

## INSURANCE MARKETS INTEGRATION AND ECONOMIC GROWTH IN THE VISEGRAD GROUP COUNTRIES IN 1999-2019

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**Purpose:** the aim of the article is to examine the impact of the degree of insurance markets integration on economic growth in the Visegrad Group countries in the years 1999-2019.

**Design/methodology/approach:** the research was divided into two stages. In the first stage the degree of the insurance markets integration of the Visegrad Group countries was assessed. Insurance market integration measures have been established with regard to gross written premium (Ilg) and investments (Qg). In the second stage of the research, the impact of the degree of insurance markets integration on economic growth in the Visegrad Group countries was assessed. In order to investigate the impact of the degree of insurance markets integration on economic growth, an econometric model was constructed. The model was built using the backward stepwise regression method and then estimated using the Engle-Granger cointegration test.

**Findings:** the conducted empirical analysis based on statistical and econometric methods allows for the formulation of several important conclusions regarding the insurance markets integration of the Visegrad Group countries. Firstly, the degree of insurance markets integration, measured by integration indicators, is quite high and there is a tendency to its further growth. At second, the impact of the insurance market integration's degree (measured by Qg) on economic growth is rather weak. Variable Ilg is statistically insignificant. Thus, the conducted research shows that the degree of insurance markets integration, measured by integration indicators, is poorly related to the economic growth in the Visegrad Group countries in the analyzed period.

**Practical implications:** the research results can be used by insurance companies and insurance market institutions to develop their insurance business.

**Originality/value:** the article presents original research findings and fills a research gap on the impact of insurance market integration on economic growth in the Visegrad countries and contributes to the discipline of economics and finance.

**Keywords:** international financial markets, insurance, economic growth, Visegrad Group.

**Category of the paper:** research article, case study.

## 1. Introduction

The insurance markets integration on the international scale affects the economic growth by stimulating the development of the insurance market as a part of the financial development (e.g. Kozarević et al., 2013; Njegomir, Marović, 2012; Andelić et al., 2010). The process of insurance market integration, like of other segments of the financial market, increases inflows of foreign capital to the insurance sector in a country, which improves the effectiveness of insurance companies (e.g. Bukowski, Lament, 2020). The access of enterprises and households to the large international insurance market, the financial stability and security of insurance companies improve as the effect of risk sharing is applied to the formation of investment portfolios (e.g. Cummins, Rubio-Misas, 2006; Swiss Re, 1996). The effectiveness of capital allocation improves. What is more, the international insurance markets integration (through the harmonisation of legal regulations) leads to the improvements of accounting standards, corporate governance, insurance supervision and the associated prudential rules, and financial law (e.g. Gąsiorkiewicz, Monkiewicz, 2022; Monkiewicz, Monkiewicz, 2022; Nissim, 2010; Monkiewicz, 2005; Monkiewicz, Wanat-Połeć, 2005; Fedor, 2005). In effect, the integration of financial markets helps improve the effectiveness of insurance companies and fosters economic growth.

The aim of the article is to examine the impact of the degree of insurance markets integration on economic growth in the Visegrad Group countries in the years 1999-2019. In the first stage of the research, the degree of the insurance markets integration of the Visegrad Group countries was assessed. Insurance market integration measures have been established with regard to gross written premium (Ilg) and investments (Qg). In the second stage of the research, the impact of the degree of insurance markets integration on economic growth in the Visegrad Group countries was assessed.

In order to investigate the impact of the degree of insurance markets integration on economic growth, an econometric model was constructed. The model was built using the backward stepwise regression method and then estimated using the Engle-Granger cointegration test.

The research used annual financial data on insurance markets from the OECD Statistics and EIOPA Statistics databases, while macroeconomic and monetary data from the AMECO Database and ECB Statistical Data were used.

The research covered the period 1999-2019. The article uses the STATISTICA 13 and GRETL software.

The paper is structured as follows: the theory of insurance market integration is briefly analysed in the first part, while the second presents the characteristics of the insurance markets of the Visegrad Group countries. The third part shows measures of the insurance markets integration' degree and their picture in the Visegrad Group. The fourth part presents impact of the insurance markets' integration on economic growth in the Visegrad Group countries and discusses the main results of the model estimation. The last part summarises the results.

## 2. Insurance market integration – literature review

The international integration of financial markets plays an important role in the development of financial markets and their impact on economic growth. The insurance market is characterised by certain specificities which make it difficult to assess integration processes. Therefore, the issues related to the integration of the insurance market constitute a poorly recognized research area.

