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SPATIAL AND DYNAMIC ANALYSIS OF HEALTH CARE EXPENDITURES IN OECD COUNTRIES

Abstract. Health care is a key sector of every economy and is of great medical, social, and economical importance to all citizens. It is also one of the most diverse sectors in the world, especially in the aspect of financing. Some countries offer “free” care, covered by the national budget, while others have implemented various forms of private financing, like private healthcare insurances. In Poland most medical services are funded by the State and ideas of privatisation are in progress. Despite that it has been estimated that 30% of overall healthcare expenditures are covered by households. This rate is among the highest in Europe, which suggests low efficiency of health care sector. Analysis of magnitude and structure of health care expenditures according to financing sources can give essential data for sector’s efficiency evaluation.

The main goal of this paper is to carry a spatiotemporal analysis of healthcare expenditures and their structure in OECD countries in years 2000-2007. Spatial differentiation of expenditures according to their sources and their dynamic of changes will be researched in chosen countries, including Poland. Three dimensional (time–space structure) analysis will be performed using panel shift-share analysis based on Berzeg model

Keywords: *spatiotemporal analysis, panel shift-share, Berzeg model*

1. INTRODUCTION

As well as being a key sector of every economy, healthcare is of great medical, social, and economic importance for all citizens. It is also one of the most diverse sectors in the world, especially with respect to the way it is funded. Some countries offer “free” healthcare paid from the national budget, while others have implemented various forms of private financing, such as private health insurance. Most medical services in Poland are funded by the State, but concepts of privatizing them are being developed. It been estimated, though, that 30% of all healthcare expenditures are covered by households. This rate is one of the highest in Europe, which suggests that the efficiency of the healthcare sector is low. An analysis of the magnitude and structure of healthcare expenditures by

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funding source could offer data that are crucial for the evaluation of the sector's efficiency.

The main goal of this paper is to carry out a spatio-temporal analysis of healthcare expenditures and of their structure in the OECD countries between 2000 and 2007. Spatial variations in expenditures by funding source and the dynamics of expenditure changes will be investigated for the selected countries, including Poland. Since this problem involves also temporal, regional, and structural aspects, the Berzeg panel model will be applied, as an example of a stochastic shift-share analysis.

2. METHODS

2.1. Classic Shift-Share Analysis

The multidimensional character of socioeconomic processes causes that one or two-dimensional analyses are often misleading. Therefore, it becomes necessary to construct tools enabling simultaneous time-space-structure research. One of the tools is Shift-Share Analysis, or SSA, that measures the rate at which variables' values change in time, taking account of the variables' structure and spatial interactions.

A basic or classic Shift-Share Analysis was introduced into the analysis of regional economic growth by Dunn at the turn of the 1950's.¹ SSA divides a relative change in a variable's value (often given as a rate) between two time points into three components: global, structural (cross-sectional) and regional (geographical). The examined values are weighted by the share of the referential variable² at the first or second time point to standardise them. The SSA model is as follows³:

$$tx_{r..} = tx_{..} + \sum_i u_{r*(i)}(tx_{.i} - tx_{..}) + \sum_i u_{r*(i)}(tx_{ri} - tx_{.i}), \quad (1)$$

x_{ri} – variable's value for the r -th region and i -th section in the initial period,

x_{ri}^* – variable's value in the final period,

z_{ri} – the referential value of the variable for the r -th region and i -th section in the initial period,

z_{ri}^* – the same value, but for the final period,

¹ Dunn E.S., [1960], *A statistical and analytical technique for regional analysis*, Papers of the Regional Science Association, vol.6, pp. 97-112.

² Weights are ratios between the regional value of the referential variable and its global value. The main variables and the referential variables can be the same.

³ Notation and mathematical formulas in this paper based on the book: Suchecki B. (ed.), [2010] *Ekonometria przestrzenna, Metody i modele analizy danych przestrzennych*, C.H.Beck, Warszawa, pp.163-165.

$u_{r*(i)}$ – regional weights: $u_{r*(i)} = \frac{Z_{ri}}{\sum_i Z_{ri}}$,

tx_{ri} –the individual regional rate of change in the r -th region and i -th section:

$$tx_{ri} = \frac{x_{ri}^* - x_{ri}}{x_{ri}}$$

$tx_{r.}$ - the average rate of change in the r -th region: $tx_{r.} = \sum_i (u_{r*(i)} \cdot tx_{ri})$,

$tx_{.i}$ – the average rate of change in the i -th section: $tx_{.i} = \sum_r (\frac{Z_{ri}}{\sum_r Z_{ri}} \cdot tx_{ri})$,

$tx_{..}$ - the global average rate of change: $tx_{..} = \sum_i \sum_r (\frac{Z_{ri}}{\sum_i \sum_r Z_{ri}} \cdot tx_{ri})$,

