

Insurance Sector Development and Economic Growth in Transition Countries

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Abstract

In this paper we empirically examine relationship between insurance sector development and economic growth in 10 transition European Union member countries, in the period from 1992 to 2007. We apply fixed-effects panel model and control for other relevant determinants of economic growth and endogeneity.

According to our findings, insurance sector development positively and significantly affects economic growth. The results are confirmed in terms of both life and non-life insurance, as well as, total insurance.

Keywords: Insurance, Economic growth, Endogenous growth theory, Panel analysis

JEL Classification Codes: C23, E44, G22, O11, O16

1. Introduction

According to the finance-growth nexus theory financial development promotes economic growth through channels of marginal productivity of capital, efficiency of channeling saving to investment, saving rate and technological innovation (Levine, 1997). Affecting economic growth through the channels is realized by functions of financial intermediaries. The functions include the provision of means for clearing and settling payments to facilitate the exchange of goods, services and assets, the provision of a mechanism for pooling resources and the subdivision of shares in various enterprises, resource allocation, risk management, price information to help coordinate decentralized decision-making in various sectors of the economy, and the means to deal with the incentive problems created when one party of a financial transaction has the information that the other party does not, or when one party acts as an agent of the other (Merton and Bodie, 1995). A numerous empirical studies confirm

financial intermediation plays a growth-supporting role (for the survey see Levine (1997), Thiel (2001) and Ang (2008)).

Among financial intermediaries, in performing functions of financial system insurance companies play important role. They are main risk management tool for companies and individuals. Through issuing insurance policies they collect funds and transfer them to deficit economic units for financing real investment. Therefore, according to the theory insurance sector could be one of the factors contributing to economic growth.

Insurance sector in transition countries is growing in importance. Life insurance penetration in transition European Union members in the period between 1992 and 2007 grew from 0.4 to 1.5 percent of GDP in average. In the same period non-life insurance penetration grew from 1.5 to 2 percent of GDP in average. Despite increasing importance insurance sector has hardly been investigated in its role in economic growth in transition countries.

The aim of this work is to examine empirically if the insurance sector plays a growth-supporting role. Our sample consists of 10 transition European Union member countries in the period from 1992 to 2007. As proxy of insurance sector development we use insurance penetration (insurance premiums in relation to GDP). We apply fixed-effects panel model and at first stage we use ordinary least squares estimation method. In order to control for endogeneity at the next stage we estimate parameters of the model using two stage least squares method. In both cases we control for other determinants of economic growth.

The paper is organized as follows. Section 2 discusses possible contributions of insurance development to economic growth based on the theory of financial intermediation and endogenous growth theory. Section 3 gives the review of the empirical studies on the insurance-growth nexus. In section 4 we present data and methodology. The results of the empirical research are given in section 5. The paper finishes with some concluding remarks and suggestions for the future work that are outlined in section 6.

2. Functions of Insurance Companies and Economic Growth

Insurance companies, as a part of financial system, fulfill a number of financial system's functions, and through certain channels that are recognized due to the development of endogenous growth models, could contribute to economic growth. Contemporaneous literature on the linkage between financial development and economic growth combine the theory of financial intermediation and two views of the endogenous growth theory.

2.1. Theory of Financial Intermediation and Endogenous Growth Theory

In order to explain arguments for existence of financial intermediaries, the theory of financial intermediation adds specific frictions to models of resource allocation based on the perfect market. Namely, if there is the perfect market, all the traders are price takers, there is no private information, and allocation of resources is Pareto optimal. Thus, in a pure neoclassical framework there is no role of financial intermediation to add value. But, according to the traditional theory of financial intermediation the real-world market is characterized by frictions that include transaction costs and asymmetric information. The reduction in transaction costs, as the main function of financial intermediaries, was first introduced by Gurley and Shaw (1960). Financial intermediaries have an advantage over direct financing in economies of scale that result from costs shared. Additionally, large amount of funds enables financial intermediaries to be more easily diversified than individual economic units. An alternative argument for the existence of financial intermediaries is information asymmetry that was first suggested by Leland and Pyle (1977). According to their theory, financial intermediaries are information collectors of borrowers' financial prospects ex-ante for solving the problem of adverse selection. Financial intermediaries can signal their informed status by investing their wealth in assets about which they have special knowledge. Diamond (1984) suggests that

financial intermediaries act as delegated monitors to overcome ex-post asymmetric information and in that way reduce the problem of moral hazard.

