Banking and Insurance Market Activities in Eurozone Countries: Are Feedback Effects at Work?

Actividades de mercado bancario y de seguros en los países de la eurozona: ¿están funcionando los efectos de retroalimentación?

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Palabras clave
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Abstract

This paper examines the nexus between banking sector depth and insurance market activities in European countries for the period 1980-2016. Using Granger causalities, we find the presence of both bidirectional and unidirectional causality between banking sector depth and insurance market activities. The policy implication of this study is that the economic policies should recognize the differences in the banking sector depth and insurance market activities in order to maintain sustainable financial development in the European countries.

Resumen

Este documento examina el nexo entre la profundidad del sector bancario y las actividades del mercado de seguros en los países europeos para el período 1980-2016. Usando las causalidades de Granger, encontramos la presencia de causalidad bidireccional y unidireccional entre la profundidad del sector bancario y las actividades del mercado de seguros. La implicación política de este estudio es que las políticas económicas deben reconocer las diferencias en la profundidad del sector bancario y las actividades del mercado de seguros a fin de mantener un desarrollo financiero sostenible en los países europeos.

1. Introduction

The relationship between financial development[1] and economic growth has been a subject of considerable academic research over the past couple of decades (Levine, 2005; Levine, 1997). Various studies have focused on different countries, time periods, modelling techniques and different proxy variables for finance-growth nexus (Pradhan et al., 2017; Law and Singh, 2014; Beck and Levine, 2004). But in general, the empirical results are mixed and have not reached a distinctive consensus (see Pradhan et al., 2016). From the existing literature, it is clear that Granger causality test has been extensively used to examine the causality between financial development and economic growth. It is also clear that the literature on finance growth nexus produced inconclusive results and there is a consensus neither on the existence nor on the direction of causality (see, for instance, Samargandi et al., 2015). One of the two major reasons are the use of different proxy variables for financial development and the deployment of different time periods in the testing process.

From the literature, one can observe that financial development is a multidimensional concept and a broad division. It includes financial intermediaries (e.g., banking activities and insurance market activities) and financial markets (such as bond markets and stock markets). A large part of an economy's savings is intermediated towards prolific investments through financial intermediaries and financial markets. Since the rate of capital accumulation is a fundamental determinant of long-run economic growth, an efficient financial system is indispensable to an economy (see, inter alia, Ductor and Grechyna, 2015; Adu et al., 2013; Hsueh et al., 2013; Pradhan, 2013). Besides, there is a need of substantial relationship among these financial activities, such as banking sector, insurance market, stock market and bond market. Knowing the exact nature of these relationships can bring overall financial development and hence, its impact on economic growth. In this context, this study makes an attempt to study the relationship between banking sector development and insurance market development, two sub-sectors of financial sector development.

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There are couple of past studies that provide the link between development of banking sector and insurance market (see, for instance, Pradhan et al., 2017; Liu and Lee, 2014; Anginer et al., 2014; Lee, 2013; Zou and Adams, 2006; Webb et al., 2005). However, the typical debate is "whether banking sector development promotes insurance market development, or does insurance market development promote banking sector development". This study adds the banking-insurance coverage to the finance literature by addressing two

1 It refers to a country's decision to allow and promote activities like increased foreign direct investment (FDI), increases in banking activity, and increases in stock market activity. These present one possible avenues through which economic growth can be increased (Sadorsky, 2010).

important questions: first, to know the existence of cointegration between banking sector development and insurance market development; and second, to explore the presence of long-run and short-run causality between the two financial activities. The focus of this study is on Eurozone countries during the period 1980-2016.

The rest of the paper is organized as follows. Section 2 presents a review of literature. Section 3 offers proposed hypothesis, variables, data and econometric model. Section 4 describes empirical results. Finally, we summarize the findings in Section 5.

2. Review of Literature

Literature provides extensive works on the nexus between banking sector development and economic growth and insurance market development and economic growth, respectively (see, for instance, Pradhan et al., 2014). From the past studies, we can observe the association between insurance market development and banking sector development. Although insurance market acitivities and banking sector activities separately make positive contributions to growth, their contributions are greater when both are present (Pradhan et al., 2017; Lee, 2013; Webb et al., 2005). The association between insurance market development and banking sector development can be either competitive or complementary. There are many reasons why the complementary relationship might hold, including the likelihood that the presence of property causality insurance avoids inefficiently high levels of bankruptcy and helps to facilitate credit transactions for houses, consumer durables, and small- and medium-sized businesses that banks typically finance (Liu and Lee, 2014; Zou and Adams, 2006).

We have couple of literature to jutsify the insurance-bank nexus from a macro perspective. For example, Grace and Rebello (1993) state that the risk protection offered by insurance companies encourages bank borrowing because of reducing companies' cost of capital. Similarly, Rule (2001) points out that insurance activities cover banks and their customers against a range of risks, underpinning bank lending by protecting customers against risks that might otherwise leave them unable to repay their debts. In contrast, there are literature where we find the competitive relationship between insurance and banking activities (Allen and Antomero, 2001; Tennant et al., 2010). Over and above discussion, we find that there is considerable relationship between banking sector development and insurance market development (see, for instance, Khanal, 2007). The nexus between the two (insurance market development and banking sector development) can have four different views, like the available liture on 'banking-growth nexus' and 'insurance-growth nexus' (see, Pradhan et al., 2017).

The first view is *supply-leading hypothesis (SLH*), which contends that banking sector development Granger causes insurance market development. The proponents of this hypothesis postulate that as the banking sector develops, its sophistication through financial services and by adopting new technology, processes and systems, its ability to provide other financial services, such as insurance services to a broader segment of the population, is much higher. Many financial institutions adopt a "one-stop centre" approach to provide clients with a wider spectrum of insurance services, namely for vehicles, home, health, retirement, education and investment in capital markets. During the last two decades, the insurance industry has become sophisticated in extending their services beyond covering premature

death, accident or savings. Insurance firms have introduced a number investment instruments such as whole-life policies, which earn interest and provide clients with capital or policy dividends upon maturity. The studies supporting this hypothesis are Liu and Zhang (2016), Pan et al. (2016), Pradhan et al. (2015), and Liu and Lee (2014).

The second view is *demand-following hypothesis (DFH)*, which contends that causality runs instead from insurance market development to banking sector development. The proponents of this hypothesis postulate that as the insurance industry extends its reach to a wider segment of the population with much richer services to mitigate their risks, the demand for banking services from this segment of the population will also increase. This is a result of the banking networks providing key distribution channels for major life insurance services (Lorent, 2010). Increasing competition from the insurance industry in markets that are traditionally serviced by the banking industry has also resulted in banks raising their competitiveness by adopting more efficient technology, systems and processes to provide better value for their clientele. The studies supporting this hypothesis are Liu and Zhang (2016), Liu et al. (2014), Liu and Lee (2014), Anginer et al. (2014), and Lee (2013).

