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The Efficiency of Post-Communist Countries' Health Systems

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Additional information is available at the end of the chapter

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Abstract

Health-care costs are a major financial burden for the transition economies, which have experienced rapidly increasing demand for health-care services. The former communist countries of the Central and Eastern Europe and Central Asia needed to reform the financing of their health-care systems and make efforts to strengthen the role of primary care while limiting the role of hospital care. The growing health needs and, consequently, costs resulted in the increased attention paid to the performance of health systems. The aim of this chapter is to determine the efficiency of health systems in post-communist countries. The data envelopment analysis method was used. The effective health systems were identified and recommendations for the inefficient countries were formulated.

Keywords: health-care efficiency, post-communist countries, data envelopment analysis

1. Introduction

At the turn of the twentieth and twenty-first centuries, both insurance- and provision-based health systems underwent profound changes. Rising health-care costs became a current economic, social and political problem. During this period, the post-communist countries transformed their economies from command to market systems. Also, the health systems were transformed from the Semashko model to insurance model.

All countries regardless of their level of economic development endeavour to improve the quality and accessibility of health services, which requires objective and reliable assessment of the functioning of their health systems. Both policymakers and society expect the best possible outputs of the health systems, due to the relatively large expenditures allocated for their functioning [1].

The efficiency of public organizations has become an area of practical measurement and scientific research. The evaluation of efficiency in terms of quantity should be the basic premise of making economic decisions. The more accurate it is, the more accurate and relevant are the information it provides.

Assessment of health systems should be carried out in two dimensions, where the *effectiveness* of the system reflects its success in achieving its objectives, whereas the *efficiency* reflects the success of transformation of inputs into outcomes [2]. In this study, the latter approach prevails.

International comparative studies of health systems often use, among other medical resources, health-care spending measured as the share of gross domestic product (GDP) or per capita. It should be noted, however, that a constant share of health-care spending in GDP over time does not mean that spending is constant, but rather that changes in health-care spending are proportional to GDP changes [3].

Controlling spending on health care and the system of its financing is a priority aspect in designing public policy. The interest in this issue has increased in recent years as a result of the economic crisis and the need for financing health care with budget funds or by increasing the share of patients' private out-of-pocket expenditure [4].

An illness can cause lack of economic security both directly and indirectly. For those without or with partial health insurance, medical expenses can be devastating, leading to debt or opting out of treatment at the expense of worsening health in the future. Health insurance may cover different options, and even the insured individuals may incur high costs, paying directly for some services or medicines.

It should be noted, however, that the transformation of command economies proved more complicated than it was originally thought. Job insecurity, social inequality and the decline in spending on social and health insurance after the economic collapse contributed to the deterioration of health-care outcomes.

The purpose of this chapter is to determine the efficiency of health-care systems of post-communist countries. The study was conducted for the 28 countries of the former Eastern bloc for the years 2000 and 2013 using the method of data envelopment analysis (DEA). Averages of health indicators for the 16 economically developed countries of Western Europe were used as a benchmark.

The originality of this approach consists in focusing research on post-communist countries, for which a small number of studies are carried out, as well as on conducting a broad discussion of projections, i.e. the necessary measures that must be taken to enable the countries which were in the Soviet sphere of influence after the Second World War to achieve such health results as in the case of the most developed European countries. Conducting research in multiple years allowed for verifying whether the actions taken within the framework of economy transition influence also the health systems.

2. Financing of health care in post-communist countries

The post-communist countries of Central and Eastern Europe and Central Asia (CEECA) transformed their economies, which included the transformation of health-care systems from the Semashko model to insurance (social health insurance, SHI) or budget (national health service, NHS) approach. Therefore, it seems necessary to measure the effectiveness of the introduced changes and assess the outcomes of health care.

The health-care system in the centralized economy of the Soviet Union was plagued by chronic underfunding, antiquated and deteriorating facilities, inadequate supplies and outmoded equipment, poor morale and no incentives for health-care workers to boost the productivity, as well as consumer dissatisfaction. Health statistics reveal poor life expectancy and high mortality rates, with striking disparities among the individual republics [5].

The post-communist economies are catching up with most developed countries, but the gap in economic development remains very significant and is especially evident in the level of gross domestic product per capita and its derivatives, e.g. health-care spending per capita. The differences are also visible in the achieved health outcomes.

Health-care systems are usually funded from sources such as taxes, public and private health insurance contributions or patients' out-of-pocket payments [6].

The percentage of health-care financing from public funds is used as an indicator enabling the assessment of the role of the state in this area. The strong role of the state, reflected by a high level of funding from the public budget, points to the elimination of inequalities in access to medical services. On the other hand, the percentage of out-of-pocket patient payments or private insurance allows for the assessment of the financial burden imposed on households in the event of necessity to use health services [7]. The high level of out-of-pocket expenses increases the difficulty of obtaining medical assistance for people with lower incomes and lower health status [8]. The countries with a low share of public expenditure should aim at reducing the level of out-of-pocket payments in favour of prepaid private insurance. This way, the public could finance health services in a more predictable manner, without facing the problematic, sudden necessity to find the funds to pay for treatment in case of an unforeseen illness. The large share of out-of-pocket payments in the case of the poorer social groups exacerbates the risk of the so-called catastrophic expenditure, leading to impoverishment or abandonment of often necessary medical services. Moving away from the out-of-pocket patients' payments towards prepaid private insurance reduces the possibility of a financial catastrophe [9–11].

