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INSURANCE MARKET DEVELOPMENT AND ECONOMIC GROWTH IN TRANSITION COUNTRIES: SOME NEW EVIDENCE BASED ON THE BOOTSTRAP PANEL GRANGER CAUSALITY TEST

The purpose of this paper is to investigate causal relations between the insurance market development and economic growth in ten transition European Union member countries in the period between 1993 and 2013. The analysis is conducted with the use of the bootstrap panel causality approach proposed by Kónya (2006), which allows for the simultaneous inclusion of both cross-sectional dependence and country-specific heterogeneity. Various types of dependencies between economic growth and the insurance market development (both in terms of the global insurance market and in the division into life insurance and non-life insurance) are identified in the study, and these findings confirm the results obtained in the majority of other papers which report differences in the role of insurance and the benefits various economies derive from the insurance market.

Keywords: insurance market, economic growth, panel Granger causality test, transition EU member countries
JEL Classifications: C33, G22, O16
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1. INTRODUCTION

In recent years, extensive discussions on the relations between the development of the insurance market and economic growth can be found in the subject literature. It is generally concluded that the significance of the role the insurance market plays in economic growth is difficult to evaluate. In studies on the relations between the development of the financial sector and economic growth the authors usually model, as a starting point assuming the following relations between the development of the insurance market and economic growth, developed by Patrick (1966): the insurance market adjusts to the actual demand of its services (the demand-following hypothesis), the development of the insurance market leads to economic growth and precedes

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the demand for its services (the supply-leading hypothesis), a bi-directional relation exists (the feedback hypotheses), and there is no causality (the neutrality hypotheses).

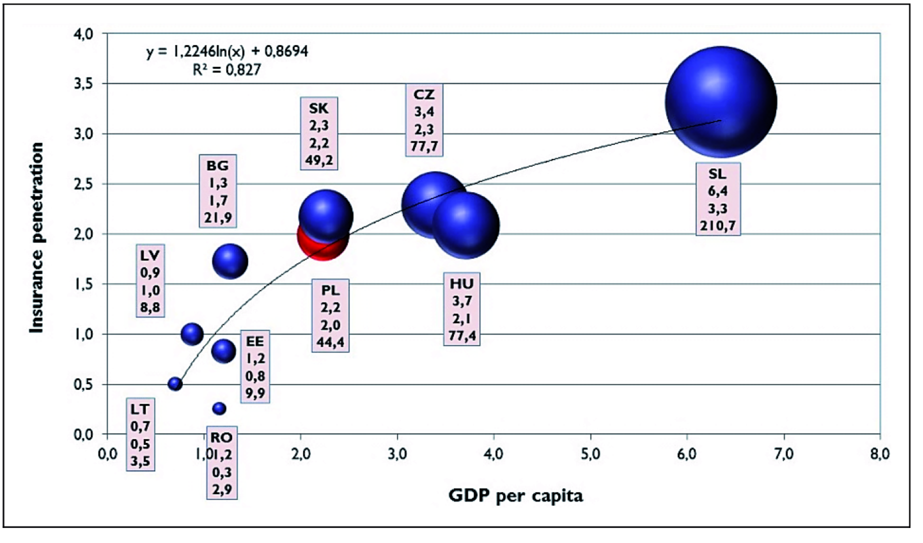
In the case of the demand-following hypothesis, it is assumed that the insurance market does not develop due to the lack of demand for its services. The increase of real income increases the demand of investors and savers for insurance services and their adequate quality, which leads to opening modern insurance institutions and the development of the market. In the case of the supply-leading hypothesis, it is assumed that the insurance market plays at least two important roles in stimulating economic growth. By reducing uncertainty and the impact of large losses, the sector can encourage new investments, innovation, and competition. As financial intermediaries with long investment horizons, insurance companies can contribute to the provision of long-term instruments to finance corporate investment and housing (Feyen et al., 2011; Hou et al., 2011).

In order to determine which of the above relations is the dominating one, several empirical studies have been undertaken (see the literature review in Table 1). However, no consensus has been reached with reference to the impact of the insurance market development and economic growth. Depending on the country and methodology, some studies find that insurance has a positive impact on economic growth, while others show that insurance has no significant positive effects on economic growth. A possible explanation for these contradictory results can be connected with the fact that the impact of insurance on economic growth in various countries depends on specific factors characteristic for these countries, the cultural traditions of their economies, their legal and regulatory systems and the relative share of the remaining intermediaries in the process of capital accumulation[1].

The aim of the paper is to analyse Granger causality between the development of the insurance market and economic growth in ten transition European Union member countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia. The motivation behind choosing these countries was two-fold. Firstly, due to their similar historical background, their insurance markets underwent a dynamic development after 1990, which can be observed in the values of the main measures of the insurance market development in the period between 1993 and 2013, i.e. gross written premiums and insurance

[1] Such conclusions can be found in several papers, e.g. Ward and Zurbruegg (2000).

