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Comparison of Selected European Countries in Terms of the Number of In-patient Days per Inhabitant

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Abstract
The aim of the paper is to determine the influence of particular factors on the diversity of European countries in terms of the number of hospital bed-days per one inhabitant. Two factors affecting the discussed variable have been analysed in the paper: the in-patient average length of stay and the proportion of the number of in-patients to the population size of a given country. To assess the impacts of these factors on the deviation of the variable considered, the logarithmic method was used. The causal analysis allowed to answer the question, how in the selected European countries the analysed factors affect the dependent variable, namely, what the directions and strengths of their impacts are. The values referring to Poland were compared with the results obtained for each of the examined countries and final conclusions were drawn on those grounds.

Key words: *number of hospital bed-days, in-patient average length of stay, frequency of hospitalisation.*

Introduction

Better health means a fuller use of the potential accumulated in human capital. However, it should be strongly emphasised that healthy life benefits not only a given person, but also translates into better functioning of the entire society. Moreover, the positive impact of health is multidimensional [1]. Good health gives a chance for greater professional and non--professional activity, which facilitates life self-fulfilment. Good health also enhances the sense of security and makes it possible to undertake actions aimed at improving the material conditions of one's existence. In contrast, disease is related to losses and these are losses not only in the individual dimension, but also in the general economic and social dimension. The increase in the number of sick citizens means a decrease in productivity in the economy of a given country, with a simultaneous increase in the burden on the state budget. Thus, health is undoubtedly one of the key determinants of economic growth and development [2].

Research confirms that those countries that spend more on health are more effective in treating most diseases and therefore have a healthier society. It is also worth adding that a clear correlation has been proven between the amount of healthcare expenditure in a given country and the average healthy life expectancy of inhabitants [3]. This means that expenditure on healthcare should be perceived not as a cost, but as an investment in human capital, which returns in the form of greater productivity and activity of citizens. Healthy citizens are not only able to work more efficiently, but also enjoy opportunities to participate more extensively in cultural and social life.

In European countries, a clear tendency to allocate increasing amounts to healthcare can be observed. Undoubtedly, this is a consequence of the ongoing demographic processes (mainly related to the aging society), changes in the degree of advancement of medical procedures implemented, and faster and faster progress in the field of technologies applied. Obviously, the appearance of new, improved therapeutic products and technical means in medicine ensures more effective treatment of known diseases, as well as enables to fight diseases previously considered very difficult or impossible to cure. At the same time, it entails the necessity of incurring constantly increasing expenses on healthcare sector, as a result of which growing public spending on healthcare is becoming an important problem of modern economies [3].

Based on the available data, it can be seen that European countries vary greatly in terms of the amount of expenditure on healthcare *per capita*, and this is due to significant differences in the level of economic development between these countries [4]. Higher amounts on healthcare are allocated by those which can simply afford it (that is, those with higher GDP *per capita*).

There are various institutional solutions for the healthcare system in European countries. The structure of financing from public and private sources is also diverse [5]. The diversity is the result of many different factors, including historical determinants, ideological considerations and economic conditions of individual societies [6]. Regardless of the system solutions used, the main objectives of the health service always include the provision of high-quality health services with ensuring their comprehensiveness, continuity and the widest possible availability [7].

As a consequence of the high dynamics of health expenditure growth observed in Europe, the issue of not only effectiveness, but also efficiency of service delivery is increasingly being raised. An action is effective when it allows to obtain a positive health effect. But, in order to answer the question whether such action is efficient, this effect has to be confronted with the quantity of material, labour and financial inputs consumed [8]. However, measuring efficiency in the healthcare sector is quite a challenging task, as the achieved results in the form of a healthier population are at least difficult to quantify. While it is possible to precisely calculate the expenses incurred, presenting the whole bundle of effects in monetary units is a truly complicated task. Nevertheless, this does not undermine the necessity to make efforts to seek the best possible allocations for state funds assigned to health purposes of the society and to undertake actions aimed at identifying hidden reserves. It seems that constant improvement of management and streamlining processes carried out in healthcare entities is the best way to boost their efficiency. Hence, no matter how much the measurement of efficiency in healthcare is a problematic issue, there is a real need to develop such methods and select such measures that would facilitate analyses and assessments. Continuous and comprehensive control of processes is the basis for their proper selection and enables appropriate changes to be made to optimise the methods and techniques applied. Evaluation of processes is also a good tool to increase transparency and strengthen the sense of responsibility not only for the results achieved, but also for the inputs consumed.

