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Demand for private health insurance: an empirical study of *post-communist* countries

ABSTRACT

The development of voluntary health insurance is characteristic of post-Communist and CEE countries. The aim of the paper is to identify the factors determining the demand for private voluntary health insurance. The main finding of the research is that the most important factor is the demographic factor. Other factors include the factor related to the ineffectiveness of treatment under universal health insurance, the factor related to health condition, the demographic factor related to longevity, and the factor related to insurance awareness and income. The research confirms conclusions from previously published studies. The most important is to confirm that the income factor positively influences the studied phenomenon. However, the results shed new light on the aspect of the demand factor, as this indicates the ageing of society and the consequent increase in private spending on health, which are the key mechanisms in the discussion, with the other factors constituting a complementary element.

Keywords: health insurance, demand analysis

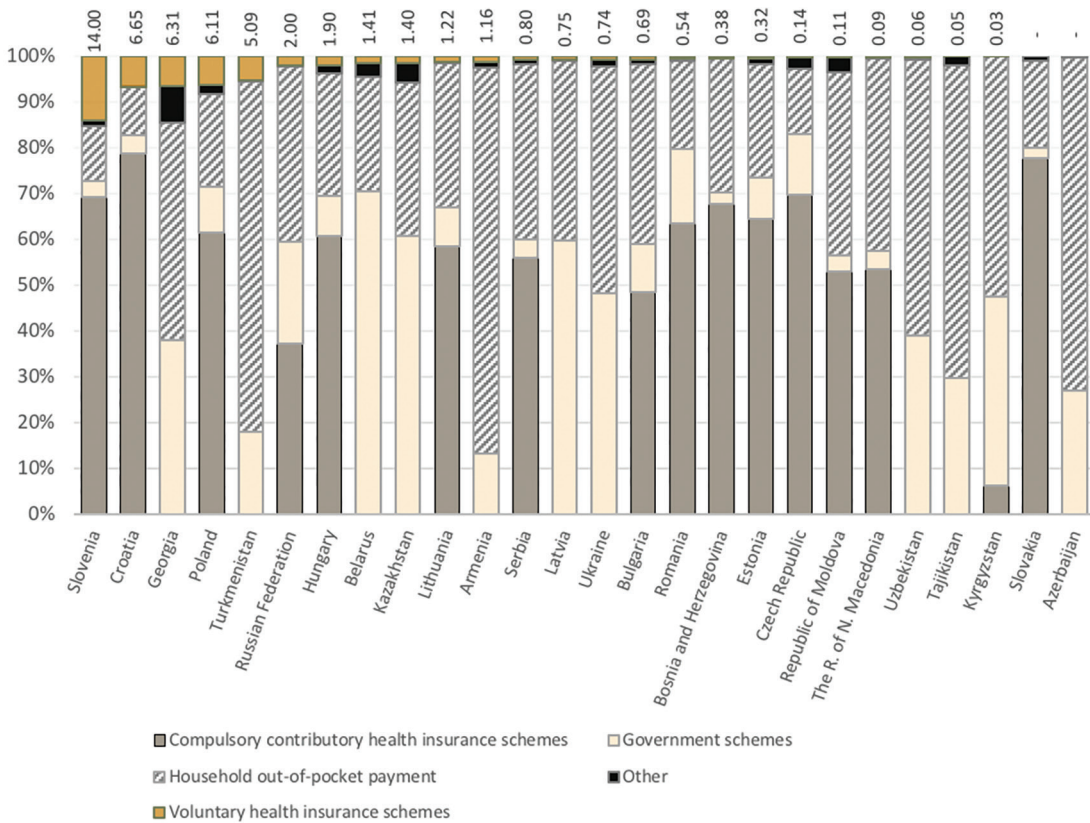
JEL classification: G2, I13

Introduction

This paper aims to identify the factors determining the demand for private voluntary health insurance and to indicate the direction of their impact on the size of this demand. The article contains conclusions supported by empirical research based on data concerning Poland.

This article is original, it researches both the character of the demand for health insurance in a *post*-communist country in Central and Eastern Europe and the application of PCA for the isolation of the independent factors that determine this demand for private health insurance. The authors' knowledge shows that so far, studies related to the identification of factors influencing the demand for private health insurance, using as an example a Central and Eastern European country post-market transformation, have not been conducted. Taking into account the above, it can be concluded that the article and the content presented therein are innovative.

Figure 1: Health expenditure by finance type, 2018



Source: own study based on data from the World Health Organisation, <https://apps.who.int/nha/database/ViewData/Indicators/en> [accessed 15.12.2020].

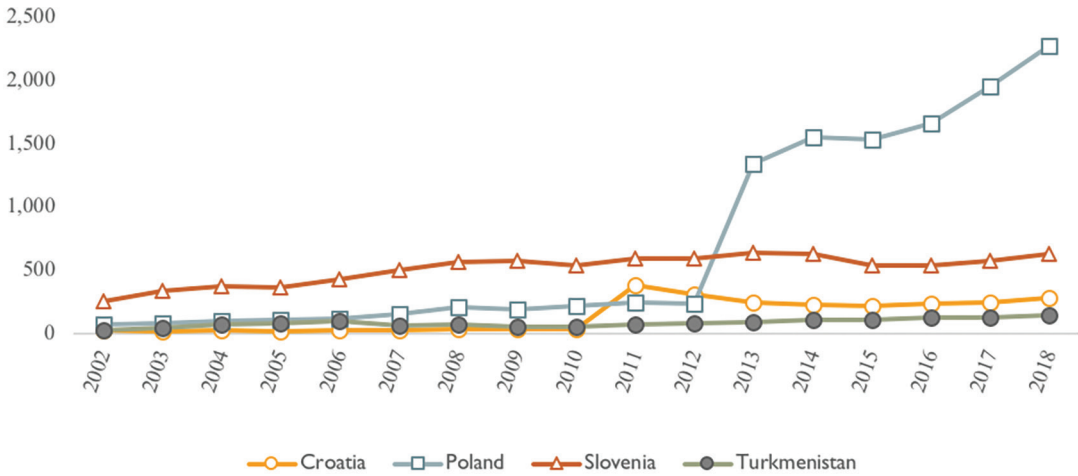
In post-Communist countries, voluntary health insurance contributes to healthcare financing. The share of this type of insurance in these countries is the highest in Slovenia; in 2018 it was 14.00%; in Croatia 6.65%; in Georgia 6.31%, while at the same time in Poland this share was 6.11%. Another country with over 5% share of private health insurance in financing healthcare is Turkmenistan (5.09%). In the remaining *post*-communist countries, this share was lower than or equal to zero (see Figure 1). In these countries, most private expenditure is made up of direct household expenditure, which also includes informal payments to healthcare professionals.

