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**SOCIO-ECONOMIC AND MACRO-FINANCIAL DETERMINANTS
AND SPATIAL EFFECTS ON EUROPEAN PRIVATE HEALTH
INSURANCE MARKETS**

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Abstract

There is a great variation in the development of private health insurance (PHI) between European countries. Using data provided by Insurance Europe, World Bank and Standard and Poor's for 30 European countries, our research investigates the main factors influencing the size of these markets. In addition to some classical economic and social factors, the role of the size of national macrofinancial aggregates is also highlighted. In order to relax the constraints due to the multicollinearity phenomenon, we use as explanatory variables aggregated indicators, both calculated by financial institutions and by us, based on component items, used as proxy variables for different components of the financial system at national level. Using cross-section regressions with White corrections for heteroskedasticity and elements of spatial econometrics, we also analyze the possible phenomena of clustering and behavioural contagion between the countries in the sample.

Keywords: private health insurance, White OLS, spatial econometrics, spatial contagion, clusterization

JEL Classification: G22, C21

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Introduction

The world has a longstanding history of the healthcare industry with insurance coverage. We should all care about our health and pay more attention to the health insurance subject because we are fragile and vulnerable to diseases. As long as we get sick, the demand for private health insurance remains a topical issue. Due to existing regulatory gaps and lack of reform in some European countries, we intend to analyze the influence of different factors on health insurance demand. Moreover, our article refers only to private health insurance (PHI). We feel obliged to emphasize the role of PHI market considering the fact that the European population is facing the phenomenon of ageing.

First, the meaning of health insurance is not univocally accepted, despite of these often-incurring medical expenses. Even if the cost of health may seem a philosophical issue, it still involves some financial consequences and generates a large proportion of healthcare expenditure relative to GDP over time. According to Eurostat (2017), substantial differences of the level of current healthcare expenditure are still observed (from the highest level in Germany Euro 369 billion equivalent to 11.3 % of GDP to Romania recording the lowest ratio 5.2 % of GDP, equivalent to Euro 9 billion).

Second, starting from the review of the literature we learn an interesting lesson. A large part of the theoretical and empirical evidence is often focused on the determinants of the insurance demand (life/non-life sector), but the influence of drivers on health insurance sector is rather limited at individual level. Pitacco (2014, pp. 29) explains that “health insurance products are usually shared between “life” and “non-life” branches according to national legislation and regulation”. Motivated by this gap, our study comes to complete the existing literature and provides an overview of the European health insurance markets using interactive maps.

The remaining of the study is organized as follows: Section 1 presents previous studies of the determinants of the private health insurance market and the hypotheses development; Section 2 describes the data and methodology; Section 3 presents the empirical results and the discussions, and the last section concludes and provides future improvements to the health insurance system.

1.1. Review of the scientific literature and hypotheses

1.2. Review of the scientific literature

Healthcare systems are categorized, on one hand, as a national health service (NHS), a social insurance system and a private insurance system (Beckfield, Olafsdottir and Sosnaud, 2013) or, on the other as public and private insurance system (Pitacco, 2014, pp. 27). For example, National Health Service is met in the United Kingdom, a social system in Germany and private insurance in almost all countries. A public health insurance is financed through contributions or income-related taxes (see the case of Romania). In opposition, the United States of America have no universal public NHS.

According to Beckfield, Olafsdottir and Sosnaud (2013), the healthcare system can also be classified by organizational configuration and by the role of principal actors. We distinguish the Bismarck model seen in countries such as France, Germany and characterized by a limited role of the state, the Semashko model, where the state directly controls the health sector in countries like Hungary; Bulgaria, Poland or the Czech Republic, and the Beveridge model where the controls are limited (see United Kingdom, Italy, Sweden or Spain).

Generally, health insurance is defined according to Pitacco (2014, pp. 29) as “a large set of insurance products which provide benefits in the case of need arising from either accident or illness, and leading to loss of income (partial or total, permanent or non-permanent), and/or expenses (hospitalization, medical and surgery expenses, nursery, rehabilitation)”. More specifically, European Insurance and Reinsurance Federation (Insurance Europe, 2018) mentions that “private health insurers provide individuals or groups with policies to cover the medical costs of illness or accidents.” Even though private insurance is often assimilated to voluntary insurance contracts, there are some exceptions in states such as Germany or The Netherlands where private insurance is mandatory, or in the case of France for example, where all employers have to purchase compulsory health coverage for employees.

The literature concerning the estimation of the insurance demand is extensive. Besides, in the field of PHI, the subject of demand is mainly treated at the individual level. In the macroeconomic estimation of the insurance demand, two indicators of life insurance consumption are frequently used, namely penetration rate (Zerria and Noubbigh, 2016; Balcilar, et al., 2020) and density rate (Gaganis, Hasan and Pasiouras, 2020; Olasehinde-Williams and Balcilar, 2020). Balcilar, et al. (2020) apply panel techniques for 11 African countries and show that penetration rate has a long-term impact on economic growth. Also, they confirm a bidirectional causality between economic growth and the insurance sector. It has already been substantiated in many studies that the urbanization level is also a key driver of insurance demand (Hwang and Gao, 2003; Curak, et al., 2013). In other words, Liu and Chen (2002) prove that people living in cities are more likely to purchase an insurance agreement compared to those living in rural areas.