One of the stages of insurance market integration were the third Generation Directives (Council Directive 92/49/EEC of 18 June 1992 and Council Directive 92/96/EEC of 10 November 1992), which introduced a single EU license whereby an insurer licensed in one EU country can do business in all EU countries without obtaining additional licenses or being subject to regulations by host countries. The Directives also abolished substantive insurance supervision, freeing insurers from the regulation of prices and conditions as well as removing other regulatory impediments to competition. However, legal systems and institutional and cultural characteristics still differ significantly across EU countries (e.g., Cummins, Venard, 2008; Bikker, Gorter, 2011; Berry-Stölzle et al., 2013; Cummins et al., 2017; Bukowski, Lament, 2020).

According to the basic concept of financial market integration, the law of one price is in force. This means that in integrated financial markets, assets generating identical cash flows have the same price (rate of return). Referring it directly to the insurance market, it would mean that policyholders should be able to purchase insurance cover in each country (region) on the same conditions, regardless of the location of an insurance company. It can be assumed that if there are uniform legal regulations for conducting insurance activity, it is possible. It is the subject of numerous legal analyses, which means that the phenomenon of the insurance market integration in its legal aspect is both the subject of regulation the adaptation of national regulations to supranational regulations, and scientific and research analyses (e.g. Gąsioriewicz, Monkiewicz, 2022; Monkiewicz, Monkiewicz, 2005, 2022; Nissim, 2010; Monkiewicz, 2005; Monkiewicz, Wanat-Poleć, 2005; Fedor, 2005).

From the financial point of view, it is important to analyse it in the real sphere and demonstrate that such processes take place, and to examine the degree of this integration. It is not an easy question to study. While, for example, in the banking sector it is possible to analyse the interest rate on individual types of loans or the interest rate on deposits, in the insurance sector one cannot directly compare the price of insurance protection (insurance premium) for individual types of insurance, or the value of claims and benefits from individual types of insurance. This is due to the differentiation of risk even within individual types of insurance and different insurance conditions. This means that the insurance premium (the price of the insurance cover) varies depending on the scope of the cover. Therefore, there is a problem with a thorough analysis and unambiguous comparison of insurance offers. The diversified

scope of insurance coverage generates different prices that are difficult to compare unequivocally even within one national market for a given type of insurance. Hence, it is difficult to say whether there is a single price in the insurance market, and therefore the possibility of assessing the degree of integration of the insurance market.

Most analyses on integration, especially on convergence in efficiency across EU financial services markets have focused on the banking industry (e.g. Weill, 2009; Casu, Girardone, 2010; Matousek et al., 2015; Tziogkidis et al., 2020).

Research into the integration of the insurance market has been carried out by, among others:

- Cummins, Rubio-Misas (2022) – analysing integration and convergence both in efficiency and in technology gap of 10 EU life insurance markets over the period 2008-2014. In research applied the meta-frontier Data Envelopment Analysis. Results show convergence in cost/revenue efficiency among major EU life insurance markets during the sample period. The global crisis has led to a slowdown in the progress of integration and convergence in efficiency and technology gap of EU life insurance markets in terms of cost efficiency but not in terms of revenue efficiency.
- Bukowski, Lament (2022) - the authors define the insurance markets integration. And they present the main measures concern the degree of the insurance market integration. The research concerns insurance markets integration in the EU (1999-2019) and analysis of the dependency between the insurance markets integration and economic growth in the EU and especially in the euro area (1999-2019). The authors also investigated the influence of the monetary policy (QE) on the insurance market and degree of insurance markets integration. Both the ratios of insurance markets' integration both in the whole EU and in the euro area are very similar, though somewhat higher in the euro area than estimated for the entire EU. There is a rather strong, positive, and statistically significant impact of the variations of  $I_{ig}$  and  $Q_{g}$  on economic growth in the European Union countries. The situation in the euro area is similar, although the effect of variable (ratio)  $I_{ig}$  is statistically insignificant, whereas the impact of  $Q_{g}$  changes on the rate of economic growth is statistically significant and quite strong.
- Giantsios, Noulas (2020) – the authors estimated revenue efficiency and efficiency convergence with dynamic panel data models for 22 EU insurance markets during the financial crisis and after – in 2006-2014. In estimating the level of convergence, the concepts of  $\beta$ -convergence and  $\sigma$ -convergence are used. The results show that the average revenue efficiency is found to be relatively stable over the period 2006-2014 with a noticeable reduction for the period 2006-2008 due to the global financial crisis.
- Cummins, Rubio-Misas (2018) – examine the impact of integration on the efficiency of EU life insurance markets in 1998-2011. The authors use Data Envelopment Analysis (DEA) and panel data models. In order to determine if the EU deregulation policies have succeeded in improving the efficiency and performance of life insurance sectors, the authors evaluate the dynamics of efficiencies obtained by DEA, a non-parametric

frontier approach. In the analysis, efficiency is measured by comparing firms to “best practice” efficient frontiers formed by the most efficient firms in the industry. Financial market development, legal and governmental systems, as well as competitive intensity are found to affect insurance market performance and integration.

