

Economic and Social Impact of Healthcare Reforms in Bulgaria

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Abstract

With the beginning of the transition to a market economy in Bulgaria, reforms in the healthcare industry also began to take place. Their main goal is related to improving the health status of the population in the country. Three decades later, the implemented reforms do not meet society's expectations. The main aim of the study is to outline the results of the reforms in the industry over the past ten years, as well as the major economic and social impact they led to. For this purpose, the impact of the reforms in healthcare industry on the efficiency with which it operates, their impact on the health status of the population and on the importance of the industry for the country's economy are studied. A comparison is made with other EU member states and with the average European levels. The study is built on primary data, provided by Eurostat for the period 2010-2020 in the input-output model in its upgraded version FIGARO. The results of the conducted research show that the implemented reforms lead to positive changes in the industry. However, there are still a number of problems in healthcare in

Bulgaria, as the country lags behind average European levels in most of the studied indicators.

Keywords: healthcare efficiency, healthcare reforms, input-output analysis, economic impact, social impact

JEL: I15; D57

1. Introduction

The topic for the results of the reforms carried out in the healthcare industry after the beginning of the transition to a market economy is one of the most frequently discussed ones in the public life in Bulgaria. The health status of the population in the country is among the last places in Europe. There is a persistent, high level of morbidity of the population of a number of socially significant diseases. These facts contribute to the constantly decreasing number of the country's population.

The reforms implemented in the industry so far do not meet the expectations of society. A significant part of the population has lost access to the full range of health services, and some of those who have such are not satisfied with either the volume of assistance provided, its quality or both of them. Often the topic of the state of the healthcare industry is

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a reason for emotional comments in the public life, and in some cases, it is even used for gaining political dividends. This necessitates the use of an impartial, scientific approach in the evaluation of the results achieved.

The conducted literature review shows that the current research on the reforms carried out in the healthcare industry in Bulgaria is focused mainly on the analysis of traditional indicators, most often through the use of a documentary method and the method of observation. This paper goes into depth on the studied issues through the use of input-output analysis. Through the use of the model, the healthcare industry is also represented in its role as a consumer of goods and as a producer of goods. In addition, the model makes it possible to clearly derive the degree of efficiency with which the industry operates.

The main aim of the study is to outline the results of the reforms carried out in the industry over the past ten years. This aim is related to the assessment of the economic and social impact of the healthcare reforms in Bulgaria. To achieve the aim the following research questions were addressed:

- What is the impact of the conducted reforms on the efficiency of the functioning of the healthcare industry?
- What is the social impact of the conducted reforms in the healthcare industry?
- What is the level of development of the Bulgarian healthcare industry in relation to the average European levels?

2. Literature review

The restructuring processes of the healthcare system in Bulgaria start with the beginning of the transition to a market economy. One of the main reasons for implementing reforms is the deterioration of

the population's health status in the country in the years after the beginning of the transition. Thus, the objective of implementing the reforms is aimed at improving the health status of the population. According to Rajan et. al. (2022), the final health system goals include health improvement, people centredness, financial protection, efficiency and equity. The other main prerequisite for beginning the reforms in the healthcare system are the significant differences between the existing relations in the early 1990s and the change in socio-economic conditions in the country. The healthcare system in Bulgaria, before the transition to a market economy, was based on the principles of universal coverage and free access to health services. The system was characterized by centralized planning and was financed at the expense of the state. Ownership was public and the private sector has been completely absent. As a result of the transition to a market economy, processes related to decentralization of the industry began in the healthcare industry, placing an increasing emphasis on the rights of the patient, introducing market elements such as the ability of consumers to make decisions, the existence of competition, the introduction of contractual relations, etc.