The third view is *feedback hypothesis (FBH)*, which contends that banking sector development and insurance market development can complement and reinforce each other (see, for instance, Liu and Lee, 2014). The argument in favour of bidirectional causality is that the development of banking sector is indispensable to insurance market development and insurance market development inevitably requires a developed banking sector. The studies supporting this hypothesis are Lee and Liu (2016), Liu and Zhang (2016), Pradhan et al. (2015, 2014), Liu and Lee (2014), Vadlamannati (2008), and Adams et al. (2006).

Table 1. *Summary of Studies on the Causal Connection between Banking Sector Development and Insurance Market Development*

Studies	Country of Study	Time Period	Hypothesis Established
Alhassan and Fiador (2014)	Ghana	1990-2010	SLH
Chang et al. (2014)	10 OECD countries	1979-2006	FBH
Guochen and Wei (2012)	China	2006-2011	SLH, DFH, FBH, NEH
Kugler and Ofoghi (2005)	United Kingdom	1966-2003	DFH, FBH
Lee et al. (2013)	6 Developed countries	1979-2007	SLH
Pradhan et al. (2014a)	34 OECD countries	1988- 2012	FBH
Pradhan et al. (2014c)	ARF countries	1988- 2012	FBH
Tang (2005)	ASEAN countries	1953-2001	SLH, DFH, FBH, NEH
Ward and Zurbruegg (2000)	9 OECD countries	1961-1996	SLH, DFH, FBH, NEH

Note 1: SLH is supply-leading hypothesis, indicating Granger causality from banking sector development to insurance market development; DFH is demand-following hypothesis, indicating Granger causality from insurance market development to banking sector development; FBH is feedback hypothesis, indicating bidirectional Granger causality between banking sector development and insurance market development; and NEH is neutrality hypothesis, indicating no Granger causality between banking sector development and insurance market development.
Note 2: OECD is Organization for Economic Cooperation and Development; and ARF is ASEAN Regional Forum

The fourth view is *neutrality hypothesis (NEH)*, which contends that insurance market development and banking sector development are independent of each other. The proponents of this hypothesis maintain that banking sector development has no role towards insurance market development. The studies supporting this hypothesis are Pradhan et al. (2017), and Liu and Zhang (2016). Table 1 presents a brief summary of these literature.

3. Proposed Hypotheses, Variables, Data Structure and Model

This study deploys Granger causality test to know the evidence on the nexus between banking sector development and insurance market activities using a sample of Eurozone countries over the period 1980 to 2016. We also use cointegration tests to reveal whether banking sector development and insurance market activities are cointegrated; that is, whether there is a long-run equilibrium relationship between the two.

The uniqueness of this study is as follows: first, the use of a large sample of countries, being mostly European, over a long period; second, the investigation of this nexus at the individual country and at the panel level; and third, we utilize the advanced econometrics tool- and certain empirical approaches not taken in these literature until now- to answer questions concerning the nature of causal relationship between the two financial activities both in the short-run and long-run.

Figure 1 depicts the possible patterns of causal relations between banking sector development and insurance market development. The study intends to test the following hypotheses:

H_1: Banking sector development in any year Granger-causes insurance market activities. This is termed banking sector-led insurance market hypothesis. This is represented as supply-leading hypothesis (SLH) of bank-insurance nexus.

H_2: Insurance market activities in any year Granger-cause banking sector development. This is termed insurance market-led banking sector development hypothesis. This is represented as demand-following hypothesis (DFH) of bank-insurance nexus.

It can be distinguished that the existence of both hypotheses (DFH and SLH) lead to the manifestation of feedback hypothesis (FBH),

Figure 1 Proposed Model and Hypotheses

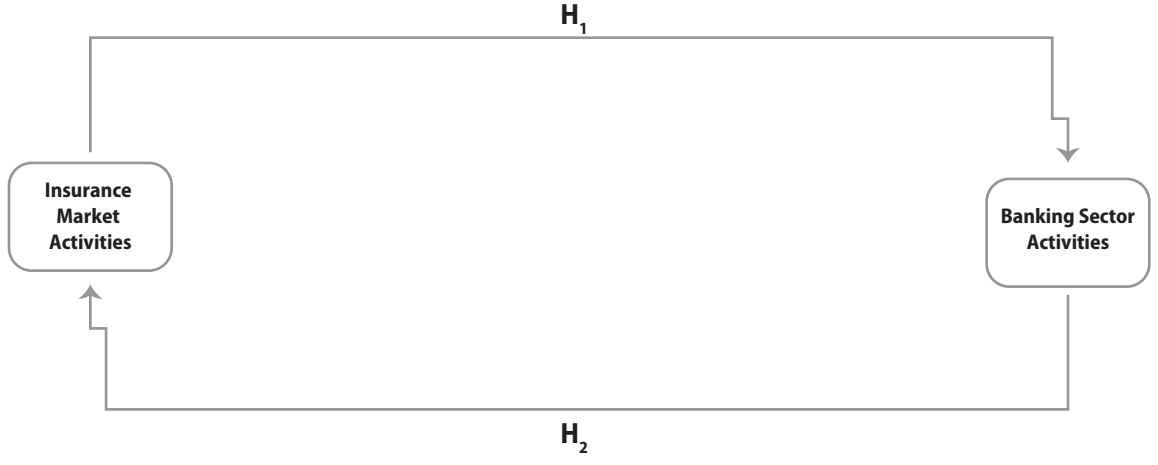

Table 2. *Descriptive Statistics of the Variables*
(Banking Sector Depth and Insurance Market Activities)