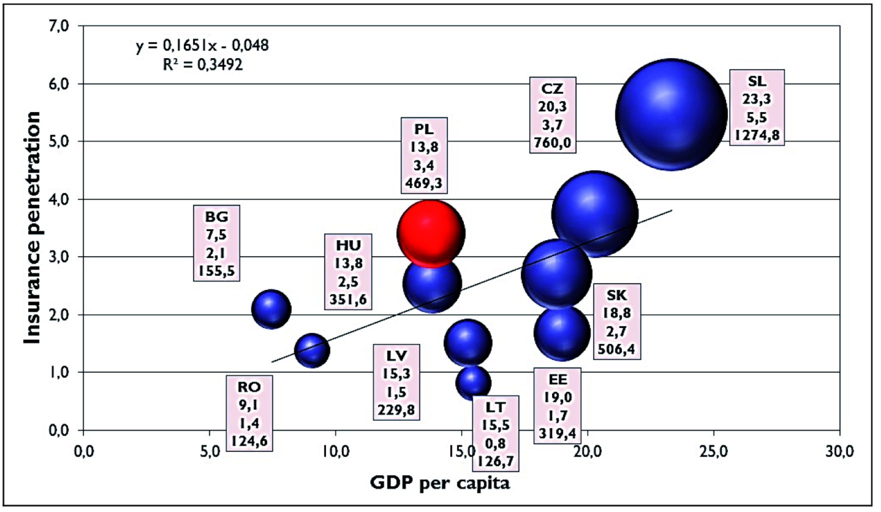
density and penetration (cf. Figures 1 to 3). This allows for verifying whether it is possible to identify one type of relations between the development of the insurance market and economic growth (i.e. demand following, supply leading, bi-directional relation, no causality) in dynamically developing insurance markets. Secondly, there are not many papers in the literature devoted to the analysis of interactions between the expansion of the insurance sector and economic growth in the transition countries, and, what is more, they report contradictory results. For example, the same group of countries, i.e. the ten transition European member countries are also analysed by Ćurak et al. (2009). To examine whether the development of life and non-life insurance market contributes to economic growth in the period between 1992 to 2007, they use the fixed-effects panel model and apply two-stage least squares (2SLS) estimators. The results obtained in their study indicate that the development of the insurance market positively and significantly promotes economic growth. However, Phutkaradze (2014), who analysed the data from the period 2000-2014 using similar methodology, finds no evidence for the claim that the insurance sector promotes economic growth in the same countries. A drawback of the



Notes: The diameter of the spheres corresponds to insurance density.

Fig. 1. The relationship between insurance penetration and GDP per capita in the analysed countries in 1993

Source: own calculation.



Notes: The diameter of the spheres corresponds to insurance density.

Fig. 2. The relationship between insurance penetration and GDP per capita in the analysed countries in 2013

Source: own calculation.

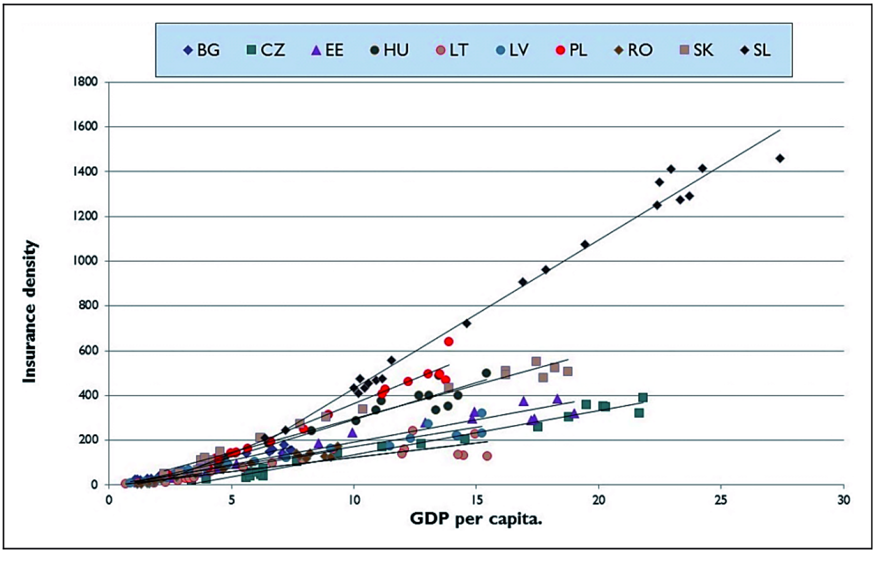


Fig. 3. The relationship between insurance density and GDP per capita in the analysed countries in the period 1993-2012

Source: own calculation.

approach applied in these papers seems to be connected with neglecting cross-sectional dependence and the assumption of the homogeneity of relations in all the countries. The method adopted in our study, i.e. the bootstrap panel causality approach proposed by Kónya (2006), allows for the simultaneous inclusion of both cross-sectional dependence and country-specific heterogeneity, which, in our opinion, yields a more accurate picture of the mutual relations between the insurance market development and economic growth.

The paper is organised as follows. In the next section we briefly review the literature on the relations between the insurance market development and economic growth. Section 3 presents the methodology. Section 4 shows data and discusses the empirical results. The final section summarizes our findings on the relations between the insurance market development and economic growth in selected Central European countries.

2. LITERATURE REVIEW

The papers in which the development of the insurance market and its relations with the real economy are investigated empirically can be divided into three main areas:

- those which identify various factors and their impact on the demand for insurance; their literature review can be found in e.g. Ferry (1977), Zeits (2003), Hussels et al. (2005);
- those which analyse the impact of the economy on the development of the insurance market; their literature review can be found in Outreville (2013);
- those which study causal relations between the development of the insurance market and economic growth.