Li, et al. (2007) evidenced the positive influence of income, education and financial development levels on life insurance demand in developed economies. Also, the average life expectancy and social security expenditure show an expected negative influence on insurance. Dragos (2014) examines the influence of education and level of urbanization over the insurance demand (life and non-life), employing the methodology of panel data. The article emphasizes that the main development opportunity for non-life insurances in terms of income is emerging Europe. Education and urbanization prove to be significant factors with positive influence for the field of non-life insurance in emerging Europe and Asia, while the Gini index of income distribution has a negative influence for both categories of countries.

In a cross-disciplinary study, Chui and Kwok (2009), analyzed the relationship between life insurance consumption and national culture practice using data from thirty-eight countries. They highlight the role of economic, institutional, cultural and demographic factors in terms of life insurance demand. Moreover, we have identified in the literature studies that have used the human development index (HDI) as a determinant of insurance demand. Thus, the results from the empirical research are disputed: the positive relationship, identified by Truett and Truett (1990) and Browne and Kim (1993) appears to stimulate the insurance demand, but no robust relationship is found in studies conducted by Beck and Webb (2003), and Outreville (1996). Recently, Mare, Dragos and Dragota (2019) evaluated the effects of spatial diffusion and contagion for the 42 Romanian counties. Their empirical results show that local HDI has a significant and positive influence for the Romanian life insurance market. These mixed results may be due to the different types of life insurance included in their databases.

Using a logistic regression model, Lin, Hsiao and Yeh (2017), showed the effects of financial literacy, financial advisors, and information sources on life insurance. All these determinants influence the decision of individuals to buy life insurance contracts.

As it could be seen in the literature there is empirical evidence that factors such as income, Gini Index, financial development, economic growth, urbanization, financial literacy, human development, and others have an impact on the insurance market.

At the microeconomic level, we identify many articles that study private health insurance in a certain country based on the survey data. In this regard, Bolhaar, Lindeboom and van der Klaauw (2012) show that in the Irish health care system, the asymmetric information is vital to the acceptance of supplementary private health insurance. Nguyen and Knowles (2010) show that the demand for school-age children and adolescent/student health insurance in Vietnam increases significantly with the expected benefits of insurance as measured by proximity to and quality of a tertiary hospital. The findings of Yang (2018) suggest that a key factor that impacts people's enrolment in the voluntary health insurance scheme in rural China is the perception of the quality of care. More recently, Innocenti, et al. (2019) examine if past negative health experiences are positively associated with intentions to purchase insurance for mitigating the risks of income losses due to illnesses and disabilities. Pendzialek, Simic and Stock (2016) review the empirical studies on price elasticity of demand for health insurance.

In a recent review of literature, Śliwiński and Borkowska (2020) divided the determinants of the demand for private voluntary health insurance into the following categories: income and time value, education, age, gender and family size, health status, level of risk aversion and others. However, it is expected that the key factors of health insurance demand are income or health status. At macroeconomic level, it has already been proven (Enz, 2000; Beck and Webb, 2003) the significant and positive influence of income on the insurance demand. At the national level, Propper (1993) in UK, Christiansen, et al. (2002) in Denmark; Barrett and Conlon (2003) in Australia; Machnes (2006) in Israel; Finn and Harmon (2006) in Ireland found the same results. Recently, Tavares (2020) using collected data from the Survey of Health, Aging and Retirement in Europe for 21 countries shows a direct relationship between income and health insurance. The study concludes that younger European men, with higher income, well-educated, married, employed, are more likely to buy a health policy.

Inherent several individual characteristics and socio-economic variables are found to be correlated with the private health insurance demand. In an in-depth analysis of this subject, Kiil (2012) identified 39 papers and concludes that the probability of buying health insurance increases with income and education level. The insurance literature identifies both at the microeconomic level and at the macroeconomic level (Li, et al., 2007; Kjosevski, 2012), a series of common determinants, but also particularities (especially at individual level).

We believe that we all agree with this statement “*While people are unable to save their health, they are able to invest in their health*” (Lieberthal, 2016, pp. 35). It remains to identify what determines Europeans to purchase private health insurance in a comprehensive study, starting from the assumption that we cannot buy our health, but we can improve the conditions in which we will be treated, investing in a private health policy.

1.2. Hypotheses

H1: Health insurance density is positively influenced by the incomes of the inhabitants.

As in the case of any product or service, we expect a direct correlation with incomes. Additionally, especially in the case of low purchasing powers, insurance products are considered as luxury products. That is why we actually expect a non-linear relationship, maybe exponential.

H2: Health insurance density is positively influenced by the level of financial development of the country.

Even in the presence of incomes (as control factor), financial development may play a significant role. Despite the rapid economic growth, financial instruments in the former communist countries did not get near the developed European economies. This effect may be due to two major causes. Insurance premiums paid by the insured are invested by the insurance companies on the stock market. If the latter is less significant in a national economy, it may transform in a barrier for the development of the insurance sector, in general, and of the health one in particular. The second cause is determined by the financial education of the citizens. Low levels of this cast down the insurance market development.