Countries	LIL	DCP	DCF	DCB	BAG	DMA	PCB	IMD	IMP
Austria	87.84	87.86	117.74	87.70	73.43	109.51	86.59	1511	5.19
Belgium	76.63	51.72	101.55	51.54	67.75	87.79	51.54	1857	6.16
Cyprus	144.78	140.85	168.53	140.81	132.31	147.02	135.57	622	3.77
Estonia	67.25	57.34	59.78	57.27	33.93	52.24	50.40	114	1.72
Finland	54.08	70.68	88.63	70.10	50.44	70.99	67.56	2316	7.32
France	70.49	84.01	10.8.55	83.97	64.00	97.33	82.59	2131	7.34
Germany	95.25	90.90	119.16	90.90	62.79	119.04	94.72	1662	5.82
Greece	71.87	56.57	95.11	56.40	64.52	80.32	54.73	263	1.54
Ireland	65.84	78.07	109.6	78.05	64.13	88.72	78.59	2368	8.26
Italy	67.09	64.67	107.88	64.56	58.33	84.64	63.62	1211	4.35
Latvia	31.99	46.45	48.83	46.45	25.94	45.94	40.72	73	2.38
Lithuania	31.64	32.47	34.95	32.45	24.41	32.72	28.45	55	1.06
Luxembourg	276.56	87.19	123.97	87.19	299.05	98.06	94.58	1816	4.05
Malta	143.89	86.40	103.52	86.36	105.70	102.07	84.39	386	4.32
Netherlands	94.56	91.06	134.73	90.95	78.09	108.27	92.43	2893	8.70
Portugal	91.49	94.63	119.14	94.31	77.80	104.49	91.67	769	5.99
Slovakia	58.62	43.64	57.32	43.55	49.96	57.46	42.06	176	2.69
Slovenia	48.15	50.03	59.30	50.02	41.76	56.49	46.00	543	4.66
Spain	92.37	102.92	138.80	102.60	71.34	121.21	99.70	853	4.31
EZP	87.86	74.60	99.85	74.48	76.09	87.60	72.94	1138	4.72

Note 1: LIL is liquidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is bank deposits, DMA is deposit money bank's assets, PCB is private credit by deposit money banks and other financial institutions, BSD is composite index of banking sector depth, IMD is insurance market density, IMP is insurance market penetration, and EZP is Eurozone panel.
Note 2: Figures represent mean value of the variables during 1980-2016.

i.e., the complementary relationship between banking sector development and insurance market activities. On the contrary, the absence of both SLH and DFH leads the manifestation of neutrality hypothesis (NEH), i.e., the situation where banking sector development and insurance market activities are completely independent.

For examining these four banking-insurance hypotheses (SLH, DFH, FBH, and NEH), we deploy eight measures of banking sector development, and two measures of insurance market activities. The eight measures of banking sector development are: bank deposits (BAG), domestic credit to private sector (DCP), domestic credit to private sector by banks (DCB), domestic credit provided by financial sector (DCF), deposit money bank's assets (DMA), private credit by deposit money banks and other financial institutions (PCB), liquidity liabilities (LIL), and a composite index of banking sector depth (BSD[2]). On the contrary, the two measures of insurance

2 BSD represents the weighted average of seven banking sector activities, namely, LIL, DCP, DCF, DCB, BAG, DMA and PCB. The weights are derived by principal component analysis (PCA). Table A.2 provides the results of PCA analysis (see Appendix A).

market activities are: insurance market density (IMD) and insurance market penetration (IMP).

Appendix A presents a detailed discussion of these variables (see Table A.1). Annual data of these variables ranging from 1980 to 2016 for the Eurozone countries were obtained from the *World Development Indicators* of the World Bank and *Sigma Economic & Research Consulting* of Switzerland. The countries included in this analysis are Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. The summary statistics of these variables[3] for each country are presented in Table 2.

The study used the following model to detect the long-run and short-run causal relationship between banking sector depth and per capita economic growth.

$$InsuranceMarketActivities_{it} = \rho_{0it} + \rho_{1i} BankingSectorActivities_{it} + \varepsilon_{it} \quad (1)$$

where, i = 1, 2... N is individual country in the panel; and t = 1, 2....T is year in the panel.

Of course, other variations of equation (1) are also entertained to change the dependent variable from insurance market activities to banking sector depth. When we looked for individual country analysis, the subscript 'i' was removed from equation (1). The parameter ρ_1 represents the long-run elasticity estimates of insurance market activities with respect to banking sector development. The task was to estimate the parameters in equation (1) and conduct panel tests on the causal nexus between the two. It is postulated that $\rho_1 > 0$, which suggests that an increase in banking sector development will likely cause an increase in insurance market activities.

The Granger causality test is further applied to know the direction of causality between banking sector development and insurance market development. We deploy the Granger causality test differently for individual country analysis and at the panel setting. The simple Granger causality model (Granger, 1988) is used for individual country analysis, while panel Granger causality model is used for the panel setting.

The below two models are used for exploring the Granger causal nexus between banking sector activities and insurance market activities.

Model 1: For Individual country analysis

$$\begin{bmatrix} \Delta InsuranceMarketActivities_t \\ \Delta BankingSectorActivities_t \end{bmatrix} = \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \end{bmatrix} + \sum_{k=1}^{p} \begin{bmatrix} \beta_{11k}(L)\beta_{12k}(L) \\ \beta_{21k}(L)\beta_{22k}(L) \end{bmatrix} \begin{bmatrix} \Delta InsuranceMarketActivities_{t-k} \\ \Delta BankingSectorActivities_{t-k} \end{bmatrix} + \begin{bmatrix} \lambda_{11} ECT_{1t-1} \\ \lambda_{21} ECT_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{11t} \\ \varepsilon_{21t} \end{bmatrix} \quad \textbf{(2)}$$

We intend to test the following hypotheses:

H_0: $\beta_{12k=0}$; and $\lambda_{11k} = 0$ for $k = 1, ..., p$
H_A: $\beta_{12k\neq 0}$; and $\lambda_{11k} \neq 0$ for $k = 1, ..., p$
H_0: $\beta_{21k=0}$; and $\lambda_{21k} = 0$ for $k = 1, ..., p$
H_A: $\beta_{21k\neq 0}$; and $\lambda_{21k} \neq 0$ for $k = 1, ..., p$

3 All these variables were converted into their natural logarithms for estimation purposes.

where, ECT[4] is error correction term, obtained from the long-run cointegration equation; and ε_{it} is an independent and normally distributed random error term in the estimation process.

Model 2: For panel data analysis

$$\begin{bmatrix} \Delta InsuranceMarketActivities_{it} \\ \Delta BankingSectorActivities_{it} \end{bmatrix} = \begin{bmatrix} \eta_{11j} \\ \eta_{21j} \end{bmatrix} + \sum_{k=1}^{p} \begin{bmatrix} \mu_{11ik}(L)\mu_{12ik}(L) \\ \mu_{21ik}(L)\mu_{22ik}(L) \end{bmatrix} \begin{bmatrix} \Delta InsuranceMarketActivities_{it-k} \\ \Delta BankingSectorActivities_{it-k} \end{bmatrix} + \begin{bmatrix} \delta_{11i} ECT_{1it-1} \\ \delta_{21i} ECT_{2it-1} \end{bmatrix} + \begin{bmatrix} \xi_{11it} \\ \xi_{21it} \end{bmatrix} \quad (3)$$

We intend to test the following hypotheses:

$$\begin{aligned} &H_0: \mu_{12ik=0}; \text{ and } \delta_{11ik} = 0 && \text{for } k = 1, \ldots, p \\ &H_A: \mu_{12ik\neq 0}; \text{ and } \delta_{11ik} \neq 0 && \text{for } k = 1, \ldots, p \\ &H_0: \mu_{21ik=0}; \text{ and } \delta_{21ik} = 0 && \text{for } k = 1, \ldots, p \\ &H_A: \mu_{21ik\neq 0}; \text{ and } \delta_{21ik} \neq 0 && \text{for } k = 1, \ldots, p \end{aligned}$$

where, i = 1, 2, 3,…, N is a country in the panel; and t = 1, 2, 3,…, is a year in the panel.