Classifying health systems in post-communist countries according to their financial agents indicates that in the Central Europe (CE) health care is financed mainly by health insurance contributions and in Eastern Europe and Central Asia (EECA) mainly from taxes and out-of-pocket payments of households. The average share of total public expenditure in the analysed countries of Central and Eastern Europe and Central Asia amounted to 58.8% in the analysed years. In 2013, the average share of public expenditure in the CE countries amounted to 66.0%,

and in the EECA countries, it was equal to 43.5%. The share of funding from government social health insurance in general averaged 63.2% and increased by 5.8 percentage points (p.p.) over the period of 14 years. In the CE countries, it averaged 73.8%, and in the EECA countries, the average amounted to 29.7%. In contrast, only in the former Soviet Union, where the budget system prevails, SHI amounted to 36.3%. In most analysed countries, the share of private and out-of-pocket funding is high. The average share of private expenditure in total expenditure on health amounted to 41.2%—in the case of the CE countries, it amounted to 34.0%, and in the case of the EECA countries, it was equal to 56.5%. The share of out-of-pocket expenditure in private spending averaged 88.6%, while in the case of the CE countries, it was lower by 1.3 p.p., and in the EECA countries, it was higher by 4.2 p.p. In most post-communist countries, even those where public funding is very low, citizens do not show interest in additional health insurance. In 2013, private prepaid plans accounted for 6% of expenditure on average: 6.9% in the CE countries and 4% in the EECA countries. In the Central Europe, almost 50% of the Slovenian, 40% of Croatian, 7% of Hungarian and 4% Latvian population have prepaid private insurance. In the Eastern Europe and Central Asia, prepaid health insurance was used by 12% of Georgian, 6% of Armenian and Uzbek as well as 4% of Russian population.

The insurance type of health system is not the classic Bismarck model but its modification. The noticeable majority of Central Europe and Balkan peninsula adopted only the method of funding (health insurance contributions), while the organization and governance of health care are organized differently in each of the countries. The health systems in which there are several third-party payers operate in Czech Republic, Lithuania and Slovakia. Most mechanisms of the Bismarck model were introduced in the health-care system of the Czech Republic and Slovakia. The payers in the system are sickness funds, which conclude contracts with service providers. The patients are free to choose the insurance company, and the largest insurer in each of the countries has over 60% market share. In both countries, there are mechanisms of pooling and (re)allocation of contributions *ex ante* referred to as risk adjustment of contributions. Only in the Czech system, there is a mechanism to retrospective risk sharing [12]. In Lithuania, there are sickness funds, but their membership is territorial. There is no competition between insurers nor any mechanism of risk adjustment of contributions. On the other hand, health-care insurance systems with a single payer prevail in Albania, Bosnia and Herzegovina, Bulgaria, Estonia, Hungary, Macedonia, Moldova, Montenegro, Poland, Romania, Serbia and Slovenia. In the post-Soviet countries of Eastern Europe and Central Asia, centrally planned health systems with less public funding than in the countries of Central Europe prevail—the examples include Azerbaijan, Georgia and Tajikistan. The tendency of the public to purchase prepaid private insurance is not significant, which makes it difficult to access to health care due to lack of financial resources in households. In Kyrgyzstan and Russia, mandatory health insurance was introduced; however, these are supply systems financed from the budget, as in other countries not listed above.

Kyrgyzstan is the only example of a Central Asian country where the introduction of a health insurance system was successful. SHI is a system complementary in relation to budget financing and supplements public funding. In the analysed period, the share of public funds from health insurance increased. At the same time, a successful reform the health infrastructure was implemented—some facilities were closed, but the overall access to health care for all

citizens was improved [13]. Despite the introduction of SHI in the Russian Federation and the initial successes, the reform of health-care financing eventually failed. In the 2000–2013 period, the share of public expenditure in the total expenditure on health care decreased — the fall included the funds from SHI.

It should also be noted that in all the post-communist countries, there were high informal payments and in-kind gifts from patients as compensation for the health-care workers' treatment efforts [14]. They were more prevalent in hospitals than in outpatient care. It is estimated that in some countries, they constitute up to 10–15% of private expenditure. Such payments and gifts are due to the lack of determination of a state-funded benefit package (in Armenia and Georgia) or the fact that the benefit package is very extensive but chronically underfunded (such as in Azerbaijan, the Russian Federation, Tajikistan and Ukraine) [15]. This practice has been limited but not eliminated, since the obvious reason for its occurrence is the relatively low salaries of health-care workers, often paid late. In some countries, the informal compensation is replaced by formal charges for health services.

