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Insurance-growth nexus: a comparative analysis with multiple insurance proxies

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ABSTRACT

Previous studies found inconsistent results for insurance-growth nexus. The aim of this study is to examine the relationships between life and non-life insurance with economic growth. The study applies pooled mean group method to examine long-term and short-term insurance-growth nexus over the period of 1980 to 2015. The findings of the study show that there exists a positive and significant relationship between life insurance and economic growth in the long-term and short-term for all selected countries, except when insurance penetration is used as a proxy. However, a positive and significant relationship was observed for non-life insurance and economic growth for all four proxies in the long-term and short-term. The relationship between insurance and economic growth is found to be different across countries and across proxies because of diverse factors such as diversity and variety of insurance products, religious and cultural traditions, level of education, and State involvement, not covered in this research.

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1. Introduction

Sustainable economic growth is important for every country. It ought to lead to population prosperity through an increase in the standard of living, healthy environment and improved technology. Thus, achieving sustainable economic growth should be the central focus of national economic policy. Insurance has a pivotal role in economic growth similar to the banking sector (Haiss & Sümegi, 2008) and it should be considered as a substitute for the stock market rather than complementary service industry (Chen, Lee, & Lee, 2012). It is now well established that financial institutions promote economic growth (Horng, Chang, & Wu, 2012; Levine, 1997; Merton & Bodie, 1995). However, the impact of insurance on economic growth remains unclear (Haiss & Sümegi, 2008; Njegomir & Stojić, 2010; Outreville, 2013; Verma & Bala,

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2013). The literature offers contradictory findings about insurance-growth nexus such as (a) negative (Zouhaier, 2014), (b) demand following (Ching, Kogid, & Furuoka, 2010), (c) supply following (Alhassan & Biekpe, 2016; Ward & Zurbruegg, 2000), (d) interdependence (Ghosh, 2013) and (e) no relationship at all (Haiss & Sümegi, 2008). These contradictory findings of insurance-growth nexus posit a major concern for decision-makers to make intelligent, prudent and well-informed policies.

Literature reported (see Tables 1 and 2) that proxy choice and assumption of common slope coefficient along with other country-specific characteristics are mainly responsible for these discrepancies. The current study is different from previous studies in a number of aspects, firstly, previous studies utilised single proxy either net written premium, insurance penetration, or insurance density to investigate insurance-growth nexus while this study utilised all three proxies in the same study. Secondly, previous studies assumed a common insurance slope coefficient across countries. Although it may seem reasonable due to financial and economic integration that countries may tend to be homogeneous in the long-term. Moreover, the effect of insurance, life and non-life, on growth differs substantively because of their distinctive characteristics. Short-term heterogeneity also exists across countries due to different economic conditions, institutional settings, and government regulations. However, previous studies did not account for this short-term heterogeneity, in contrast, the current study accounted for both, long-term homogeneity and short-term heterogeneity. Lastly, the current study tested a new proxy for insurance development, premiums adjusted for population and GDP, the new proxy seems quite reasonable to consider because it takes into account population and GDP simultaneously.

1.1. Literature review

Effective and efficient management of four economic factors is a prerequisite for sustainable economic growth. According to Professor Clark as stated by Willett (1901), capital and labour are the prominent productive factors to increase the wealth of a nation. On the other hand, the *theory of economic growth* developed by Harrod and Domar in the 1940s claimed that only capital is the most influencing factor for economic development. Capital needs to be managed effectively to attain sustainable economic growth (Benston & Smith, 1974; Pyle, 1971). According to the theory of economic growth 'well-developed financial intermediation can promote economic growth through the marginal productivity of capital, the efficiency of channelling savings to investment, savings rate and technological innovations' (as cited by Madukwe & Anyanwaokoro, 2014, p. 102). The idea of intermediation was adopted from Telser (1955) – Houthakker (1968) model of hedging. Leland and Pyle (1977) and Benston and Smith (1974) are considered to be the prominent researchers who laid down the foundations of the *theory of financial intermediation* (Skogh, 1991). Benston and Smith (1974) highlighted that government regulations are also an important factor influencing intermediaries. Government regulations can affect financial intermediaries in the following ways (a) licencing, (b) credit allocation, (c) price control, (d) commodity type, and (e) supervision. On the other hand, Allen and Santomero (1998) disagree with the factors presented above and claimed that information asymmetric,

Table 1. Insurance-growth nexus (cross-country studies).