We use the AIC[5] statistic to fix the lag length of these two models. Equally, the inclusion of ECT (in both Models 1 and 2) exclusively depends upon the condition of order of integration and the cointegrating relationship between banking sector and insurance market activities. Hence, the first requirement is to check the order of integration and cointegration between the two financial activities. So, the study first deploys unit root test and cointegration test, both at the individual country as well as at the panel level, to ascertain the order of integration and the presence of cointegrating relationship between the two.

The Augmented Dickey Fuller (ADF; Dickey et al., 1981) unit root test is used for individual country analysis, while the Levin-Lin-Chu (LLC: Levin et al., 2003) panel unit root test is used for the panel setting. On the other hand, Johansen (Johansen, 1988) cointegration test is deployed at individual country, while Fisher cointegration test (Maddala and Wu, 1999) is deployed at the panel setting. The discussion of these tests is not available here, as they are well pronounced in most of the econometrics books.

4. Empirical Results and Discussion

The Granger causality tests are used to examine the causal nexus between banking sector and insurance market activities. A necessary step for this test is to know the order of integration of the time series variables and their cointegrating relationships. The discussion begins with the stationarity issue. Deploying unit root tests (ADF[6] at individual country and LLC[7] at the panel setting), the study rejects the null hypothesis of unit root at the first difference but not at the level data (see Table 3). This indicates that insurance market activities (IMD/IMP) and banking sector activities (LIL/DCP/DCF/DCB/BDG/DMA/PCO/BSD) are non-stationary at the level data but are stationary at the first difference. This is

4 The inclusion of ECT in the model depends upon the presence of cointegration between banking sector activities (LIL/DCP/DCF/DCB/BDG/DMA/PCO/BSD) and insurance market activities. ECT is removed in the estimation process, if any of the banking sector activities and insurance market activities are not cointegrated.

5 AIC is Akaike Information Criterion (for details, see Akaike, 1974).

6 ADF is Augmented Dickey Fuller test (for details, see Dickey et al., 1981)

7 LLC is Levin-Lin-Chu test (for details, see Levin et al., 2002).

Table 3. *Results of Unit Root Test*

	Stationarity of the Variables								
Countries	LIL	DCP	DCF	DCB	BAG	DMA	PCB	IMD	IMP
Austria	3.17/-3.54**	1.70/-5.12**	2.86/-1.87	1.70/-5.13*	0.61/-4.16*	0.28/-3.29*	1.47/-3.91*	2.69/-3.61*	-0.56/-5.62*
Belgium	2.41/-3.11*	1.02/-4.78**	1.48/-4.92	0.97/-4.74*	2.21/-3.11*	0.23/-3.12*	0.56/-3.36*	2.30/-3.59*	-1.48/-2.20**
Cyprus	1.96/-2.93*	3.13/-1.99**	3.39/-1.87	3.13/-1.99***	1.34/-2.91**	2.69/-1.86***	2.39/-2.92	2.18/-4.87*	-1.51/-5.64*
Estonia	--/--	1.37/-3.90**	0.67/-3.75	1.36/-3.89*	0.64/-1.83***	1.87/-3.09*	1.82/-3.13*	0.92/-4.27*	-0.19/-5.29*
Finland	1.21/-3.07*	0.43/-1.70**	0.18/-2.06	0.37/-1.89***	1.12/-2.98**	0.66/-2.09***	0.44/-1.97***	2.44/-3.05*	-2.55/-4.92*
France	1.27/-2.59*	0.62/-1.92***	2.85/-2.99	0.63/-1.93***	1.07/-3.79*	1.36/-3.20*	0.71/-2.56**	1.55/-2.64**	0.30/-6.53*
Germany	2.70/-2.77*	0.41/-8.36*	4.13/-2.89	0.41/-8.35*	0.71/-5.89*	-0.35/-3.11*	-0.57/-1.85***	2.75/-3.36*	-0.48/-5.18*
Greece	1.83/-3.88*	1.35/-3.05**	1.69/-5.15	1.31/-3.05*	1.36/-5.48*	1.33/-3.64*	1.09/-2.56**	1.34/-2.96*	-6.60/-4.01*
Ireland	0.81/-4.12*	1.15/-2.83**	1.57/-4.27	1.15/-2.83**	0.44/-2.63**	0.18/-2.78**	0.29/-2.92**	1.77/-3.60*	-0.76/-6.34*
Italy	1.10/-2.22*	1.08/-2.10**	2.59/-2.80	1.09/-2.11***	0.71/-3.38*	2.11/-3.71*	1.83/-4.09*	4.03/-6.45*	-4.15/-5.28*
Latvia	0.70/-3.71*	-2.58/-2.05**	-1.85/-1.44	-2.58/-2.05***	2.61/-3.41*	0.92/-2.37***	-3.94/-1.12	1.33/-1.68***	-0.06/-2.84*
Lithuania	3.31/-3.12*	0.26/-1.80***	0.15/-1.65	0.25/-1.81***	3.12/-2.24**	0.41/-2.26***	0.59/-1.74***	0.84/-3.18*	-0.73/-4.24*
Luxembourg	0.49/-2.89*	0.64/-2.11	1.17/-2.89	0.64/-2.11***	0.13/-4.05*	0.02/-2.84	-0.13/-2.90**	2.02/-4.00*	-1.50/-4.44**
Malta	1.18/-3.47*	0.69/-3.53	2.03/-4.98	0.69/-3.53*	0.65/-3.43*	-2.71/2.60***	1.02/-2.66**	1.63/-3.74*	-0.56/-4.94*
Netherlands	4.07/-3.48*	3.56/-0.07	3.28/-4.45	2.56/-0.14	2.74/-7.15*	1.86/-5.53*	1.98/-5.35*	2.53/-4.08*	-1.69/-6.22*
Portugal	0.81/-3.30*	-0.14/-1.10	-0.13/-2.11	-0.15/-1.07	0.94/-4.78*	0.86/-2.70**	0.13/-2.00***	3.00/-3.74*	-1.81/-4.35*
Slovakia	0.44/-1.97***	-0.24/-2.99	-0.17/-3.81	-0.24/-3.05*	-0.32/-3.99*	0.92/-1.88	-0.33/-2.87**	1.49/-2.04**	-0.77/-1.57***
Slovenia	1.01/-1.95***	-1.41/-8.83	-0.07/-4.87	-0.24/-7.81*	-0.22/-2.98***	-0.37/-4.43*	-1.84/-7.81*	1.29/-2.17**	-0.80/-3.60*
Spain	1.10/-1.85***	-0.41/-6.83	-0.37/-6.87	-0.41/-6.83*	0.82/-2.28***	-0.57/-6.63*	-1.84/-5.48*	1.54/-4.26*	-1.80/-5.75*
EZP	2.99/408.5*	8.78/139.1	5.83/178.4	8.84/139.3*	4.44/254.4v	9.41/169.6*	14.2/161.1*	5.41/167.8*	46.6/67.0*