Because of the changes in financial environment related to deregulation, improved provision of information through technological progress, and financial innovation, which have been resulted in reduction of transaction and information frictions, while at the same time financial intermediation has been growing, Allen and Santomero (1998) suggest improvements in the traditional theory of financial intermediation. According to their view, the theory should also take into account risk management activities of financial intermediaries and reduction of participation costs.

In order to encompass both traditional financial intermediation theory and the changes in the financial environment, and to understand the role of insurance companies in financial system and their contribution to economic growth, we are going to use the functional approach to the financial system proposed by Merton and Bodie (1995). They emphasize six core functions: the provision of means for clearing and settling payments to facilitate exchange of goods, services and assets, the provision of a mechanism for the pooling of resources and the subdivision of shares in various enterprises, resource allocation, provision of means of risk managing, providing price information to help coordinate decentralized decision-making in various sectors of the economy, providing means to deal with the incentive problems created when one party to a financial transaction has information that the other party does not, or when one party acts as an agent of the other.

For the purpose of analyzing insurance companies in the context of their contribution to economic growth, these functions could be expressed as insurance, resources accumulation and their allocation with managing various financial risks and facilitation of exchange. By realization of these functions insurance companies could contribute to economic growth.

Linking of financial intermediaries' functions, and thereby functions of insurance companies too, and economic growth, was enabled by the development of endogenous growth theory. In order to show the channels through (which) financial development affects economic growth we follow Pagano (1993). According to the endogenous growth "AK" model economy produces a single good and aggregate output Y in period t is function of the aggregate capital stock K :

$$Y_t = AK_t \quad (1)$$

with A being marginal productivity of capital. The capital stock in the period t is

$$K_t = I_{t-1} + (1-\delta)K_{t-1} \quad (2)$$

with I investment that is equal to non-consumed good that depreciate at the rate δ per period. The capital market equilibrium condition requires that gross saving equals gross investment. Since one part of saving $(1-\phi)$ is lost in the process of channeling of savings to investment, the funds available for investment are:

$$\phi S_{t-1} = I_{t-1} \quad (3)$$

The growth rate g at time t is $g_t = (Y_t/Y_{t-1}) - 1 = (K_t/K_{t-1}) - 1$. Using equations (2) and (3) the steady-state growth rate is

$$g = As\phi - \delta \quad (4)$$

with s symbolizing saving rate (S/Y).

The model shows three channels from financial development to economic growth: the marginal productivity of capital, the proportion of saving funneled to investment, and the savings rate.

The other view of the theory of endogenous growth, namely the Schumpeterian growth models, is focused on technological innovations as channel through which the growth could be affected. Therefore, we could add, to the above mentioned channels that connect financial intermediation to economic growth, another one, the rate of technological innovation. Since the insurance companies act as financial intermediaries, the same channels connect their functions with economic growth.

2.2. Insurance and Economic Growth

Providing protection, insurers could affect economic growth through the channels of marginal productivity of capital, technological innovations and saving rate. Insurance companies indemnify the

ones who suffer a loss and stabilize the financial position of individuals and firms. With possibility of transfer of different kinds of risks to insurance companies, risk adverse economic units are more induced to buy goods and services, especially those of higher values. In this way insurance sustains demand or consumption for goods and services which encourage production and employment and finally, economic growth. Firms exposed to various risks of their liability, property, illness and disability of their employees and life of key employees, have possibility of managing of those risks by transfer to insurance companies. This allows firms to concentrate their attention and resources on their core business. Therefore, they are more willing and able to take real investments that result in higher rate of economic growth. Additionally, entrepreneurs are encouraged to take not only those investments that encompassed present products and production processes, but also those that include technological innovation. Namely, being innovative presupposes the willingness to take the risk. Although insurance cannot change the risk attitude of economic units (risk aversion does not change with insurance) it plays a key role in freeing entrepreneurial spirit (CEA, 2006). Therefore, insurance helps entrepreneurs to take innovative and higher-return projects. Without mechanism for mutualisation, pooling and transferring risk which insurance companies provide, part of the economic activities would not take place and positive effects on social welfare would fail. In other words, by creating an environment of greater security, insurance fosters investment and innovation or economic growth.

