Research in International Business and Finance 36 (2016) 447–458

Contents lists available at ScienceDirect

Research in International Business and Finance

journal homepage: www.elsevier.com/locate/ribaf

Insurance penetration and economic growth nexus: Cross-country evidence from ASEAN

Rudra P. Pradhan[a,*], B. Mak Arvin[b], Neville R. Norman[c,d], Mahendhiran Nair[e], John H. Hall[f]

[a] Vinod Gupta School of Management, Indian Institute of Technology, Kharagpur 721302, India
[b] Department of Economics, Trent University, Peterborough, Ontario K9J 7B8, Canada
[c] Department of Economics, University of Melbourne, Victoria 3053, Australia
[d] Department of Economics, University of Cambridge, Cambridge CB3 9DD, UK
[e] School of Business, Monash University Malaysia, Jalan Lagoon Selatan 47500, Malaysia
[f] Department of Financial Management, University of Pretoria, Pretoria 0028, South Africa

ARTICLE INFO

Article history:
Received 7 November 2014
Received in revised form
23 September 2015
Accepted 24 September 2015
Available online 9 October 2015

JEL classification:
L96
O32
O33
O43

Keywords:
Insurance market penetration
Broad money
Stock market capitalization
Economic growth
ASEAN
Granger causality
ARF countries

ABSTRACT

This paper investigates whether there are Granger causal relationships between insurance market penetration, broad money, stock-market capitalization, and economic growth, using panel data for the Association of South East Asian Nations (ASEAN) Regional Forum (ARF) countries for the 1988–2012 period. Using a multivariate framework, we show that all the variables are cointegrated and reveal a network of causal connections, including short-run bidirectional causality between insurance market penetration and economic growth. Recommendations based on this study include establishing a sound regulatory framework for a country's insurance industry, and introducing professional education and certification of insurance personnel to ensure adherence to global best practices and standards. Moreover, opening up a country's domestic insurance market to larger foreign players can ensure a wider choice of cost-effective, quality insurance.

1. Introduction

A growing strand of the financial economics literature shows the transition to high and sustained economic growth is preceded by the emergence of modern flexible financial systems, a process called 'financial diffusion.' So, well-managed public finances, a stable money supply, central banks, banking systems, securities markets and sound insurance markets causally predate economic development. And the studies show that financial diffusion is important even in small economies;

* Corresponding author.
E-mail addresses: rudrap@vgsom.iitkgp.ernet.in (R.P. Pradhan), marvin@trentu.ca (B.M. Arvin), n.norman@unimelb.edu.au, nrn1v@econ.cam.ac.uk (N.R. Norman), mahendhiran.nair@monash.edu (M. Nair), john.hall@up.ac.za (J.H. Hall).

http://dx.doi.org/10.1016/j.ribaf.2015.09.036
0275-5319/

that financial development fosters development by mobilizing savings, mitigating risks and helping to evolve legal and regulatory institutions (for instance, Andersson et al., 2010; Bolbol et al., 2005; Colombage, 2009). But the role of insurance markets in economic growth has been less thoroughly examined than the role of banks and stock markets (Arena, 2008; Chang et al., 2013; Lee et al., 2013a,b,c; Chen et al., 2013).

The importance[1] of the insurance–economic growth relationship[2] has been recognized in the literature (Beck and Webb, 2003; Guochen and Wei, 2012; Lee et al., 2013a,b,c). Insurance contributes[3] to the economy in many ways, both directly and indirectly, to sustain high economic growth. Hence, insurance,[4] like other financial services, has grown significantly in importance in ensuring sustainable economic growth (Holsboer, 1999).

Recent studies document positive relationships between insurance penetration and economic growth (for instance, Ward and Zurbruegg, 2000) but neglect the direction(s) of causality. Thus, our challenge here is to advance the research beyond documenting correlations to examining the causal relationship between the development of the insurance industry and economic growth (for instance, Lee et al., 2013a,b,c). Causality may run adversely: insurance penetration may simply be an outcome of economic growth (for instance, Beck and Webb, 2003; Catalan et al., 2000). Those prior studies that do study causality tend to use only a bivariate framework with narrow coverage (for instance, Chang et al., 2013). A multivariate framework is essential for causality analysis between insurance-growth relationships. Some use panel data, involving many countries over time. Some examine the link between insurance markets and other economic growth, banks and stock markets, but few papers concentrate on the causal link(s) between these variables.[5]

Here we investigate whether there are demonstrable Granger causal relationships[6] between insurance penetration, banking intensity, stock market depth, and economic growth, using a panel dataset covering the Association of Southeast Asian Nations (ASEAN) Regional Forum (ARF) countries[7] for the 1988–2012 period. Evidently, increased banking activities foster insurance activities. Analogously, insurance penetration requires the development in stock markets for the placement of funds deposited with insurance intermediaries. The direction of causality between these variables in a multivariate framework invites rigorous investigation.

Our multivariate panel-data estimation procedure offers robust estimates by using variations between countries, as well as variations over time. We adopt a sample of countries that have hitherto received little attention; and we use more advanced econometric techniques than have previously been used in this literature, to establish whether there are causal links between the variables. We comment on the direction of the causal nexus between insurance penetration and economic growth. We make a contribution to the literature by determining the direction of causality between any two variables in the presence of the other two variables.

The remainder of this paper is organized as follows: Section 2 provides an overview of insurance markets in the ASEAN countries; Section 3 presents a summary of the prior literature; Section 4 describes our sample, variables, and data; Section 5 describes our econometric estimation strategy and presents the results; and the final section concludes with policy implications and recommendations.

2. An overview of the development of insurance markets in ASEAN countries

ASEAN has ten member countries, namely Brunei Darulssalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar (Burma), the Philippines, Singapore, Thailand and Vietnam and a population of 600 million people. ASEAN has experienced rapid economic development, with a total income level of close to USD 2.4 trillion (Lim, 2014). The further integration of these ten economies and the implementation of the ASEAN Free Trade Agreements (FTAs) is expected increase regional income and trade by 5% and 11.6%, respectively (Plummer and Chia, 2009). Intra-ASEAN trade has increased rapidly over the last decade, escalating to USD 600 billion in 2013 (Lim, 2014).

[1] Insurance makes many economic activities possible. Its role extends beyond contributing to the size of the finance sector, to employment, and to the magnitude of assets under management. In fact, economic growth is often seen in parallel with the soundness of national insurance markets (Outreville, 1996).

[2] Some relevant prior studies are the following: Andersson et al. (2010), Chang and Lee (2012), Chang et al. (2013), Lee (2011, 2013), Lee et al. (2013a,b,c), Liu and Lee (2014), and Webb et al. (2005).

[3] Insurance contributes to national economies by (1) promoting financial stability and reducing volatility; (2) being a substitute for government programmes; (3) facilitating trade and commerce; (4) mobilizing savings; (5) enabling risk to be managed more efficiently; (6) encouraging loss mitigation; and (7) fostering an efficient capital allocation (for instance, Han et al., 2010; Liu et al., 2014).

[4] Insurance markets have grown in importance to become a central theme in modern economics (D'Arcy and Gorvett, 2004).

[5] For example, Horng et al. (2012).

[6] We omitted other important variables such as urban population growth, the youth dependency ratio and interest rate, considered by other studies (for example, Chang and Lee, 2012), in order to concentrate on the link between insurance penetration, banking intensity, stock market depth, and economic growth.

[7] ARF consists of the group of 25 countries and the European Union. The countries in this forum are Australia, Bangladesh, Brunei, Cambodia, Canada, China, East Timor, India, Indonesia, Japan, the Korean Republic, Laos, Malaysia, Mongolia, Myanmar, New Zealand, Pakistan, Papua New Guinea, the Philippines, the Russian Federation, Singapore, Sri Lanka, Thailand, the United States of America, and Vietnam. These countries are further clustered into three sub-groups: member countries, dialogue partner countries, and observer countries. The member countries are Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. The dialogue partner countries are Australia, Canada, China, the European Union, India, Japan, New Zealand, the Korean Republic, the Russian Federation, and the United States of America. The observer countries are Bangladesh, East Timor, Mongolia, Pakistan, Papua New Guinea, and Sri Lanka.