Often, a net rate is frequently used:

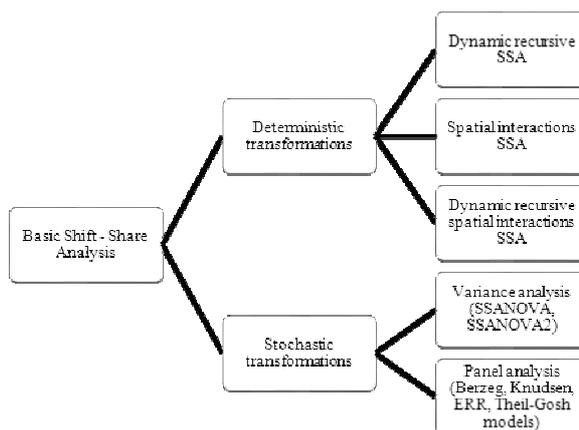
$$tx_{r.} - tx_{..} = \sum_i u_{r*(i)} (tx_{.i} - tx_{..}) + \sum_i u_{r*(i)} (tx_{ri} - tx_{.i}), \tag{2}$$

or simply: $c_r = s_r + g_r$, where: $c_r = tx_{r.} - tx_{..}$ - is a pure, net effect,

$s_r = \sum_i u_{r*(i)} (tx_{.i} - tx_{..})$ - is the structural effect, $g_r = \sum_i u_{r*(i)} (tx_{ri} - tx_{.i})$ - is the geographical effect.

However, because the classic SSA is static and disregards possible changes in the referential variable, it is advisable to analyse successive periods. Moreover, despite its spatio-structural character, the classic SSA omits all spatial interactions. Numerous modifications addressing this problem have been made. A general classification of the proposed transformations is presented below.

Fig. 1. Classification of Shift-Share Analysis



Source: developed by the authors.

2.2. Deterministic transformations

Dynamic SSA

In 1988, Barff and Knight introduced a dynamic recursive approach, where the classic SSA is calculated for each pair of successive years to update the weights and the appropriate effects are summed up:

$$\sum_t C_{rt} = \sum_t S_{rt} + \sum_t g_{rt}, \text{ where: } t - \text{time index.} \quad (3)$$

Spatial Shift-Share Analysis (SSSA)

Then, in 2004, Nazara and Hewings⁴ proposed incorporating a spatial weight matrix (\mathbf{W})⁵ to address spatial interactions.

$$tx_{r.} - tx_{..} = \sum_i u_{r*(i)} (\mathbf{W}tx_{.i} - tx_{..}) + \sum_i u_{r*(i)} (tx_{ri} - \mathbf{W}tx_{.i}). \quad (4)$$

Dynamic Spatial SSA is also possible.

2.3. Stochastic transformations

SSANOVA

At the turn of the 1970's, Berzeg⁶ proposed incorporating a weighted variance analysis into SSA, so that the stochastic elements could be considered. Geographical effects were initially derived from the random term, which was inconsistent with theory stating that the error term should equal 0. Because of that, SSANOVA⁷ explicitly adding the geographical component was introduced.

Panel SSA

A panel approach aims to enable a simultaneous time-spatial-structural analysis. Although Marimon and Zilibotti⁸ proposed this model at the turn of the 20th c., it remains a theoretical model because of deficient estimation methodology:

⁴ Nazara S., Hewings G.J.D., [2003], *Towards regional growth decomposition with neighbor's effect: a new perspective on shift-share analysis*, Regional Economics Application Laboratory (REAL), University of Illinois at Urbana-Champaign, Working Paper, REAL 03-T-21; Nazara S., Hewings G.J.D., [2004], *Spatial structure and Taxonomy of Decomposition in shift-share analysis*, Growth and Change, vol. 35, n° 4, Fall, pp.476-490.

⁵ A weight matrix may be based on a contiguity or distance matrix. For more details see: Suchecki B. (ed.), [2010], *Ekonometria przestrzenna, Metody i modele analizy danych przestrzennych*, C.H.Beck, Warszawa.

⁶ Berzeg K., [1978], *The empirical content of shift-share analysis*, Journal of Regional Science, 18, pp. 463-469; Berzeg K., [1984], *A note on statistical approaches to shift-share analysis*, Journal of Regional Science, 24/2, pp.277-285.

⁷ Arcelus F.J., [1984], *An extension of shift-share analysis*, Growth and Change, 15, pp.3-8; Berzeg K., [1984]; Patterson M.G., [1991], *A note on the formulation of a full-analogue regression model of the shift-share method*, Journal of Regional Science, 31, pp.11-16.