H3a: An East-West clusterization direction is to be found for the health insurance sector.

H3b: There are significant diffusion and contagion effects.

The former communist countries of the Eastern Europe have had, for a very long time, state-controlled health systems. Consequently, their citizens were not educated towards a private sector that would require private health insurance contracts. That is why we expect to see a clear clusterization of the sample on the East-West direction, with Eastern countries having much lower health insurance densities. Additionally, as stated in the previous working hypotheses, and following the works of Mare, et al. (2016, 2019a, 2019b) we expect significant contagion or diffusion processes on the health insurance market, conditioned by both the level of human and financial development and the income (internal conditions specific to each country). The contagion and diffusion processes should appear due to the high interdependencies existing among the European countries, that make information travel much faster.

2. Research methodology

2.1. Methodology

In order to evaluate the three working hypotheses, we have employed, on one hand, the classical OLS regression and, on the other, spatial econometrics tools. Due to the high level of heterogeneity and to treat heteroskedasticity, the OLS regression was constructed in the robust form, with the White correction method applied (White, 1980). The robust estimator obtained (White’s estimator or heteroskedasticity-consistent estimator – HCE) is given by the following formula:

$$v_{HCE}(\hat{\beta}_{OLS}) = (X'X)^{-1} X' \text{diag}(\hat{\epsilon}_1^2, \dots, \hat{\epsilon}_n^2) X (X'X)^{-1} \tag{1}$$

Hypotheses *H1* and *H2* were tested through this method.

Spatial analysis methods were applied in the last part of the research, to evaluate *H3*. If significant clusterization processes occur, either on the North-South or the East-West directions, the coefficients of latitude and longitude should be significant in an OLS spatial regression. The sign of the coefficients shows the direction of the increment in the variable (in this case, the health insurance density). The latitude and longitude variables are, actually, the values of the centre means corresponding to the centroids of each spatial unit assessed. But sometimes, the intensity of a phenomenon is much better explained if compared to another. That is why, in order to assess the contagion and diffusion processes stated in *H3b*,

we have constructed the rate maps of the *LN_DENS* over *HDI* and *FIN_DEV*. The spatial factor was introduced through the spatial weights matrix used to spatially smoothen the rate maps. This procedure is similar to the robust approach in the classical OLS, being meant to treat the high heterogeneity characteristic to spatial data.

The existence of contagion and diffusion is confirmed if clear spatial arrangements are emphasized by the spatially smoothed rate maps. Another method is to test if there are spatial interactions that should be included in a regression model. The starting point is, again the OLS model, but with the neighboring scheme given by the spatial weights matrix attached. If the spatial diagnostic post-estimation tests (Moran's I for errors and Lagrange Multiplier – LM tests) reject the null hypothesis that the best fitting model is the OLS and they emphasize the need to re-specify the regression with spatial components (spatial autoregressive or spatial moving average), then contagion and diffusion exist. The opposite situation is valid when the OLS regression is accepted.

2.2. Data and variables

Data refers to 30 European countries for which information related to health insurance is available, aggregated at national level (Appendix no. 1). Variables to be used in the analysis for the hypotheses testing are synthesized in Table no. 1. They are coded, with explanations and the data source.

Table no. 1. Variables used in the analysis and sources of data

Dependent variables	
<i>HLTH_INS_DENS</i>	Health Insurance Density (total premiums per inhabitant - domestic market) is calculated as the ratio of total insurance premiums (in Euros) to total population. Due to the large positive asymmetry and the nonlinear correlation with the explanatory variables, in regressions it will be used in its logarithmic form. Data from 2018. Source: Insurance Europe
<i>LN_DENS</i>	The natural logarithm of the variable <i>HLTH_INS_DENS</i> .
Explanatory variables	
<i>GDP_CAP</i>	GDP per capita (10 ³ US \$) is gross domestic product divided by midyear population. Data from 2018. Source: World Bank.
<i>GDP_PPP</i>	GDP by Purchasing Power Parity indicator provides per capita values for gross domestic product (GDP) expressed in 10 ³ current international dollars converted by purchasing power parity (PPP) conversion factor. Data from 2018. Source: World Bank.
<i>GINI_IND</i>	Gini Index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. Data from 2018. Source: World Bank estimates.
<i>URBAN</i>	Urban population (% of total) refers to people living in urban areas as defined by national statistical offices. Data from 2018. Source: World Bank.