3. Research on the efficiency of health-care systems

Measuring the efficiency of health-care systems is not an easy task, and the main difficulty is the correct measurement of the outcomes of the system operation. The most frequently used approach is based on the measurable indirect indicators of services, which by definition have a fundamental effect on the health of the population. The outcomes of the health-care system can be defined as the change in the state population health that can be attributed to health-care spending, e.g. life expectancy, infant mortality, inequality in access, incidence of certain diseases, etc. [1]. Although there may be some controversy as to the suitability of some of these variables as important outcomes of health care, most of the analyses conducted on the level of systems use life expectancy and infant mortality to assess the performance of health systems (e.g. Refs. [3, 16–19]). Infant mortality is not a dramatic problem in the developed countries. However, even among members of the Organisation for Economic Co-operation and Development (OECD), such as Mexico, Chile or Turkey, or in former Soviet republics such as Tajikistan, Turkmenistan or Uzbekistan, this indicator is still high. It is much easier to define the inputs, which, when used properly, determine the overall efficiency. Usually the resource approach is used, based on quantifiable inputs such as the number of physicians or available infrastructure (e.g. number of beds, diagnostic equipment, financial resources, etc.). It is also a common practice to base models on variables indirectly reflecting outputs and inputs, proxies, which is a consequence of the limited availability of relevant data [20].

Given the purpose of this chapter, the review of the literature focuses on the studies of the effectiveness of health systems conducted in the world, treating expenditure and its structure as input and using the DEA method.

The share of public spending in total health-care expenditure was included as one of the inputs in the study of differences in physicians' effectiveness of improving public health in OECD countries [21]. In addition, the analysis takes into account the number of physicians,

the level of GDP per capita, the level of education of the society as well as environmental variables: the consumption of alcohol and smoking. The results were based on the life expectancy at birth and at 65 years of age and the number of years of life lost due to heart diseases (for men and women separately) and infant mortality. These variables are commonly used as the outcomes of health-care systems.

The analysis carried out for the 165 countries for which data were available in the WHO database shows that the share of public health-care spending and the size of health-care spending in public budgets are two factors positively related to the functioning of health-care systems [1]. A modified DEA model was used, allowing for the introduction of weight restrictions, which increases the discriminatory strength of the method. Two kinds of input, the total expenditure on health per capita and the expected length of education (as an environmental factor), as well as two outputs—good-health life expectancy and the number of years lost due to disability or premature death—were taken into account. The level of public financing reached 64% in the most effective countries from the sample, whereas in the least efficient ones, the public funding did not exceed 50%. It can be said that in the countries whose governments show commitment to the development and financing of health-care systems, the available resources are used more effectively while allowing for achieving adequate health outcomes.

A similar approach to creating models of technical effectiveness of health-care systems can be found in other publications. In the case of OECD countries, a study of the effectiveness of health-care resources usage, measured by such parameters as the number of physicians, the number of beds per 1000 inhabitants, the number of units of magnetic resonance imaging (MRI) per million inhabitants or health-care spending as the percentage of GDP, was conducted [16]. The authors adopted infant mortality rate and life expectancy at birth as the results of such inputs. The extended analyses also take into account the social and environmental factors, such as the Gini coefficient, school expectancy or tobacco consumption. Two models were built separately for each outcome. Two countries, Iceland and Luxembourg, were eliminated from the analysis due to missing data. An interesting observation is that among the fully efficient countries, such as Sweden, Norway and Japan, there are also those with weak health outcomes, such as Turkey and Mexico. This is due to the fact that the poor performance of these countries is related to their low consumption of resources. This shows that at every level of the achieved health outcomes, a country may be technically efficient or inefficient as regards the use of its resources.

It is emphasized that the maximization of health system outcomes requires a good understanding of the factors included in the health production function. Such an analysis can help the decision makers to understand the conditions for a more efficient operation of health-care systems better. In their study [19], they used output-oriented BCC and super efficiency models, both with variable returns to scale. As outcomes, the infant mortality rate (IMR) and life expectancy at birth were adopted. As inputs, the number of doctors per 1000 inhabitants, the number of hospital beds per 1000 inhabitants, health expenditure per capita, GDP per capita and consumption of fruit and vegetables per capita were adopted. Two models were built, with different inputs in order to achieve different objectives of the study, i.e. to differentiate the production function, which is mainly based on the expenditure deemed discretionary, that is

possible to be controlled by the health system, and the production function, which includes the inputs that are non-discretionary, that is outside of the possibility of control by the health-care system. The authors also conducted a regression analysis of the results of measurements of the efficiency, using such explanatory variables as, fat intake as a proxy for the style of life of residents and their behaviours and the unemployment rates and the Gini index as the variables representing the degree of the challenges associated with changes in the social environment affecting the health of the population. Based on the results of the analysis, it can be determined that health-care systems in nine countries with large and stable economies were identified as efficient when the evaluation of their functioning was based on discretionary inputs (controlled by health systems), whereas inefficiency was observed when the assessment was based on non-discretionary inputs that are largely beyond the control of health-care systems.