⁸ Marimon R., Zilibotti F., [1998], *Actual versus virtual employment in Europe. Is Spain different?*, European Economic Review, 42, pp.123-15.

$$y_{rit} = h(i) + m(r,i) + b(t) + f(i,t) + g(r,t) + e_{rit} \quad (5)$$

where:

y_{rit} - is a rate of change in the r -th region, i -th sector and t -th period,

$h(i)$ - is a time and space-constant structural effect,

$m(r,i)$ is a particular spatio-sectoral effect constant in time and space in the r -th region, i -th sector,

$b(t)$ is a trend,

$f(i,t)$ is a space-constant structural trend,

$g(r,t)$ is a sector-constant geographical trend,

e_{rit} is the model's error term.

The closest practical models are: Emmerson, Ramanathan and Ramm (ERR), Theil-Gosh, Knudsen⁹ and Berzeg. The latter is formulated as follows:

$$y_{rit} = \alpha + \beta_i + \gamma_r + \varepsilon_{rit}, \quad (6)$$

where:

y_{rit} - a rate of change in the r -th region, i -th sector and t -th period,

α - a global change parameter;

β_i is a total structural effect,

γ_r - a specific regional component,

ε_{rit} - the model's error term.

However, the presumed unique random error heteroscedasticity and time interdependence make it necessary to transform a one-equation panel model into a set of Seemingly Unrelated Regressions with restrictions:

$$\hat{\alpha}_t \sum_i \left(\sum_r x_{ri} \right) \cdot \beta_i = \sum_r \left(\sum_i x_{ri} \right) \cdot \gamma_r = 0. \quad (7)$$

In this case, individual parameter significance t-Student test could be too restrictive for the panel models, so a general Fisher's F test is recommended, if applicable.

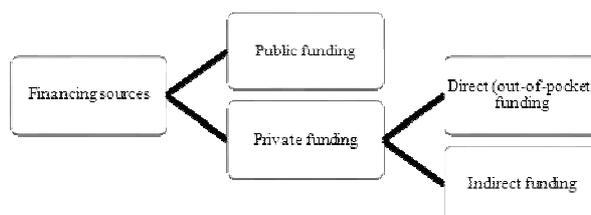
3. DATA

Different historical, political, and economic backgrounds have caused that countries operate their distinct healthcare systems representing a wide spectrum of solutions. Because each system is unique and keeps evolving, international comparisons are considerably hindered. One way of analysing various health

⁹ Modified by adding a time effect to Berzeg model. Knudsen D.C., [2000], *Shift-share analysis: further examination of models for the description of Economic change*, Socio-Economic Planning Sciences 34, pp.177-198.

care systems is to consider where their funding comes from, as well as the spatiotemporal diversity of the funding structures.

Fig. 2. Healthcare funding by source



Source: developed by the authors.

Public expenditure is mainly funded from general taxes collected by a state, a county or a municipality. In many cases, social health insurance administered by the state, private companies, or both (the Polish case), to protect the country's population against medical costs is also classified as public expenditure. Although the mechanism of social health insurance is outside the government-funded healthcare, it is usually defined in the national legislation. OECD defines public expenditure as follows: „...*Public expenditure on healthcare: health expenditure incurred by public funds. Public funds are state, regional and local Government bodies and social security schemes. Public capital formation on health includes publicly financed investment in health facilities plus capital transfers to the private sector for hospital construction and equipment*”¹⁰.

Private funding is all payments made by households or employers to cover expenditures other than those defined as public.

„...*Private expenditure on healthcare: privately-funded part of total health expenditure. Private sources of funds include out-of-pocket payments (both over-the-counter and cost-sharing), private insurance programmes, charities and occupational healthcare*”¹¹, where:

„...*Total expenditure on health is defined as the sum of expenditure on activities that – through application of medical, paramedical, and nursing knowledge and technology – has the goals of:*

- *promoting health and preventing disease;*
- *curing illness and reducing premature mortality;*
- *caring for persons affected by chronic illness who require nursing care;*
- *caring for persons with health-related impairments, disability, and handicaps who require nursing care;*
- *assisting patients to die with dignity;*

¹⁰ <http://www.ecosante.org/OCDEENG/411000.html> (10.05.2010)

¹¹ Ibidem.

- *providing and administering public health;*
- *providing and administering health programmes, health insurance and other funding arrangements*¹².

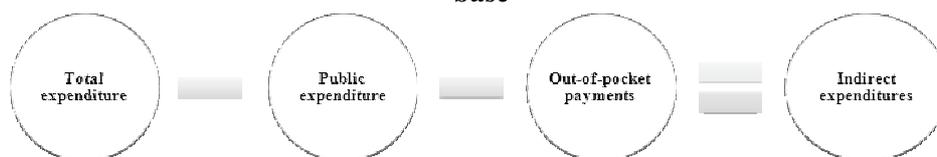
Total expenditure excludes education and training of health personnel, research and development in health, food, hygiene and drinking water control, environmental health, administration and provision of social services in kind to assist living with disease and impairment, administration and provision of health-related cash-benefits.