Author (s)	Scope	Statistical test	Insurance proxy	Focus and time	Result
Ward and Zurbruegg (2000)	9 OECD countries	Granger causality test	Total written premiums	Life/non-life insurance 1961–1996	Impact of the insurance industry varies on economic growth based on different economic levels
Arena (2008)	55 countries	GMM	Insurance penetration	Life and non-life insurance 1974–2004	Life insurance observed to have a more significant impact on economic growth for high-income countries whilst non-life insurance posits a more significant impact for both low-income as well as high-income countries
Haiss and Sümegi (2008)	29 European countries	Panel data analysis	Gross premiums income	Life/non-life insurance 1992–2004	Authors found that life insurance significantly affects economic growth for 15 developed EU. However, non-life plays a significant role in the less developed EU members
Tong (2008)	US, Sweden, Germany and South Korea	OLS, Fixed effect and simulation equation	Insurance penetration	Life and non-life insurance	The author concluded that non-life insurance has a significant and positive effect on economic growth for all countries. On the other hand, life insurance has a positive and a significant effect on economic growth for the US and South Korea whilst it has a negative impact on economic growth for Germany and Sweden
Ćurak, Lončar, and Poposki (2009)	10 transition EU countries	Fixed effect	Insurance penetration	Aggregate, life and non-life insurance 1992–2007	Authors found an insignificant impact of life insurance on economic growth whilst non-life and aggregate insurance showed a positively significant relationship with economic growth
Han et al. (2010)	77 countries	GMM	Insurance density	Life and non-life insurance 1994–2005	Insurance industry significantly contributes to the economic growth of developing countries as compared to developed
Ege and Bahadır (2011)	29 countries	Panel data analysis	The growth rate of net insurance premiums	Aggregate 1999–2008	Insurance sector affects economic growth positively
Chen et al. (2012)	60 countries	GMM	Insurance penetration and density	Life insurance 1976–2005	A positive and significant relationship between life insurance and economic growth
Hou, Cheng, and Yu (2012)	12EU	Fixed effect	Insurance penetration	Life insurance 1980–2009	Life insurance significantly affecting the economic growth of European countries
Lee, Lee, and Chiu (2013)	41 countries	Dynamic OLS	Insurance penetration and density	Life insurance 1979–2007	For the majority of the countries, results reported a positive significant relationship between life insurance and economic growth
Chang, Lee, and Chang (2014)	10 OECD countries	Granger causality	Insurance penetration	Life insurance 1979–2007	They concluded that every one percent change in insurance premiums will cause a 0.06% change in economic growth and there is a significant bidirectional relationship between insurance and economic growth
Zouhaier (2014)	23 OECD countries	Bootstrap panel Granger causality	Insurance penetration and insurance density	Non-life insurance 1990–2011	A positive significant relationship between non-life insurance and economic growth when non-life insurance was measured with insurance penetration whilst the relationship turned into negative when the authors applied insurance density instead of insurance penetration as a proxy for insurance development
Hou and Cheng (2017)	31 countries	GMM and (PMG)	Insurance penetration	Life insurance 1981–2008	The author found that the banking sector has a significant relationship with economic growth while the insurance and stock market were not much significant for many countries.
Demirci and Zeran (2017)	13 OECD countries	EK causality model	Insurance density	1983–2011	Insurance-growth nexus may not hold true even if economies were at the same level of development, many exogenous factors may affect this relationship

Source: Compiled by Author.

Table 2. Insurance-growth nexus (individual country studies).

Author(s)	Scope	Statistical test	Insurance proxy	Focus and time	Result
Kugler and Ofoghi (2005)	UK	Co-integration	Net insurance premiums	Life and non-life at disaggregate 1971–1997	A positive significant relationship between insurance and economic growth
Adams et al. (2009)	Sweden	Causality test	Insurance penetration	Aggregate 1830–1998	Insurance industry Granger cause economic growth for Sweden
Njegomir and Stojić (2010)	Ex-Yugoslavia Region	Country-specific fixed effect model	Net written premiums	Aggregate 2004–2008	Insurance positively affects economic growth
Ching et al. (2010)	Malaysia	VECM and Causality	Total assets of life insurance	Life insurance 1997–2008	A significant long-term relationship between life insurance and economic growth. However, economic growth Granger cause insurance development only
Kjosevski (2011)	Macedonia	Multiple regression	Insurance penetration	Aggregate 1995–2010	A positive and a significant effect of aggregate and non-life insurance on economic growth whilst the relationship was found to be negative for the life insurance
Horng et al. (2012)	Taiwan	VAR	Insurance density	Aggregate 1961–2006	Insurance industry Granger cause economic growth for Taiwan
Verma and Bala (2013)	India	OLS	Total net written premiums and total insurance investment	Life insurance 1990–2011	Life insurance significantly affects the economic growth of India
Chau, Khin, & Teng (2013)	Malaysia	Co-integration and Causality	Net written premiums	Life and non-life insurance 1982–2012	A significant short-term relationship between life insurance and economic growth whilst a significant long-term relationship was found for non-life insurance
Ghosh (2013)	India	VECM Granger Causality	Net written premiums	Life 1970–2012	Life insurance in the long-term has a positive significant effect on economic growth in India
Cristea et al. (2014)	Romania	Correlation	Insurance penetration and density	Life and non-life insurance 1997–2012	A strong association between insurance and economic growth of Romania when measured by insurance penetration. However, the insurance industry and economic growth showed weak association when measured by insurance density
Akinlo and Apanisile (2014)	Sub-Saharan Africa	Pooled OLS, GMM, & fixed effect model	Net written premiums	Aggregate 1986–2011	A significant positive relationship between the insurance industry and economic growth for sub-Saharan Africa
Alhassan & Biekpe (2016)	Sub African	ARDL and Causality	Insurance penetration	1990–2010	A bidirectional relationship between insurance and economic growth. In addition, results of the ARDL model revealed that life insurance showed a more significant long-term effect on economic growth compared to non-life insurance
Ukpong and Acha (2017)	Nigeria	Co-integration and causality	Net written premiums and insurance investment	Life, non-life and total insurance 1990–2013	A significant positive relationship between life, non-life and total insurance with economic growth for Nigeria
Ying et al. (2017)	China	VECM	Net written premiums	Life and non-life insurance 1999–2015	Authors concluded that life insurance showed a significantly negative relationship with economic growth in the short-term whereas the long-term impact of life insurance on the economy is positive. On the other hand, the study further found a significant positive relationship between non-life insurance and economic growth in the short-term where the long-term impact of non-life insurance found to be insignificant