Note 1: LIL is liquidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is bank deposits, DMA is deposit money bank's assets, PCB is private credit by deposit money banks and other financial institutions, BSD is composite index of banking sector depth, IMD is insurance market density, IMP is insurance market penetration, and EZP is Eurozone panel.

Note 2: The unit root test inferences are reported on the basis of ADF test statistics for individual country and LLC test statistics for panel level analysis.

Note 3: ADF is Augmented Dickey Fuller unit root test; and LLC is Levin-Lin-Chu panel unit root test.

Note 4: first figures indicate the unit root test statistics at the level data, and second figures indicate unit root test statistics at first difference data.

Note 5: I (1) stands for Integrated of order one.

Note 6: * is statistical significance at 1% level; ** is statistical significance at 5% level, and *** is statistical significance at 10% level.

Table 4. *Summary of Cointegration Test Results between Banking Sector Development and Insurance Market Density*

	Cointegration with IMD							
Countries	LIL	DCP	DCF	DCB	BDG	DMA	PCO	BSD
Austria	0	0	0	0	1	0	0	1
Belgium	0	0	0	0	0	0	0	0
Cyprus	1	0	0	0	1	1	0	1
Estonia	--	1	1	0	0	1	1	1
Finland	0	0	0	0	0	0	0	0
France	0	0	0	0	0	0	0	0
Germany	0	0	0	0	0	0	0	1
Greece	0	0	0	0	0	0	0	0
Ireland	1	0	0	0	0	0	0	0
Italy	0	0	0	0	0	0	0	0
Latvia	1	1	0	1	1	2	2	0
Lithuania	2	0	0	0	2	0	0	0
Luxembourg	1	0	2	0	0	0	1	0
Malta	2	0	0	0	1	0	0	0
Netherlands	0	0	0	0	0	0	0	1
Portugal	0	0	0	0	1	0	0	0
Slovakia	1	0	0	0	1	0	0	1
Slovenia	0	1	1	1	0	1	0	1
Spain	0	0	0	0	0	0	0	0
EZP	2	2	2	2	2	2	2	2

Note 1: LIL is liqidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is bank deposits, DMA is deposit money bank's assets, PCB is private credit by deposit money banks and other financial institutions, BSD is composite index of banking sector depth, IMD is insurance market density, and EZP is Eurozone panel.

Note 2: Cointegration is with respect to IMD and banking sector development (LIL/DCP/DCF/DCB/BAG/DMA/PCB/BSD).

Note 3: 0 stands for absence of cointegration between IMD and banking sector activities, 1 stands for presence of one cointegrating vector between IMD and banking sector activities and 2 stands for presence of two cointegrating vectors between IMD and banking sector activities.

Note 4: Reported figures are the number of cointegrating vector(s).

true for all the Eurozone countries, both at individual country and at the panel setting. This suggests that both banking sector and insurance market activities are integrated of order one [i.e. I (1)], which opens the possibility of cointegration between them.

Subsequently, the study deploys cointegration tests at the individual country and at the panel setting separately for checking the existence of cointegration between banking sector and insurance market activities. The results of both the test statistics are reported in Table 6. These results indicate that, in most of the occasions, banking sector and insurance market activities are cointegrated, suggesting the existence of long run relationships between the two financial activities. However, on some occasions, cointegration does not exist in few

Table 5. *Summary of Cointegration Test Results between Banking Sector Development and Insurance Market Penetration*

	Cointegration with IMP							
Countries	LIL	DCP	DCF	DCB	BDG	DMA	PCO	BSD
Austria	0	0	0	0	0	0	0	0
Belgium	0	0	0	0	0	1	0	0
Cyprus	0	0	0	0	0	0	0	0
Estonia	--	2	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0
France	1	0	0	0	2	0	0	2
Germany	0	0	0	0	0	0	0	1
Greece	0	0	0	0	0	0	0	0
Ireland	2	0	0	0	0	0	0	0
Italy	0	0	0	0	0	0	0	0
Latvia	1	0	1	0	0	1	1	1
Lithuania	2	0	1	0	2	0	0	0
Luxembourg	1	0	1	0	1	1	1	0
Malta	2	0	0	0	2	0	0	0
Netherlands	0	0	0	0	0	0	0	1
Portugal	0	0	0	0	1	1	1	1
Slovakia	1	2	2	2	2	2	2	1
Slovenia	0	1	0	0	0	2	2	0
Spain	0	0	0	0	0	0	0	0
EZP	2	2	2	2	2	2	2	2

Note 1: LIL is liquidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is bank deposits, DMA is deposit money bank's assets, PCB is private credit by deposit money banks and other financial institutions, BSD is composite index of banking sector depth, IMP is insurance market penetration, and EZP is Eurozone panel.
Note 2: Cointegration is with respect to insurance market activities and banking sector depth (LIL/DCP/DCF/DCB/BAG/DMA/PCB/BSD).
Note 3: 0 stands for absence of cointegration between IMP and banking sector activities, 1 stands for presence of one cointegrating vector between IMP and banking sector activities and 2 stands for presence of two cointegrating vectors between IMP and banking sector activities.
Note 4: Reported figures are the number of cointegrating vector(s).

Eurozone countries (see Tables 4 and 5). For Granger causality detection, we deploy vector error correction model (VECM[8]) for the presence of cointegration between banking sector and insurance market activities, and simple vector autoregressive (VAR[9]) model for the absence of cointegration between the two.

