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ANALYSIS OF HOUSEHOLD EXPENDITURES DIVERSIFICATION ON HEALTHCARE USING STRUCTURAL-GEOGRAPHIC METHODS

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ABSTRACT. The aim of this paper is to analyse using spatial concentration measures and dynamic shift-share, regional diversification of expenditures made by households from their personal incomes on treatment and various medical investigations, medicines and pharmaceutics, informal charges, gifts as proof of sincere gratitude for the care received, and charges in public hospitals. Poland's voivodeships were used as the set of regions. The analysis was based on the statistical data for 2000-2013 derived from social diagnosis. The research questions included the following: spatial diversification of the phenomenon by voivodeship, identifying those areas characterised by above-average concentration (or the lack thereof) of expenditure volume compared to other voivodeships, verifying the occurrence of strong concentrations or dispersions of the phenomenon in time and space depending on the variable category, analysing the pace of and the changes in the volume of expenditures in time and space and indicating the cause for these changes depending on the structure of expenditures or competitiveness of a region.

JEL Classification: I1, D13, D31, C46

Keywords: health care expenditures, regional spatial diversification and concentration, dynamic shift-share analysis.

Introduction

Studies concerning various aspects of healthcare are an example of interdisciplinary analyses that not only allow the determination of criteria for the assessment of social and healthcare policies, but also the evaluation of economic efficiency of measures taken by the state in order to ensure health safety for all citizens. In its broad meaning, health safety not only includes safe and effective medical techniques and safeguarding against the risk of disease, but also guaranteeing access to medical services with no significant barriers.

Availability of health services can, among others, be defined as their obtainability and ease of use. Obtainability "depends on the fact whether a service is actually ensured, that is to say whether there are its producers, whether it has producers or whether there are producers for it, if so, what is their amount, what kind of principles determine the use of those services

and thus their obtainability by a certain social group, including the principles that determine the occurrence of economic, organisational and/or spatial barriers. Easiness, in turn, refers to availability of healthcare to patients, taking into account financial, organisational, cultural and emotional barriers" (Służba zdrowia, 2008, p. 232).

The above-quoted definition implies that ensuring healthcare availability in society is a complex problem whose solution is sought for by contemporary healthcare systems.

The importance of current socio-economic problems to be resolved within healthcare systems is reflected by the objectives set by specific supranational (WHO) and national (National Health Programmes) strategies. In Polish National Health Programme (NHP) prepared for 2006-2013, one of the principal objectives is to reduce territorial and social inequities in the access to health services. Pursuant to NHP's recommendations, the principles of equity and availability of medical care should be observed when proposing changes in the healthcare system. The principle of equity means that healthcare system should ensure equal treatment for all patients. In turn, the principle of availability indicates that healthcare system should not create barriers to accessing medical services in their broad sense.

In order to properly fulfil the primary objective formulated in NHP for 2006-2013, it is necessary to assess the existing territorial diversification of healthcare availability. This can be done in many different ways using many methods, including those offered by social statistics and spatial statistics. Each of these methods requires populations be assessed for meeting specific conditions.

If the methods of social statistics are to be employed to analyse equity and availability of healthcare, measures considered classic by the specialist literature can be used. Those that are most commonly applied include various measures of concentration (Baumann *et al.*, 1995) and distance whose structure is based on the Lorenz curve, with no need to determine the distribution type of a studied phenomenon/variable. The most common and most frequently used measure is the Gini coefficient, which is calculated based on individual or aggregated data (Suchecka, Laskowska, 1997; Laskowska, 2000, pp. 15-16). However, the set of regions to be analysed is usually a set of administrative (geographic) areas which may vary in size due to their features (e.g. geographic area, population size). In such a case, spatial distribution of a studied phenomenon (variable) does not always reflect actual differences. When the effects of regions' varying sizes are eliminated, spatial analyses can be carried out whilst taking the variables' comparability into account. To that end, we proposed the solution of considering an additional variable, the so-called reference or weight variable, in the conducted analyses. When introduced, this variable enables a comparison of the analysed phenomenon that takes into account the spatial distribution of the reference variable.

An expansion to spatial distribution analyses of a studied phenomenon (concentration, location, specialisation) can be the analyses that use spatial-cross-sectional and temporal-cross-sectional data, which belong to the group of structural-geographic methods. Out of that group, the most commonly used are Shift-Share Analysis (SSA) methods and models. The structural and geographic shift-share analysis allows the assessment of the development level of a studied phenomenon in a selected region as compared to the development level of that same phenomenon in the reference area.

The aim of this paper is to analyse, based on spatial concentration measures (LQ, Gini) and Dynamic Shift-Share Analysis, regional diversification of expenditures made by households from their personal incomes on treatment and various medical investigations, medicines and pharmaceutical products, informal charges, gifts as proof of sincere gratitude for the care received, and charges in public hospitals. The voivodeships were used as the set of regions. The empirical analyses carried out were based on the relevant statistical data for

2000-2013[1] derived from publicly available representative study results – reports of the Council for Social Monitoring "Social Diagnosis. Objective and Subjective Quality of Life in Poland" (Czapiński and Panek, 2000, 2003, 2005, 2007, 2009, 2011 and 2013), which contained the above-mentioned categories of household expenditures. The research questions posed concerned, among others, spatial diversification of the phenomenon level according to voivodeships, identification of those areas characterised by the above-average concentration (or the lack thereof) of the volume of expenditures compared to other voivodeships, verification of the occurrence of a strong concentration or dispersion of the phenomenon level in time and space depending on the variable category, analysis of changes in the volume of expenditures in time and space as compared to the pace of changes in the phenomenon volume in Poland and indicating the cause for these changes depending on the structure of expenditures or competitiveness of a region as compared to others.