Direct or out-of-pocket payments are part of private financing that is based on direct outlays of cash. They are usually paid by households for private care, medications, etc.

“Out-of-pocket payments (households) comprise cost-sharing, self-medication and other expenditure paid directly by private households, irrespective of whether the contact with the health care system was established on referral or on the patient’s own initiative”¹³.

Indirect private expenditures are mainly represented by voluntary (private) and community health insurance schemes and various co-insurance and co-payment schemes funded by households and firms. The OECD database¹⁴ does not provide data on indirect expenditures, only information on total, public and out-of-pocket funding is available. Since total funding consists of public and private payments and the private ones can be subdivided into direct and indirect payments, the latter category will be calculated as a difference between total expenditure and the sum of public and out-of-pocket expenditures.

Fig. 3. Indirect private expenditures calculated based on the OECD database



Source: developed by the authors.

The OECD database offers information on:

- total health expenditure as a percentage of GDP,
- total, public and out-of-pocket expenditures per capita, PPP in USD terms¹⁵,

¹² Ibidem.

¹³ Ibidem.

¹⁴ <http://stats.oecd.org/Index.aspx> (05.04.2010)

¹⁵ Purchasing Power Parity

- public and out-of-pocket expenditures as a percentage of total health expenditure, for 25 member states (Australia, Austria, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Korea, Mexico, the Netherlands, New Zealand, Norway, Poland, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States) between 2000 and 2007.

Figure. 3 shows how indirect private expenditures were calculated.

The largest total health expenditure in relation to GDP, steadily rising from 13.6% to 16%, was noted in the USA. Generally, in the analysed period total expenditures kept growing in most of the countries, faster than their GDPs did.

The lowest rates were found for Mexico and Korea, but these rates too rose from 5.1 % to 5.9% and from 4.7% to 6.3%, respectively. In Poland, total health expenditure's share in GDP increased from 5.5% in 2000 to 6.4% in 2007. Regarding total health expenditure per capita, the USA was a leader again with its 5,053 PPP USD in 2000 (8 times more than in Poland and 9 times more than in Mexico that spent the least) and 7,290 PPP USD in 2007 (7 times more than in Poland and 8.9 times more than in Mexico where the spending was the lowest again).

Total health expenditure per capita increased in most countries, though. The Norwegian public expenditure on health was the largest every year. In 2000, the country spent from public funds 2,507 USD PPP per capita, i.e. over 6 times more than Poland and 10.6 times more than Mexico, where the spending was the lowest. In 2007, this amount increased to 4,005 USD (5.5 times more than in Poland and 10.7 times more than in Mexico; in the Netherlands public expenditures on health were liquidated following the healthcare reform).

Public expenditures per capita too were rising throughout the whole period, likewise private expenditures. In 2000, direct expenditures were the largest in Switzerland, 1,061 USD PPP per capita (6 times more than in Poland), and indirect ones in the USA – 1,988 USD PPP (in that period indirect funding was not used in Poland).

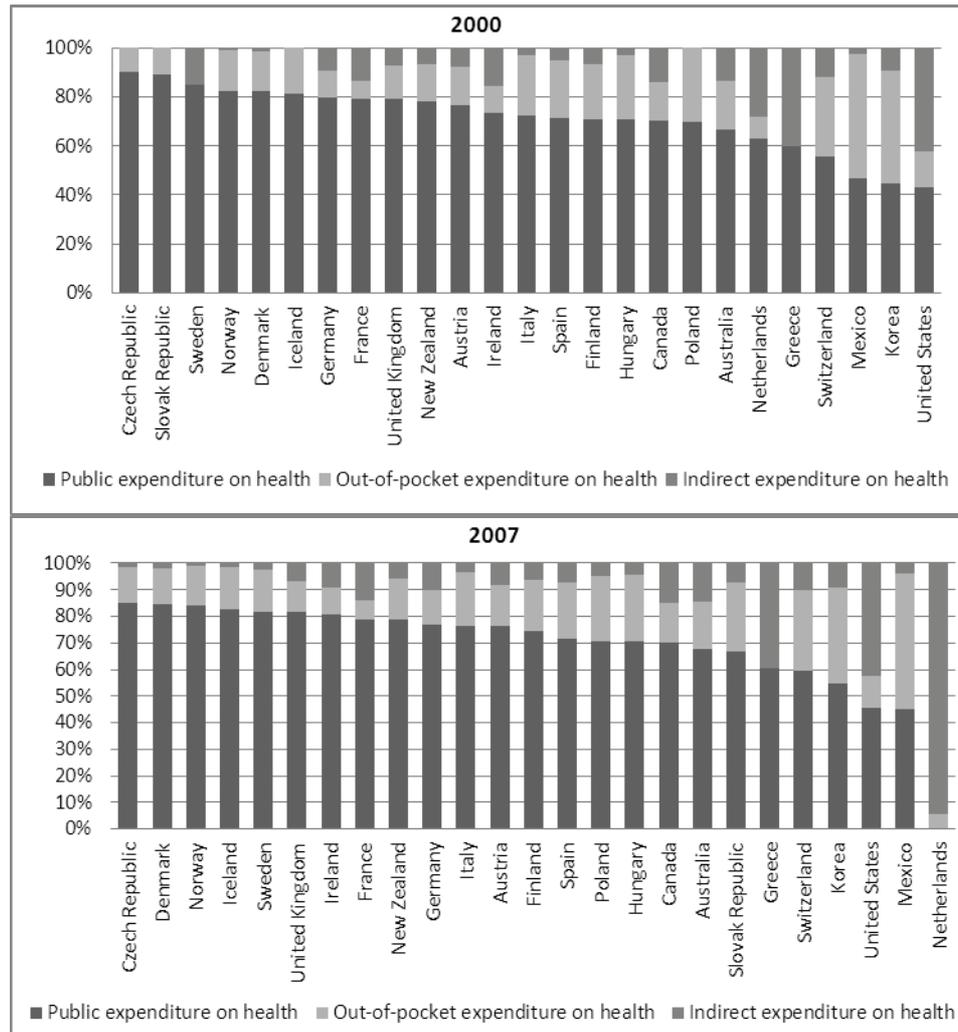
In some countries out-of-pocket funding (Greece, Sweden) or direct payments (Czech and Slovak Republics, Poland, Iceland) did not exist. In 2007, the Swiss direct expenditures that were the largest every year reached 1,350 USD PPP (5.3 times more than in Poland), while Greece did not have such expenditures at all.

