

# Researching the Advancement of Technology in the Insurance Sector That Would Boost Up the Economy and Financial Inclusion

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**Abstract:** This study aims to investigate on the evolution and impact of Insurtech on the Sub Saharan Africa industry to promote economic development and financial inclusion. The sample is constructed on a panel data whereby 22 countries is taken into consideration for a period of 10 years between 2011 to 2021. We have employed twelve variables in our model whereby Firm Performance being the dependent variable followed by control variables such as Liability-Asset ratio, Total Asset, Insurance Herfindal index, Density of Insurance, Return on Investment, Gross Domestic Product per Capita, Urbanization Rate, Credit to the Private Sector, Labour Force with advanced education and Education Attainment at least completed primary population. A Two Stage Generalized Method of Moments (GMM) Technique is used in this research paper in order to resolve potential endogeneity. The results demonstrate that Insurtech has positive impact with insignificant effect on Firm Performance. However, Liability-Asset ratio, Labour Force and Education Attainment has impacted negatively on the Firm Performance.

**Index terms:** Insurtech, Firm Performance, Economic development and Financial Inclusion

## 1 Introduction

InsurTech refers to a technology-driven innovation in the insurance industry in terms of software, applications, start-ups, products and services (Baumann, 2018; Chester et al., 2018, Swiss Re Institute, 2017). The insurance industry has largely been impacted by the digital transformation since there has been a drastic change in products and processes, Customer relations and relations with the sector's various competitors (Albrecher et al., 2019; IAIS, 2017). InsurTech has boost up investments worldwide with a statistic of 46% investments in United States, 40% in the EMEA area (Europe, Middle East and Africa) and 14% in Asia-Pacific area. According to Huang L., 2018, big data, blockchain and artificial intelligence have been gradually changing the ecology of insurance industry. The insurance companies, intermediary companies and High-tech companies aimed to improve profitability, service capacity and minimising risks through the use of frontier new technologies.

A poor knowledge of the market, lack of an appropriate business model as well as the high level of competition in the insurance sector would be a threat to existing companies, thus leading to digital disruption. Some studies prove that Insurtech has impacted the insurance industry in both insurance side and customer side. There are three methods whereby the Insurtech affect the insurance value creation and these are infrastructure, service supply and network promotion as highlighted by Stoeckli et al. (2019). The advancement of Insurtech can also lead to an increased risk of interconnectedness in instances where there is limited number of technology engines that support big data. Moreover, Insurtech spread its effects across the value chain of the insurance market from the stage of product design and development, across pricing and underwriting, and until claims management. The European Insurance and Occupational Pensions Authority (EIOPA, 2021) highlighted that Insurtech brings

out new opportunities for the customers as they would be exposed to a more personalised products and services, better customer experience and enhanced transparency and competition.

## **2.1 Theoretical Literature Review**

Big data and Artificial Intelligence are one of the rapid technologies development that have impacted the traditional financial industry. Financial technologies (FinTech) have therefore been invented in order to absorb the shocks occurred in financial sector, enhance financial services and activities in terms of facilitating quick payments, having better access to financial information, investment consulting and financing (Schueffel, 2016). The emergence of FinTech was first knocked at the banking sector and have eventually expanded in the insurance sector.

The innovation in technology has brought about positive impacts to the insurance sector in terms of it has facilitated the task between the insured and insurer whereby the insured can claim on online platform and the insurer can process the claims digitally. As a result of which, the insurance claims can be processed in an easier manner and within a shorter time period (Alhassan AL, Biekpe N.(2016)). Insurtech has attracted many large venture capital investments and strategic investments are being made by insurers in insurance startups in an attempt for future development in the business. As a result of which, it helps in improving customer experience and in reducing the fees when a particular product is sold (Jia L., Zhao H. (2016)). However, the application of artificial intelligence or robo advice can also lead to unemployment in the country as the employees in the insurance sector might find it difficult to cope or we can say that the services rendered by new technology will no longer require the service provided by the employees. (Handel, P., Skog, I., Wahlstrom, J., Bonawiede, F., Welch, R., Ohlsson, J., et al. (2014)).