Our paper focuses on the literature from the last group. It should be remembered that scientific analysis of causal relations between the development of the insurance market and economic growth is a relatively recent phenomenon. In general, papers from this area verify the four hypotheses mentioned in the introduction: demand-following, supply-leading, feedback and neutrality. Ward and Zurbruegg's (2000) paper is considered to be the first paper in this area; its authors analyse the potential short and long-term causal relations between the development of the insurance market and economic growth in nine OECD member countries. The aim of their paper is to investigate whether the development of the insurance market contributes to economic growth (*supply-leading*

Table 1

A review of selected empirical studies on causal relations between the development of the insurance market and economic growth in the period between 2000 and 2015

Paper	Market	Sample-Countries	Methodology	Results
Catalan et al. (2000)	Life, Non-life, Pensions	14 OECD, 5 emerging	Granger causality tests	Heterogeneity in the results: no causality in many OECD countries, mixed results in emerging countries and when causality does exist, it runs from contractual savings to market capitalization.
Ward and Zurbruegg (2000)	Total insurance premiums	9 OECD countries (1961-1996)	Granger causality tests	Weak evidence: supply-leading in several countries and no significant causality links in others.
Webb et al. (2002)	Life, Non-life	55 countries (including 17 from the EU) (1980-1996)	Simultaneous equations	Supply-leading: increased productivity over the period. A synergy between banks and insurers.
Impavido et al. (2003)	Global insurance market	25 OECD, 7 emerging	GMM dynamic panel estimations	Heterogeneity in the results: contractual savings have a stronger impact in market based financial systems.
Boon (2005)	Total insurance funds	Singapore	Cointegration tests and Granger equations	Supply-leading: long-term effects from insurance to GDP.
Kugler and Ofoghi (2005)	Life, Non-life (different groups of insurance)	United Kingdom (1996-2003)	Cointegration tests and Granger equations	Causality runs in both directions.
Arena (2008)	Life, Non-life	56 countries (1976-2004)	GMM dynamic panel estimations	Supply-leading: both life and non-life sectors. Life insurance more important for high-income countries.
Haiss and Sümegi (2008)	Life, Non-life	29 European countries	OLS on unbalanced panel	Supply-leading: life insurance more important for high-income countries and non-life more important for emerging EU countries.
Adams et al. (2009)	Global insurance market	Sweden. Long time series (1830–1998)	Granger causality tests	Supply-leading for insurance but bank loans do not Granger-cause growth in insurance or economic growth.
Ćurak et al. (2009)	Life, Non-life	10 transition European Union member countries (1992-2007)	OLS and 2SLS estimations	Supply-leading for both life and non-life insurance.
Han et al. (2010)	Global insurance market	77 countries	GMM dynamic panel estimations	Supply-leading: this relationship is more significant for non-life insurance than for life insurance. Non-life insurance is of great importance for economic growth in developing countries.
Ching et al. (2010)	Life	Malaysia	Cointegration tests	Demand following: one-way relationship from real GDP to life insurance market.
Avram et al. (2010)	Global insurance market	93 countries	OLS and GMM panel estimations	Supply-leading: verified for insurance density but not for insurance penetration.

Lee (2011)	Life, Non-life	10 OECD countries	DOLS panel estimations	Strong long-run cointegration relationship between GDP and insurance. Causal relationships. Non-life market development has a larger effect on economic growth than life insurance.
Chen et al. (2012)	Life	60 countries (1976-200)	GMM dynamic panel estimations	Supply-leading: strong impact of the development of the life insurance market on economic growth. Stock market and the life insurance market are substitutes rather than complements.
Houa et al. (2012)	Life	12 Euro countries (1980 – 2009)	Fixed effect model	Life insurance and banking activity are important predictors of economic development in the Eurozone.
Bednarczyk (2012)	Life, Non-life	Poland	Granger causality test	Demand following.
Chi-Wei et al. (2013)	Life, Non-life	7 Middle Eastern countries	Bootstrap panel Granger causality test	The relationship between life insurance development and economic growth can be significantly affected by country-specific factors; life insurance and macro economy generally have bi-directional Granger causal relationship in higher income level countries; non-life insurance can do better in promoting economic growth in low-income Middle Eastern countries.
Lee et al. (2013)	Life	41 countries (1979–2007)	Panel seemingly unrelated regressions augmented Dickey-Fuller (SURADF) test	Development of life insurance markets and economic growth exhibit long-term and short-term bi-directional causalities.
Chang, et al. (2014)	Life, Non-life and Total insurance	10 OECD countries (1979–2006)	Bootstrap panel Granger causality test	1. One-way Granger causality running from all insurance activities to economic growth for France, Japan, Netherlands, Switzerland, and the UK. 2. Economic growth Granger-causes insurance activities in Canada (for life insurance), Italy (for total and life insurance) and the USA (for total and non-life insurance). 3. Bi-directional Granger causality between life insurance activity and economic growth in the USA. 4. No causality between insurance activities; economic growth found in Belgium (for all insurance), Canada (for total and non-life insurance), Italy (for non-life insurance) and Sweden (for life insurance).
Phutkaradze (2014)	Total insurance	10 transition European Union member countries (2000-2012)	Fixed effect model	A lack of evidence that insurance promotes economic growth in post-transition economies.
Pradhan et al. (2015)	Total insurance, Financial market	34 OECD countries (1988–2012)	Panel vector auto-regression model	1. Insurance market development specifically and financial market development overall seem both to be long-term causative factors of economic growth. 2. Short-term causality results show a diverse pattern of short-term adjustment dynamics between the variables, including the possibility of feedback between them in several instances.
Dash et al. (2018)	Life, Non-life and Total insurance	19 Eurozone countries (1980–2014)	VECM	Both unidirectional and bidirectional causality between insurance market penetration (IMP) and per capita economic growth. However, these results are mostly non-uniform across the Eurozone countries during this selected period.