- Schoenmaker, Sass (2016) – analyse the internationalisation of insurance groups and identify some scope for supervision connected with problems due to internationalisation. The empirical findings suggest a high degree of cross-border penetration in European insurance. This high and increasing degree of internationalisation of European insurance groups poses a challenge for supervision – it may tilt the supervisory balance.
- Kozarević et al. (2013) – research the process of integration of Western Balkan countries (Albania, Bosnia and Herzegovina, Croatia, Montenegro, Former Yugoslav Republic of Macedonia, Kosovo and Serbia) into the EU in 2002-2011. The Spearman’s coefficient of rank correlation is used as the measurement of correlation between the development of the integration into the EU. The authors use the following indicators of insurance market development: total premium per capita, ratio of total premium to GDP (Gross Domestic Product), share of life insurance products, legal and institutional environment and solvency standard. The authors conclude there is a strong positive correlation between the insurance development in the Western Balkan states and the process of their European integration.
- Njegomir, Marović (2012) – have identified five key trends in the insurance market. These affect the insurance industry and the activity of insurance companies. They are: integration processes, which encompass globalisation, consolidation and convergence, intensified catastrophic events, and new risks, mainly caused by the emerging technologies. Integration is one of the factors which influences insurance markets development.
- Andelić et al. (2010) – analyse the influence of globalisation on the insurance and reinsurance markets of Eastern Europe from 2000 to 2008. The results confirm the significance of the relationship between globalisation trends and changes in the insurance and reinsurance markets of Eastern Europe. Integration is one of the factors which influences insurance markets development.
- Jurkiewicz, Wycinka (2006) – evaluate the level of European markets integration in 1999 by using multivariate statistical methods (Pearson correlation index, k-mean clustering, factor analysis, Self Organizing Map). The authors use two groups of variables. The first group show the importance of insurance markets to the economy (premium/GDP, investment/GDP, investments in shares/market capitalisation, insurance employment/service, premium per inhabitant, insurance employment per inhabitant). The other group of variables describe the structure of insurance markets (provisions/premium ratio, number of companies per thousand inhabitants, share of the

five largest life insurance companies, share of the five largest non-life insurance companies, share of life premium in total premium, share of life investment in total insurance investments, life investments/life premium, non-life investments/non-life premium, share of motor premium in total premium). According to the authors, the European insurance market is integrated on a very low level.

The analysis of the literature on the subject shows that the research so far has not in principle assessed the degree of insurance markets integration, except research Bukowski, Lament (2022). The integration of insurance markets was studied mainly as one of the factors of market development and improvement of their efficiency. Two studies – Jurkiewicz, Wycinka (2006) and Kozarević et al. (2013) – concern the assessment of the degree of insurance markets integration, however, the proposed research methodology does not constitute a comprehensive approach, but only covers selected elements. Research by Kozarević et al. (2013), Njegomir, Marović (2012) and Andelić et al. (2010) indicate that the insurance market integration influences the development of the insurance market.

The conducted research on the subject literature allowed for the formulation of the following research hypothesis: the degree of the insurance market integration affects economic growth.

The article fills the research gap in assessing the degree of insurance markets integration and their impact on economic growth. Such research was conducted by Bukowski, Lament (2022) in relation to the insurance markets of the European Union and the euro area.

### **3. Research methodology**

#### **3.1. Characteristics of the insurance markets of the Visegrad group countries**

Domestic insurance markets are diversified in terms of their size and degree of development. This is due to the size of the country, its population and the degree of economic development. Due to the similar level of economic development of the Visegrad Group countries, it seems that their insurance markets should be characterized by similar parameters. The insurance markets of the surveyed countries were analyzed against the European Union (EU) insurance market using such measures as: gross premium written, number of insurance companies, share of life insurance in the insurance market, insurance penetration ratio (premium written/GDP) and insurance density ratio (premium written/population). The research period covers the years 1999-2019, but to ensure better transparency of the presentation of research results, they were presented every 5 years. The characteristics of the insurance markets of the Visegrad Group countries compared to the EU insurance market are presented in Table 1.