Smart phones and internet access are one of the form of Mobile technology and applications that has promoted Insurtech developments. For instance, individuals are now able to have access to the latest information in terms of insurance coverage as well as on imminent withdrawal of airtime for premium payments on their mobile phones through SMS. As such, these kind of technology innovations and development will help emerging markets that encounters low insurance penetration and poor distribution network. According to HM Treasury and FCA (2016), Robo Advice or automated advice covers a broad spectrum of services and also delivers advice in a more cost-efficient way. The Robo Advice is very popular in the insurance sector for the investment management and it also helps in making financial decisions. For those individuals who do not have access to financial advice, are now being able to access through automated advice (Husnjak, S., Perakovic, D., Forenbacher, I., and Mumdziew, M. (2015)).

### **2.1.1 Impact Of Insurtech**

Many Insurance Companies are in an attempt of upgrading customer experience and improving business processes through the offering of innovative products in terms of digital channels and digitalization of operations. As such when engaging with Insurtech, it enables incumbents to learn from their digital expertise in order to adapt with the process of digitalization faster (Huang J., Mo H., Li W. (2018)). However, the emergence of InsurTech companies also creates competitive threat to incumbents. With the help of InsurTech innovation, incumbents are now able to expand the insurance coverage to market segments in terms of new products and services are introduced in the market, there is reduction in the transaction cost and improvement in the risk identification and measurement processes. The integration of new business model could be in itself considered as a challenge due to the differences in size, culture, technology and way of doing business between old and new players (Qinxin Wang (2020)).

The adaptation to technological and market development will enable insurers and their customers to benefit from digitalization and regulatory processes. Innovative business model are being developed with the help of InsurTech which promotes greater insurability of policyholders, facilitate product comparison, simplify the process of purchasing as well as enable better tailor coverage. InsurTech has more weightage in emerging markets whereby insurance distribution networks are less developed. This is so because InsurTech has the ability to improve financial inclusion and increase insurance penetration (Wanyan et al., 2019).

The introduction of InsurTech has also posed challenges to traditional insurance companies in terms of technology-led disruption, forcing incumbent to reinvent their business processes and change their attitude towards the customers. Moreover, if insurance companies do not respond proactively to ongoing digitalization such as in adjusting their portfolios, distribution channels, organizational structure and internal processes, they will not be able to maintain a good position in the market and thus the rapid evolution of InsurTech would be considered as more a threat than opportunity to them (Guo et al., 2019).

According to Vincent Y.L Chang (2023), insurers' InsurTech-oriented investments have a substantial negative impact on their short-term performance because insurers who engage in InsurTech-oriented projects tend to increase spending. InsurTech-oriented investments have a strong positive association with long-term performance, implying that the concept of time lag and accumulated effects is justified.

### **2.1.2 Insurtech Development And Firm Performance**

There are three main roles of Insurtech companies in the insurance industry namely disruptors, disintermediators and enablers as demonstrated by Neale et al. (2020). Therefore, insurance companies should adopt InsurTech-oriented investments in order to improve firm efficiency and reduce operation costs and as a result of which it would avoid disruption from Insurtech firms. Furthermore, they can applied effective strategies in terms of merger and acquisition (M&A), venture capital investments, digitalisation, automation and big data analytics, linked technological applications that would further promote efficiency and synergy effects of the company.

Digital Innovation has impacted most insurance industry activities which comprises of insurance value chain, product development and insurance policy, underwriting and claims, sales and distribution, pricing and asset-liability management and risk management as stated by Eling and Lehmann (2018). Hence, it is important for insurers to develop new business model to facilitate the transformation of the value chain, process optimisation, and operational efficiency as well as to deliver complete financial services.

Digitalization has changed the financial and insurance ecosystem and has also reshaped the competitive landscapes as stated by Cappiello (2018). Grima et al. (2020) has also demonstrated in his study that blockchain technology can enabled claims settlement and enhance fraud control. In addition, blockchain technology facilitates insurance tasks whereby it enables insurers to understand its benefits for employees, management and customers.

### **2.1.3 Insurance Development And Economic Growth**

There are various economic prospects and different structural and economic policies in various regions that explained the different effect of different region on its economic growth. For example, insurance development has made a smaller contribution to Europe's economic growth, which might be attributed to the prolonged ultra-low interest rate in Euro Zone and high interconnectedness between insurers and banks and economic issues in Europe. Following the 2008, Global Financial Crisis and the 2009, European Debt Crisis, Europe enacted expansionary monetary policy to encourage business activities.