Some publications that apply to researching the effectiveness of health systems in post-communist countries are discussed below. The analysis covered the health outcomes of Croatia and Slovak Republic in the context of other countries from Central and Eastern Europe (CEE). Although the overall health spending efficiency of the CEE countries is on par with that of the OECD, substantial inefficiencies occur in the process of transforming intermediate health inputs into health outcomes. High levels of cost-effectiveness reflect relatively low prices for labour; hence despite the low level of spending, the resources of health care are relatively high. Given the favourable ratio of public to private spending and available resources, it can be said that the health outcomes of the populations could be improved. The authors propose a stimulated development of private insurance by restricting the basic benefit package provided by public spending. Also the costs of pharmaceuticals should be restricted by replacing the original drugs with their generic counterparts and negotiating prices for the reimbursed drugs. Efficiency may also be enhanced by reducing reliance on hospital care. This can be done through the better use of hospital beds and outpatient contacts, as well as by reducing the number of beds [22–24].

S. Mirmirani, H. Li and A. Ilacqua compared the efficiency of health systems in eight selected post-Soviet countries with average results for the OECD countries. The study was conducted for the years 1997–2001. The inputs used included per capita health-care expenditure in USD, PPP, number of inpatient hospital beds per thousand population, number of physicians per thousand population and the percentage of children with measles inoculation. The “immunization” is used as a proxy variable. The average life expectancy of both sexes at birth and infant mortality rates is used as output variables [18].

4. The proposed model and the utilized data

The data envelopment analysis (DEA) non-parametric method of measuring the relative efficiency has been developed rapidly since 1978, when a novel article “Measuring the efficiency of decision making units” by A. Charnes, W.W. Cooper and E. Rhodes was published [25]. DEA is a data-oriented approach to the evaluation of functioning of a set of peer entities called decision-making units (DMUs), which transform multiple inputs to multiple outputs

[26]. The definition of DMU is rather general to provide the flexibility to use it in a wide range of possible applications. DMU is generally regarded as an object responsible for converting inputs to outputs, the action of which is to be evaluated [27], which allows for the use of this method in many different contexts, both in manufacturing and in almost all public sectors.

The usefulness of the method stems from the possibility of assessing the relative efficiency of decision-making units. It is used in the banking sector, health care, agriculture, transport or education for reasons that can be characterized as identifying sources of inefficiency, creating DMU rankings, evaluation of management systems, assessment of the effectiveness of programmes or policies, creating a quantitative basis for the reallocation of resources, etc. [28]. The DEA method is used in testing the efficiency of health-care systems at practically all levels, ranging from physicians (both primary and specialist care), through providers of medical services (hospitals, emergency assistance, etc.), to global, country-level assessments.

Two basic radial models, CCR (with constant returns to scale) and BCC (with variable returns to scale), evaluate the radial (proportional) efficiency but do not account for the surpluses of inputs and shortages of outputs, thus allowing for detecting only the radial inefficiencies. According to the DEA definition of efficiency, the operation of DMU is fully (100%) efficient if and only if both the efficiency score equals one and the inputs and output slacks are zero. In the case where the efficiency score is equal to one and one or both slacks are different from zero, it can be said that DMU is weakly efficient [27, 29]. This is a drawback, as the efficiency result does not take into account the non-zero slacks. This drawback is not present in the additive model, which directly takes into account the slacks in the calculation of efficiency and can distinguish between efficient and inefficient DMUs—there is, however, no possibility to measure the size of inefficiency with a scalar measure similar to that used in the basic radial models. Drawing upon the additive model, a measure of the efficiency based on slacks was developed (slack-based measure, SBM). This measure takes into account the non-zero slacks of inputs and outputs, if they are present [27]. The DEA models can be focused on the inputs or outputs, depending on which variables the decision-maker can control.

The calculations are based on the input-oriented slack-based model (SBM) under constant returns-to-scale assumption [30]. Since only the inputs are controllable by the decision-makers shaping the health policy, an input-oriented model was adopted. In an input orientation, improvement of efficiency is possible through reduction of inputs. The SBM input efficiency score ρ_i^* of DMU_{*o*} ($o = 1, \dots, n$) is calculated for given amounts of outputs y_{rj} , $r = 1, \dots, s$ and inputs x_{ij} , $i = 1, \dots, m$, where $j = 1, \dots, n$ [26].

$$\rho_i^* = \min_{\lambda, s^-, s^+} 1 - \frac{1}{m} \sum_{i=1}^m \frac{s_i^-}{x_{io}} \quad (1)$$

subject to

$$x_{io} = \sum_{j=1}^n x_{ij} \lambda_j + s_i^- \quad (i = 1, \dots, m) \quad (2)$$

$$y_{ro} = \sum_{j=1}^n y_{rj} \lambda_j - s_r^+ \quad (r = 1, \dots, s) \quad (3)$$

$$\lambda_j \geq 0 \quad (\forall j), \quad s_i^- \geq 0 \quad (\forall i), \quad s_r^+ \geq 0 \quad (\forall r) \quad (4)$$

where λ is the intensity vector and s^-, s^+ are input and output slack vectors respectively.

