

Exigency of Innovation on Bureaucratic Quality and Non-life Insurance Penetration Nexus: A Panel Corrected Standard Errors Approach

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Abstract

Purpose

Non-life insurance is considered to have an advantage over traditional life insurance for some situations because it covers a variety of risks such as fire, theft, and casualty-related losses. However, poor government policy may negate the tendency for non-life insurance policy subscriptions. Considering this issue, the authors investigate the relationship between bureaucratic quality and nonlife insurance penetration. Institutional quality, innovation, and insurance align with the timeline of Sustainable Development Goals, SDG 16 (Peace, Justice, and Strong Institutions), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 8 (Decent Work and Economic Growth). These goals together form the bedrock of financial resilience sustainable development

Methodology:

The sample of the present study consists of 420 country-year observations for 35 Sub-Saharan Africa (SSA) economies for the period 2009–2020. This study applies regression with a panel corrected standard errors (PCSEs) to examine the exigency of innovation on bureaucratic quality and non-life insurance penetration nexus, while Driscoll-Kraay estimation was utilized to check the robustness of the results.

Findings:

The study shows that the effect of bureaucratic quality on non-life insurance penetration is positive and significant. The study also finds that the association between bureaucratic quality and non-life insurance penetration is contingent on innovation.

Practical implications:

The findings will guide stakeholders to develop and implement measures that are capable of improving non-life insurance penetration in SSA countries. The findings demonstrate that bureaucratic quality is an essential determinant of non-life insurance penetration. Countries in the SSA region could increase non-life insurance penetration by fortifying the quality of their policy design and implementation. This study will also contribute to reduce the impact of adverse consequences of low insurance penetration among the citizens of emerging nations.

Uniqueness:

This is a premier study explaining the link between bureaucratic quality and non-life insurance penetration in the context of new institutional economics (NIE) and resource based view (RBV) theories.

Jel:C33, G22, G18, O30, N17

1. Introduction

Non-life insurance is increasingly gaining attention as one of the important component of risk management approach that aids in the protection of individuals and properties from the financial consequences of unforeseen events (Hafiz et al., 2022; Garba et al., 2022; Salleh et al., 2020). Insurance outspreads beyond risk mitigation to promotes investment decisions, financial stability poverty alleviation, construction practices, financial inclusion and long-term asset management(Janzen et al., 2020; Malifete et al., 2026; Salleh et al., 2018). The urgency of this study is motivated by the objectives of the 2030 Sustainable Development Agenda. Non-life insurance is a critical

enabler for SDG 9 through mitigation of risks affecting technological and infrastructural investments. Furthermore, by underwriting entrepreneurship risks, insurance provide stability necessary for achieving SDG 8. These functionalities, however, relies on regulatory certainty deeply tied with SDG 16. Institutional fragility poses a direct to market stability, indicating that any failure in bureaucratic quality can hinder achievement of these goals. Hence, assessing how innovation can bridge this institutional gap is a necessity for long term economic resilience of countries.

At its core, bureaucratic quality measures how well a government is able to articulate and implement wide-ranging regulations and policies. Indeed, bureaucratic quality is essential for the development and growth of any economy. Governments around the world attempt to create and implement policies that are capable of promoting inclusiveness among their citizens (Sarhangi et al., 2021). Literature emphasises that bureaucratic quality stands as a primary factor dictating improved access to financial services. While extant studies underscore the importance of institutional frameworks for competitiveness and inclusive development (Asongu & Odhiambo, 2019, Cherif & Gazdar, 2014, Dragos et al., 2019, Srbinoski et al., 2022, United Nations Economic Commission for Africa, 2022), our study suggests that the interacting with innovation is a more determinant of success.

This study examines how bureaucratic quality relates to non-life insurance penetration. Moreover, the study examines whether innovation moderates the nexus between bureaucratic quality and non-life insurance penetration. Even though there is an expanding body of literature on insurance, only a few studies have concentrated on the nexus between bureaucratic quality and non-life insurance product penetration, and their findings are inconclusive. For example, Park and Lemaire (2012), Alhassan and Biekpe (2016), Mahaini et al. (2019) and Dragos et al. (2019) find significant positive association; while Kjosevski and Petkovski (2012) and Poposki and Kjosevski (2013) find no association. Also, Asongu et al. (2019) argued that inclusion of policy-related variables through the channel of institutional factors could unearth an in-depth understanding the role of institutions on economic performance. This position is consistent with Schneider and Nega (2016) who suggested a thorough assessment of New Institutional Economics (NIE) paradigm along with reinforcing inventions to ameliorate inequality.