Source: Authors' own collation.

transaction cost, and government regulations are no longer important while discussing the theory of financial intermediation rather factors like risk-sharing and participation cost are central to the theory of financial intermediation today. Outreville (2013) claimed that the role of insurance in the economic growth of two countries at the same economic level might be different. Therefore, Ward and Zurbruegg (2000) suggested that due to differences in culture, regulations, and religious aspects, a study on insurance-growth nexus should be on a per-country basis and special consideration should be given to the heterogeneous nature of countries while evaluating the role of insurance in economic growth. Previous studies which investigated the insurance-growth relationship utilised linear models that assume homogeneous slope and intercept thereby ignoring the potential heterogeneity across countries. Although authors like Arena (2008), Beck, and Webb (2003), Han, Li, Moshirian, and Tian (2010), and Levine et al. (2002) applied a dynamic model to examine the insurance-growth relationship but again the model applied to study the relationship assumed homogeneous slope coefficient for cross-sections and the model did not consider the short-term and long-term relationship. A study conducted by Ward and Zurbruegg (2000) addressed the issue of short and long-run insurance-growth relationship but their study was on a per-country basis and they used causality approach. Following studies has been examined the insurance-growth nexus from different perspective using diverse statistical techniques

Majority of the studies presented in Tables 1 and 2 found a positive relationship between insurance, life and non-life and economic growth. The studies which found an insignificant or negative impact of insurance on economic growth either used aggregate data or a different proxy. As life and non-life differ substantively, therefore, aggregating both of these distinctively different insurance products may yield an insignificant or negative impact on the economy. By the same token, a different proxy for insurance industry may also yield different results, therefore, proxy choice and segregation of life and non-life insurance is important when studying insurance-growth nexus. Further, ignoring short-term heterogeneity and long-term homogeneity assumption may also result in discrepancies and contradictory findings. Based on the majority of the studies presented in Tables 1 and 2, this study hypothesis that

H1: life insurance has a positive and significant impact on economic growth

H2: non-life insurance has a positive and significant impact on economic growth

1.2. Methodology

This study adopted the same methodology as of Mohy-ul-Din, Regupathi, and Abu-Bakar (2017). However, the insurance-growth nexus is investigated with four different proxies such as net written premiums, insurance penetration, insurance density, and premiums adjusted for population and GDP (see Table 3). The measure of the insurance industry by net written premiums was criticised by Arena (2008) for the fact that it does not cover all three dimensions of insurance of risk transfer, indemnification and intermediation but it is believed to measuring only risk transfer and

Table 3. Summary of the variables proxy, operational definition and sources.

Variable	Proxy	Operational definition	Data source
Insurance industry	Net Written Premiums	Total Net written premiums paid by all the policyholders during a given year	Sigma Re
	Penetration	Total Net written premiums paid by all the policyholders during a given year as a percentage of GDP	
	Density	The ratio of total net written premiums in a given year to the total population	
	Premiums Adjusted for population and GDP	The ratio of total insurance premiums in a given year to total population and GDP	
Economic Growth	GGDP	Change in total output produced in an economy	World Development Indicators

Source: Authors' own collation.

indemnification functions only. Many authors such as Chang (2012), Haiss and Sümegi (2008), and Zheng, Liu, and Deng (2009) reported that two insurance measures, insurance penetration and insurance density, are not very good measures of insurance development because it takes into account only one aspect either gross domestic product or population and completely ignores the other. Hence, this study developed an index by taking both population and GDP at the same time. The new index is a ratio of total net written premiums collected from all the policyholders during a year divided by population and GDP and multiplying with 1 million.

$$\text{Premiums Adjusted for population and GDP} = \frac{\text{Net written premiums}}{(\text{population} \times \text{GDP})} \times 1 \text{ million}$$

$$GDP_{it} = \alpha + \beta_1 LINSP_{it} + \beta_2 NLINSP_{it} + \beta_3 EM_{it} + \beta_4 TO_{it} + \beta_5 FDI_{it} + \beta_6 BD_{it} + \beta_7 SMKT_{it} + €$$