**Table 1.**

*Characteristics of the insurance markets of the Visegrad Group countries in comparison to the EU insurance market in 1999-2019*

Specification	Years				
	1999	2004	2009	2014	2019
Gross written premium (US Dollar, Million) (1)					
Czech Republic	1 815 (0.15)	4 380 (0.28)	7 561 (0.51)	6 238 (0.45)	7 215 (0.61)
Poland	4 663 (0.38)	7 558 (0.49)	16 286 (1.09)	14 144 (1.02)	15 869 (1.35)
Slovakia	574 (0.04)	1 487 (0.09)	2 794 (0.18)	2 198 (0.15)	2 490 (0.21)
Hungary	1213 (0.1)	2 963 (0.19)	3 898 (0.26)	2 964 (0.21)	3 909 (0.33)
European Union	1 205 375 (100.0)	1 520 437 (100.0)	1 484 642 (100.0)	1 375 113 (100.0)	1 171 643 (100.0)
Number of insurance companies (2)					
Czech Republic	42 (0.92)	40 (0.92)	53 (1.31)	53 (1.44)	46 (1.43)
Poland	63 (1.38)	72 (1.66)	66 (1.63)	57 (1.55)	59 (1.84)
Slovakia	28 (0.61)	26 (0.6)	34 (0.84)	38 (1.03)	38 (1.18)
Hungary	24 (0.52)	24 (0.55)	27 (0.66)	25 (0.68)	16 (0.49)
European Union	4 549 (100.0)	4 325 (100.0)	4 045 (100.0)	3 667 (100.0)	3 202 (100.0)
Share of life insurance in the insurance market (in %)					
Czech Republic	31.5	39.2	41.7	45.0	32.0
Poland	31.8	37.8	58.9	52.1	32.3
Slovakia	33.1	40.2	51.4	54.2	48.5
Hungary	16.5	23.7	26.5	30.8	29.1
European Union	51.5	56.8	61.0	58.4	56.6
Insurance penetration ratio (premium written / GDP) (in %)					
Czech Republic	3.0	3.6	3.6	3.5	2.8
Poland	2.7	2.9	3.7	2.9	2.6
Slovakia	1.9	2.5	3.2	2.9	2.6
Hungary	2.3	2.6	2.8	2.6	2.6
European Union	5.2	5.4	5.5	5.6	6.8
Insurance density ratio (premium written / population) (US Dollar)					
Czech Republic	175	426	718	711	663
Poland	118	194	427	453	418
Slovakia	106	276	535	543	517
Hungary	201	207	294	271	346
European Union	2 541	3 252	2 616	2 610	2 374

Note:

1. Data in brackets represent the share of the gross written premium of a given country in the gross premium written of the European Union (data in %).
2. Data in brackets represent the share of the number of insurance companies in a given country in the number of insurance companies in the European Union (data in %).

Source: the authors' own research based on: OECD Statistics, EIOPA Statistics databases and Swiss Re (2020).

The analysis of data characterizing the insurance markets of the Visegrad Group countries shows that their share in the EU insurance market, measured by gross written premium in the analyzed period, ranged from 0.67% in 1999 to 2.5% in 2019. The largest insurance market is the Polish market, whose share in the EU market ranged from 0.38% to 1.35% of gross written premium, and the smallest is the Slovak market, whose share in the EU insurance market was from 0.04% to 0.21% of the premium gross written off. The number of insurance companies on the insurance market of the Visegrad Group constituted from 3.43% in 1999 to 4.94% of the total number of insurance companies operating in the EU. Also, according to this criterion, the largest insurance market was the Polish market. The assessment of the structure of the insurance

market, i.e. the share of life insurance in the insurance market, shows that it generally does not exceed 50% (except for selected periods in relation to Poland and Slovakia) and differs quite significantly from the EU insurance market, where the share of insurance in life in the analyzed period amounted to about 60% of total insurance. The insurance penetration ratio, reflecting the importance of the insurance sector in the economy of a given country, ranged from 1.9% (in 1999 in Slovakia) to 3.7% (in 2009 in Poland). The similar value of this indicator in the analyzed countries (it is noticeable especially in 2019) indicates a similar importance of the insurance sector in the national economies of the surveyed countries. It should be noted that the EU insurance market has a much higher insurance penetration ratio - almost 7% in 2019. The insurance density ratio, which is used to assess the level of development of the insurance market, should be interpreted similarly. The EU insurance market is characterized by a much higher level of this ratio. It should be noted that the Czech and Slovak insurance markets achieved a better insurance density ratio than Poland and Hungary.

Summing up, it should be stated that the insurance markets of the Visegrad Group countries are diversified both in terms of their size and structure as well as their development and importance in the economy. However, this is not too much differentiation, allowing the analyzed insurance markets to be treated as a homogeneous group. The described differences result to a large extent from the size of a given country, the number of its inhabitants, and the degree of its development.

### 3.2. Measures of the insurance markets integration degree and their picture in the Visegrad group

We have presented our concept of the insurance markets integration degree measures in the book: *Insurance Markets Integration in the European Union* (Bukowski, Lament, 2022).

“We assume that a higher integration degree of country *i*'s insurance market into foreign markets means a higher share of the written premium from insurance for foreign residents abroad in the total written premium of the home companies in country *i*. To begin with, we propose the following approach. We assume that one of the main indicators in the field of insurance is the written premium. We treat that indicator as a base for the construction of the insurance markets integration indicators.