Insurance increases marginal productivity of capital also in a way that it makes no need for high liquid contingency funds of firms what results in more funds available for financing high-return projects. Without insurance coverage large contingency funds would be needed to protect firms against risk. It would be particularly hard for small and medium size firms whose access to financing in the case of adverse events is very limited.

Increasing availability of funds could result from kind of insurance products by which insurance companies provide protection from credit risk to other financial intermediaries. In that way financial intermediaries are more willing to lend funds for financing real investments what encourage economic growth.

Positive effect on economic growth through more efficient allocation of resources could be realized by relieving the burden of social welfare system. It is particularly important in the new demographic situation of prolongation of life expectancy, an increase in elderly people and a falling birth-rate while at the same time people expect to receive a high level of healthcare and pensions. It makes big pressure on social security system and could have negative effect on economic growth. But, private insurers could give their contribution in solving problem of social security system. They provide protection from the financial consequence of illness and injury, unemployment and retirement. Thus, insurance products such as life, health and payment protection insurance, can substitute for government security programs.

In the process of making decision on underwriting risk insurance companies gather relevant information on risk factor and assess risk. Insurers' risk assessment is reflected in price and policy conditions. Providing insurance to firms about which they have special knowledge insurers can signal their informed status. In this way, they offer firms an indicator of their risk level. This influences their decisions on investment projects and contributes to more efficiently allocation of their resources.

The function of providing insurance coverage could affect economic growth through saving rate channel in mixed way. On the one side, insurance protection contributes to greater security what makes individuals and firms less careful. As a consequence, they could lower their precautionary savings. On the other side, by offering various life insurance products that combine risk protection and saving benefits, insurance companies encourage long-term savings. Besides providing insurance, insurance companies could affect economic growth by function of resources accumulation and their allocation with managing various financial risks.

2.3. Resources Accumulation and Allocation and Economic Growth

In the process of accumulation and allocation of resources insurance companies lower transaction costs, achieve diversification and lower nonsystematic risk, provide limited liquidity and lower information asymmetry, by which they contribute to economic growth through channels of marginal productivity of capital, saving rate and technological innovation. However, besides the positive effect on economic growth through saving rate channel, by lowering nonsystematic risk by diversification and by lowering liquidity risk, insurance companies could affect economic growth negatively.

Insurers lower transaction costs or achieve economies of scale by collecting funds from dispersed economic units who pay relatively small premiums and by allocating these amassed funds to deficit economic units in order to finance large projects. In this way, insurers increase the feasibility of large, high-return real investments. Additionally, large amount of accumulated funds enables insurance companies to be more easily diversified than individual economic units who are limited in achieving diversification by small amount of their saving. In both ways they improve resources allocation and contribute to economic growth. The same effect on economic growth could be achieved through the technological innovation channel by diversification when insurance companies lend funds for financing a greater number of unrelated innovative projects. However, diversification could negatively affect economic growth through lowering saving rate. Namely, it is possible that the lower risk resulted from diversification may induce individuals to save less as it is showed by the model of Devereux and Smith (1994).

In the process of resources accumulation and their allocation insurance companies create liquidity. They use funds entrusted to them by policyholders to make long-term investments while at the same time provide instant liquidity if loss occurs. Particularly important in providing long-term sources of financing are life insurance companies that offer contractual savings products. In this way, insurers satisfy needs of both policyholders who have immediate access to loss payments and benefits and borrowers who can realize long-term project and need not repay their loans immediately. If the long-term entrusted funds borrowed from insurance companies are used for financing technological innovation, lower liquidity risk provided by insurance companies affects technological progress, too. However, there is also an opposite view according to which lowering liquidity risk through rising supply of consumer credit and mortgage loans of financial intermediaries could lower saving rate (Jappelli and Pagano, 1994).