It should be emphasized that in Croatia voluntary health insurance mainly covers user charges under the mandatory health insurance system (co-payments). This insurance is purchased individually from either the Croatian Health Insurance Fund or private insurers, to jump waiting lists for diagnostic tests and physiotherapy and to obtain a higher standard of hospital accommodation [Džakula, et al., 2014; *The State of Health...*, 2017]. However, in Slovenia complementary voluntary health insurance plans cover user charges for all publicly financed health services. Complementary voluntary health insurance plans are purchased by almost everyone who is obliged to pay these charges. Other voluntary health insurance plans in Slovenia cover complementary and supplementary benefits that are not publicly financed [Albreht, Kuhar, Prevolnik Rupel. 2022; Sagan, Thompson, 2016; Thomas, Thomson, Evetovits, 2015]. In Georgia, in 2007/2008, a medical assistance programme for the poorest was introduced, covering 20% of the population. This solution was intended to reduce government obligations in the field of health protection and was financed by the state. Between 2007 and 2013, commercial health insurance was recognized in Georgia as the main mechanism for providing prepaid healthcare for the general population. In Turkmenistan, in which the share of private health insurance accounts for over 5%, the development of these types of service is the result of the government's voluntary health insurance system from year 1996 with premiums calculated as fixed percentages of salary or other income that are collected in a state fund the government oversees [Farrington, Koylyu, Johansen, 2019; Kutzin, Cashin, Jakab, 2010].

Among the group of countries mentioned, Poland deserves attention, with its relatively high share of private health insurance without additional incentives to join the private health insurance pool determined by legal regulations. The private health insurance market is characterized here by its dynamic growth and one of the higher values among *post*-communist countries (Figure 2). Additionally, Poland is an example of a country in which the transformation of the market was successful. Taking these features into account, the Polish market was selected to conduct this empirical research.

Private health insurance in Poland performs a function parallel to the public health insurance system. Poles, even though they are entitled to a wide range of benefits under the public healthcare system [Journal of Laws, 2020], the cost of which is fully covered or co-financed from public funds, incur additional expenses for treatment out of their own pockets, to ensure faster access, a greater choice, or higher standards of necessary medical services. Having a private health policy is no exemption from participating in public health insurance.

Figure 2: Market value of voluntary health insurance schemes in *post-Communist* countries where the insurance accounts for at least 5% of healthcare financing, 2002–2018, [in million US \$].



Source: own study based on data from the World Health Organisation, <https://apps.who.int/nha/database/ViewData/Indicators/en> [accessed 15.12.2020].

Analyzing the private health insurance market in Poland, it should also be mentioned about the medical subscriptions, services that are prepaid and offered by non-state healthcare facilities and chains. Subscription services in Poland are purchased mainly by employers for their personnel. These packages include occupational-health medical examinations but also benefits to which persons are entitled under the public system and benefits exceeding it, e.g. dental benefits in the scope exceeding services guaranteed in the public system. The value of this service market, estimated by experts, in the examined period was over PLN 3 billion (PLN 6.9 billion in 2023) [PricewaterhouseCoopers, 2023; Śliwiński, Borkowska, 2018]. The literature on the subject does not recognize medical subscriptions as a category of insurance. The entities offering medical subscriptions in setting the price do not use actuarial risk estimation methods and do not create insurance provisions. This is a ‘quasi-insurance’ element of the healthcare system in Poland. Therefore, the demand for this type of services is not included in the analysis.

Materials and methods

The data used for the study concern the Polish market in the period 2002–2018, and comes from national databases, reports, and resources published by national institutions such as Statistics Poland (GUS) and the Polish Financial Supervision Authority (KNF). The time span of the analysis covers the years 2002–2016. The period adopted for the study is the result of the availability of data that are published with a significant delay and the fact that an

unusual, periodic phenomenon occurred in the year 2020, namely the worldwide COVID-19 pandemic was started. This phenomenon affected the demand for health services and the demand for insurance and could have disrupted study results covering a 15-year period. In order to avoid speculation in the interpretation of research results, we decided to include the shorter period in the analytical work. However, the impact of the COVID-19 pandemic on demand for private voluntary health insurance is very important and interesting and may be an element of further research extending the results presented in this study.

The research was carried out using the factor analysis method (PCA) as well as correlation and linear multiple regression. Due to the lack of empirical research in Poland in the area, the list of potential diagnostic variables was based on those used in international research, the specificity of the Polish market, and expert opinions. The extracted factors are linear combinations of chosen independent variables. The demand for private health insurance, which is dependent, is presented by the amount of gross written premium from private voluntary health insurance. This term is understood as sickness insurance, the gross written premium of which is recorded in Sections I and II of sickness insurance following the Act on Insurance and Reinsurance [Journal of Laws, 2015]. This insurance also includes travel insurance because the gross premium written from this type of insurance cannot be separated in Poland. Gross written premium calculated in this way continues to be a dependent (explained) variable.