Despite the global financial crisis, the insurance growth in countries like Africa, Latin America and Asia was not impacted negatively. The insurance growth in Africa are mainly contributed by the growth of non-life insurance. The emergence of technology in the insurance sector has shape the way of doing business given the fact that InsurTech provides new insurance models to meet changing customer needs. Moreover, it provides insurance service through usage-based model or through personalized insurance solution to e-commerce business and small medium enterprises (SMEs). SMEs are considered as a pillar for economic growth especially in developing countries such as Association of Southeast Asian Nations (ASEAN). The PwC InsurTech Report (2016) has revealed that InsurTech creates opportunities for the new players and as a result of which it could increase both insurance growth and economic growth in the country.

The majority of the poor cannot afford insurance, and they may have to reduce their consumption in order to save for any unforeseen disasters. High insurance costs as a result of protectionist policy might deter locals from purchasing insurance. Local people must pay higher insurance premiums, reducing their spending and as such

leading to a slowing economic growth. Studies have shown that insurance development does not contribute significantly to South American economic growth, owing to economic instability, excessive income inequality, and protectionism against the insurance sector. Economic instability affects insurers' profits, and insurers are hesitant to reinvest their profits.

#### **2.1.4 Insurance Development And Financial Inclusion**

Financial inclusion is a global policy priority, and demand-side initiatives such as financial education plays a major role in assisting people in accessing and using appropriate, formal financial products. The OECD/INFE started a project on the role of financial education in financial inclusion in 2010 with the assistance of the Russian Trust Fund for Financial Literacy and Education. According to the findings of the study (Peterson K.Ozili,2019), low levels of financial inclusion are linked with lower levels of financial literacy. Recent study, including a large sample of INFE participants, allowed us to find different methods in which policymakers are creating financial education policies for financial inclusion.

Machine learning is a processing technique that enables insurance firms to work with client databases more quickly and accurately. People will be able to deal with historical data with the help of the machine learning technology. The processing of this data enables them to optimize the return on investment in insurance as well as generate accurate predictions for the future in terms of the company's pricing strategy, advertising content, and customer claims processing system. Forecasting analytics will produce forecasts of the level of risks and rewards for insurance firms as a supplementary aid to the machine learning findings. It undoubtedly has a positive impact on the accuracy of insurance payout rates, the amount of losses, and profitability. It is important to abide by consumer protection rules in the insurance market which are created both around the user and around the insurance company, make them particularly vulnerable to various cyberattacks.

Artificial intelligence is a useful instrument in the big data space because it serves as a central energy host, defined by strong automatic processes. This helps to speed up client interactions, optimize workflows, and create new methods. Blockchain technology is also being actively implemented in the insurance industry. This is so because this form of data does not deteriorate in part, it is a convenient and safe method to transfer data between the customer and the insurance company. Telematics is an innovative sensor technology designed to collect and transmit data in real time over long distances. This technology is already actively used in car insurance, where the proprietor can select a customized data analysis plan and the most profitable insurance policy with the lowest premiums.

## **2.2 Empirical Literature Review**

### **2.2.1 Insurtech Development And Firm Performance**

Insurers' long-term performance improves when they engage in InsurTech-related investments because the benefits of such accumulated investments are realized over time. Moreover, Insurers who enter the UBI program early will have a higher yield on assets and money in the future years, according to Che et al. (2021). According to Vincent Y.L Chang (2023), insurers' InsurTech-oriented investments reduce the overall firm performance in the short term but provide long-term benefits due to the cumulative impact of InsurTech-oriented investments.

Technology investments can be classified as capital spending and as a result, when firms engage with capital investments, their yearly spending and expenses would rise, resulting in poor short-term performance as highlighted by Titman et al. (2004) and Cordis and Kirby (2017). Inadequate expenditures, a lack of synergy, or a failure to integrate technology investments may also contribute to poor total performance according to Anderson and Garcia-Feijoo(2006) and Chae et al. (2014). Furthermore, a business may intend to engage in technology or new technology investments on a yearly basis, resulting into an increase in underinvestment and poor short-term performance.

Furthermore, the long-term accumulation of technology investments has resulted in synergistic advantages such as increased operational production or sales efficiency, accurate pricing, and less adverse selection in insurance and moral hazard in claims settling. (Che et al. 2021). Under the wave of InsurTech, insurers must recognize that

firms are increasing their InsurTech-related investments and that IT or digitalization can help them achieve synergy and become more efficient in tackling the crucial challenge that new InsurTechstart-ups face.