Concentration and shift-share methods are applied in studies on economic growth, e.g. Dinc (2002) and Rozpędowska-Matraszek (2010); migration, e.g. Sweeney and Goldstein (2005) and Franklin (2012); remunerations, e.g. Antczak and Żółtaszek (2010), Twardowska and Jewczak (2013); environmental quality/sustainable development, e.g. Constantini, Mazzanti and Montini (2012), Antczak (2010); labour market, e.g. Mayor and Lopez (2009), Batóg and Batóg (2007); regional specialisation: Jayet (1993) and Balassa (1965); as well as in economics and healthcare, e.g. Beyers (2013), Suchecka (2012), Jewczak and Żółtaszek (2011), and Weszczak and Staszek (2013). However, studies that simultaneously use the described set of methods (measures) for the analysis concerning healthcare expenditures have not been conducted in Poland so far.

1. Inequalities in context of spatial concentration

Equity in healthcare can be construed as vertical equity, implying that individuals or households with different incomes finance medical care to different degrees, or as horizontal equity, suggesting that individuals or households with the same demand for medical care have the same access to the care irrespective of their incomes. Issues of vertical (subject-related) equity are studied with respect to financing medical care. In turn, as far as availability is concerned, issues of horizontal (object-related) equity are analysed (Wagstaff and Van Doorslear, 1992).

The definitions quoted above indicate that access to healthcare should depend more on needs rather than the ability to pay. Demand for medical care is associated with the perception of health as capital, right or need.

Health as capital is most commonly expressed in terms of the cost of illness in its economic and social sense. On the other hand, understanding health as a right results in considering access to healthcare in the same manner as access to other goods. This approach makes the concept of health as a need win more and more proponents in contemporary healthcare systems. Thus, availability of medical care is considered a civil right and ought not depend on the individual's ability to pay. Fulfilling that postulate results in irregularities in the workings of the health sector, as reflected in a mismatch between resources (especially financial ones) and healthcare needs that increase and change in time and space; hence leading to social inequities (Wagstaff and Van Doorslaer, 1996, pp. 2-3).

The results of many international studies confirm the thesis that a just healthcare system may coexist with an unjust system for financing it, or vice versa (i.e. Diagnoza Społeczna, 2013). In order to measure the degree of that "injustice", various measures of concentration are used. Inequity in the sense of concentration is understood as the non-

[1] Variables for the year 2013 were partly obtained from the Social Diagnoses of 2011 and 2013, more see in: http://ce.vizja.pl/en/issues/volume/7/issue/3.1, accessed: 20.06.2015.

uniform distribution of the total sum of values of a studied feature among specific units in a set and is most commonly measured with tools based on the Lorenz curve. The most common and most frequently used measure is the Gini coefficient, which is calculated based on individual or aggregated data. In turn, spatial analyses assume the spatial Gini coefficient as a synthetic measure of a phenomenon's concentration, (*more see in*: Suchecki *et al.*, 2010, pp. 132-164). When applied to financing healthcare from individual resources, measures based on Lorenz concentration curves allow one to determine to what extent expenditures made by individuals on medical care are uniformly distributed as well as indicate which expenditure category contributes to increasing inequities in both time and geographic space.

This section of the study uses spatial concentration measures – the Lorenz spatial curve index (i.e. the Location Quotient (LQ)) and the spatial *Gini* coefficient/index. The aim of the analysis is to verify and identify the spatial concentration of specific expenditure categories by voivodeship from 2000 to 2013.

Spatial concentration is expressed as the difference between the distribution of the analysed variable X and the distribution of reference variable Z.[2] The measurement of concentration in the form of location quotients, the Lorenz curve and indices was proposed by B. Balassa (1965), Atkinson (1970) and Gatswirth (1971), and subsequently popularised in works including Hannah and Kay (1977), Kakwani (1980), Kolm (1976), H. Jayet (1993), Overman and Combes (2004), Thisse (2006) and Suchecki (*et al*., 2010).

When geometrically interpreted, the difference is a distance between components of the vectors $\mathbf{v}(x)$ and $\mathbf{v}(z)$ in an R-dimensional space where the r-component of those vectors, according to earlier assumptions, equals $q_r = x_r/x$ and $p_r = z_r/z$. The values of x_r/x and z_r/z are shares of the r-region in the set of all regions for the aggregate variables X and Z. The values of those shares are independent of the selected unit of measurement. If the spatial distributions of variables X and Z are identical, differences in shares equal zero for all r components. On the other hand, the values of the components of those vectors that are different to zero reflect a higher or lower regional diversification of analysed variables.