The study started with a *factor analysis*. The factors created describing the conditions shaping the demand for private health insurance were then used to analyze the correlation, to identify the relationship between them, and the level of demand for private health insurance. The analysis also took into account the effect of the delay between the stimulus – implementation of the phenomena included in the demand factors identified – and the response, demand being an aggregate of individual customer behaviour. To confirm the strength and direction of the impact of the selected factors on demand, a *regression analysis* was performed.

In this study, the main hypothesis H was verified, according to which the economic, demographic, and private health expenditure factors, as well as those related to health, gender, and education, determine the demand for private health insurance. The research was aimed at identifying non-price determinants of market demand. As part of the main hypothesis H, the following specific hypotheses were developed:

The level of changes in demand for private health insurance depends on changes in:

- H₁ the health condition factor,
- H₂ the motherhood factor, determined, among other things, by gender,
- H₃ the insurance awareness factor, determined among other things, by education,
- H₄ the demographic changes factor,
- H_{4.1} the increase in the longevity of men and women,
- H_{4.2} the increase in the number of people of post-working age and the decrease in the number of people of pre-working age,
- H₅ the household health expenditure factor,
- H_{5.1} the share of private health expenditure in total household expenditure,

- H_{5.2} the level of this expenditure in households.
- H₆ the factor related to the effectiveness of medical services, provided as part of publicly funded healthcare,
- H₇ the income factor determined by variables such as national income and personal income (disposable income).

It was assumed that the demand for health insurance relates to that reported by households regardless of the form of the conclusion of the insurance contract: individual insurance or group insurance, which is consistent with the literature on the subject [Zalega, 2007]. This assumption was adopted because in Poland the decision to conclude a group agreement, e.g. by an employer for employees and their family members, is mainly influenced by the insured person's individual decision to wholly or partially finance the cost of the premium. Apart from the cost of the insurance premium, which is allotted to the costs of the benefits of occupational medicine, this financing means taxable income for the insured person and is associated with the calculation of social security contributions.

Results

To identify the factors, 21 variables were used in the principal component analysis (PCA). Due to the period covered (15 years) the time series containing 14 observations were created and the decision was made to analyze the method of the principal components for two groups of data: A and B; the procedure of generating increments of variables resulted in the loss of one observation and the assumption adopted about the analysis of the impact of internal and external factors on the demand.

This turned out to be correct, which is confirmed by the results of the Pearson correlation analysis between the factors selected – see Table A8 in the Appendix to this article. The list of variables selected for analysis in groups A and B and descriptive statistics concerning the time series and dependent variable created are included in Table A1 in the Appendix.

To confirm the validity of the use of factor analysis, separate correlation coefficients were calculated for group A to identify internal demand factors, hereinafter referred to as group A, and for group B to identify external factors of demand, hereinafter referred to as group B. The adequacy of the sample was then verified by the Bartlett sphericity test and Kaiser–Mayer–Olkin (K–M–O) statistics. The level of sample adequacy for factor analysis measured by K–M–O statistics exceeds 0.609 for group A and 0.534 for group B, which can be assessed as allowing the use of principal component analysis. The next step was the application of the Bartlett sphericity test. The correlation coefficients as well as the results of the K–M–O and the Bartlett tests obtained are presented in Tables A2 and A3 in the Appendix.

In the procedure of determining the principal component, 9 factors were obtained for group A, which explained a total of 100% of the variances of the original variables. However, it should be noted that among the eigenvalues obtained, there are positive ones and very

close to 0. Therefore, the number of factors was chosen using the Kaiser Criterion, indicating that only those factors with an eigenvalue higher than 1 should be used for further analysis. Therefore, the research activities in group A were based on three main factors because only three factors of group A have eigenvalues greater than one. The factors selected reproduce 82.465% of the variability of the entire set of observable variables.

For group B, the principal component analysis procedure yielded 12 factors, thus explaining a total of 100% of the variances of the original variables. The number of factors for group B, as well as for group A, was selected using the Kaiser Criterion. In this group the first four factors have an eigenvalue higher than one and reproduce 82.277% of the variability of the entire set of observable variables, therefore, four main factors were extracted in group B.

The eigenvalues and the amount of variance explained by each successive factor in groups A and B are set out in Table A4 in the Appendix.

The matrix of factor loadings for groups A and B was then determined (Table A5 in the Appendix). The Table highlights the factor loadings with the highest value. The choice of the rotation method was guided by the principle of fair consideration of all the factors. In order to maximize the loadings variation between the factors and to minimize their variation within the new factor, Varimax rotation was performed (Table A6 in the Appendix).

After the main factors had been created, they were interpreted and named. This was done on the basis of a factor loadings analysis. It was assumed that the item is eligible for a particular factor if its factor loadings value is at least 0.50.