<i>LIFE_EXP</i>	Life Expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Data from 2018. Source: World Bank.
<i>HDI</i>	The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. Data from 2018. Source: United Nations Development Programme – Human Development Reports.
<i>MK_CAP</i>	Market capitalization of listed domestic companies (% of GDP) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. Due to the large fluctuations of prices on the capital market and the lack of data for a certain year or country in the sample, the maximum value from the time interval 2014 - 2018 was considered. Source: World Bank.
<i>PRV_CRD</i>	Domestic credit to private sector (% of GDP) refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. Data from 2018. Source: World Bank.
<i>FIN_LIT</i>	Financial Literacy Index survey probes four basic financial concepts: risk diversification, inflation, numeracy, and compound interest. Based on interviews with more than 150,000 adults across 148 countries, the survey gives researchers, policy makers, and practitioners a unique, first-of-its kind, and in-depth look at financial literacy across the globe. Data from 2018. Source: Standard & Poor's.
<i>FIN_DEV</i>	Financial Development is a composite index based on the variables <i>MK_CAP</i> , <i>PRV_CRD</i> and <i>FIN_LIT</i> . Calibrated for possible values from 0 to 100. High values of the index are due to high values of the credit market, the capital market and the good financial education of the population. Source: authors' calculation.

Source: World Bank, Insurance Europe, Standard & Poor's, United Nations Development Programme and authors' calculation.

2.3. Construction of the *FIN_DEV* composite index

FIN_DEV is defined based on the *MK_CAP*, *PRV_CRD* and *FIN_LIT* variables. These have different measurement units and scales. In order to aggregate them, we have, first, standardized them. Let:

$$I_1 = MK_CAP \tag{2}$$

$$I_2 = PRV_CRD \tag{3}$$

$$I_3 = FIN_LIT \tag{4}$$

Using the index $i = 1, \dots, N$ for the countries in the sample and $I_j, j = 1, 2, 3$ the three indicators. A normalized value, centered and reduced, can be computed for each indicator and country, through the classical standardization procedure (subtracting the average and dividing by the standard deviation).

$$X_{ji} = \text{norm}I_{ji} = \frac{(I_{ji} - \bar{I}_j)}{\sigma_{I_j}} \quad (5)$$

the normalized value for indicator I_j for the i country.

In order to obtain values from 0 to 100 for each indicator, we use the normal distribution (Gauss) upon the standardized value of each indicator.

$$FIN_DEV_i = \frac{c_1 \left(100 \int_{-\infty}^{X_{1i}} \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt \right) + c_2 \left(100 \int_{-\infty}^{X_{2i}} \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt \right) + c_3 \left(100 \int_{-\infty}^{X_{3i}} \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt \right)}{c_1 + c_2 + c_3} \quad (6)$$

Where c_1, c_2 and c_3 represent shares (%) of the I_1, I_2 and I_3 indicators that can be changes under the restriction: $c_1 + c_2 + c_3 = 1$ (100%). In our application, we have maintained equal shares ($c_1 = c_2 = c_3$) for MK_CAP, PRV_CRD and FIN_LIT .

To verify the robustness of the aggregation of a composite index based on its component items, we use Cronbach's alpha (tau-equivalent reliability).

$$\rho_T = \frac{k}{k-1} \left(1 - \frac{\sum_{i=1}^k \sigma_i^2}{\sigma_X^2} \right)$$

X_i denotes the observed score for item i , while $X = (X_1 + X_2 + \dots + X_i + \dots + X_k)$ is the composite index (variable) index formed by the k items $X_1, X_2, \dots, X_i, \dots, X_k$. σ_i denotes the standard deviation of X_i and σ_X denotes the standard deviation of X .

3. Results and discussion

The distribution of the health insurance density values for the countries in the sample points out a very high variation, from 0.86 €/habitant in Hungary to 2719 €/habitant in the Netherlands.

Figure 1 shows the country distribution of the $HLTH_INS_DENS$ variable, both on the linear and logarithmic scales. We do this in order to be able to also observe the differences existing between countries with low values.

Evaluating the descriptive statistics of the variables we observe that the relative variation of the health insurance density (2.213) is much higher than that of the income proxy variables (GDP_CAP and GDP_PPP) (Table 2). This suggests that the development of the health insurance sector is not strictly linked to the population's purchasing power, but also to other factors (like, for example, the financial development of a country).