Table 1
Summary of the studies indicating a causal link between broad money, stock market capitalization and economic growth.

Study	Methods	Study area	Data used	Validity of hypotheses
Case 1: studies between broad money supply and economic growth				
Al-Yousif (2002)	a	30 developing countries	1970–1999	SLH, DFH, FBH
Calderon and Liu (2003)	b	109 countries	1960–1994	SLH
Chow and Fung (2011)	b	69 countries	1970–2004	FBH
Dritsakis and Adamopoulos (2004)	b	Greece	1960–2000	FBH
Hsueh et al. (2013)	a	Ten Asian countries	1980–2007	SLH
Case 2: Studies between stock market capitalization and economic growth				
Dritsaki and Dritsaki-Bargiota (2005)	b	Greece	1988–2002	DFH
Enisan and Olufisayo (2009)	b	7 Sub-Saharan African	1980–2004	SLH
Hou and Cheng (2010)	b	Taiwan	1971–2007	FBH
Peia and Roszbach (2015)	b	22 advanced countries	1965–2011	SLH, DFH
Pradhan et al. (2013)	b	16 Asian countries	1988–2012	SLH
Rousseau and Xiao (2007)	b	China	1995–2005	NLH

Note 1: SLH (supply-leading hypothesis): if unidirectional causality is present from financial development to economic growth; DFH (demand-following hypothesis): if unidirectional causality from economic growth to financial development is present; FBH (feedback hypothesis): if bidirectional causality between financial development and economic growth is present; NLH (neutrality hypothesis): if no causality between financial development and economic growth is present.
Note 2: a: bivariate Granger causality; b: dynamic panel data model.
Note 3: Financial development is considered here for either broad money supply or stock market capitalization.

Within the region, the stages of development in various countries vary significantly. Singapore and Brunei are high-income economies. Malaysia, Thailand, the Philippines and Vietnam are middle-income countries, and Cambodia, Indonesia, Laos, and Myanmar (Burma) are low-income economies. Increasing economic development and frequent natural disasters have increased the urgency to develop the region's insurance industry.

Rapid economic development and reforms in the financial sector in the region over the last two decades have not increased insurance penetration rates. The insurance industry in the ASEAN region remains generally underdeveloped except in Singapore and Malaysia. Generally, insurance is rudimentary, with life and term insurance dominating; investment-linked schemes are seldom available (Kwon, 2002). Much non-life insurance relates to fire insurance and mandatory insurance schemes such as automotive and workers' compensation (Kwon, 2002).

The limited development of insurance industry has predictable negative effects on the future socioeconomic sustainability of the region. Increasing urbanization will increase risks to wealth and life where regions are prone to floods, land slides, earthquakes, tsunamis and other natural calamities, with negative impacts on economic development, rebounding on foreign direct investment. Thus, our results and policy recommendations can enhance existing body of knowledge on the ASEAN countries' insurance industries.

We examine causal linkages between insurance penetration and key economic variables such as broad money, stock market capitalisation and economic growth for ASEAN countries. If short-term and long-term relationships between insurance penetration and other macroeconomic variables are established, then development of the insurance industry is a key catalyst for sustained economic development in the region. The specific characteristics of the ASEAN region, detailed above, require a more careful examination on the role of the insurance industry in ensuring sustainable economic development in the region.

3. Literature review

A summary of studies establishing causal links between financial development (defined as broad money supply or stock market capitalization) and economic growth is given in Table 1. The key relationships between these variables are discussed below.

The first is the *supply-leading hypothesis* (*SLH*), which suggests that the development of an insurance sector is a necessary pre-condition for economic growth. Here, the causality runs from development of the insurance sector to economic growth. The proponents of this hypothesis maintain that development of the insurance sector may induce higher economic growth by facilitating savings in the form of financial assets, thereby promoting capital formation and hence, promoting economic growth. Studies supporting this hypothesis have been published by Alhassan and Fiador (2014), Lee et al. (2013b), Guochen and Wei (2012), Haiss and Sumegi (2008), Lee (2011), Ward and Zurbruegg (2000), and Webb et al. (2005).

The second is the *demand-following hypothesis* (*DFH*), which suggests that causality runs from economic growth to the development of the insurance sector. Supporters of the demand-following hypothesis suggest that development of the insurance sector plays only a minor role in economic growth, and that the development of the insurance sector is merely an outcome or result of economic growth in the real side of the economy. The idea is that, as an economy grows, additional insurance coverage may emerge in the market in response to a higher demand for financial services. Studies supporting this hypothesis have been conducted by Beck and Webb (2003), Catalan et al. (2000), Guochen and Wei (2012), and Ward and Zurbruegg (2000).

Table 2
Summary of studies indicating a link between insurance market development and economic growth.

Studies	Methods	Study area	Data used	Validity of hypotheses
Alhassan and Fiador (2014)	b	Ghana	1990–2010	SLH
Arena (2008)	b	56 Countries	1976–2004	SLH
Beenstock et al. (1986)	b	12 OECD countries	1970–1981	DFH
Chang et al. (2014)	a	10 OECD countries	1979–2006	FBH
Catalan et al. (2000)	a	14 OECD countries	1975–1997	DFH
Chen et al. (2012)	b	60 Countries	1976–2005	SLH
Guochen and Wei (2012)	a	China	2006–2011	SLH, DFH, FBH, NLH
Haiss and Sumegi (2008)	a	29 European countries	1992–2005	SLH
Han et al. (2010)	b	77 Countries	1994–2005	SLH
Nejad and Kermani (2012)	a	Iran	1960–2010	FBH
Lee et al. (2013b)	a	6 Developed countries	1979–2007	SLH
Pradhan et al. (2015)	b	34 OECD countries	1988–2012	FBH
Ward and Zurbruegg (2000)	a	9 OECD countries	1961–1996	DFH, FBH
Webb et al. (2005)	a	55 Countries	1980–1996	SLH

Note 1: SLH (supply-leading hypothesis): if unidirectional causality is present from insurance market development to economic growth; DFH (demand-following hypothesis): if unidirectional causality from economic growth to insurance market development is present; FBH (feedback hypothesis): if bidirectional causality between insurance market development and economic growth is present; NLH (neutrality hypothesis): if no causality between insurance market development and economic growth is present.
Note 2: a: bivariate Granger causality; b: dynamic panel data model.

The third is the *feedback hypothesis* (*FBH*), which suggests that economic growth and development of the insurance sector can complement and reinforce each other, making development of the insurance sector and real economic growth mutually causal. The argument in favour of this bidirectional causality is that development of the insurance sector is indispensable to economic growth, as economic growth inevitably requires a developed insurance market. Studies supporting this hypothesis were done by Beck and Webb (2003), Guochen and Wei (2012), Nejad and Kermani (2012), and Pradhan et al. (2015).

The fourth is the *neutrality hypothesis* (*NLH*), which suggests that development of the insurance sector and economic growth are independent from each other. The proponents of this hypothesis maintain that the development of the insurance sector has no influence on economic growth. This means they are independent from each other and follow the Lucas (1988) neutrality hypothesis of finance (Pradhan et al., 2013). The only study supporting this hypothesis is one by Guochen and Wei (2012).

Table 2 presents a summary of causal relations between development of the insurance sector and economic growth.

