The Geneva Papers on Risk and Insurance - Issues and Practice
https://doi.org/10.1057/s41288-022-00278-2

Institutional determinants of insurance penetration in Africa

Mamadou Bah[1] · **Nelson Abila**[1]

Received: 17 September 2021 / Accepted: 29 September 2022

Abstract

This paper investigates the institutional determinants of insurance demand in Africa. We used a panel of 42 countries over the period 1996–2017. A system GMM approach was used for the estimations. Consistent with previous results, we find that institutional quality has positive and significant effects on insurance penetration in Africa. Specifically, regulatory quality, rule of law, control of corruption, political stability and absence of violence, and government effectiveness are the five institutional quality indicators that have positive and significant effects on the demand for total insurance and life insurance. However, only regulatory quality, control of corruption and government effectiveness are positively associated with non-life insurance demand. This indicates that governments should improve the business environment and strengthen the political environment to boost insurance development in Africa.

Keywords Insurance · Life insurance · Non-life insurance · Institutional quality · Africa · GMM

Introduction

The effects of institutions on economic performance have been well acknowledged in the literature since the pioneering work of North (1990). Rodrik et al. (2002) argued that institutions are among the deepest determinants of economic performance of countries. Whilst the extant literature underlines the influence of institutions on economic growth, investment, trade and financial development (Levine et al. 2000; Beck et al. 2000; Acemoglu et al. 2002; Levchenko 2007; Liu et al. 2015; Bah et al. 2021), less work has been done specifically on the link between institutions and the

✉ Mamadou Bah
bah_20042000@yahoo.fr; m.a.bah@afdb.org

Nelson Abila
n.abila@afdb.org; nelabila@gmail.com

[1] African Development Bank Group (AfDB), Abidjan, Côte d'Ivoire

Published online: 16 October 2022

insurance sector, particularly in Africa. Yet, insurance as a kind of contract may depend on the institutional quality within a country. For example, the legal transfer of risk related to insurance is dependent upon legal guidelines, rules and their enforcement, the efficiency of conflict resolution through the judiciary and integrity of the law-making process (Esho et al. 2004). According to Erbaş and Sayers (2006), lower institutional quality in a country implies lower transparency and hence higher uncertainty and lower insurability. The probability of political intervention and distribution of property rights in an economy depend on economic polarisation (Keefer and Knack 2002). Hence, the maintenance and the quality of laws and contractual obligations are constrained by the government's willingness and ability to alter the legal basis for the development and deepening of insurance and other related financial subsectors over time. This is expected to lead to economic and legal stability required for the development of insurance activities. The influence of institutional quality on insurance can also be seen by the protection of property rights. According to Wen and Zhang (1993), individuals' long-term investment behaviour is distorted when property rights cannot be assured. Beck and Webb (2003) argue that political instability affects the economic horizon of potential buyers and suppliers of life insurance products and thus may discourage the development of a healthy life insurance market.

Some recent studies, including Balcilar et al. (2019), Gupta et al. (2019) and Canh et al. (2020), posit that government economic policy uncertainty (EPU) influences insurance market activity. According to Canh et al. (2020), EPU can influence the insurance market in several ways. On the demand side, EPU is likely to reduce output (Bloom 2009) and employment (Mumtaz 2018) which can ultimately reduce disposable income and investors' confidence in life insurance consumption. In the end, it is expected that sudden drops in income combined with increases in unemployment could reduce the demand for life insurance consumption. However, policy uncertainty could also motivate individuals to take care of their assets and health, and thus protect their wealth during unexpected economic downfalls, via taking out insurance policies. On the supply side, insurers are expected to face higher risks and costs arising from economic uncertainty. To mitigate the risks arising from differences between insurers' actual and expected returns on investment due to higher EPU, insurance companies charge higher premiums to buyers. For example, Balcilar et al. (2020a, b) find that insurance premiums are positively associated with EPU in 15 developed and emerging economies over the period 1998–2016.

Whilst previous studies seem to validate the importance of institutional quality on the development of the financial sector, there is a need to focus on the development of the African insurance sector. To our knowledge, the literature on institutional determinants of insurance demand for Africa specifically is scarce. Yet, institutional quality could be relevant for the insurance sector, as acknowledged by previous studies, including Ward and Zurbruegg (2002), Ngwenduna et al. (2015), Guerineau and Sawadogo (2015), Alhassan and Biekpe (2016) and Giné et al. (2019). The present study contributes to the existing literature on the crucial importance of institutional quality for the development of the insurance sector in developing countries, particularly in Africa, in a number of ways. First, we use a broader definition of institutional quality to test for individual effects on insurance penetration in Africa,

a relationship not covered in most previous insurance studies for the continent. Second, previous studies have focussed either on life or non-life insurance, which is understandable given the differences in their nature. However, both life and non-life insurance activities develop in symbiosis. Therefore, in this study, we distinguish between total insurance, life insurance and non-life insurance to obtain a global analysis on the effects of institutional quality. Third, we use the GMM system (two steps) as it solves the endogeneity problem, which is common in macro panel data. The study includes 42 African countries over the period 1996–2017.

The rest of the paper is organised as follows. The next section reviews the literature on institutional quality and insurance demand, followed by some stylised facts on institutional quality and insurance activities in African countries. Then, we present the methodology, including our econometric specification, data sources and the estimation technique. We then provide the estimation results followed by a discussion. The final section concludes and offers policy implications.

Literature review

The link between institutions and economic performance is well recognised in the literature. Whilst much work focuses on financial development and institutional quality, less has been done on the insurance market. This study contributes to the strand of the literature focusing on the institutional determinants of insurance development. Analysis of the determinants of insurance demand goes back to Yaari (1965) who introduced the concept of uncertainty of life into a framework explaining an individual's lifetime consumption allocation process. Subsequent studies added other determinants of insurance consumption. For example, Hakansson (1969) added wealth, income, price of insurance and interest rates to the model as additional variables that may impact insurance consumption. Karni and Zilcha (1986) also incorporated a measure of risk aversion into the model. The empirical literature on insurance consumption identifies economic determinants on the one hand, including income, inflation, interest rate and financial development, and socio-demographic determinants, including education and life expectancy, on the other (Browne and Kim 1993; Browne et al. 2000; Ward and Zurbruegg 2002; Beck and Webb 2003; Esho et al. 2004; Elango and Jones 2011; Kjosevski 2012; Park and Lemaire 2012; Sen and Madheswaran 2013; Trinh et al. 2016; Balcilar et al. 2020b, a). In the context of Africa, some authors, including Alhassan and Biekpe (2015, 2016), Olayungbo and Akinlo (2016), Balcilar et al. (2020b, a) and Olarewaju and Msomi (2021), investigated economic and socio-demographic determinants of insurance activities.

Besides those determinants, other studies have argued that institutional quality is an important determinant of insurance consumption. North (1990) defined institutions as the rules of the game in force, linking all social actors, including the state, that shape behaviour and expectations and contribute to growth. These institutions can be formal (laws, constitution, regulations) or informal (traditions, customs, codes of conduct, values, social norms, etc.) Respecting or enforcing these rules reduces transaction costs and uncertainties. This creates an essential framework

that allows, for example, an economic agent to enter/not enter into a transaction or an insurance contract with others. Indeed, the protection of property rights and the regulation of rights and obligations are essential for the development of an insurance market. A lack of property rights protection distorts individuals' investment behaviour and hampers insurers' ability to invest efficiently and control the price of their products (Wen and Zhang 1993; Chang and Lee 2012).

The implementation of legal rules sometimes depends on the political environment, including political stability or corruption. Beck and Webb (2003) show that political instability shortens the economic horizon of both potential buyers and suppliers of insurance products and thus may discourage the development of a healthy life insurance market. As life insurance is considered to be a long-term relationship between a consumer and a company, the more stable the legal and political systems in the country, the higher the willingness of contracting parties to initiate business relationships (Kjosevski 2012). According to Roe and Siegel (2011), traditional channels of investor protection, such as legal origin, trade openness, colonial conditions and the related and resultant institutions, cannot function well in unstable political environments. Effective functioning of legal rules and jurisdictions therefore depends on the soundness of political systems. Political environments are thus directly and indirectly correlated with insurance activities.

Empirical findings indicate the important role of institutional quality for insurance development activities. Ward and Zurbruegg (2002) showed that political stability exerts a significant impact on life insurance demand in both developed and developing economies. They also find that improvements in the legal system positively impact the demand for life insurance, whilst the effect is not significant in OECD countries, possibly because these already have a sound legal system. Beck and Webb (2003) find that overall institutional development, accounting for legal rules and political factors, has a positive effect on life insurance development. Avram et al. (2010) also find that the quality of the legal system and the protection of property rights exert a significant effect on insurance sector development.

Chang and Lee (2012) analysed the effects of institutional quality on life insurance by the stage of economic development using a panel threshold analysis. They found that institutional factors, including a broad measure of civil liberties, political stability, government effectiveness, regulatory quality, rule of law and control of corruption, have an overwhelming positive effect on life insurance penetration in low-income countries, but the effect is marginal in high-income countries.

Mahaini et al. (2019) tested the impact of political, legal and economic institutions on life insurance and family *takaful* (a kind of Islamic insurance system) consumption in 33 Organization of Islamic Cooperation (OIC) countries over the period 1990–2016 using fixed effects and random effects models. The results showed that the more unstable the country is, the higher the consumption of life insurance.

Table 1 Insurance market depth by region, 2019

	Penetration (% GDP)	Total premiums (USD million)	Premiums per capita (USD)
Emerging Middle East	1.7	44,819	90
Middle East & Africa	2.1	112,974	63
Africa	2.8	68,150	52
Latin America & Caribbean	3	157,146	244
Emerging market	3.2	1161,675	175
Emerging Asia	3.9	811,050	207
Advanced market	9.6	5130,924	4664
World	7	6,292,600	793

Source Swiss Re (2020)

Some studies also focussed specifically on Africa. Based on a sample of 20 sub-Saharan African countries over the period 1996–2011, Guerineau and Sawadogo (2015) investigate the determinants of life insurance development. They showed that life insurance is a luxury good in sub-Saharan Africa. Institutional quality, including the protection of property rights and government stability, is positively associated with life insurance demand. Taking motivation from the low insurance penetration rates in Africa, Alhassan and Biekpe (2016) investigated the factors that influence life insurance consumption in 31 African countries from 1996 to 2010. By using ordinary least squares and GMM estimations, they found that institutional quality, measured by the average score of the six governance indicators developed by Kaufmann et al. (2010), has positive effects on life insurance consumption. Previously, Ngwenduna et al. (2015) explored the driving factors of life insurance consumption in 51 African countries. Their findings showed that among institutional quality indicators only political stability and government effectiveness have a positive effect on life insurance consumption in Africa.

The reviewed literature shows that studies focusing specifically on determinants of insurance penetration in Africa, taking into account institutional quality, are scarce, despite the low level of insurance development in Africa. Whilst Ngwenduna et al. (2015) and Alhassan and Biekpe (2016) included institutional quality as a potential determinant of insurance activity in Africa, these studies focussed only on one component of insurance consumption, namely life insurance. The present study not only includes total, life and non-life insurance, it also focuses on the institutional determinants of insurance development in Africa. Thus, this study aims to fill the gap in literature by providing more understanding of insurance consumption in Africa, and stimulate further examination of insurance market development there.