Taking into account the distribution of variables presented in Table A6 in the Appendix, it is possible to name the factors as follows:

- F_1 – the factor related to health condition. The following variables are strongly associated with this factor:
 - X_1 Households using medical services not financed by the National Health Fund due to too long deadlines for the provision of these services in entities having contracts with the National Health Fund (%)
 - X_2 Share of the chronically ill in households (%)
 - X_3 People exercising in sports clubs
- F_2 – the factor related to motherhood. The following variables are strongly associated with this factor:
 - X_4 Fertility rate (represents the number of children that an average woman would have over the entire reproductive period (15–49 years))
 - X_5 Marriages (in thousands)
 - X_6 Share of children under 6 in the structure of households (%)
 - X_7 Share of women in the total population (%)
- F_3 – the factor related to the insurance awareness of the whole insurance market in Poland. The following variables are strongly associated with this factor:
 - X_8 Enrolment rate (percentage of students – secondary and post-lower secondary education) (%)

- X_9 Gross written premiums in PLN million to GDP
- F_4 – the factor related to demographic changes and the share of private expenditure on health in the total expenditure of households. The following variables are strongly associated with this factor:
 - X_{10} Demographic dependency ratio (population of retirement age (60/65 and more) to working age)
 - X_{11} Demographic dependency ratio (population of pre-working age (0–17) to working age)
 - X_{12} Share of health expenditure in household expenditure (%)
 - X_{13} Failure to use medical advice due to lengthy waiting times for an appointment with a doctor (basic health care + specialist)
- F_5 – the factor associated with the effectiveness of treatment in the framework of universal health insurance. The following variables are strongly associated with this factor:
 - X_{14} Cancer mortality: women
 - X_{15} Cancer mortality: men
- F_6 – the factor related to the length of life of men and women and the level of private health expenditure in household expenditure. The following variables are strongly associated with this factor:
 - X_{16} Life expectancy: women (in years)
 - X_{17} Life expectancy: men (in years)
 - X_{18} Private expenditure on the current healthcare (PLN million)
 - X_{19} Infant deaths per 1,000 live births
- F_7 – the factor related to income. The following variables are strongly associated with this factor:
 - X_{20} Disposable income (PLN /month/person)
 - X_{21} Gross national income (current prices) (PLN million)

Using the coefficients obtained from the inversion of the component matrix, new values of the so-called latent variables were determined.

Then the data obtained as a result of the study of the principal component analysis was used to measure the strength of the correlation between the variables, taking into account those which describe the main factors determining the demand for private health insurance and the level of this demand (Table A7 in the Appendix). The Pearson's correlation coefficients between the factors taken into account are presented in Table A8 in the Appendix. The analysis examined the latency of the effects of the independent (*explanatory*) variables on the dependent (*explanatory*) variable. Delays included in the study relate to 5 years, due to the period covered by the study. The value of the coefficient estimated was presented in each field.

This result shows that the F_4 factor is a statistically significant stimulator of the demand for private health insurance. This means that as demographic changes in the proportion of people of pre-working and post-working age, relative to those of working age, increase and

private health expenditure in household expenditure increases, the demand for private health insurance increases. The correlation between the dependent variable and the F_7 factor which scales the income is negative. The strength of its influence depends on the period of the delay between the implementation of the factor (characteristics considered) and the dependent variable. This factor was the most important destimulant for the demand in the second year of delay ($r = -0.441$). The remaining hypotheses were not conclusive and were, therefore, further verified in the process of regression analysis.

In order to determine the strength and direction of the determination, the linear multiple regression method was used. Coefficients corresponding to given characteristics, making up the factors created in the framework of the principal component analysis, were used to construct the model of linear multiple regression.

Further activities focussed on the construction of regression models taking into account the assumptions of a 5-year delay of the gross written premium. The selection of variables for each model was carried out by the backward elimination method.

After the model was evaluated, it was further verified using the analytical tools available in SPSS IBM software. A summary of the results for the statistically evaluated models has been provided in Table 1.

Table 1: Estimated regression equations of independent factors on the demand for health insurance in the period t+k

Dependent variable from period	Estimated equation	R ²	Adjusted R ²	p-value
current	$Y = -0.001 + 0.186 F_5$	0.280	0.220	0.052
t + 1	irrelevant regression	–	–	–
t + 2	$Y = -0.053 + 0.241 F_4$	0.341	0.275	< 0.05
t + 3	$Y = -0.422 - 0.355 F_1 - 0.355 F_3 + 0.346 F_4 + 0.189 F_5 + 0.515 F_6 + 0.674 F_7$	0.957	0.892	< 0.05
t + 4	$Y = 0.389 + 0.214 F_3 - 0.324 F_4 - 0.296 F_6 - 0.681 F_7$	0.988	0.979	< 0.05
t + 5	irrelevant regression	–	–	–

F_1 – health condition; F_2 – maternity; F_3 – insurance awareness; F_4 – demographic changes: an increase in the number of people of post-working age and a decrease in the number of people of pre-working age, the share of private expenditure on health in household expenditure; F_5 – the effectiveness of treatment in the public health system; F_6 – the demographic factor related to the longevity of men and women; the level of private spending on health; F_7 – Gross national income and disposable income.

Source: own estimation.

The analysis shows the best fit of the M_{t+4} model. The coefficient of determination R-squared (R^2), called the model matching factor, for M_{t+4} is 0.988 and is higher than the coefficient R^2 for the others, showing how much variance is explained by the linear regression model, obtained by the least squares method. In the case of multiple regression, the corrected result is read. The resulting M_{t+4} model explains more than 98% of the variability of the dependent variable. While the estimated model in the fourth year of delay was statistically significant and its R^2 matching factor was the highest of the estimated models, it took into account the

positive impact on demand of only one factor – insurance awareness. In this case, an increase in insurance awareness by one unit resulted in an increase in demand by 0.21. This model was not considered further. The result of the M_{t+4} model, obtained in the light of the literature studies cannot be accepted as the only explanatory factor of the demand for private health insurance in Poland. The influence of factors identified in the foreign literature and accepted for the study and described in this paper in accordance with the results obtained occurs by the third year of the delay.