Source: an extended version of Table 5 from Outreville (2013), pp. 29-31.

relationship) or whether the development of this market follows economic growth (*demand-following* relationship). The results are not conclusive: the Granger causality test reveals that only in Canada and Japan the insurance market Granger-causes economic growth, a bi-directional relation is found in Italy, while in the remaining countries, including Great Britain, the USA, Austria and Switzerland no long-term relations are found. The authors conclude that the impact of the insurance market on the economy differs in various countries due to idiosyncratic factors specific to a given country, such as its cultural tradition of the economy or the development of its legal system.

Examples of other important papers from this area are given in Table 1. Generally, empirical studies are based on panel data for developing and developed countries, while single countries are rarely analysed. The results obtained are not conclusive, although most studies provide evidence for the *supply-leading* relationships. Their authors also emphasise the significant difference in the results obtained for life insurance and non-life insurance with regard to their impact on economic growth and the directions of causal relations.

3. METHODOLOGY

As mentioned in the introduction, a suitable method of inference about causality when working with panel data has to include both slope heterogeneity and cross-sectional dependence. Hurlin (2008) presents a panel data causality test which allows for slope heterogeneity. Unfortunately, it does not consider cross-sectional dependence, thus, if it exists, substantial biases and size distortions occur (Pesaran, 2004). The alternative methodology proposed by Kónya (2006) includes both slope heterogeneity and cross-sectional dependence.

Kónya's (2006) procedure allows for the identification of specific countries in which Granger causal relationship occurs. His bootstrap panel causality approach has three relevant advantages. Firstly, the approach is carried out under the structure of seemingly unrelated regression (SUR), which, as demonstrated by Zellner (1962), is more efficient than the OLS if cross-sections are subject to dependence. Secondly, the test for the direction of causality is based on the Wald tests with country-specific bootstrap critical values. That is why it does not impose a joint hypothesis across all members of the panel and specific countries in which a Granger causal relationship can be identified. Thirdly, the procedure does not require any pretesting for panel unit roots or cointegration, which is important "since the unit-root and cointegration tests in general suffer from low power" (Kónya, 2006). On the other hand, ignoring potential (common) stochastic trends results in a situation in which the results of the suggested procedure can be used only for the evaluation of short-term causality (one-period-ahead forecast).

The approach proposed by Kónya (2006) is used in the analysis of relationships between insurance market development and economic growth. Chang et al. (2014) examine the linkages between insurance activity and economic growth in ten OECD countries over the period of 1979–2006, while Chi-Wei et al. (2013) test causality between insurance development and economic growth in seven Middle Eastern countries. Chang et al. (2013) investigate whether globalization promotes insurance activity in eight Eastern Asian countries over the period of 1979–2008.

The tools used for the bootstrap panel causality tests are presented below.

Before Kónya's (2006) approach is briefly presented, we sketch the outline of tests for cross-sectional dependence. The choice of a suitable method allowing for the analysis of causality for panel data requires the assessment of cross-sectional dependence. Panel data models are more likely to exhibit cross-sectional dependence in the errors which may arise due to the presence of common shocks and unobserved components. Cross-sectional dependence can arise due to a variety of factors, such as omitted common factors, spatial spillover effects, unobserved common factors or general residual interdependence. One reason for this may be connected with the fact that during the last few decades we have faced a higher economic and financial integration of countries and financial entities, which induces strong interdependencies between cross sectional units. According to Breitung and Pesaran (2008) and Bai and Kao (2006), the default assumption of independence between cross-sections seems to be inadequate both in the cointegration analysis and causality analysis. If economic links between countries are relatively strong, cross-sectional dependence (for instance, causality between the insurance market development and economic growth) is likely to appear, thus incorrect cross-sectional independence assumptions may lead to erroneous causal inferences. Therefore, taking into account commonly observed cross-sectional dependencies in panel analysis for macroeconomic data, first of all, we decide to verify the hypothesis of the existence of cross-sectional dependence. To test for the presence of such cross-sectional dependence in our data, we apply cross section dependence tests developed by Pesaran (2004), with the null hypothesis claiming no cross-sectional dependence.