Let's look at the main variables:

$$WP_{hi,t} = WP_{hi,t}^L + WP_{hi,t}^P \quad (1)$$

$$WP_{fi,t} = WP_{fi,t}^L + WP_{fi,t}^P \quad (2)$$

$$WP_{hfi,t}^T = WP_{hi,t} + WP_{fi,t} \quad (3)$$

$$II_{i,t} = \frac{WP_{fi,t}}{WP_{hfi,t}^T} \quad (4)$$

where:

$WP_{hi,t}$  – total written premium of home companies from the insurance for home residents,  $i$  country in period  $t$ ,

$WP_{fi,t}$  – total written premium of home companies from insurance for foreign residents abroad in the region (home company directly),  $i$  country in period  $t$ ,

$WP_{hi,t}^L$  – written premium of home companies from the insurance for home residents,  $i$  country in period  $t$  – life insurance,

$WP_{hi,t}^P$  – written premium of home companies from the insurance for home residents,  $i$  country in period  $t$  – non-life insurance,

$WP_{fi,t}^L$  – written premium of home company from insurance for foreign residents abroad (home company directly),  $i$  country in period  $t$  – life insurance,

$WP_{fi,t}^P$  – written premium of home company from insurance for foreign residents abroad (home company directly),  $i$  country in period  $t$  – non-life insurance,

$WP_{hfi,t}^T$  – total written premium of home companies from the insurance for home residents and for foreign residents,  $i$  country in period  $t$ ,

A higher value of the indicator means a higher degree of country  $i$  integration into foreign insurance markets in the period  $t$ .

For all groups of countries:

$$\Pi_g = \frac{\sum_{i=1}^n \Pi_{i,t} d_{i,t}}{\sum_{i=1}^n d_{i,t}} \quad (5)$$

where:  $d_{i,t}$  – number of inhabitants in country  $i$  in period  $t$  as the weight.

A higher value of the indicator means a higher degree of integration of insurance market into the group of  $n$ -countries (for example EU, the euro area's countries) in the period  $t$ .

We also propose other indicators based on the concept of the quantity-based indicators.

$$Q_{i,t}^P = \frac{PI_{i,t}^h + PI_{i,t}^f}{GDP_{i,t}} \quad (6)$$

where:

$PI_{i,t}^h$  – the portfolio investment of the country  $i$ 's insurance companies abroad in period  $t$ ,

$PI_{i,t}^f$  – the portfolio investment of foreign insurance companies in country  $i$  in period  $t$ ,

$GDP_{i,t}$  – GDP in country  $i$  in the period  $t$ .

A higher value of the indicator means a higher degree of country  $i$ 's integration into foreign insurance markets in the period  $t$ .

For the group of countries:

$$Q_g = \frac{\sum_{i=1}^n Q_{i,t}^P d_{i,t}}{\sum_{i=1}^n d_{i,t}} \quad (7)$$

where:  $d_{i,t}$  – number of inhabitants in country  $i$  in period  $t$  as the weight.

A higher value of the indicator means a higher degree of integration of an insurance market into the group of  $n$ -countries (for example, the EU, the euro area's countries) in the period  $t$  (Bukowski, Lament, 2022, p. 100).

We adopt in this paper those measures to our analysis of the insurance markets integration in the Visegrad Group.

In order to illustrate the extent of variables concerning insurance markets studied and their distribution in the time examined, the following tables (Table 2 and Table 3) contain key statistics for those variables.

**Table 2.**

*Basic statistics concerning the variables studied of the Visegrad Group insurance markets in 1999-2019 – gross written premium*

Specification	$WP_{hi,t}$ (Total)	$WP_{hi,t}^L$ (Life)	$WP_{hi,t}^P$ (Non-life)	$WP_{fi,t}$ (Total)	$WP_{fi,t}^L$ (Life)	$WP_{fi,t}^P$ (Non-life)	$WP_{hfi,t}^T$ (Total)
N importance	84	84	84	84	84	84	84
Average	6228.933	2987.023	3252.594	43.757	19.482	24.275	6248.384
Median	4053.364	1878.941	2079.954	3.878	0	0.2835	4053.3645
Maximum	24641.334	16181.845	11202.089	376.439	218.159	318.571	24641.334
Minimum	574.271	190.218	353.672	0	0	0	615.136
Variance	29804002	9215051.79	6975490.54	7416.44	1843.34	4827.477	29860022.1
Standard deviation	5459.304	3035.630	2641.115	86.118	42.934	69.48	5464.432

Note:

$WP_{hi,t}$  – total written premium of home companies from the insurance for home residents (US Dollar, Million).