Fomba et al. (2022), argued that significant proportion of countries in the SSA region have ineffective bureaucracy quality. However, Burhan et al. (2017), maintained that quality of bureaucracy related to the business environment is shaped by innovation capability. Su et al. (2022), added that innovation backs effective utilisation of existing assets to explore opportunities in an environment with poor institutional settings. This statement is in line with the resource-based view (RBV) theory of strategic management that views innovation as a resources that enables entities to revolutionise the production process to overcome constraints to gain a competitive advantage (Barney, 1991). To unravel the challenges surrounding non-life insurance penetration in Sub-Saharan Africa, this study merges two different theoretical sights. While New Institutional Economics (NIE) establishes the essential framework for understanding why bureaucratic quality is a fundamental determinant of broader market performance, but it does not fully account for micro level resilience. To address this, we incorporate the Resource-Based View (RBV), which explains how firms leverage innovative capabilities as strategic drivers to sustain growth despite systemic bureaucratic deficiencies.

Based on this background, this study argues that effective policy formulation and implementation enshrined in the bureaucratic quality could facilitate the non-life insurance product penetration in SSA economies. Present study also maintains that relevance of innovation in moderating the effect of bureaucratic quality on non-life insurance penetration in the SSA countries is uncontestable. Since according to Asongu and Odhiambo (2020) insurance

penetration within Sub-Saharan Africa remains critically low, with subscription rates hovering at approximately 5% of the total population.. This assertion is in line with Chikalipah (2017), which reported that access to financial service such as insurance in SSA countries is far from being effective. On the other hand, insurance is an increasingly important component of risk management approach that aids in the protection of individuals and property from the financial consequences of unforeseen events (Hafiz et al., 2026; Garba et al., 2022; Salleh et al., 2020). Insurance also promotes financial inclusion, increases financial stability, reduces poverty (Janzen et al., 2020; Salleh et al., 2018) and supports in the financing of infrastructural development (Karapiperis, 2017). Initiatives to increase insurance penetration across the SSA region are of great concern to policymakers, regulators, and managers (Asongu & Odhiambo, 2019). The authors further maintained that enhancing insurance penetration would help SSA countries overcome some of the barriers impeding their development. However, Hermes and Hudon (2018), argued that unsound institutions among others could be the root for low insurance penetration.

Hence, the present study draws number of crucial contributions to the insurance and risk engineering literature, especially from the non-life insurance perspective. For instance, it examines the direct effect of bureaucratic quality and non-life insurance penetration. Previous studies provide inconclusive evidence regarding the relationship between regulatory quality and insurance penetration. Integrating innovation on the bureaucratic quality and non-life insurance penetration nexus as a moderator is one of its kind to the best of the researchers' knowledge and will fill in the gap in the knowledge. Specifically, by grounding the discussion on the aforementioned theoretical perspectives and employing panel corrected standard error estimation technique, this research theorizes and empirically investigates the exigency of innovation on the bureaucratic quality and non-life insurance penetration nexus. The study contributes to the decision-making process of boards of directors, managers and policymakers in reducing the low uptake of non-life insurance products in SSA economies. This study argues that the interaction of innovation and bureaucratic quality might stimulates non-life insurance penetration.

2. Review of Literature and hypothesis development

The state of institutional framework is unquestionably crucial to the development of the insurance sector and by implication financial inclusion. Given that institutional framework has different dimensions, this gives a strong background to the present study. For instance, bureaucratic quality as one of the institutional components is one of the determinants of economic development and, consequently, insurance penetration (Ricotta, 2016).

The NIE theory explains the effect of institutional framework such as bureaucratic quality on economic performance. Institutions constitute commonly accepted rules of behaviour and specific limitations of choice. They are crucial for understanding contemporary problems in the economy. North (1990), asserts that institutions shape the political and socioeconomic interactions of actors in the economy. The author added that institutions could either support or impede economic activity performance. This assertion of the new institutionalist paradigm, suggests that effective institutions could lead to more favourable economic outcomes.