Where
GDP_{it} = Real Gross Domestic Product
$LINSP_{it}$ = Life net written premiums
$NLINSP_{it}$ = Non − life net written premiums
TO_{it} = Trade Openness (import + export)/*GDP*
FDI_{it} = Foreign Direct Investments (FDI/GDP
BD_{it} = Banking Sector Development (Credit to private sector/GDP
SMD_{it} = Stock Market Development (Market capitalization/GDP)
EM_{it} = Employment

A statistical test to validate the relationship among variables largely depends on nature and type of data. Fixed or random effect model can be used when the data possess different regression coefficients for the country and across time (Tiwari & Mutascu, 2011). However, the fixed or random-effect model would only work when

$N > T$ and would provide biased results if alternative condition prevails (Baltagi, 2015). Moreover, Pesaran, Shin, and Smith (1999) claimed that the assumptions of cross-country independence and homogeneous slope parameter for micro panel data, $N > T$, does not hold true in case of macro panel data ($N = T$ or $N < T$). Therefore, applying fixed/random effect models for such data might provide inconsistent results (Pesaran, Shin, & Smith, 1999; Sisay, 2015). As a result, in order to investigate the relationship between economic growth and selected explanatory variables, the present study implies a methodology that estimates panels where $N < T$ which also allow for the heterogeneity effect among the countries as well.

Dynamic models such as the generalised method of moments (GMM), mean group or Pooled mean group (PMG) are considered to be appropriate when $N < T$ (IHS Global Inc., 2015; Im, Pesaran, & Shin, 2003). However, GMM would be incapable in the estimation of true effect when T is reasonably large and variables are not stationarity at the same level (Alam & Quazi, 2003; Engle & Granger, 1987; Pesaran et al., 1997). If the variables are not stationarity at the same level and T is large, the mean group (MG) or pooled mean group (PMG) is more suitable for such a data set. Mean group (MG) method calculates a separate regression equation for each cross-section, distribution of coefficients and means of the estimated coefficients. However, this approach ignores the possible homogeneity of certain parameters among cross-sections. Pooled Mean Group (PMG), on the other hand, allows short-term intercepts, coefficients and error variances to move freely for cross-sections while the long-term coefficient would be the same for all cross-sections (Pesaran et al., 1999). Chang (2012) also supported the notion that PMG is more suitable than Dynamic Fixed Effect (DFE) or Mean Group (MG) method because both of these methods are at the extremities of the spectrum. PMG is an intermediary approach, combination of DFE and MG as it allows error variance, intercept and short-term coefficients to vary, as is the case with MG and placing a restriction for long-term coefficient to be same across the group, as is the case with DFE.

In order to capture short-run effect, long-run effect and speed of adjustment to long-run, Pesaran et al. (1999) suggested the following model

$$y_{it} = \sum_{j=1}^{p} \Lambda it\ y_i,\ t-j + \sum_{j=1}^{q} \Lambda_{it}^{*} \delta_{ij}' X_{i,\ t-j} + \mu_i + \varepsilon_{it}$$

Where X_{it} represents $K \times 1$ vector of explanatory variables (insurance, banking development etc), δ_{it} represents $K \times 1$ coefficients, μ_i is group-specific effect and Λ_i are scalars. Error correction models require T to be large enough that it can be fitted for each of the group separately. The error term is an $I(0)$ process for all cross-section if the explanatory variables are co-integrated and I (1). The speed of adjustment, responsiveness, towards equilibrium could be used as a measure to judge the co-integration level of variables. The feature of responsiveness implies an error correction model where short-term dynamics are influenced by the deviation from equilibrium. Therefore, the equation can be written as

$$\Delta y_{it} = \Phi i\left(y_{i,\ t-1} - \theta_i' x_{it}\right) + \sum_{j=1}^{p-1} \Lambda_{ij}^{*}\ \Delta y_{i,\ t-1} + \sum_{j=0}^{q-1} .\delta_{ij}' * \Delta X_{i,\ t-j} + \mu_i + \varepsilon_{it} \quad (4-11)$$

Where

$$\Phi i = -(1 - \sum_{j=1}^{p} \Lambda_{ij}^{*}$$

$$\theta_i = \frac{\sum_{j=0}^{q} .\delta_{ij}}{1 - \sum_{k} \Lambda_{ik}}$$

$$\Lambda_{ij}^{*} = - \sum_{m=j+1}^{p} .\Lambda_{im}' \ for\ j = 1, 2 \ldots\ldots q-1$$

And

$$\delta_{ij}^{*} = - \sum_{m=j+1}^{q} .\delta_{im}'$$

θ_i represents the long-term relationship between variables whereas Φi is the speed of adjustment. The value of Φi should be significant and negative only then it represents a return towards long-run equilibrium.