Indirect expenditures were the largest in the Netherlands, 3,624 USD PPP, because of the reform the country implemented; in Poland they were over 71 times lower, while in Greece and Sweden they did not exist at all.

As shown, the absolute values of healthcare expenditures are largely dissimilar. Their amounts differ depending on the level of prosperity in the country and its healthcare system. Obviously, the richer the country and its citizens, the lar-

ger expenditures per capita. It is worth noting, though, that the mechanisms of the healthcare system determine the structure of the expenditures more strongly than the country's prosperity.

Fig. 4. Structure of healthcare funding by country, years 2000 and 2007



Source: developed by the authors based on OECD database.

The above structure of healthcare funding shows that the expenditures did not change much in most of the countries in the seven-year period. In 21 countries in 2000 and in 20 countries in 2007 public sources funded at least 60% of total expenditures. In 2000, the lowest public spending on healthcare, above

40%, was noted in the USA, Korea and Mexico, while the highest, around 90%, in the Czech Republic and Slovakia; in Poland the rate was 70%.

The highest rates of indirect private funding, approximately 40%, characterised the USA and Greece, where direct payments were not used. In some countries, i.e. the Czech Republic and Slovakia, Poland, Norway and Iceland, indirect expenditures did not exist at all. In 2007, the situation was largely the same. In general, public spending rates decreased; the highest of them (the Czech Republic, Denmark, and Norway) did not exceed 85.2%, while the lowest (USA, Mexico) were still around 40%.

The Dutch healthcare reform removed all public expenditures on health to replace them with state-run mandatory insurance against long-term hospitalization and disability costs and with a mandatory health insurance scheme covering regular treatment cases, operated by private health insurance companies¹⁶.

In Poland, public resources funded over 70% of total health expenditures. However, most of the countries developed indirect financing, mostly due to healthcare insurance.

The lowest indirect funding rate (less than 1%) was observed in Norway, because its self-financing system is based on mandatory public insurance covering not only healthcare costs, but also incomes lost during sick leaves, as well as paying public pensions, unemployment benefits, benefits for single parents and other benefits.¹⁷

Private health insurance in Poland, although not common, covers about 5% of all expenditures. Greece has a mixed tax and insurance system, which basically excludes direct funding¹⁸. The USA healthcare system is almost equally funded from public and indirect sources. Except for some governmental schemes, such as Medicare and Medicaid, health expenditures in the US are covered by private health insurance and many healthcare facilities are privately owned¹⁹.

The above analysis does not explain, though, how global trends, structural changes and individual (geographical) factors contributed to changes in the structure and volumes of healthcare expenditures.

¹⁶ <http://www.minvws.nl/en/themes/health-insurance-system/> (Ministry of Health, Welfare and Sport) (02.03.2010), W.P.M.M. van de Ven and F.T. Schut, (May/June 2008) *Universal Mandatory Health Insurance In The Netherlands: A Model For The United States?*, *Health Affairs*, Volume 27, Number 3,

¹⁷ World Health Organization Statistical Information System: Core Health Indicators (http://apps.who.int/whosis/database/core/core_select.cfm (10.05.2010))

¹⁸ "Health Care Systems in Transition. Greece" (<http://www.who.it/document/e72454.pdf> (12.05.2010))

¹⁹ "Income, Poverty, and Health Insurance Coverage in the United States:2007" U.S. Census Bureau. <http://www.census.gov/prod/2008pubs/p60-235.pdf233.pdf>. Retrieved 2008-08-26.