2.1 Bureaucratic Quality. According to Kimaro et al. (2017), bureaucratic quality describes the government's ability to develop and enforce sound policies that benefit the economy. Studies suggest that bureaucratic quality is an enabler for efficient policy development and implementation (Cherif & Dreger, 2016; Ejubekpokpo, 2016). According to Mushtaq and Khan (2018), policy stability enables implementation of long-term plans which improves investors' confidence. This view aligns with Rodríguez-Pose and Di Cataldo (2015), who suggest that

bureaucratic quality facilitates the formulation and realisation of long-term innovation policies. Harymawan et al. (2019), added that bureaucratic quality plays an important role in business decision making. This condition is important to financial inclusion because it creates an enabling atmosphere for the insurance firms to float products and services like takaful, and insurtech that attract the uninsured to the mainstream of insurance market (Hafiz et al., 2022).

Literature have documented that effectiveness of the legal and regulatory environment, are equally vital to market development (Nguyen et al., 2010; Sanjeewa & Ouyang, 2020). But, their effectiveness depends on the bureaucratic quality, which is characterised by bureaucrats' independence and policy steadiness. For instance, bureaucratic quality make certain a bureaucratic structure that facilitates a suitable business environment (Dar et al., 2020). By implication, bureaucratic quality may enable additional investment in the insurance industry which might increase policy uptake since more tailored products are likely to be available.

Similarly, Eldomiaty et al. (2019) posited that information asymmetry can result in buyers' taking decisions that are not in their best interest, which likely have negative consequences affecting the individual buyer and the entire market. However, bureaucratic quality reduces the problem of information asymmetry through mainstreaming information disclosure into modern financial regulation policies (Kukoc, 1998). Studies such as, Iheonu et al. (2017), Radzeviča et al. (2018) and Mahaini et al. (2019) have reported a significant positive effect of bureaucratic quality on economic growth. Similarly, Kwenda and Chinoda (2019) documented a positive significant effect of bureaucratic quality on financial inclusion, by implication the non-life insurance growth. From the lens of insurance literature, Dragos et al. (2019) equally found that bureaucratic quality as the most critical institutional factor for insurance business development. Contrary to the literature that supported the positive direction of the effect of bureaucratic quality on insurance penetration, Kjosevski and Petkovski (2012) and Poposki and Kjosevski (2013) have reported the non-significant findings. While Omoteso and Mobolaji (2014), and Sarhangi et al (2021) results reveal a negative direction. Accordingly, this study formulates the following hypothesis:

H1. Bureaucratic quality has a significant effect on non-life insurance penetration.

2.2. Innovation. As observed by Garba et al. (2026) improving service delivery and sustainable competitive edge requires firms to integrate innovation in insurance products. This matches with Reimsbach (2020) who noted that performance efficiency relies on the firm's innovative strategies tailored on its products to meet the constantly shifting demands of customers. In the highly dynamic and challenging environments, firm's growth and sustainability are frequently dependent on firm's innovative capability (Hafiz et al., 2022). Insurance companies, therefore, must leverage innovation to thrive in a market with insufficient institutional quality. Studies across macro and micro analytical perspectives have found a direct positive relationship between innovation and economic activity performance (Qamruzzaman & Wei, 2019; Raghupathi & Raghupathi, 2017). More specifically, Horvey and Odei-Mensah (2025) found innovation drives insurance market landscape, evidenced by its significant positive influence on insurance development. These collective evidences confirmed that, despite weak institutional arrangements, innovation offers operational drive requires to advance market penetration. Accordingly, this study formulates following hypothesis:

H2. Innovation exert a substantial influence on non-life insurance penetration.