Table 2 Insurance development in Africa (1996–2017)

Insurance penetration (% GDP)				Insurance density (USD)			
10 lowest countries		10 highest countries		10 lowest countries		10 highest countries	
Guinea	0.036	Tunisia	1.525	Guinea	0.160	Cabo Verde	34.558
Equatorial Guinea	0.038	Angola	1.963	Congo, Dem. Rep	0.613	Lesotho	44.311
Chad	0.196	Kenya	2.032	Central African Republic	1.016	Tunisia	51.376
Congo, Dem. Rep	0.210	Eswatini	2.253	Chad	1.068	Morocco	56.032
Central African Republic	0.257	Morocco	2.378	Equatorial Guinea	1.144	Gabon	68.705
Mauritania	0.383	Botswana	2.628	Burundi	1.526	Eswatini	92.183
Sierra Leone	0.396	Lesotho	4.290	Ethiopia	1.580	Botswana	147.519
Sudan	0.403	Mauritius	4.418	Sierra Leone	1.847	Namibia	273.306
Libya	0.425	Namibia	6.868	Niger	2.029	Mauritius	300.540
Mali	0.463	South Africa	13.607	Madagascar	2.361	South Africa	674.027

Source Authors' calculation

Some Stylised Facts on Insurance development and institutional quality in Africa

Africa's insurance sector is underdeveloped compared to other regions of the world. Access to insurance services is limited to few people, mostly upper middle-income groups. According to Swiss Re,[1] Africa's total premiums written for 2019 was USD 68.15 billion. Africa thus accounts for only 1.08% of global insurance premiums.

Table 1 presents insurance market depth in Africa and other regions of the world. Africa has the second lowest premium volume, second only to the Emerging Middle East. The continent's share of the global insurance market decreases further without South Africa. Indeed, the premium volume for the South African insurance market is USD 47.093 billion, representing 58.8% of total premiums written on the continent in 2019. Insurance penetration ratio is a measure of insurance market deepening and is equal to the insurance-market-size-to-GDP ratio. Africa has the lowest insurance penetration ratio (2.8%) for 2019 and is way below the global penetration ratio of 7%. The premium per capita value for Africa is again the lowest of all regions at USD 52 compared to the global average of USD 793 for 2019.

If insurance development in Africa is low compared to the rest of the world, the disparity between African countries is even more pronounced. Table 2 shows that South Africa (13.6%), Namibia (6.87%) and Mauritius (4.42%) have the highest insurance penetration ratios in Africa over the period 1996–2017. At the bottom we find Guinea, Equatorial Guinea and Chad, with insurance penetration ratios of 0.036%, 0.038% and 0.196%, respectively, over the same period. South Africa remains the country that spends the most per capita (USD 674.027) on insurance

[1] https://www.sigma-explorer.com/.

Table 3 Ten best-/worst-performing African countries in terms of institutional quality (1996–2017)

Lowest institutional quality		Highest institutional quality	
Congo, Dem. Rep	− 1.703	Benin	− 0.179
Sudan	− 1.554	Senegal	− 0.176
Central African Republic	− 1.316	Lesotho	− 0,154
Burundi	− 1.286	Tunisia	− 0.146
Equatorial Guinea	− 1.268	Ghana	− 0.028
Chad	− 1.253	South Africa	0.329
Libya	− 1.241	Namibia	0.329
Angola	− 1.233	Cabo Verde	0.509
Eritrea	− 1.158	Botswana	0.711
Congo, Rep	− 1.122	Mauritius	0.735

Source Authors' calculation

in the period 1996–2017, followed by Mauritius (USD 300.54), Namibia (USD 273.306) and Botswana (USD 147.519). Guinea and the Democratic Republic of the Congo spend less than USD 1 per capita on insurance. These countries are preceded by Central African Republic and Chad, for which insurance density is USD 1.016 and USD 1.068, respectively. It appears that insurance consumption on the continent is dominated by countries in southern Africa. According to Ngwenduna et al. (2015), this dominance could be attributable to the presence of south African insurance companies in all these countries.

Looking at institutional quality from the Worldwide Governance Indicators (WGIs) developed by Kaufmann et al. (2010) for Africa, it appears that the 10 best-performing countries in terms of institutional quality have an average[2] score of 0.19 over the period 1996–2017 (Table 3). Mauritius is the country with the highest institutional quality over the period, with a score of 0.735, followed by Botswana (0.711) and Cabo Verde (0.509). On the other side, the 10 worst-performing in terms of institutional quality have an average score of − 1.313 over the period 1996–2017. The Democratic Republic of the Congo, Sudan and Central African Republic have the worst scores on average over the period.

Methodology

Model specification

Our empirical strategy to test the effects of institutional quality on insurance development follows some previous work on the determinants of insurance demand,

[2] This is the simple average of the following six governance indicators: voice and accountability, political stability, rule of law, corruption control, government effectiveness and regulatory quality (Kaufmann et al. 2010).

including Chang and Lee (2012), Guerineau and Sawadogo (2015), Zerriaa et al. (2017) and Giné et al. (2019). The following empirical model was used in this study:

$$Y_{i,t} = \alpha_0 Y_{i,t-1} + \alpha_1 Instq_{i,t} + \alpha_2 Control_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

where i indexes the country and t indexes the time. $Y_{i,t}$ is the dependent variable, standing in for insurance penetration (including total insurance, life insurance and non-life insurance). *Instq* represents the institutional quality variable. In the analysis of institutional quality, we estimated not only Eq. 1 by using the institutional quality index, which is an average of the quality of institutions in each country, but we also ran regressions using each of the components of the index separately. *Control* is a set of economic and demographic variables selected from the literature on the determinants of insurance demand. $\varepsilon_{i,t}$ is the error term and μ_i is the country-specific fixed or random country-specific effect to capture the other determinants not explicitly included in the list of explanatory variables.

Variables and data

Insurance variables

Life and non-life insurance are the two major types of insurance provided to people. Whilst life insurance covers risks related to the length of human life, non-life insurance covers other, non-life-related risks. The existing literature on insurance development uses insurance penetration and insurance density to measure a country's insurance activities. Insurance penetration is defined as the ratio of insurance premiums to GDP. It measures the importance of insurance activities relative to the size of the economy and ignores the population factor. Insurance density is defined as premiums per capita and takes the population into consideration, but neglects economic development. It measures how much each inhabitant of a country spends, on average, on insurance (Beck and Webb 2003). According to Park et al. (2002), insurance density may be subject to measurement error. Indeed, since insurance premiums in local currency have to be converted to a common currency such as US dollars before division by total population, exchange rates can have a confounding effect and significantly obscure the true picture of the degree of insurance penetration, especially under a volatile currency exchange system. The effects of this problem can be exacerbated when attempting cross-national analysis and comparison. Consequently, in this study, we consider insurance penetration (total insurance, life insurance and non-life insurance) as our primary variable in the econometric analysis. However, insurance density will be used for robustness checks of our baseline results.

Institutional variables

In this study, the six WGIs developed by Kaufmann et al. (2010) are used to measure institutional quality. They are categorised according to three concepts. The first deals with "the process by which governments are selected, monitored and replaced". It includes two indicators, namely *Voice and Accountability* and *Political Stability*. The second concept refers to "the capacity of government to effectively formulate and implement sound policies"; the two WGIs associated with this category are *Regulatory Quality* and *Government Effectiveness*. The third category refers to the factors associated with "the respect of citizens and the state for institutions that govern economic and social interactions"; the two WGIs associated with this category are *Control of Corruption* and *Rule of Law.* The six indicators take values from − 2.5 to + 2.5 and high values indicate a sounder institutional environment. A positive effect of institutional quality on insurance penetration is expected.

Control variables

The control variables have been selected according to the literature on determinants of insurance demand. These variables include income per capita (GDP per capita), life expectancy at birth, social expenses measured by health expenditure (as a percentage of GDP) and education measured by the number of tertiary enrolments.

Income level This variable is one of the most robust determinants of insurance consumption (Browne and Kim 1993; Outreville 1996; Ward and Zurbruegg 2002; Beck and Webb 2003) and a positive relationship is expected. First, individual consumption and human capital generally increase with income. This can generate greater insurance demand for insurers and expected consumption (Beck and Webb 2003). Second, as income increases, insurance becomes more affordable. According to the literature, income is measured by a country's real GDP per capita (Ward and Zurbruegg 2002; Zerriaa et al. 2017). From this literature, we expect income to be positively correlated with insurance penetration.

Life expectancy at birth It is expected that higher life expectancy will negatively impact insurance penetration, particularly life insurance, since it implies a low probability of death. Hence, it lowers the motivation to purchase life insurance. Therefore, a negative correlation is expected between life expectancy at birth and insurance penetration.

Education The level of education (tertiary school enrolments) is used as a proxy for financial literacy, as in previous studies including Park and Lemaire (2012), Alhassan and Biekpe (2016) and Zerriaa et al. (2017). Most empirical studies assumed a positive relationship between insurance demand and education. First, a high level of education is expected to stimulate educated people's desire to provide a safety net for their dependents and their goods. Second, it may also increase people's ability to understand the benefits of risk management and long-term savings, therefore increas-

ing their desire to mitigate risk through insurance (Beck and Webb 2003). However, some exceptions exist within the empirical literature, including Outreville (1996), Beck and Webb (2003), Feyen et al. (2013) and Millo and Carmeci (2014), who posit a negative relationship between education and insurance consumption. According to Alhassan and Biekpe (2016), low financial literacy suggests that education may not translate into high consumption of financial services, as is the case of insurance penetration in Africa. Whilst the literature is not conclusive on the nature of this relationship, we expect that education is negatively correlated with insurance penetration.

Health expenditure The ratio of health expenditure to GDP is used as a proxy for social security expenditure. Social expenditure is postulated to be negatively correlated with insurance penetration as social security displaces private investment (Beck and Webb 2003). In fact, increased government spending on social security systems reduces the need for individuals to acquire protection via life insurance. Given the low level of health expenditure in Africa, it is expected that government health spending will complement insurance activities as it does not yet reach a level that would substitute for insurance policies. Therefore, a positive correlation between health expenditure and insurance penetration is expected.

Data

The study uses an unbalanced panel for 42 countries in Africa with data for the period 1996–2017 (see Appendix for the list of countries). The temporal scope of the research is motivated by data constraint availability at the time of the study. The data come mainly from the following sources:

1. Financial Development and Structure Dataset (FDSD) developed by Beck et al. (2009) for dependent variables, notably total insurance, life insurance and non-life insurance;
2. World Development Indicators of the World Bank for control variables (i.e. income per capita, life expectancy at birth, education and health expenditure);
3. Worldwide Governance Indicators for institutional quality variables (i.e. voice and accountability, control of corruption, rule of law, government effectiveness, political stability and absence of violence, and regulation quality).