4. Data and the empirical model

Data on the ARF economies for 1988–2012 are obtained from the *World Development Indicators* published by the World Bank and Sigma Economic Research & Consulting, Switzerland. Although the ARF, in origin, consists of 25 countries, plus the European Union, we focus on only 18 member nations for our analysis. This is due to lack of adequate time series data on the remaining seven countries The 18 countries included in this study are Australia, Bangladesh, Canada, China, India, Indonesia, Japan, the Korean Republic, Malaysia, New Zealand, Pakistan, the Philippines, the Russian Federation, Singapore, Sri Lanka, Thailand, the United States, and Vietnam. These countries are divided into two sub-groups for our analysis. The first group comprise of the ARF-Member and ARF-Observer countries (AMOC), namely Bangladesh, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, and Vietnam. The second group consists of ARF-Dialogue Partner countries (ADPC), namely Australia, Canada, China, India, Japan, New Zealand, the Korean Republic, the Russian Federation, and the United States. These two groups are created to balance the sample size: each group comprises of nine countries. The two samples within the ARF are created to validate the findings more effectively at a disaggregate level.

Our multivariate analysis uses four variables: the percentage change in the real per capita gross domestic product (our measure for the level of economic growth, denoted as *GDP*); the ratio of insurance premiums to the gross domestic product (our measure of insurance penetration, denoted by *INS*[8]); broad money as a percentage of the gross domestic product (our measure of banking sector depth, denoted by *BRM*); and the stock market capitalization as a percentage of the gross domestic product (our measure of the level of stock market size, denoted by *SMC*). The variables are defined in Table 3 with their summary statistics presented in Table 4.[9] Obviously, a high value of *INS*, *BRM* and *SMC* suggests the incidence of a highly developed financial markets in the economy (see Chowdhury and Maung, 2012).

[8] Insurance premiums associate the scale of the insurance market with that of the economy and are used at three levels: life insurance, non-life insurance and total insurance. Life insurance, in general, provides the assurance of a payment of a specific amount of indemnification to a beneficiary after the insured's death or to the insured if he/she lives beyond a certain age. By contrast, non-life insurance, otherwise called "general insurance" in many countries, includes all other types of insurance, such as homeowner's insurance, motor vehicle insurance, marine insurance, liability insurance, etc. (Chen et al., 2013). Thus, insurance penetration is used in this paper at three levels: life insurance penetration, non-life insurance penetration, and total insurance penetration.

[9] All these variables were converted into their natural logarithms for estimation purposes and for the purpose of discussion in Section 5.

Table 3
List of variables.

Variables/descriptions	Variable code
Life insurance penetration	***LIP***
[Direct domestic life premiums as a % of gross domestic product]	
Non-life insurance penetration	***NIP***
[Direct domestic non-life premiums as a % of gross domestic product]	
Total insurance penetration	***TIP***
[Direct domestic premiums (both life & non-life) as a % of gross domestic product]	
Per capita economic growth	***GDP***
[% change in per capita gross domestic product]	
Broad money	***BRM***
[Broad money,[a] used as a proxy for size of the banking activities, as a % of gross domestic product]	
Stock market capitalization	***SMC***
[Market capitalization[b] of the listed companies, used as a proxy for the evolution in the size of the stock market, as a % of gross domestic product]	

Note 1: All monetary measures are in real US dollars.
Note 2: Variables above are defined in the *World Development Indicators* and published by the World Bank and in *World Insurance* published by Sigma Economic Research & Consulting, Switzerland.
Note 3: The coverage of these variables is 1988–2012.
Note 4: Insurance penetration means direct domestic premiums (for life/non-life/total) in USD expressed as a % of gross domestic product.
Note 5: The paper uses these three measures of insurance penetration to capture the insurance coverage in the financial sector development.
[a] Broad money is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveller's checks; and other securities such as certificates of deposit and commercial paper.
[b] Market capitalization (also known as market value) is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles.

We use the following log-linear model to describe the relationship between the variables for the two panels of ARF countries:

$$\ln(GDP_{it}) = \eta_0 + \eta_{1i}\ln(INS_{it}) + \eta_{2i}\ln(BRM_{it}) + \eta_{3i}\ln(SMC_{it}) + \varsigma_{it} \quad (1)$$

where

- i (=1, 2, . . ., N) represents a country in the sample;
- t (=1, 2, . . ., T) denotes the time period for each country;
- *INS* is insurance market penetration, which is captured by three indicators, namely life-insurance penetration, denoted by *LIP*; non-life insurance penetration, denoted by *NIP*; and total (both life and non-life) insurance penetration, denoted by *TIP*;
- ς_{it} refers to independently and normally distributed random variables for all i and t with zero means and finite heterogeneous variances (σ_i^2);
- η_1, η_2, η_3 are the coefficients and represent the long-run elasticities of *GDP* with respect of *INS*, *BRM*, and *SMC*, respectively.

Since causality may flow from any one variable to another, analogously three other equations may be written replacing *GDP* as the dependent variable. The task is to estimate the coefficients in Eq. (1) and similar equations and conduct panel tests on the causal nexus between the four variables.

Using the specification in (1), we examine dynamic causal relationships between insurance penetration, banking sector depth, stock market depth, and economic growth, using a panel vector autoregressive (VAR) model. The advantage of this empirical approach is that it exploits individual time series and cross-sectional variations in data and avoids biases associated with cross-sectional regressions by taking into account the country-specific fixed effect (for more details, see Levine, 2005). The testing procedures involve three steps. The first step is to check for the unit roots of each variable. The second step is to test long-run cointegration relationships between these variables. On the basis of unit root and cointegration results, the third step is to estimate the panel vector error-correction model in order to infer the Granger causal relationship between the variables.

5. Econometric methodology and empirical results

Our specific interest is to detect causal links between economic growth and insurance penetration in the presence of banking sector depth and stock market depth. We conduct two tests: a panel cointegration test and a panel Granger causality test.

Before conducting either test, an essential first step is to identify the stationarity properties of the variables through other tests. This step is necessary because cointegration and causality tests both require variables to be stationary. There are many tests to choose from. In this study we use four panel unit root tests: the Levine–Lin–Chu (*LLC*) test, proposed by Levine et al. (2002), the Breitung (*BR*) test, proposed by Breitung (2000), the Im–Pesaran–Shin (*IPS*) test, proposed by Im

Table 4
Summary statistics for the variables.

Variables	*GDP*	*BRM*	*SMC*	*LIP*	*NIP*	*TIP*
Sample 1: the AMOC group						
Part 1: summary statistics						
Mean	1.27	1.80	1.46	−2.07	−2.17	−1.37
Median	1.29	1.77	1.50	−2.14	−2.18	−1.85
Maximum	1.46	2.15	2.52	−1.05	−1.69	2.53
Minimum	0.05	1.35	−0.54	−3.13	−2.76	−2.57
Standard Deviation	0.13	0.22	0.62	0.44	0.29	1.34
Skewness	−5.70	0.07	−0.75	0.05	−0.27	2.06
Kurtosis	49.9	1.79	3.41	2.47	2.11	5.73
Part 2: cross-correlation matrix						
BRM	0.01	1.00				
	[0.98]					
SMC	0.04	0.71*	1.00			
	[0.90]	[0.00]				
LIP	0.06	0.87*	0.791*	1.00		
	[0.85]	[0.00]	[0.00]			
NIP	0.05	0.79*	0.76*	0.82*	1.00	
	[0.84]	[0.00]	[0.00]	[0.00]		
TIP	0.03	0.66*	0.56*	0.60*	0.69*	1.00
	[0.96]	[0.00]	[0.00]	[0.00]	[0.00]	
Sample 2: the ADPC group						
Part 1: summary statistics						
Mean	1.26	1.91	1.69	−1.62	−1.70	−1.30
Median	1.26	1.88	1.75	−1.52	−1.62	−1.21
Maximum	1.46	2.38	2.25	−1.01	−1.28	−0.88
Minimum	0.48	1.25	−2.38	−3.39	−2.50	−2.17
Standard deviation	0.11	0.25	0.49	0.48	0.33	0.32
Skewness	−2.42	−0.13	−4.41	−1.40	−0.67	−0.85
Kurtosis	16.6	2.80	32.2	3.51	2.12	2.52
Part 2: cross-correlation matrix						
BRM	0.11	1.00				
	[0.85]					
SMC	0.34	0.39*	1.00			
	[0.40]	[0.00]				
LIP	−0.02	0.44*	0.40*	1.00		
	[0.90]	[0.00]	[0.00]			
NIP	−0.17	0.26*	0.49*	0.42*	1.00	
	[0.70]	[0.00]	[0.00]	[0.00]		
TIP	−0.09	0.46*	0.57*	0.85*	0.79*	1.00
	[0.80]	[0.00]	[0.00]	[0.00]	[0.00]	