Another importance of insurance companies for economic growth is their role in gathering and analyzing information on borrowers. In other words, insurance companies contribute to more efficient allocation of capital by lowering information asymmetry. Individual savers do not have time, resources and ability to gather and analyze information on borrowers, which might result in problem of adverse selection or even in their unwillingness to lend their funds. The advantages of insurance companies in resources allocation in relation to individual economic units are access to relevant information, knowledge and lower costs of information processing. Insurance companies are specialized for selecting high-productive projects. This results in the allocation of funds to those projects where the marginal productivity of capital is highest, and thus in higher rate of economic growth, as showed in the model of Greenwood and Jovanovic (1990). Additionally, since insurance companies have a continuing interest in the firms to whom they lend funds, they have an incentive to monitor managers to ensure shareholder rights and to achieve high standards of corporate governance. Insurers are more specialized in monitoring and could realize these activities at lower costs than individual economic units. In this way, insurance companies lower ex-post information asymmetry and the problem of moral hazard and contribute to more efficient capital allocation.

2.4. Other Channels of Influence on Economic Growth

Insurance companies could contribute to economic growth by realization of fourth function of financial system, facilitation of exchange. However, insurers do not facilitate exchange of goods and services

through payment mechanism directly, but indirectly through some kind of insurance products. In such manner, credit insurance has an important role, especially in the international exchange.

Performing all their functions, insurance companies absorb some fraction of resources $(1-\phi)$. This part of the resources is used to cover costs of insurance companies and to reward for their services, but it could also reflect X-non-efficiency and their market power, as well as regulatory limits on their activities. If insurance companies could lower this fraction of resources, i.e., raise proportion of saving funneled to investment, they would contribute to economic growth. One of the ways of increasing X-efficiency is mergers and acquisitions in insurance sector, as well as between insurance companies and other financial intermediaries, the processes that have been intensified in the last few decades. Financial innovations like derivatives instruments (both financial and insurance ones) and insurance securitization might contribute to more efficient management of actuarial and financial risks in insurance companies, which could contribute to lower leakage of resources. Additionally, innovative insurance distribution channels like bancassurance and e-channel could lower the distribution costs and increase efficiency of transfer saving into investments. Thus, these developments in insurance sector could positively affect economic growth rate. Regarding regulation Roubini and Sala-i-Martin (1992) revealed that a government repression of a financial sector has negative effect on growth.

The relevance of the above mentioned arguments pro insurance contribution to economic growth depends on their empirical validity. Therefore, the following is a review of empirical researches on the relationship between insurance and economic growth.

3. Review of the Empirical Literature

In the review of the empirical researches on the linkage between insurance and economic growth, we provide information on the samples according to the period of time and country/countries coverage, the measures of insurance variable, the methods of estimation and the results. Although there are empirical studies on the insurance-growth nexus, where the dependent variable is insurance, while economic growth is explanatory variable, our primary focus is the relationship between those two variables in the opposite direction. Therefore, we provide a review of empirical researches on the impact of insurance on economic growth.

Ward and Zurbrugg (2000) examine causal relationship between growth in insurance activity and economic growth for nine OECD countries during the period from 1961 to 1996. The annual real GDP is used as a measure of economic activity and annual total real insurance premiums as a measure of insurance activity. The authors apply bivariate VAR methodology to test for Granger causality. Causality tests from vector autoregressions in levels show that the insurance activity leads economic growth in two countries (Canada and Japan), while in the case of Italy there is a bidirectional relationship between insurance and economic activity. However, this relationship is weaker and less significant than for two above mentioned countries. For all other countries there is no evidence for the interaction. Causality tests from the error-correction models show similar results as previous tests. Exceptions are Australia and France for which results show some kind of connection. The authors conclude that the causal relationships between insurance and economic growth might well vary across countries because of the influence of number of country specific factors, such as cultural, regulatory and legal environment, the improvement in financial intermediation and the moral hazard effect in insurance.