The aim of the study is to compare the health outcomes in selected countries. The statistical information available in the case of post-communist countries is much more limited than e.g. in the case of OECD or European Union countries. The possibility of using variables in a model is determined by the consistency of measurement for post-communist countries and the availability of the data [15]. Thus, the model used three variables treated as inputs, characterizing the structure of spending and the level of income inequality. The PR_TE variable defines the share of private expenditure in total health expenditure. The OOP_TE variable determines what is the total share of the out of pocket payment in the total health expenditure. It is assumed that the lower is the public's load of private health expenditure, the higher is the availability of medical services and thus the higher is the possibility of obtaining better health outcomes in the population. The third variable, GINI, is the value of the Gini index. The Gini index is a measurement of the income distribution of a country's residents. This number, which ranges between 0 and 1 and is based on residents' net income, helps define the gap between the rich and the poor, with 0 representing perfect equality and 1 representing perfect inequality. In this model it is expressed as a percentage.

The overall health status of population is generally operationalized by indicators of longevity such as life expectancy or healthy life expectancy. So the outputs in this model are reflected by two variables: LE60—life expectancy at age 60 and HLE—healthy life expectancy at birth. The third output variable is ISR—infant survival rate, which is the opposite of infant mortality rate (IMR is unwanted output and was included in the model as the difference 1000-IMR).

Using the above-described model, the 28 post-communist countries¹ and the virtual unit (DMU) as an aggregate of average values for 16 developed countries of Western Europe² (DE16), which achieve very good health outcomes, were analysed. The virtual unit (DE16) consists of countries where the health system is organized according to Beveridge and Bismarck models. Data from the years 2000 and 2013 from the WHO database and The World Bank databases were used. In the case of missing data, the principle of using the nearest value was applied.

The calculations were carried out by means of the DEA-Solver-LV (3) software by Saitech.

The basic descriptive statistics of variables for years 2000 and 2013 are presented (**Table 1**).

The last row shows the difference between the mean values of the variables (2013–2000). The average share of private spending did not change; however, the share of patients' out-of-pocket payment in the total expenditure decreased by 1.0 percentage point, which is a proof of weak development of the pre-paid health insurance. The income inequalities in the countries surveyed decreased slightly, by 0.5 p.p.; however, the span of this variable increased. All results improved: LE60 increased by about 9% and HLE by 6%. The infant mortality decreased significantly: in the year 2000, it was highest in Tajikistan and amounted to 74.7 infants per

¹Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Montenegro, Poland, Republic of Macedonia, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

²Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland and United Kingdom.

Year	Statistics	PR_TE	OOP_TE	GINI	LE60	HLE	IMR
2000	Mean	41.2	37.8	32.8	17.9	62.6	23.3
	Stand. error	21.3	20.9	3.6	1.1	2.9	19.1
	Max	83.0	82.5	40.8	20.4	66.8	74.7
	Min	9.7	9.7	27.2	15.7	56.6	4.5
2013	Mean	41.2	36.8	32.3	19.5	66.3	12.3
	Stand. error	15.9	14.9	5.1	1.5	2.6	11.8
	Max	79.2	71.1	44.1	23.4	71.1	46.6
	Min	16.7	12.1	24.7	16.4	59.8	2.3
Mean 2013 – mean 2000		0.0	–1.0	–0.5	1.6	3.7	–11.0

Source: Own computation.

Table 1. The basic descriptive statistics of variables for years 2000 and 2013.

1000 live births. In 2013, the highest infant mortality rate was reported in Turkmenistan—46.6 infants per 1000 live births. In 2000, it was 17 times higher and in 2013, 20 times higher than the lowest mortality observed in these years in Slovenia.

5. The results and their interpretation

The results of computation are shown (Table 2).

Column “Score” contains the efficiency score and column “R” the position in the ranking. In the year 2000, the full efficiency (score equal to 1.000) was achieved by the Czech Republic, Hungary, Slovenia and the virtual DMU referred to as DE16, which were among the best also in 2013 (besides Hungary). The full efficiency in 2013 was also reached by Croatia and Ukraine.

In 2013, six countries reduced their efficiency score—in the case of two of them, it was significant. Hungary, with full efficiency in 2000, achieved the level of only 0.627 in 2013, and Slovakia achieved a result of 0.753 in 2013, compared to 0.923 in the year 2000. The other four countries lowered their efficiency score to a negligible degree.

On the other hand, the remaining countries improved their scores, of which 7 to significant degree (above 0.15). The greatest improvement was achieved by Croatia and Ukraine, which reached full efficiency, improving the result by 0.234 and 0.548 respectively. Bosnia and Herzegovina, Estonia, Kazakhstan, Kyrgyzstan and Poland improved their result by 0.15–0.23.

For a more detailed analysis of the causes of these positive and negative changes Hungary, Slovakia, Croatia, Ukraine, Azerbaijan and Georgia were selected. The table includes also additional aggregated data for the most developed economies of Western Europe—DE16, which should be considered to constitute best practice. The source data for the input and output variables for these countries for the years 2000 and 2013 are presented (Table 3).