In the light of the research conducted and the results of the verification of specific hypotheses, the main research hypothesis H was positively verified, according to which the demand for private health insurance depends on groups of factors, which include income, demographic and private spending on health, as well as factors related to health and education. The following is the summary of the results of the verification of specific hypotheses:

- Positive verification:

The level of changes in demand for private health insurance depends on changes in:

H_1 the health condition factor,

H_3 the insurance awareness factor, determined among other things by education,

H_4 the demographic changes factor,

$H_{4.1}$ the increase in the longevity of men and women,

$H_{4.2}$ the increase in the number of people of post-working age and the decrease in the number of people of pre-working age,

H_5 the household health expenditure factor,

$H_{5.1}$ the share of private health expenditure in total household expenditure,

$H_{5.2}$ the level of this expenditure in households.

H_6 the factor related to the effectiveness of medical services, provided as part of publicly funded healthcare,

H_7 the income factor determined by variables such as national income and personal income (disposable income).

- No grounds to reject the antithesis:

H_2 the motherhood factor determined, among other things, by gender.

The correlation analysis showed that the most statistically significant correlation with the gross written premium from private voluntary health insurance was the factor associated with the increase in the share of private health expenditure and with demographic changes, expressed as an increase in the demographic dependency ratio.

The regression analysis shows that the interdependence of factors related to health conditions, demographic changes, private health expenditure, insurance awareness and the income factor, explains almost 90% of gross written premiums in the third year of the delay. On the other hand, this result is achieved by the occurrence in the regression analysis in the first place, of the factor mentioned above related to demographic changes.

It should be noted that among the factors identified, there are those that have a negative as well as a positive impact on demand. The first group includes the factor related to health

condition. The second group includes mainly demographic factors, namely, the factor related to the ineffectiveness of treatment under universal health insurance and the income factor, which have a positive impact on the demand for private health insurance.

Discussion

In *post*-communist countries like Croatia, Slovenia, Georgia, and Turkmenistan where private health insurance has developed, the result was obtained by the introduction of complementary insurance, covering patients' co-payment of benefits covered by the statutory system, and benefits that are not publicly financed. The factors positively affecting demand for voluntary health insurance in these countries are legal regulations and restrictions in access to basic health insurance. Taking into account the country-dependent character of the above-mentioned regulations and the public healthcare system in Poland, we decided to pay attention to the factor associated with the effectiveness of treatment in the framework of universal health insurance. The object of this study was, among others, to analyze the impact of this factor on demand for private health insurance.

The international literature on the subject indicates that material well-being, identified by a variable related to the income obtained [AARbu, 2010; Auerbach, Ohri, 2006; Finn, Harmon, 2006; Jones, Koolman, Doorslaer, 2006; King, Mossialos, 2005; Liu, Chen, 2002; Phelps, 1973; Propper, 1987; Propper, Rees, Green, 2001; Vera-Hernandez, 1999; Wallis, 2004] is an important part of the decision to buy or have private health insurance. The research cited showed that the higher the income, the greater the probability of purchasing private insurance. The most important thing in our study is to confirm what is mentioned above that the income factor positively influences the demand for private health insurance.

However, the described study shed new light on the aspect of the demand factor, as this indicates that the ageing of society and the consequent increase in private spending on health are the key mechanisms in the discussion, the other factors are the complementary element. The study shows that an increase in the share of private expenditure on health in households due to demographic changes increases the demand for private voluntary health insurance. This factor is the most statistically significant. However, the highest increase in gross written premium from private voluntary health insurance results from the inter-dependence of all the factors identified in the study, such as:

- 1) the above-mentioned demographic factor,
- 2) the income factor – preliminary variables describing this factor are disposable income and gross national income,
- 3) the factor related to the ineffectiveness of treatment under universal health insurance, related to such variables as female and male cancer mortality,
- 4) the demographic factor obtained by combining such variables as life expectancy in men and women, private current health care expenses, and infant deaths *per* 1000 live births,

- 5) the factor related to insurance awareness described by the enrolment rate and gross written premiums in PLN million to GDP,
- 6) the factor related to the health condition and such variables as households using medical services not financed by the National Health Fund due to too long deadlines in entities having contracts with the National Health Fund, the share of the chronically ill in households and people exercising in sports clubs.

The results of the research on the factors of private health insurance demand show also that demographic factors including age and family size are significant determinants of the demand for private health insurance. According to van de Ven and van Praag [1981], age is a trait related to material well-being and influences the demand for private health insurance. Age has also been identified as an important factor in the demand for private health insurance by researchers such as Rees and Green [2001], King and Mossialos [2005], and Wallis [2004], as well as Auerbach and Ohri [2006], and Emmerson, Frayne, and Goodman [2001]. As mentioned above, our study confirmed that the most important factor in market demand for voluntary private health insurance in Poland is the demographic factor, which was obtained by combining such variables as the age dependency ratio, the share of private health expenditure in total household expenditure and the share of people who did not avail themselves of medical advice due to long waiting times.

According to Arrow [1963], demand is also influenced by the expected medical consumption related to existing health conditions or the probability of illness; we do not know when we will become sick, or what diseases and what costs we will incur. Research confirms that health status is an important determinant of the demand for private health insurance. However, the results obtained are correlated with the role of private health insurance in a given country. Jones, Koolman, and Doorslaer [2006], in studies conducted in the Irish, Italian, Portuguese, and UK markets, found that the probability of purchasing insurance increases with better health. Propper [1987] is of the same opinion; in her opinion, U.K. families whose members suffer from chronic diseases are less likely to buy private health insurance. On the other hand, Paccagnella, Rebba, and Weber [2012] assume that, however poor one might be, one's health has a positive bearing on the purchase of private health insurance in Denmark, the Netherlands, Switzerland, and Austria. Our results indicate that the factor related to the health condition affects the demand for health insurance: as a 'bad' health condition increases, the demand for private voluntary health insurance decreases.