Webb, et al. (2005) analyze the effect of banking and insurance on the growth of capital and output based on cross-country data of 55 countries for the period from 1980 to 1996. The insurance variable is measured by average insurance penetration (insurance premiums relative to GDP) of life and non-life insurance respectively. At the first stage they use ordinary least squares estimation method, while at the later one an iterated three stage least squares simultaneous estimation. The results of the first estimation, assuming exogenous financial variables, indicate positive effect of banking development on economic growth, while insurance variables do not enter significantly. The results of simultaneous equations, assuming endogenous relationship between financial activity and economic

growth, show that higher levels of banking and life insurance penetration predict higher rates of economic growth. Concerning the other direction of the relationship, economic growth affects life insurance penetration, while it does not predict banking development. There is no link between non-life insurance and economic growth in any direction.

Kugler and Ofoghi (2005) examine long-run relationship between insurance market size and economic growth in United Kingdom for the period from 1966 to 2003 for long-term insurance, and for the period from 1971 to 2003 for general insurance (from 1991 to 1997 for marine-aviation-transport insurance and reinsurance). In comparison to Ward and Zurbruegg, who use aggregate variable in their estimation (total written premiums) because of which there is possibility of co-integration, this study use disaggregated data for the measure of market size. Namely, net written premium for each market in insurance industry in the United Kingdom is used as a measure of market size for that market. The market is divided into long-term insurance market, that includes life insurance, annuities, individual pensions and other pensions, and general business insurance market including motor, accident and health, liability, property, pecuniary loss, marine, aviation and transport insurance and reinsurance. Using Johansen's cointegration tests the authors find a long-run relationship between development in insurance market size and economic growth for all components of insurance markets. Causality tests show that there is a long-run causality from growth in insurance market size to economic growth for eight out of nine insurance markets (the exception is pecuniary loss insurance). Causality in short-run exists from life, liability and pecuniary loss insurance to economic growth. There is an evidence of bidirectional causal relationship in the long-run between economic growth and insurance market size for the three insurance categories, with more powerful causality from economic growth to insurance development than the causality from the other direction.

Another empirically country-case analysis is the one by Adams et al. (2005) which examines the dynamic historical relation between banking, insurance and economic growth in Sweden in the period from 1830 to 1998. Insurance development is measured by annual aggregate (non-life and life) insurance premiums. They use time-series data and econometric tests for cointegration and Granger causality. The results show that the development of banking, but not insurance, preceded economic growth during the nineteenth century, while it was reversed in the twentieth century. Insurance development appears to be driven more by the pace of growth in the economy rather than leading economic development over the entire period of analysis.

Arena's (2008) empirical study on causal relationship between insurance market activity and economic growth includes 56 countries (both developed and developing ones) in the period from 1976 to 2004. Insurance premiums are used as proxies of total and life and non-life insurance activity separately. As an estimation method, the author uses the generalized method of moment for dynamic models of panel data. The results show a positive and significant effect of total, life and non-life insurance market activity on economic growth. Impact of life insurance on economic growth is driven by high-income countries only. In the case of non-life insurance, its impact is driven by both developed and developing countries, but it is larger in developed countries than in the developing ones. The author also examines the possibility of non-linear effects of life and non-life insurance variables on economic growth, but the results do not show the non-linearity in the relationship.

Haiss and Sümegi (2008) apply a cross-country panel data analysis from 29 European countries in the period from 1992 to 2005. The insurance variable is measured by premium income and total net investment of insurance companies. Premium income is split into life and non-life premium income. As estimation method the authors use ordinary least squares on unbalanced panel with country and time-fixed effects. According to the findings there is a positive impact of life insurance on GDP growth in the EU-15 countries, Switzerland, Norway and Iceland, while non-life insurance has a larger impact in Central and Eastern Europe.

Wadlamannati (2008) examines the effects of insurance growth and reforms along with other relevant control variables on economic development in India in the period from 1980 to 2006. Growth of insurance penetration (life, non-life and total) is used as proxies of insurance sector growth. The author applies ordinary least squares, cointegration analysis and error correction models. The study

confirms positive contribution of insurance sector to economic development and a long run equilibrium relationship between the variables. While the reforms in the insurance sector do not affect economic activity, their growth has positive impact on economic development.