Spatial distribution can also be analysed using the following location quotients:

$$LQ_r = \frac{x_r / x}{z_r / z} = \frac{x_r / z_r}{x / z} = \frac{q_r}{p_r}, \qquad (1)$$

Alternatively, an analysis of vector $\mathbf{v}(LQ)$ of the location quotients has been proposed. In this case, if the studied phenomenon does not show concentration, the r-component of that vector equals one, i.e. $\mathbf{v}(LQ_r) = \mathbf{v}(1)$. Based on the data used in the discussed study, it is difficult to determine causes that significantly affect the regional differences observed in household expenditures on the selected healthcare services categories. Such an assessment would require more detailed research. General information on that issue is provided by values of the location quotients (LQ) calculated for each voivodeship. They indicate the share of expenditures made by households on a given medical service category in a selected voivodeship compared to general healthcare expenditures covered by individual resources in Poland. In order to determine the degree of non-uniformity of the spatial distributions of expenditures on selected categories of medical goods and services, the spatial location quotients discussed above (*Formula 1*) were used to obtain the share of total expenditures made by households in specific voivodeships in the total expenditures on a given category of medical goods and services as the reference (weight) variable. Calculation results are shown in *Table 1*.

[2]The distribution of the reference variable Z is a spatial distribution of the variable corresponding to the interpretation of the relationship between *X*/*Z*, based on economic or geographic meaning.

Table 1. Average values of LQs calculated for variables and the years 2000-2013

	Expenditures on treatment and examinations	*Informal payments*	*Gifts*	*Charges at public hospital*	*Expenditures on drugs*
			Average values LQ in 2000-2013		
dln	0.99	1.14	0.55	1.18	0.83
kp	1.25	0.62	0.89	0.86	1.22
le	1.12	0.94	1.11	0.65	1.20
lu	1.31	0.64	0.96	0.55	1.38
ł	0.98	1.09	1.15	0.86	1.07
mł	1.04	0.93	1.18	1.00	1.15
mz	1.08	0.90	1.48	1.05	0.88
pdk	1.18	0.37	0.39	1.19	1.39
św	0.84	1.22	1.06	0.86	1.06
o	1.27	0.39	1.29	1.07	1.21
śl	1.20	0.70	1.05	0.78	1.07
wlk	1.01	1.21	1.26	0.83	0.99
pm	0.94	0.93	1.06	1.07	0.94
wm	1.07	0.49	1.61	0.55	1.36
pdl	1.07	1.02	0.75	0.63	1.14
zp	1.53	0.82	0.37	0.89	1.39

Notes: explanation of abbreviations: dln – dolnośląskie, kp – kujawsko-pomorskie, le – lubelskie, lu-lubuskie, ł – łódzkie, mł – małopolskie, mz – mazowieckie, pdk – podkarpackie, św – świętkokrzyskie, o – oploskie, śl – śląskie, wlk – wielkopolskie, pm – pomorskie, wm – warmińsko-mazurskie, pdl – podlaskie, zp – zachodnio-pomorskie.

Source: compiled by the authors.

The comparison of the mean values of the location quotients from 2000 to 2013 indicates differences in expenditure burdens (concentrated) for households in specific voivodeships depending on the expenditure category. Voivodeships where household expenditures on treatment and various medical investigations were definitely above the mean of those expenditures in Poland (in the studied period on average) were: Zachodnio-Pomorskie (*LQ* = 1.53, i.e. 53% above the mean value for the country), Lubuskie (*LQ* = 1.31), Opolskie (*LQ* = 1.27) and Kujawsko-Pomorskie (*LQ* = 1.25). In turn, the voivodeship with the lowest mean concentration level of that variable category was the Świętokrzyskie voivodeship (*LQ* = 0.84). Regions with concentrated levels of expenditures on treatment and medical investigations close to the mean reference variable value were the Dolnośląskie (*LQ* = 0.99) and Wielkopolskie voivodeships (*LQ* = 1.00).

As for expenditures made with respect to informal charges, the voivodeships with the highest concentration of that variable were Świętokrzyskie (*LQ* = 1.22) and Wielkopolskie (*LQ* = 1.21) when compared to the mean level of the phenomenon in Poland. By far the lowest mean concentrated levels of expenditures made by households on informal charges below the value for the reference area in the studied period were in the Podkarpackie (*LQ* = 0.37, 63% below the national mean) and Opolskie (*LQ* = 0.39) voivodeships. The only area where the level of cost burden with respect to informal charges was close to the weight variable's value throughout the entire analysed period was the Podlaskie voivodeship (*LQ* = 1.02).

A particularly high above-average concentration level of expenditures on gifts characterised the Warmińsko-Mazurskie (*LQ* = 1.61, 61% above the national mean) and Mazowieckie (*LQ* = 1.48) voivodeships. The lowest mean concentration level of that variable category was noted in the Podkarpackie (*LQ* = 0.39) and Zachodnio-Pomorskie (*LQ* = 0.37)

voivodeships. The concentration level of expenditures on gifts close to the mean (reference) level was achieved by the Lubuskie voivodeship (LQ =0.94).

As for the level of expenditures on charges in public hospitals, the mean quotient values range from 0.55 to 0.19. Thus, between 2000 and 2013, the highest concentration level of such expenditures was held by the Podkarpackie voivodeship and the lowest by Lubuskie and Warmińsko-Mazurskie. In contrast, the Małopolskie voivodeship reflects the mean/country's concentration level of those charges (LQ = 1.00).