Having known the existence of cointegration between the two, the next step is to determine the direction of causality between banking sector and insurance market activi-

8 We test the robustness of the empirical results by changing the lag length of the model estimation. However, these test results are not reported here due to space constraints.

9 The test of robustness of the empirical results are not reported here due to space constraints.

Table 6. *Granger Causality Test Results for the Short run (With IMD)*

Countries	LIL	DCP	DCF	DCB	BAG	DMA	PCB	BSD
Austria	FBH	SLH	FBH	SLH	NEH	FBH	FBH	FBH
Belgium	SLH	NEH	SLH	FBH	SLH	SLH	SLH	DFH
Cyprus	DFH	SLH	SLH	SLH	DFH	DFH	SLH	DFH
Estonia	--	DFH	FBH	DFH	FBH	SLH	SLH	DFH
Finland	DFH	DFH	FBH	DFH	FBH	FBH	DFH	DFH
France	FBH	SLH	SLH	SLH	FBH	FBH	FBH	DFH
Germany	SLH	NEH	DFH	NEH	DFH	NEH	NEH	DFH
Greece	DFH	DFH	DFH	DFH	DFH	DFH	DFH	DFH
Ireland	SLH	DFH	DFH	DFH	DFH	DFH	DFH	FBH
Italy	SLH	FBH	FBH	FBH	SLH	FBH	FBH	DFH
Latvia	DFH	FBH	FBH	FBH	FBH	FBH	DFH	FBH
Lithuania	SLH	DFH	FBH	DFH	SLH	DFH	DFH	DFH
Luxembourg	DFH	SLH	FBH	SLH	SLH	FBH	FBH	DFH
Malta	FBH	NEH	SLH	NEH	FBH	SLH	SLH	SLH
Netherlands	NEH	FBH	SLH	FBH	NEH	NEH	SLH	DFH
Portugal	FBH	DFH	FBH	SLH	FBH	FBH	FBH	DFH
Slovakia	DFH	FBH	FBH	FBH	DFH	SLH	FBH	DFH
Slovenia	SLH	DFH	DFH	DFH	FBH	DFH	DFH	DFH
Spain	NEH	FBH	SLH	FBH	FBH	FBH	FBH	DFH
EZP	DFH	FBH	FBH	FBH	FBH	FBH	FBH	FBH

Note 1: LIL is liquidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is bank deposits, DMA is deposit money bank's assets, PCB is private credit by deposit money banks and other financial institutions, BSD is composite index of banking sector depth, IMD is insurance market density, and EZP is Eurozone panel.
Note 2: SLH is supply leading hypothesis between insurance market development (IMD) and banking sector development (LIL/DCP/DCF/DCB/BAG/DMA/PCB/BSD), DFH is demand following hypothesis between IMD and banking sector development, FBH is feedback relationship between IMD and banking sector development, and NEH is neutrality hypothesis between IMD and banking sector development.
Note 3: Testing is conducted at the 5% level of significance.

ties. Using Granger causality test, we estimated both long-run and short-run results. The results of ECT coefficients indicate long-run results, while Wald chi-square test is used to report short-run results.

The analysis is based on individual indicators of banking sector development (LIL/DCP/DCF/DCB/BDG/DMA/PCO/BSD) and insurance market development (IMD/IMP). Coming to long-run equilibrium relationship, we find its existence on some occasions, while studying Granger causality form banking sector activities to insurance market activities, and vice versa. On the other hand, we have divergence experience in the context of short-run Granger causality. The summary of these short-run results are reported in Tables 6 and 7.

Table 6 reports the results of banking sector activities and IMD, while Table 7 reports the results of banking sector activities and in-

Table 8. *Granger Causality Test Results for the Short run (With IMP)*

Countries	LIL	DCP	DCF	DCB	BAG	DMA	PCB	BSD
Austria	SLH	DFH	FBH	FBH	DFH	FBH	DFH	DFH
Belgium	NEH	DFH	NEH	DFH	NEH	SLH	DFH	DFH
Cyprus	NEH	NEH	NEH	NEH	DFH	NEH	NEH	NEH
Estonia	--	SLH	NEH	NEH	DFH	NEH	NEH	DFH
Finland	NEH	NEH	NEH	NEH	NEH	NEH	NEH	DFH
France	FBH	SLH	FBH	SLH	SLH	SLH	SLH	DFH
Germany	DFH	FBH	DFH	FBH	DFH	NEH	FBH	DFH
Greece	DFH	DFH	FBH	DFH	DFH	FBH	DFH	FBH
Ireland	SLH	SLH	FBH	SLH	SLH	SLH	SLH	SLH
Italy	NEH	SLH	NEH	SLH	DFH	NEH	NEH	NEH
Latvia	SLH	DFH	NEH	DFH	DFH	SLH	SLH	SLH
Lithuania	DFH	FBH	FBH	FBH	FBH	FBH	FBH	FBH
Luxembourg	NEH	SLH	SLH	SLH	SLH	FBH	DFH	FBH
Malta	FBH	SLH	SLH	SLH	DFH	DFH	SLH	DFH
Netherlands	NEH	NEH	DFH	NEH	SLH	NEH	NEH	NEH
Portugal	DFH	FBH	DFH	FBH	FBH	NEH	NEH	DFH
Slovakia	DFH	NEH	DFH	NEH	FBH	FBH	FBH	FBH
Slovenia	DFH	DFH	NEH	DFH	FBH	FBH	FBH	FBH
Spain	SLH	SLH	SLH	SLH	SLH	SLH	SLH	SLH
EZP	DFH	NEH	NEH	NEH	DFH	DFH	SLH	DFH

Note 1: LIL is liquidity liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is bank deposits, DMA is deposit money bank's assets, PCB is private credit by deposit money banks and other financial institutions, BSD is composite index of banking sector depth, IMD is insurance market density, IMP is insurance market penetration, and EZP is Eurozone panel.
Note 2: SLH is supply leading hypothesis between insurance market penetration (IMP) and banking sector development (LIL/DCP/DCF/DCB/BAG/DMA/PCB/BSD), DFH is demand following hypothesis between IMP and banking sector development, FBH is feedback relationship between IMP and banking sector development, and NEH is neutrality hypothesis between IMP and banking sector development.
Note 3: Testing is conducted at the 5% level of significance.

surance market penetration. The results of this section are presented below.

Case 1: Between liquidity liability and insurance market activities

For Cyprus, Finland, Greece, Latvia, Luxembourg, Slovakia, and the Eurozone, there is a unidirectional causality from insurance market density (IMD) to banking sector activity (*IMD* => *LIL*: ***liquidity liability***), whereas for Belgium, Germany, Ireland, Italy, Lithuania, and Slovenia, banking sector activity Granger causes insurance market density (*LIL* => *IMD*). Furthermore, for Austria, France, Malta, and Portugal, there is bidirectional causality between banking sector activity and insurance market density (*LIL* <=> IMD), while in the context of the Netherlands, and Spain, banking sector activity does not Granger cause insurance market density (*LIL* <#> *PEG*).