4. RESULTS

The Berzeg panel model was transformed into Seemingly Unrelated Regressions and estimated for the rates of change for 25 countries²⁰ and 3 funding sources (public, out-of-pocket, indirect) in the years 2001/2000, 2002/2001, 2003/2002, 2004/2003, 2005/2004, 2006/2005 and 2007/2006. The results are presented in Table 1 below.

Tab. 1. Estimates of the Berzeg model's coefficients by type of effect

EFFECT	VARIABLE	COEFF.	Estimate	EFFECT	VARIABLE	COEFF.	Estimate
GLOBAL		α_0	40.10	REGIONAL (INDIVIDUAL COUNTRY EFFECT)	IRELAND	γ_{12}	14.46
STRUCTURAL	PUBLIC FUNDING	β_1	0.05		ITALY	γ_{13}	-11.29
	OUT-OF-POCKET FUNDING	β_2	-11.78		KOREA	γ_{14}	58.00
	INDIRECT FUNDING	β_3	14.23		MEXICO	γ_{15}	15.86
REGIONAL (INDIVIDUAL COUNTRY EFFECT)	AUSTRALIA	γ_1	-2.37		NETHERLANDS	γ_{16}	-4.50
	AUSTRIA	γ_2	-15.00		NEW ZEALAND	γ_{17}	3.83
	CANADA	γ_3	7.78		NORWAY	γ_{18}	-1.41
	CZECH REPUBLIC	γ_4	-7.46		POLAND	γ_{19}	19.74
	DENMARK	γ_5	-8.12		SLOVAK REPUBLIC	γ_{20}	57.69
	FINLAND	γ_6	-3.45		SPAIN	γ_{21}	16.57
	FRANCE	γ_7	-3.09		SWEDEN	γ_{22}	-15.78
	GERMANY	γ_8	-6.69		SWITZERLAND	γ_{23}	-10.18
	GREECE	γ_9	28.97		UNITED KINGDOM	γ_{24}	-3.81
	HUNGARY	γ_{10}	-23.13		UNITED STATES	γ_{25}	7.88
	ICELAND	γ_{11}	-38.21				

Source: developed by the authors based on Soritec estimation of the Berzeg model's coefficients. Estimates of β_3 and γ_{25} were calculated after the estimation procedure was run.

Because each effect was received for SUR model, the coefficients provide a measure of annual change. In order to present the 2000-2007 change, they were multiplied by the number of analysed periods (7).

The estimate of the global effect (est. α_0) shows that 40.1% of expenditure change is attributable to the general trend characterising the development of healthcare funding (i.e. common to all countries, funding sources and periods analysed).

The structural effects illustrate how the structure of funding (constant in time and space) contributes to changes in total funding amounts. Public expenditures

²⁰ Australia, Austria, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Korea, Mexico, Netherlands, New Zealand, Norway, **Poland**, Slovakia, Spain, Sweden, Switzerland, the United Kingdom and the United States.

(est. β_1) slightly (by 0.05%) augment them, indirect expenditures (est. β_2) somewhat reduce them, by 4.2%, while direct payments (est. β_3) cause an 11.8% decrease.

Regional effect (est. γ_1 to est. γ_{25}) shows each country's individual characteristics, constant in time and structure. In the USA, the geographical element made the rate of change grow by 7.9%, but in Austria it contributed to a 2.4% decline.

Mel residuals are empirical approximations of the random effects influencing expenditure values.

5. DISSCUSION

The Berzeg stochastic analysis shows that a relative change in healthcare expenditures is caused by various impacts: global, structural, and regional. Some of them operate more strongly than others. The global effect indicates that the volumes of healthcare funding are generally growing. This is the strongest determinant of constantly increasing values of payments.

The structural effects suggest that both public funding and indirect funding increase health expenditure, the latter being a much stronger factor, while direct payments decrease them. However, as we already mentioned, the structure of healthcare expenditures was not constant in either time or space. Therefore, the total structural effect defined as the sum of structural effects weighted by the shares of particular expenditures was calculated for each country and period:

$$s_{rt} = \sum_i \frac{x_{rit}^*}{\sum_i x_{rit}^*} \hat{\beta}_i, \quad (8)$$

where:

$\hat{\beta}_i$ - the coefficient estimated for the i -th funding source in the Berzeg model,
 $i=1, 2, 3,$

x_{rit}^* - the absolute value of healthcare expenditures for the r -th region, i -th funding source and t -th period.²¹ The total structural effects are presented in Fig.5.