The most important position in the healthcare system – both in respect of sums of money involved and the functions performed – is occupied by stationary treatment. It includes various types of healthcare institutions whose task is to provide services related to the treatment and organisation of 24-hour care for patients [9]. Hospitals play a key role among these establishments. A medical facility may be considered a hospital if it is characterised by a constant readiness to admit and accommodate patients, provides the patients staying there with round-the-clock, comprehensive and qualified medical care consisting of observation, diagnosis, nursing and treatment [10]. Hospital treatment is very expensive and, in most countries, it absorbs a significant and growing part of funds allocated for meeting the health needs of the society [11].

It can be noticed that European countries vary greatly in terms of the annual number of in-patient days *per capita*. Thus, the question is: what is the reason? Is it because the in-patient average length of stay varies greatly in these countries? Or is it because, in some countries, inhabitants are hospitalised much more often, and in some countries much less often? Or maybe it results from both of those factors? If so, then another question arises: what is the weight of each of the aforementioned factors? Consequently, the determination of impacts of individual factors on the diversity of European countries with regard to the number of in-patient days *per capita* has become the aim of the research carried out in the further part of this article. As stated earlier, the study covered two factors shaping the value of the dependent variable, namely the in-patient average[1] length of stay and the proportion of the number of in-patients to the population size of a given country. The results for Poland were compared with those obtained for eighteen selected European countries, and on this basis, final conclusions were drawn.

The difference between the value of the measure under consideration for a given country and the value of this measure for Poland was defined as a deviation for the purposes of this study. Such a deviation may be positive or negative. Therefore, wherever in this article a deviation is mentioned, it should be understood as a positive or negative deviation from the value characteristic for Poland. The structure of the deviation can be known thanks to the causal analysis. In this paper the logarithmic method was proposed as the most attractive method of the causal analysis.

Material and methods

In order to build an appropriate ratio equality, it was assumed that the examined variable α could be presented as a product of factors β and γ. The value of variable α for Poland is the reference basis and has been denoted as α_{PL}. In turn, the value of this variable calculated for the i-th country (i = 1, ..., 18) is marked by α_1. The ratio $w_{i;\alpha}$ – constructed for variable

$$\alpha - \text{is } \frac{\alpha_i}{\alpha_{\mathrm{PL}}}.$$

Since $\alpha_i = \beta_i\gamma_i$ and $\alpha_{PL} = \beta_{PL}\gamma_{PL}$ dividing α_i by α_{PL}, one can get:

$$\frac{\alpha_i}{\alpha_{\mathrm{PL}}} = \frac{\beta_i\gamma_i}{\beta_{\mathrm{PL}}\gamma_{\mathrm{PL}}}, \qquad (1)$$

[1] The average used in this article is the arithmetic mean.

where:
$\alpha_i, \beta_i, \gamma_i$ – the values of variables α, β and γ referring to the *i*-th country;
$\alpha_{PL}, \beta_{PL}, \gamma_{PL}$ – the values of variables α, β and γ referring to Poland.

The same can be written differently, namely:

$$\frac{\alpha_i}{\alpha_{\mathrm{PL}}} = \frac{\beta_i}{\beta_{\mathrm{PL}}} \cdot \frac{\gamma_i}{\gamma_{\mathrm{PL}}}, \qquad (2)$$

or:

$$w_{i;\alpha} = w_{i;\beta} \cdot w_{i;\gamma}, \qquad (3)$$

where $w_{i;\alpha} = \frac{\alpha_i}{\alpha_{\mathrm{PL}}}$, $w_{i;\beta} = \frac{\beta_i}{\beta_{\mathrm{PL}}}$, $w_{i;\gamma} = \frac{\gamma_i}{\gamma_{\mathrm{PL}}}$.

Thus, if a variable α is the product of variables β and γ affecting the discussed variable α, the ratio computed for α is the product of ratios computed for factors β and γ.

From a mathematical point of view, logarithms with any base can be taken of both sides of an equation, provided that the numbers that the logarithms have been taken of are positive. The values of ratios $w_{i;\alpha}$, $w_{i;\beta}$ and $w_{i;\gamma}$ are always greater than zero, hence the logarithms can be taken of both sides of the equation (3). Obviously, the base of the logarithm must be > 0 and ≠ 1. The choice of the base, however, has no bearing on the final results of the causal analysis, but only on its partial results. The logarithm with base 10 (i.e. the common logarithm) will be used in further computations.