$WP_{hi,t}^L$  – written premium of home companies from the insurance for home residents (US Dollar, Million).

$WP_{hi,t}^P$  – written premium of home companies from the insurance for home residents – non-life insurance (US Dollar, Million).

$WP_{fi,t}$  – total written premium of home companies from insurance for foreign residents abroad in the region (home company directly) (US Dollar, Million).

$WP_{fi,t}^L$  – written premium of home company from insurance for foreign residents abroad (home company directly) – life insurance (US Dollar, Million).

$WP_{fi,t}^P$  – written premium of home company from insurance for foreign residents abroad (home company directly) – non-life insurance (US Dollar, Million).

$WP_{hfi,t}^T$  – total written premium of home companies from the insurance for home residents and for foreign residents (US Dollar, Million).

Source: the authors' own research based on STATISTICA 13.

**Table 3.**

*Basic statistics concerning the variables studied of the Visegrad Group insurance markets in 1999-2019 – investments of insurance companies*

Specification	$PI_{i,t}^h$	$PI_{i,t}^f$
N importance	84	84
Average	1620.424	8139.533
Median	1004.478	6228.316
Maximum	5766.964	26051.843
Minimum	0.00	282.637
Variance	3650604.45	34350825.6
Standard deviation	1910.655	5860.957

Note:

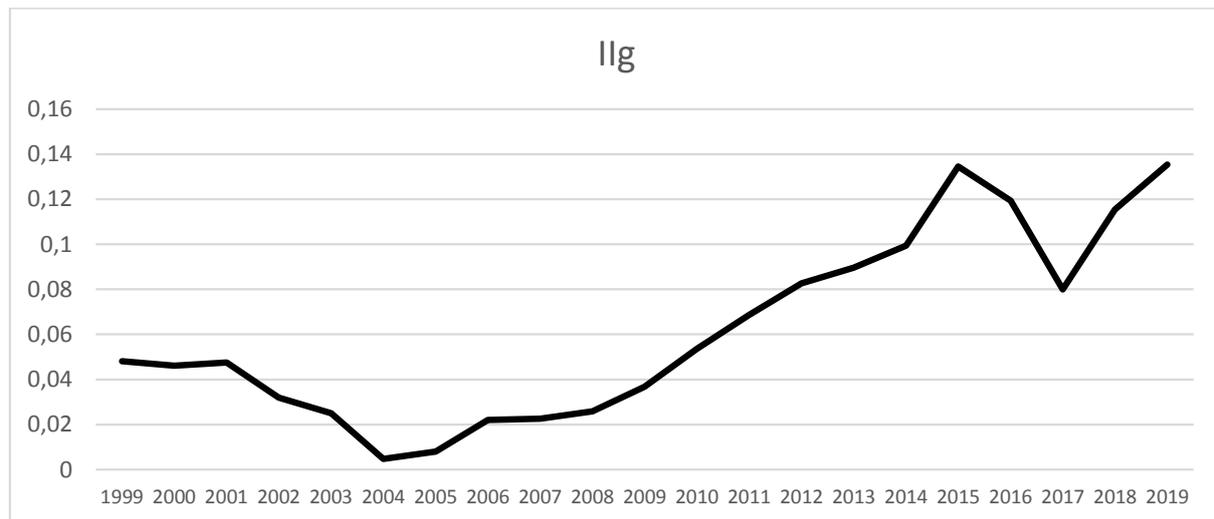
$PI_{i,t}^h$  – the portfolio investment of the country's insurance companies abroad (US Dollar, Million).

$PI_{i,t}^f$  – the portfolio investment of foreign insurance companies in country (US Dollar, Million).

Source: the authors' own research based on STATISTICA 13.