Although there are strong theoretical explanations for positive impact of insurance sector to economic growth, the results of empirical researches carried out up to date are mixed. However, the number of empirical studies is relatively small, especially in relation to those on banking contribution to economic growth (for the survey see Levine (1997), Thiel (2001) and Ang (2008)). Moreover, the insurance-growth nexus in transition countries is examined separately only as a part of one study (Haiss and Sümegi, 2008). One of the main problems is availability of data on insurance activity. In order to contribute to filling of the gap, the following is the new empirical study.

4. Data and Methodology

In our research of insurance development and economic growth nexus, we estimate standard growth equation using a panel (cross-country, time-series) dataset consisting of 10 transition European Union member countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) over the period of 1992-2007. In order to get more observations we used annual panel data. Since some of the data on variables for some countries and years are missing, our sample is unbalanced. Table 1 presents the descriptive statistics for all the variables used in the regressions.

Table 1: Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
GDP growth	0.04330	0.04470	0.12240	-0.09400	0.03298
GDP per capita	4,673.56	4,356.81	11989.53	1,351.73	2,413.26
Life insurance	0.00779	0.00705	0.01741	0.00032	0.00484
Non-life insurance	0.01879	0.01713	0.03971	0.00515	0.00771
Insurance total	0.02659	0.02415	0.05653	0.00547	0.01107
Private credit	0.30802	0.29036	0.66685	0.06427	0.14817
Stock capitalization	0.14604	0.13283	0.43088	0.00043	0.10627
Investment	0.24894	0.25160	0.38360	0.08120	0.05458
Openness	0.51641	0.54800	0.78890	0.22310	0.15875
Education	0.94214	0.95610	1.09000	0.76780	0.06947
Inflation	0.22631	0.06190	94.85000	-0.00920	0.98764

Economic growth is measured by the growth rate of GDP per capita. The sources of data for this and all other variables are in the appendix. Insurance development is measured by insurance penetration (insurance premiums in percentage of GDP). We used three different insurance variables - life insurance, non-life insurance and total insurance. With regard to the functions of insurance companies and their potential positive contributions to economic activity, that we discussed in the context of theoretical considerations, the coefficients of parameters for both life and non-life insurance variables are expected to be positive.

To control for other determinants of economic growth, we include a broad set of control variables in our regression. The first two are also financial variables - banking and stock market development. The level of banking development is measured by bank credit to private sector in relation to GDP (private credit). As a proxy of stock market development we use stock capitalization divided by GDP. We expect positive relationship between the both financial variables and economic growth.

The next control variable is the initial level of economic development, measured by GDP per capita. This variable is introduced in the model to capture the convergence effect, or the tendency of the economic growth rate to converge across countries. Since we use the first difference of the variable, the expected sign of the parameter of the initial level of economic development variable is positive.

The following control variable is investment. We follow common practice for this variable by using gross capital formation (formerly gross domestic investment) as a proxy for investment. Gross

capital formation consists of outlays on additions to the fixed assets of the economy plus the net changes in the level of inventors. The expected sign of the coefficient is positive. A positive sign is also expected for the coefficient of education variable. Education accounts for human capital. Although there are a number of measures of the education variable, in the empirical studies of determinants of economic growth, the most commonly used measures are primary or secondary enrollments. We use secondary enrollment, which indicates the total number of children of secondary school age enrolled as a proportion of the total number of children of secondary school age.

The next variable used in our research as a determinant of economic growth is openness. As a measure of openness, we use the exports of goods and services in relation to GDP. We expect that exports are positively related to economic growth. The last variable used to control for other influences on economic growth is the inflation rate. It is used to account for monetary discipline. It is expressed by the GDP deflator (annual percentage). With this variable, we expect a negative correlation with economic growth.