Taking the logarithms of both sides of the equation (3), the following expression can be obtained:

$$\log (w_{i;\alpha}) = \log (w_{i;\beta} \cdot w_{i;\gamma}) \qquad (4)$$

Then, using the logarithm property stipulating that the logarithm of a product of two numbers is equal to the sum of the logarithms of these numbers, the equation presented below can be derived:

$$\log(w_{i;\alpha}) = \log(w_{i;\beta}) + \log(w_{i;\gamma}) \quad (5)$$

The next step is to divide both sides of this equation by the term . This results in the expression:

$$1 = \frac{\log(w_{i;\beta})}{\log(w_{i;\alpha})} + \frac{\log(w_{i;\gamma})}{\log(w_{i;\alpha})}, \quad (6)$$

where:

$\frac{\log(w_{i;\beta})}{\log(w_{i;\alpha})}$ – the impact of factor β on the deviation of variable α,

$\frac{\log(w_{i;\gamma})}{\log(w_{i;\alpha})}$ – the impact of factor γ on the deviation of variable α.

The final step is to multiply both sides of the equation (6) by the deviation calculated for variable α. The result is:

$$\alpha_i - \alpha_{\mathrm{PL}} = (\alpha_i - \alpha_{\mathrm{PL}}) \cdot \frac{\log(w_{i;\beta})}{\log(w_{i;\alpha})} + (\alpha_i - \alpha_{\mathrm{PL}}) \cdot \frac{\log(w_{i;\gamma})}{\log(w_{i;\alpha})}, \quad (7)$$

where:

$(\alpha_i - \alpha_{\mathrm{PL}}) \cdot \frac{\log(w_{i;\beta})}{\log(w_{i;\alpha})}$ – the deviation of variable α caused by factor β;

$(\alpha_i - \alpha_{\mathrm{PL}}) \cdot \frac{\log(w_{i;\gamma})}{\log(w_{i;\alpha})}$ – the deviation of variable α caused by factor γ.

In this paper, the causal analysis has been used to answer the question of what are – in eighteen European countries – the impacts of individual factors on the deviation of the annual number of hospital bed-days per inhabitant from the value characteristic for Poland. It was assumed that variable α is the number of hospital bed-days per inhabitant, variable β –

the in-patient average length of stay, and variable γ – the proportion of the number of in-patients to the population size. The analysis was based on the data for 2018 collected in Table 1.

Table 1. In-patients, hospital bed-days and the population size in selected European countries

Country	In-patients (total in 2018)	Hospital bed-days (total in 2018)	Population size (average in 2018)
Symbols	*P*	*D*	*L*
France	12,424,193	109,344,157	66,965,912
Italy	6,896,911	54,568,449	60,421,760
Poland	**6,570,185**	**46,230,794**	**37,974,750**
Spain	4,899,954	40,563,057	46,797,754
Romania	4,113,449	29,845,498	19,472,545
Bulgaria	2,401,759	12,552,904	7,025,037
Czechia	2,082,385	19,503,165	10,629,928
Belgium	1,923,554	11,847,879	11,427,054
Hungary	1,882,253	18,127,868	9,775,564
Netherlands	1,546,635	6,923,765	17,231,624
Switzerland	1,443,857	11,781,040	8,514,329
Sweden	1,411,756	7,937,132	10,175,214
Slovakia	1,040,010	7,435,175	5,446,771
Finland	891,384	6,870,543	5,515,525
Norway	868,436	4,650,800	5,311,916
Croatia	661,745	5,723,162	4,090,870
Slovenia	362,834	2,538,839	2,073,894
Cyprus	69,435	421,970	870,068
Liechtenstein	1,566	7,699	38,246

Source: own compilation based on the Eurostat database [16].

Analysis of the ratio constructed for the average number of hospital bed-days

The first task to be performed is to assess the number of in-patient days *per capita* in each of the eighteen countries considered against the value of this measure in Poland.

Ratio $w_{i;\beta}$ was constructed by dividing the value computed for the *i*-th country by the value referring to Poland. Table 2 contains results of the relevant calculations.