The validity of the PMG estimators hinges on the reasonableness of the homogeneity restrictions imposed on the long-term coefficients. The insurance industry in the short-run is heterogeneous due to different institutional setting such as regulations, financial markets imperfections, income levels and many other factors. While in the long-run, globalisation along with financial and economic integration will not only develop insurance markets but will also stimulate the convergence of insurance industry across the world. It is quite reasonable to assume a long-term homogeneity because of globalisation, economic and financial integration (Chang, 2012). The concept of short-term heterogeneity and long-term homogeneity is also applicable to the insurance industry (Chang, 2012; Loayza & Ranciere, 2006).

2. Results and discussion

The section presents the results and justifications with reference to theory and literature. Many authors claimed that statistical significance would be spurious if a variable is stationary at the second difference (Baltagi, 2006, 2005; Levin, Lin, & Chu, 2002; Raj & Baltagi, 1992). Hence, it is important to check for stationarity of data using multiple-unit root tests before estimating statistical tests like correlation, panel causality, and PMG/MG. A summary of the results of IPS and LL is presented in Table 4.

Table 4. List of abbreviations & stationarity summary.

Abbreviation	Full form	Number of Lags
GGDP	Growth rate of gross domestic product	1
LI	Life insurance premiums	0
NL	Non-life insurance premiums	0
PLI	Penetration life insurance	0
PNL	Penetration non-life	0
DLI	Density life insurance	0
DNL	Density non-life insurance	0
LI (adjusted)	Life insurance premiums adjusted for population and GDP	0
NL (adjusted)	Non-life insurance premiums adjusted for population and GDP	0
BD	Banking development	1
SMD	Stock market development	0
EM	Employment rate	0
FDI	Foreign direct investment	0
TO	Trade openness	0

Source: Authors' own collation.

It is obvious from the stationary summary presented in Table 3 that none of the variables is stationary at the second level. Data stationery has special implication for both, causality and PMG models. Although Espinoza, Fayad, and Prasad (2013) stated that the PMG model is efficient enough that it doesn't require a separate unit root testing, however, one of the assumption of PMG is that none of the variables should be stationary at second level difference (Din, Regupathi, & Abu-Bakar, 2017).

Correlation analyses are performed to explore the associations among the variables. The results of the correlation analysis between GGDP and all other variables are presented in Table 5 for all observations and each country.

Bednarczyk (2013) and Gujarati (2003) gave general criteria to measure the strength of association if the correlation coefficient is less than 0.3, it would indicate weak correlation, a value between 0.3 to 0.7 would indicate a moderate level of correlation and a value greater than 0.7 would indicate a strong correlation. However, a high correlation may possibly indicate multicollinearity issue. Results for all the explanatory variables showed a positive, significant, and moderate correlation with GGDP eliminating the possibility of multicollinearity for all observations. Results further highlighted that all other variables are positively correlated with economic growth except employment and banking sector. Further, a strong correlation was observed between four insurance proxies, highlighting the possibility of multicollinearity and this could be used as evidence that all of these proxies are measuring same phenomena and has significant implications for further results. In addition, it is important to note that a moderate correlation, comparatively higher than other macroeconomic variables, also exist between insurance proxies and the financial sector, banking development and stock-marketing. This is so because banking, stock-market and insurance performs similar functions and may be taken as either a complementary or substitutional service industry.

The causality test is applied to check the direction of the relationship among variables. Literature reported that the following relationships are expected between insurance and economic growth such as uni-directional (either supply following or demand following), bi-directional, or no causal relationship (Avram, Nguyen, & Skully, 2010; Bednarczyk, 2013; Chen et al., 2012; Olayungbo, Akinlo, & McMillan, 2016). In order to apply Dumitrescu-Hurlin causality test, data should be stationary

Table 5. Correlation matrix.

	All six countries												
	GGDP	LI	NL	DLI	DNL	PLI	PNL	LI (Adj)	NL (Adj)	TO	FDI	EM	BD	SMD
GGDP	1.00													
LI	0.526***	1.00												
NL	0.455***	0.644***	1.00											
DLI	0.382***	0.659***	0.420***	1.00										
DNL	0.474***	0.727***	0.848***	0.598***	1.00									
PLI	0.550***	0.506***	0.572***	0.889**	0.681***	1.00								
PNL	0.407***	0.723*	0.687***	0.6554***	0.861***	0.503*	1.00							
LI (A)	0.492***	0.771***	0.709***	0.633***	0.706***	0.736***	0.496***	1.00						
NL(A)	0.477***	0.540***	0.534***	0.606***	0.432***	0.618***	0.588***	0.520***	1.00					
TO	0.182***	0.093	0.221***	−0.081	−0.190***	0.078	−0.048	−0.243**	−0.352***	1.00				
FDI	0.023	0.080	−0.045	0.320***	0.079	0.377*	0.105	0.058	−0.110	0.503***	1.00			
EM	−0.235**	−0.093	0.167**	0.009	0.052	0.009	0.076	0.078*	0.404***	−0.129*	0.330***	1.00		
BD	−0.567**	0.141**	0.474	0.423***	0.557***	0.583*	0.409***	0.283***	0.388***	−0.246***	0.411***	0.471***	1.00	
SMD	0.369***	0.154**	0.196***	0.449***	0.465***	0.571*	0.514***	0.125*	−0.035	0.387***	0.509***	0.158**	0.323***	1.00

Notes: signs (*), (**), and (***) represents 10%, 5%, and 1% significance level.
Source: Authors' own collation.

