras			
Mali		Jamaica			
Mauritius		Mexico			
Mozambique		Nicaragua			
Namibia		Panama			
Niger		Paraguay			
Nigeria		Peru			
Republic of Congo		Suriname			
Senegal		Venezuela			
South Africa					
Sudan					
Tanzania					
Togo					
Uganda					
Zambia					