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Maciej Jewczak[*], *Agata Żółtaszek*[**]

SPATIAL SHIFT-SHARE ANALYSIS AS A HEALTH POLICY TOOL

Abstract. Issues related to the functioning of the healthcare sector always result in turbulent and endless discussions. Most of those voices concern: the reduction of costs, spending on healthcare, walk outs, multi-occupation of medical staff, operating and health sector entities' debts. The criteria of economic analysis in the health sector require to look at the activities of medical units, from the perspective of the society and its characteristics that determine them, and taking into account the effects connected with the geographic diversification of the management, financing and organization of the healthcare system.

The aim of this paper is to apply the spatial shift-share methods that are based on information about of the structural changes of economic and social phenomena, developed in geographic space, within a specified period of time, to analyze the state of the health sector. The attempt to identify regional trends in the health care sector, depending on the sector's major characteristics, will be made. The analysis also aims to identify areas and determinants of health care sector that may play a key role in specialization and the development of the regions.

Key words: *spatial shift-share analysis, health care sector, regional diversification.*

1. THE SHIFT-SHARE METHODS

In examining the economic and social phenomena the multidimensional variables have to be considered. Among the multivariate methods for data analysis the shift-share advanced models for the space-cross-sectional-over time studies deserve special attention.

These tools allow evaluating and testing for the region's level of development (a rate of change in growth) in relation to the reference area, while accounting for the possible interactions and the spatial dependence.

The purpose of this study is to present the application of advanced dynamic and spatial analysis methods and models in the study of health-related (HR) causes of deaths of Poles in the years 1999-2008, to compare the results obtained and to indicate the field of current study that the health policy makers should survey.

[*] MA, Department of Spatial Econometrics, University of Lodz
[**] MA, Doctoral Studies, Department of Spatial Econometrics, University of Lodz.

The health-related causes of deaths in Poland were described earlier using taxonomical methods. The methods helped identify which of the Polish regions analyzed for the period 1999-2008 were the best and the worst in terms of health related mortality. Besides, to describe the spatial concentration of certain types of the health related causes of death in 2008, the location quotients were calculated.

The classic shift-share analysis (SSA) was proposed at the turn of 1950s as a means of examining the diversity of regional economic growth.[1] It allows the distribution of changes for regional (geographic, competitive, differentiating), cross-sectional (structural, sectoral) and global (national) components.

The net effects are frequently subtracted from the constant global change (the relative change in the region), which enables the structural and spatial effects to be selected. The changes being are weighted[2] by the reference variable's shares in certain regions (e.g. an area of the region), taken from the initial period or the final period to ensure standardized implementation of the tested characteristics.

The downsize of the classical approach is its stability. The structural and spatial decomposition are subjects of change in the value of the initial period in comparison to the final. If the analyzed point is not too distant in time, the adoption of a permanent weight does generate significant errors. However, if value changes are tested in a period of several years, then it seems unreasonable to assume constant shares of the regions' reference variable in the national value, when this feature is of economic or demographic character.

The problems posed by the classical approaches were attempted to be solved by changing the system used to establish the weights, e.g. by applying a value being an average for the initial and final period. However, the improvement was not significant. In the late 1980's Barff and Knight[3] dynamized the classical SSA approach. They based their method on the assumption about changeable weights and on recursively conducted calculations. This leads to setting value changes of the tested characteristics (relative, absolute or net) and separates outcomes sequentially, for each pair of successive periods of time. This allows incorporating the changes in the regional structure and makes the allocation of the individual effects more efficient. Thus obtained results enable concluding about the development trends in regional economies, etc.. However, the sum in periods of

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

[2] The weights are the share values of referential variable in the region in value of the variable for the whole area (country). The referential variable may be different from the analyzed one.

[3] Barff R.A., Knight III P.L., [1998], *Dynamic Shift-Share Analysis*, Growth and Change, 19/2.

changes in the characteristics of the test is the sum of the structural, geographical and national effects (in the case of the gross analysis).

The classic approach and the dynamic SSA take into account the geographical aspect of the changes in the value of the test variable. However, these approaches do not assimilate the idea of spatial relationships between the regions, treating them as economically and geographically unrelated objects. In 2004, Nazar and Hewings[4] introduced the spatial weights matrix into the SSA.[5]

Besides the usual instruments employed by the classic and recursive approach, this method additionally takes account of the importance of the spatial interaction between the regions. The spatial factor dependence is activated in either the structural effect or the geographical effect, or in both effects simultaneously.[6] The structural effect indicates whether the change variant phenomenon (e.g. in the sector) is faster in the analyzed region or in its adjacent areas. The geographical effect is called an indicator of the local community's competitiveness and allows determining whether a particular region and its "neighbours" can compete in terms of the analyzed variable.