The health insurance system in Bulgaria was established with the Health Insurance Act in 1998. This was the legal basis for changing the health system and for the introduction of both compulsory and voluntary health insurance in the country (Georgieva et al., 2007). The compulsory health insurance system is implemented by the National Health Insurance Fund, which has a monopoly in the implementation of these activities. The medical services it pays for are included in a basic package, and the medicines are on the so-called positive list. Each year their amount is

Table 1. Key changes as a result of the health reform in Bulgaria

Year	Type of Reforms	Impact
1991	Qualified medical professionals are entitled to engage in private medical practice. <i>Source: Health Act</i>	Decentralization of the industry; Introducing market elements
1998	Establishment of the National Health Insurance Fund (NHIF). <i>Source: Health Insurance Act</i>	Implementation of compulsory health insurance; Introduction of cost sharing in the form of co-payments when the patients are charged a flat rate for services; Introduction of National Framework Contract (NFC).
1998	Introduction of voluntary health insurance. <i>Source: Health Insurance Act; Insurance Code</i>	Introduction of an additional source of funding in the healthcare system.
1998	Patient Empowerment. <i>Source: Health Insurance Act; National Framework Agreement</i>	Definition of patient's rights. Regulation of the rights of citizens, their autonomy, and the right to choose their physicians and health institutions.
1999	Introduction of a system for accreditation of hospitals and diagnostic consulting centers. <i>Source: Medical-Treatment Facilities Act</i>	Ensuring the quality of health services, assessing the basic training opportunities for students and postgraduates for achieving better results and informing medical professionals and citizens.
2001	Introduction of clinical pathways. <i>Source: National Framework Contract for 2001</i>	A new way in which medical activities are financed.
2009	Introduction of a positive drug list. <i>Source: Medicines and Pharmacies in Human Medicine Act; Medicinal Products in Human Medicine Act, Regulation 10 Issued by the Minister of Health from 2009</i>	The positive drug list includes medicinal products authorized for use in the Republic of Bulgaria classified by pharmacological group.
2011	An opportunity is introduced for health-insured persons to be entitled to additional requested services related to the provision of medical care, which are paid at prices determined by the respective medical institutions. <i>Source: Regulation for the Exercise of the Right of Access to Medical Aid Issued by the Council of Ministers</i>	An attempt to prevent informal payments in the provision of health services.
2013	Introduction of electronic health record. <i>Source: Health Insurance Act</i>	Access of citizens to their health record, which contains information about the choice of a GP, as well as about the activities carried out and reported by the GP, specialist doctors, hospitals, laboratories and pharmacies.
2019	The existing procedure for accreditation of medical institutions is abolished. <i>Source: Medical-Treatment Facilities Act</i>	Use of other approaches for ensuring the quality of health services.

Source: Authors' table

negotiated in the National Framework Contract by the contract organizations of doctors. Employers and workers began paying their compulsory health insurance contributions in mid-1999 and this is practically the first financial resource with which the National Health Insurance Fund started working.

The healthcare system in Bulgaria is funded by numerous sources, including mandatory health contributions, taxes, health insurance, corporate payments, donations, as well as direct payments from patients. The main share of financial resources in the industry is due to the health insurance contributions paid by the health insured persons and employers in the

country. With regard to this funding source, there are three main problems.

The first is related to the fact that although in the country health insurance is mandatory for all citizens, a significant part of them are practically not insured. According to data of the Ministry of Finance of the Republic of Bulgaria (2019), their number in 2017 amounted to 719 ths. persons, which is over 10% of the population of the country. At the same time, the patient's payment of health insurance does not guarantee the reception of medical service in full scope or quality (Ivanova, 2020). These facts discourage many people from making insurance payments or providing insurance payments for the remuneration they actually receive. This results in a smaller financial resource flowing into the system.

The second factor that negatively affects the financing of the healthcare system is the low level of income in the country. Schieber and Maeda (1997, p. 15) state that low-income countries and regions can raise less than half the revenues that high-income countries can raise. According to Eurostat, the annual net earnings in Bulgaria are the lowest in the entire European Union. Over the past ten years there has been a positive trend of shortening the distance of Bulgarian annual net earnings relative to average European levels. However, Bulgaria's lagging behind on this indicator is still too great. For 2021, net annual earnings in Bulgaria are about 3.5 times lower than the Community average. The lower level of income in the country also leads to a more limited possibility of allocating funds to health funding the country.

The third factor is related to the presence of a grey sector in the country's economy. A number of international studies identify Bulgaria as the country with the highest share of the informal economy of all countries in the

European Union (Bulgarian Industrial Capital Association, 2021, p. 9).