Case 2: Between domestic credit to private sector and insurance market activities

For Estonia, Finland, Greece, Ireland, Lithuania, Portugal and Slovenia, there is a unidirectional causality from insurance market density to banking sector depth (*PEG* => *DCP*: ***domestic credit to private sector)***, whereas for Austria, Cyprus, France and Luxembourg, banking sector depth Granger causes insurance market density (*DCP* => *IMD*). Furthermore, for Italy, Latvia, the Netherlands, Slovakia, Spain, and the entire Eurozone, there is bidirectional causality between banking sector depth and insurance market density (*DCP* <=> *IMD*), while in the context of Belgium, Germany, and Malta, insurance market density does not Granger cause banking sector depth (*DCP* <#> *IMD*).

Case 3: Between domestic credit provided by financial sector and insurance market activities

For Germany, Greece, Ireland, and Slovenia, there is a unidirectional causality from insurance market density to banking sector depth (*IMD* => *DCF*: ***domestic credit provided by financial sector)***, whereas for, Belgium, Cyprus, France, Malta, the Netherlands, and Spain, banking sector depth Granger causes insurance market density (*DCF* => *IMD*). Furthermore, for Austria, Estonia, Finland, Italy, Latvia, Lithuania, Luxembourg, Portugal, Slovakia and the Eurozone, there is bidirectional causality between banking sector depth and insurance market density (*DCF* <=> *IMD*).

Case 4: Between domestic credit to private sector by banks and insurance market activities

For Estonia, Finland, Greece, Ireland, Lithuania, and Slovakia, there is a unidirectional causality from insurance market density to banking sector depth (*IMD* => *DCB*: ***domestic credit to private sector by banks)***, whereas for Austria, Cyprus, France, Luxembourg, and Portugal, banking sector depth Granger causes insurance market density (*DCB* => *IMD*). Furthermore, for Belgium, Italy, Latvia, the Netherlands, Spain, and the Eurozone as a panel, there is bidirectional causality between banking sector depth and insurance market density (*DCB* <=> *IMD*), while in the context of Germany and Malta, insurance market density does not Granger cause banking sector depth (*DCB* <#> *IMD*).

Case 5: Between banking deposits and insurance market activities

For Cyprus, Germany, Greece, Ireland and Slovakia, there is a unidirectional causality from insurance market density to banking sector depth (*IMD* => *BAD*: ***banking deposits)***, whereas for Belgium, Italy, Lithuania, and Luxembourg, banking sector depth Granger causes insurance market density (*BAD* => *IMD*). Furthermore, for Estonia, Finland, France, Latvia, Malta, Portugal, Slovenia, Spain, and the Eurozone, there is bidirectional causality between banking sector depth and insurance market density (*BAD* <=> *IMD*), while in the context of Austria, and the Netherlands, insurance market density does not Granger cause banking sector depth (*BAD* <#> *IMD*).

Case 6: Between deposit money bank assets and insurance market activities

For Cyprus, Greece, Ireland, Lithuania, and Slovakia, there is a unidirectional causality from insurance market density to banking sector depth (*IMD* => *DMA*: ***deposit money bank assets)***, whereas for Belgium, Estonia, Malta and Slovakia, banking sector depth Granger causes insurance market density (*DMA* => *IMD*). Furthermore, for Austria, Finland, France, Italy, Latvia, Luxembourg, Portugal, Spain, and the Eurozone, there is bidirectional causality between banking sector depth and insurance market density (*DMA* <=> *IMD*), while in the context of Germany, and the Netherlands, insurance market density does not Granger cause banking sector depth (*DMA* <#> *IMD*).

Case 7: Between private credit by deposit money banks and other financial institutions and insurance market activities

For Finland, Greece, Ireland, Latvia, Lithuania, and Slovakia, there is a unidirectional causality from insurance market density to banking sector depth (*IMD* => *PCB*: ***private credit by deposit money banks and other financial institutions)***, whereas for Belgium, Estonia, Malta and the Netherlands, banking sector depth Granger causes insurance market density (*PCB* => *IMD*). Furthermore, for Austria, Italy, Luxembourg, Portugal, Slovakia, Spain, and the Eurozone, there is bidirectional causality between banking sector depth and insurance market density (*PCB* <=> *IMD*), while in the context of Germany, insurance market density does not Granger cause banking sector depth (*PCB* <#> *IMD*).

Case 8: Between composite index of banking sector depth and insurance market activities

For Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Italy, Lithuania, Luxembourg, the Netherlands, Portugal, Slovakia, Slovenia, and Spain, there is a unidirectional causality from insurance market density to banking sector depth (*IMD* => *BSD*: ***composite index of banking sector depth)***, whereas for Malta, banking sector depth Granger causes insurance market density (*BSD* => *IMD*). Furthermore, for Austria, Ireland, Latvia, and the Eurozone, there is bidirectional causality between banking sector depth and insurance market density (*BSD* <=> *IMD*).

As is evident by these results, the nature of causal relationship between banking sector depth and insurance market density is more or less country-specific and indicator-specific[10]. On some occasions, banking sector depth causes insurance market density, while on other occasions, it is the insurance market density that brings about banking sector development. On some instances, they (banking sector depth and insurance market density) reinforce each other, while on some other instances they do not cause each other, i.e., they have an independent (neutrality) relationship.

To complement the above findings and discussion, we have also studied the relationship between banking sector activities and insurance market penetration (IMP). Here, we also observe eight different cases, as per the deployment of eight banking sector activities, namely LIL, DCP, DCF, DCB, BDG, DMA, PCB, and BSD. The results of this section are reported in Table 8. The findings of this sec-

10 It is with reference to LIL, DCP, DCF, DCB, BDG, DMA, PCB, and BSD.

tion are more or less similar in comparison to insurance market density. In the long-run, we do not find any considerable linkage between insurance market penetration and banking sector activities.[11] This is relatively true for all eight cases considered. However, in the short-run, we find both bidirectional and unidirectional Granger causality between banking sector activities and insurance market penetration. On some occasions, banking sector development causes insurance market penetration, while on other occasions, it is the insurance market penetration that brings about banking sector development. On some instances, they (banking sector activities and insurance market penetration) reinforce each other, while on some other instances they do not cause each other, and hence support neutrality hypothesis of banking-insurance nexus.