The SSA with spatial weights matrix as well as the classical shift-share analysis are static. In the same way as the previous SSA dynamization methods, the analysis Nazar and Hewings proposed must be repeated for each pair of successive periods, and the changes in the values and effects summed up. Spatial weights do not change over time, but there are differences in static and dynamic approaches. A compilation of the spatial and dynamic approaches shows that the rate of change in the analyzed variable and then in the structural and geographical effects varies between the periods, unlike the spatial weights matrix, and not only from the final to the initial moment of the analysis. Though the spatial interactions are considered as constant over time.

2. STATISTICAL DATA

For the sake of taxonomical comparison, the measure of development was calculated for each region. First, the character of each variable was established –

[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, no. 4, Fall, pp. 476-490.

[5] The spatial weights matrix can be based on a matrix of neighborhood, distance, or nearest neighbors, and standardized by a line or a column. See: Anselin L., [1988], *Spatial Econometrics: Methods and Models*, Kluwer Academic Publishers, Dordrecht.

[6] For models examining the gross change, the global effect is constant in all regions and omits the spatial weights matrix.

all causes of death were accepted as destimulants – high values were not desirable. The values were standardized as follows:

$$z_{ij} = \frac{x_{ij} - \overline{x}_j}{S_j}, \ (i=1,\dots,n; j=1,\dots,m)^7, \tag{1}$$

and then the pattern and anti-pattern were calculated. For each observation the Euclidean distance from the pattern was calculated:

$$d_{i0} = \sqrt{\sum_{j=1}^{m} (z_{ij} - z_{0j})^2}, \ (i=1,2,\dots,n)^8, \tag{2}$$

Finally, the taxonomical indicator of development was calculated:

$$m_i = 1 - \frac{d_{i0}}{d_0}, \ (i=1,2,\dots,n), \text{ where: } d_0 = \sqrt{\sum_{j=1}^{m} (z_{0j} - z_{-0j})^2}\ ^9, \tag{3}$$

The location quotients were calculated for the spatial distribution of the relations between the variables used in the following way:

$$LQ_r = \frac{x_r / x}{z_r / z} = \frac{x_r / z_r}{x / z}\ ^{10}. \tag{4}$$

The *LQ* indicators define regions where the concentration of the analyzed cause of death is above average. *LQ*>1 indicates that the analyzed characteristics of the region is higher than average compared with the referential area (e.g. the country). *LQ*<1 shows that the analyzed characteristics of the region is below average compared with the referential area. Finally, *LQ*=1 indicates that the analyzed characteristics of the region is equal to the average value compared with the referential area.

In this article, high *LQ* values may show the cause of death prevailing in the given region in relation to the country's death rate.

In the presented SSA, the tested and reference variables were the health-related causes of death represented by 16 causes of deaths from diseases that were noted in the Polish regions in the years 1999-2008. Under the classical approach, the ***pure change*** was calculated as follows:

$$tx_{r\bullet} - tx_{\bullet\bullet} = \sum_i u_{r\bullet(i)} (tx_{\bullet i} - tx_{\bullet\bullet}) + \sum_i u_{r\bullet(i)} (tx_{ri} - tx_{\bullet i})$$

[7] Suchecki B. (red.), [2010], *Ekonometria przestrzenna, Metody i modele analizy danych przestrzennych*, Wydawnictwo C.H. Beck, Warszawa, p.59.

[8] Ibidem, p.60

[9] Ibidem, p.63

[10] Ibidem, p.135

where: $(tx_{r\bullet} - tx_{\bullet\bullet})$ – the pure effect of regional (net regional) growth, the excess of the average regional growth rate over the national growth rate, $(tx_{\bullet i} - tx_{\bullet\bullet})$ – the structural factor of regional growth, and $(tx_{ri} - tx_{\bullet i})$ – the local growth factor in the *i*-th sector (i.e. the cause of death) in the *r*-th region.

Regarding the dynamic approach, the analysis was carried out similarly for any two periods: 2000/1999, 2001/2000, 2002/2001, 2003/2002, 2004/2005, 2006/2005, 2007/2006 and 2008/2007.

The databank contained sixteen variables (HR causes of deaths) such as:

- total tumors;
- blood, haematogenous organs diseases and auto immunological diseases;
- endocrine, nourishment and metabolism disorders;
- psychiatric and behavior disorder;
- diseases of the nervous system and sense organs;
- hypertension;
- heart ischemia;
- brain vessels diseases;
- arteriosclerosis;
- respiratory diseases;
- digestive system diseases;
- skin and hypodermic tissue diseases;
- bone, joint, muscular and connective tissue diseases;
- urinary and sexual system diseases;
- congenital defects, deformations and chromatic aberration;
- external causes of illness and death – accidents and their sequacity.