Note 1: *GDP*: Per capita economic growth rate; *BRM*: Broad money; *SMC*: Stock market capitalization; *LIP*: Life insurance penetration; *NIP*: Non-life insurance penetration; *TIP*: Total (life & non-life) insurance penetration.
Note 2: AMOC: ASEAN Regional Forum (ARF) Member Countries and Observer Countries; ADPC: ARF Dialogue Partners Countries. A more detailed description of the countries' inclusion appears in the text.
Note 3: * indicates significance at the 1% level.

et al. (2003), and the Augmented Dickey Fuller–Fisher Chi-square test (*ADF*), suggested by Maddala and Wu (1999). Since these tests are widely used and are fully described in econometrics textbooks. Table 5 presents the results of panel unit root tests for each variable. While in levels, data for each of the four variables are non-stationary, they become stationary at the 1% or 5% significance levels in their first differences for both the AMOC and the ADPC groups. This implies that the variables for the AMOC group and the ADPC group are I [1]: they are integrated of order 1.

The next step is to test whether there is a long-run relationship between the variables. A number of tests are available. We use the panel cointegration tests of Pedroni (1999) for this purpose, due to their popularity. The tests use the following equation, with the variables hereafter defined in their logarithmic forms:[10]

$$GDP_{it} = \theta_{INSi} + \rho_{INSi}t + \eta_{1INSi}INS_{it} + \eta_{2INSi}BRM_{it} + \eta_{3INSi}SMC_{it} + \xi_{it} \quad (2)$$

where θ_i is a fixed (country-specific) intercept that is allowed to vary across individual cross-sectional units; and t is a deterministic time trend specific to individual countries in the panel.

The null hypothesis of no cointegration is based on seven different test statistics (Pedroni, 1999), which includes four individual panel statistics, namely the panel v-statistic, the panel ρ-statistic, the panel t-statistic (non-parametric), and the panel t-statistic (parametric); and three group statistics, namely the group ρ-statistic, the group t-statistic (non-parametric),

[10] Similar equations may be written using other variables besides economic growth as the dependent variable.

Table 5
Results of panel unit root tests.

Variables	Test statistics								Conclusion
	LLC		BR		IPS		ADF		
	0D	1D	0D	1D	0D	1D	0D	1D	Order
Sample 1: the AMOC group									
GDP	3.59	−10.8*	−0.79	−7.25*	−1.11	−6.75*	17.2	108.8*	I [1]
BRM	3.90	−7.92*	−064	−3.60*	−0.56	−4.03*	16.1	75.30*	I [1]
SMC	7.82	−7.17*	−0.19	−6.11*	−0.78	−4.24*	14.8	66.80*	I [1]
LIP	4.66	−4.55*	1.55	−3.35*	−1.48	−2.47*	11.5	43.40**	I [1]
NIP	7.20	−4.22*	1.41	−2.83*	−0.27	−2.26*	20.7	32.00*	I [1]
TIP	5.53	−3.96*	1.54	−2.98*	−1.38	−2.35*	26.1	29.90*	I [1]
Sample 2: the ADPC group									
GDP	19.2	−6.01*	−1.74	−4.70*	−1.67	−6.97*	24.5	77.1*	I [1]
BRM	2.09	−2.94*	−0.68	−3.83*	−1.41	−3.22*	20.3	40.7**	I [1]
SMC	18.3	−6.53*	−0.29	−2.58*	−0.86	−7.08*	15.5	80.1*	I [1]
LIP	6.99	−2.55*	1.38	−2.24**	1.41	−2.48*	7.74	33.9**	I [1]
NIP	0.38	−3.41*	−0.85	−4.75*	−1.41	−4.97*	12.9	55.9*	I [1]
TIP	5.02	−2.76*	0.46	−2.53*	0.34	−2.61*	11.1	33.3**	I [1]

Note 1: *GDP*: per capita economic growth rate; *BRM*: broad money; *SMC*: stock market capitalization; *LIP*: life insurance penetration; *NIP*: non-life insurance penetration; *TIP*: total (life and non-life) insurance penetration.
Note 2: LLC: Levine–Lin–Chu *t*-stat; BR: Breitung *t*-stat; IPS: Im–Pesaran–Shin *W*-stat; ADF: Augmented Dickey Fuller–Fischer Chi-square test.
Note 3: 0D: level data; 1D: first difference data; I [1] is integration of order one, representing the level of stationarity of the series.
Note 4: * and ** indicate significance at the 1% and 5% levels, respectively.

and the group *t*-statistic (parametric). Since these test statistics are widely used and described elsewhere, we do not explain them here.[11]

The results of the panel cointegration tests, based on these seven panel statistics, are given in Table 6. Out of seven statistics, at least four of the tests are significant at 1%, 5% and 10% significance levels for the AMOC and the ADPC groups. Consequently, the null hypothesis of no cointegration can be rejected for both groups of countries. This suggests that there are indeed long-run relationships between economic growth (*GDP*), insurance penetration (*INS*), banking depth (*BRM*), and stock market depth (*SMC*).

On the basis of the results above, we conduct a panel Granger causality test, using the error-correction model given below to ascertain the nature of the short- and the long-run dynamics between the variables. The short- and long-run impact of *INS*, *BRM* and *SMC* on the *GDP* are captured by the following specification:

$$\Delta GDP_{it} = \pi_{1j} + \sum_{k=1}^{p_1} \beta_{1ik} \Delta GDP_{it-k} + \sum_{k=1}^{p_2} \lambda_{1ik} \Delta INS_{it-k} + \sum_{k=1}^{p_3} \mu_{1ik} \Delta BRM_{it-k} + \sum_{k=1}^{p_4} \pi_{1ik} \Delta SMC_{it-k} + \delta_{1i} ECT_{it-1} + \zeta_{1it} \quad (3)$$

The hypothesis to test whether or not *INS*, *BRM* and *SMC* 'Granger cause' *GDP* can be expressed as follows:

$$H_0 : \lambda_{1ik} = 0; \mu_{1ik} = 0; \pi_{1ik} = 0; \delta_{1i} = 0 \quad \text{for } k = 1, 2, \ldots, p_1/p_2/p_3/p_4$$
$$H_A : \lambda_{1ik} \neq 0; \mu_{1ik} \neq 0; \pi_{1ik} \neq 0; \delta_{1i} \neq 0 \quad \text{for at least one } k$$

The short- and long-run impact of *GDP*, *BRM* and *SMC* on *INS* is captured by the following specification:

$$INS_{it} = \pi_{2j} + \sum_{k=1}^{p_1} \beta_{2ik} \Delta INS_{it-k} + \sum_{k=1}^{p_2} \lambda_{2ik} \Delta GDP_{it-k} + \sum_{k=1}^{p_3} \mu_{2ik} \Delta BRM_{it-k} + \sum_{k=1}^{p_4} \pi_{2ik} SMC_{it-k} + \delta_{2i} ECT_{it-1} + \zeta_{2it} \quad (4)$$

The hypothesis to test whether or not *GDP*, *BRM* and *SMC* 'Granger cause' *INS* can be expressed as follows:

$$H_0 : \lambda_{2ik} = 0; \mu_{2ik} = 0; \pi_{2ik} = 0; \delta_{2i} = 0 \quad \text{for } k = 1, 2, \ldots, p_1/p_2/p_3/p_4$$
$$H_A : \lambda_{2ik} \neq 0; \mu_{2ik} \neq 0; \pi_{2ik} \neq 0; \delta_{2i} \neq 0 \quad \text{for at least one } k$$

The short- and long-run impact of *INS*, *GDP* and *SMC* on *BRM* are captured by the following specification:

$$BRM_{it} = \pi_{3j} + \sum_{k=1}^{p_1} \beta_{3ik} \Delta BRM_{it-k} + \sum_{k=1}^{p_2} \lambda_{3ik} \Delta INS_{it-k} + \sum_{k=1}^{p_3} \mu_{3ik} \Delta GDP_{it-k} + \sum_{k=1}^{p_4} \pi_{3ik} \Delta SMC_{it-k} + \delta_{3i} ECT_{it-1} + \zeta_{3it} \quad (5)$$

[11] See, for example, Pradhan et al. (2015).