Country	2000		2013		Country	2000		2013	
	Score	R	Score	R		Score	R	Score	R
Albania	0.383	22	0.508	21	Lithuania	0.518	12	0.574	15
Armenia	0.334	27	0.472	24	Macedonia	0.417	19	0.543	16
Azerbaijan	0.324	28	0.407	28	Moldova	0.382	23	0.514	20
Belarus	0.653	7	0.653	10	Montenegro	0.523	11	0.523	19
Bosnia and Herzegovina	0.454	15	0.622	12	Poland	0.496	14	0.680	9
Bulgaria	0.441	17	0.507	22	Romania	0.645	8	0.784	7
Croatia	0.766	6	1.000	1	Russian Federation	0.430	18	0.423	27
Czech Republic	1.000	1	1.000	1	Serbia	0.501	13	0.577	14
Estonia	0.561	9	0.795	6	Slovakia	0.923	5	0.753	8
Georgia	0.297	29	0.363	29	Slovenia	1.000	1	1.000	1
Hungary	1.000	1	0.627	11	Tajikistan	0.365	25	0.435	26
Kazakhstan	0.379	24	0.542	17	Turkmenistan	0.539	10	0.504	23
Kyrgyzstan	0.403	20	0.587	13	Ukraine	0.452	16	1.000	1
Latvia	0.402	21	0.533	18	Uzbekistan	0.360	26	0.458	25
					DE16	1.000	1	1.000	1

Source: Own computation.

In columns score where the result = 1 the countries have a full efficiency.

Table 2. Efficiency scores for the years 2000 and 2013.

Country	Year	PR_TE	OOP_TE	GINI	LE60	HLE	ISR
Hungary	2000	29.3	26.3	27.2	18.3	63.7	990.3
	2013	36.4	27.5	30.6	20.1	67.4	994.8
Slovakia	2000	10.6	10.6	28.9	18.3	64.9	989.8
	2013	30.0	22.1	26.1	20.3	68.1	994.0
Croatia	2000	13.9	13.9	31.3	19.3	66.4	992.8
	2013	20.0	12.5	32.5	21.2	69.4	996.2
Ukraine	2000	48.2	44.1	29.1	16.7	60.6	984.2
	2013	45.5	42.8	24.7	18.1	64.1	991.4
Azerbaijan	2000	81.4	63.3	36.5	16.8	59.3	939.3
	2013	79.2	71.1	31.8	18.5	64.7	970.1
Georgia	2000	83.0	82.5	40.5	18.6	64.1	968.8
	2013	78.5	61.9	41.4	19.7	66.4	988.3
DE_16	2000	24.0	16.7	30.9	21.9	69.0	995.5
	2013	21.9	15.3	30.5	24.1	71.9	997.1

Source: Own computation.

Table 3. Data from selected countries for the years 2000 and 2013.

The primary reason for the decrease of efficiency in Hungary and Slovakia is a very significant change in the financing structure. The PR_TE variable increased by 7.1 p.p. in Hungary and as much as 19.4 p.p. in Slovakia, whereas the OOP_TE variable increased by 1.7 p.p. in Hungary and as much as 11.5 p.p. in Slovakia. In the case of Hungary, these negative phenomena coincided with an increase in the income inequalities of the society, illustrated by the change in the GINI index from 27.2 in 2000 to 30.6 in 2013. In the case of Slovakia, the inequalities decreased. It should be noted, however, the all the health outcomes in these two countries improved.

In the case of Croatia, which improved its efficiency score, there was indeed an increase in the share of private expenditure (PR_TE) but the expenses covered directly by households (OOP_TE) decreased. The GINI index deteriorated slightly. On the other hand, in the case of Ukraine both private spending (PR_TE) and the expenditure covered directly by the public (OOP_TE) decreased. Also the income inequalities in the population (GINI) decreased significantly. The favourable results of Ukraine since 2014 deteriorated due to the ongoing military conflict.

Azerbaijan and Georgia reduced the share of private spending by 2.2 and 4.5 p.p., respectively. These expenses are about two times higher than the average for post-communist countries and almost four times higher than the average for developed countries of Western Europe. The share of direct expenditure in Azerbaijan increased by 7.8 p.p., while in Georgia it decreased by 20.6 p.p. The income inequalities fell by 4.7 percentage points in Azerbaijan and increased slightly by 0.9 p.p. in Georgia. The health outcomes improved.

Figure 1 is the illustration of the efficiency scores shown in **Table 3** of the changes described above. The efficiency scores are shown in descending order, which allows for the analysis of the direction and magnitude of change.

The conducted analysis allows for indicating several typical situations. The countries that achieved better health outcomes are those in which there is a low level of private spending, such as e.g. the Czech Republic (16.7%). The higher share of private spending is seen in Croatia and Slovenia, but these countries have low share of out-of-pocket expenses—62.4% and 42.7% respectively. These are the only two post-communist countries in which the voluntary private insurances operate effectively. Increasing the share of private spending while increasing direct expenditure affected the health results achieved by Hungary and Slovakia negatively. A very high share of private expenditure and at the same time a high share out of pocket payments contributes to the achievement of worse health outcomes.