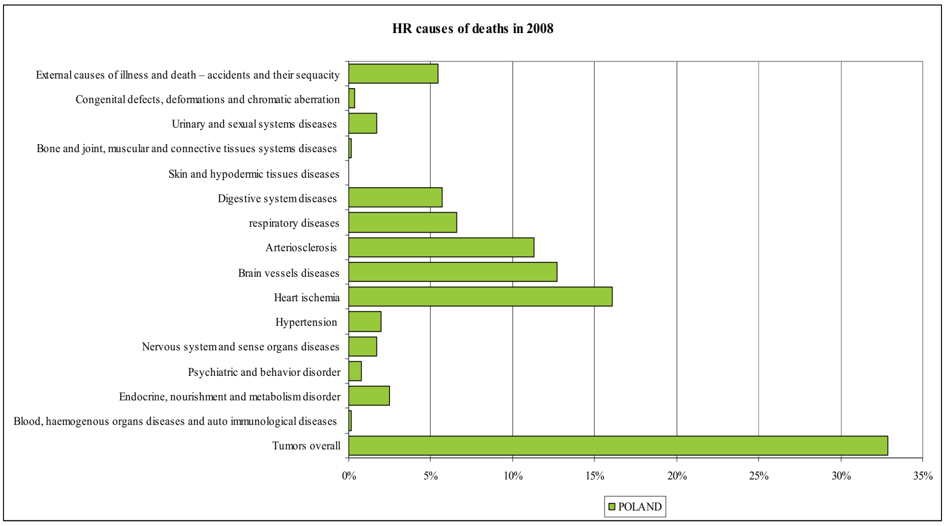
The data were derived from the General Statistical Department in Poland: www.stat.gov.pl. All the needed data on period 1999-2008 can be found in Population Section.

3. RESULTS

Figure 1 shows that the major HR causes of deaths in Poland in 2008 were tumors that accounted for nearly 35% of the total number of the analyzed HR deaths. Other major causes of death were heart ischemia (16%), brain vessel diseases (13%) and arteriosclerosis (11%).

The taxonomic indicators of development were calculated for the initial and final years of estimation, i.e. 1999 and 2008. As shown by the taxonomic indicators based on the health-related causes of death that were calculated for both periods for the sixteen Polish regions the situation in the regions did not change significantly over time.

Fig. 1. Health related causes of deaths in Poland in 2008



Source: developed by the authors based on GUS data, www.stat.gov.pl.

Tab. 1. The taxonomic indicators of development in Polish regions in 1999 and 2008

RANK	1999	REGION	REGION	2008
1	0,909	LUBUSKIE	OPOLSKIE	0.918
2	0,904	OPOLSKIE	LUBUSKIE	0.914
3	0,860	WARMIŃSKO-MAZURSKIE	ŚWIĘTOKRZYSKIE	0.857
4	0,819	PODLASKIE	PODLASKIE	0.848
5	0,804	ŚWIĘTOKRZYSKIE	WARMIŃSKO-MAZURSKIE	0.837
6	0,740	POMORSKIE	ZACHODNIOPOMORSKIE	0.819
7	0,718	ZACHODNIOPOMORSKIE	PODKARPACKIE	0.747
8	0,714	PODKARPACKIE	KUJAWSKO-POMORSKIE	0.742
9	0,684	KUJAWSKO-POMORSKIE	POMORSKIE	0.709
10	0,659	LUBELSKIE	LUBELSKIE	0.650
11	0,581	MAŁOPOLSKIE	DOLNOŚLĄSKIE	0.584
12	0,510	DOLNOŚLĄSKIE	ŁÓDZKIE	0.561
13	0,447	ŁÓDZKIE	MAŁOPOLSKIE	0.516
14	0,339	WIELKOPOLSKIE	WIELKOPOLSKIE	0.442
15	0,268	ŚLĄSKIE	ŚLĄSKIE	0.183
16	0,041	MAZOWIECKIE	MAZOWIECKIE	0.119

Source: developed by the authors based on GUS data, www.stat.gov.pl.

The Opolskie and Lubuskie are the most developed regions as far as the health related cause of death are concerned. Several regions maintained their positions in the ranking, for instance the Lubelskie region. A less developed region, having the highest rates of health-related causes of deaths, was Mazowieckie that occupied the last positions in both 1999 and 2008. This suggests that deaths related to the population's health condition may be concentrated there, despite that fact that this region has the capital of city with a significant number of population.