### 2.2.2 Insurance Development And Economic Growth

Abdul and Nicholas (2016) found out that there is a positive impact on non-life insurance activity in Algeria, Gabon, Kenya, Madagascar, Morocco and Nigeria. They have also come across that there is a positive impact on life insurance particularly in Mauritius and South Africa. These countries support the supply-leading hypothesis on the causality relationship between insurance activity and economic growth. According to Ward and Zurbruegg’s (2000), there is a direct relationship between insurance market and economic growth as demonstrated by three OECD countries. The researchers also revealed that the development in insurance sector promotes capital accumulation and improvement in productivity. Pradhan et al (2015) also found out that the expansion of insurance market fosters long term economic growth. However, studies has also proved that the positive effects of life insurance density on economic growth can be reduced due to a rise in savings rate whereby life insurance and savings are considered as substitutes in the growth progress as highlighted by Chen et al. (2012).

### 2.2.3 Insurance Development And Financial Inclusion

IrynaDidenko (2021) and Natalia Sidelnyk (2021) conducted a research on Insurance Innovation as a part of the Financial Inclusion and proves that insurance innovations are an integral and integral part of the financial sector as a whole. In addition, the main vectors of development of innovative co-concept in the field of insurance are highlighted: machine learning, forecasting analytics, and consumer protection system in the information space, the concept of “unstructured data”, artificial intelligence, blockchain technology, and telematics.

When it comes to the insurance market, the problem of financial literacy of the people, as its capacity to assimilate new financial products, and financial inclusion, as a desire to be an engaged consumer in the financial services market. There have been numerous science advancements in this area. These are specifically the works of (Gatsi, 2020; Rehman, 2020; Mihalcova et al., 2020; Korcsmaros et al., 2019).

Many scientific papers have been published in the last decade on the idea of big data and its application in different fields of human activity (Delanoy&Kasztelnik, 2020; Giebe et al., 2019; Njegovanovi, 2018). The works of such scientists as Porrini, 2018; Starostina et al., 2020; Umadia&Kasztelnik, 2020; Yanyshyn et al., 2019; Keliuoty-Staniulnien&Kukarnait, 2020; Vargas-Hernández &Rodríguez2018) examined a broad variety of supply of innovative goods and services in the field of insurance.

## 3. Methodology

### 3.1 Model Specification

We will examine the advancement of technology in the insurance sector that would boost up the Economy and Financial Inclusion using the approach applied by Qinxin Wang (2020) and Vincent Y. L Chang (2023).

$$LNFP_{it} = \beta_0 + \beta_1 LNInsurtech_{it} + \beta_2 LNLA Ratio_{it} + \beta_3 LNLA_{it} + \beta_4 LNIHI_{it} + \beta_5 LNDOI_{it} + \beta_6 LNROI_{it} + \beta_7 LNGDP_{it} + \beta_8 LNUR_{it} + \beta_9 LNCPS_{it} + \beta_{10} LNLFI_{it} + \beta_{11} LNEDU_{it} + \mathcal{E}_{it}$$

Where,

Variables	Contract ions	Descriptions
Dependent Variable	FP	Firm Performance
Independent Variables	Insurtech	Degree of development of Current Insurtech

	LA Ratio	Liability Asset Ratio
	TA	Total Asset
	IHI	Insurance Herfendal index
	DOI	Density of Insurance
	ROI	Return on Investment
	GDP per Capita	Gross Domestic Product per Capita
	UR	Urbanization Rate
	CPS	Credit to the Private Sector (% GDP)
	LF	Labour Force with advanced education (% of total working age population with advanced education)
	EDU	Education Attainment at least completed primary, population + 25 years, total (%) cumulative
	$\epsilon$	Error term

### 3.2 Description Of Variables

#### 3.2.1 Dependent Variable

##### 3.2.1.1 Firm Performance

Every company is concerned with its performance, and good performance not only increases its market value but also helps the industry grow in the long term. (Ahmed, Ahmed & Usman, 2011). Performance is very vital for firms as it aids their survival in the insurance industry. Profit as stated in financial statements of insurance firms in Nigeria has fluctuated over time. This led to the conclusion that certain firm-specific variables must have influenced the performance of insurance companies over time.

#### 3.2.2 Independent Variables

##### 3.2.2.1 Insurtech

InsurTech refers to technical advancements that are developed and applied to enhance the insurance industry's efficiency. InsurTech helps large insurance companies in exploring new options beyond conventional human efforts. This could include dynamically-priced insurance policies, small business insurance, and social insurance options. InsurTech also grant insurance companies access to data streams from Internet of Things devices. This creates a dynamic pricing system based on market conditions and customer behaviour.