In countries with a developed market economy, the private sector is an integral part of the healthcare industry. A number of studies focus precisely on the relationship between the public and private sectors in the healthcare system (Sheaff, et al, 2019; Andersson, et al, 2021). At the beginning of the 21st century, the private sector began to enter the healthcare industry in Bulgaria. Dental care in the country is almost entirely private. The private sector also dominates in specialized outpatient care. The public sector maintains a high relative share in hospital care, but there is also a trend of strong private capital penetration and since 2000 the number of private hospitals has been steadily increasing.

With the introduction of funding for hospitals from the National Health Insurance Fund, hospital health services are paid for following the relevant clinical pathways. Many private hospitals have a contract with the National Health Insurance Fund. This further stimulates the development of the private sector in the healthcare industry with the help of public funding.

The financial performance of private hospitals is significantly better than those of national and municipal hospitals. However, part of the services offered gives way to the quantity and quality of health services in state medical institutions. In most scientific studies, quality is not a minimum and a restraint. Quality is the essence of the output (Drucker, 2001, p.143). Standard medical performance indicators applied in management (including quality) and used in medical standards in specialties as requirements for the organization and structure of individual units cannot be quality measures at an individual

level (Valkov, 2021, p.832). Just because there is a higher mortality rate in a ward does not mean that the quality of the medical service provided is lower. The higher mortality may also be due to the fact that this ward is targeted by more severe cases. Treatment of more severe cases generates huge costs, which in many cases exceed many times the funds received for the treatment carried out. In some cases, certain health services are not provided in private hospitals because they are economically disadvantaged. In these cases, patients are referred for treatment to regional and national health facilities. It reflects economic problems for public hospitals which are struggling to withstand intense competition in the market.

The poor financial performance of public health facilities can be explained with several reasons. Since the beginning of the transition to a market economy and the reforms carried out, there are two trends that continue to this day. The first is related to the decrease in the population in the country. By 1989, the population in Bulgaria was 9 million people, dropping to 6.8 million in 2021. According to Valkov (2021), the impact of non-market defects increases as a result of both objective (e.g. demographic) and subjective (e.g. managerial) factors. For example, public hospital debts are rising, unused beds lead to unnecessary costs and inefficiencies. The second trend is related to the growing number of private hospitals in the country. The rapid expansion of the private sector is associated with serving a larger number of patients. In terms of the number of patients who have passed through, the ratio changes significantly in favor of the private sector, which at the beginning of the period covers only 5% of the patients in the country, and in 2016 it is already over 43% (Penkova et al., 2018, p.

112). The decrease in the total population and the increased provision of medical services by the private sector at the expense of the public sector lead to a decrease in the usability of beds in a number of public hospitals and, as a result, to a deterioration in their financial situation.

Experience shows that closing hospitals is almost impossible once they start functioning, and reforming them is very difficult. Against this reality, opening new hospitals does not mean that existing and less efficient hospitals will soon be dropped (Cherkezov, 2017). The fact that in Bulgaria public hospitals have the role not only of a health service provider, but in some cases a social care contractor, is also another difficulty in reforming hospital care.

The most significant cause of the existing financial problems of public hospitals is related to the established system for financing the activity of clinical pathways and their correct valuation. The prices paid for some of the clinical pathways are much lower than the real costs that are necessary for the treatment of the patient. Underfunding of clinical pathways is one of the drivers of hospital deficits (Zahariev & Georgieva, 2018, p.6). Each patient enrolled on underfunded pathways generates a negative financial result. This encourages hospitals not to accept patients in them. On the other hand, there are clinical pathways whose prices ensure significant profitability. This encourages private hospitals to target them and thus achieve better financial results. Another reason for the poor financial performance is the large number of health uninsured people who directly target emergency departments and generate even greater losses for public hospitals.

Although there are financial difficulties facing a large number of public hospitals, their number remains relatively constant. In

many cases, public hospitals are not closed for social reasons. Closing some of them would lead to situations where residents of smaller settlements would be left without the necessary medical care. Keeping medical care at the required level in smaller and poorer areas of the country also requires financial assistance from local and central government. In many cases, however, smaller municipalities do not have the resources to finance these medical institutions, which also contributes to their financial instability.