2.3 The moderating role of Innovation. Bureaucratic quality increases economic activity performance through effective and efficient formulating and implementing of sound policies (Amir & Gokmenoglu, 2020). On the one hand, firms and industries operating in home countries with weak bureaucratic quality can utilize their innovative

capacities to gain competitive advantage and improve market share (Su et al., 2022). Even when local bureaucratic processes are weak and regulations mechanisms are opaque, innovation capability is critical to economic activity performance like insurance penetration (Jia et al., 2022). In countries where institutions are weak, industries use innovation to optimise business processes, which causes modifications in current services and business norms (Su et al., 2022). Scholars argued that innovation improves bureaucratic quality by developing new policy-making strategies that prioritise empathy, creative and abductive thinking (Hafiz et al., 2022; McGann et al., 2019). Yu et al. (2019) and Tetteha et al. (2020) found the complementary role of innovation on firm performance. As a result, the supposition of a moderating effect of innovation is consistent with the RBV theory (Barney, 1991), which believes that entities can leverage their tangible or intangible resources (innovation) to revolutionise their services to overcome home country constraints and gain more patronage.

Furthermore, in light of the earlier established inconsistencies in the findings of extant studies on the direct effect of bureaucratic quality on non-life insurance penetration that warrants further investigation using the most recent data and the right analytical strategy. Hence, this study argues that innovation could complement bureaucratic quality in enhancing non-life insurance penetration in the SSA countries. Based on the above argument, the following conditional hypothesis has been formulated:

H3. An increase in bureaucratic quality is associated with an increase in non-life insurance penetration when Innovation is accounted for.

3. Methodology and Data

Data on non-life insurance penetration was collected from the Financial Development and Structure Database (FDSD), which makes available information about the non-life insurance penetration of countries. The institutional framework-related information was obtained from the World Governance Index database of the World Bank Group, which provides scores for bureaucratic quality. The indicator has a range of values of between - 2.5, which is the lowest score, and the apex score of + 2.5. A low score reflects weak quality, whilst a higher score indicates efficient quality. Information for the Global Innovation Index (GII) was collected from the World Intellectual Property Organization (WIPO) database. The sample period of this study is 2009–2020. The selection for this period was based on the following reasons. First, the computation of GII started in 2007 (Dutta et al., 2018). However, the records became consistently available in the year 2009 for most countries in the SSA region. Second, the period coincides with the signing of an agreement on improving access to financial services by most developing countries under the Alliance for Financial Inclusion 2008, the post-2015 Sustainable Development Goals (SDG) of which financial inclusion is a significant determinant and the African Financial Inclusion Policy initiative 2017. Consequently, the study sample consists of 420 country-year observations from 35 SSA countries.

3.1 Model Specification

The study uses the panel corrected standard error (PCSE) approach to examine the effect of bureaucratic quality on non-life insurance penetration. Thus, PCSE is robust to autocorrelation, heteroskedasticity, yields homoscedastic and statistically reliable error variances and is less prone to outliers (Hafiz et al., 2022; Ikpesu. et al., 2019). The PCSE is specified following Hafiz et al. (2022) and Weedige (2019) and is modified in line with the present study as:

$$NLIFE = \beta_0 + \beta_1 BQ_{it} + \beta_2 GII_{it} + \beta_3 GIBQ_{it} + \beta_4 GDP_{it} + \beta_5 IND_{it}$$

$$+ \beta_6 \text{CRP}_{it} + \beta_7 \text{UEM}_{it} + \beta_8 \text{PPL}_{it} + \varepsilon_{it}$$

Where: β_0 = is the value of the intercept. β_1, β_2 , represent the coefficients of the explanatory variables. β_3 , represent the interactive term. While $\beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ represent the coefficients of the control variables. Hence, **NLIP** = Non-life Insurance Penetration. It represents the proportional contribution of non-life insurance premiums to the domestic growth product. It gauges the importance of general insurance products in relation to the size of the economy. (Guerineau & Sawadogo, 2015). It is used as the dependent variable in the present study. **BQ** = Bureaucratic Quality. It represents the capacity of the government to formulate and implement sound policies that would benefit the economy (Kimaro et al., 2017). **GII** = Innovation index, it describes the annual ranking of countries regarding their capacity for, and efficiency in, innovation (WIPO, 2021). **GIBQ** = is the orthogonalized interaction term of BQ and GII, applied to eliminate the multicollinearity between the principal variables with their product term. Furthermore, **GDP**= Growth Domestic Product, **IND**= Income Distribution, **CRP**= Credit to the private sector, **UEM**= Unemployment rate, and **PPL**= Annual Population Growth. They serve as control variables. Their inclusion was informed by the review literature to control the effects of other determinants of non-life insurance penetration (Buric et al., 2017; Çelik & Kayali, 2009; Feyen et al., 2011; Hafiz et al., 2022; Kjosevski & Petkovski, 2012; Zerriaa et al., 2017).