Method

The two-step GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998) was adopted in this study. The following two main reasons guided the choice of this method. First, the data structure of the study is such that the number of cross-sections is substantially higher than the corresponding number of periods in each cross-section. Roodman (2009a) argues that GMM is designed for situations with "*small* T and *large* N" panels, meaning few time periods and many individuals. Hence, $N(42) > T(22)$, and the condition for the application of the GMM

technique is fulfilled. Second, the estimation strategy considers endogeneity[3] by accounting for simultaneity or reverse causality in the explanatory variables through an instrumentation process on the one hand and controlling for the unobserved heterogeneity with time-invariance on the other hand. In addition, inherent biases that are characteristic of *difference* in estimators are corrected with the *system* estimator. The two-step procedure is also preferred over the one-step approach to correct for heteroscedasticity.

For a good GMM specification, it is important to substantiate the narrative with identification and exclusion restrictions. According to Boateng et al. (2017) and Asongu and Nwachukwu (2016), identification refers to the choice of the dependent, endogenous-explaining, and strictly exogenous variables, whereas exclusion restriction is the process by which the dependent variable is influenced by the strictly exogenous variable exclusively through the endogenous-explaining variables. Consistent with Roodman (2009b), we assume that all variables are endogenous and only time-invariant variables are considered to be strictly exogenous. The Difference in Hansen Test is used to assess the validity of the exclusion restriction for instrument exogeneity. The null hypothesis of this test should not be rejected to validate the exclusion restriction.

Results and discussion

Pre-estimation tests: descriptive statistics and correlation matrix

The mean and the median of all variables are presented in Table 7 (see Appendix), as well as the standard deviation and maximum and minimum values. It appears that all variables are positively skewed except political stability and regulatory quality. The kurtosis values are positive for all variables, indicating that they are leptokurtic in nature.

Furthermore, some studies suggest that it is important to test the correlation between independent variables to detect multicollinearity. Multicollinearity may cause contradiction between the parameter estimates and the theory (Agung 2009). According to Gujarati (2004), if the pair-wise correlation coefficients between two regressors exceed 0.8, then multicollinearity is a serious problem. In line with this explanation, we present the results of the correlation analysis between the whole set of variables used in this study in Table 8 (see Appendix). The table shows that the correlation coefficients between our control variables (GDP per capita, education, life expectancy at birth, health expenditure) are below 0.8. In addition, the correlation coefficients between control variables and institutional quality (voice and accountability, political stability, control of corruption, government effectiveness, regulatory quality, and rule of law) are also less than 0.8. The institutional quality

[3] It should be noted that the GMM method is appropriate when there is a suspicion of endogeneity, which is present in most macro panel data. The main causes of endogeneity include omitting variables, double causality and errors in the measurement of variables.

Table 4 Effects of institutional quality on total insurance penetration in Africa (1996–2017): system GMM estimation

Dependent variable: Total insurance penetration (% GDP)							
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Insurance penetration (− 1)	0.656***	0.710***	0.664***	0.617***	0.679***	0.740***	0.712***
	(0.187)	(0.149)	(0.175)	(0.191)	(0.163)	(0.156)	(0.168)
Income	0.547**	0.488**	0.530***	0.694**	0.529***	0.480***	0.664***
	(0.244)	(0.187)	(0.190)	(0.282)	(0.177)	(0.153)	(0.232)
Life expectancy	− 2.580**	− 1.265*	− 1.727**	− 1.902**	− 2.030***	− 2.156**	− 2.313**
	(1.081)	(0.705)	(0.851)	(0.884)	(0.710)	(0.880)	(0.971)
Health	0.119**	0.102**	0.0791*	0.123**	0.116***	0.0954**	0.0549**
	(0.0526)	(0.0481)	(0.0404)	(0.0520)	(0.0343)	(0.0430)	(0.0254)
Education	0.00477	− 0.00375	− 0.00802	− 0.00578	− 4.99e-05	0.000913	− 0.00856
	(0.0131)	(0.0103)	(0.0141)	(0.0105)	(0.00924)	(0.0118)	(0.00923)
Institutional quality index	0.541**						
	(0.262)						
Political stability		0.219**					
		(0.103)					
Voice and accountability			0.175				
			(0.262)				
Regulatory quality				0.790***			
				(0.284)			
Rule of law					0.600***		
					(0.201)		
Control of corruption						0.489**	
						(0.186)	
Government effectiveness							0.364**
							(0.164)
Constant	6.273*	1.278	2.998	2.614	4.251**	5.081	4.581
	(3.489)	(2.267)	(2.457)	(1.904)	(2.022)	(3.119)	(2.797)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	454	454	454	454	454	454	454
No. of countries, *n*	42	42	42	42	42	42	42
No. of instruments, *i*	30	35	25	37	32	36	38
Instruments ratio, *n/i*	1.4	1.2	1.7	1.1	1.3	1.2	1.1
Fisher *p* value	44.45	51.41	41.20	69.95	37.61	104	80.11

Table 4 (continued)

Dependent variable: Total insurance penetration (% GDP)							
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
AR1 *p* value	0.053	0.042	0.055	0.045	0.053	0.043	0.043
AR2 *p* value	0.292	0.389	0.272	0.208	0.325	0.215	0.154
Hansen *p* value	0.840	0.558	0.901	0.713	0.819	0.794	0.722
DHT for instruments							
(a) Instruments in levels							
H excluding group	0.717	0.524	0.692	0.697	0.689	0.824	0.659
Dif(null, *H* = exogenous)	0.752	0.495	0.879	0.525	0.760	0.472	0.614
(b) IV (years, eq(diff))							
H excluding group	0.854	0.493	0.570	0.747	0.709	0.700	0.718
Dif(null, *H* = exogenous)	0.477	0.550	0.960	0.403	0.786	0.750	0.480

Source Authors' calculation

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

indicators are highly correlated between themselves, but this is not a problem as they do not appear in the same model. Therefore, the correlation analysis indicates that there is no tendency for multicollinearity among the independent variables.

Estimation results

The empirical results using system GMM are presented in Tables 4 and 5, which show the effect of institutional quality on insurance consumption in Africa. We estimate the overall institutional quality index and the six components of the index separately on insurance penetration (total insurance, life insurance and non-life insurance), taking into account the effects of control variables, including GDP per capita, health expenditure, life expectancy and education.

The validity of estimates with the GMM system required the absence of second-order autocorrelation, the validity of instruments and the validity of the choice of exogenous and endogenous variables. In our estimates, the null hypothesis of the absence of second-order Arellano and Bover autocorrelation test (AR(2)) in difference is not rejected in all models. To test the validity of instruments, the Hansen

Table 5 Effects of institutional quality on life and non-life insurance penetration in Africa (1996–2017): System GMM estimation

Variable	Dependent variable: Life insurance penetration (% GDP)								Dependent variable: Non-life insurance penetration					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Life insurance penetration (− 1)	0.660***	0.791***	0.604***	0.687***	0.648***	0.801***	0.474***	0.886***	0.804***	0.938***	0.901***	0.750***	0.933***	0.871***
	(0.174)	(0.120)	(0.172)	(0.192)	(0.165)	(0.143)	(0.136)	(0.162)	(0.203)	(0.215)	(0.147)	(0.129)	(0.154)	(0.242)
Income	0.554***	0.313**	0.785***	0.812***	0.531***	0.345**	0.491***	0.325*	0.411**	0.403***	0.407***	0.373**	0.299**	0.416***
	(0.187)	(0.131)	(0.259)	(0.287)	(0.194)	(0.150)	(0.172)	(0.162)	(0.201)	(0.147)	(0.125)	(0.178)	(0.118)	(0.149)
Life expectancy	− 2.322***	− 1.379**	− 2.737***	− 2.797**	− 2.135***	− 1.255**	− 2.080***	− 0.905**	− 1.228*	− 1.542**	− 1.046***	− 1.209**	− 1.203**	− 1.343**
	(0.842)	(0.653)	(0.802)	(1.157)	(0.663)	(0.565)	(0.616)	(0.433)	(0.674)	(0.615)	(0.355)	(0.592)	(0.515)	(0.652)
Health	0.0771**	0.0635**	0.0738*	0.0795**	0.0885*	0.0402**	0.0541**	0.0593**	0.0578**	0.0623***	0.0778**	0.0634**	0.0459***	0.0711***
	(0.0374)	(0.0244)	(0.0432)	(0.0354)	(0.0469)	(0.0194)	(0.0202)	(0.0253)	(0.0264)	(0.0217)	(0.0294)	(0.0266)	(0.0166)	(0.0226)
Education	− 0.00697	− 0.00246	− 0.0228	− 0.0103	− 0.00771	− 0.00331	− 0.00836	− 0.00929	− 0.00418	− 0.00487	− 0.0100	− 0.00850	− 0.00571	− 0.0116
	(0.00862)	(0.00794)	(0.0154)	(0.0102)	(0.0119)	(0.00621)	(0.00598)	(0.00728)	(0.00814)	(0.00638)	(0.00724)	(0.00590)	(0.00477)	(0.00741)
Institutional quality index	0.432**							0.221**						
	(0.196)							(0.108)						
Political stability		0.146**							0.0500					
		(0.0633)							(0.0601)					
Voice and account-ability			0.220							0.0535				
			(0.261)							(0.197)				
Regulatory quality				0.565**							0.196**			
				(0.240)							(0.0841)			
Rule of law					0.509**							0.0136		
					(0.231)							(0.138)		
Control of corruption						0.160**							0.231***	

Table 5 (continued)

Variable	Dependent variable: Life insurance penetration (% GDP)								Dependent variable: Non-life insurance penetration					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
						(0.0783)							(0.0843)	
Government effectiveness							0.359***							0.199***
							(0.130)							(0.0683)
Constant	5.285*	3.111	5.226***	5.162	4.717*	2.435	4.871***	1.114	1.679	2.903	0.889	1.898	2.549*	2.135
	(2.770)	(2.237)	(1.890)	(3.203)	(2.457)	(1.680)	(1.645)	(1.084)	(1.873)	(1.759)	(1.165)	(1.254)	(1.512)	(1.930)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Observations	454	454	454	454	454	454	454	468	468	468	468	468	468	468
No. of countries, *n*	42	42	42	42	42	42	42	42	42	42	42	42	42	42
No. of instruments, *i*	39	39	39	29	41	39	39	27	26	24	31	39	29	27
Instruments ratio, *n*/*i*	1.1	1.1	1.1	1.4	1.02	1.1	1.1	1.6	1.6	1.75	1.3	1.1	1.4	1.6
Fisher *p* value	9.477	41.26	6.583	10.01	9.701	52.03	28.75	181.3	99.20	83.98	146.3	123.9	135.3	111.3
AR1 *p* value	0.119	0.099	0.126	0.106	0.122	0.102	0.119	0.006	0.016	0.019	0.006	0.008	0.004	0.024
AR2 *p* value	0.582	0.610	0.602	0.346	0.685	0.519	0.280	0.561	0.495	0.511	0.472	0.372	0.707	0.784
Hansen *p* value	0.727	0.829	0.728	0.762	0.510	0.870	0.913	0.438	0.732	0.878	0.768	0.751	0.604	0.782
DHT for instruments														
(a)Instruments in levels														
***H* excluding group**	0.632	0.604	0.931	0.791	0.661	0.775	0.910	0.385	0.794	0.819	0.756	0.694	0.575	0.666
Dif (null, *H* = exogenous)	0.678	0.993	0.118	0.514	0.209	0.801	0.564	0.459	0.451	0.675	0.487	0.615	0.458	0.864

Table 5 (continued)

Variable	Dependent variable: Life insurance penetration (% GDP)								Dependent variable: Non-life insurance penetration					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(b) IV (years, eq(diff))														
***H* excluding group**	0.514	0.721	0.745	0.443	0.697	0.777	0.912	0.911	0.782	0.720	0.681	0.850	0.916	0.961
Dif (null, *H* = exogenous)	0.896	0.800	0.457	0.824	0.152	0.767	0.576	0.349	0.436	0.796	0.665	0.341	0.226	0.249

Source Authors' calculation

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

test is favoured as it is robust, even if it is weakened by too many instruments. Our results show that the Hansen test for validity of instruments is not rejected. In addition, to circumvent the proliferation of instruments, we ensure that the rule of thumb stating that the number of instruments (i) is less than the corresponding number of cross-sections (n) in every regression is respected, as suggested by Roodman (2009a). Indeed, the instrument ratio ($r = n/i$) is higher than 1 in all our regressions. The null hypothesis of the difference in Hansen test to validate the exclusion restriction is not rejected in all models, meaning that our choice of exogenous and endogenous variables is correct.