The InsurTech implementation constitutes of both technology-based components and solutions-based components. Some of the examples of the technologies that are used in InsurTech are as follows: Artificial Intelligence, Machine Learning, Internet of Things (IoT), smartphone apps, Drones, Blockchain Technology



and Advanced Analytics. Some of the InsurTech solutions are Appetite Solutions, Data Solutions, Payment Solutions and Quoting Solutions.

### 3.2.2.2 Liability-Asset Ratio

The liabilities to assets (L/A) ratio is a solvency measure that analyse at how much of a company's assets are made of liabilities. A high liabilities to assets ratio can be a bad indicator of poor shareholder ownership and possible solvency problems. Rapidly growing businesses frequently have a larger obligations to assets ratio (Quick expansion of debt and assets). Companies in signs of financial distress will often also have high L/A ratios. A business with declining revenues and poor long-term prospects of growth will be impacted on retained equity. Low L/A ratios suggest that a business has few to no obligations. With some notable exceptions, this is normally a good sign of financial health for the company. The liability-Asset Ratio is computed as follows:

$$\text{Liability-Asset Ratio} = \frac{\text{Total Liabilities}}{\text{Total Asset}}$$

### 3.2.2.3 Total Asset

Total Assets are the assets held by the organization that have an economic worth whose benefits can be derived in the future. Assets are also classified on the balance sheet as either current assets or long-term assets. A current asset is an asset that can be liquidated within a year, whereas long-term assets are those assets that are liquidated in more than a year. Some types of total assets are as follows: Cash & cash equivalents, Marketable securities, Account Receivables, Prepaid Expenses, Inventory, Fixed Assets, Intangible Assets and Goodwill. The total Asset is computed as per below formula:

$$\text{Total Assets} = \text{Liabilities} + \text{Owner's Equity}$$

According to Joseph Inokotong (2023), the total asset of Insurance Industry in Nigeria hits very high as published in the Nigerian Tribune Newspaper. That is, the total Assets of Nigeria's Insurance industry stood at N2.328 trillion in the fourth quarter of 2022, sustaining a positive growth that signifies expansion at the rate of two 2.4 per cent, quarter on quarter (QoQ) and at 4.4 per cent, year on year (YoY).

The statistics of the insurance market performance for the fourth quarter 2022 revealed consistent growth in a premium generation, quality improvements in essential indicators including claims settlement and profitability. The market could be ruled as sound and stable whilst, the stance of the market deepening remains optimistic despite operational and macro-economic challenges.

### 3.2.2.4 Insurance Herfindal Index

The Herfindahl-Hirschman Index (HHI) is a common measure of market concentration and is used to determine market competitiveness, often pre and post-merger and acquisition (M&A) transactions. The natural level for HHI for the life industry is 2,500 and 1,100 for the non-life industry. HHIs above these indicate that the industry is not competitive and HHIs below this indicate that the industry is competitive and fragmented. A study conducted on insurance for inclusive and sustainable growth: imperatives for action from four-country synthesis (2019) deduced that the HHI for both the life and non-life industry in Rwanda is above the normal level, proving that the industry is not competitive. Furthermore, the HHI for life and non-life for Kenya, Nigeria and Ghana are below the normal level, indicating that they are competitive and fragmented.

### 3.2.2.5 Density Of Insurance

Insurance density is used as an indicator for the development of insurance within a country and is calculated as ratio of total insurance premiums to whole population of a given country. Benlagha and Hemrit (2020) found that internet use did not affect life insurance consumption. Further, a 1% increase in the use of broadband resulted in a 0.109% increase in life insurance density. On the other hand, a 1% increase in the use of fixed telephones resulted in a 0.159% increase in life insurance density. This finding is consistent with the studies on the relationship between ICT adoption and life insurance density. Athenia (2022) stated that adoption of technology promotes the development of the life insurance market in Africa. The results also give support to the notion that

the degrees of financial freedom of insurance firms that are unfettered by laws influence insurance sales levels and, as a result, encourage life insurance access in Africa.

### **3.2.2.6 Return On Investment**

Return on investment refers to the amount of profit directly related to an expense or group of expenses. Investors also want to know the potential ROI of an investment before committing any funds to a company. Forecasting a company's potential ROI is a key factor for investors who, after all, ultimately want to profit from their investment. Return on Investment is important to calculate in order to have a budget insight, to be able to make better decision concerning to Hiring, Long term business planning and helps in meeting customer expectations.