Table 6. Dumitrescu-Hurlin panel causality test.

Null hypothesis	W-Stat.	Zbar-Stat	*p-value*
NL does not Granger-cause GGDP	2.05	1.82	.06
GGDP does not Granger-cause NL	2.09	1.89	.05
PNL does not Granger-cause GGDP	0.87	0.21	.82
GGDP does not Granger-cause PNL	3.18	3.77	.00
DNL does not Granger-cause GGDP	0.33	1.14	.25
GGDP does not Granger-cause DNL	9.93	15.50	.00
NL (adjusted) does not Granger-cause GGDP	2.49	2.58	.00
GGDP does not Granger-cause NL (adjusted)	2.03	1.78	.07
LI does not Granger-cause GGDP	2.47	2.54	.01
GGDP does not Granger-cause LI	5.08	7.07	.00
PLI does not Granger-cause GGDP	0.99	0.00	.19
GGDP does not Granger-cause PLI	2.69	2.93	.00
DLI does not Granger-cause GGDP	1.73	1.28	.20
GGDP does not Granger-cause DLI	8.30	12.65	.00
LI (adjusted) does not Granger-cause GGDP	2.72	2.98	.00
GGDP does not Granger-cause LI (adjusted)	2.06	1.84	.06

Source: Authors' own collation.

(Dumitrescu & Hurlin, 2012). The results of Dumitrescu and Hurlin causality are presented in Table 6 for all observations using four different insurance proxies.

According to Dumitrescu and Hurlin (2012), if the *p*-value of Wbar/Zbar-stat is greater than 5% then we cannot reject the null hypothesis, and that would imply that there is no causal relation from X to Y. The results presented in Table 6 revealed that the direction of the relationship between insurance and economic growth significantly depends on proxy choice. For instance, results reported a bidirectional, feedback, the relationship between non-life insurance and economic growth as indicated by *p*-value, .06 and .05 respectively when measured by net written premiums and insurance premiums (adjusted).

Tables 7 and 8 show the results of the relationships computed with PMG models for all observations (long-term and short-term) and for each country (short-term) using four different proxies.

Baltagi (2015), Hou and Cheng (2017), and Loayza and Ranciere (2006) suggested to apply Hausman-test to choose between the PMG or MG model and the null hypothesis for Hausman-test is '*MG is a consistent and efficient model*'. As the *p-values* of the Hausman test, in Table 7, is greater than 5%, we can reject the null hypothesis and accept the alternative that is PMG is consistent and efficient for this data set. Another key assumption of PMG model, besides others, is that the error correction term must be negatively significant and not lesser than –2 in absolute value (Chang, 2012; Espinoza et al., 2013; Hou & Cheng, 2017; Loayza & Ranciere, 2006; Pesaran et al., 1997). The results presented in Table 7 reported negative and significant error correction terms (speed of adjustment), moreover, the absolute value for error correction terms are less than unity for all four proxies.

The results of the first broad category of hypotheses indicate that higher net written premiums, higher insurance density, and premiums adjusted would positively influence the economic condition of the country in the long-term. A positive relationship between life insurance and economic growth illustrated in Table 7 (net written premiums, insurance density, and premiums adjusted for population and GDP) is consistent with the theory and literature. Authors like Akinlo and Apanisile (2014), Cristea, Marcu, and Cârstina (2014), Hadhek (2014) and Madukwe and

Table 7. Long-term and short-term relationships between insurance and economic growth.

Pooled mean group

	Long-term homogeneity				Short-term heterogeneity			
Variables	Net written premiums	Insurance penetration	Insurance density	Premiums adjusted	Net written premiums	Insurance penetration	Insurance density	Premiums adjusted
Life Insurance	0.253***	–2.79***	2.03***	0.051***	0.058***	–0.154	0.031*	0.093***
Non-Life Insurance	0.701***	4.59***	3.97***	0.063***	0.840***	5.313**	0.21*	0.200**
Trade Openness	0.365***	0.09**	2.07**	0.675***	0.803***	0.496***	0.422***	0.047**
Stock Market Development	0.002***	3.26***	0.98***	0.495***	0.349**	0.295***	1.14***	0.101***
Banking Development	–0.584**	–0.83***	–1.03***	–0.638**	–0.149**	–0.586***	–0.213***	–0.011*
Employment	–0.011*	–0.64**	–0.89***	–0.067**	0.048***	–1.745*	–0.081**	–0.043**
Foreign Direct Investment	0.183***	0.06**	1.03**	0.108***	0.697***	0.636***	0.090**	0.004**
Error Correction Term	–0.21[a]***	–0.27***	–0.60***	–0.771***				
Hausman Test								
Chi-Square	0.60	0.36	0.63	0.72				
Probability	*0.4370*	*0.5435*	*0.5817*	*0.4526*				

Notes: signs (*), (**), and (***) represents 10%, 5%, and 1% significance level respectively. Estimations are done by using (xtpmg) routine in Stata. Both, PMG and MG are applied by controlling for country and time effects.
Source: Authors' own collation.