3.2 Analysis

In order to examine the available data, the section first presents the descriptive statistics, followed by the correlation matrix and concludes with the presentation of the regression analysis that assesses the direct and indirect relationship between bureaucratic quality and non-life insurance penetration. Table 1 shows the descriptive statistics. The summary statistics reveal that the average non- life insurance penetration in SSA countries is 0.831% with rate ranging from a lowest of 0 to a highest of 11.9%. The average of bureaucratic quality is -0.583 with lowest and highest values of -1.624 and 1.057. This summary indicates that bureaucratic quality in the sampled SSA countries is weak. However, improvement of bureaucratic quality becomes imperative because the high rate of insurance penetration of countries is contingent on the soundness of policy formulation, implementation and government commitment towards the policy. The innovation index has an average scores of 22. 757, a lowest of 1.810 and a highest of 49.160.

Regarding the control metrics, GDP exhibits a mean of 2541.399, bounded by a minimum of 212.137 and a peak of 18505.700. For the IND variable, the central tendency sits at 43.596, fluctuating between a low of 31.500 and an upper limit of 63.400. CRP yields an average output of 23.177, with its distribution spanning from 2.627 up to 106.260. PPL averages 2.419, shifting from a baseline of -2.629 to a maximum threshold of 3.907. Lastly, UEM reflects a mean value of 8.019, covering a range between 0.320 and 28.740.

Table 1
Descriptive statistics.

Variable	Mean	Min	Max	Std. Dev.
NLIFE	0.831	0.000	5.700	0.618
BQ	-0.583	-1.624	1.057	0.576
GII	22.757	1.81	49.160	10.043
GDP	2541.399	212.137	18505.700	3188.251
IND	43.596	31.500	63.400	6.883
CP	23.177	2.627	106.260	18.949
UEM	8.019	0.320	28.740	7.390
PPL	2.419	-2.629	3.907	0.890

Table 2 shows the correlation matrix for the explanatory indicators used in the study model. The outcome reveals a correlation among the indicators. However, the outcome does not reveal any significant issues with multicollinearity given that all of the coefficient values are less than 0.85. Roni et al. (2020) suggested that a correlation coefficient greater than 0.85 could cause significant multicollinearity issues. While, Tabachnick and Fidell (2019) pegged it at 0.9.

Table 2
Correlation Matrix

Variables	NLIP	BQ	GDP	CRP	IND	UEM	PPL
NLIP	1.000						
BQ	0.5207*	1.000					
	0.000						
GDP	-0.3672*	-0.6204*	1.000				
	0.000	0.000					
CRP	0.6228*	0.6720*	-0.5028*	1.000			
	0.000	0.000	0.000				
IND	0.4121*	0.2413*	-0.1120*	0.2467*	1.000		
	0.000	0.000	0.022	0.000			
UEM	0.4236*	0.2690*	-0.3682*	0.3059*	0.3550*	1.000	
	0.000	0.000	0.000	0.000	0.000		
PPL	-0.5206*	-0.5406*	0.5140*	-0.6013*	-0.2212*	-0.5022*	1.000
	0.000	0.000	0.000	0.000	0.000	0.000	
Note: * indicates significance at 5%.							

4. Regression findings

To estimate a correct model, there is a need to check for heteroskedasticity, autocorrelation, and cross-sectional dependence. The result of the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity indicates the presence of heteroscedastic errors ($\chi^2 = 56.94, p = 0.000$). The Pesaran test reveals the existence of cross-sectional dependence ($CD = 0.529, p = 0.039$). Equally, the Wooldridge test revealed the presence of first-order serial autocorrelation ($F(1, 34) = 74.54, p = 0.000$). The results from these tests revealed the presence of heteroskedasticity, cross-sectional dependency, and serial autocorrelation, which could lead to an inaccurate conclusion (Hafiz et al., 2022). This study utilised the Panel Correlated Standard Error (PCSE) model, as Moundigbaye et al. (2018) recommended. The PCSE model is robust against the problems of heteroskedasticity, autocorrelation, and cross-sectional dependency (Beck & Katz, 2011; Moundigbaye et al., 2018).