As far as expenditures on medicines and pharmaceutical products are concerned, the highest concentration levels above the country's mean (over thirty per cent) were seen in the Zachodnio-Pomorskie (LQ = 1.39), Podkarpackie (LQ = 1.39) and Lubuskie (LQ = 1.38) voivodeships. The least money was allotted to that expenditure category in the Dolnośląskie voivodeship (LQ=0.83). The concentration level of expenditures on medicines and pharmaceutical products close to the mean/country level was achieved by the Wielkopolskie voivodeship (LQ = 0.99).

Changes in household expenditure levels occurring in specific analysed years (*Table 1*) indicate that there was considerable regional diversification of the studied phenomenon depending on the given variable category. These regularities are also confirmed by the mean values of the Gini spatial concentration coefficient[3] (computed for specific expenditure categories, years of analysis and voivodeships) in *Figure 1*.

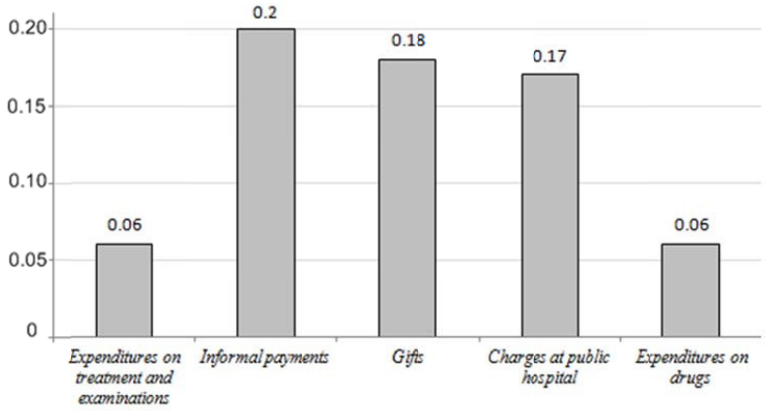

Figure 1. Average values of the spatial concentration Gini index
Source: compiled by the authors.

The calculated mean values of the concentration indices shown in *Figure 1* indicate a small degree of non-uniformity in financing treatment and various medical investigations as well as financing medicines and pharmaceutical products (mean values of *GINI* = 0.06, about 6%), but a considerable concentration level in the case of expenditures on informal charges, gifts and charges in public hospitals. Expenditures on informal charges (*GINI* = 0.2) is characterised by the highest index value, indicating an increase in regional non-uniformity for that expenditure category in the voivodeships from 2000 to 2013. The non-uniform distribution of expenditures on financing healthcare services from individual households'

[3] $G_r^i = \frac{\Delta}{4L\overline{Q}_r^i}$, $\Delta = \frac{1}{R(R-1)}\sum_{r=1}^{R}\sum_{m=1}^{R}\left|LQ_r^i - LQ_m^i\right|$, where: LQ – Location Quotient, R – the number of regions (spatial units), r, m – concrete region.

resources is also indicated by the values of the spatial concentration indices for expenditures on gifts as proofs of gratitude (0.18) and expenditures on charges in public hospitals (0.17). The reasons for the observed situation may include the development of the private medical services market in facilitating quick access to healthcare, higher quality of healthcare in non-public facilities compared to services provided by publicly financed ones, the possibility to transfer some costs of treatment started in the private sector to the public one, and the rising prices of medicines, both those subject to refund by the central payer and over-the-counter ones which may to some extent translate into the increased tendency of household members to self-treat (Tymowska, 2007, p. 102; Suchecka, 2010 p. 156).

The results obtained in the course of the analysis of spatial concentration, defined as inequity in expenditures made on healthcare from personal incomes, reveal changes occurring in these values both in the voivodeships (geographic space) and over time, simultaneously showing the potential of using spatial concentration and location methods.

2. A brief introduction to the theory of shift-share

Structural-geographic analyses enable more detailed studies that use spatial-cross-sectional and temporal-cross-sectional data. This group of methods consists of, among other, Shift-Share Analysis – SSA. Shift-share analysis was proposed in the 1940s (Creamer, 1942), and formalised and popularised in research on the diversification of regional economic growth in the 1960s (Dunn, 1960). Structural-geographic methods allow one to assess the development level of a region (a voivodeship) compared to the development level of a reference area (the country). As opposed to concentration measures, the use of the SSA method allows for the assessment of changes in regional development whilst taking into account changes in the structure of the studied phenomenon.

There are many approaches to the shift-share method, from classic to dynamic/recursive to spatial (including the spatial weights matrix). In the classic shift-share analysis of a phenomenon, a variable quantified in compound form – an absolute change or pace of changes (rate of increase/decrease) of the variable subject to direct observation – is examined. The results of that method depend on the selected system of weights, which can bias the final results of the analysis, (more see in: Antczak and Żółtaszek, 2010). In turn, the dynamic approach takes into consideration the changeability of weights in consecutive analysed periods. The analysis algorithm is based on recursive calculations of the changes, which always consider two consecutive years in a studied several-year period, and the aggregation of consecutive partial results.