As institutional quality is the variable of interest in this study, it worth recalling that control variables, including income per capita, life expectancy, health expenditure and education, have the expected signs. However, only income per capita, life expectancy and health expenditure are significant. Income per capita has a positive and significant effect on insurance consumption in all African countries considered in this study. The results are consistent with the extant literature on insurance demand, confirming it as a robust determinant of insurance consumption (Ward and Zurbruegg 2002; Beck and Webb 2003; Chang and Lee 2012; Lee et al. 2013; Dragos et al. 2017; and Zerriaa et al. 2017; Canh et al. 2020). The recent study by Olarewaju and Msomi (2021) shows that income per capita has a positive effect on insurance penetration for 15 West African countries over the period 1999–2019 using a P-ARDL approach. In fact, higher income is expected to increase the standard of living and wealth of individuals, and therefore the affordability and awareness of insurance.

Our results demonstrate that life expectancy is negatively associated with insurance consumption in Africa. This confirms the results of previous studies (Beck and Webb 2003; Li et al. 2007; Guerineau and Sawadogo 2015; Alhassan and Biekpe 2016). As a higher life expectancy means a lower probability of death, it lowers the motivation to purchase life insurance. Health expenditure, a measure of social security, is positively associated with insurance penetration in Africa. This supports the "complementarity" hypothesis of social security systems with private insurance consumption (Kjosevski 2012; Li et al. 2007). Alhassan and Biekpe (2016) found similar results for life insurance in Africa over the period 1996–2010. The low level of insurance development combined with the weak security system on the continent could explain the complementarity between these variables; the social system is not at a sufficient level to compete with the insurance sector.

According to Table 4, increasing institutional quality has positive effects on total insurance penetration (life insurance and non-life insurance) in African countries. Indeed, a sounder institutional environment is necessary for a vibrant insurance market. Whilst all institutional quality indicators have the expected signs, only five, namely political stability and the absence of violence, regulatory quality, rule of law, control of corruption and government effectiveness, are significant. This confirms the fact that sound institutions increase trust and confidence between economic agents (Dixit 2009). Our results are in line with those of Browne et al. (2000), Esho et al. (2004) and Avram et al. (2010), who argue that a better legal system with stronger protection of property rights facilitates better insurance development.

Specifically, political stability and the absence of violence is found to positively influence insurance penetration in Africa. A stable political environment stimulates the consumption of insurance as political instability impedes financial development and then dampens the dynamics of the insurance market. For example, a lack of political stability shortens the economic horizon for potential buyers and suppliers of insurance products and thus may hinder insurance market development (Beck and Webb 2003).

Regulatory quality and the rule of law appear to be important for insurance penetration in African countries. Regulatory quality measures the ability of government to formulate and implement sound policies and regulations that promote the development of private-sector development, including the insurance sector. The efficiency of competition regulation in the market, the ease of starting a new business, and investment and financial freedom positively influence insurance demand (Dragos et al. 2017). These findings are in line with the results of Park et al. (2002), who found that regulatory quality, measured by economic freedom, is a significant predictor of insurance pervasiveness. Regarding the rule of law, insurance is a kind of contract. The legal system therefore affects both parties in terms of their contractual obligations. According to Beck and Webb (2003), a lack of property rights protection and contract enforcement hampers insurers' ability to invest efficiently and control the price of their products.

The level of corruption in our sample influences insurance penetration as the coefficient associated with the control of corruption indicator is positive and significant. Some previous studies, including Chang and Lee (2012), Dragos and Dragos (2013) and Giné et al. (2019), have demonstrated that corruption has a detrimental effect on insurance demand in a country.

Government effectiveness appears to be a determinant of insurance penetration in Africa. Our results show a positive coefficient associated with this institutional quality indicator. The quality of policy formulation and implementation and the credibility of the government's commitment to such policies are prerequisites for a favourable business environment.

The effect of institutional quality on insurance penetration could differ according to the nature of insurance. To test this hypothesis, we investigate the effects of institutional quality on life insurance on the one hand and non-life insurance on the other hand (see Table 5).

The results in Table 5 (models 1–7) show that institutions are important for life insurance penetration in Africa and five out of the six institutional quality indicators (all except voice and accountability) have positive and significant effects. Regulatory quality, rule of law and government effectiveness have the highest coefficients, followed by control of corruption and political stability and the absence of violence.

Our results confirm those of previous studies identifying institutional quality as a key determinant of life insurance penetration (Ward and Zurbruegg 2002; Avram et al. 2010; Chang and Lee 2012; Guerineau and Sawadogo 2015; Giné et al. 2019). From a panel of 31 African countries over the period 1996–2010, Alhassan and Biekpe (2016) observed that institutional quality has positive effects on life insurance penetration. Kjosevski (2012) found that rule of law is the most accurate predictor of life insurance in 14 countries in central and south-eastern Europe for the period 1998–2010. Dragos

et al. (2017) demonstrated that regulatory quality is a significant institutional factor for both developed and developing countries (with a greater influence in developed countries), whilst rule of law significantly influences life insurance demand in transition and emerging countries. Sen and Madheswaran (2013) also observed that regulatory changes influence life insurance consumption in 12 Asian economies. Guerineau and Sawadogo (2015) focussed on the determinants of life insurance in 20 sub-Saharan African countries over the period 1996–2011. They observed that the protection of property rights and government stability are positively associated with life insurance consumption. Avram et al. (2010) observed that rule of law and protection of property rights have positive effects on life insurance consumption in a sample of 93 countries over the period 1980–2006. Outreville (2018) observed that only government effectiveness has a positive and significant effect on life insurance consumption in a sample of 15 emerging countries over the period 2000–2015.

According to Table 5 (models 8–14), our regressions show that institutional quality influences non-life insurance penetration in African countries. Whilst the overall index of institutional quality is positive and significant, however, only three out of the six components, namely regulatory quality, control of corruption and government effectiveness, are significant. Rule of law, political stability and voice and accountability are non-significant, even if they have the expected sign. These results are in line with the findings of Erbaş and Sayers (2006), Avram et al. (2010), Park and Lemaire (2012) Dragos and Dragos (2013) and Giné et al. (2019). According to Giné et al. (2019), in a sample of 180 countries over 20 years, a change in the governance index is associated with changes of 47% over non-life insurance penetration. Separately, changes in all six institutional index components are associated with changes of similar magnitude to insurance penetration, except for the political stability component. From a sample of 82 countries, including countries from East Africa and West Africa, over the period 1999–2008 Park and Lemaire (2012) found that a low degree of political risk leads to highly significant increases in non-life insurance demand. The positive and significant effect of regulatory quality for non-life insurance is in line with the findings of Brokešová et al. (2014) on four central European transition economies over the period 1995–2010. Trinh et al. (2016) observed that economic freedom is a driver of non-life expenditure both in developed and developing countries over the period 2000–2011. Using a sample of 31 European countries between 2006 and 2010, Dragos and Dragos (2013) discovered that a country's level of corruption has an effect on the development of non-life insurance, which is in line with our findings.

Robustness checking

We conducted some robustness tests of the above findings. First, we excluded outliers in the regression for insurance penetration to test the sensibility of the results (see Supplementary Material). When we excluded the outliers in the regression, the results are qualitatively similar to the baseline results, with the exception of non-life insurance penetration, for which the institutional quality index is non-significant. Control of corruption, regulatory quality and government effectiveness, however, remain positive and significant.

Second, we split our time period into two (1996–2008 and 2009–2017), motivated by the 2008 financial crisis, to check the sensitivity of our baseline results. The findings are presented in Table 9 in the Appendix for total insurance, life insurance and non-life insurance penetration. Table 9 in the Appendix presents the results for total insurance penetration. We discovered that for the 1996–2008 subperiod, the results confirm the positive effects of institutional quality on insurance activities, as the findings are qualitatively similar to the baseline results with few exceptions. Indeed, whilst overall institutional quality index, control of corruption and government effectiveness remain statistically significant at the 5% level, as for the baseline, political stability is only significant at the 10% level, compared to 5% for the baseline results. The significance of the regulatory quality and rule of law indicators decreased to the 5% level using the subperiods, compared to the 1% level in the baseline. The results for the 2009–2017 subperiod showed that five out of six institutional quality indicators (all except voice and accountability) are significant, but at the 10% level. The results for life insurance are presented in Table 10 in the Appendix. Here, we observed that our results for the pre-financial crisis period (1996–2008) are quite similar qualitatively to the baseline results. For example, all institutional quality indicators except voice and accountability are significant determinants of life insurance penetration in Africa. However, for the post-crisis period (2009–2017), only regulatory quality and government effectiveness are significant. Regarding non-life insurance penetration (Table 11 in the Appendix), we found that only control of corruption and government effectiveness have significant positive effects over the pre-crisis period, confirming the baseline results with the exception of regulatory quality, which is not significant. In the post-crisis period, regulatory quality and government effectiveness have positive effects on non-life insurance penetration, but at the 10% level.

Finally, we used an alternative measure of insurance development—insurance density, i.e. insurance per capita—similar to previous studies including Park and Lemaire (2012) and Guerineau and Sawadogo (2015) (see Table 9 in the Appendix). For total and life insurance density, the findings are qualitatively similar to the baseline results, with minor changes for non-life insurance density. Indeed, for total insurance density, five out of six variables (all except voice and accountability) are statistically significant and positive (Table 12 in the Appendix). The same findings are obtained for life insurance density (Table 13 models 1–7 in the Appendix). However, whilst only three institutional quality indicators, namely regulatory quality, control of corruption and government effectiveness, were significant for non-life insurance penetration in the baseline results, for non-life insurance density, the coefficients of political stability and rule of law are also positive and significant (Table 13 models 8–14 in the Appendix). Therefore, the results confirm that institutional quality is a robust determinant of insurance consumption in Africa.