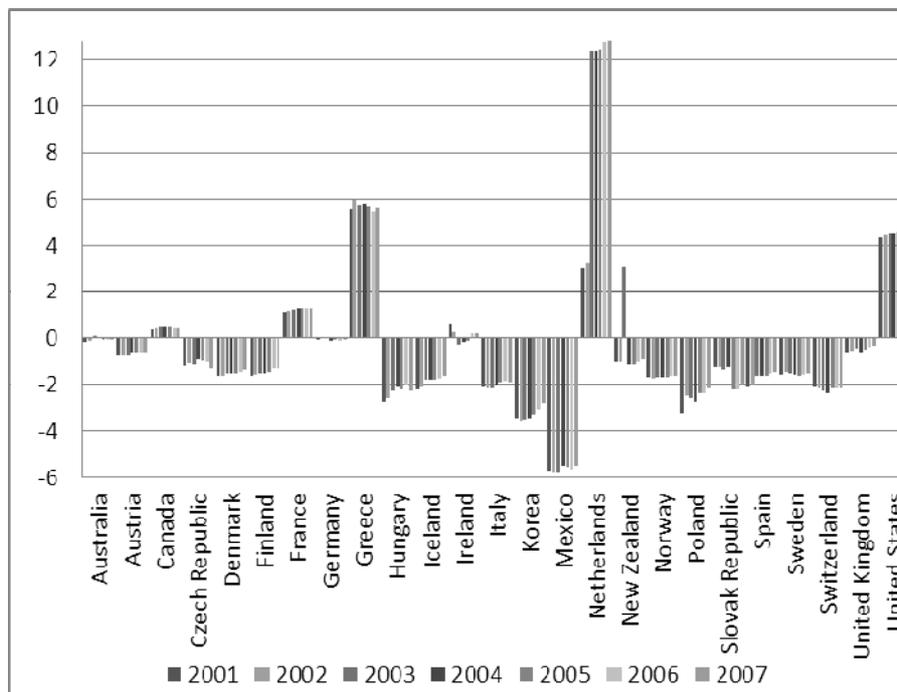
Private funding exerts much stronger influence on total change rate than relatively neutral public funding. On the other hand, the indirect expenditures tend to accelerate the rate of total expenditures growth, while the direct ones moderate it. These facts are clearly reflected in the values of the total structural effect.

The total structural effect was rather stable in each country. Its direction changed in only a few cases, which confirms the findings provided by the previous structural analysis. In Ireland, the share of indirect funding decreased be-

²¹ Because parameters are estimated for rates characterizing two successive years, x_{rit}^* is a value for the final period. Therefore s_{rt} for $t=2001, \dots, 2007$.

tween 2003-2005, while public funding expanded, and was lower than before and after that period, so the total structural effect was positive in 2000, 2001, 2006, 2007 and negative in the other years. On the other hand, in 2003 New Zealand experienced substantial one-time decline in out-of-pocket expenditures vis-à-vis indirect expenditures, hence it had the only positive value of total structural effect that year.

Fig. 5. Total structural effects by country, years 2001 - 2007 (%)

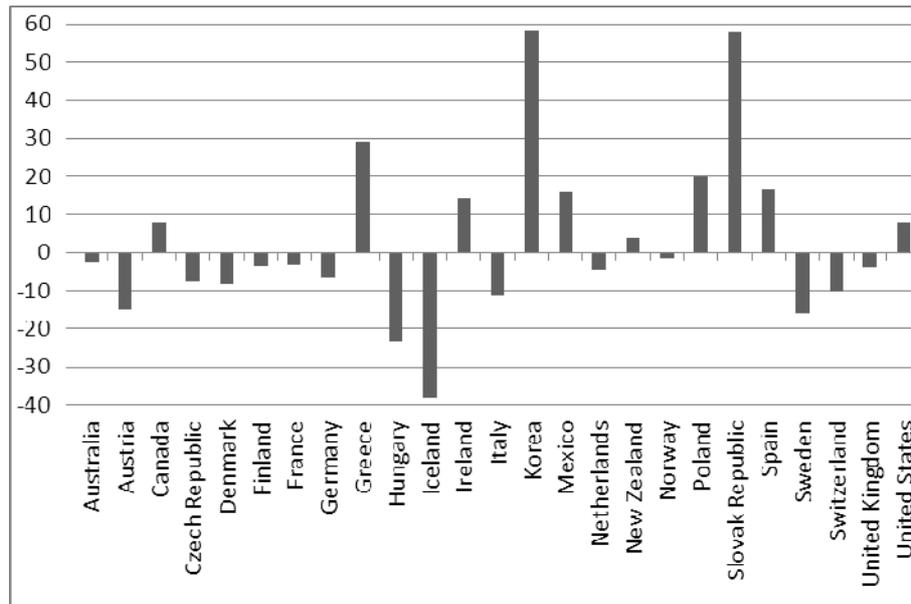


Source: developed by the authors.