Table 8. Short-term country-wise results.

	Net written premiums		Insurance penetration		Insurance density		Premiums adjusted	
Countries	Life	Non-life	Life	Non-life	Life	Non-life	Life	Non-life
USA	0.18	0.03**	−0.56**	3.44*	1.94**	1.12**	0.093	0.058**
UK	0.23***	0.61***	−2.83***	5.19**	−1.13	0.93***	0.21	0.790***
China	0.46*	0.60***	−0.35	1.84***	1.97***	−0.901	0.058**	0.404***
India	0.64***	0.27*	3.95**	6.04***	1.24***	2.88	0.055**	0.459**
Pakistan	0.34***	0.23***	−1.3	4.25	3.24	1.28	0.545	0.429
Malaysia	0.65***	0.43***	0.88**	6.76***	2.7	1.80***	0.619***	0.506**

Source: Authors' own collation.

Anyanwaokoro (2014), and Ying, Linsen, and Wenjie (2017) also reported a positive relationship between life insurance and economic growth.

Ciftcioglu and Bein (2017) reported that finance-growth nexus largely depends on proxy choice, different proxies for the same variable may yield different results (Dash et al., 2018). Similarly, Chang (2012) claimed that proxy choice is usually a concern when investigating the relationship between insurance development and macroeconomic variables. In this study, different results are found when using different proxies. Unlike, net written premiums, insurance density and premiums adjusted, a negative significant relationship between life insurance and economic growth were observed when insurance development is measured with insurance penetration. The studies of Avram et al. (2010), Chang (2012) and Zheng et al. (2009) also found inconsistent results when they examined insurance-growth nexus by using more than one proxy simultaneously. Apart from proxy choice, the other reasons for this inconsistent result are not known to the authors. As all the sampled countries belong to diverse economic backgrounds, developed, upper-middle-income and lower-middle-income, are regressed together assuming long-term homogeneity. Hence, higher GDP value may not be the only reason for the significant negative or insignificant relationship between insurance and growth, therefore, more complicated country-specific factors such as diversity and variety of insurance products, religious and cultural traditions, level of education, and State involvement (Cristea, Marcu, & Cârstina, 2014), not covered in this research, may be responsible for these discrepancies.

The contribution of insurance varies in the long-run and short-run because of the different characteristics of life and non-life insurance. Besides characteristics of life and non-life insurance, diverse institutional settings and different macroeconomic factors also affect the relationship between insurance and economic growth in the long and short-term. Short-term results for life insurance showed insignificant results for Pakistan when insurance penetration, insurance density and premiums adjusted were used as a proxy for insurance development. This insignificant relationship is possibly due to financial fragility. Pakistan adopted financial integration and liberalisation practices during the analysis period, and this could results in financial fragility, excessive sensitivity for the financial crisis. Therefore, economies may face, in the short-term, volatility of credit reduced capital efficiency and financial crisis as seen by the world, such as black Monday in 1987, Asian-crisis of 1997, dotcom bubble in 1999, financial crises of 2007 and 2014 after financial liberalisation in the short-term. Soon after liberalisation, financial institutions would increase their credit base, financing bad projects in good times and vice versa. Hence, financial institutions and intermediaries may not contribute significantly to the economy in the short-term. However, the

economy would move to equilibrium and would be free of any financial crisis. Apart from the financial crisis, financial liberalisation may also result in an adverse selection problem for financial institutions where they may be unable to distinguish between good investments from bad. This inability may result in lower capital productivity and an insignificant contribution to the economy in the short-term. The nature of premiums for life insurance is of long-term nature and insurance companies invest these premiums in long-term projects. These positive net present value projects may also provide short-term returns; however, any such returns may possibly be utilised for administrative expense purposes or they may not be significant enough to contribute to the economy. The insignificant relationship between life insurance and economic growth for Pakistan, perhaps, could also be attributed to unsound institutional setting such as political instability, legal and accounting reforms, nationalisation or liberalisation. One of the key indices used to measure political stability is Polity IV, with a rating of 10 indicating a highly democratic government whereas −10 indicating an autocratic or bureaucratic government. The Polity IV score for Pakistan ranges somewhere between −07 to 04, indicating frequent government intervention, political instability and nationalising or privatising, in the insurance business. Similarly, economic freedom statistics also reported very low scores for Pakistan, 127 positions (Gwartney, Lawson, & Hall, 2017). Hence, due to political interference and low economic freedom, the financial intermediation function of life insurance is not contributing significantly to the economy.