Table 6
Panel cointegration test results.

Test statistics	Panel (within dimension)		Group (between dimension)	
	Calculated value	Probability	Calculated value	Probability
Sample 1: the AMOC group				
Case 1: *GDP*, *BRM*, *SMC*, *LIP*				
Panel *v*-statistic	−1.28	[0.89]		
Panel *ρ*-statistic	−1.71**	[0.04]		
Panel *PP*-statistic	−10.3*	[0.00]		
Panel *ADF*-statistic	−5.10*	[0.00]		
Group *ρ*-statistic			0.34	[0.63]
Group *PP*-statistic			−9.64*	[0.00]
Group *ADF*-statistic			−4.72	[0.00]
Case 2: *GDP*, *BRM*, *SMC*, *NIP*				
Panel *v*-statistic	0.27	[0.39]		
Panel *ρ*-statistic	−1.48***	[0.07]		
Panel *PP*-statistic	−11.1*	[0.00]		
Panel *ADF*-statistic	−5.39*	[0.10]		
Group *ρ*-statistic			0.28	[0.61]
Group *PP*-statistic			−8.59*	[0.00]
Group *ADF*-statistic			−4.60*	[0.00]
Case 3: *GDP*, *BRM*, *SMC*, *TIP*				
Panel *v*-statistic	2.28	[0.99]		
Panel *ρ*-statistic	−1.55***	[0.06]		
Panel *PP*-statistic	−8.99*	[0.00]		
Panel *ADF*-statistic	−4.35*	[0.10]		
Group *ρ*-statistic			0.44	[0.67]
Group *PP*-statistic			−7.48*	[0.00]
Group *ADF*-statistic			−3.65*	[0.00]
Sample 2: the ADPC group				
Case 1: *GDP*, *BRM*, *SMC*, *LIP*				
Panel *v*-statistic	−0.86	[0.81]		
Panel *ρ*-statistic	−1.80**	[0.04]		
Panel *PP*-statistic	−9.51*	[0.00]		
Panel *ADF*-statistic	−2.72*	[0.00]		
Group *ρ*-statistic			0.21	[0.58]
Group *PP*-statistic			−10.3*	[0.00]
Group *ADF*-statistic			−2.81*	[0.00]
Case 2: *GDP*, *BRM*, *SMC*, *NIP*				
Panel *v*-statistic	0.31	[0.71]		
Panel *ρ*-statistic	−1.56***	[0.06]		
Panel *PP*-statistic	−14.1*	[0.00]		
Panel *ADF*-statistic	−4.60*	[0.00]		
Group *ρ*-statistic			0.48	[0.68]
Group *PP*-statistic			−11.1*	[0.00]
Group *ADF*-statistic			−3.67	[0.00]
Case 3: *GDP*, *BRM*, *SMC*, *TIP*				
Panel *v*-statistic	0.40	[0.35]		
Panel *ρ*-statistic	−1.61	[0.05]		
Panel *PP*-statistic	−10.9*	[0.00]		
Panel *ADF*-statistic	−3.51*	[0.00]		
Group *ρ*-statistic			0.47	[0.67]
Group *PP*-statistic			−9.34*	[0.00]
Group *ADF*-statistic			−3.04*	[0.00]

Note 1: *GDP*: per capita economic growth rate; *BRM*: broad money; *SMC*: stock market capitalization; *LIP*: life insurance penetration; *NIP*: non-life insurance penetration; and *TIP*: Total (life and non-life) insurance penetration.
Note 2: AMOC: ASEAN Regional Forum (ARF) Member countries and Observer Countries; ADPC: ARF dialogue partners countries. A more detailed description of the countries' inclusion appears in the text.
Note 3: *, **, and *** indicate significance at the 1%, 5%, and 10% levels, respectively.

The hypothesis to test whether or not *INS*, *GDP* and *SMC* 'Granger cause' *BRM* can be expressed as follows:

$$H_0 : \lambda_{3ik} = 0; \mu_{3ik} = 0; \pi_{3ik} = 0; \delta_{3i} = 0 \quad \text{for } k = 1, 2, \ldots, p_1/p_2/p_3/p_4$$
$$H_A : \lambda_{3ik} \neq 0; \mu_{3ik} \neq 0; \pi_{3ik} \neq 0; \delta_{3i} \neq 0 \quad \text{for at least one } k$$

The short- and long-run impact of *INS*, *GDP* and *BRM* on *SMC* are captured by the following specification:

$$SMC_{it} = \pi_{4j} + \sum_{k=1}^{p_1} \beta_{4ik} \Delta SMC_{it-k} + \sum_{k=1}^{p_2} \lambda_{4ik} \Delta BRM_{it-k} + \sum_{k=1}^{p_3} \mu_{4ik} \Delta INS_{it-k} + \sum_{k=1}^{p_4} \pi_{4ik} \Delta GDP_{it-k} + \delta_{4i} ECT_{it-1} + \zeta_{4it} \quad (6)$$

Table 7
Panel Granger causality test results.

Dependent variable	Independent variables					Short-run inferences
	ΔGDP	ΔBRM	ΔSMC	ΔINS	ECT_{-1}	
Sample 1: the AMOC group						
Case 1: *GDP, BRM, SMC, LIP*						
ΔGDP	–	6.82*	48.0*	3.36***	−6.96*	*BRM => GDP; SMC => GDP; LIP => GDP*
ΔBRM	7.93*	–	5.63**	8.54*	1.92	*GDP => BRM; SMC => BRM; LIP => BRM*
ΔSMC	5.86**	1.87	–	6.91*	−0.93	*GDP => SMC; BRM #> SMC; LIP => SMC*
ΔLIP	7.03*	3.41***	2.33	–	−0.20	*GDP => LIP; BRM => LIP; SMC #> LIP*
Case 2: *GDP, BRM, SMC, NIP*						
ΔGDP	–	8.63*	50.5*	3.45***	−6.02*	*BRM => GDP; SMC => GDP; NIP => GDP*
ΔBRM	7.24*	–	8.00*	3.96***	2.51	*GDP => BRM; SMC => BRM; NIP => BRM*
ΔSMC	5.99*	0.94	–	7.11*	−0.30	*GDP => SMC; BRM #> SMC; NIP => SMC*
ΔNIP	8.61*	3.68***	1.75	–	−0.73	*GDP => NIP; BRM => NIP; SMC #> NIP*
Case 3: *GDP, BRM, SMC, TIP*						
ΔGDP	–	8.65*	57.3*	3.81***	−6.42*	*BRM => GDP; SMC => GDP; TIP => GDP*
ΔBRM	7.67*	–	8.28*	8.78*	2.62	*GDP => BRM; SMC => BRM; TIP => BRM*
ΔSMC	5.74**	2.52	–	8.60*	−0.23	*GDP => SMC; BRM #> SMC; TIP => SMC*
ΔTIP	11.5*	5.23**	7.10*	–	−0.99	*GDP => TIP; BRM => TIP; SMC => TIP*
Sample 2: the ADPC group						
Case 1: *GDP, BRM, SMC, LIP*						
ΔGDP	–	3.71***	45.4*	11.0*	−6.97*	*BRM => GDP; SMC => GDP; LIP => GDP*
ΔBRM	1.02	–	5.60**	1.19	0.02	*GDP #> BRM; SMC => BRM; LIP #> BRM*
ΔSMC	6.75*	5.76**	–	9.79*	−3.23***	*GDP => SMC; BRM #> SMC; LIP => SMC*
ΔLIP	4.13***	5.18**	12.8*	–	−0.35	*GDP => LIP; BRM => LIP; SMC => LIP*
Case 2: *GDP, BRM, SMC, NIP*						
ΔGDP	–	4.88**	35.9*	22.5*	−6.50*	*BRM => GDP; SMC => GDP; NIP => GDP*
ΔBRM	3.65***	–	6.01*	3.53***	1.79	*GDP => BRM; SMC => BRM; NIP => BRM*
ΔSMC	5.60**	1.19	–	12.5*	−0.52	*GDP => SMC; BRM #> SMC; NIP => SMC*
ΔNIP	3.74***	4.01***	28.5*	–	−0.96	*GDP => NIP; BRM => NIP; SMC => NIP*
Case 3: *GDP, BRM, SMC, TIP*						
ΔGDP	–	6.47*	37.9*	16.1*	−6.29*	*BRM => GDP; SMC => GDP; TIP => GDP*
ΔBRM	1.76	–	5.00**	0.22	1.71	*GDP #> BRM; SMC => BRM; TIP #> BRM*
ΔSMC	5.76**	4.36***	–	12.7*	−1.43	*GDP => SMC; BRM #> SMC; TIP => SMC*
ΔTIP	3.98	4.08***	18.5*	–	−0.50	*GDP => TIP; BRM => TIP; SMC => TIP*