Table 3 presents and discusses the PCSE estimation results for the sampled SSA countries. Worth noting is that the interactive term was obtained using orthogonalised residual to alleviate multicollinearity issues (Law, 2019). The P-values of the F-statistics suggested that the models were satisfactorily estimated. Model 1 contained bureaucratic quality and all control variables that tested H1, which assumes bureaucratic quality significantly affects non-life insurance penetration. The results in model 1 reveal that bureaucratic quality (BQ) has positive and statistically significant effects on non-life insurance penetration ($\beta_1 = 0.0409, p < 0.01$), signifying that H1 has been supported. Dragos et al. (2019) also found bureaucratic quality as the most significant institutional component for insurance industry development for European countries. Moreover, the coefficient of innovation is significantly positive ($\beta_2 = 0.021, p > 0.01$), providing weak support for H2. While the outcome falls short of the traditional 5% significant threshold level, yet the positive direction is in line with Yu et al. (2019) and Tetteha et al. (2020) that documented significant effect of innovation on performance. As reflected in model 3, the moderating (interactive) effect of innovation on the relationship of bureaucratic quality with non-life insurance penetration was positive and statistically significant ($\beta_3 = 0.109, p < 0.01$), suggesting that H3 is supported.

To determine the overall extent of the contingent effect of innovation on the nexus between bureaucratic quality and non-life insurance penetration, and in line with existing studies, the result is stated in terms of net effect (Hafiz et al., 2022; Agoba et al., 2020; Asongu et al., 2019). One of the requirements for estimating the net effect is that the predicted coefficients of the direct and moderated effects must be significant (Hafiz et al., 2022). The net effect is mathematically derived through taking the partial derivative of the dependent variable with respect to the independent variable. This is given as Net effect = $\beta_1 + \beta_3 \times (\text{Mean of moderating variable})$. The result from the estimate shows that innovation significantly complements bureaucratic quality, with a net effect of 0.7221 on non-life insurance product penetration in the SSA region. This finding demonstrates the capacity for innovation to act as a mechanism for institutional leapfrogging across Sub-Saharan African non-life insurance market. Given that traditional institutional reforms such as improving bureaucratic quality often requires long-term processes, product driven innovation presents a dynamic substitute to expand non-life insurance market. Consequently, insurers can effectively evade the restraints of rigid bureaucratic framework through leveraging digital solutions and novel product designs. This allows for financial services delivery even in the regions historically known with the records of ineffective bureaucratic framework. These insights, therefore, aligns with the resource-based view (RBV) and McGann et al. (2019), reinforcing the principle that innovative capabilities are vital strategic imperatives for achieving market penetration amidst environmental constraints.

Concerning the control variables, as shown in Table 3, the growth domestic product (GDP) turned out to be positive and insignificant in models (1) but positive and significant in model (2). Credit to the private sector (CRP)

was positive and significant in all three models. Similarly, income distribution (IND) was positive and significant in all the two models. The unemployment rate (UEM) was positive and significant in both models. In contrast, annual population growth (PPL) was negative in model 1 and insignificant in all the two (2) models. This phenomenon is likely attributable to high population growth in some SSA countries that outperform insurance development, possibly reducing per capita penetration.

Table 3
Regression result

Variable	(1) PCSE	(2) PCSE
BQ	0.409 (0.0924)***	0.449 (0.113)***
GII	0.021 (0.011)*	0.012 (0.016)
BQGI		0.109 (0.049)**
GDP	0.0139 (0.0125)	0.0314 (0.0120)***
CRP	0.0109 (0.0019) ***	0.0162 (0.0022)***
IND	1.1430 (0.193) ***	0.7661 (0.2074)***
UEM	0.0123 (0.0046) ***	0.0171 (0.0045)***
PPL	-0.0997 (0.0534) *	0.0806 (0.0522)
_CON	-4.5292 (0.784) ***	-4.2005 (0.7868)***
Net Effect of GII		0.7221
R-Square	0.4211	0.4504
F-Stat	53.01	55.70
P.Value	0.000	0.000
Observations	420	420
Note: Coefficients (corrected standard errors). *** p < 0.01, ** p < 0.05, * p < 0.1.		