Table 2. Ratios referring to the average number of hospital bed-days

Country	Number of in-patient days per inhabitant	Ratio based on the values of variable α	Country	Number of in-patient days per inhabitant	Ratio based on the values of variable α
Symbols	$\alpha = \frac{D}{L}$	$w_{i;\alpha} = \frac{\alpha_i}{\alpha_{PL}}$	Slovenia	$122.4 \cdot 10^{-2}$	1.006
Hungary	$185.4 \cdot 10^{-2}$	1.523	**Poland**	$\mathbf{121.7 \cdot 10^{-2}}$	**1.000**
Czechia	$183.5 \cdot 10^{-2}$	1.507	Belgium	$103.7 \cdot 10^{-2}$	0.852
Bulgaria	$178.7 \cdot 10^{-2}$	1.468	Italy	$90.3 \cdot 10^{-2}$	0.742
France	$163.3 \cdot 10^{-2}$	1.341	Norway	$87.6 \cdot 10^{-2}$	0.719
Romania	$153.3 \cdot 10^{-2}$	1.259	Spain	$86.7 \cdot 10^{-2}$	0.712
Croatia	$139.9 \cdot 10^{-2}$	1.149	Sweden	$78.0 \cdot 10^{-2}$	0.641
Switzerland	$138.4 \cdot 10^{-2}$	1.137	Cyprus	$48.5 \cdot 10^{-2}$	0.398
Slovakia	$136.5 \cdot 10^{-2}$	1.121	Netherlands	$40.2 \cdot 10^{-2}$	0.330
Finland	$124.6 \cdot 10^{-2}$	1.023	Liechtenstein	$20.1 \cdot 10^{-2}$	0.165

Source: own calculations based on Table 1.

Table 3. Ratios referring to the in-patient average length of stay

Country	In-patient average length of stay	Ratio based on the values of variable β	Country	In-patient average length of stay	Ratio based on the values of variable β
Symbols	$\beta = \frac{D}{P}$	$w_{i;\beta} = \frac{\beta_i}{\beta_{PL}}$	Slovakia	7.15	1.016
Hungary	9.63	1.369	**Poland**	**7.04**	**1.000**
Czechia	9.37	1.331	Slovenia	7.00	0.994
France	8.80	1.251	Belgium	6.16	0.875
Croatia	8.65	1.229	Cyprus	6.08	0.864
Spain	8.28	1.176	Sweden	5.62	0.799
Switzerland	8.16	1.160	Norway	5.36	0.761
Italy	7.91	1.124	Bulgaria	5.23	0.743
Finland	7.71	1.095	Liechtenstein	4.92	0.699
Romania	7.26	1.031	Netherlands	4.48	0.636

Source: own calculations based on Table 1.

The highest number of hospital bed-days in relation to the population size was recorded in Hungary – in this country in 2018 the number of in--patient days *per capita* was over 1.5 times higher than the analogous value calculated for Poland. In turn, the lowest number of in-patient days per inhabitant was registered in Liechtenstein – the average number of hospital bed-days in this country was only 16.5% of the quantity relating to Poland.

Analysis of the ratio constructed for the in-patient average length of stay

The second task is to evaluate the in-patient average length of stay in each of the countries considered in relation to the value calculated for Poland.

Ratio $w_{i;\beta}$ was constructed by dividing the value β_i computed for the i-th country by the value β_{PL} referring to Poland. The obtained results are presented in Table 3.

In 2018, the longest in-patient stays were recorded in Hungary – in this country the average length of stay in a hospital was nearly 137% of the average length of stay in a hospital in Poland. The shortest in-patient stays were noted in the Netherlands – in 2018 in this region, the discussed quantity was 36.4% lower than in Poland.

Analysis of the ratio constructed for the frequency of hospitalisation

The third task is to compare all the countries with regard to the frequencies of hospitalisation.

Ratio $w_{i;\beta}$ was constructed by dividing the value computed for the i-th country by the value referring to Poland. The results of the calculations are collected in Table 4.