The results of empirical research on the influence of a specific gender on private health insurance are not clear [Śliwiński, Borkowska, 2018]. In the UK, Besley, Hall, and Preston [1999] as well as King and Mossialos [2005] found that more men than women had private health insurance. Auerbach and Ohri [2006], on the other hand, emphasize that in the United States, women are more likely to buy private health insurance than men. Gender is also indicated as an important determinant of demand, in the studies conducted by Wallis [2004], Fang, Keane, and Silverman [2008]. On the basis of the research conducted, it is impossible

to verify either positively or negatively the relationship between the demand for private health insurance and gender.

The methodological basis of the research mentioned above are discrete choice methods. The source of statistical material are mainly the results of panel surveys of household budgets. The dependent variable is the purchase of private health insurance. The most frequently used explanatory variables are information on age, income, gender, employment status, education, health, family size, as well as region, waiting time for benefits under public health care, and marital status [Śliwiński, Borkowska, 2018]. These variables result mainly from the nature of the object studied (internal factors).

The studies cited show that the demand for the services in question is determined by many features. Such a situation takes place, for example, in the above-mentioned factor of material well-being, which includes both income, the source of obtaining it, the type of work performed, education, age and family characteristics. Therefore, it is reasonable to analyze the explanatory variables, taking into account the relationships between them [Śliwiński, Michalski, Rószkiewicz, 2013].

The impact of macro-economic, demographic, sociocultural, and structural factors (external factors) has not been identified in research into the determinants of the demand for private health insurance; these are important demand factors for both property and life insurance [Outreville, 2013]. At this point, it should be noted that in empirical studies, it is common to express the demand for insurance with the level of gross written premium [Browne, Kim, 1993; Mantis, Farmer, 1968; Outreville, 1996; Śliwiński, Michalski, Rószkiewicz, 2013]; such an approach is not common in research into the demand factors for health insurance.

Summary

Households in *post*-communist countries lack sufficiently strong incentives to insure themselves against the negative economic consequences of falling ill by purchasing voluntary insurance policies. This situation is certainly influenced by historical conditions and the shape of the healthcare system derived, as it is, from a centrally planned economy through public financing. The research serves both theoretical and cognitive purposes. The results of the study can be used by insurance companies to expand the insurance offer with products that take into account the impact on the demand for this type of service of the factors identified. Consequently, this may lead to a further increase in the value of gross premiums written from this line of business.

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Appendix

Table A1: Descriptive statistics of the created time series and dependent variable

Sym.	Variables	Min.	Max.	Mean	SD*	CV**
Y	Dependent variable – demand for health insurance (gross written premium from sickness insurance, Section I and II) (in PLN thousand)	211,052.16	1,682,411.99	867,884.24	516,587.24	59.52%
Variables selected for analysis in Group A						
X ₁	Households using medical services not financed by the National Health Fund due to too long deadlines for the provision of these services in entities having contracts with the National Health Fund (%)	38.30	69.71	54,25	10,63	19,60%
X ₂	Share of the chronically ill in households (%)	25.50	34.10	29.06	3.19	10.98%
X ₃	People exercising in sports clubs	674,600.00	1,030,204.00	866,755.47	97,496.41	11.25%
X ₄	Fertility rate (represents the number of children that an average woman would have over the entire reproductive period (15–49 years))	1.22	1.40	1.30	0.06	4.52%
X ₅	Marriages (in thousand)	180.40	257.70	210.62	25.38	12.05%
X ₆	Share of children under 6 in the structure of households (%)	7,20	8,10	7,65	0.34	4,39%
X ₇	Share of women in the total population (%)	51.58	51.72	51.63	0.05	0.09%
X ₈	Enrolment rate (percentage of students – secondary and post-lower secondary education) (%)	11.87	22.02	17.76	2.88	16.23%
X ₉	Gross written premiums in PLN million to GDP	2.86	4.61	3.43	0.47	13.85%
Variables selected for analysis in Group B						
X ₁₀	Demographic dependency ratio (population of retirement age (60/65 and more) to working age)	24.06	32.63	26.71	2.86	10.72%
X ₁₁	Demographic dependency ratio (population of pre-working age (0–17) to working age)	28.57	36.50	30.65	2.50	8.17%
X ₁₂	Share of health expenditure in total household expenditure (%)	3.90	5.60	4.35	0.56	12.93%
X ₁₃	Failure to use medical advice due to lengthy waiting times for an appointment with a doctor (basic healthcare + specialist)	11,00	35.00	23.20	7.51	32.39%
X ₁₄	Cancer mortality: women	0.50	1.90	0.95	0.57	59.87%
X ₁₅	Cancer mortality: men	0.70	1.50	0.97	0.34	34.68%
X ₁₆	Life expectancy: women (in years)	78.80	81.90	80.29	1.03	1.28%
X ₁₇	Life expectancy: men (in years)	70.40	73.90	71.91	1.26	1.75%
X ₁₈	Private expenditure on current healthcare (PLN million)	14,565.30	36,515.20	24,816.36	7,034.56	28.35%
X ₁₉	Infant deaths <i>per</i> 1 000 live births	4.00	7.50	5.47	1.13	20.72%
X ₂₀	Disposable income (PLN/month/person)	664.21	1,474.56	1,064.24	276.88	26.02%
X ₂₁	Gross national income (current prices) (PLN million)	807,883.00	1,787,647.00	1,304,303.33	335,839.05	25.75%

* SD – Standard deviation; ** WZ – Coefficient of variation

Source: own elaboration.