### **3.2.2.7 gross Domestic Product Per Capita**

Gross Domestic Product (GDP) per capita is a key indicator of economic performance and is widely used as a comprehensive gauge of average living standards or economic wellbeing. According to World Bank, the Gross Domestic Product per capita in Mauritius was last reported at 9703.52 US dollars in 2021. The GDP per Capita in Mauritius is equivalent to 77 percent of the world's average. According to Trading Economics global macro models and expert forecasts (2022), GDP per Capita in Mauritius is projected to hit 10228.00 USD by the end of 2023. In the long-term, the Mauritius GDP per capita is projected to trend around 10657.00 USD in 2024 and 11062.00 USD in 2025, according to our econometric models.

### **3.2.2.8 Urbanization Rate**

This is the percentage of total population of a country or area living in places defined as urban (according to the national criteria applied in the last population census). This indicator shows the concentration of populations in towns. Indirectly, it describes ways of life, the balance of population spatial distribution and the pulling-power of towns. According to Statista published by Aaron O'Neill (2023), the share of urban population in Mauritius remained nearly unchanged at around 40.77 percent.

### **3.2.2.9 Domestic Credit To The Private Sector (%Gdp)**

Domestic credit to the private sector refers to financial resources given by financial companies to the private sector in the form of loans, purchase of non-equity securities, trade credits, and other accounts receivable that create a claim for repayment. Finance and leasing businesses, money lenders, insurance corporations, pension funds, and foreign exchange firms are all examples of financial organizations. . In 2020, it was revealed that the domestic credit to the Private sector (% GDP) in Mauritius has reached to 95.91% as stated by the World Bank Collection of development indicators.

### **3.2.2.10 Labour Force With Advanced Education (% Of Total Working Age Population With Advanced Education)**

It refers to the proportion of the working age population with an advanced level of education who are in the labor force. According to the International Standard Classification of Education 2011 (ISCED 2011), advanced education comprises short-cycle tertiary education, a bachelor's degree or equivalent education level, a master's degree or equivalent education level, or doctoral degree or equivalent education level. Labor force with advanced education (% of total working-age population with advanced education) varies by country in Africa. The country with the highest value in the region is Tanzania, with a value of 94.33. The country with the lowest value in the region is Congo, with a value of 36.48. (Source: International Labour Organization, ILOSTAT database (2019)).

### **3.2.2.11 Education Attainment At Least Completed Primary, Population + 25 Years, Total (%) Cumulative**

Educational attainment is a commonly used proxy for the stock of human capital in terms of the skills available in the population and the labour force. As globalisation and technology continue to re-shape the needs of labour markets around the world, there is a growing demand for people with a wider knowledge base and more



specialized skills, such as advanced analytical abilities and complex communication skills. As a result, more individuals are pursuing higher levels of education now than in previous generations, leading to significant shifts in attainment levels over time within countries. Educational attainment, at least completed primary, population 25+ years, varies by country in Africa. The country with the highest value in the region is Seychelles, with a value of 94.28. The country with the lowest value in the region is The Gambia, with a value of 2.40. (Source: UNESCO Institute for Statistics (2019)).

#### 4. Analysis And Findings

##### 4.1 Generalized Method Of Moments (Gmm)

Given the presence of serial correlation and heteroskedasticity in the fixed model effect, the coefficients might be biased. This economic problem can be minimized by adding the lagged dependent variable on the right hand side of the equation. Not only will this reduce the problem of serial correlation and heteroskedasticity. Having included the lagged FP as independent variable, the econometric specification has changed into a dynamic panel and therefore the fixed effect model is thus eliminated.

It is important to note that:

1. The system GMM approach in dynamic panel data estimation was opted in this study because the latter is more efficient compared to the difference GMM since it takes into account two moment conditions – the model in levels and the differenced equation
2. Moreover the GMM-type instruments are at lag 2 while the exogenous are all at first difference.