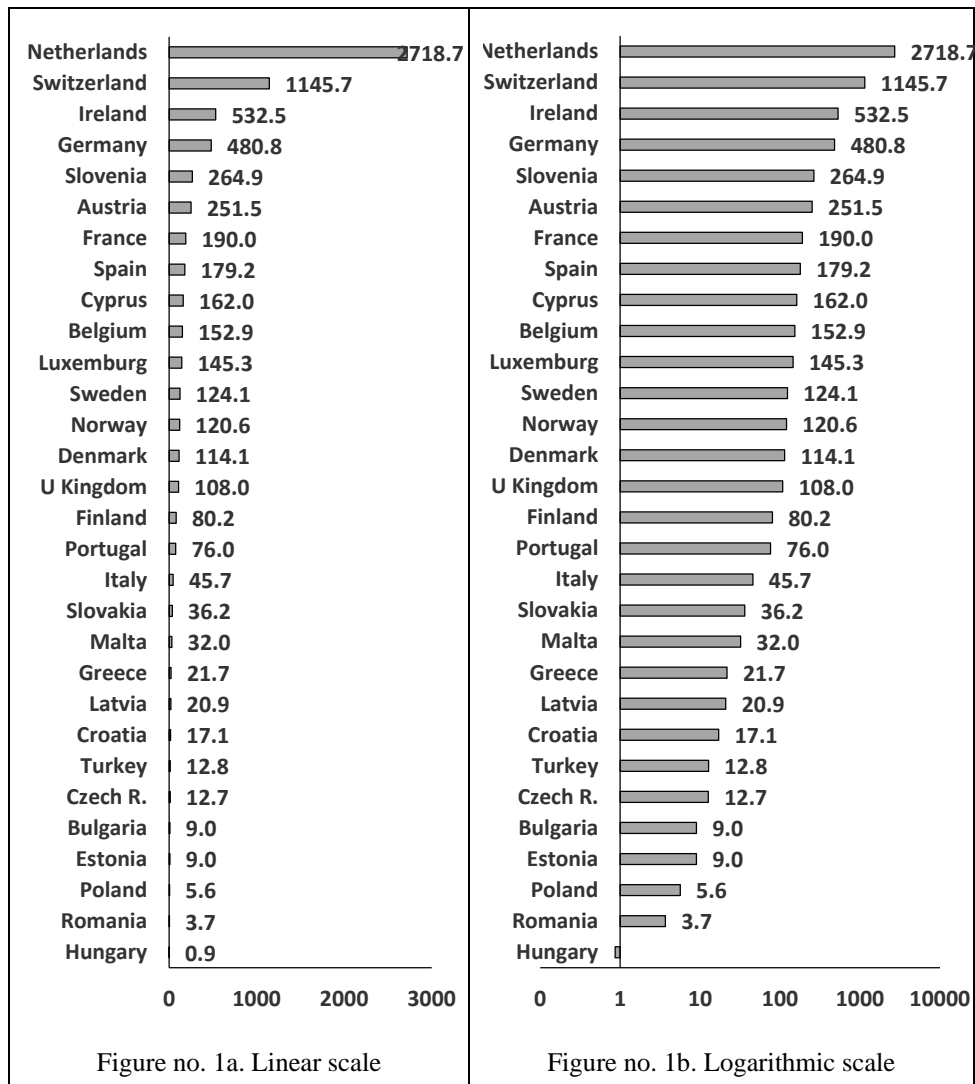


Figure no. 1. Health insurance density distribution for the countries in the sample

Source: authors' calculation in Excel, using data from Insurance Europe (2018)

Table no. 2. Descriptive statistics

	Min	Max	Mean	St Dev	Coef Var
<i>HLTH_INS_DENS</i>	0.865	2719	235.8	521.8	2.213
<i>GDP_CAP</i>	9.370	116.65	38.833	25.74	0.663
<i>GDP_PPP</i>	22.60	116.79	46.490	19.47	0.419
<i>GINI_IND</i>	24.2	41.4	31.5	4.19	0.133
<i>URBAN</i>	53.7	98	74.5	11.6	0.156

	Min	Max	Mean	St Dev	Coef Var
<i>LIFE_EXP</i>	74.8	83.8	80.3	2.69	0.034
<i>HDI</i>	0.806	0.954	0.890	0.042	0.047
<i>MK_CAP</i>	8.3	160.9	58.1	38.0	0.655
<i>PRV_CRD</i>	25.7	139.6	78.5	28.5	0.363
<i>FIN_LIT</i>	22	71	50.3	13.606	0.270
<i>FIN_DEV</i>	4.9	89.6	49.2	23.9	0.486

Source: authors' calculation in Excel

Additionally, one can see that the distribution of the health insurance density has a significant positive skewness (Figure no. 2). Consequently, we will use the log of the variable in the regression models, *LN_DENS*. In this way, the shape of the distribution gets closer to the normal one (Figure no. 3).

Moreover, skewness reduction also relaxes the heteroskedasticity problem. After taking the log, the distribution is quasi-symmetrical and gets closer to a normal one (Figure no. 3).

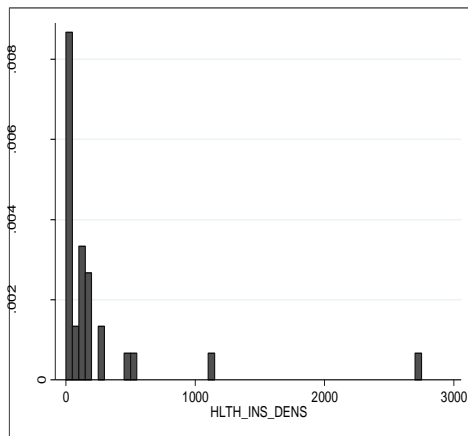


Figure no. 2. Asymmetrical distribution of the *HLTH_INS_DENS* variable

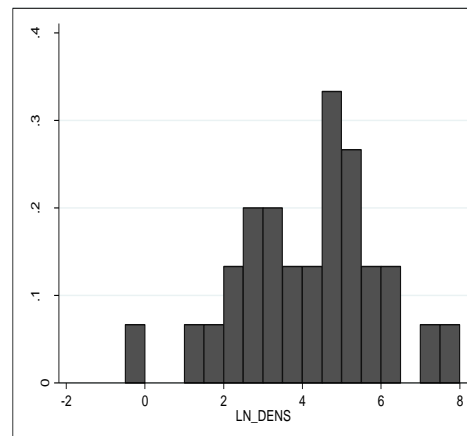


Figure no. 3. Distribution of the *LN_DENS* variable

In the single factor regressions (Table no. 3, OLS 1-8), almost all variables are significant (with the exception of the *GINI_IND*) and with the expected sign.