The share of private expenditure in the total expenditure (PR_TE) on healthcare and the share of patients' out-of-pocket payments (OOP_TE) are the variables which indirectly characterize the barriers in access to healthcare services. Of course, the obtained results should not be interpreted as meaning that a change in the financing structure has a direct impact on the improvement of health outcomes. However, the indirect effect has been demonstrated, which confirms the results of other authors dealing with research on the availability of medical services for patients.

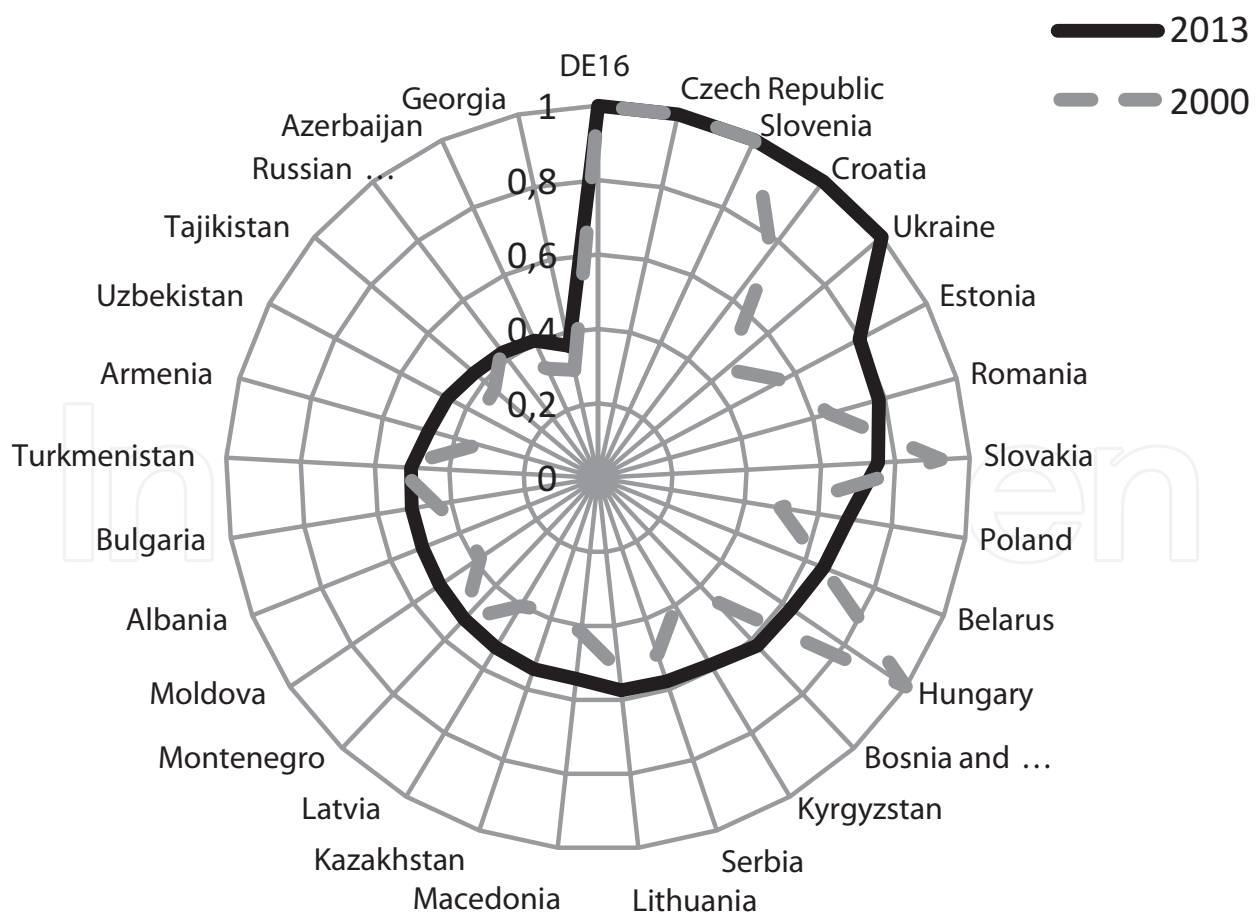


Figure 1. Comparison of the effectiveness results in the years 2000 and 2013. Source: Own elaboration.

The next step of the analysis is to provide a projection, that is the directions and magnitudes of changes that should be introduced by the inefficient countries in order to achieve the efficiency of leaders. This is illustrated in **Table 4**. The calculations were carried out for the year 2013.