In addition to the problems related to the financing of the system, the implemented reform in the healthcare industry in Bulgaria has also brought to the fore problems related to equality between users of the health service, especially with regard to access to health services. Marmot (2007) states that the development of society, rich or poor, can be judged by the quality of its population's health, how fairly health is distributed across the social spectrum, and the degree of protection provided from disadvantage due to ill-health. A number of researchers such as Cisse, Luchini and Moatti (2007) focused on inequalities, analyzing variations in health status between different social classes. Other researchers such as Wagstaff, Paci and Doorslaer (1991) investigate the various methods to measure inequalities in health.

Equality is often seen through the prism of funding the healthcare system. It depends on how fair the financing of medical activities is to the solvency of the population. Access to healthcare depends on the extent to which citizens have to pay directly for the medical services they use. The higher the payments with their own funds from households, the greater the financial burden on the population. The high-level self-funded payments significantly limits the financial protection

of all, particularly unfavorably affecting the poorest layers (National Health Strategy, 2015, p.54). With a higher financial burden on the population, equal access to health services is distorted as it becomes dependent on income. In this way, higher-income citizens will have better access to the health service they need.

According to Eurostat, the out-of-pocket household payments for Bulgaria are the highest in the entire European Union, amounting to 35.53% of the total current health expenditure in 2020. This figure is significantly higher than the European Union average.

The drivers of out-of-pocket expenditure are payments for services not covered by the benefit package (including most dental and long-term care), as well as cost-sharing for a range of services and prescription medicines (OECD, 2019, p.11). According to Rohova (2017), the health funding system in Bulgaria is not based on the principles of solidarity and equality. The high share of out-of-pocket expenditures leads to a problem with access to healthcare for people on lower incomes in the country and with a violation of equality.

The problem of household health spending is also compounded by the informal payments. In 2000, an attempt was made to overcome this negative practice by introducing official user fees and regulating cases where health insured persons should pay with their funds for certain services. Despite the efforts made, informal payments continue to be practised in the healthcare system in Bulgaria. According to Durankev (2012, p.201), the existence of unregulated payments in the healthcare system in Bulgaria is a serious problem that leads to serious consequences. Unregulated payments further hinder the access to health services, distort the principle of

equal treatment enshrined in the country's healthcare system and lead to a deterioration in the nation's health. The implemented reform in the healthcare industry also leads to a state of the industry, characterized by unevenness of the network of health facilities within the territory of the country. Penkova, Gorchilova and Valkov (2018, p. 109) state that defect of the whole system is the significant inequality of health services provision – concentration in the large and university cities, lack of full coverage of the population from small settlements, lack of good doctors and pharmacies in many of the settlements.

Naturally, the private sector is heading towards the larger settlements where the higher-income population is concentrated. At the same time, there is a liberal registration regime and a practical impossibility of the National Health Insurance Fund to refuse a contract for carrying out activities on clinical pathways. This leads to the concentration of hospital care in Sofia and major regional cities and to the increasingly limited supply of highly specialized services in smaller settlements.

Many countries around the world have examples where the demand for health services has been a factor in the development of the healthcare system. Cruz-Martinez (2021), Huber & Stephens (2012) and Yuda & Pholpark (2022) provide examples of the use of demand-side and supply-side economic factors as explanatory factors of healthcare expansion and improvement. As a result of the implemented reforms in Bulgaria, a number of patient organizations were founded, whose purpose is to provide better and affordable healthcare to the population. They are associations of citizens and are registered as non-profit legal entities. Their activity is related to the protection of patients' rights, participation in forums where topics related

to the future of health insurance, e-health, preventive examinations, etc. are discussed. Representatives of patient organizations participate in the work of various state bodies directly related to patients and their rights. For example, a representative of patient organizations participates in the supervisory board of the National Health Insurance Fund.

3. Methodology

Logic of the study

As a methodological foundation of the study the model of Vasilii Leontieff - inter-industry balance, known today as the input-output model is used. At its core is the understanding of a country's economic industries as both producers and consumers of resources. In addition, the model makes it possible to study the directions of realization of the production created by the economic industries, as well as to study the costs with which this production is created.