Conclusion

The prevailing socioeconomic and political reality in Africa has increasingly highlighted the importance of institutions for economic performance. This study aims to deepen the literature and advance knowledge on the subject of financial

services development by investigating the effects of institutional quality on insurance demand and penetration in Africa over the period 1996–2017. To this end, we used the GMM system approach to identify the dimensions of institutional quality that influence insurance demand. In general, our findings show that institutional quality has a positive and significant effect on insurance demand in Africa. Specifically, regulatory quality, rule of law, political stability and the absence of violence, control of corruption and government effectiveness have positive and significant effects on total insurance and life insurance penetration. However, only regulatory quality, government effectiveness and control of corruption have positive and significant effects on non-life insurance penetration. Our robustness tests confirm the importance of institutional quality for insurance development in Africa. Institutional quality dimensions, control of corruption and government effectiveness remain statistically significant in most of our robustness regression tests.

Our findings provide some policy implications for African countries where insurance development is low and institutional quality remains a challenge. To boost insurance development, high priority should be given to reforms that provide enabling conditions for private-sector participation, including strong enforcement of property rights and contracts, a well-functioning legal and judicial system and a corruption-free government. In addition, governments should pursue reforms relative to the overall political environment in order to strengthen investors' confidence in the insurance sector, particularly life insurance.

This study has some limitations that could be investigated in further research. First, there is wide disparity in insurance development across African countries. Further research related to factors impacting insurance consumption across economic regions would add insight into the differences between countries in the same economic community (for example, the Economic Community of West African States (ECOWAS) or the Economic Community of Central African States (ECCAS)). Second, other determinants of insurance consumption, such as culture or economic shocks, have not been included in this study. For example, authors including Outreville (2018) argue that culture could affect individual behaviour when it comes to insurance consumption. Investigating cultural determinants of insurance development in Africa may provide some useful insights on insurance activities. EPU or the recent COVID-19 pandemic are further areas to be explored, either in Africa as a whole or in subregions within the continent.

Appendix

List of countries Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Democratic Republic of the Congo, Republic of the Congo, Côte d'Ivoire, Egypt, Eritrea, Eswatini, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda and Zambia.

See Tables 6, 7, 8, 9, 10, 11, 12, and 13.

Table 6 Definition and description of variables

Definition variable	Description	Data source
Life insurance penetration	Life insurance premium volume as a share of GDP	FDSD
Life insurance density	Life insurance premium volume per capita	FDSD
Non-life insurance penetration	Non-life insurance premium volume as a share of GDP	FDSD
Non-life insurance density	Non-life insurance premium volume per capita	FDSD
Voice and accountability	Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	WGI
Political stability and absence of violence	Measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism	WGI
Control of corruption	Captures perceptions of the extent to which elites and private interests exercise public power for private gain, including both petty and grand forms of corruption, as well as "capture" of the state	WGI
Regulatory quality	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private-sector development	WGI
Rule of law	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence	WGI
Government effectiveness	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	WGI
GDP per capita	Provides per capita values for GDP expressed in current international dollars converted by the purchasing power parity (PPP) conversion factor. GDP is the sum of gross value added by all resident producers in the country plus any product taxes and minus any subsidies not included in the value of the products	WDI
Life expectancy at birth	Indicates the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life	WDI
Tertiary school enrolment	Ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown	
Health expenditure (% GDP)	Estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include capital health expenditures such as buildings, machinery, IT and stocks of vaccines for emergency or outbreaks	WDI

FDSD Financial Development Structure Database, *WDI* World Development Indicators, *WGI* Worldwide Governance Indicators

Table 7 Descriptive statistics

Variable	Obs	Mean	Median	SD	Min	Max	Skewness	Kurtosis
Insurance penetration	792	1.592	0.780	2.514	0.004	17.023	3.763	18.139
Life insurance penetration	794	0.787	0.148	2.073	0.000	15.381	4.336	23.163
Non-life insurance penetration	815	0.823	0.609	0.905	0.003	14.723	9.831	139.084
Insurance density	786	51.548	7.924	132.594	0.030	939.372	4.183	22.000
Life insurance density	788	32.134	1.219	105.826	0.002	741.787	4.485	24.313
Non-life insurance density	809	19.380	5.558	30.573	0.024	197.586	2.651	11.075
GDP per capita	915	4281.638	2247.833	4633.769	359.794	29,895.199	2.052	7.936
Life expectancy at birth	924	57.969	57.280	8.364	35.380	76.499	0.359	2.381
Education	596	9.853	5.936	10.412	0.321	60.497	1.794	6.194
Health expenditure	750	5.224	4.876	1.877	1.453	11.793	0.860	3.564
Institutional quality index	923	− 0.588	− 0.579	0.602	− 2.100	0.880	0.262	2.708
Voice and accountability	924	− 0.603	− 0.709	0.737	− 2.226	1.007	0.281	2.323
Political stability	924	− 0.557	− 0.411	0.908	− 2.845	1.219	− 0.255	2.344
Government effectiveness	923	− 0.625	− 0.657	0.589	− 1.892	1.057	0.410	2.843
Regulatory quality	924	− 0.576	− 0.513	0.592	− 2.298	1.127	− 0.168	3.384
Rule of law	924	− 0.602	− 0.600	0.632	− 2.130	1.077	0.308	2.729
Control of corruption	924	− 0.560	− 0.645	0.601	− 1.723	1.217	0.699	3.016

Source Authors' calculation

Table 8 Correlation between different variables

Variables	Total insurance	Life insurance	Non-life insurance	GDP per capita	Life expectancy	Health expenditure	Education	Institutional quality index	Voice and accountability	Political stability	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
Total insurance	1.000													
Life insurance	0.960	1.000												
Non-life insurance	0.667	0.431	1.000											
GDP per capita	0.380	0.352	0.247	1.000										
Life expectancy	0.036	0.015	0.023	0.580	1.000									
Health expenditure	0.364	0.349	0.349	− 0.098	− 0.118	1.000								
Education	0.250	0.248	0.141	0.769	0.713	− 0.022	1.000							
Institutional quality index	0.484	0.458	0.264	0.391	0.255	0.218	0.245	1.000						
Voice and accountability	0.463	0.449	0.219	0.221	0.125	0.162	0.097	0.865	1.000					
Political stability	0.270	0.241	0.169	0.357	0.194	0.071	0.142	0.856	0.659	1.000				
Government effectiveness	0.542	0.511	0.320	0.449	0.336	0.245	0.387	0.917	0.730	0.685	1.000			
Regulatory quality	0.476	0.465	0.229	0.345	0.156	0.233	0.191	0.898	0.775	0.669	0.867	1.000		
Rule of law	0.425	0.396	0.240	0.408	0.347	0.247	0.324	0.958	0.797	0.786	0.889	0.841	1.000	
Control of corruption	0.482	0.455	0.279	0.324	0.249	0.276	0.243	0.873	0.671	0.680	0.821	0.718	0.854	1.000

Source Authors' calculation

Table 9 Effects of institutional quality on insurance penetration in Africa, 1996–2008 and 2009–2017: System GMM estimations

Dependent variable: Total insurance penetration (% GDP)														
Variable	1996–2008								2009–2017					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Insurance (− 1)	0.608***	0.698***	0.664***	0.650***	0.675***	0.540***	0.597***	0.805***	0.716**	0.900***	0.855***	0.837***	0.814***	0.812***
	(0.102)	(0.0719)	(0.0747)	(0.0830)	(0.0782)	(0.0819)	(0.111)	(0.203)	(0.294)	(0.170)	(0.183)	(0.127)	(0.289)	(0.208)
Income	0.500**	0.396**	0.490**	0.537*	0.515**	0.618**	0.670**	0.758**	0.935*	1.098**	0.702**	0.763**	0.705**	0.616**
	(0.239)	(0.184)	(0.229)	(0.311)	(0.243)	(0.269)	(0.257)	(0.363)	(0.499)	(0.445)	(0.317)	(0.370)	(0.316)	(0.273)
Life expectancy	− 3.020**	− 1.618*	− 2.501**	− 2.424**	− 3.027*	− 4.000***	− 3.496**	− 2.482*	− 3.660*	− 3.703**	− 2.210*	− 2.506*	− 2.698**	− 2.186*
	(1.365)	(0.936)	(1.227)	(1.120)	(1.775)	(1.074)	(1.456)	(1.368)	(1.861)	(1.687)	(1.209)	(1.471)	(1.284)	(1.224)
Health	0.0921**	0.0684*	0.0934**	0.0835**	0.0671**	0.0866*	0.0930**	0.0689	0.0361	0.111*	0.0484	0.0569	0.0907*	0.0759*
	(0.0379)	(0.0378)	(0.0413)	(0.0382)	(0.0295)	(0.0439)	(0.0367)	(0.0653)	(0.0952)	(0.0628)	(0.0442)	(0.0865)	(0.0519)	(0.0448)
Education	0.00126	− 0.00746	0.00759	0.00329	0.00411	0.0150	− 0.00536	− 0.0103	0.00171	− 0.00678	− 0.0131	− 0.0131	− 0.00824	− 0.00924
	(0.0103)	(0.00734)	(0.00802)	(0.0191)	(0.0127)	(0.0217)	(0.0151)	(0.00996)	(0.0150)	(0.0140)	(0.0150)	(0.0176)	(0.0137)	(0.00954)
Institutional quality index	0.634**							0.376*						
	(0.304)							(0.204)						
Political stability		0.170*							0.154*					
		(0.0983)							(0.0898)					
Voice and accountability			0.308***							− 0.321				
			(0.111)							(0.256)				
Regulatory quality				0.469**							0.497*			
				(0.218)							(0.276)			
Rule of law					0.231**							0.390*		
					(0.113)							(0.213)		
Control of corruption						0.458**							0.496*	
						(0.223)							(0.255)	

Table 9 (continued)

Dependent variable: Total insurance penetration (% GDP)

Variable	1996–2008								2009–2017					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Government effectiveness							0.484**							0.347*
							(0.220)							(0.177)
Constant	8.663**	3.627	6.399*	5.860*	8.417	11.68***	9.281*	4.338	7.730	5.928	3.817	4.409	5.522	4.228
	(4.099)	(2.757)	(3.464)	(3.109)	(5.629)	(3.269)	(4.740)	(4.788)	(5.848)	(4.865)	(3.544)	(5.905)	(3.998)	(3.442)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Yes	No	No
Observations	225	225	225	225	225	225	225	229	229	229	229	229	229	229
No. of countries, *n*	39	39	39	39	39	39	39	40	40	40	40	40	40	40
No. of instruments, *i*	27	28	28	27	36	32	31	30	30	28	30	31	31	28
Instruments ratio, *n/i*	1.4	1.4	1.4	1.4	1.1	1.2	1.3	1.3	1.3	1.4	1.3	1.3	1.3	1.4
Fisher *p* value	45.59	142.6	160.3	127.2	210.2	50.90	88.40	213.4	16.97	41.63	81.22	114.1	22.02	156.8
AR1 *p* value	0.0126	0.0102	0.0105	0.00669	0.0113	0.0129	0.0129	0.149	0.223	0.187	0.146	0.153	0.203	0.164
AR2 *p* value	0.439	0.594	0.649	0.290	0.521	0.395	0.255	0.100	0.102	0.0849	0.118	0.110	0.104	0.105
Hansen *p* value	0.734	0.758	0.760	0.514	0.805	0.920	0.539	0.785	0.712	0.962	0.745	0.637	0.956	0.906
DHT for instruments														
(a) Instruments in levels														
H excluding group	0.335	0.817	0.427	0.257	0.524	0.895	0.815	0.636	0.684	0.873	0.880	0.598	0.918	0.958

Table 9 (continued)