Table A2: Correlation coefficients**Group A**

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉
X ₁	1.000	0.922	-0.765	0.271	-0.108	0.026	-0.428	-0.243	-0.021
X ₂	0.922	1.000	-0.773	0.189	-0.235	-0.055	-0.424	-0.316	-0.142
X ₃	-0.765	-0.773	1.000	0.079	0.427	0.004	0.420	0.349	0.234
X ₄	0.271	0.189	0.079	1.000	0.709	-0.536	0.251	0.074	0.419
X ₅	-0.108	-0.235	0.427	0.709	1.000	-0.432	0.574	0.207	0.454
X ₆	0.026	-0.055	0.004	-0.536	-0.432	1.000	-0.356	0.111	-0.136
X ₇	-0.428	-0.424	0.420	0.251	0.574	-0.356	1.000	-0.002	0.150
X ₈	-0.243	-0.316	0.349	0.074	0.207	0.111	-0.002	1.000	0.790
X ₉	-0.021	-0.142	0.234	0.419	0.454	-0.136	0.150	0.790	1.000

Group B

	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	X ₂₀	X ₂₁
X ₁₀	1.000	0.934	0.470	-0.305	0.311	0.333	0.010	0.242	0.202	0.414	-0.046	-0.092
X ₁₁	0.934	1.000	0.424	-0.307	0.272	0.275	0.064	0.273	0.203	0.349	0.152	0.040
X ₁₂	0.470	0.424	1.000	-0.370	-0.301	-0.270	0.008	-0.157	0.499	0.024	-0.113	0.123
X ₁₃	-0.305	-0.307	-0.370	1.000	0.352	0.360	-0.206	0.016	-0.111	-0.052	-0.344	-0.004
X ₁₄	0.311	0.272	-0.301	0.352	1.000	0.984	-0.176	0.237	-0.258	0.336	-0.316	-0.395
X ₁₅	0.333	0.275	-0.270	0.360	0.984	1.000	-0.289	0.134	-0.196	0.402	-0.376	-0.390
X ₁₆	0.010	0.064	0.008	-0.206	-0.176	-0.289	1.000	0.796	-0.360	-0.524	0.230	0.095
X ₁₇	0.242	0.273	-0.157	0.016	0.237	0.134	0.796	1.000	-0.464	-0.224	0.062	-0.182
X ₁₈	0.202	0.203	0.499	-0.111	-0.258	-0.196	-0.360	-0.464	1.000	0.506	0.300	0.533
X ₁₉	0.414	0.349	0.024	-0.052	0.336	0.402	-0.524	-0.224	0.506	1.000	0.112	-0.044
X ₂₀	-0.046	0.152	-0.113	-0.344	-0.316	-0.376	0.230	0.062	0.300	0.112	1.000	0.522
X ₂₁	-0.092	0.040	0.123	-0.004	-0.395	-0.390	0.095	-0.182	0.533	-0.044	0.522	1.000

Source: own elaboration.

Table A3: KMO and Bartlett's sphericity test

Description		Group A	Group B
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.609	0.534
Bartlett's sphericity test	Approx Chi-Square	68.947	112.855
	df	36	66
	Sig.	0.001	0.000

Source: own elaboration.

Table A4: Total variance explained**Group A**

A	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	B	C	D	E	F	G	H	I	J
1	3.463	38.473	38.473	3.463	38.473	38.473	2.998	33.315	33.315
2	2.375	26.387	64.860	2.375	26.387	64.860	2.475	27.502	60.817
3	1.584	17.605	82.465	1.584	17.605	82.465	1.948	21.648	82.465
4	0.588	6.532	88.998						
5	0.487	5.406	94.404						
6	0.180	1.997	96.401						
7	0.164	1.827	98.227						
8	0.118	1.309	99.536						
9	0.042	0.464	100.000						

Group B

	B	C	D	E	F	G	H	I	J
1	3.205	26.710	26.710	3.205	26.710	26.710	2.747	22.894	22.894
2	2.937	24.471	51.181	2.937	24.471	51.181	2.725	22.709	45.603
3	2.379	19.822	71.003	2.379	19.822	71.003	2.464	20.534	66.137
4	1.353	11.274	82.277	1.353	11.274	82.277	1.937	16.140	82.277
5	0.912	7.598	89.875						
6	0.454	3.785	93.660						
7	0.342	2.852	96.512						
8	0.231	1.927	98.439						
9	0.091	0.758	99.197						
10	0.059	0.490	99.687						
11	0.032	0.264	99.951						
12	0.006	0.049	100.000						

Columns: A – Factor, B – Total, C – % of Variance, D–Cumulative %, E – Total, F – % of Variance, G – Cumulative %, H – Total, I – % of Variance, J – Cumulative %.

Source: own elaboration.

Table A5: Factor loadings matrix – first estimation**Group A**

Variables	Factor		
	F_1	F_2	F_3
X_1	-0.822	0.460	0.209
X_2	-0.856	0.421	0.077
X_3	0.877	-0.193	0.100
X_4	0.689	0.316	-0.376

Variables	Factor		
	F_1	F_2	F_3
X_5	0.196	0.877	0.251
X_6	0.609	0.669	0.175
X_7	-0.238	-0.710	0.289
X_8	0.391	-0.148	0.824
X_9	-0.822	0.460	0.209

Group B

Variables	Factor			
	F_4	F_5	F_6	F_7
X_{10}	0.387	0.765	0.431	-0.109
X_{11}	0.294	0.759	0.482	0.049
X_{12}	-0.267	0.632	0.156	-0.570
X_{13}	0.368	-0.415	-0.391	0.227
X_{14}	0.931	0.019	-0.005	0.223
X_{15}	0.942	0.076	-0.103	0.174
X_{16}	-0.242	-0.300	0.857	0.127
X_{17}	0.245	-0.231	0.845	0.226
X_{18}	-0.356	0.721	-0.398	0.142
X_{19}	0.358	0.643	-0.353	0.285
X_{20}	-0.518	0.235	0.182	0.683
X_{21}	-0.606	0.255	-0.095	0.498