But in the multiple regressions (Table no. 4, OLS 9-10) some of the coefficients lose their significance. This is due to the strong correlations existing between the exogenous variables (Table no. 5).

In order to overcome this inconvenient and be able to demonstrate the influence of both the purchasing power and the financial development upon the health insurance density, we employ composite indexes (variables). For a country's standard of living there is such an index – *HDI* – the Human Development Index.

Among other factors, this includes the *GDP/cap* and the *Life Expectancy* – which are also considered in our study. But for the financial development of a country we had to construct an aggregated index, *FIN_DEV*, which contains the variables related to the credit and stock markets and to the financial education of population. The index is representative for its

components (Cronbach alpha = 0.761). The technical aspects related to the construction of *FIN_DEV* are to be found in the *Methodology*. The possible theoretical values of the indicator range from 0 to 100, with high values standing for a good financial development of the country. In our sample of 30 European countries, the lowest value was obtained for Romania (4.9), while the highest for the Netherlands (89.6). The country distribution of this indicator is to be found in Appendix no. 2.

Table no. 3. Results of the simple OLS regressions: dependent variable *LN_DENS*, coefficients and *t-stat*

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)
<i>GDP_CAP</i>	***0.05 (4.65)	.	.	.	.	.	.	.
<i>GDP_PPP</i>	.	***0.06 (4.02)	.	.	.	.	.	.
<i>GINI_IND</i>	.	.	0.02 (1.25)	.	.	.	.	.
<i>URBAN</i>	.	.	.	*0.04 (1.72)	.	.	.	.
<i>LIFE_EXP</i>	.	.	.	.	***0.49 (6.10)	.	.	.
<i>MK_CAP</i>	.	.	.	.	.	***0.03 (5.47)	.	.
<i>PRV_CRD</i>	.	.	.	.	.	.	***0.04 (4.16)	.
<i>FIN_LIT</i>	.	.	.	.	.	.	.	**0.06 (2.69)
constant	***2.36 (5.21)	**1.56 (2.27)	**7.00 (2.82)	0.90 (0.47)	***-35.9 (-5.47)	***2.18 (5.15)	0.98 (1.31)	1.15 (1.01)
R ²	0.436	0.366	0.046	0.095	0.571	0.516	0.415	0.206

Note: ***, **, *: significant at 1%, 5% and 10% level.

Source: authors' calculation in STATA.

The two composite indexes, *HDI* and *FIN_DEV* are both statistically significant, regardless if they are used as single factors or together, in the same regression (Table no. 4, OLS 11-13). These results validate hypotheses *H1* and *H2*.

Table no. 4. Results of the multifactorial OLS regressions and the composite indexes regressions: dependent variable *LN_DENS*, coefficients and *t-stat*

	OLS (9)	OLS (10)	OLS (11)	OLS (12)	OLS (13)
<i>GDP_CAP</i>	0.009 (0.73)	.	.	.	.
<i>GDP_PPP</i>	.	0.013 (0.93)	.	.	.
<i>GINI_IND</i>	-0.002 (-0.03)	-0.003 (-0.05)	.	.	.
<i>URBAN</i>	*-0.039 (-1.88)	*-0.040 (-1.93)	.	.	.

	OLS (9)	OLS (10)	OLS (11)	OLS (12)	OLS (13)
<i>LIFE_EXP</i>	**0.270 (2.25)	**0.263 (2.24)	.	.	.
<i>MK_CAP</i>	**0.0178 (2.22)	**0.018 (2.25)	.	.	.
<i>PRV_CRD</i>	0.008 (0.81)	0.009 (0.90)	.	.	.
<i>FIN_LIT</i>	0.020 (0.85)	.021 (0.94)	.	.	.
<i>HDI</i>	.	.	***32.44 (6.15)	.	**19.67 (2.51)
<i>FIN_DEV</i>	.	.	.	***0.055 (5.84)	**0.029 (2.12)
constant	*-17.60 (-1.76)	*-17.36 (-1.80)	***-24.73 (-5.26)	***1.425 (2.78)	** -14.78 (-2.29)
R²	0.739	0.743	0.575	0.550	0.635

Note: ***, **, *: significant at 1%, 5% and 10% level.

Source: authors' calculation in STATA.

Table no. 5. The Pearson correlation coefficients between variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>LN_DENS</i> (1)	1.000								
<i>GDP_CAP</i> (2)	0.660	1.000							
<i>GDP_PPP</i> (3)	0.605	0.971	1.000						
<i>GINI_IND</i> (4)	-0.215	-0.159	-0.121	1.000					
<i>URBAN</i> (5)	0.309	0.448	0.400	-0.017	1.000				
<i>LIFE_EXP</i> (6)	0.756	0.656	0.594	-0.254	0.464	1.000			
<i>MK_CAP</i> (7)	0.718	0.607	0.531	-0.024	0.530	0.623	1.000		
<i>PRV_CRD</i> (8)	0.644	0.486	0.389	0.001	0.451	0.655	0.682	1.000	
<i>FIN_LIT</i> (9)	0.454	0.591	0.500	-0.525	0.508	0.421	0.394	0.296	1.000

Source: authors' calculation in STATA.