Note 1: *GDP*: per capita economic growth rate; *BRM*: broad money; *SMC*: stock market capitalization; *LIP*: life insurance penetration; *NIP*: non-life insurance penetration; *TIP*: Total (life and non-life) insurance penetration.
Note 2: AMOC: ASEAN Regional Forum (ARF) Member countries and Observer Countries; ADPC: ARF Dialogue Partners Countries. A more detailed description of the countries' inclusion appears in the text.
Note 3: ECT_{-1} is the lagged error-correction term. Δ is the first difference operator. *F*-statistics for the first differenced explanatory variables are used here. For ECT_{-1}, *t*-statistics are used instead.
Note 4: *, **, and *** indicate significance at 1%, 5%, and 10% levels, respectively.
Note 5: => indicates the direction of short-run causality.
#> indicates absence of short-run causality.

The hypothesis to test whether or not *INS*, *GDP* and *BRM* 'Granger cause' *SMC* can be expressed as follows:

$$H_0 : \lambda_{4ik} = 0; \mu_{4ik} = 0; \pi_{4ik} = 0; \delta_{4i} = 0 \quad \text{for } k = 1, 2, \ldots, p_1/p_2/p_3/p_4$$
$$H_A : \lambda_{4ik} \neq 0; \mu_{4ik} \neq 0; \pi_{4ik} \neq 0; \delta_{4i} \neq 0 \quad \text{for at least one } k$$

where p_i (for $i = 1, 2, 3, 4$) are lag lengths for the differenced variables of the respective equations, and can be determined by the Engle–Granger approach. The error-correction terms (ECTs) are based on the long-run equilibria in Eq. (2) and are derived from the cointegrating equations. The lagged ECTs in Eqs. (3)–(6) represent the long-run dynamics, analogous to an equilibrium process, while differenced variables represent the short-run dynamics between the variables.

For short-run causal relationships, if the null hypothesis $\lambda_{1ik} = 0$ (or $\lambda_{2ik} = 0$) is rejected, then there is Granger causality, running from *INS* to *GDP* (or *GDP* to *INS*).[12] If the joint null hypothesis $\mu_{1ik} = 0$ and $\pi_{1ik} = 0$ (or $\mu_{3ik} = 0$ and $\pi_{4ik} = 0$) is rejected, then there is Granger causality from *BRM* and *SMC* to *GDP* (or from *GDP* to *BRM* and *SMC*, respectively). Analogously, if the joint null hypothesis $\mu_{2ik} = 0$ and $\pi_{2ik} = 0$ (or $\lambda_{3ik} = 0$ and $\mu_{4ik} = 0$) is rejected, then there is Granger causality from *BRM* and *SMC* to *INS* (or *INS* to *BRM* and *SMC*, respectively). For long-run causal relationships, the null hypothesis ($\delta_{ji} = 0$, for $j = 1, 2, 3, 4$) needs to be rejected. The short-run causal relationships mentioned above are assessed on the basis of the Wald *F*-statistics. The long-run causal relationship is assessed by *t*-tests applied to the lagged ECT coefficients. Table 7 reports the results of the Granger causality test, for both the long run and the short run, for the two samples.

[12] *INS* is used for *LIP*, *NIP* and *TIP* (see Table 3 for details).

The empirical results show that the lagged error-correction terms are statistically significant for all three insurance penetration indicators (*INS*[13]) for both the AMOC and ADPC groups of countries, at a 1% significance level only when ΔGDP is the dependent variable. This suggests that economic growth tends to converge to its long-run equilibrium path in response to changes in its regressors, which consist of banking sector depth, stock market depth, and an indicator of insurance market penetration. From these results, we can confirm that insurance penetration, along with banking sector depth and stock market depth, are significant drivers of economic growth in the long run for both groups of countries.

When ΔINS (or ΔBRM or ΔSMC) are the dependent variables, the lagged error-correction terms are not statically significant in any one of the three cases (*LIP*/*NIP*/*TIP*) for either of the samples in our study. These results suggest that *BRM*, *SMC* and *GDP* do not have a long-run causal relationship with *INS*. Similarly, *BRM*, *SMC* and *GDP* do not have a long-run causal relationship with *INS* indicators.

The empirical analysis also show that *BRM*, *INS* and *GDP* do not have a long-run causal impact on *SMC* for our cases, with the exception of Case 1 for the ADPC group, where the causal relationship was found to be significant at a 10% significance level. This implies that life insurance penetration, coupled with banking sector depth and economic growth, has a long-run causal impact on stock market capitalisation. This result is not surprising, as insurance companies are major players in the share, bond, and real estate sectors in many of the countries in the group. Our results are consistent with those of Catalan et al. (2000), who find that the insurance sector has a positive impact stock market capitalisation.

In contrast to results for the long-run Granger causality analysis, our study reveals a wide spectrum of short-run causality patterns between the three variables. These results are summarized below.

5.1. Sample 1: the AMOC group

In Case 1, there is evidence of bi-directional causality between the following variables: life insurance penetration and economic growth [*LIP* <=> *GDP*], life insurance penetration and broad money [*LIP* <=> *BRM*], economic growth and broad money [*GDP* <=> *BRM*], and economic growth and stock market capitalization [*GDP* <=> *SMC*]. This provides evidence of two-way Granger causality (feedback) between *LIP* and *GDP*, *LIP* and *BRM*, *GDP* and *BRM*, and *GDP* and *SMC*. Moreover, the results show unidirectional causality from life insurance penetration to stock market capitalization [*LIP* <=> *SMC*], and from stock market capitalization to broad money [*SMC* <=> *BRM*].

In Case 2, there is evidence of bidirectional causality between the following variables: non-life insurance penetration and economic growth [*NIP* <=> *GDP*], non-life insurance penetration and broad money [*NIP* <=> *BRM*], economic growth and broad money [*GDP* <=> *BRM*], and economic growth and stock market capitalization [*GDP* <=> *SMC*]. This suggests evidence of feedback Granger causality between *NIP* and *GDP*, *NIP* and *BRM*, *GDP* and *BRM*, and *GDP* and *SMC*. Moreover, the results show unidirectional causality from non-life insurance penetration to stock market capitalization [*NIP* <=> *SMC*], and from stock market capitalization to broad money [*SMC* <=> *BRM*]. The latter two findings of unidirectional causality are also very similar to the results in Case 1.