The Shift-Share Method consists of decomposing the total change (most commonly a relative one, i.e. the rate of increase/decrease) into three components: global (country-related), cross-sectional (structural, sectoral; in relation to one or many features) and regional (geographic, competitive, differentiating). Net effects are often determined, these being the relative change in a region reduced by a constant global change. That allows one to select structural and spatial effects. If the changes are studied over a longer period, it is justified to assume changing weights and perform recursive calculations. This means determining a relative, absolute or net change in the value of the studied feature and specific effects sequentially, for each pair of consecutive periods. Dynamic approach is equivalent to carrying out a series of shifts in the classical analysis, determining the weight from year to year, (see: Barff *et al.*, 1988).

Therefore, further calculations will be based on the following formula:

$$\sum_{k=1}^{V} tx_{r\bullet,k} = \sum_{k=1}^{V} tx_{\bullet\bullet,k} + \sum_{k=1}^{V}\sum_{i} u_{r\bullet(i),k}\,(tx_{\bullet i,k} - tx_{\bullet\bullet,k}) + \sum_{k=1}^{V}\sum_{i} u_{r\bullet(i),k}\,(tx_{ri,k} - tx_{\bullet i,k}), \qquad (2)$$

where $tx_{ri,k} = \frac{(x^*_{ri,k} - x_{ri,k})}{x_{ri,k}}$ is the rate of increase in the *I* category of expenditures in the *r* voivodeship in the *k* subperiod of analysis; $x_{ri,k}$ is value of a feature in the *r* voivodeship and in the *i* category of expenditures in the initial year of the period of analysis *k*; $x^*_{ri,k}$ is the value of a feature in the *r* voivodeship and in the *i* category of expenditures in the final year of the period of analysis *k*; $tx_{r\bullet,k}$ is the mean pace of changes in the sum of expenditures in the *r* voivodeship in the subperiod *k*; $tx_{\bullet i,k}$ is the mean pace of changes in the *i* category of expenditures in the subperiod *k*; $tx_{\bullet\bullet,k}$ is the mean pace of changes in the aggregate variable in the country in the *k* subperiod; $u_{r\cdot(i),k}$ are the regionally changing values of weights – shares of a studied feature (x_{ri}) in the total volume of specific categories of the studied features in a given voivodeship ($x_{\cdot i}$), in the *k* subperiod of analysis; *V* is the five subperiods of analysis: 2003/2000, 2005/2003, 2005/2007, 2009/2007, 2011/2009 and 2013/2011.

3. Results of analysis

Figure 2 shows results of the applied dynamic shift-share analysis (compare *Formula 2*) of changes in the volume of household expenditures (data for the last three months in PLN) according to types from 2000 to 2013, taking into account the directions of changes in the phenomenon from one year to the next. Regional weights in the form of shares of the studied variable, individual cross-sectional-regional paces of changes and changes in the volume of expenditures were used to compute (marginal) means and effects: global, structural and geographic (local, competitive).

Poland's mean pace of changes in the volume of expenditures on healthcare from 2000 to 2013 was 119.5%. Therefore, the volumes of household expenditures on the described categories rose by about 120% on average in 2013 compared to 2000 (taking into account changes in the volumes of expenditures in specific years and voivodeships). The data shown in *Figure 2* indicates that all voivodeships experienced an increase in expenditures on medical services and healthcare in the analysed years. The values of the mean regional paces of changes are positive and range from 10% (Warmińsko-Mazurskie) to 506% (Zachodnio-Pomorskie). Thus, the Zachodnio-Pomorskie voivodeship is characterised by a significantly faster pace of increase in expenditures compared to the other regions. The value of the mean pace of changes in that voivodeship is 506% and amounts to an over fivefold increase in expenditures on healthcare in 2013 compared to 2000. Furthermore, the pace of increase in that region is 386 pp faster (global effect) than the mean pace for the country. This situation arises mainly due to the geographic effect or "competitiveness" of the region (geographic effect was 409 pp; structural effect was -22.9 pp.). Hence, from 2000 to 2013, households in the Zachodnio-Pomorskie voivodeship allotted the most money to expenditures connected with healthcare compared to the other voivodeships. Therefore, that region is quite "competitive" in respect of expenditures on medical products and services, gifts and charges. The group of voivodeships characterised by the pace of increase in expenditures from private resources made on all the specified healthcare categories, which is definitely faster than the mean for Poland, also includes the Dolnośląskie (mean regional pace: 313%, net effect: 193 pp faster pace of increase than the mean for Poland), Mazowieckie (mean regional pace: 251%, 132 pp faster pace of increase than the country's pace of increase) and Lubelskie (mean regional pace: 242%, net effect: 122 pp) voivodeships. In the Dolnośląskie, Mazowieckie and Lubelskie voivodeships, the factor determining the fast pace of increase in

expenditures was also the regions' "competitiveness"[4] (geographic effects: 143 pp, 125 pp and 155 pp respectively). That means an increase in the volume of expenditures with respect to all healthcare categories in those regions that is faster than the pace of increase for that variable in the other voivodeships in the studied period.