Kónya's (2006) panel causality approach models the data as a system of two sets of the following equations[2]:

$$y_{1,t} = \alpha_{1,1} + \sum_{l=1}^{mly_1} \beta_{1,1,l} y_{1,t-l} + \sum_{l=1}^{mlx_1} \delta_{1,1,l} x_{1,t-l} + \sum_{l=1}^{mlz_1} \gamma_{1,1,l} z_{1,t-l} + \sum_{l=1}^{mlv_1} \vartheta_{1,1,l} v_{1,t-l} + \varepsilon_{1,1,t} ,$$

$$y_{2,t} = \alpha_{1,2} + \sum_{l=1}^{mly_1} \beta_{1,2,l} y_{2,t-l} + \sum_{l=1}^{mlx_1} \delta_{1,2,l} x_{2,t-l} +$$

$$\sum_{l=1}^{mlz_1} \gamma_{1,2,l} z_{2,t-l} + \sum_{l=1}^{mlv_1} \vartheta_{1,2,l} v_{2,t-l} + \varepsilon_{1,2,t} , \tag{1}$$

$$y_{N,t} = \alpha_{1,N} + \sum_{l=1}^{mly_1} \beta_{1,N,l} y_{N,t-l} + \sum_{l=1}^{mlx_1} \delta_{1,N,l} x_{N,t-l} +$$

$$\sum_{l=1}^{mlz_1} \gamma_{1,N,l} z_{N,t-l} + \sum_{l=1}^{mlv_1} \vartheta_{1,N,l} v_{N,t-l} + \varepsilon_{1,N,t} ,$$

and

$$x_{1,t} = \alpha_{2,1} + \sum_{l=1}^{mly_2} \beta_{2,1,l} y_{1,t-l} + \sum_{l=1}^{mlx_2} \delta_{2,1,l} x_{1,t-l} + \sum_{l=1}^{mlz_2} \gamma_{2,1,l} z_{1,t-l} + \sum_{l=1}^{mlv_2} \vartheta_{2,1,l} v_{1,t-l} + \varepsilon_{2,1,t} ,$$

$$x_{2,t} = \alpha_{2,2} + \sum_{l=1}^{mly_2} \beta_{2,2,l} y_{2,t-l} + \sum_{l=1}^{mlx_2} \delta_{2,2,l} x_{2,t-l} +$$

$$\sum_{l=1}^{mlz_2} \gamma_{2,2,l} z_{2,t-l} + \sum_{l=1}^{mlv_2} \vartheta_{2,2,l} v_{2,t-l} + \varepsilon_{2,2,t} , \tag{2}$$

$$x_{N,t} = \alpha_{2,N} + \sum_{l=1}^{mly_2} \beta_{2,N,l} y_{N,t-l} + \sum_{l=1}^{mlx_2} \delta_{2,N,l} x_{N,t-l} +$$

$$\sum_{l=1}^{mlz_2} \gamma_{2,N,l} z_{N,t-l} + \sum_{l=1}^{mlv_2} \vartheta_{2,N,l} v_{N,t-l} + \varepsilon_{2,N,t} ,$$

where $y_{i,t}$ denotes economic growth (in country *i* and *t* period), $x_{i,t}$ refers to the insurance market development (i.e. life insurance density, non-life insurance density or total insurance density), $z_{i,t}$ is the capital formation, $v_{i,t}$

[2] It is possible to include a deterministic component into the system of equations.

is the education[3], N denotes the number of countries in the panel ($i = 1,2,\ldots,N$), t is time period ($t = 1,2,\ldots,T$), and l is the number of lags in equations. $\varepsilon_{1,i,t}, \varepsilon_{2,i,t}$ are expected to be correlated contemporaneously across equations (due to common random shocks). The model allows for a deterministic trend.

The system of equations allows for testing unidirectional and bi-directional Granger causality for each country separately. There is unidirectional Granger causality running from economic growth to insurance market development (the equivalent of the demand-following hypothesis) if in (2) not all $\beta_{2,i}$ s are zero but in (1) all $\delta_{1,i}$ s are zero. There is unidirectional causality running from the insurance market development to economic growth in country i (the equivalent of the supply-leading hypothesis) if not all $\delta_{1,i}$ s are zero, but all $\beta_{2,i}$ s are zero in (2). There is bi-directional Granger causality between insurance market development and economic growth if neither all $\delta_{1,i}$ s nor all $\beta_{2,i}$ s are zero (the equivalent of the feedback hypothesis). Finally, there is no Granger causality between the insurance market development and economic growth if all $\delta_{1,i}$ s and all $\beta_{2,i}$ s are zero (the equivalent of the neutrality hypothesis).

The country-specific bootstrap[4] critical values are obtained as follows[5]:

[1] A system of equations (1) is estimated under the null hypothesis of non-causality running from the insurance market development to economic growth (i.e. imposing the $\delta_{1,i,l} = 0$ restriction for all i and l). The residuals:

$$e_{H_0,i,t} = y_{i,t} - \hat{\alpha}_{1,i} - \sum_{l=1}^{mly_1} \hat{\beta}_{1,i,l} y_{1,t-l} - \sum_{l=1}^{mlz_1} \hat{\gamma}_{1,i,l} z_{1,t-l} - \sum_{l=1}^{mlv_1} \hat{\vartheta}_{1,i,l} v_{1,t-l}$$

for $i = 1,\ldots,N$ and $t = 1,\ldots,T$ are collected in a $N \times T$ matrix $\left[e_{H_0,i,t}\right]$.