Insurance ought to play a more significant role in developing countries such as China, India and Malaysia as compared to developed economies. The insignificant relationship between life insurance and economic growth for the USA and UK is possibly due to the fact that these insurance markets are well-developed and a significant fraction of total world's premium belongs to these countries. Therefore, insurance may be making only a marginal negligible contribution to the economy of the USA and UK. Similarly, the USA and the UK have a very sound institutional environment, in a sound institutional setting, there are likely to be more contributors to the economic growth and the contribution insurance might be less significant or negligible, hence, negligible. Another possible explanation could be attributed to high per capita income that leads towards risk-taking behaviour; therefore, individuals do not transfer their risk to any third party but prefer to retain it themselves. The substitution effect could also be quoted here to justify the insignificant relationship between life insurance and economic growth for the UK and US. If other financial sectors such as stock market are well-developed in the country, then these well-developed institutions might work as a substitute for insurance and insurance may possibly do not contribute to economic growth. the stock market is highly developed compared to the insurance industry, especially for UK and US. Hence, life insurance may possibly not contribute to economic growth. In a nutshell, the hypothesis 'life insurance affects economic growth in the long-term and/or short-term for all observations' can be accepted conditionally. The acceptance is subject to the proxy choice.

For the second broad category of hypotheses, all four insurance proxies and GDP reported a significant and positive relationship between non-life insurance and economic growth in the long-term for all observations. The studies of Bednarczyk (2013),

Table 9. Summary of findings vs hypothesis.

Economic classification	Countries	Net written premiums	Penetration	Density	Premiums adjusted
Life insurance					
All Observations Long-term		As expected	Contrary	As expected	As expected
All Observations Short-term		As expected	Not significant	As expected	As expected
Developed	USA	Not significant	Contrary	As expected	Not significant
	UK	As expected	Contrary	Not significant	Not significant
Upper-Middle-Income Countries	China	As expected	Not significant	As expected	As expected
	Malaysia	As expected	As expected	Not significant	As expected
Lower Middle Income Countries	Pakistan	As expected	Not significant	Not significant	Not significant
	India	As expected	As expected	As expected	As expected
Non-Life insurance					
All Observations Long-term		As expected	As expected	As expected	As expected
All Observations Short-term		As expected	As expected	As expected	As expected
Developed	USA	As expected	As expected	As expected	As expected
	UK	As expected	As expected	As expected	As expected
Upper-Middle-Income Countries	China	As expected	As expected	Not significant	As expected
	Malaysia	As expected	As expected	As expected	As expected
Lower Middle Income Countries	Pakistan	As expected	Not significant	Not significant	Not significant
	India	As expected	As expected	Not significant	As expected

Source: Authors' own collation.

Liu, Lee, and Lee (2016), Olayungbo, Akinlo, and McMillan (2016) and Ying et al. (2017) also found a significant positive relationship between non-life insurance and economic growth. Similarly, the *theory of risk and insurance* and the *theory of financial intermediation* emphasise that risk-sharing would encourage risk-taking behaviour in society and that would result in more entrepreneurial activities and economic growth.

The insignificant relationship between non-life insurance penetration and economic growth can be explained by the proxy choice. Unlike life insurance, non-life insurance showed comparatively lesser inconsistency. Apart from the institutional setting and financial fragility, the insignificant relationship between non-life insurance and economic growth for Pakistan can also be explained from the market size perspective. Life insurance is the dominant insurance line in Pakistan whereas non-life insurance size is only about 30% of the life insurance market. Similarly, according to recent Sigma statistics (2017), non-life insurance contribution is 0.0026%, almost negligible, for Pakistan. As a result of this small portion of a share, the impact of the non-life insurance industry in Pakistan's economy is not significant. On the other hand, three out of four proxies show a significant and positive relationship between non-life insurance and economic growth for China and India, only the insurance density is found to be insignificant. Hence, the proxy choice again may be able to explain this insignificant relationship. In summary, the hypothesis 'non-life insurance affects economic growth in the long-term and/or short-term for all observations' is accepted, again, acceptance is subject to proxy choice especially for a short-term effect.

3. Conclusion

This study provides evidence on the relationship between life, non-life insurance and economic growth over the long-term and short-term. In light of the results presented in Table 9, it is not easy to have definite remarks because four different proxies were used to examine the relationship between insurance and economic growth and results showed quite a diverse effect. The inconsistent results for countries within the same

economic levels indicate that level of economic development is not merely the sole reason for explaining the relationship between insurance and economic growth, other country-specific factors may also affect this relationship that was not covered in this study. Further, this study concludes that net written premiums, insurance penetration, and insurance density are not very good proxies to measure insurance development because they do not consider population and GDP simultaneously and they may yield contradictory results for the same dataset. The newly developed proxy is a relatively more accurate proxy for insurance development because it accounts for population and GDP simultaneous. As the short-term results showed huge variability for coefficient and speed of adjustment values for each country meaning that country-specific factors play a significant role. Therefore, the future researcher may undertake an in-depth study of each country using different country-specific variables such as human development index (HDI), governance, political stability, corruption, and rule of law would be an interesting topic for future research.

Disclosure statement

No potential conflict of interest was reported by the authors.

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