The present sample consists in European countries, that/which are linked through significant socio-economic relationships. This intense interdependence must be taken into account, as clusterization or contagion effects may appear. In order to treat this, we have included space as an analysis dimension. By doing this, we have also accounted for the neighbouring effect in the analyzed sample. Results obtained through the classical procedures (Tables no. 3 and 4), show the positive relationship existing between the level of development and the health insurance market.

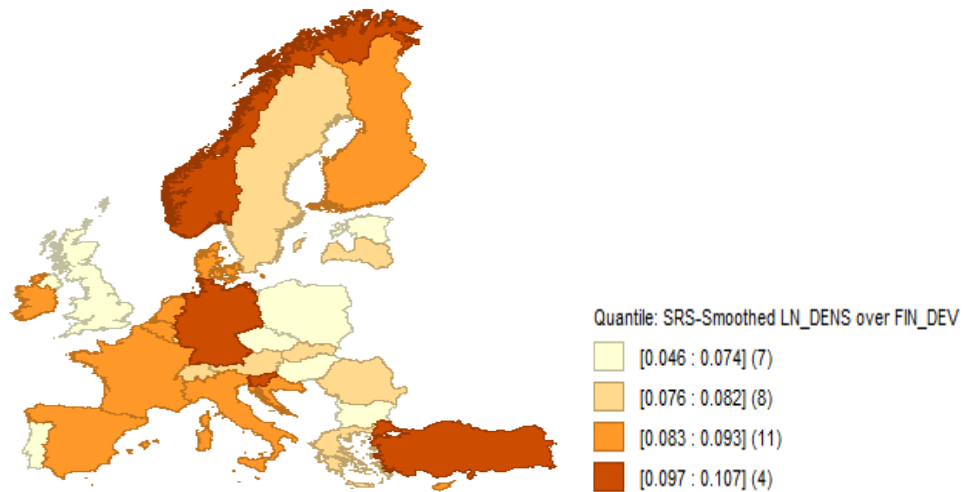


Figure no. 4. Quartile map LN_DENS over FIN_DEV
Source: authors' calculation in GeoDa.

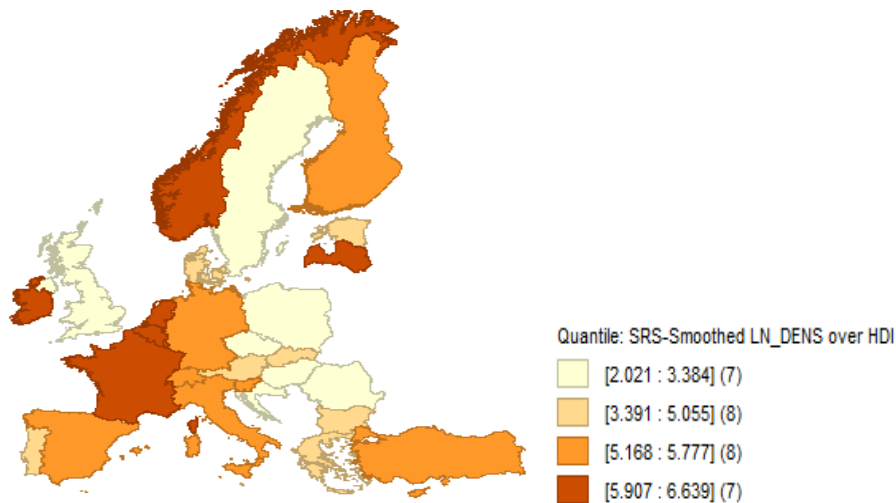


Figure no. 5. Quartile map LN_DENS over HDI
Source: authors' calculation in GeoDa.

As the former is characterized by a significant East-West clusterization in Europe, we also expect this to be valid for the development of the health insurance sector. Former communist countries, in which the health sector is strongly sustained by the state, have a lower development level of this type of insurance products. To test this, we have employed the simple spatial regression with latitude and longitude as independents. Only the coefficient of longitude turned out to be significant (p -value = 0.002 < 0.05) and negative, proving that as we go from West to East, the health insurance density lowers (Table no. 6). For the

assessment of the contagion and diffusion processes, we have first constructed the rate maps of *LN_DENS* over *FIN_DEV* and *HDI*. But due to the high heterogeneity level, these maps were constructed in the spatially smoothed form (Figures no. 4 and 5).

According to Mare et al. (2019a, 2019b), if a significant diffusion and contagion process is to be found, a clear grouping direction should be present on these maps. None of the two figures have this feature. The lack of a diffusion and contagion process is finally confirmed by the regression analysis, as the classical OLS model is not rejected by any of the spatial diagnostics tests (Table no. 6 – all spatial diagnostic tests have probabilities $\gg 0.05$). Consequently, we partially accept *H3* – there is a significant clusterization based on longitude (*H3a*), but no significant contagion and diffusion processes (*H3b* rejected).