Variables	GMM first step		GMM second step	
	Coefficient	Sig.	Coefficient	Sig.
$\beta_0$	4.757	0.062*	2.171	0.059*
LLNFP	0.451	0.722	0.415	0.810
LNINSURTECH	1.654	0.012***	1.714	0.067**
LNLARATIO	-7.372	0.001***	-6.202	0.056**
LNTA	0.971	0.089*	0.055	0.051**
LNIHI	5.678	0.042**	5.943	0.072*
LNDOI	0.011	0.028**	0.001	0.058**
LNROI	0.007	0.917**	0.012	0.757**
LNGDP	0.334	0.047**	0.387	0.006***
LNUR	0.162	0.313	0.121	0.427
LNCPS	1.231	0.075	1.201	0.061
LNLF	-0.878	0.012***	-0.865	0.008***
LNEDU	-0.698	0.051**	-0.675	0.044**
	AR(1) (P-value)= 0.650 AR(2) (P-value)= 0.685 Sargan test (P-value)=		AR(1) (P-value)=0.270 AR(2) (P-value)=0.285 Sargan test (P-value)=0.995	

	0.944	
*** 1% level of significance	** 5% level of significance	* 10% level of significance

## 4.2 Results From Main Findings

### 4.2.1 Firm Performance And Insurtech

As it can be seen from the above table that there is a positive insignificant relationship between LNFirm Performance and LNInsurtech which is in line with the study conducted by Vincent Y.L Chang (2023). It is deduced that when there is an increase of 1 unit in LNFP, this will lead to an increase of 1.654 and 1.714 unit in the value of LNInsurtech of the Sub Saharan African countries. This explains by the fact that when an insurer make an investment in InsurTech, they are likely to enjoy a long term benefits derived from the cumulative effect of InsurTech oriented investments. Moreover, the development of InsurTech improve the efficiency and productivity of the firm as well as reduce the operation cost.

### 4.2.2 Firm Performance And Liability-Asset Ratio

A negative significant relationship has been established between LNFirm Performance and LNLiability-Asset ratio as stipulated in the third row of the table. This finding is in line with the International Monetary Fund Report published in June 2022. This means that when there is an increase of one unit in LNFP, it would lead to a decrease of -7.372 and -6.202 unit in the value of liability-Asset Ratio of the Sub Saharan African countries. This clearly show that the financial health of the firm is not stable and this could be due to that the insurers could be exposed to interest rate risks and managing those asset liability risks could be difficult for them. Furthermore, the negative result could be also explained by the fact that the firm is encountering a declining revenues as well as it holds a poor shareholder’s equity which indicates that the firm is at risk of bankruptcy.

### 4.2.3 Firm Performance And Total Asset

There is a positive significant relationship between Firm Performance and Total Asset as reflected in the fourth row of the table. This result is consistent with the study conducted by Mallik (2011), Naveed, Zulfgar and Ahmad (2011), Kripa and Ajasllari (2016) and Folake and Mfon (2021).An increase in one unit of LNFP has resulted into an increase of 0.971 and 0.055 unit in the value of Total Asset as depicted in the table. This indicates that the firm is in a profitable position and this could be perhaps through the collection of insurance premium whereby the company provide more fund to carry out investment and thus boost up their market share.

### 4.2.4 Firm Performance And Insurance Herfendal Index

There is also a positive connection between firm performance and Insurance Herfendal Index as shown in the table above. An increase in one unit of LNFP has led to an increase of 5.678 and 5.943 unit in the value of Insurance Herfendal index. The Insurance Herfendal Index helps in determining the competitiveness of the market. In other words, as and when indexed increases, it indicates that the larger firm gains market share at the expense of smaller firm. Normally when a market with HHI of less than 1000 is considered as to be competitive while if a market with HHI of more than 1000 is considered as being at risk of monopoly. In my study, by looking at the results, it can be said that the firm is competitive.

### 4.2.5 Firm Performance And Density Of Insurance

There is a positive significant link between Firm performance and Density of Insurance as depicted in the above table. This result is in line with the study conducted by Benlagha and Hemrit (2020) and Athenia (2022).It is deduced that when there is an increase of 1 unit in LNFP, this will lead to an increase of 0.011 and 0.001unit in the value of LNDensity of Insurance of the Sub Saharan African countries. This means that the adoption or advancement of InsurTech has stimulated the development of the life insurance market in Africa. It could be perhaps because of the new InsurTech business model that has been put in place in order to meet the needs of the customers.

#### **4.2.6 Firm Performance And Return On Investment**

As shown in the table above, there is a positive significant relationship between firm performance and Return on Investment. This finding is consistent with the research conducted by Manish Khetan (2020). It can be concluded that when there is an increase of 1 unit in LNFP, this will bring about an increase of 0.007 and 0.012 unit in the value of LNReturn of Investment in the Sub Saharan Countries. This can be explained by the fact that insurers have adopted a prudent InsurTech strategy or organization making strategic investment on InsurTech that has accelerated the return on investment.