[2] These residuals are re-sampled by randomly selecting a full column from the matrix $\left[e_{H_0,i,t}\right]$, and the selected bootstrap residuals are denoted as $\left[e^*_{H_0,i,t}\right]$ where $t = 1,2,3,\ldots,T^*$, and T^* can be greater than T.

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[3] Z and ν are treated as an auxiliary variable, and they will not be directly involved in the Granger causality analysis.

[4] On bootstrapping in general, see e.g. Horowitz (2003). On bootstrapping in SUR models, see Atkinson et al. (1992), and Rilstone and Veall (1996).

[5] We present a procedure for testing Granger causality running from X to Y. Similar steps are required for testing causality running from Y to X.

[3] The bootstrap sample of Y is generated under the assumption of no causality running from insurance market development to economic growth, that is:

$$y_{i,t}^{*} = \hat{\alpha}_{1,i} + \sum_{l=1}^{mly_1} \hat{\beta}_{1,i,l}\, y_{i,t-l}^{*} + \sum_{l=1}^{mlz_1} \hat{\gamma}_{1,i,l}\, z_{1,t-l} + \sum_{l=1}^{mlv_1} \hat{\vartheta}_{1,i,l}\, v_{1,t-l} + e_{H_0,i,t}^{*}, \qquad (3)$$

[4] Substitute $y_{i,t}^{*}$ for $y_{i,t}$ and estimate equations (3) without any restrictions. For each country perform the Wald test implied by the no-causality null hypothesis.

[5] The empirical distributions of the Wald test statistics are developed by repeating steps 2 to 4. The bootstrap critical values are specified by selecting the appropriate percentiles of these sampling distributions.

Eventually, the Wald test statistics obtained from the regressions on the original series are compared with the bootstrap critical values.

Specifying the number of lags in all equations is a crucial step in Kónya's approach. Following Kónya (2006), we decide to allow for different lags in each system but not to allow for different lags across countries. Assuming that the number of lags ranges from 1 to 4, we estimate all the equations and use the Akaike Information Criterion (AIC) to determine the optimal solution. The AIC is defined as:

$$AIC_l = \ln|\mathbf{W}| + \frac{2N^2q}{T}, \qquad (4)$$

where $\mathbf{W}$ stands for estimate residual covariance matrix, N is the number of equations, q is the number of coefficients per equation, and T is the sample size.

4. DATA AND EMPIRICAL RESULTS

The analysis of causal relationships between the insurance market development and economic growth based on the annual panel data is conducted for the period between 1993 and 2013 for ten transition European Union member countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia. Economic growth is measured by the growth rate of GDP per capita (*GDP*) in constant 2005 U.S. dollars on the basis of the *World Development Indicators* published by the World Bank. The insurance market development is measured by three different types of insurance density: life insurance density (LID, i.e. direct domestic life premiums divided by population), non-life insurance density (NID, i.e. direct domestic non-life premiums divided by population), and total insurance density (TID, i.e. direct domestic life and non-life premiums divided by population). The data come from Sigma reports of the Swiss Reinsurance Company.

Taking into consideration the rapid economic changes experienced by the countries analysed, the set of variables is extended to include real gross fixed capital formation per capita (*K*) in constant 2005 US dollars as a proxy of capital[6] and net enrolment rate, secondary, both sexes (*EDU*) as a proxy of education[7] (%). All variables are in natural logarithms. The summary statistics, the means and standard deviations of these variables, are presented in Table 2.

Up to 1989, Central European countries and the *Baltic states were under communist rule with centrally planned economies. In 1989, communism fell in Bulgaria,* Czechoslovakia, Hungary, Poland, and Romania. After the dissolution of the Soviet Union in 1991, Estonia, Latvia, and Lithuania reappeared on the map, and in 1993, Czechoslovakia was divided into two countries: the Czech Republic and the Slovak Republic. That is why the year 1993 is chosen as the initial period of the analysis of causality between economic growth and insurance market development.

Table 2

Summary statistics – the mean and standard deviations

Country	GDP		LID		NID		TID	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Bulgaria	3581.5	933.6	10.9	5.1	58.4	26.5	69.3	29.8
Czech Republic	12332.2	2077.3	155.0	76.7	246.4	61.1	401.4	136.3
Estonia	8607.3	2644.3	36.8	25.9	119.5	47.1	156.3	71.6
Hungary	9805.4	1600.8	123.7	57.8	146.7	26.5	270.4	80.3
Lithuania	6928.7	2312.6	22.5	16.3	56.1	33.3	78.7	48.8
Latvia	6318.8	2190.9	8.9	3.7	91.9	42.6	100.9	44.4
Poland	7711.1	1938.8	105.8	70.2	135.0	44.5	240.8	112.1
Romania	4413.8	1108.7	10.2	7.2	43.5	25.4	53.8	32.5
Slovak Republic	11122.0	2862.3	112.8	68.2	159.2	55.6	272.0	122.8
Slovenia	16493.3	2919.0	210.8	113.2	606.5	147.0	817.4	258.4

Note: results obtained for not logarithmized variables

Source: own calculation.

[6] The use of real gross fixed capital as a proxy of capital follows work by Soytas and Sari (2007) in assuming that under the perpetual inventory method with a constant depreciation rate, the variance in capital is closely related to the change in investment.