Table 4. Ratios referring to the frequency of hospitalisation

Country	Quotient of in-patients and citizens	Ratio based on the values of variable γ	Country	Quotient of in-patients and citizens	Ratio based on the values of variable γ
Symbols	$\gamma = \frac{P}{L}$	$w_{i;\gamma} = \frac{\gamma_i}{\gamma_{PL}}$	Belgium	$16.8 \cdot 10^{-2}$	0.973
Bulgaria	$34.2 \cdot 10^{-2}$	1.976	Norway	$16.3 \cdot 10^{-2}$	0.945
Romania	$21.1 \cdot 10^{-2}$	1.221	Croatia	$16.2 \cdot 10^{-2}$	0.935
Czechia	$19.6 \cdot 10^{-2}$	1.132	Finland	$16.2 \cdot 10^{-2}$	0.934
Hungary	$19.3 \cdot 10^{-2}$	1.113	Sweden	$13.9 \cdot 10^{-2}$	0.802
Slovakia	$19.1 \cdot 10^{-2}$	1.104	Italy	$11.4 \cdot 10^{-2}$	0.660
France	$18.6 \cdot 10^{-2}$	1.072	Spain	$10.5 \cdot 10^{-2}$	0.605
Slovenia	$17.5 \cdot 10^{-2}$	1.011	Netherlands	$9.0 \cdot 10^{-2}$	0.519
Poland	$\mathbf{17.3 \cdot 10^{-2}}$	**1.000**	Cyprus	$8.0 \cdot 10^{-2}$	0.461
Switzerland	$17.0 \cdot 10^{-2}$	0.980	Liechtenstein	$4.1 \cdot 10^{-2}$	0.237

Source: own calculations based on Table 1.

The highest proportion of the number of in-patients to the number of inhabitants was registered in Bulgaria – in the year examined the frequency of hospitalisation in Bulgaria was 97.6% higher than in Poland. In turn, Liechtenstein had the lowest number of in-patients in relation to the population size – in Liechtenstein the considered quotient was less than 1/4 of the value relevant to Poland.

Determination of impacts of the factors covered by the study

The last task to be carried out is to determine the influences of the two factors considered on the deviation of the number of hospital bed-days *per capita* in each of the European countries analysed from the level specified for Poland.

It was established in this paper that the number of hospital bed-days per inhabitant may be presented as a product, where the first multiplier is the in-patient average length of stay, and the second multiplier is the quotient of the number of in-patients and the number of inhabitants. The aforementioned relationship is as follows:

$$\frac{D}{L} = \frac{D}{P} \cdot \frac{P}{L}. \qquad (8)$$

The ratio equality (3) was derived from this relationship.

Table 5 presents the values of ratios calculated for the eighteen studied countries. In the upper right corner of Table 5 are located those countries for which the ratios $w_{i;\beta}$ and $w_{i;\gamma}$ have values greater than 1. In the lower right corner of Table 5 are placed those countries for which the ratios $w_{i;\beta}$ have values greater than 1, but the ratios $w_{i;\gamma}$ – less than 1. In the upper left corner of Table 5 are put those countries for which the ratios $w_{i;\beta}$ have values less than 1, but the ratios $w_{i;\gamma}$ – greater than 1. And finally, in the lower left corner of Table 5 one can find those countries for which both ratios have values lower than 1.

Table 5. Ratio equalities derived

Higher frequency of hospitalisation ↑

Bulgaria:	**1.468** = 0.743 · 1.976	Hungary:	**1.523** = 1.369 · 1.113
Slovenia:	**1.006** = 0.994 · 1.011	Czechia:	**1.507** = 1.331 · 1.132
		France:	**1.341** = 1.251 · 1.072
		Romania:	**1.259** = 1.031 · 1.221
		Slovakia:	**1.121** = 1.016 · 1.104
Poland	**1.000 = 1.000 · 1.000**		
Belgium:	0.852 = 0.875 · 0.973		
Norway:	0.719 = 0.761 · 0.945	Croatia:	**1.149** = 1.229 · 0.935
Sweden:	0.641 = 0.799 · 0.802	Switzerland:	**1.137** = 1.160 · 0.980
Cyprus:	0.398 = 0.864 · 0.461	Finland:	**1.023** = 1.095 · 0.934
Netherlands:	0.330 = 0.636 · 0.519	Italy:	0.742 = 1.124 · 0.660
Liechtenstein:	0.165 = 0.699 · 0.237	Spain:	0.712 = 1.176 · 0.605

Lower frequency of hospitalisation ↓

← **Shorter** stays of patients in hospitals — **Longer** stays of patients in hospitals →

Source: own compilation based on Tables 2, 3 and 4.