Dependent variable: Total insurance penetration (% GDP)														
Variable	1996–2008								2009–2017					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Dif(null, *H* = exogenous)	0.983	0.435	0.963	0.824	0.990	0.676	0.133	0.731	0.531	0.888	0.300	0.539	0.786	0.454
(b) IV (years, eq(diff))														
H excluding group	0.439	0.742	0.671	0.406	0.695	0.901	0.745	0.732	0.538	0.888	0.769	0.439	0.922	0.804
Dif(null, *H* = exogenous)	0.941	0.514	0.670	0.585	0.778	0.644	0.075	0.611	0.741	0.876	0.421	0.891	0.771	0.922

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

Table 10 Effects of institutional quality on life insurance penetration in Africa, 1996–2008 and 2009–2017: System GMM estimations

Dependent variable: Life insurance penetration (% GDP)

Variable	1996–2008							2009–2017						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Life insurance penetration (− 1)	0.636***	0.660***	0.667***	0.598***	0.553***	0.357***	0.612***	0.960***	0.821***	0.905***	0.817***	0.842***	0.760***	0.912***
	(0.0673)	(0.101)	(0.0909)	(0.0968)	(0.125)	(0.112)	(0.0969)	(0.117)	(0.123)	(0.300)	(0.125)	(0.158)	(0.198)	(0.167)
Income	0.334**	0.358**	0.481**	0.421**	0.492**	0.595**	0.476**	0.228**	0.885***	0.714**	0.738**	0.645**	0.917***	0.383*
	(0.160)	(0.159)	(0.206)	(0.202)	(0.220)	(0.287)	(0.227)	(0.0984)	(0.297)	(0.318)	(0.359)	(0.257)	(0.325)	(0.216)
Life expectancy	− 2.069**	− 1.650**	− 2.386**	− 2.069**	− 3.089**	− 5.322***	− 2.915**	− 1.287**	− 3.815**	− 3.316**	− 2.633*	− 3.202**	− 3.823***	− 2.333**
	(0.937)	(0.758)	(0.901)	(1.012)	(1.471)	(1.466)	(1.203)	(0.536)	(1.673)	(1.516)	(1.407)	(1.377)	(1.210)	(0.940)
Health	0.0638*	0.0901**	0.0602***	0.0733**	0.0565*	0.105**	0.0811**	0.00678	0.0313	0.0149	0.0451	0.0347	0.0105	0.00376
	(0.0328)	(0.0438)	(0.0214)	(0.0315)	(0.0323)	(0.0468)	(0.0344)	(0.0318)	(0.0927)	(0.0238)	(0.0603)	(0.0752)	(0.0909)	(0.0212)
Education	− 0.00259	− 0.000968	− 0.00298	− 0.00106	0.00186	0.0171	− 0.00611	0.00153	− 0.00466	0.00886	− 0.00648	0.000693	− 0.00485	0.00518
	(0.0132)	(0.0107)	(0.0120)	(0.0133)	(0.0154)	(0.0224)	(0.0171)	(0.00741)	(0.00907)	(0.0132)	(0.0189)	(0.00826)	(0.0171)	(0.00563)
Institutional quality index	0.399**							0.214						
	(0.186)							(0.225)						
Political stability		0.138**							0.110					
		(0.0681)							(0.158)					
Voice and accountability			0.0298							− 0.468				
			(0.137)							(0.317)				
Regulatory quality				0.435**							0.450**			
				(0.210)							(0.220)			
Rule of law					0.486**							0.288		
					(0.194)							(0.477)		
Control of corruption						0.959**							0.321	

Table 10 (continued)

Dependent variable: Life insurance penetration (% GDP)														
Variable	1996–2008							2009–2017						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
						(0.453)							(0.598)	
Government effectiveness							0.293**							0.243**
							(0.137)							(0.110)
Constant	5.864*	3.653	5.822**	5.158*	8.833*	17.05***	8.113**	3.581*	8.672	7.503	5.142	8.067	8.826*	6.621**
	(3.050)	(2.331)	(2.832)	(3.023)	(4.725)	(5.106)	(3.517)	(1.913)	(5.236)	(4.667)	(4.248)	(4.814)	(4.842)	(2.534)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	Yes
Observations	225	225	225	225	225	225	225	229	229	229	229	229	229	229
No. of countries, *n*	39	39	39	39	39	39	39	40	40	40	40	40	40	40
No. of instruments, *i*	29	30	23	29	30	30	30	33	37	39	31	38	39	40
Instruments ratio, *n/i*	1.3	1.3	1.7	1.3	1.3	1.3	1.3	1.2	1.1	1.03	1.3	1.05	1.03	1
Fisher *p* value	110.4	36.18	51.05	80.49	19.49	11.56	58.55	76.60	27.10	10.45	37.26	43.45	16.57	74.40
AR1 *p* value	0.0630	0.0525	0.0380	0.0522	0.0685	0.0936	0.0462	0.246	0.233	0.278	0.220	0.251	0.234	0.252
AR2 *p* value	0.381	0.641	0.468	0.305	0.454	0.273	0.366	0.179	0.376	0.681	0.162	0.262	0.225	0.195
Hansen *p* value	0.743	0.630	0.689	0.271	0.690	0.599	0.802	0.742	0.379	0.960	0.421	0.761	0.480	0.954
DHT for instruments														
(a) Instruments in levels														
H excluding group	0.751	0.676	0.314	0.620	0.571	0.307	0.791	0.746	0.209	0.911	0.317	0.578	0.469	0.923

Table 10 (continued)

Dependent variable: Life insurance penetration (% GDP)

Variable	1996–2008							2009–2017						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Dif(null, H = exogenous)	0.495	0.402	0.934	0.077	0.680	0.944	0.554	0.459	0.710	1.000	0.604	0.892	0.438	0.935
(b) IV (years, eq(diff))														
H excluding group	0.866	0.612	0.552	0.187	0.558	0.423	0.832	0.662	0.333	0.951	0.386	0.684	0.330	0.926
Dif(null, H = exogenous)	0.197	0.472	0.738	0.685	0.825	0.949	0.424	0.660	0.501	0.606	0.477	0.855	0.870	0.874

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

Table 11 Effects of institutional quality on non-life insurance penetration in Africa, 1996–2008 and 2009–2017: System GMM estimations

Dependent variable: Non-life insurance penetration														
Variable	1996–2008							2009–2017						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Non-life insurance penetration (−1)	0.565***	0.508***	0.536***	0.558***	0.477***	0.498**	0.368***	0.504***	0.702***	0.642***	0.681**	0.645***	0.455***	0.452**
	(0.188)	(0.171)	(0.173)	(0.177)	(0.145)	(0.243)	(0.132)	(0.175)	(0.257)	(0.227)	(0.262)	(0.197)	(0.146)	(0.184)
Income	0.190*	0.257***	0.215**	0.302**	0.268**	0.313**	0.376***	0.395**	0.700***	0.647***	0.484**	0.547***	0.460***	0.349**
	(0.103)	(0.0915)	(0.101)	(0.132)	(0.120)	(0.131)	(0.130)	(0.186)	(0.242)	(0.236)	(0.231)	(0.164)	(0.133)	(0.137)
Life expectancy	− 0.892*	− 1.197**	− 1.241**	− 1.267**	− 1.306**	− 1.933*	− 2.302**	− 0.997*	− 1.460**	− 1.521**	− 1.200*	− 1.548***	− 1.430*	− 1.251**
	(0.492)	(0.589)	(0.546)	(0.610)	(0.565)	(1.005)	(0.925)	(0.527)	(0.701)	(0.707)	(0.668)	(0.565)	(0.715)	(0.585)
Health	0.0274	0.00706	0.00756	0.0321	0.0108	0.0273	0.0164	0.00500	0.0128	0.0185	0.00208	0.00128	0.0169	0.0197
	(0.0242)	(0.0249)	(0.0283)	(0.0331)	(0.0303)	(0.0349)	(0.0339)	(0.0492)	(0.0356)	(0.0283)	(0.0286)	(0.0334)	(0.0552)	(0.0327)
Education	0.000500	0.000260	0.00251	0.000230	0.00116	0.00344	0.000668	− 0.00393	− 0.0141	− 0.0106	− 0.00599	− 0.00243	0.000924	− 0.000684
	(0.00783)	(0.00870)	(0.00639)	(0.0124)	(0.00947)	(0.00962)	(0.0103)	(0.00612)	(0.01000)	(0.0107)	(0.00925)	(0.00913)	(0.00627)	(0.00431)
Institutional quality index	0.212**							0.0717						
	(0.104)							(0.179)						
Political stability		− 0.0228							0.00128					
		(0.165)							(0.0823)					
Voice and accountability			0.0812							− 0.107				
			(0.0764)							(0.197)				
Regulatory quality				0.0660							0.122*			
				(0.117)							(0.0644)			
Rule of law					0.0336							0.0315		
					(0.116)							(0.136)		

Table 11 (continued)

Dependent variable: Non-life insurance penetration														
Variable	1996–2008							2009–2017						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Control of corruption						0.212**							0.0482	
						(0.104)							(0.373)	
Government effectiveness							0.347**							0.162*
							(0.162)							(0.0880)
Constant	2.408	3.153	3.678*	2.975	3.543**	5.733*	6.948**	1.308	0.656	1.264	1.390	2.227	2.488	2.699
	(1.790)	(2.311)	(2.031)	(2.178)	(1.620)	(3.183)	(3.396)	(1.553)	(2.714)	(2.283)	(2.017)	(1.677)	(2.570)	(2.127)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	231	231	231	231	231	231	231	237	237	237	237	237	237	237
No. of countries, *n*	40	40	40	40	40	40	40	40	40	40	40	40	40	40
No. of instruments, *i*	35	30	34	38	30	36	38	27	29	32	31	29	30	33
Instruments ratio, *n/i*	1.1	1.3	1.2	1.05	1.3	1.1	1.05	1.5	1.4	1.3	1.3	1.4	1.3	1.2
Fisher *p* value	197.9	191.8	213.6	283.3	351.8	302.5	59.19	52.70	35.50	22.21	104.2	51.86	34.52	52.20
AR1 *p* value	0.0523	0.0545	0.0477	0.0358	0.0458	0.0889	0.0526	0.0151	0.0328	0.0434	0.0208	0.0102	0.0210	0.0234
AR2 *p* value	0.885	0.879	0.962	0.688	0.889	0.939	0.325	0.389	0.342	0.263	0.573	0.170	0.493	0.241
Hansen *p* value	0.490	0.231	0.654	0.403	0.745	0.759	0.597	0.393	0.865	0.877	0.775	0.971	0.385	0.931
DHT for instruments														

Table 11 (continued)

Dependent variable: Non-life insurance penetration														
Variable	1996–2008							2009–2017						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(a) Instruments in levels														
H excluding group	0.415	0.385	0.676	0.167	0.648	0.600	0.712	0.518	0.818	0.934	0.786	0.996	0.417	0.947
Dif(null, *H* = exogenous)	0.568	0.187	0.478	0.955	0.663	0.801	0.285	0.235	0.661	0.392	0.495	0.664	0.334	0.516
(b) IV (years, eq(diff))														
H excluding group	0.642	0.127	0.665	0.370	0.628	0.673	0.488	0.573	0.828	0.923	0.741	0.957	0.475	0.834
Dif(null, *H* = exogenous)	0.102	0.891	0.392	0.488	0.978	0.881	0.993	0.103	0.630	0.145	0.549	0.725	0.174	0.927