Tab. 2. Location quotients for 16 HR causes of deaths in Poland in 2008

REGION	Total tumors	Blood, heamoatoge-nous organ diseases and auto immu-nological diseases	Endocrine, nourishment and metabolism disorders	Psychiatric and behavior disorder	Nervous system and sense organ diseases	Hypertension
ŁÓDZKIE	0.94	0.94	0.96	**1.61**	1.03	0.20
MAZOWIECKIE	1.03	0.92	0.84	0.65	0.90	**1.39**
MAŁOPOLSKIE	0.89	0.82	0.65	0.01	0.87	1.08
ŚLĄSKIE	0.99	**1.41**	1.16	**1.35**	1.16	0.76
LUBELSKIE	0.90	1.50	0.80	**1.68**	1.16	0.53
PODKARPACKIE	0.93	1.14	0.72	1.06	**1.28**	**1.41**
PODLASKIE	0.98	1.00	**1.65**	**1.88**	**1.35**	**1.52**
ŚWIĘTOKRZYSKIE	0.93	1.07	1.01	1.06	0.91	0.82
LUBUSKIE	1.10	**1.76**	0.97	**1.49**	1.24	0.57
WIELKOPOLSKIE	1.03	1.31	**1.65**	0.46	1.12	**1.52**
ZACHODNIOPOMORSKIE	1.08	0.61	1.21	1.02	0.96	**1.47**
DOLNOŚLĄSKIE	1.00	0.54	0.54	0.32	0.62	0.51
OPOLSKIE	0.99	0.80	**1.30**	0.02	0.84	1.23
KUJAWSKO-POMORSKIE	1.07	0.65	1.04	1.04	0.81	**1.34**
POMORSKIE	1.17	0.93	**1.28**	**2.37**	1.05	0.14
WARMIŃSKO-MAZURSKIE	1.11	0.28	0.73	**1.41**	1.00	**2.15**

REGION	Heart ischemia	Brain vessel diseases	Arteriosclerosis	Respiratory diseases	Digestive system diseases
ŁÓDZKIE	0.76	**1.29**	1.20	1.12	1.17
MAZOWIECKIE	1.04	1.01	0.60	**1.35**	1.05
MAŁOPOLSKIE	1.11	0.77	**1.84**	0.87	0.76
ŚLĄSKIE	**1.33**	1.02	0.47	0.92	1.18
LUBELSKIE	0.74	1.21	**1.62**	0.82	0.88
PODKARPACKIE	0.93	0.90	**1.61**	0.79	0.76
PODLASKIE	1.11	1.11	0.24	1.21	1.01
ŚWIĘTOKRZYSKIE	1.22	1.11	0.96	1.02	0.85
LUBUSKIE	1.08	**1.29**	0.40	0.83	1.06
WIELKOPOLSKIE	1.13	1.08	0.45	0.74	0.90
ZACHODNIOPOMORSKIE	1.12	0.87	0.59	0.88	1.15
DOLNOŚLĄSKIE	0.76	0.87	**1.86**	0.78	1.12
OPOLSKIE	0.66	0.75	**1.93**	0.87	0.85
KUJAWSKO-POMORSKIE	1.02	0.95	0.90	1.05	0.92
POMORSKIE	0.74	0.84	0.76	**1.26**	1.06
WARMIŃSKO-MAZURSKIE	0.73	0.94	0.73	**1.47**	0.92

	Skin and hypodermic tissue diseases	Bone and joint, muscular and connective tissues systems diseases	Urinary and sexual system diseases	Congenital defects, deformations and chromatic aberra-tion	External causes of illness and death – accidents and their sequacity
ŁÓDZKIE	0.00	1.05	0.84	0.66	0.97
MAZOWIECKIE	**2.95**	**1.37**	0.94	0.96	1.00
MAŁOPOLSKIE	**1.60**	0.44	0.98	1.18	0.84
ŚLĄSKIE	0.66	0.90	0.83	0.73	0.99
LUBELSKIE	**1.43**	1.24	0.72	1.10	1.14
PODKARPACKIE	0.00	1.09	1.02	**1.32**	0.96
PODLASKIE	**2.86**	0.91	1.11	0.81	1.15
ŚWIĘTOKRZYSKIE	0.78	0.38	**1.40**	0.83	0.72
LUBUSKIE	1.21	**1.25**	0.92	1.03	0.88
WIELKOPOLSKIE	0.34	**1.49**	1.06	**1.34**	**1.28**
ZACHODNIOPOMORSKIE	0.00	**1.28**	1.09	0.88	1.02
DOLNOŚLĄSKIE	**1.41**	0.29	1.12	1.08	0.99
OPOLSKIE	0.00	0.38	1.06	0.74	1.05
KUJAWSKO-POMORSKIE	0.00	1.51	0.85	1.15	0.82
POMORSKIE	0.00	1.31	1.17	1.19	1.20
WARMIŃSKO-MAZURSKIE	0.00	0.66	**1.74**	1.05	0.85

Source: developed by the authors based on GUS data, www.stat.gov.pl.