In the next stage of the research, further steps of the logarithmic method were performed. Thanks to the method, it was possible to find out to what extent the deviation of the dependent variable can be explained by the influence of the first factor and to what extent by the second factor. The impacts and related effects are shown in Table 6.

As an example, the values obtained for Hungary will be interpreted. In 2018, the number of hospital bed-days *per capita* in Hungary was 52.3% higher than in Poland. In Hungary, it was 185.4 days of hospitalisation per 100 inhabitants, while in Poland it was 121.7 in-patient days per 100 inhabitants (i.e. the difference amounted to 63.7 days for every 100 inhabitants). This difference in 74.6 p.p. was due to the fact that Hungarians were discharged from hospitals after – on average – 9.63 days after admissions, and Poles – after 7.04 days (thus, in Hungary the average stay was 36.9% longer than in Poland). In the remaining 25.4 p.p., the difference of 63.7 days can be explained by relatively more frequent hospitalisation of patients in Hungary than in Poland (11.3% more frequent). In 2018 in Hungary, the proportion of the number of hospitalisations to the number of inhabitants was equal to 1/5, while in Poland this proportion mentioned was approximately 1/6. Had a Hungarian been hospitalised as rarely as a Pole, the number of hospital bed-days per one Hungarian would have been higher than the corresponding number in Poland by only 47.5 days for every 100 inhabitants, and this deviation could have been attributed solely to the fact that sick Hungarians stay in hospitals longer than sick Poles. If, however, the in-patient average length of stay of Hungarians had been the same as the in-patient average length of stay of Poles, the number of hospital bed-days per one inhabitant in Hungary would have been higher than in Poland by 16.2 days for every 100 inhabitants, and this would have been caused by the fact that a Hungarian is hospitalised more often than a Pole.

Table 6. Weights that may be assigned to the causes of the deviations identified

Country	Deviation in the number of in-patient days per inhabitant	because of: longer / shorter stays of patients in hospitals	because of: higher / lower frequencies of hospitalisation	Weight of the in-patient average length of stay	Weight of the frequency of hospitalisation
Symbols	$\alpha_i - \alpha_{PL}$			$\frac{\log(w_{i;\beta})}{\log(w_{i;\alpha})}$	$\frac{\log(w_{i;\gamma})}{\log(w_{i;\alpha})}$
Hungary	$63.7 \cdot 10^{-2}$	$47.5 \cdot 10^{-2}$	$16.2 \cdot 10^{-2}$	74.6 p.p.	25.4 p.p.
Czechia	$61.7 \cdot 10^{-2}$	$43.0 \cdot 10^{-2}$	$18.7 \cdot 10^{-2}$	69.7 p.p.	30.3 p.p.
Bulgaria	$56.9 \cdot 10^{-2}$	$-44.1 \cdot 10^{-2}$	$101.1 \cdot 10^{-2}$	−77.5 p.p.	177.5 p.p.
France	$41.5 \cdot 10^{-2}$	$31.7 \cdot 10^{-2}$	$9.9 \cdot 10^{-2}$	76.2 p.p.	23.8 p.p.
Romania	$31.5 \cdot 10^{-2}$	$4.2 \cdot 10^{-2}$	$27.3 \cdot 10^{-2}$	13.3 p.p.	86.7 p.p.
Croatia	$18.2 \cdot 10^{-2}$	$26.9 \cdot 10^{-2}$	$-8.8 \cdot 10^{-2}$	148.4 p.p.	−48.4 p.p.
Switzerland	$16.6 \cdot 10^{-2}$	$19.2 \cdot 10^{-2}$	$-2.6 \cdot 10^{-2}$	115.7 p.p.	−15.7 p.p.
Slovakia	$14.8 \cdot 10^{-2}$	$2.0 \cdot 10^{-2}$	$12.7 \cdot 10^{-2}$	13.9 p.p.	86.1 p.p.
Finland	$2.8 \cdot 10^{-2}$	$11.2 \cdot 10^{-2}$	$-8.4 \cdot 10^{-2}$	397.0 p.p.	−297.0 p.p.
Slovenia	$0.7 \cdot 10^{-2}$	$-0.7 \cdot 10^{-2}$	$1.4 \cdot 10^{-2}$	−100.6 p.p.	200.6 p.p.
Belgium	$-18.1 \cdot 10^{-2}$	$-15.0 \cdot 10^{-2}$	$-3.1 \cdot 10^{-2}$	82.9 p.p.	17.1 p.p.
Italy	$-31.4 \cdot 10^{-2}$	$12.3 \cdot 10^{-2}$	$-43.8 \cdot 10^{-2}$	−39.3 p.p.	139.3 p.p.
Norway	$-34.2 \cdot 10^{-2}$	$-28.3 \cdot 10^{-2}$	$-5.9 \cdot 10^{-2}$	82.8 p.p.	17.2 p.p.
Spain	$-35.1 \cdot 10^{-2}$	$16.8 \cdot 10^{-2}$	$-51.8 \cdot 10^{-2}$	−47.8 p.p.	147.8 p.p.
Sweden	$-43.7 \cdot 10^{-2}$	$-22.0 \cdot 10^{-2}$	$-21.7 \cdot 10^{-2}$	50.4 p.p.	49.6 p.p.
Cyprus	$-73.2 \cdot 10^{-2}$	$-11.7 \cdot 10^{-2}$	$-61.6 \cdot 10^{-2}$	15.9 p.p.	84.1 p.p.
Netherlands	$-81.6 \cdot 10^{-2}$	$-33.3 \cdot 10^{-2}$	$-48.3 \cdot 10^{-2}$	40.8 p.p.	59.2 p.p.
Liechtenstein	$-101.6 \cdot 10^{-2}$	$-20.2 \cdot 10^{-2}$	$-81.4 \cdot 10^{-2}$	19.9 p.p.	80.1 p.p.