The model we use in our research is the fixed-effects model for the next three model specifications:

$$y_{it} = \alpha_{it} + \beta LI_{it} + \sum_{k=2}^8 \theta_k C_{it} + \varepsilon_{it} \quad (1)$$

$$y_{it} = \alpha_{it} + \beta NLI_{it} + \sum_{k=2}^8 \theta_k C_{it} + \varepsilon_{it} \quad (2)$$

$$y_{it} = \alpha_{it} + \beta TI_{it} + \sum_{k=2}^8 \theta_k C_{it} + \varepsilon_{it} \quad (3)$$

with subscripts *i* denoting country and *t* denoting time. α is the intercept term. y_{it} is the dependent variable representing the growth rate of GDP per capita. LI_{it} , NLI_{it} and TI_{it} represent insurance variable - life insurance, non-life insurance and total insurance respectively. C_{it} is the vector of observations on the control variables that include private credit, stock capitalization, level of economic development, education, openness and inflation. β and θ are the vectors of coefficients to be estimated on the explanatory variables. The disturbance term is $\varepsilon_{it} \sim N.I.D.(0, \sigma^2)$.

Before running the regression an Im, Pesaran and Shin (IPS) panel unit-root test was employed to test the stationarity of the variables in order to avoid the spurious regression. The results of the unit root test are presented in Table 2. While the null hypothesis of the unit-root was strongly rejected for four out of the eleven variables, the obtained results indicate that there was a unit root in life insurance, non-life insurance, insurance total, private credit, stock capitalization, GDP per capita and education. To solve the problem of non-stationarity, the series were differenced.

Table 2: Unit root test

Variable	t value	p value
Economic growth	-5.81469	0.00000
Life insurance	0.13548	0.55390
Non-life insurance	0.81540	0.79260
Insurance total	0.04772	0.51900
Private credit	1.28398	0.90040
Stock capitalization	0.40168	0.65600
GDP per capita	4.45933	1.00000
Investment	-4.09281	0.00000
Education	1.60266	0.94550
Openness	-2.10222	0.01780
Inflation	-64.60910	0.00000

At the first stage the parameters are estimated by ordinary least squares (OLS). But, the equations estimated using OLS ignore the effects in other direction. Since there is a possibility of

reverse causality between insurance development and growth, in the next stage we extend analysis to the estimation by using instrumental variables that accounts for some endogeneity in the explanatory variables. We apply two-stage least squares (2SLS) estimators. As instruments, we use one-period lagged regressors. In order to estimate the regressions with heteroscedasticity robust standard errors we use White's modified standard error estimates in all specifications.

5. Empirical Results

The estimates of the parameters of the models for three specifications are presented in the following tables. Table 3 presents parameters estimated using OLS, while the coefficients estimated by 2SLS are reported in Table 4.

According to the results for the first model specification the life insurance variable enters positively in growth equations, but it lacks significance. The coefficients of all control variables, but education, have the expected sign and they are significant. The non-life insurance variable's parameter in the second model specification is positive and significant and the same is true for the coefficient of total insurance variable in the third model specification. The results confirm theoretical literature on the linking between insurance development and economic growth. Regarding the control variables, all coefficients have expected sign and they are significant, except of private credit and education in the third specification.

Table 3: Estimation results - OLS

Explanatory variables	Dependent variable: economic growth		
	(1)	(2)	(3)
Constant	-0.04557*** (0.01300)	-0.04003*** (0.00623)	-0.04389*** (0.01093)
Life insurance	0.58666 (0.45450)		
Non-life insurance		1.73595*** (0.34365)	
Insurance total			0.46818*** (0.18502)
Private credit	0.05303* (0.02997)	0.00005 (0.03584)	0.04002 (0.02780)
Stock capitalization	0.04303* (0.02322)	0.04521*** (0.01770)	0.04639** (0.01996)
GDP per capita	0.00018*** (0.00001)	0.00021*** (0.00001)	0.00019*** (0.00001)
Investment	0.10872*** (0.02333)	0.07423*** 0.01929	0.10516*** (0.02268)
Education	0.04209 (0.03189)	0.11637*** 0.02594	0.04774 (0.03328)
Openness	0.04478** (0.01805)	0.04334*** 0.01052	0.04165** (0.01627)
Inflation	-0.00740*** (0.00098)	-0.00979*** 0.00076	-0.00759*** (0.00095)
Adjusted R-squared	0.91365	0.93670	0.91518
F-statistic	25.08056	38.48818	25.55819
Prob(F-statistic)	0.00000	0.00000	0.00000
Durbin Watson stat	1.71647	2.09293	1.67972

Standard errors in parentheses. ***, **, * denote statistical significance at the 1, 5, 10 percent level

Regarding coefficients estimated using instrumental variables that accounts for endogeneity in the explanatory variables, all insurance variables' coefficients have significant positive signs. Life insurance is significant at 5 per cent level, while both non-life and total insurance are significant at 1%

level. Regarding the control variables, all of the coefficients, except for private credit in the second specification, have the expected sign. Insignificance of private credit variable in the most of the specifications could suggest that banks and insurance companies' financial intermediation are substitutes.