The situation concerning the HR causes of deaths deteriorated in the Pomorskie, Warmińsko-Mazurskie and Małopolskie regions, while Świętokrzyskie improved its position over the nine years.

To determine the concentration of the health-related causes of deaths in Mazowieckie, the location quotients (*LQ*) were calculated. The *LQ* indicators were calculated for the year 2008. As it was established for some regions in Poland and for some of HR causes of death there was a concentration of a type of death noted.

Tumors, although prevailing in the ranking of the major causes of deaths, do not show any regional concentrations, likewise the digestive system diseases. Above-average location quotients compared with the referential area indicate that:

- blood, haematogenous organ diseases and auto immunological diseases-related causes of death prevailed in the Śląskie and Lubuskie regions;
- endocrine, nourishment and metabolism disorder-related causes of death were the most frequent in the Podlaskie, Wielkopolskie, Opolskie and Pomorskie regions;
- psychiatric and behavior disorder-related causes of death prevailed in the Pomorskie, Podlaskie, Lubelskie and Łódzkie regions;
- nervous system and sense organ diseases-related causes of death prevailed in the Podlaskie and Podkarpackie, regions
- hypertension-caused deaths prevailed in the Warmińsko-Mazurskie, Podlaskie, Wielkopolskie, Zachodniopomorskie regions;
- heart ischemia-related causes of death dominated in Śląskie;
- brain vessel diseases caused deaths mainly in the Łódzkie and Lubuskie regions;
- arteriosclerosis-related causes of death dominated in the Opolskie, Dolnośląskie, Małopolskie and Lubelskie regions;
- respiratory diseases caused deaths mainly in the Warmińsko-Mazurskie and Mazowieckie regions;
- skin and hypodermic tissue diseases caused deaths primarily in the Mazowieckie, Podlaskie and Lubelskie regions;
- bone and joint, muscular and connective tissue systems diseases caused deaths predominantly in Wielkopolskie and Mazowieckie;
- urinary and sexual system diseases usually caused deaths in the Warmińsko-Mazurskie and Świętokrzyskie regions;
- congenital defects, deformations and chromatic aberration-related causes of death prevailed in the Wielkopolskie and Podkarpacie regions;
- external causes of illness and death – accidents and their sequacity mainly caused deaths in the Wielkopolskie region.

The taxonomic indicator and the locations quotients show that there are certain regions and certain fields of medicine that health policy should focus on to prevent further increases in the health related causes of deaths.
The shift share analysis was performed to find the growth rates of the numbers of deaths. In table 3 results for classic SSA are presented.

Tab. 3. The Shift-Share Analysis of the HR causes of deaths in Polish regions in 1999-2008 (growth rates as %)

REGION	AVERAGE GROWTH RATE	EFFECTS		
		Ck	Sk	Gk
ŁÓDZKIE	-3.88	-4.52	0,72	-5,24
MAZOWIECKIE	-4.04	-4.68	-0,56	-4,12
MAŁOPOLSKIE	12.15	11.51	-0,62	12,13
ŚLĄSKIE	5.52	4.88	-0,21	5,09
LUBELSKIE	7.85	7.21	0,15	7,06
PODKARPACKIE	-0.60	-1.24	-0,93	-0,31
PODLASKIE	5.69	5.05	1,77	3,27
ŚWIĘTOKRZYSKIE	-6.08	-6.72	-0,99	-5,73
LUBUSKIE	1.23	0.59	0,59	-0,00
WIELKOPOLSKIE	-6.28	-6.91	0,28	-7,19
ZACHODNIOPOMORSKIE	0.44	-0.20	0,31	-0,51
DOLNOŚLĄSKIE	2.05	1.41	0,32	1,09
OPOLSKIE	2.41	1.78	-1,18	2,95
KUJAWSKO-POMORSKIE	-4.92	-5.56	-0,10	-5,46
POMORSKIE	2.32	1.68	1,14	0,54
WARMIŃSKO-MAZURSKIE	-0.15	-0.78	0,68	-1,46
NATIONAL GROWTH RATE	0.64			

C – pure total effect (net), S – structural effect, G – geographical effect; k – for static approach;
Source: developed by the authors based on GUS data, www.stat.gov.pl.

When the average growth rates of regions are compared with the national growth rate (0.64%) in the period 2008-1999, then we see that in some regions the number of HR causes of deaths increased in excess of 1% (Małopolskie, Śląskie, Lubelskie, Podlaskie, Dolnośląskie, Opolskie, Pomorskie). In other regions the number of HR causes of deaths decreased more than 1% (Łódzkie, Mazowieckie, Świętokrzyskie, Wielkopolskie, Kujawsko-Pomorskie).