Table no. 6. Spatial regression results; dependent variable *LN_DENS*; coefficients and *t*-stat

	OLS (14)	OLS (15)	OLS (16)	OLS (17)
<i>Latitude</i>	0.1e-6 (0.2e-6)	-	-	-
<i>Longitude</i>	***-0.8e-5 (0.2e-5)	-	-	-
<i>HDI</i>	-	***32.436 (5.27)	-	**19.669 (7.82)
<i>FIN_DEV</i>	-	-	***0.055 (0.009)	**0.029 (0.014)
constant	***4.269 (1.31)	***-24.73 (4.7)	***1.43 (0.51)	** -14.77 (6.46)
R ²	0.313	0.575	0.55	0.635
Spatial diagnostic test (probs)				
Moran's I error	-	0.107	0.134	0.162
LM lag	-	0.223	0.101	0.122
Robust LM lag	-	0.689	0.279	0.298
LM error	-	0.187	0.217	0.247
Robust LM er.	-	0.519	0.991	0.876
LM SARMA	-	0.387	0.261	0.298

Note: ***, **, * : significant at 1%, 5% and 10% level.

Source: authors' calculation in GeoDa.

Conclusion

For a sample of 30 European countries, we have assessed the macroeconomic factors that determine the development of the private health insurance sector. As expected, there is a high heterogeneity in terms of health insurance density in the analyzed sample. These high discrepancies are due to the past of each society and the level of socio-economic development. And there is an important link between the two. The Western group of countries was democratic after the 2nd World War, thing that led to a certain type of development and social education. It is very well known that there is a significant clusterization process in Europe, with Western states having a much higher purchasing power and standard of living.

Our first set of results clearly shows a positive relationship between the GDP (measured in any form) and the health insurance density. This can be explained by the fact that the private health insurance sector was able to develop in countries where the economic environment allowed for private intervention in the economy, that brought, especially in the health sector, a much higher quality than the public one. Additionally, this cluster of countries also has the most developed financial markets and a high level of financial literacy of the citizens. This,

again, brings into light another important specificity – the health insurance contract, in respect to other such products, is seen as a luxury product, so a high standard of living is necessary for a person to buy such a contract. On the contrary, the Eastern, ex-communist states, have a long history of publicly sustained sectors, with a very important gap in the economic and financial education of their inhabitants. In these socialist nations, the inhabitant was used to be provided with all the social security issues by the state.

A second very important result is the demonstration that, in Europe, both the level of human development and the financial one, significantly and positively influence the private health insurance sector. These results emphasize the transmission channels on which actors in this domain should interfere in order to increase the demand for such products. A last group of results may be divided into two. On one hand, the spatial analysis conducted has clearly shown that the positive relationship between the level of development and the health insurance sector has materialized in a similar clusterization direction in Europe based on the latter – East-West, with Eastern countries having much lower levels. On the other, an important assumption was not validated. Previous studies in the field of insurance have demonstrated contagion and diffusion processes existing for different types of insurance products. As there is a very high interaction in Europe, due to the European Union and all the socio-economic agreements, we have also expected such contagion and diffusion to be present for the private health insurance market. This, because information travels fast, there is very high mobility of people, goods and capital, etc. On the contrary, the present analysis has emphasized the lack of spatial contagion and diffusion processes. This is a very important result, as this means that the private health insurance sector, in comparison with other types of insurance, is more influenced by the internal, domestic conditions specific to each country. And this impact is that high, that it cancels the transmission channels and the information coming from outside a certain nation.

An important implication arises from the analysis – actors interested in developing the private health insurance market should address the internal specificities of each national market and create products according to the country's financial and social development.

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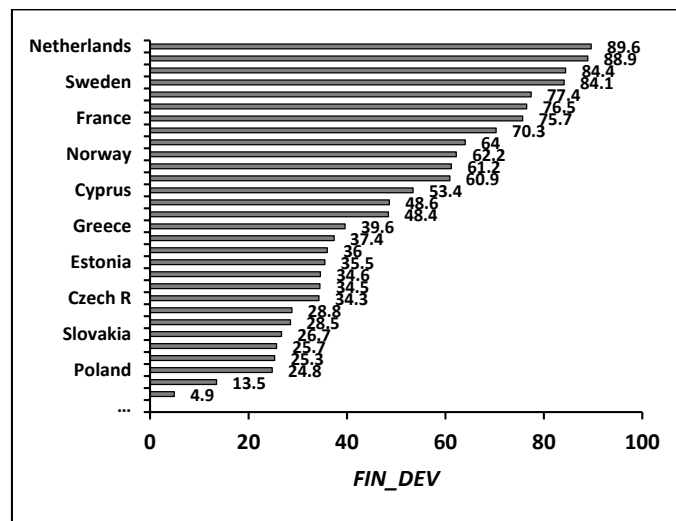
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Appendix no. 1. List of European countries in the sample

Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Luxemburg (LU), Malta (MT), Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), Turkey (TR), United Kingdom (UK).

Appendix no. 2. Distribution of financial development (*FIN_DEV*)



Source: authors' calculation in Excel.