In Case 3, there is bidirectional causality between the following variables: total (both life and non-life) insurance penetration and economic growth [*TIP* <=> *GDP*], total insurance penetration and broad money [*TIP* <=> *BRM*], economic growth and broad money [*GDP* <=> *BRM*], economic growth and stock market capitalization [*GDP* <=> *SMC*], and total insurance penetration and stock market capitalization [*TIP* <=> *SMC*]. This gives evidence of two-way Granger causality between *NIP* and *GDP*, *NIP* and *BRM*, *GDP* and *BRM*, *GDP* and *SMC*, and *TIP* and *SMC*. Moreover, the study finds only one form of unidirectional causality, namely from stock market capitalization to broad money [*SMC* =>*BRM*]. This is very similar to both Cases 1 and 2 above.

5.2. Sample 2: the ADPC group

In Case 1, there is evidence of bidirectional causality between the following variables: life insurance penetration and economic growth [*LIP* <=> *GDP*], life insurance penetration and stock market capitalization [*LIP* <=> *SMC*], and economic growth and stock market capitalization [*GDP* <=> *SMC*]. This provides support for the hypothesis of two-way Granger causality between *LIP* and *GDP*, *LIP* and *SMC*, and *GDP* and SMC. In addition, the study shows unidirectional causality from stock market capitalization to broad money [*SMC* <=> *BRM*] and broad money to both life insurance penetration and economic growth [*BRM* <=> *LIP*; *BRM* <=> *GDP*]. This indicates one-way Granger causality between *SMC* and *BRM*, *BRM* and *LIP*, and *BRM* and *GDP*.

In Case 2, there is evidence of bi-directional causality between the following variables: non-life insurance penetration and economic growth [*NIP* <=> *GDP*], non-life insurance penetration and broad money [*NIP* <=> *BRM*], economic growth and broad money [*GDP* <=> *BRM*], non-life insurance penetration and stock market capitalization [*NIP* <=> *SMC*], and economic growth and stock market capitalization [*GDP* <=> *SMC*]. This finding supports the hypothesis of two-way Granger causality between *NIP* and *GDP*, *NIP* and *BRM*, *GDP* and *BRM*, *NIP* and *SMC*, and *GDP* and *SMC*. In addition, the findings show unidirectional causality from stock market capitalization to broad money [*SMC* <=> *BRM*]. This supports the evidence of one-way causality between *SMC* and *BRM*.

[13] *INS* represents the separate interaction of *LIP*, *NIP* and *TIP* with *GDP*, *BRM* and *SMC*.

In Case 3, there are three bidirectional causality and three unidirectional causality relationships between these four variables. The bidirectional causality relationships are between the following variables: total insurance penetration and economic growth [*TIP* <=> *GDP*], total insurance penetration and stock market capitalization [*TIP* <=> *SMC*], and economic growth and stock market capitalization [*GDP* <=> *SMC*]. The unidirectional causality relationships are from stock market capitalization to broad money [*SMC* <=> *BRM*], and from broad money to both economic growth and to total insurance penetration [*BRM* <=> *GDP*; *BRM* <=> *TIP*].

6. Conclusion and policy implications

Prior research on the relationships between economic growth, insurance penetration, banking intensity, and the intensity of the stock market tend to focus on the correlations between these variables. Those few studies that consider causality among the variables use a bivariate framework with a narrow coverage. Our study adopts a multivariate, rather than bivariate, framework, testing causality among all four variables simultaneously. In previous studies the role of other variables operating adjacently are neglected or omitted entirely. We also use a sample of ASEAN Regional Forum countries embracing both developed and developing regions with a long data span of 1988–2012. This group of countries has not hitherto been examined in the relevant literature. Using advanced econometric techniques, we reveal numerous causal links between the variables, both in the short and the long run.

The stand-out finding from our study is that the results obtained are remarkably uniform across the two sub-samples of ARF countries (our AMOC and ADPC groups). We find short-run bidirectional causality between insurance penetration and economic growth in the presence of broad money and stock market capitalization. We find bidirectional causality between stock market capitalization and economic growth and insurance penetration and broad money, and unidirectional causality from stock market capitalization to broad money.

As all four major variables are cointegrated, the long-term economic growth of the AMOC and ADPC groups of countries depend on sustainable growth in the insurance sector, coupled with a well-developed banking sector and a vibrant stock market. Hence, the developments of the insurance industry, the banking sector and economic growth have long-run impacts on stock market capitalisation for the ADPC group of countries.

The study provides important policy implications for emerging economies in the ARF group of countries. Stimulating sustainable economic growth among these economies requires the development of a dynamic insurance industry, coupled with a sound banking sector and a well-developed stock market. A vibrant and competitive insurance sector may enable these economies to promote savings, provide alternate sources of investment, reinforce the development of the stock market, and shift the government burden of supporting large pension schemes to employee insurance-supported retirement schemes.

In addition, many of the developing economies in the ARF depend on inflows of foreign direct investment (FDIs) for economic development, and some of them regularly face natural disasters. Volatility in FDI inflows and constant natural calamities have impeded economic development in many of these economies. Hence, increased domestic savings on the basis of insurance schemes can enable these economies to diversify their sources of investment for economic development. Furthermore, underwriting risks for natural calamities will enable governments and communities in these natural disaster regions to allocate their resources more efficiently for productive activities that contribute to sustained economic development. Essentially, the insurance sector in these countries should play the role of "shock-absorber" by mitigating risks associated with volatility in FDI inflows and natural disasters.

To ensure that the insurance sector deepens the banking sector, stock market and economic development among the ARF countries, the following policies will enhance the development of the insurance sector: a sound regulatory architecture to instil good corporate governance and ethical practices in the insurance sector; professional education and certification for insurance personnel to ensure that global best practices and standards are adhered to; education for public and firms (especially micro, small and medium enterprises) on the importance of insurance for long-term financial sustainability and wealth creation; tax incentives to encourage higher uptake of life insurance and other insurance schemes; and opening up the domestic insurance market to foreign players with better economies of scale and scope to ensure that consumers have a wider choice of cost-effective and quality insurance schemes.

The results in this study differ from those of other studies in the existing growth-insurance nexus literature, because we consider the relationship between economic development and three sectors (insurance, banking, and the stock market) simultaneously using multivariate cointegrating and causality modelling frameworks. This makes it possible to capture short-run and long-run relationships between economic development, and the insurance, banking and capital market sectors more accurately than prior studies. Results from the robust modelling approach adopted in this study provide valuable insights on the types of policies ARF countries should put in place to enhance economic development. If the dynamics between the three sectors mentioned above and economic development are neglected, model misspecification problems will emerge, leading to incorrect inferences on the key drivers of economic development.

References

Alhassan, A.L., Fiador, V., 2014. Insurance-growth nexus in Ghana: an autoregressive distributed lag cointegration approach. Rev. Dev. Financ. 4 (2), 83–96.
Al-Yousif, Y.K., 2002. Financial development and economic growth: another look at the evidence from developing countries. Rev. Financ. Econ. 11 (2), 131–150.