Given the purpose of this article, the information that in some regions the numbers of deaths due to health-related causes dropped is good news for the policy makers. However, the most important piece of information is whether this change (an increase or a decrease) results from the HR mortality changes in regions (a structural effect) or from the region's comparative advantage or disadvantage (a geographical effect). Considering the variables, a region should hold a comparative advantage with positive results because the character of the variables is negative. For instance, a 12.15% increase in the HR causes of deaths in Małopolskie – representing practically a 11.51% increase above the national growth rate – at minimum level resulted from structural changes in the region (-0.62%), but in majority the increase was a result of 12.13% geographical (comparative) effect between other regions. The changes in the regions were mostly induced by the geographical (comparative) effect, rather than the structural changes in the regional HR causes of deaths.

Taking into account the geographical and structural changes of regions in time, the SSA was conducted that comply the changeability of weights in the next periods of the analysis in recurrent way, taking simultaneously two successive years in studied several years' period, and then partial effects were aggregated. To sum up the SSA, the classic (static) and dynamic shift-share were compared.

Tab. 4. Shift-Share Analysis of the HR causes of deaths in Polish regions 1999-2008: the differences between static and dynamic approach

REGION	EFFECTS			SUMS FROM ALL PERIODS OF ANALYSIS			ABSOLUTE DIFFERENCES		
	Ck	Sk	Gk	ΣCd	ΣSd	ΣGd	|Ck-ΣCd|	|Sk-ΣSd|	|Gk-ΣGd|
ŁÓDZKIE	-4.52	0.72	-5.24	-4.51	-0.05	-4.46	0.01	0.77	0.78
MAZOWIECKIE	-4.68	-0.56	-4.12	-4.70	-0.45	-4.25	0.02	0.10	0.12
MAŁOPOLSKIE	11.51	-0.62	12.13	11.37	-0.57	11.94	0.14	0.05	0.19
ŚLĄSKIE	4.88	-0.21	5.09	4.82	-0.23	5.05	0.07	0.02	0.04
LUBELSKIE	7.21	0.15	7.06	7.01	0.00	6.98	0.20	0.15	0.08
PODKARPACKIE	-1.24	-0.93	-0.31	-1.22	-0.21	-1.01	0.02	0.72	0.69
PODLASKIE	5.05	1.77	3.27	5.82	1.95	3.85	0.77	0.18	0.58
ŚWIĘTOKRZYSKIE	-6.72	-0.99	-5.73	-6.56	-0.80	-5.78	0.15	0.19	0.04
LUBUSKIE	0.59	0.59	-0.00	1.02	2.24	-1.26	0.43	1.64	1.26
WIELKOPOLSKIE	-6.91	0.28	-7.19	-6.84	-0.21	-6.64	0.07	0.49	0.56
ZACHODNIOPOMORSKIE	-0.20	0.31	-0.51	0.23	-0.43	0.65	0.43	0.74	1.15
DOLNOŚLĄSKIE	1.41	0.32	1.09	1.49	0.82	0.66	0.08	0.50	0.43
OPOLSKIE	1.78	-1.18	2.95	1.83	0.66	1.14	0.06	1.84	1.81
KUJAWSKO-POMORSKIE	-5.56	-0.10	-5.46	-5.49	0.36	-5.87	0.07	0.45	0.41
POMORSKIE	1.68	1.14	0.54	1.74	0.28	1.45	0.05	0.86	0.91
WARMIŃSKO-MAZURSKIE	-0.78	0.68	-1.46	0.30	-0.02	0.33	1.09	0.70	1.79
EFFECTS	3.50	1.40	2.10	6.30	3.51	2.79	ABSOLUTE GROWTH RATE DIFFERENCE		
NATIONAL GROWTH RATE	0.64			Σ OF EACH NATIONAL GROWTH RATE		0.72	|0.64-0.72| = 0.08		

C – pure total effect (net), S – structural effect, G – geographical effect; k – for static approach, d – for dynamic approach;
Source: own work, on the basis of GUS data, www.stat.gov.pl.

The dynamic approach to the SSA provides more accurate and reliable results owing to better allocation of growth to components. This method enables estimating changes in the studied phenomenon in the entire analyzed period (the weights are derived from two successive years of the studied period spanning several years). Because the static SSA uses only values taken from the initial and final period of analysis, the results are less precise, as several periods are omitted from the analysis.

A comparison of the two approaches reveals significant differences between their estimates. The absolute subtracts of the pure total effect varies from 0.01% (the Łódzkie region) to 1.09% (Warmińsko-Mazurskie). The national growth rate stands at 0.08%. which is lower for the static analysis compared with the difference dynamics. In most cases, the classic approach overestimates the pure total effect. The levels of structural and geographical effects estimated with these two methods are also different.