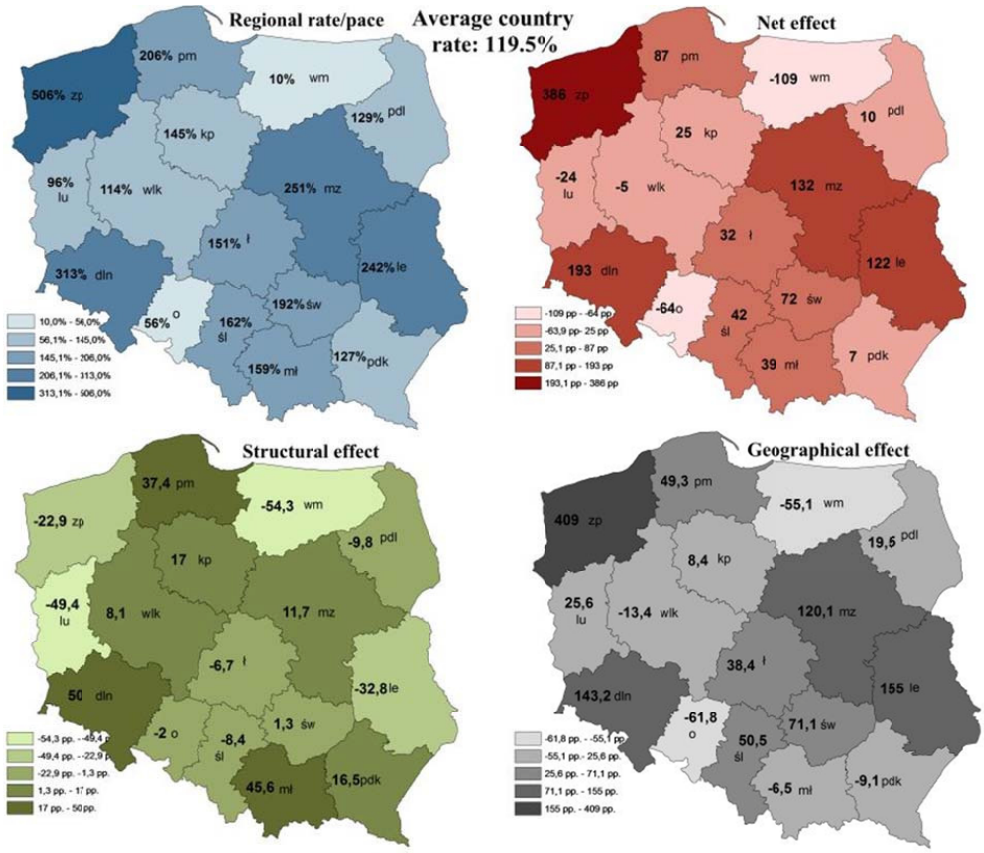

Figure 2. Results of dynamic shift-share analysis of changes in the amount of household spending on health care, by province, category and year
Source: compiled by the authors.

Voivodeships where the mean pace of expenditures on healthcare is slower than the mean pace of increase in the variable include Warmińsko-Mazurskie (net effect: -10.9 pp), Opolskie (net effect: -64 pp), Lubuskie (net effect: 24 pp) and Wielkopolskie (net effect: -5 pp). However, in the Lubuskie voivodeship (the only one among those mentioned), the net effect value was mainly influenced by changes to the structure of expenditures in that region being slower than changes arising from local determinants (structural effect: -49.4 pp,

[4] Household spending on health care is associated with population morbidity (a detailed discussion of the issue, see Section 1 of this publication). This means that the higher the morbidity, the greater the cost for the treatment of diseases. Thus, the analysed variable is rather a destimulant for regional development, and the term "competitiveness" indicates an above-average propensity to spend money and is thus a negative phenomenon.

geographic effect: 25.6 pp). The Wielkopolskie voivodeship is characterised by a pace of changes in expenditure volume close to the mean pace for the country (regional pace in the voivodeship: 114%; the country's pace was 119.5%), *see Figure 2.*

The data contained in *Figure 2* also indicates that the net effect value of the volume of household expenditures on medical and other healthcare-related services in specific voivodeships from 2000 to 2013 may be affected by changes in the structure of costs. Alternatively, the change could result from the "competitiveness" effect. On the other hand, the values of the structural and geographic effects are affected by shares of the volumes of changes in a specific expenditure category (*Table 2*).

Table 2. The share of (changes in) individual expenditure levels in the volume of net, structural and geographical effects (in percentage points)