Source: own calculations based on Tables 2 and 5.

Discussion

On the one hand, the governments of European countries strive to achieve the fullest possible implementation of social goals, and one of such goals is undoubtedly concern for the health of citizens. On the other hand, they want to achieve and maintain a budget balance. Therefore, simultaneously with satisfying social needs by providing more and more effective health services of higher and higher quality, there is a need to constantly improve the efficiency of the services provided [12].

In the case of the business sector, efficiency means comparing the output produced with the outlay made, while both – outlay and output – can usually be easily identified and expressed in monetary terms. In the case of the healthcare sector, it would rather not be possible to construct the efficiency ratio in exactly the same way, as the benefits to society resulting from better health are multidimensional and difficult to quantify. Nevertheless, irrespective of these methodological difficulties, the need to base the conducted activity on the economic calculation in the area where funds from the state budget are used, is an undisputed issue. In the healthcare sector, however, the efficiency should be understood much broader than the relation of the outlay to the output expressed in monetary units. In addition to the direct benefits that a healthy society brings to the state, there are a number of indirect benefits, many of which are noticeable only in the long run. Despite the fact that the positive effects of health are difficult to clearly identify and precisely measure, their existence is obvious, as investment in health is an investment in human capital [13].

The best recommendation seems to be the introduction of elements of process management to healthcare entities, and some good practices in this area can be taken from the business sector. Of course, the implementation of solutions used in commercial enterprises would require adapting them to the specificity of processes taking place in entities providing health services [14]. However, measuring processes in the healthcare sector is not an option, but a necessity. This necessity results, inter alia, from the permanent shortage of resources essential for meeting the constantly growing social needs at the higher and higher costs of the procedures applied, from the need for more rational management of limited public funds, as well as from the increased requirements of "patients/clients" regarding the standards and quality of services provided [15]. Hospital treatment is the one that absorbs the largest part of financial flows allocated to satisfying the health needs of the society. The in-patient average length of stay and the frequency of hospitalisation are the two variables that affect the number of hospital bed-days per inhabitant of a given country. In this paper, the impacts of these two factors on the variation in the number of hospital bed-days *per capita* were indicated for eighteen selected European countries.

Figure 1 depicts the diversity of the countries covered by the study with respect to the deviation of the variable inspected from the value computed for Poland. The horizontal axis of the two-dimensional coordinate system exhibits the impact effect of the first factor, and the vertical axis – the impact effect of the second factor.

In conclusion, it is worth mentioning that in 2018:

- in ten countries the number of days spent in hospital beds *per capita* was higher than in Poland, and in the remaining eight states the number of days spent in hospital beds *per capita* was lower than in Poland;
- in ten countries the in-patient average length of stay was bigger than in Poland, and in the remaining eight states the in-patient average length of stay was smaller than in Poland;
- in seven countries the quotient of the number of hospitalisations and the number of inhabitants was higher than in Poland, and in the remaining eleven states the frequency of hospitalisations was lower than in Poland.