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

Table 12 Effects of institutional quality on total insurance density in Africa (1996–2017): system GMM estimations

Dependent variable: Total insurance density (% GDP)							
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Insurance density (− 1)	0.743***	0.756***	0.657***	0.742***	0.628***	0.557***	0.576***
	(0.153)	(0.231)	(0.0948)	(0.249)	(0.144)	(0.198)	(0.197)
Income	0.850**	0.916**	0.525**	0.805**	1.015**	1.046**	1.035**
	(0.344)	(0.341)	(0.213)	(0.370)	(0.408)	(0.459)	(0.396)
Life expectancy	− 2.597**	− 2.051**	− 2.796**	− 2.823**	− 2.593**	− 2.365**	− 2.182**
	(1.172)	(0.826)	(1.286)	(1.264)	(1.073)	(1.113)	(0.993)
Health	0.0843**	0.105*	0.0816*	0.112**	0.112**	0.107**	0.0767*
	(0.0351)	(0.0542)	(0.0457)	(0.0518)	(0.0437)	(0.0461)	(0.0433)
Education	− 0.00990	− 0.0147	0.00511	0.00368	− 0.0146	− 0.0130	− 0.0102
	(0.0117)	(0.00898)	(0.0168)	(0.0119)	(0.0129)	(0.0116)	(0.00846)
Institutional quality index	0.644**						
	(0.291)						
Political stability		0.285***					
		(0.103)					
Voice and accountability			0.282				
			(0.240)				
Regulatory quality				0.428**			
				(0.205)			
Rule of law					0.536**		
					(0.243)		
Control of corruption						0.712**	
						(0.287)	
Government effectiveness							0.436**
							(0.211)
Constant	4.480	1.454	7.387*	5.357	3.294	2.281	1.634
	(3.821)	(3.509)	(3.807)	(4.785)	(2.606)	(3.938)	(3.800)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	No	No	Yes	Yes	Yes	Yes
Country effect	454	454	225	454	454	454	454
No. of countries, *n*	42	42	39	42	42	42	42
No. of instruments, *i*	38	30	31	38	33	38	36
Instruments ratio, *n/i*	1.1	1.4	1.3	1.1	1.3	1.1	1.2
Fisher *p* value	132.2	244	127.2	217.4	233.7	87.52	176.1

Table 12 (continued)

Dependent variable: Total insurance density (% GDP)							
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
AR1 *p* value	0.0223	0.0402	0.00669	0.0412	0.0305	0.0436	0.0445
AR2 *p* value	0.460	0.535	0.290	0.472	0.410	0.423	0.397
Hansen *p* value	0.473	0.445	0.514	0.332	0.580	0.214	0.259
DHT for instruments							
(a) Instruments in levels							
H excluding group	0.428	0.326	0.334	0.226	0.523	0.198	0.187
Dif(null, *H* = exogenous)	0.542	0.620	0.913	0.820	0.587	0.406	0.852
(b) IV (years, eq(diff))							
H excluding group	0.232	0.301	0.750	0.212	0.470	0.203	0.238
Dif(null, H = exogenous)	1.000	0.866	0.213	0.682	0.742	0.381	0.427

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1%, respectively

Table 13 Effects of institutional quality on life and non-life insurance density in Africa (1996–2017): system GMM estimations

Variable	Dependent variable: Life insurance density							Dependent variable: Non-life insurance density						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Life insurance density (− 1)	0.875***	0.779***	0.717***	0.701***	0.829***	0.756***	0.598***	0.706***	0.677***	0.706***	0.800***	0.781***	0.706***	0.741***
	(0.136)	(0.171)	(0.141)	(0.132)	(0.128)	(0.148)	(0.194)	(0.212)	(0.170)	(0.181)	(0.0992)	(0.112)	(0.225)	(0.252)
Income	1.163**	1.785**	1.785**	1.681***	1.337***	0.791*	2.214***	0.923**	0.987***	1.047***	0.948***	0.900***	0.946***	0.902**
	(0.513)	(0.814)	(0.761)	(0.564)	(0.481)	(0.399)	(0.740)	(0.402)	(0.343)	(0.363)	(0.306)	(0.281)	(0.345)	(0.393)
Life expectancy	− 3.895**	− 3.423***	− 3.930**	− 3.843**	− 4.370***	− 2.076*	− 5.414***	− 2.384**	− 1.844*	− 2.540**	− 2.275**	− 2.498***	− 2.599**	− 2.169*
	(1.630)	(1.200)	(1.457)	(1.780)	(1.065)	(1.196)	(1.376)	(1.155)	(1.011)	(1.193)	(1.107)	(0.900)	(1.210)	(1.213)
Health	0.0394	0.194	0.168*	0.174**	0.0647	0.0439	0.301**	0.0764**	0.0758***	0.0702**	0.0442	0.0455	0.0667*	0.0932***
	(0.0679)	(0.129)	(0.0893)	(0.0668)	(0.0886)	(0.0853)	(0.143)	(0.0330)	(0.0231)	(0.0327)	(0.0337)	(0.0369)	(0.0333)	(0.0310)
Education	− 0.0322	− 0.0581	− 0.0522	− 0.0370	− 0.0333	− 0.0168	− 0.0611	− 0.0137	− 0.0160	− 0.00791	− 0.0212*	− 0.0142	− 0.0132	− 0.0155
	(0.0199)	(0.0348)	(0.0316)	(0.0227)	(0.0198)	(0.0155)	(0.0368)	(0.0111)	(0.0126)	(0.0126)	(0.0114)	(0.00860)	(0.00918)	(0.00928)
Institutional quality index	0.531**							0.524**						
	(0.236)							(0.228)						
Political stability		0.327**							0.244**					
		(0.158)							(0.120)					
Voice and accountability			0.424							0.0757				
			(0.409)							(0.350)				
Regulatory quality				0.680*							0.355*			
				(0.365)							(0.197)			
Rule of law					0.637**							0.534**		
					(0.262)							(0.198)		
Control of corruption						0.556*							0.489**	
						(0.308)							(0.193)	
Government effectiveness							0.934**							0.420**

Table 13 (continued)

Variable	Dependent variable: Life insurance density							Dependent variable: Non-life insurance density						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
							(0.407)							(0.191)
Constant	7.289	− 0.197	2.076	2.335	7.743*	2.682	4.391	3.011	0.268	2.389	2.353	3.808	3.785	2.185
	(4.431)	(4.509)	(3.376)	(5.444)	(4.148)	(4.659)	(5.072)	(4.418)	(3.632)	(4.300)	(3.018)	(2.909)	(4.834)	(4.254)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	454	454	454	454	454	454	454	468	468	468	468	468	468	468
No. of countries, *n*	42	42	42	42	42	42	42	42	42	42	42	42	42	42
No. of instruments, *i*	30	28	26	37	23	39	30	40	34	36	37	41	39	37
Instruments ratio, *n*/*i*	1.4	1.5	1.6	1.1	1.8	1.1	1.4	1.05	1.2	1.2	1.1	1.02	1.1	1.1
Fisher *p* value	69.76	99.14	42.70	77.25	33.44	33.03	30.75	140.2	91.10	164.6	161.9	240.3	145.9	131.7
AR1 *p* value	0.0597	0.0757	0.0755	0.0706	0.0717	0.0600	0.0738	0.0404	0.0355	0.0281	0.00935	0.0129	0.0407	0.0555
AR2 *p* value	0.215	0.202	0.222	0.254	0.274	0.221	0.156	0.448	0.512	0.466	0.433	0.412	0.431	0.416
Hansen *p* value	0.807	0.779	0.487	0.612	0.792	0.520	0.725	0.617	0.474	0.390	0.211	0.697	0.551	0.493
DHT for instruments														
(a) Instruments in levels														
H excluding group	0.547	0.650	0.434	0.644	0.952	0.385	0.775	0.626	0.420	0.298	0.117	0.622	0.546	0.461
Dif(null, *H* = exogenous)	0.984	0.921	0.493	0.298	0.265	0.707	0.299	0.353	0.570	0.723	0.812	0.652	0.391	0.480
(b) IV (years, eq(diff))														
H excluding group	0.349	0.782	0.637	0.382	0.685	0.657	0.535	0.410	0.389	0.368	0.125	0.741	0.324	0.329

Table 13 (continued)

Variable	Dependent variable: Life insurance density							Dependent variable: Non-life insurance density						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dif(null, H = exogenous)	0.989	0.544	0.303	0.881	0.711	0.235	0.737	0.925	0.650	0.433	0.689	0.393	0.958	0.882

The numbers in parentheses represent the robust standard errors of the estimated coefficients

*, ** and *** represent significance at the 10%, 5% and 1% levels, respectively

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1057/s41288-022-00278-2.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Acemoglu, D., S. Johnson, and J.A. Robinson. 2002. Reversal of fortune: geography and institutions in the making of the modern world income distribution. *The Quarterly Journal of Economics* 117 (4): 1231–1294.

Agung, I.G.N. 2009. *Time series data analysis using E-view*. Clementi Loop: Wiley.

Alhassan, A.L., and N. Biekpe. 2015. Efficiency, productivity and returns to scale economies in the non-life insurance market in South Africa. *The Geneva Papers on Risk and Insurance—Issues and Practice* 40 (3): 493–515. https://doi.org/10.1057/gpp.2014.37.

Alhassan, A.L., and N. Biekpe. 2016. Determinants of life insurance consumption in Africa. *Research in International Business and Finance* 37: 17–27. https://doi.org/10.1016/j.ribaf.2015.10.016.

Arellano, M., and O. Bover. 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics* 68 (1): 29–51.

Asongu, S.A., and J.C. Nwachukwu. 2016. The role of governance in mobile phones for inclusive human development in Sub-Saharan Africa. *Technovation* 55–56: 1–13. https://doi.org/10.1016/j.technovation.2016.04.002.

Avram, K., Y. Nguyen, and M. Skully. 2010. Insurance and economic growth: A cross country examination. *Australian centre for financial studies—Finsia banking and finance conference*, 1–45.

Bah, M., H. Atangana Ondoa, and K.D. Kpognon. 2021. Effects of governance quality on exports in Sub-Saharan Africa. *International Economics* 167: 1–14. https://doi.org/10.1016/j.inteco.2021.05.003.

Balcilar, M., R. Gupta, and C. Lee. 2020a. Insurance and economic policy uncertainty. *Research in International Business and Finance* 54: 101253. https://doi.org/10.1016/j.ribaf.2020.101253.

Balcilar, M., R. Gupta, C.C. Lee, and G. Olasehinde-Williams. 2020b. Insurance-growth Nexus in Africa. *The Geneva Papers on Risk and Insurance—Issues and Practice* 45 (2): 335–360. https://doi.org/10.1057/s41288-019-00145-7.

Balcilar, M., G.O. Olasehinde-Williams, and M. Shahbaz. 2019. Asymmetric Dynamics of Insurance Premium: The impact of monetary policy uncertainty on insurance premiums in Japan. *International Journal of Monetary Economics and Finance* 12 (3): 233–247. https://doi.org/10.1504/IJMEF.2019.100625.