#### **4.2.7 Firm Performance And Gross Domestic Product Per Capita**

A positive significant relationship has been established between Firm Performance and Gross Domestic Product per Capita as reflected in the table above. This outcome is in line with the research conducted by HuiShan Lee, Zhen-JiangYong and Qiao-Ming Lim (2018). Given the fact that there has been a positive effects on the investment, it would therefore automatically boost up the level of GDP in a country which explains the increase of 1 unit in LNFP has resulted into an increase of 0.334 and 0.387 unit in the value of LNGDP per Capita. Furthermore, it can be perhaps that an increase in InsurTech creates more access points to SMEs and thus promote economic growth in the country.

#### **4.2.8 Firm Performance And Urbanization Rate**

A positive link has been established between Firm Performance and Urbanization Rate as depicted in the table above. These findings are in line with study conducted on Africa's Urbanisation Dynamics 2022: The Economic Power of Africa's cities. It can be deduced that when there is an increase of 1 unit in LNFP, this will lead to an increase of 0.162 and 0.121 unit in the value of LNUrbanization rate in the Sub Saharan Countries. This can be explained by the fact that the cluster of cities has brought about development in the urban economies in the sense that it has create more access points to services, infrastructure and economic opportunity for millions of people in Africa. Thus, it improves the standard of living of the people and businesses.

#### **4.2.9 Firm Performance And Domestic Credit To The Private Sector (%Gdp)**

A positive relationship with no significant effect has been established between Firm Performance and Domestic credit to the Private sector as reflected in the table above. This result is in consistent with Okparaka Vincent (2016). It can be deduced that when there is an increase of 1 unit in LNFP, this will bring about to an increase of 1.231 and 1.201 unit in the value of LNCPS in the Sub Saharan Countries. This could be perhaps that global InsurTech practices has been adopted that have enhanced the financial position of the firms and more loans policy has been applied to advance loans to the private sector.

#### **4.2.10 Firm Performance And Labour Force With Advanced Education (% Of Total Working Age Population With Advanced Education)**

A negative significant relationship has been established between Firm Performance and Labour Force with advanced education as shown in the table constructed above. This finding is in line with the study conducted by Anderson and Garcia-Feijoo(2006) and Chae et al. (2014). It can be deduced that when there is an increase of 1 unit in LNFP, will bring about to a decrease of -0.878 and -0.865 unit in the value of LNLF in the Sub Saharan Countries. This can be explained by the fact that there has been an inadequate investments in technology and a lack of knowledge on new technologies or technical aspect at the workplace that has contributed to a poor performance.

#### **4.2.11 Firm Performance And Education Attainment At Least Completed Primary, Population + 25 Years, Total (%) Cumulative**

A negative significant relationship has been established between Firm Performance and Education attainment as shown in the table constructed above. This finding is in line with the study conducted by Anderson and Garcia-Feijoo(2006) andChae et al. (2014). It can be deduced that when there is an increase of 1 unit in LNFP, this will bring about to a decrease of -0.698 and -0.675 unit in the value of LNEDU in the Sub Saharan Countries. This can be explained by the fact that there are still some group of people, businesses that are not well educated on

the financial technologies that has led to a poor performance and even result into a rise in the level of risk and crimes in the nation.

## 5. Conclusion

The advancement of technology in insurance sector has shaped the way of doing business and has boost up the economic growth of the country.As a result of which it has improve the standard of living of the people at large. This study finds that there is a positive relationship with insignificant effects established between InsurTech and Firm Performance. This is so because of its benefits that InsurTech derives that is it improves the financial services and activities in terms of facilitating rapid payments and having better access to financial information. Moreover, new InsurTech business model are being put in place in order to meet the needs of the customers. The outbreak of Covid-19 has somehow accelerated with the implementation of digital innovations. It has forced the insurers to streamline their processes, enhance and digitize their insurance claims management operations during the pandemic.

However, the major concern is when there is an inadequate investments in technology and when there is lack of knowledge on new technologies or technical aspect at the workplace that contributes to a poor performance. Studies has also proved that low levels of financial inclusion are linked with lower levels of financial literacy. In addition, when people that are not well educated on the financial technologies, not only led to a poor performance but also resulted into a rise in the level of risk and crimes in the nation.

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