5. Conclusion and Policy Implications

This study scanned the Granger causality nexus between banking sector development and insurance market development for the Eurozone countries during 1980-2016. The main message from our study for the policy-makers and research analysts alike is that inferences drawn from research on financial development that excludes the dynamic interrelation of the two variables will be defective. It is the conjoint interdependence between the two that makes the study more insights and guides the future research on this topic.

Our study concedes mixed evidence on the interrelationship between banking sector development and insurance market development in the Eurozone countries, both at the individual country and at the panel level. In some circumstances, insurance market development leads to banking sector development, lending support to *demand-following hypothesis* of banking-insurance nexus (i.e., *one-way causation*). In some other circumstances, it is the banking sector development that determines the level of insurance market development, lending support to *supply-leading hypothesis* of banking-insurance nexus (i.e., the *reverse* un*idirectional causation*). There are also cases, where banking sector development and insurance market development are interdependent on each other. This is the situation where both are self-reinforcing and offer support to *feedback hypothesis* of banking-insurance nexus (i.e., the *bidirectional causation*). Moreover, there are also cases, where banking sector development and insurance market development are independent of each other. This is the situation where both are neutral and offer support to *neutrality hypothesis* of banking-insurance nexus (i.e., the *insignificant causation*). This follows the views and support of various earlier studies (Pradhan et al., 2017; Liu and Zhang, 2016).

The study therefore suggests that in order to have insurance market development, attention must be paid to policies that promote banking sector development. This, in turn, requires efficient allocation of financial resources combined with wide-ranging movement in the banking sector.

Furthermore, the establishment of a well-developed financial system, including well-functioning financial institutions and markets, particularly with reference to the development of banking sector, can facilitate further investment and easier means of raising capital to support the economic activities of these countries. Given the possibility of reverse causality or bi-directional causality on some occasions, policies that increase insurance market development would be desirable to bring about banking sector development.

11 It is judged on the basis of significance of error correction term.

Therefore, it is suggested that government play a more optimistic role in order to foster banking sector development and that can be integrated with insurance market development.

No doubt, many Eurozone countries have recognized the importance of banking sector development for insurance market development and accordingly, they have increased their efforts towards refining their financial systems. These include eliminating interest rate controls, reducing government involvement in credit allocations, minimizing taxation of financial intermediaries and so forth. However, what is more required is to concentrate on these progresses by removing some of the obstacles in the banking-insurance nexus, such as tax, legal, and regulatory hurdles, and drive towards the internalization of banking activities. At the end, government should pay high attention to bring the stable environments in order to promote the link between banking sector development and insurance market development.

Appendix A

Definition of Variables and Banking Sector Depth Index Analysis

Table A.1. *Definition of Variables*

Variable Code	Variable Definition
LIL	Liquid liabilities: it is the broad money supply, expressed as a percentage of gross domestic product.
DCP	Domestic credit to private sector: it is the financial resources provided to the private sector by financial corporations, expressed as a percentage of gross domestic product.
DCF	Domestic credit provided by financial sector: it is all credit to the various sectors on a gross basis, expressed as a percentage of gross domestic product.
DCB	Domestic credit to private sector by banks: financial resources provided by banks to private sector, expressed as a percentage of gross domestic product.
BAG	Bank deposits: It is total demand, time and saving deposits in banks as a percentage of gross domestic product.
DMA	Deposit money banks' assets: it is total assets held by deposit money banks, expressed as a percentage of gross domestic product.
PCB	Private credit by deposit money banks and other financial institutions: it is expressed as a percentage of gross domestic product.
BSD	Composite index of development of banking sector: this is derived through principal component analysis and is the weighted average of seven banking sector indicators, namely, LIL, DCP, DCF, DCB, BAG, DMA, and PCB.
IMD	Insurance market density: It is the direct domestic premiums, both life and non-life per capita, in US Dollars, and expressed as per thousand population.
IMP	Insurance market penetration: It includes direct domestic premiums, both life and non-life, in US Dollars and expressed as percentage of gross domestic product.

Note 1: The variables above are defined in the World Development Indicators, published by the World Bank and in World Insurance, published by Sigma Economic Research & Consulting, Switzerland. All monetary variables are in real US dollars.
Note 2: This paper uses eight different variables (one at a time) to represent the banking sector depth.
Note 3: BSD is considered as overall banking sector depth and designed with the help of principal component analysis (PCA). Table 2 presents the results of PCA with the logarithms of the four measures of development of banking sector such as DCB, DCF, DCP and PCO.
Note 4: Life insurance is a form of insurance coverage that pays out premiums to the insured or their specified beneficiaries upon a certain accident (Chen et al., 2013; Lee and Chiu, 2012; Lee et al., 2012; Pan et al., 2012; Pradhan et al., 2015; Dash et al., 2018).
Note 5: Non-life insurance essentially consists of insurance policies that protect the insured against losses and damages other than those covered by life insurance such as property, motor, marine, transport, pecuniary loss, and aviation (Chen et al., 2013; Lee and Chu, 2012; Lee et al., 2012; Pan et al., 2012; Pradhan et al., 2015; Dash et al., 2018).

Table A.2. *Summary of PCA-related Information for Composite Index of Banking Sector Development*

Part A: Eigen Analysis of Correlation Matrix			
PCs	Eigen Value	Proportion	Cumulative
1	5.568	0.796	0.796
2	1.215	0.174	0.970
3	0.129	0.018	0.988
4	0.061	0.009	0.997
5	0.020	0.002	0.999
6	0.008	0.001	1.000
7	0.000	0.000	1.000

Part B: Eigen Vectors (component loadings)							
Variables	PC1	PC2	PC3	PC4	PC5	PC6	PC7
LIL	0.322	-0.581	-0.026	0.024	-0.746	-0.001	-0.001
DCP	0.409	0.203	0.335	-0.233	0.001	-0.354	-0.707
DCF	0.401	0.092	-0.802	-0.416	0.116	0.033	-0.001
DCB	0.409	0.202	0.332	-0.230	-0.001	-0.358	0.707
BAG	0.270	-0.694	0.121	0.056	0.654	-0.008	0.001
DMA	0.400	0.221	-0.215	0.846	0.036	-0.167	-0.003
PCB	0.410	0.203	0.271	-0.011	0.008	0.847	0.003

Note 1: PCA is principal component analysis, and PCs denote principal components.
Note 2: LIL is liquid liabilities, DCP is domestic credit to private sector, DCF is domestic credit provided by financial sector, DCB is domestic credit to private sector by banks, BAG is banking deposits, DMA is deposit money banks' assets, and PCB is private credit by deposit money banks and other financial institutions.

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