Country	PR_TE		OOP_TE		GINI	
	Data	Change	Data	Change	Data	Change
Albania	51.6	-0.678	51.5	-0.697	29.0	-0.102
Armenia	58.3	-0.717	54.7	-0.716	30.5	-0.152
Azerbaijan	58.3	-0.795	54.7	-0.785	30.5	-0.200
Belarus	34.6	-0.518	31.9	-0.508	26.5	-0.016
Bosnia and Herzegovina	30.0	-0.445	29.0	-0.460	33.8	-0.230
Bulgaria	40.7	-0.593	39.6	-0.606	36.0	-0.280
Estonia	22.1	-0.241	18.9	-0.165	33.2	-0.208
Georgia	78.5	-0.789	61.9	-0.748	41.35	-0.374
Hungary	36.4	-0.542	27.5	-0.430	30.6	-0.147
Kazakhstan	46.9	-0.648	46.3	-0.665	27.5	-0.060
Kyrgyzstan	41.0	-0.600	36.4	-0.577	27.4	-0.063
Latvia	38.1	-0.564	36.5	-0.572	35.5	-0.267
Lithuania	33.4	-0.501	32.6	-0.519	35.2	-0.257
Macedonia	31.1	-0.465	31.1	-0.497	44.05	-0.409
Moldova	54.0	-0.694	44.6	-0.652	29.2	-0.113
Montenegro	42.7	-0.610	42.7	-0.633	32.2	-0.190
Poland	30.4	-0.452	22.8	-0.313	32.4	-0.195
Romania	20.3	-0.184	19.7	-0.209	34.9	-0.257
Russian Federation	51.9	-0.680	48.0	-0.675	41.6	-0.375
Serbia	39.5	-0.578	37.9	-0.587	29.1	-0.103
Slovakia	30.0	-0.445	22.1	-0.292	26.1	-0.003
Tajikistan	69.4	-0.769	60.1	-0.749	30.5	-0.177
Turkmenistan	34.5	-0.537	34.5	-0.565	40.8	-0.387
Uzbekistan	45.5	-0.671	42.8	-0.671	24.7	-0.284

Source: Own computation.

Table 4. Projection of changes in the inefficient countries for the year 2013.

The DATA columns contain the values of the respective variables registered in 2013. The CHANGE columns present the percentage change, the introduction of which would lead to achieving full efficiency in individual countries. The direction of these changes is the same for all variables and countries, and the size varies. The changes are for PR_TE from 0.184 to 0.795, for OOP_TE from 0.165 to 0.785 and for GINI from 0.003 to 0.409.

In order to achieve full efficiency, these countries should change the structure of financing and income inequalities, e.g. Azerbaijan should reduce PR_TE by 79.5%, OOP_TE by 78.5% and GINI by 20.0%, whereas Georgia should reduce PR_TE by 78.9%, OOP_TE by 74.8% and GINI by 37.4%, which to reduce the proportion of people at risk of catastrophic health expenditures in this countries [31].

6. Conclusion

The health care systems of the post-communist countries are financed according to the historical burden of the past: the Central Europe is dominated by funding with health insurance contributions, while in Eastern Europe and Central Asia the budgetary financing prevails. Financing health care from health insurance premiums appears to be more stable than budget financing, although it is also vulnerable to economic fluctuations. However, as in the Western European countries, the health insurance system should be supplemented with budget funds. The problem of the former Eastern bloc countries is the low amounts that may be used to finance health care services, medications, rehabilitation or additional services. The costs of medical equipment and medicines are similar in all the countries, and in many of them, only basic treatments and therapies with generic drugs instead of original (modern) ones are financed. Thus, in many countries, there are difficulties in access to modern medical technologies.

Limiting the extensive infrastructure of the health care sector and the financing of the health needs of the population, as opposed to facilities, is the key to improving the performance of health systems. An unsolved problem related to the efficiency and financing is low salaries of medical staff in the surveyed countries.

The study of health systems efficiency in 28 post-communist countries indicates significant differences between the compared countries (DMUs). As a target and, at the same time, the basis for comparison, the aggregated health system of the 16 developed countries of Western Europe, which achieves very good health outcomes (DE16), was indicated. Comparable health outcomes are also achieved by three most developed countries of Central and Eastern Europe: Slovenia, Czech Republic and Croatia. In Croatia, the infant mortality rate is currently slightly higher than in the case of the other leaders.

It is postulated that in all the countries a system of co-payments for the use of health care, understood as the cost of access to the health care system, should be introduced. The aim of such action would be to rationalize demand. It could also reduce the scale of informal fees and slightly raise the total funding of the system. It is also postulated that the countries of

Central Asia should increase public funding in order to provide citizens with access to health care (e.g. Kyrgyzstan).

It is also necessary to determine the exact package of benefits—health services which will be financed from public funds. This would allow for the development of voluntary health insurance, from which above-standard services would be funded.

It is imperative to strengthen the role of the general practitioner and ambulatory health care, as well as reduce the number of inpatients. In many countries, doctors working as general practitioners have rather low qualifications and the raising their qualifications is necessary [32].

The instability of employment, lack of social protection, low wages, income inequalities and psychological stress additionally contribute to high number of suicides, large number of civilization-related disease cases, and as a result, shorter life expectancy. In transition countries, the life expectancy is on average 8 years shorter than in Western Europe, while healthy life expectancy is 7 years shorter.

The problem of excessive alcohol consumption in some post-Soviet countries and the high percentage of tobacco consumers remains unresolved. Another problem is the unhealthy lifestyle, poor nutrition, inactivity and a high percentage of overweight people. The post-socialist way of thinking and the low performance of health care systems combined with low financing are the causes of poor health care outcomes.

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