Andersson, L.A., Eriksson, L., Lindmark, M., 2010. Life insurance and income growth: the case of Sweden 1830–1950. Scand. Econ. Hist. Rev. 58 (3), 203–219.
Arena, M., 2008. Does insurance market activity promote economic growth? A cross country study for industrialized and developing countries. J. Risk Insur. 75 (4), 921–946.
Beck, T., Webb, I., 2003. Economic, demographic, and institutional determinants of life insurance consumption across countries. World Bank Econ. Rev. 17 (1), 51–88.
Beenstock, M., Dickinson, G., Khajuria, S., 1986. The determination of life premiums: an international cross-section analysis 1970-1981. Insur. Math. Econ. 5 (1), 616–634.
Bolbol, A.A., Fatheldin, A., Omran, M.M., 2005. Financial development, structure, and economic growth: the case of Egypt, 1974–2002. Res. Int. Bus. Financ. 19 (1), 171–194.
Breitung, J., 2000. The local power of some unit root tests for panel data. In: Baltagi, B.H. (Ed.), Advances in Econometrics, Volume 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels. JAY Press, Amsterdam, pp. 161–178.
Calderon, C., Liu, L., 2003. The direction of causality between financial development and economic growth. J. Dev. Econ. 72 (1), 321–334.
Catalan, M., Impavido, G., Musalem, A.R., 2000. Contractual savings or stock market development: which leads? Policy Research Paper, No. 2421. World Bank, Washington, DC.
Chang, C., Lee, C., 2012. Non-linearity between life insurance and economic development: a revisited approach. Geneva Risk Insur. Rev. 37 (2), 223–257.
Chang, T., Cheng, S.C., Pan, G., Wu, T.P., 2013. Does globalization affect the insurance markets? Bootstrap panel Granger causality test. Econ. Model. 33 (1), 254–260.
Chang, T., Lee, C.C., Chang, C.H., 2014. Does insurance activity promote economic growth? Further evidence based on bootstrap panel Granger causality test. Eur. J. Financ. 20 (12), 1187–1210.
Chen, P.F., Lee, C.C., Lee, C.F., 2012. How does the development of life insurance market affect economic growth? Some international evidence. J. Int. Dev. 24 (7), 865–893.
Chen, S.S., Cheng, S.C., Pan, G., Wu, T.P., 2013. The relationship between globalization and insurance activities: a panel data analysis. Jpn. World Econ. 28 (3), 151–157.
Chow, W.W., Fung, M.K., 2011. Financial development and growth: a clustering and causality analysis. J. Int. Trade Econ. Dev. 35 (3), 1–24.
Chowdhury, R.H., Maung, M., 2012. Financial market development and the effectiveness of R&D investment: evidence from developed and emerging countries. Res. Int. Bus. Financ. 26 (2), 258–272.
Colombage, S.R.N., 2009. Financial markets and economic performances: empirical evidence from five industrialized economies. Res. Int. Bus. Financ. 23 (3), 339–348.
Dritsaki, C., Dritsaki-Bargiota, M., 2005. The causal relationship between stock, credit market and economic development: an empirical evidence for Greece. Econ. Chang. Restruct. 38 (1), 113–127.
Dritsakis, N., Adamopoulos, A., 2004. Financial development and economic growth in Greece: an empirical investigation with Granger causality analysis. Int. Econ. J. 18 (4), 547–559.
D'Arcy, S., Gorvett, R., 2004. The use of dynamic financial analysis to determine whether an optimal growth rate exists for a property-liability insurer. J. Risk Insur. 71 (4), 583–616.
Enisan, A.A., Olufisayo, A.O., 2009. Stock market development and economic growth: evidence from seven Sub-Saharan African countries. J. Econ. Bus. 61 (2), 162–171.
Guochen, P., Wei, S.C., 2012. The relationship between insurance development and economic growth: a cross-region study for China. In: China International Conference on Insurance and Risk Management, July 18–21, 2012, Qingdao, China.
Haiss, P.R., Sumegi, K., 2008. The relationship between insurance and economic growth in Europe: a theoretical and empirical analysis. Empirica 35 (4), 405–431.
Han, L., Li, D., Moshirian, F., Tian, L., 2010. Insurance development and economic growth. Geneva Pap. Risk Insur. 35 (2), 183–199.
Holsboer, J.H., 1999. Repositioning of the insurance industry in the financial sector and its economic role. Geneva Pap. Risk Insur. 24 (3), 243–290.
Horng, M.S., Chang, Y.W., Wu, T.Y., 2012. Does insurance demand or financial development promote economic growth? Evidence from Taiwan. Appl. Econ. Lett. 19 (2), 105–111.
Hou, H., Cheng, S.Y., 2010. The roles of stock market in the finance-growth nexus: time series cointegration and causality evidence from Taiwan. Appl. Financ. Econ. 20 (12), 975–981.
Hsueh, S., Hu, Y., Tu, C., 2013. Economic growth and financial development in Asian countries: a bootstrap panel Granger causality analysis. Econ. Model. 32 (3), 294–301.
Im, K.S., Pesaran, M.H., Shin, Y., 2003. Testing for unit roots in heterogeneous panels. J. Econom. 115 (1), 53–74.
Kwon, W.J., 2002. The ASEAN insurance market. Int. Insur. Sect. Q. 16 (1), 1–6.
Lee, C.C., 2011. Does insurance matter for growth: empirical evidence from OECD countries. B.E. J. Macroecon. 11 (1), 1–26.
Lee, C.C., 2013. Insurance and real output: the key role of banking activities. Macroecon. Dyn. 17 (2), 235–260.
Lee, C.C., Lee, C.C., Chiu, Y.B., 2013a. The link between life insurance activities and economic growth: some new evidence. J. Int. Money Financ. 32 (3), 405–427.
Lee, C.C., Huang, W.L., Yin, C.H., 2013b. The dynamic interactions among the stock, bond and insurance markets. N. Am. J. Econ. Financ. 26 (3), 28–52.
Lee, C.C., Tsong, C.C., Yang, S.J., Chang, C.H., 2013c. Investigating the stationarity of insurance premiums: international evidence. Eur. J. Financ. 19 (4), 276–297.
Levine, A., Lin, C.F., Chu, C.S.J., 2002. Unit root tests in panel data: asymptotic and finite-sample properties. J. Econom. 108 (1), 1–24.
Levine, R., 2005. Finance and growth: theory and evidence. In: Aghion, P., Durlauf, S. (Eds.), Handbook of Economic Growth. Elsevier Science, Amsterdam.
Lim, H.H., 2014. Towards an integrated ASEAN insurance market – keynote address by Mr. Lim Hng Kian, Minister for Trade and Industry, Deputy Chairman, Monetary Authority of Singapore. In: Inaugural ASEAN Insurance Summit, 1 October 2014, Singapore.
Liu, G., He, L., Yue, Y., Wang, J., 2014. The linkage between insurance activity and banking credit: some evidence from dynamic analysis. N. Am. J. Econ. Financ. 29 (3), 239–265.
Liu, G.C., Lee, C.C., 2014. Insurance activities and banking credit causal nexus: evidence from China. Appl. Econ. Lett. 21 (9), 626–630.
Lucas, R., 1988. On the mechanics of economic development. J. Monet. Econ. 22 (1), 3–42.
Maddala, G.S., Wu, S., 1999. A comparative study of unit root tests with panel data and new sample test. Oxf. Bull. Econ. Stat. 61 (S1), 631–652.
Nejad, H.R., Kermani, S.A., 2012. The relationship between insurance development and economic growth in Iran. Financ. Manag. 47 (1), 9079–9087.
Outreville, J.F., 1996. Life insurance markets in developing countries. J. Risk Insur. 63 (2), 263–278.
Pedroni, P., 1999. Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxf. Bull. Econ. Stat. 61 (1), 653–670.
Peia, O., Roszbach, K., 2015. Finance and growth: time series evidence on causality. J. Financ. Stab. 19 (1), 105–118.
Plummer, M.G., Chia, S.Y. (Eds.), 2009. Realizing the ASEAN Economic Community: A Comprehensive Assessment. ISEAS, Singapore.
Pradhan, R.P., Arvin, M.B., Norman, N.R., 2015. Insurance development and the finance-growth nexus: evidence from 34 OECD countries. J. Multinatl. Financ. Manag. 31 (1), 1–22.
Pradhan, R.P., Arvin, M.B., Bele, S., Taneja, S., 2013. The impact of stock market development on inflation and economic growth of 16 Asian countries: a panel VAR approach. Appl. Econom. Int. Dev. 13 (1), 203–220.
Rousseau, P.L., Xiao, S., 2007. Banks, stock markets, and China's 'great leap forward'. Emerg. Mark. Rev. 8 (3), 206–217.
Ward, D., Zurbruegg, R., 2000. Does insurance promote economic growth? Evidence from OECD countries. J. Risk Insur. 67 (4), 489–506.
Webb, I.P., Grace, M.F., Skipper, H.D., 2005. The effect of banking and insurance on the growth of capital and output. SBS Rev. Termas Financ. 2 (2), 1–32.