To conclude the comparisons of the classic and dynamic SS, table 5 presents the average growth rates calculated for the HR causes of deaths.

Tab. 5. Average growth rates, absolute differences

REGION	AVERAGE GROWTH RATES		ABSOLUTE DIFFERENCE
	CLASSIC SS	DYNAMIC SS	
ŁÓDZKIE	- 3.88	- 3.79	0.09
MAZOWIECKIE	- 4.04	- 3.98	0.06
MAŁOPOLSKIE	12.15	12.09	0.06
ŚLĄSKIE	5.52	5.54	0.02
LUBELSKIE	7.85	7.73	0.12
PODKARPACKIE	- 0.60	- 0.50	0.11
PODLASKIE	5.69	6.54	0.85
ŚWIĘTOKRZYSKIE	- 6.08	- 5.84	0.23
LUBUSKIE	1.23	1.74	0.51
WIELKOPOLSKIE	- 6.28	- 6.12	0.15
ZACHODNIOPOMORSKIE	0.44	0.95	0.52
DOLNOŚLĄSKIE	2.05	2.22	0.16
OPOLSKIE	2.41	2.55	0.14
KUJAWSKO-POMORSKIE	- 4.92	- 4.77	0.15
POMORSKIE	2.32	2.46	0.14
WARMIŃSKO-MAZURSKIE	- 0.15	1.02	1.17

Source: developed by the authors based on the GUS data, www.stat.gov.pl.

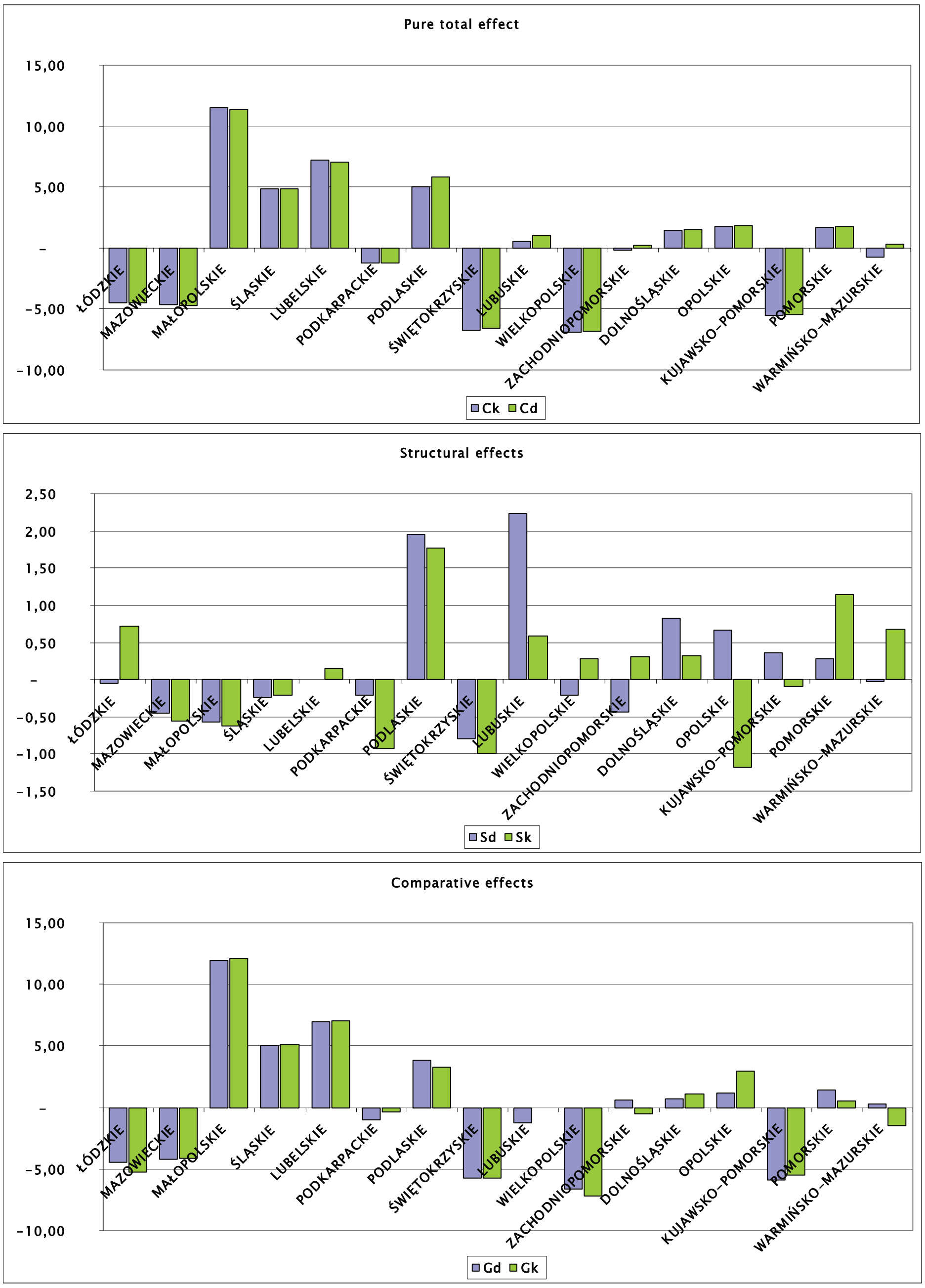
The average growth rate for the static SSA usually exceeds that provided by the recursive analysis. This confirms that the dynamic approach should be used to avoid incorrect results.