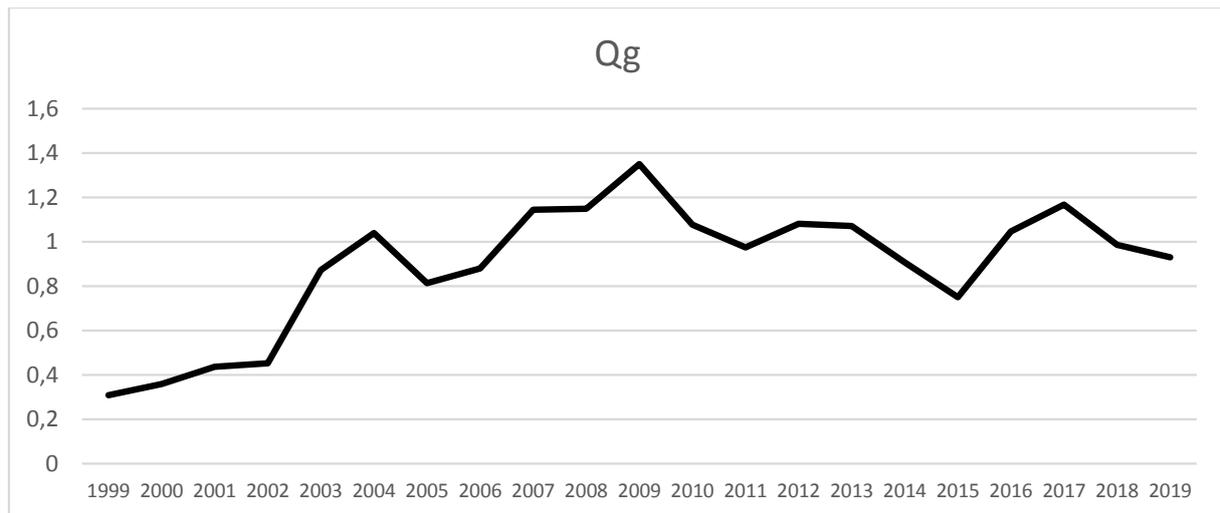
An analysis of the data in Table 2 and in Table 3 shows the variables for the premium and investments of insurance companies active in the Visegrad Group markets in 1999-2019 are internally diversified. This is affirmed by both the variables assessing the dispersion – variance and standard deviation, which demonstrate a dispersion of the variables around the average – and those estimating the maxima and minima, evidence of a large diversity of the variables' distribution. Causes of the considerable dispersion in the distributions of the variables examined can be attributed to a diversity of their insurance markets' development, and the rather long period of research, which the basis statistics show to have been varied – hence the large differences between the minimum and maximum values of the variables.

Figures 1 and 2 present the integration of insurance markets in the Visegrad Group countries in 1999-2019.



**Figure 1.** Degree of insurance markets integration in the Visegrad Group in 1999-2019 – indicator IIG.

Source: own estimation.



**Figure 2.** Degree of insurance markets integration in the Visegrad Group in 1999-2019 – indicator Qg.  
Source: own estimation.

Both of the indicators IIg and Qg indicate that generally we can note increase in integration degree of insurance markets since 1999 till the 2019. But of course, we can observe that there were some periods when the degree of integration decreased (as for example 2015-2017). On this stage of our research it is difficult to say why.

We can also observe that there are differences in indication of the measure IIg and Qg. But it is normal, because each of both indicator is based on the different variables. The same on the lower scale we can observe in the case of the synthetic measures of the degree of financial markets integration, which are applied in the report: *Financial integration in Europe* (Bukowski, 2020).

#### 4. The impact of the insurance markets integration on economic growth – results of model estimation

The data from OECD Statistics and EIOPA Database (the figures concerning the insurance markets), AMECO Database and ECB Statistical Data Warehouse (macroeconomic and monetary data) databases are utilised. The research period covers years 1999-2019.

The research was carried out using the GRETL software.

To determine the impact of the insurance markets' integration on economic growth in the Visegrad Group countries, the following model is constructed:

$$\ln GDP_t = a_0 + a_1 \ln GFCF_t + a_2 \ln IIg_t + a_3 \ln Qg_t + u_t \quad (8)$$

where:

$GDP_t$  – gross domestic product in the Visegrad Group countries, respectively, in constant price terms (2010),

$GFCF_t$  – gross fixed capital formation as a proxy for gross investment in economies for the  
Visegrad Group countries respectively, in constant price terms (2010),

$I_g$  – the ratio of insurance market integration,

$Q_g$  – the ratio of insurance market integration,

$u_t$  – random factor.

Model was built with using step wise regression with backward elimination. As a criterion we have taken collinearity and correlation between independent variables and explanatory variable.

Results of the Engle – Granger test for cointegration:

Augmented Dickey-Fuller test for uhat

testing down from 1 lags, criterion AIC

sample size 19

unit-root null hypothesis:  $a = 1$

test without constant

including one lag of (1-L)uhat

model:  $(1-L)y = (a-1)*y(-1) + \dots + e$

estimated value of  $(a - 1)$ : -0.994745

test statistic:  $\tau_{ct}(4) = -3.92366$ , with critical value – 1.95 (significance level 0.05)

asymptotic p-value 0.1608

1st-order autocorrelation coeff. for e: -0.182.

The Engle-Granger test for cointegration of times series indicates that all used in the model time series are cointegrated.

We used AR (1) – Prais-Winsten a method of model's estimation. It was dictated by existing heteroscedasticity and autocorrelation. Results of the model estimation are shown in Table 4.