4.1 Robustness test

A robustness test was carried out to determine the validity of the findings using the Driscoll-Kraay approach. The outcomes of the Driscoll-Kraay are comparable to the PCSE. The coefficients of the study variables followed the same direction as those obtained using the PCSE estimator. However, some control variables in the Driscoll-Kraay models exhibit variation regarding the sign of the coefficients compared to PCSE models. Despite this variation, the study maintained that bureaucratic quality is a critical driver of non-life insurance product penetration. Further, innovation can be leveraged to enhance insurance uptake in the SSA countries. The findings obtained using the Driscoll-Kraay estimation technique are presented in Table 4. Based on the robustness checks, this study concludes that the efficiency of these findings is undoubted.

Table 4
Robustness result

Variable	(2) Driscoll-Kraay	(3) Driscoll-Kraay
BQ	0.409 (0.1104)***	0.449 (0.111)***
GII	0.021 (0.016)	0.013 (0.009)
BQGI		0.109 (0.038)***
GDP	0.0139 (0.0225)	0.0314* (0.0159)
CRP	0.0109 (0.0031)***	0.0162*** (0.00107)
IND	1.1430 (0.2174)***	0.766*** (0.278)
UEM	0.0123 (0.0052)**	0.0171*** (0.00357)
PPL	-0.1134 (0.0558)**	-0.0806 (0.0667)
_CON	-4.5292 (1.3486)***	-4.2005 (1.302)***
Observations	420	420
R-Square	0.4211	0.4504
Note: Coefficients (Driscoll-Kraay standard errors). *** p < 0.01, ** p < 0.05, * p < 0.1.		

5. Conclusion and Recommendations

This study examines the nexus between bureaucratic quality and non-life insurance product penetration in the SSA region. The study equally investigates the exigency of innovation in the nexus between bureaucratic quality and non-life insurance product penetration. The study utilizes the PCSE approach, leading to significant discoveries. The study establishes empirical evidence of a positive and significant effect of bureaucratic quality on non-life insurance product penetration. The study equally found that an increase in bureaucratic quality is associated with an increase in non-life insurance product penetration when innovation is accounted for in the SSA region. This evidence indicates that insurance businesses could benefit by leveraging on innovation since it reinforces the institutional framework through policy formulation and implementation, which are critical for the sustainability of businesses. The study, therefore, suggests that SSA countries devise policies to strengthen their governance structures, such as bureaucratic quality, to stimulate the uptake of insurance products.

5.1 Implications

By integrating the moderating role of innovation, this study provides a new perspective on the nexus between bureaucratic quality and non-life insurance penetration. Accordingly, the outcome of this study would contribute immensely towards supporting the decision-making of the public, policymakers and managers towards reducing the insurance gap in SSA countries. Rather than pursuing top-down regulatory expansion, SSA policymakers should shift toward building inclusive insurance frameworks. This shift requires viewing bureaucratic quality not as a hurdle to be governed, but as a foundation for designing accessible, market-responsive systems. Policymakers can foster this by creating 'regulatory sandboxes' that allow firms to test innovative, low-cost insurance products tailored for the underinsured such as micro-insurance for rural farmers or tech-driven takaful products without being inhibited by outdated compliance requirements. By aligning institutional goals with private sector innovation transform governments from being passive regulators to proactive facilitators of financial inclusion, thereby broadening insurance protections for vulnerable populations.

5.2 Limitation and areas of future studies

The study uses the WIPO database to source innovation data. This limits the scope of the study regarding the number of SSA countries and the period covered. Hence, future studies should examine this topical issue, considering other global regions such as ASEAN, using alternative indicators for innovation like the World Bank's number of scientific and technical journal articles. Similarly, mediation analysis will offer further in-depth understanding about this indirect relationship.

Declarations

Author Contribution

1. Hafiz, U.A- wrote the main manuscript text
2. Garba, M. - prepared figures, tables and checked results.
3. Salleh, F. -proofread the manuscript
4. All authors reviewed the manuscript

Data Availability

Data used in this research would be made available by the corresponding author on request

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