Table 4: Estimation results - 2SLS

Explanatory variables	Dependent variable: economic growth		
	(1)	(2)	(3)
Constant	-0.06220** (0.02723)	-0.05297*** (0.00913)	-0.05656*** (0.02402)
Life insurance	0.87451** (0.41427)		
Non-life insurance		1.93695*** (0.45220)	
Insurance total			0.53084*** (0.18501)
Private credit	0.06098* (0.03298)	-0.02411 (0.04240)	0.04335 (0.03059)
Stock capitalization	0.03400 (0.02762)	0.03238 (0.02062)	0.03770 (0.02614)
GDP per capita	0.00017*** (0.00002)	0.00020*** (0.00001)	0.00017*** (0.00002)
Investment	0.06311 (0.07094)	0.07791** (0.03798)	0.04846 (0.06632)
Education	0.02329 (0.03499)	0.12614*** (0.02182)	0.02825 (0.03625)
Openness	0.10402*** (0.03939)	0.07004*** (0.01733)	0.09859*** (0.03592)
Inflation	-0.00931*** (0.00198)	-0.011694*** (0.00183)	-0.00978*** (0.00171)
Adjusted R-squared	0.90019	0.95850	0.90073
F-statistic	23.44861	36.82380	24.45588
Prob(F-statistic)	0.00000	0.00000	0.00000
Durbin_Watson stat	1.77918	2.03372	1.69051

Standard errors in parentheses. ***, **, * denote statistical significance at the 1, 5, 10 percent level

6. Summary and Concluding Remarks

Using endogenous growth model and panel data estimation techniques we examined whether life and non-life insurance, individually and collectively contribute to economic growth across sample of 10 transition European Union member countries in the period from 1992 to 2007.

According to our results insurance development promotes economic growth. Thus, functions of insurance companies - providing means of risk management and performing mobilization and allocation of resources - are important for economic growth. The results are confirmed in terms of life and non-life insurance, as well as, total insurance, even after controlling for other determinants of economic growth and endogeneity. These study findings are consistent with the arguments of finance-growth nexus theory.

The findings could be suggestive for insurance sector's policy makers. The key is to implement the policies that are going to provide institutional improvements, encourage competition, and contribute to increasing efficiency, especially in risk management, and product development of insurance companies. Countries that are concerned with demographic challenges and problems with social security system should continue to implement incentives for stimulating more participation of insurance companies in providing the private supplement to public pension and healthcare pillars. With

all of these improvements, insurance sector would have more potential to contribute to economic growth.

In the future research of insurance-growth nexus, besides insurance penetration, insurance development could be measured by insurance density and by the assets of insurance companies. Regarding estimation techniques future work could apply generalized method of moments for dynamic models of panel data that also control for endogeneity. Moreover, in dependence of availability of data, in the future research more transition countries could be added in sample.

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Appendix: Source of the Data on the Variables Used in the Regression Analysis

Variable	Sources
Gross domestic product	World development indicators (WDI) database, World Bank
Insurance (life, non-life, total)	Sigma, Swiss Re Economic Research & Consulting, Swiss Re, Zurich Pye (2003) National insurance supervisory authorities for the part of the countries.
Private credit	Financial structure database, World bank Transition Report, EBRD
Stock capitalization	Financial structure database, World bank Transition Report, EBRD
Investment	World development indicators (WDI) database, World Bank
Education	EdStats, World Bank
Export	International Financial Statistics, IMF, line 90c World development indicators (WDI) database, World bank
Inflation	World development indicators (WDI) database, World Bank