Beck, T., A. Demirgüç-Kunt, and R. Levine. 2009. Financial institutions and markets across countries and over time—Data and analysis. *Policy Research Working Paper*.

Beck, T., R. Levine, and N. Loayza. 2000. Finance and the sources of growth. *Journal of Financial Economics* 58: 261–300.

Beck, T., and I. Webb. 2003. Determinants of life insurance consumption across countries. *The World Bank Economic Review* 17 (1): 51–88. https://doi.org/10.1093/wber/lhg011.

Bloom, N. 2009. The impact of uncertainty shocks. *Econometrica* 77 (3): 623–685. https://doi.org/10.3982/ECTA6248.

Blundell, R., and S. Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87 (1): 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8.

Boateng, A., S. Asongu, R. Akamavi, and V. Tchamyou. 2017. Information asymmetry and market power in the African banking industry. *Journal of Multinational Financial Management*. https://doi.org/10.1016/j.mulfin.2017.11.002.

Brokešová, Z., E. Pastoráková, and T. Ondruška. 2014. Determinants of insurance industry development in transition economies: Empirical analysis of visegrad group data. *The Geneva Papers on Risk and Insurance—Issues and Practice*. https://doi.org/10.1057/gpp.2014.1.

Browne, M.J., J. Chung, E.W. Frees, and M.J. Browne. 2000. International property-liability insurance consumption. *The Journal of Risk and Insurance* 67 (1): 73–90.

Browne, M.J., and K. Kim. 1993. an international analysis of life insurance demand. *The Journal of Risk and Insurance* 60 (4): 616–634.

Canh, N.P., U. Wongchoti, and S.D. Thanh. 2020. Does economic policy uncertainty matter for insurance development ? Evidence from 16 OECD countries. *The Geneva Papers on Risk and Insurance—Issues and Practice*. https://doi.org/10.1057/s41288-020-00192-5.

Chang, C.H., and C.C. Lee. 2012. Non-linearity between life insurance and economic development: A revisited approach. *Geneva Risk and Insurance Review* 37 (2): 223–257. https://doi.org/10.1057/grir.2011.10.

Dixit, A. 2009. Governance institutions and economic activity. *The American Economic Review* 99 (1): 3–24.

Dragos, S., and C. Dragos. 2013. The role of institutional factors over the national insurance demand: Theoretical approach and econometric estimations. *Transylvanian Review of Administrative Sciences* 39: 32–45.

Dragos, S.L., C. Mare, I.M. Dragota, C.M. Dragos, and G.M. Muresana. 2017. The Nexus between the demand for life insurance and institutional factors in Europe: New evidence from a panel data approach. *Economic Research-Ekonomska Istrazivanja* 30 (1): 1477–1496. https://doi.org/10.1080/1331677X.2017.1325764.

Elango, B., and J. Jones. 2011. Drivers of insurance demand in emerging markets. *Journal of Service Science Research* 3: 185–204. https://doi.org/10.1007/s12927-011-0008-4.

Erbaş, S.N., and C.L. Sayers. 2006. Institutional quality, knightian uncertainty, and insurability: A cross-country analysis. *IMF Working Paper*, *WP/06/179*.

Esho, N., D. Ward, and R. Zurbruegg. 2004. Law and the determinants of property-casualty insurance. *The Journal of Risk and Insurance* 71 (2): 265–283.

Feyen, E., R. Lester, and R. Rocha. 2013. What drives the development of the insurance sector? An empirical analysis based on a panel of developed and developing countries. *Journal of Financial Perspectives* 1 (1): 117–139.

Giné, X., B. Ribeiro, and P. Wrede. 2019. Beyond the S-curve: Insurance penetration, institutional quality and financial market development. *Policy Research Working Paper*, June. https://doi.org/10.1596/1813-9450-8925

Guerineau, S., and R. Sawadogo. 2015. On the determinants of life insurance development in Sub-Saharan Africa: The role of the institutions quality in the effect of economic development. *Etudes et Documents N°19. CERDI* 19: 1–34.

Gujarati, D.N. 2004. *Basic econometric*. The McGraw-Hill Companies.

Gupta, R., A. Lahiani, C.C. Lee, and C.C. Lee. 2019. Asymmetric dynamics of insurance premium: The impacts of output and economic policy uncertainty. *Empirical Economics* 57 (6): 1959–1978. https://doi.org/10.1007/s00181-018-1539-z.

Hakansson, N.H. 1969. Optimal investment and consumption strategies under risk, an uncertain lifetime, and insurance. *International Economic Review* 10 (3): 443–466.

Karni, E., and I. Zilcha. 1986. Risk aversion in the theory of life insurance: The Fisherian model. *The Journal of Risk and Insurance* 53 (4): 606. https://doi.org/10.2307/252966.

Kaufmann, D., K. Aart, and M. Massimo. 2010. Woldwide Governance Indicators. *Policy Research Working Paper 5430.* Washington, DC: The World Bank. http://info.worldbank.org/governance/wgi/index.aspx#reports%5Cnhttp://www.brookings.edu/~/media/research/files/reports/2010/9/wgikaufmann/09_wgi_kaufmann.pdf

Keefer, P., and S. Knack. 2002. Polarization, politics and property rights: Links between inequality and growth. *Public Choice* 111 (1): 127–154.

Kjosevski, J. 2012. The determinants of life insurance demand in Central and Southeastern Europe. *International Journal of Economics and Finance* 4 (3): 237–247. https://doi.org/10.5539/ijef.v4n3p237.

Lee, C.C., Y. Bin. Chiu, and C.H. Chang. 2013. Insurance demand and country risks: A nonlinear panel data analysis. *Journal of International Money and Finance* 36: 68–85. https://doi.org/10.1016/j.jimonfin.2013.03.009.

Levchenko, A.A. 2007. Institutional quality and international trade. *Review of Economic Studies* 74 (3): 791–819. https://doi.org/10.1111/j.1467-937X.2007.00435.x.

Levine, R., N. Loayza, and T. Beck. 2000. Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics* 46 (1): 31–77.

Li, D., F. Moshirian, P. Nguyen, and T. Wee. 2007. The demand for life insurance in OECD countries. *Journal of Risk and Insurance* 74 (3): 637–652.

Liu, Q., R. Lu, and X. Ma. 2015. Corruption, financial resources and exports. *Review of International Economics* 23 (5): 1023–1043. https://doi.org/10.1111/roie.12194.

Mahaini, M.G., K. Noordin, and M.T. Mohamad. 2019. The Impact of Political, Legal and Economic Institutions on Family Takaful/ Life Insurance Consumption in OIC Countries. *UMRAN - International Journal of Islamic and Civilizational Studies* 6 (3): 97–114. https://doi.org/10.11113/umran2019.6n3.357.

Millo, G., and G. Carmeci. 2014. A subregional panel data analysis of life insurance consumption in Italy. *Journal of Risk and Insurance* 82 (2): 317–340. https://doi.org/10.1111/jori.12023.

Mumtaz, H. 2018. Does uncertainty affect real activity? Evidence from state-level data. *Economics Letters* 167: 127–130. https://doi.org/10.1016/j.econlet.2018.03.026.

Ngwenduna, B.K.S., M.G. Hayes, and J. Angove. 2015. An investigation into life assurance markets in Africa. *Actuarial Society of South Africa's 2015 Convention* 27: 17–18. http://www.actuarialsociety.org.za/

North, D.C. 1990. *Institutions, institutional change and economic performance*. ed. J. Alt and D. North. New York: Cambridge University Press. https://doi.org/10.1017/cbo9780511528118.012

Olarewaju, O., and T. Msomi. 2021. Determinants of insurance penetration in West African countries: A panel auto regressive distributed lag approach. *Journal of Risk and Financial Management* 14 (8): 350. https://doi.org/10.3390/jrfm14080350.

Olayungbo, D.O., and A.E. Akinlo. 2016. Insurance penetration and economic growth in Africa: Dynamic effects analysis using Bayesian TVP-VAR approach. *Cogent Economics & Finance*. https://doi.org/10.1080/23322039.2016.1150390.

Outreville, J.F. 1996. Life insurance markets in developing countries. *The Journal of Risk and Insurance* 63 (2): 263–278.

Outreville, J.F. 2018. Culture and life insurance ownership: Is it an issue? *Journal of Insurance Issues* 41: 168–192.

Park, H., S.F. Borde, and Y. Choi. 2002. determinants of insurance pervasiveness: A cross-national analysis. *International Business Review* 11 (1): 79–96. https://doi.org/10.1016/S0969-5931(01)00048-8.

Park, S.C., and J. Lemaire. 2012. The impact of culture on the demand for non-life insurance. *Astin Bulletin: THe Journal of the IAA* 42 (2): 501–527. https://doi.org/10.2143/AST.42.2.2182806.

Rodrik, D., A. Subramanian, F. Trebbi. 2002. Institutions Rule: The primacy of institutions over geography and integration in economicd Development. *NBER Working Paper No. 9305*. https://doi.org/10.1111/1465-5922.t01-1-00003

Roe, M.J., and J.I. Siegel. 2011. Political instability: Effects on financial development, roots in the severity of economic inequality. *Journal of Comparative Economics* 39(3): 279–309.

Roodman, D. 2009a. A note on the tTeme of too many instruments. *Oxford Bulletin of Economics and Statistics* 71 (1): 135–158. https://doi.org/10.1111/j.1468-0084.2008.00542.x.

Roodman, D. 2009b. How to Do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal* 9 (1): 86–136. https://doi.org/10.1177/1536867x0900900106.

Sen, S., and S. Madheswaran. 2013. Regional determinants of life insurance consumption: Evidence from selected Asian economies. *Asian-Pacific Economic Literature* 27 (2): 86–103. https://doi.org/10.1111/apel.12024.

Trinh, T., X. Nguyen, and P. Sgro. 2016. Determinants of non-life insurance expenditure in developed and developing countries: An empirical investigation. *Applied Economics* 48 (58): 5639–5653. https://doi.org/10.1080/00036846.2016.1181834.

Ward, D., and R. Zurbruegg. 2002. Law, politics and life insurance consumption in Asia. *The Geneva Papers on Risk and Insurance—Issues and Practice* 27 (3): 395–412.

Wen, J., and C. Zhang. 1993. Investment under risk in property rights. *China Economic Review* 4 (1): 49–53.

Yaari, M.E. 1965. Uncertain lifetime, life insurance, and the theory of the consumer. *The Review of Economic Studies* 32 (2): 137–150.

Zerriaa, M., M.M. Amiri, H. Noubbigh, and K. Naoui. 2017. Determinants of life insurance demand in Tunisia. *African Development Review* 29 (1): 69–80. https://doi.org/10.1111/1467-8268.12239.

About the authors

Mamadou Bah holds a PhD in Economics from Pan African University-African Union and University of Yaoundé 2 (Cameroon). He is currently a Senior Research Economist Consultant at the African Development Bank. His research interests include development economics, economic growth, institutions, project evaluation, econometrics.

Nelson Abila is a development economist within the African Development Bank. He holds a Doctor of Science degree in Economics and Business Administration with specialisation in energy economics and sustainable development from the University of Vaasa. His research interests include renewable energy, biofuel adoption and agricultural industrialisation.