X_1 – Households using medical services not financed by the National Health Fund due to too long deadlines for the provision of these services in entities having contracts with the National Health Fund (%); X_2 – share of the chronically ill in households (%); X_3 – people exercising in sports clubs; X_4 – Fertility rate (represents the number of children that an average woman would have over the entire reproductive period (15–49 years)); X_5 – marriages (in thousand); X_6 – share of children under 6 in the structure of households (%); X_7 – share of women in the total population (%); X_8 – enrolment rate (percentage of students – secondary and post-lower secondary education) (%); X_9 – gross written premiums in PLN million to GDP; X_{10} – demographic dependency ratio (population of retirement age (60/65 and more) to working age); X_{11} – demographic dependency ratio (population of pre-working age (0–17) to working age); X_{12} – share of health expenditure in total household expenditure (%); X_{13} – failure to use medical advice due to lengthy waiting times for an appointment with a doctor (basic healthcare + specialist); X_{14} – cancer mortality: women; X_{15} – cancer mortality: men; X_{16} – life expectancy: women (in years); X_{17} – life expectancy: men (in years); X_{18} – private expenditure on current healthcare (PLN million); X_{19} – infant deaths *per* 1 000 live births; X_{20} – disposable income (PLN/month/person); X_{21} – gross national income (current prices) (PLN million).

Source: own elaboration.

Table A6: Rotated factor loadings matrix – Varimax rotation

Group A

Variables	Factor		
	F_1	F_2	F_3
X_1	0.960	0.074	-0.003
X_2	0.947	0.042	-0.132
X_3	-0.846	0.151	0.244

cont. Table A6

Variables	Factor		
	F ₁	F ₂	F ₃
X ₄	0.229	0.843	0.267
X ₅	-0.237	0.823	0.294
X ₆	-0.027	-0.777	0.134
X ₇	-0.552	0.606	-0.108
X ₈	-0.219	-0.095	0.925
X ₉	-0.028	0.281	0.910

Group B

Variables	Factor			
	F ₄	F ₅	F ₆	F ₇
X ₁₀	0.930	0.253	0.033	-0.048
X ₁₁	0.900	0.246	0.103	0.126
X ₁₂	0.687	-0.510	-0.256	-0.148
X ₁₃	-0.524	0.461	-0.101	-0.124
X ₁₄	0.111	0.910	0.068	-0.270
X ₁₅	0.126	0.908	-0.051	-0.301
X ₁₆	0.081	-0.259	0.896	0.151
X ₁₇	0.188	0.211	0.894	0.013
X ₁₈	0.336	-0.157	-0.665	0.495
X ₁₉	0.372	0.517	-0.534	0.239
X ₂₀	0.054	-0.113	0.145	0.886
X ₂₁	-0.032	-0.246	-0.142	0.779

Source: own elaboration.

Table A7: Pearson's correlation coefficient between the factors and the demand for health insurance (dependent variable – gross written premium (GWP)), including a one-year, two-year, three-year, four-year and five-year delay

Factors	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	F ₇
GWP	0.301	-0.392	-0.226	0.271	0.529	0.223	-0.074
GWP (<i>t</i> + 1)	0.204	-0.049	-0.225	0.426	-0.186	0.056	0.013
GWP (<i>t</i> + 2)	0.194	-0.411	-0.470	0.584*	0.465	-0.234	-0.441
GWP (<i>t</i> + 3)	-0.167	-0.030	-0.099	0.472	0.000	0.491	-0.179
GWP (<i>t</i> + 4)	-0.559	-0.114	0.009	0.601	-0.181	-0.455	-0.210
GWP (<i>t</i> + 5)	-0.515	0.370	-0.025	0.577	0.422	-0.140	-0.245

* Correlation significant at the 0.05 level (2-tailed)

F₁ – health condition; F₂ – maternity; F₃ – insurance awareness; F₄ – demographic changes: an increase in the number of people of post-working age and a decrease in the number of people of pre-working age, the share of private expenditure on health in household expenditure; F₅ – the effectiveness of treatment in the public health system; F₆ – the demographic factor related to the longevity of men and women; the level of private spending on health; F₇ – gross national income and disposable income.

Source: own elaboration.

Table A8: Pearson's correlation coefficient between the factors

Factor	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	F ₇
F ₁	1	-0.257	-0.426	0.339	0.055	0.243	0.363
F ₂	-0.257	1	0.447	-0.059	-0.261	-0.255	0.419
F ₁	-0.426	0.447	1	-0.421	-0.506	0.116	0.351
F ₂	0.339	-0.059	-0.421	1	0.158	-0.137	0.170
F ₁	0.055	-0.261	-0.506	0.158	1	-0.026	-0.582*
F ₂	0.243	-0.255	0.116	-0.137	-0.026	1	-0.196
F ₂	0.363	0.419	0.351	0.170	-0.582*	-0.196	1

* Correlation significant at the 0.05 level (2-tailed)

F₁ – health condition; F₂ – maternity; F₃ – insurance awareness; F₄ – demographic changes: an increase in the number of people of post-working age and a decrease in the number of people of pre-working age, the share of private expenditure on health in household expenditure; F₅ – the effectiveness of treatment in the public health system; F₆ – the demographic factor related to the longevity of men and women; the level of private spending on health; F₇ – gross national income and disposable income.

Source: own elaboration.