[7] The use of net enrollment rate, secondary, both sexes (%) as a proxy of education in Ćurak et al. (2009).

In the first step, the cross-sectional dependence (CD) tests developed by Pesaran (2004) are used to test for the presence of cross-sectional dependence in the panel of countries. Table 3 presents the results of the tests for specific variables and average correlation coefficients. The cross-sectional dependence statistics and associated *p*-values strongly reject the null of cross-section independence and indicate that cross-correlations are significant, which implies the existence of cross-sectional correlation among the countries in our sample. These findings show that a shock which occurs in one country will be transmitted to other countries. This serves as proof that our choice of the estimation technique has been appropriate.

Table 3

Cross-sectional dependence tests
(average correlation coefficients and Pesaran (2004) CD test)

Variable	**Cross-sectional dependence test**			
	CD-test	***p*-value**	**corr**	**abs(corr)**
GDP	29.73	0.000	0.967	0.967
LID	22.94	0.000	0.746	0.746
NID	27.03	0.000	0.879	0.879
TID	27.81	0.000	0.905	0.905
K	27.24	0.000	0.886	0.886
EDU	13.83	0.000	0.450	0.465

Note: Under the null hypothesis of cross-section independence CD ~ N(0,1). The Pesaran (2004) test is performed using the Stata "xtcd" command

Source: own calculation.

For each system of equations the number of lags is chosen according to the AIC criterion[8]. Additionally, specifications incorporating a deterministic trend are taken into account.

The results from the bootstrap[9] panel Granger causality tests are reported in tables 4-6.

[8] We use the AIC criterion to compare the specifications with and without a linear trend. Finally, we construct SUR with one lag and a linear trend.
[9] Following the original paper of Kónya (2006) and several other papers, e.g. Nazlioglu et al. (2011), we use 10,000 replications in the procedure. Andrews and Buchinsky (2000) provide an exact method of evaluating the adequacy of the chosen number of replications.

Table 4

Panel Granger causality test results based on bootstrapped Wald statistics: life insurance density and economic growth

Country	H_0: Life insurance density does not Granger-cause GDP (H_1: LID → GDP)				H_0: GDP does not Granger-cause life insurance density (H_1: GDP → LID)			
	Wald statistics	Bootstrap critical value			Wald statistics	Bootstrap critical value		
		10%	5%	1%		10%	5%	1%
Bulgaria	0.559	16.728	20.143	28.122	1.525	15.164	21.320	35.010
Czech Republic	12.151	16.275	20.808	32.645	0.392	24.857	32.320	57.561
Estonia	**8.256*****	2.772	3.807	7.795	**11.056***	9.939	13.680	23.912
Hungary	1.262	4.012	6.015	11.130	7.433	22.363	28.920	60.847
Lithuania	2.964	4.298	5.267	9.992	0.039	19.951	28.143	47.810
Latvia	4.042	4.394	6.895	12.590	2.532	8.605	11.919	18.696
Poland	4.191	21.709	26.102	41.072	0.004	10.694	16.464	49.189
Romania	**6.484****	2.837	4.299	8.046	3.834	28.308	33.747	53.506
Slovak Republic	**9.371*****	0.790	1.203	2.142	5.528	12.074	18.754	32.766
Slovenia	12.888	29.162	36.949	58.090	0.017	25.607	31.879	50.346

Note: ***, **, and *indicate significance at the 1, 5, and 10 percent levels, respectively. Bootstrap critical values are obtained from 10,000 replications.

Source: own calculation.

Table 5

Panel Granger causality test results based on bootstrapped Wald statistics: non-life insurance density and economic growth

Country	H_0: Non-life insurance density does not Granger-cause GDP (H_1: NID → GDP)				H_0: GDP does not Granger-cause non-life insurance density (H_1: GDP → NID)			
	Wald statistics	Bootstrap critical value			Wald statistics	Bootstrap critical value		
		10%	5%	1%		10%	5%	1%
Bulgaria	4.925	13.053	16.397	21.896	6.095	23.250	28.807	44.370
Czech Republic	12.533	16.206	19.901	27.871	0.258	26.329	33.898	53.187
Estonia	1.390	3.407	4.965	11.005	0.504	19.019	23.845	36.419
Hungary	1.658	5.105	7.382	11.943	**34.684****	18.939	26.217	47.703
Lithuania	0.226	18.027	22.563	33.188	0.039	12.635	20.083	39.743
Latvia	0.237	4.893	6.461	12.311	0.003	15.939	19.924	38.318
Poland	1.126	25.149	32.586	54.173	**10.935***	7.359	11.265	19.746
Romania	0.684	3.589	4.530	7.893	**56.664***	55.343	69.459	97.526
Slovak Republic	**1.186****	0.648	0.933	1.746	**22.100****	10.422	14.537	29.634
Slovenia	0.392	30.100	38.250	68.046	29.758	30.911	38.825	75.794

Note: ***, **, and *indicate significance at the 1, 5, and 10 percent levels, respectively. Bootstrap critical values are obtained from 10,000 replications.

Source: own calculation.