	NE	*Exp. on treatment & examinations*	*Informal payments*	*Gifts*	*Charges in a public hospital*	*Exp. on drugs*	*SE*	*Exp. on treatment& examinations*	*Informal payments*	*Gifts*	*Charges in a public hospital*	*Exp. on drugs*	*GE*
dln	193.3	-10.2	27.2	4.3	43.5	-14.9	50.0	-18.1	182.9	4.4	-27.2	1.3	143.2
kp	25.4	-30.5	-5.0	1.0	72.9	-21.4	17.0	5.3	15.8	-9.2	-4.5	1.0	8.4
le	122.1	-39.8	17.9	0.7	20.8	-32.4	-32.8	-19.7	83.8	49.9	43.2	-2.2	154.9
lu	-23.8	-41.5	4.5	7.1	5.4	-24.8	-49.3	20.5	-3.2	2.2	3.7	2.4	25.6
ł	31.7	-47.6	25.3	-2.5	37.2	-19.1	-6.7	10.4	8.5	18.0	11.7	-10.2	38.4
mł	39.1	-14.1	41.3	-0.8	39.2	-19.9	45.6	14.5	-42.0	18.2	-2.1	4.9	-6.5
mz	131.8	-30.1	22.6	3.0	40.9	-24.6	11.7	21.2	30.8	28.7	40.1	-0.6	120.1
pdk	7.4	-42.2	0.1	0.0	80.0	-21.4	16.5	32.7	20.4	0.7	-65.0	2.1	-9.1
św	72.3	-19.8	25.5	3.7	21.0	-29.2	1.3	-13.4	21.5	-1.9	66.5	-1.5	71.1
o	-63.8	-28.8	18.8	10.3	21.5	-23.7	-2.0	-5.7	-28.6	12.0	-39.9	0.4	-61.8
śl	42.2	-28.9	27.3	0.1	14.1	-21.0	-8.4	-0.5	-12.5	9.2	60.3	-6.0	50.5
wlk	-5.3	-34.6	6.8	23.2	37.3	-24.6	8.1	6.0	-14.7	-	5.4	5.2	-13.4
pm	86.7	-35.9	17.3	29.9	44.3	-18.2	37.4	3.5	-1.9	-	75.7	0.7	49.3
wm	-109.5	-40.4	11.4	-9.2	15.9	-32.0	-54.3	-7.8	-4.5	-	-21.6	-4.2	-55.1
pdl	9.7	-31.8	33.9	-3.3	7.4	-16.0	-9.8	10.1	-45.1	18.2	32.4	3.9	19.5
zp	386.1	-24.0	13.9	4.9	11.2	-28.9	-22.9	-16.1	219.2	-7.2	219.0	-5.9	409.0

Notes: NE – net effect, SE – structural effect, GE – geographical effect.
Source: compiled by the authors.

Data presented in *Figure 2* imply that there are components in voivodships (in the form of the share of the volume of specific expenditure categories) that are of importance in the values of structural and geographical effects. For example, the net effect value in the Zachodnio-Pomorskie voivodeship was influenced by local factors (geographic effect: 409 pp). In turn, the detailed results in *Table 2* indicate that the geographic effect value in that voivodeship was most significantly affected by changes in the volume of shares of expenditures made on informal charges (219.3 pp) and charges in public hospitals (219 pp) – the fastest as compared to the pace of changes in those expenditure categories in the other regions. On the other hand, in the Małopolskie voivodeship – where the pace of changes in the volume of expenditures from 2000 to 2013 was 33 pp faster than the country's pace (net effect: 39.1 pp.) – the net effect value was mainly influenced by the volume of the structural effect (45.6 pp). In turn, changes in the structure of household expenditures being faster than the country's mean resulted mainly from changes in the volume of shares of informal charges (41.3 pp) and charges in public hospitals (39.2 pp) compared to changes in the levels of the other expenditure categories in that region and compared to the pace of changes in those cost categories in Poland.

The volumes of net effects calculated based on structural-geographic equation (2) are also explained by the verification of the sectoral pace of changes and net effect as well as an

analysis of absolute values of changes in the volume of specific expenditure categories in voivodeships in the studied years, *Table 3*.

Table 3. Average periodic changes in the amount of expenses and the effects of structural and geographical equality (in percentages and percentage points)

	Exp. on treatment& examinations (in %)	*Informal payments (in %)*	*Gifts (in %)*	*Charges in a public hospital (in %)*	*Exp. on drugs (in %)*
dln	34.6	4.9	115.3	45.3	3.4
kp	88.1	-47.9	350.9	51.5	97.4
le	31.6	14.7	4.5	34.6	11.1
lu	84.6	83.9	45.0	33.6	20.6
ł	47.7	6.2	206.4	14.3	152.6
mł	93.1	6.4	84.5	50.7	49.7
mz	74.1	-43.2	127.8	29.6	80.2
pdk	104.5	4.5	150.7	43.0	217.9
św	58.0	-9.5	430.8	37.5	133.7
o	52.5	103.8	-104.8	34.5	-7.6
śl	51.5	54.0	307.9	28.5	182.6
wlk	72.9	37.4	151.1	66.0	-14.6
pm	65.6	8.6	242.9	36.4	42.8
wm	32.8	-242.4	-118.1	39.4	8.5
pdl	97.6	64.4	224.2	55.1	14.9
zp	86.4	106.5	23.8	36.1	32.5
Average sectoral rate (w %)	109.7	235.5	437.7	44	279.7
Sectoral net effect (w pp.)	-9.8	116	318.2	-75.5	160.2
Average country rate/pace 119.5%					

Source: compiled by the authors.

The results presented in *Table 3* indicate that all of the analysed expenditure categories showed a positive mean pace of changes in their volumes from 2000 to 2013. This means an increase in the mean level of household expenditures on healthcare in Poland's voivodeships in the analysed period.