Between the countries, though, the total structural effect showed variations that could be seen through simple comparisons of the structures. In most analysed countries the total structural effect slowed down healthcare expenditure growth, because of out-of-pocket and public payments. The deceleration was the strongest in Mexico, where indirect funding is limited and direct funding is substantial. Poland had a negative structural effect, but growing indirect funding weakened its impact over time. Healthcare expenditure increased the fastest in the Netherlands, where public and indirect payments were non-existent or limited. The situation was similar in Canada, France, Greece and the USA, where indirect funding exceeds direct funding.

Regarding their strength and direction, the regional effects were very diverse (see Figure.6).

Fig. 6. Regional effects of the Berzeg model by country (%)



Source: developed by the authors.

The impact of the individual component was the strongest in Korea and Slovakia, where it was responsible for almost 60% of the total rate of change, and the weakest in Norway, where it accounted for less than 1.5%. In 9 states, including Korea, the Slovak Republic and Poland, the geographical effect was positive (and moderately strong), which means that healthcare expenditures tended to grow regardless of other effects. In the other countries the factor was negative and in Iceland its value was the lowest – 38%. Even though health funding grew larger in most of the countries, the geographical effect slowed the process down.

6. CONCLUSIONS

Between 2000 and 2007, the total, public, out-of-pocket and indirect expenditures per capita in the selected 25 OECD member states tended to rise. However, the changes did not follow the same pattern. The differences were caused by temporal, spatial, and cross-sectional elements that were either difficult or impossible to identify and measure at the same time. Shift-Share Analysis was

performed and a Berzeg stochastic panel model being an SSA modification was created to enable a multidimensional analysis.

Generally, all countries and funding sources were characterised by a stable upward trend being a key factor in every country. On-going medical progress as well as growing numbers of new and mutating diseases apparently made public and private funding grow.

The structural effects were diverse. Public funding was almost insignificant while private funding exerted a strong impact; at the same time, indirect funding tended to increase healthcare expenditures, in contrast with direct funding that worked in the opposite direction. The total structural effect accelerated changes when the rate of insurance exceeded out-of-pocket payments, otherwise slowing them down. The total structural effect in the Netherlands was more than twice stronger than the effects in all the other countries. This confirms that the country has a problem with the steadily and fast growing private insurance premiums.

The geographical individual effects showed inter-state variations. There have not been any noticeable similarities based on the level of economic development or healthcare system.

The spatio-temporal analysis of healthcare expenditures in the OECD countries involving a panel Berzeg model has shown that trying to examine, compare, plan and forecast the levels of healthcare funding is a complex task. The most controllable and predictable factor is the structural effect, because it is usually regulated by the law.

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PRZESTRZENNO-CZASOWE ANALIZY WYDATKÓW NA OCHRONĘ ZDROWIA W KRAJACH OECD

Sektor ochrony zdrowia jest kluczowym działem gospodarki każdego państwa, wzbudza bezpośrednie zainteresowanie obywateli, zarówno w aspektach medycznym i społecznym, jak i ekonomicznym. Jednocześnie jest jednym z bardziej zróżnicowanych sektorów na świecie, szczególnie pod względem struktury źródeł jego finansowania. W niektórych krajach usługi medyczne są „darmowe”, opłacane całkowicie z budżetu państwa, w innych wprowadzono różne formy prywatnego finansowania, np. prywatne ubezpieczenia zdrowotne. W Polsce znaczna część usług medycznych opłacana jest budżetu i dopiero toczą się dyskusje dotyczące wprowadzenia współfinansowania i prywatnych ubezpieczeń zdrowotnych. Mimo to szacuje się, że 30% ogółu wydatków na ochronę zdrowia pochodzi od gospodarstw domowych. Udział ten jest jednym z najwyższych w Europie, co sugeruje niską efektywność sektora ochrony zdrowia. Analiza wysokości i struktury wydatków na ochronę zdrowia według źródeł finansowania może więc dostarczyć istotnych danych do oceny efektywności sektora medycznego.

Celem referatu jest przeprowadzenie analizy przestrzenno - czasowej wysokości wydatków na ochronę zdrowia oraz ich struktury w krajach OECD w latach 2000 – 2007. Zbadane zostanie zróżnicowanie geograficzne wydatków z uwzględnieniem źródeł finansowania oraz dynamika ich zmian w wybranych krajach na świecie, w tym Polski. Trójwymiarowa analiza, czasowo – przestrzenno – strukturalna, przeprowadzona zostanie w oparciu o panelowy model analizy przesunięć udziałów (Shift-Share Analysis) Berzega.