Table 6

Panel Granger causality test results based on bootstrapped Wald statistics: total insurance density and economic growth

Country	H_0: Total insurance density does not Granger-cause GDP (H_1: TID → GDP)				H_0: GDP does not Granger-cause total insurance density (H_1: GDP → TID)			
	Wald statistics	Bootstrap critical value			Wald statistics	Bootstrap critical value		
		10%	5%	1%		10%	5%	1%
Bulgaria	3.151	16.982	21.027	28.881	14.907**	9.067	12.702	22.365
Czech Republic	9.020	16.732	21.426	32.329	2.114	4.654	6.650	12.348
Estonia	3.709**	2.155	3.364	7.395	0.243	22.101	27.592	47.261
Hungary	0.029	5.128	7.184	13.332	0.939	14.144	18.861	34.413
Lithuania	0.027	16.251	21.568	33.238	1.887	19.399	31.002	59.244
Latvia	0.313	4.195	6.272	13.111	0.781	6.058	9.332	16.407
Poland	1.971	23.899	28.358	43.808	8.199	22.642	32.340	50.382
Romania	0.746	2.921	4.052	6.731	8.189**	5.436	7.985	13.532
Slovak Republic	3.945***	0.859	1.271	2.639	2.888	20.931	32.029	58.329
Slovenia	3.476	29.342	39.351	66.736	3.378	15.792	22.089	40.869

Note: ***, **, and *indicate significance at the 1, 5, and 10 per cent levels, respectively. Bootstrap critical values are obtained from 10,000 replications.

Source: own calculation.

The results presented in Table 4 confirm the supply-leading hypothesis for Romania (at the significance level 5%) and the Slovak Republic (at the significance level 1%). This means that insurance market development measured by life insurance density in these two countries could play an important role in their economic growth, both directly and indirectly in the production process as a complementary factor to education and capital. Consequently, we may conclude that domestic life premiums per capita is a limiting factor to economic growth and, thus shocks to insurance market supply will have an impact on economic growth. The feedback hypothesis is confirmed only for Estonia. This means that domestic life premiums per capita which measure the development of the insurance market and economic growth are jointly determined and affected at the same time. The results support the neutrality hypothesis for other countries: Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, and Slovenia. The neutrality hypothesis states that the insurance market development measured by domestic life premiums per capita and economic growth are not sensitive to one another. Therefore, any development of the life insurance market is expected to have a negligible effect on economic growth.

However, our analysis of causality between the insurance market development measured by domestic non-life premiums per capita and economic growth confirms the demand-following hypothesis for Hungary, Poland, and Romania (see Table 5). This means that economic growth in these three countries could play an important role in the development of their insurance markets measured by non-life premiums per capita. The feedback hypothesis is confirmed for only one country, the Slovak Republic, which means that the development of its non-life insurance market and economic growth are mutually dependent there. The presence (at the significance level 0.05) of bi-directional causality between the development of the non-life insurance market and economic growth supports the feedback hypothesis, stating that the development of the non-life insurance market oriented toward improvements in non-life premium per capita may not have an adverse impact on economic growth. The neutrality hypothesis is confirmed for other European Union member transition countries: Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, and Slovenia.

However, Table 6 demonstrates the impact of the development of the total insurance market on economic growth only in Estonia and the Slovak Republic, which confirms the supply-leading hypothesis for these countries. It also shows the impact of economic growth on the development of the total insurance market in only two countries: Bulgaria and Romania, which confirms the demand-following hypothesis for these countries. The neutrality hypothesis is confirmed for other European Union member transition countries: the Czech Republic, Hungary, Latvia, Lithuania, Poland, and Slovenia. Thus, the development of the total insurance market measured by life and non-life premiums per capita and economic growth are not sensitive to one another.

CONCLUSIONS

The paper investigates causal relations between the development of the insurance market measured by insurance density and economic growth for ten transition European Union member countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia. The global insurance market and life insurance and non-life insurance markets are studied in the paper. In order to avoid the problem of the influence of omitted variables bias, two variables, capital and education, are included in the model. Kónya's (2006) procedure used in the study allows for the simultaneous examination of both cross-sectional dependence and country-specific heterogeneity.

The empirical results can be summarised as follows:

1. In most countries, relations between the development of the insurance market and economic growth are not found. Only in Estonia, Romania and Slovakia the relation between the development of the life insurance market and economic growth is found. Such a relation is also found for the non-life insurance market in Slovakia, Hungary, Poland and Romania. A relation between the whole insurance market and economic growth is found in Estonia, Slovakia, Bulgaria and Romania.
2. The results do not confirm the assumption that economies with expansive insurance sectors and fast economic growth are characterised by the same type of relations between the development of the insurance market and economic growth.
3. The results obtained in our study are not consistent with the results obtained by Ćurak et al. (2009) and Phutkaradze (2014) conducted with the same group of countries. This difference might result from different study periods and the different methodologies used in these studies.

In conclusion it should be stated that, although our study uses the bootstrap panel causality approach proposed by Kónya (2006), which allows for the simultaneous inclusion of both cross-sectional dependence and country-specific heterogeneity, it identifies various types of dependencies between economic growth and the insurance market development (both in terms of the global insurance market and in the division into life insurance and non-life insurance). Our findings confirm the results reported by the majority of other studies from this area, which also find the different roles of the insurance market and the benefits it brings to economies of particular countries.

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