To compare the results, the correlation indicators were calculated for each pair of effects for the static and dynamic SSA, and:

- corr(Ck, Cd) = 0.9979,
- corr(Sk, Sd) = 0.5439,
- corr(Gk, Gd) = 0.9847.

The above shows that significant differences between the estimates of the static and dynamic analyses mostly exist for the structural effects.

Fig. 2. Comparison of the effects for the static and dynamic SSA



Source: developed by the authors based on the GUS data, www.stat.gov.pl.

4. DISCUSSION AND CONCLUSIONS

Every health policy analysis is directly addressed to the health policy makers. The government should pay more attention to the results of all significant health care analyses. In the presented case, the methods summing up the HR-related causes of deaths indicate, which of them should be dealt with by particular Polish regions. The decisions made at the central level are not always the best ones. Knowing each regions' strengths and weaknesses as far as the HR cause of death is concerned on the basic level should result in more effective decision making for the health policy.

Although this article only discusses the HR causes of death, the broader context of the analysis shows the health programs that could be launched in the regions to support preventive measures. However, knowing what should be done and which fields of health policy have room for improvement is not enough. The other end of the problem is insufficient funding, aging society, technological advancement in medicine, drug abuse, and the unhealthy style of modern life. Looking comprehensively at the health care, the Ministry of Health should make decisions to satisfy every citizen, which is by no means possible. However, the Ministry of Health should analyze the public demand for health services. The shift-share analysis has indicated regions in need of special, intentional aid. When resources do not expand as fast as the needs, demand and costs, and the patients have to wait months to receive specialist treatment, all methods offering more detailed analysis and information should be used.

The analysis showed that the tumors are the major HR cause of deaths in Poland. According to the taxonomic assessment, in 2008 the worse situation regarding the HR causes of deaths was in the Mazowieckie region, while the Opolskie and Lubuskie regions had the highest indicators of development for mortality variables.

The shift-share methods traced, categorized and described in terms of national growth and regional characteristics the reasons for changes in the HR causes of deaths. This type analysis can be very helpful for the policy makers in allocating resources to fund the treatment of particular diseases, regions, organizational changes, etc.

The analysis has proved the practicality of making the dynamic-total analyses instead of using the static results. Most of the described changes resulted from the comparative effect rather than from structural changes. The total shift for the dynamic SSA was 6.30, being 2.80 higher compared with the 3.50 for the static.

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ANALIZY STRUKTURALNO-GEOGRAFICZNE JAKO NARZĘDZIE POLITYKI ZDROWOTNEJ

Zagadnienia związane z funkcjonowaniem sektora opieki zdrowotnej budzi zawsze burzliwe i niekończące się dyskusje. Najczęściej głosy te dotyczą ograniczania kosztów, wydatków ponoszonych na rzecz opieki zdrowotnej, strajków, wieloetatowości białego personelu, działalności, zadłużenia zakładów opieki zdrowotnej. Kryterium ekonomicznej analizy sektora służby zdrowia nakłada obowiązek spojrzenia na działalność jednostek medycznych, zarówno z perspektywy samego społeczeństwa i powiązanych z nim cech je determinujących, jak i uwzględniając efekty związane z geograficzną dywersyfikacją zarządzania, finansowania i organizacji systemu opieki zdrowotnej.

Celem niniejszego referatu jest zastosowanie metod strukturalno-geograficznych (przesunięć udziałów SSA) do badania zarówno zmian strukturalnych zjawisk zachodzących w przestrzeni geograficznej, w określonym przedziale czasu, jak i do analizy efektów przyjętej polityki zdrowotnej. Analiza ma na celu identyfikacje obszarów i determinant stanu zdrowia Polaków oraz chorób, które mogą pełnić kluczowe role w specjalizacji podejmowanych programów zdrowotnych, jak i polepszania sytuacji w poszczególnych regionach.