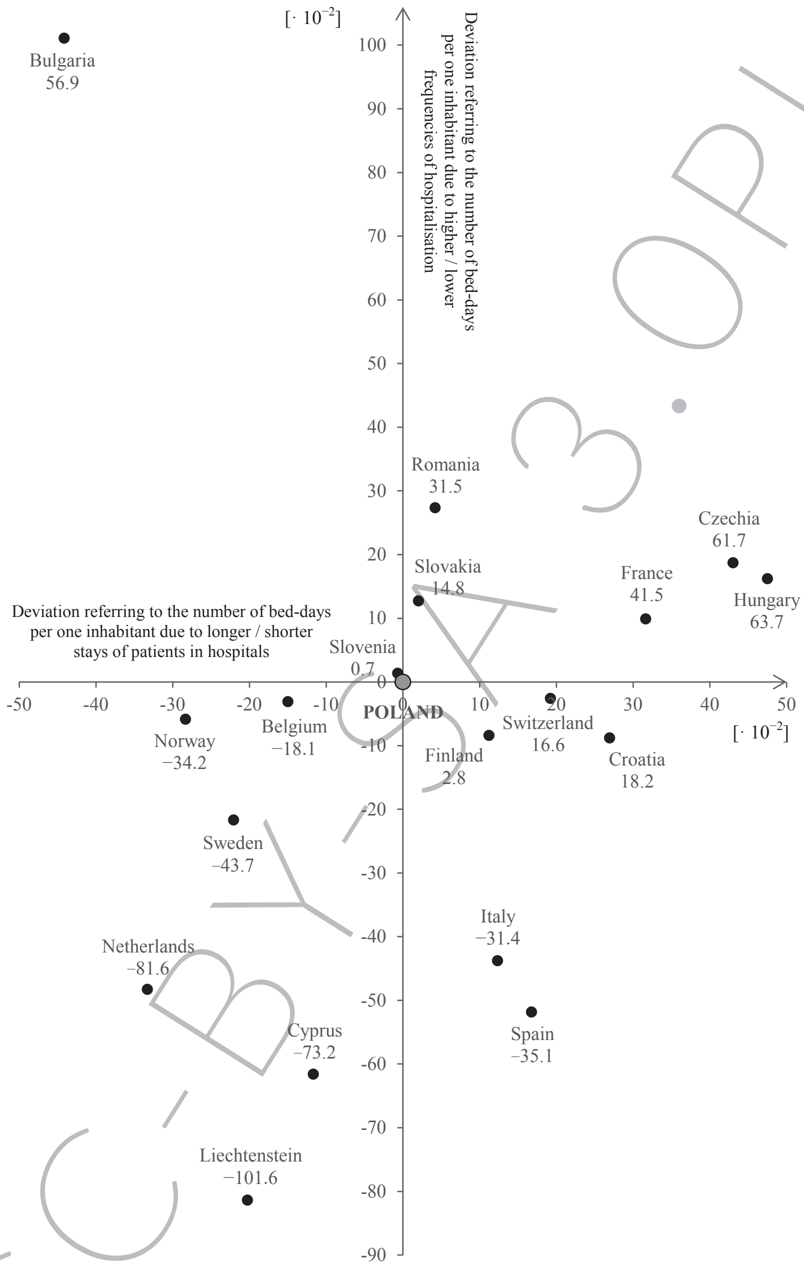

Figure 1. Causes of the observed deviations of the number of hospital bed-days *per capita* in selected European countries from the value calculated for Poland (data for 2018)

Source: own compilation based on Table 6.

It should be strongly emphasised that the research conducted in this article is only a contribution to a further search for the causes of the heterogeneity in the group of European countries with regard to the number of days of hospitalisation per one inhabitant. In this piece of work, the author analysed two factors that have a direct impact on the variable under consideration. Nonetheless, these two factors are influenced by a set of other variables which also – but indirectly – shape the number of hospital bed-days *per capita*. In further studies, the author will try to answer the question whether any associations between the structure of financing from public and private sources and the length and frequency of hospitalisation exist, as well as what the nature of such possible relationships is. In particular, the differences in the structure by disease types and the impact of these differences on the diversity of European countries in terms of the number of in-patient days *per capita* will be the subject of the author's further investigations.

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