The category of informal charges was characterised by the fastest pace of changes in expenditures (437.7%). In this category of expenditures, the pace of increase was faster than the mean pace of changes in Poland by over 318.2 pp. The slowest changes in the volume of household expenditures occurred in the category of charges paid in public hospitals (sectoral effect 44%, net sectoral effect -75.5 pp).

As for the category of expenditures on various medical investigations and treatment, the biggest changes in the volumes of those expenditures from 2000 to 2013 occurred in the Podkarpackie (mean increase of 104.5%), Podlaskie (mean increase of 97.6%) and Małopolskie (increase of 93.1%) voivodeships. The lowest increase in the level of that expenditure category occurred in the Lubelskie voivodeship (+ 31.6%). As far as the category of households' expenditures on informal charges is concerned, the highest increase in the variable level was noted in the Zachodnio-Pomorskie (+106.5%) and Opolskie (+103.8%)

voivodeships, whereas the biggest decrease was observed in the Warmińsko-Mazurskie (-242.4%) voivodeship.

In the studied period, the largest increase in expenditures on gifts occurred in the Świętokrzyskie voivodeship (430%), while the largest decrease in this variable's level was noted in only two voivodeships: again in Warmińsko-Mazurskie (-118.1%) and in Opolskie (-104.8%).

From 2000 to 2013, there was an increase in the level of expenditures on charges in public hospitals in all voivodeships. The biggest change in the level of that variable characterized the Wielkopolskie voivodeship (66%). More than fifty per cent increases were observed in the Kujawsko-Pomorskie, Małopolskie and Podlaskie voivodeships. The smallest increase in volume of that expenditure category was observed in the Łódzkie voivodeship (14.3%).

In turn, the largest increase in the level of household expenditures on medicines and pharmaceutical products was noted for the Podkarpackie voivodeship (217.9%), and the smallest for Dolnośląskie (3.4%). On the other hand, the biggest decrease was observed in the Wielkopolskie voivodeship (-14.6%).

The changes in the volumes of expenditures on the presented types of medical care, services and products are reflected by the level of sectoral effects as well as the volumes of global, structural and geographic effects.

Conclusions

The results of the applied quantitative methods allowed for the analysis of changes in household expenditures on treatment and various medical investigations, informal charges, gifts, charges in public hospitals as well as medicines and pharmaceutical products from 2000 to 2013, taking into account spatial structure (voivodeships) and annual changes in the volume of the phenomenon in time.

The research carried out indicated that the observed level of household expenditures on healthcare is non-uniformly distributed in both time and space, particularly with respect to informal charges, expenditures on gifts and charges in public hospitals. This fact is confirmed by the mean values of the Gini spatial concentration coefficient (*Table 1* and *Figure 1*). Simultaneously, the Gini indices indicate that household expenditures on treatment and various medical investigations as well as on medicines and pharmaceutical products in specific years were characterised by a slight non-uniformity of distributions, GINI = 0.06; (*Figure 1*). The location quotients' values revealed that the highest degree of concentration occurs in the Zachodnio-Pomorskie, Kujawsko-Pomorskie, Lubuskie, Wielkopolskie, Warmińsko-Mazurskie, Dolnośląskie or Mazowieckie voivodeships (*Table 1*). The lowest mean LQ values occurred for the Podkarpackie, Opolskie and Lubuskie voivodeships. Issues concerning the concentration degree of expenditure volumes are reflected by the mean paces of changes in the phenomenon level in specific voivodeships. The biggest rise in expenditures actually occurred in the Zachodnio-Pomorskie, Dolnośląskie, Mazowieckie or Lubelskie voivodeships, while the slowest pace of changes was noted in the Opolskie, Warmińsko-Mazurskie and Podlaskie voivodeships (*Figure 2*).

Furthermore, the shift-share analysis results indicate that there was an upward trend in the volume of expenditures on the discussed categories of medical services and care from 2000 to 2013 (the national pace of changes was +119.5%). Moreover, each voivodeship and each expenditure category are also characterised by a positive pace of changes reflected by the positive values of the mean regional and sectoral paces (*Figure 2* and *Table 3*).

The decomposition of the global effect into domestic, structural and geographic/competitiveness effects revealed that the net effects in the voivodeships are

considerably affected by local/competitiveness factors (geographic effects). There may be many causes of this phenomenon. The most important of those were specified in the first part of this paper, while the results of the conducted analysis generally confirmed the theses formulated in other studies.

Conclusions about the spatial non-uniformity of the studied phenomenon drawn in this paper are also proved by the shares of changes in the volumes of specific expenditure type levels in the paces of changes in specific voivodeships. In a majority of regions, the level of competitiveness factors was mainly affected by the pace of changes in the volume of informal charges and charges paid in public hospitals, e.g. in the Zachodnio-Pomorskie or Dolnośląskie voivodeships (*Table 2).* However, the spatial diversification of household expenditures made from their own resources is significant, which translates into the need to individually analyse the situation in each of the studied units.

To sum up, the conducted analysis enabled the allocation of changes to the selected components in the studied phenomenon and thus provided additional information indicating that the observed changes are regionally (in respect of voivodeships) characterised by a specific developmental trend which, however, is specific for each region. Nevertheless, due to the nature of statistical information (high generality of panel data), the obtained results should be regarded as a starting point for further, more detailed research that takes cause and effect relationships into account.

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