**Table 4.**

*Results of model estimation. Model: Prais-Winsten, using observations 1999-2019 (T = 21).  
Dependent variable: l\_GDP, rho = 0.955643*

	Coefficient	Std. Error	t-ratio	p-value	
const	14.1740	2.08556	6.796	<0.0001	***
l_Ilg	0.00927044	0.0113047	0.8200	0.4235	
l_Qg	0.0717104	0.0255228	2.810	0.0121	**
l_GFCF	0.539858	0.0806612	6.693	<0.0001	***
Statistics based on the rho-differenced data:					
Sum squared resid	0.009554	S.E. of regression	0.023706		
R-squared	0.990915	Adjusted R-squared	0.989311		
F(3, 17)	26759.23	P-value(F)	2.02e-31		
rho	0.267827	Durbin-Watson	1.336939		
Statistics based on the original data:					
Mean dependent var	28.04691	S.D. dependent var	0.202066		

Cont. table 4.

Test for normality of residual	
Null hypothesis:	error is normally distributed
Test statistic:	Chi-square(2) = 4.96129 with p-value = 0.0836892
Test for ARCH of order 1	
Null hypothesis:	no ARCH effect is present
Test statistic:	LM = 1.05932 with p-value = $P(\text{Chi-square}(1) > 1.05932) = 0.30337$

Note:

\*\*\* The variable is significant at the significance level of 0.01,

\*\* The variable is significant at the significance level of 0.05,

\* The variable is significant at the significance level of 0.1.

Source: the authors' own calculation with GRETLL.

The test for normality of residual and test for ARCH of order 1 indicated that residuals have the normal distribution and there is not ARCH effect.

The model has a good (R-squared equal 0.99 and adjusted R-squared equal 0.98). The changes the explanatory variables values explain in 99% (98%) changes of the explained variable. The impact of the insurance market integration's degree (measured by Qg) on economic growth is rather week. Variable Iig is statistically insignificant. Throughout the EU and euro area insurance market integration influence economic growth much harder the coefficient of Qg are appropriate 0.28 and 0.28. It is also interesting that for the euro area variable Iig is also statistically insignificant, but significant in the case of EU (Bukowski, Lament, 2022).

## 5. Discussion

The analysis of the literature on the subject shows that the research so far has not in principle assessed the degree of insurance markets integration, except research Bukowski, Lament (2022). The integration of insurance markets was studied mainly as one of the factors of market development and improvement of their efficiency. Two studies – Jurkiewicz, Wycinka (2006) and Kozarević et al. (2013) – concern the assessment of the degree of insurance markets integration, however, the proposed research methodology does not constitute a comprehensive approach, but only covers selected elements. Research by Kozarević et al. (2013), Njegomir, Marović (2012) and Andelić et al. (2010) indicate that the insurance market integration influences the development of the insurance market. The conducted research on the subject literature allowed for the formulation of the following research hypothesis: the degree of the insurance market integration affects economic growth.

The insurance market integration on the international scale influences economic growth like it does the other financial markets like the stock exchange market, bond market, money market, credit and deposit (banking) market. It affects the development of insurance market as

a component of financial development. The latter influences economic growth. This is confirmed by studies conducted by Kozarević et al. (2013); Njegomir, Marović (2012) and Andelić et al. (2010). However, the above-mentioned authors did not examine the degree of the insurance market integration, but the impact of integration processes on the development of insurance markets. Proprietary measures for assessing the degree of insurance markets integration were proposed by Bukowski, Lament (2022). The authors assessed the degree of the insurance markets integration of the European Union and the euro area. The results of the research presented in this article cover a different research group and concern the insurance markets of the Visegrad Group. Research on the insurance markets integration in more homogeneous groups is confirmed by research conducted, among others, by Cummins, Rubio-Misas (2022) - for the life insurance markets.

The research carried out in relation to the insurance markets of the Visegrad Group countries shows that:

- firstly, the degree of insurance markets integration, measured by integration indicators, is quite high and there is a tendency to its further growth. The obtained results are similar to the results obtained for the European Union insurance markets and the euro area (Bukowski, Lament, 2022),
- at second, the impact of the insurance market integration's degree (measured by  $Qg$ ) on economic growth is rather weak. Variable  $Ilg$  is statistically insignificant. The obtained results are different in relation to the results of the research carried out by Bukowski, Lament (2022) - positive, and statistically significant impact of the variations of  $Ilg$  and  $Qg$  on economic growth in the European Union countries. The situation in the euro area is similar, although the effect of variable (ratio)  $Ilg$  is statistically insignificant, whereas the impact of  $Qg$  changes on the rate of economic growth is statistically significant and quite strong.

Thus, the conducted research shows that the degree of insurance markets integration, measured by integration indicators, is poorly related to the economic growth in the Visegrad Group countries in the analyzed period.

Subsequent research should rely on testing the developed measures for assessing the degree of integration of insurance markets and cover other groups of insurance markets. This will be the subject of further research by the authors of the article.

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