Many studies have examined the model's benefits, but most are nationally focused. Today, living in a rapidly globalizing world, the relations between countries become more and more intense. Moreover, in these conditions the need for a thorough and adequate study of these relationships arises. The input-output model provides an opportunity to study and analyze the multiregional relations (the relations between national economies).

As Leontieff (1963, p.119) himself points out, the input-output model could be used for multiregional analysis. There "the output of each region is defined as a combination of outputs of economic activities carried on within its geographic boundaries; its input accordingly comprises the direct inputs of these industries and the goods and services

absorbed directly by the final demand sectors of that region.”

The present study, due to its geographical scope, requires the use of the further developed version of symmetric input-output tables, namely FIGARO tables (**F**ull **I**nternational and **G**lobal **A**ccounts for **R**esearch in input-**O**utput analysis). The project is built on the National Accounts framework and the information provided by national symmetric input-output tables (SIOTs) and trade statistics (Rueda-Cantuche et. al., 2017). The input-output model and the FIGARO tables provide an opportunity to analyze a large set of data that characterize the different aspects of the economic life in one country, as well as its relation with other countries. In the current study, the focus is placed on the healthcare industry by analyzing how the output in the industry is created and consumed.

The model of the input-output analysis gives the opportunity to analyze the development of this specific industry of a national economy – both as a producer of goods for the other industries and economies, and in the same time as a user of goods that are produced in all other industries of the national economy

and other economies. Information about the healthcare industry in the European Union comes from primary sources and is gathered by the European Statistical Institute (Eurostat). Model B is used to build symmetric input-output tables. The assumption when using this model, is that there is a similarity in the main product for each industry, while the difference exists in the technology used.

A necessary clarification to add is that no matter how good a tool is, it is not possible for it to cover the entire spectrum of specifics of the studied object. Thus, for example, although it theoretically provides this possibility, now the input-output model fails to fully capture the labor aspect. For this reason, the research also analyzes data beyond symmetric FIGARO tables, as healthcare expenditures and number of employees in healthcare industry.

The specificity of the industry also leads to the need to study its impact on the population of a country. In other words, it is not possible to carry out a correct assessment of the functioning of the healthcare industry without examining the social aspect of its impact by

Table 2. Logic of the study, based on the research hypothesis and indicators related to them

Research hypothesis	Indicators
H1: The implemented reforms in the healthcare industry lead to an increase in the efficiency of its functioning	<ul style="list-style-type: none"> • Sum of the elements by vector-column of the full cost matrix; • Labor productivity; • Amount of healthcare expenditures that creates a unit value added; • Amount of healthcare expenditure per employee in the industry.
H2: The implemented reforms in the healthcare industry lead to an increase in the health status of the population	<ul style="list-style-type: none"> • Life expectancy; • Healthy life years.
H3: The implemented reforms in the healthcare industry lead to an increase in the importance of the industry for the country's economy	<ul style="list-style-type: none"> • Share of industry's output for final consumption within the volume of the output for final consumption of a national economic system; • Share of the value added of the industry within the total value added for a national economic system.

Source: Authors' figure

using the basic indicators that characterize it - life expectancy and healthy life years.

Finally, the methodology exposition has the task of bringing out the relationship between the main aspects of the research and the established research hypotheses. Their brief presentation is made through **Table 2**.

Data used

The time span of the research is in the period 2010-2020, which is a long enough period, allowing to derive main trends, as well as to formulate correct and permanent conclusions, and to test the research hypotheses.

This study period was chosen for several main reasons, despite the availability of the extreme data for 2020. First, by using the latest data we guarantee that the results and conclusions formulated are likely to be the most accurate and reliable. Second, the latest data is more relevant to current scientific research and topics, even in the presence of extreme values. And at last, using the latest data enhances the credibility of scientific research. Outdated data may lead to outdated conclusions, which may be challenged by the scientific community.

As it was already outlined, the FIGARO tables cover the main aggregated economic industries, and the ones that are studied in the research are healthcare industry and professional, scientific and technical activities. The international trade relations between countries, based on the volume of healthcare industry's production imported and

exported is conditionally divided to relations with EU countries and relations with the rest of the world. For the purpose, we have made additional calculation for unification of information about non-EU countries. In the basic FIGARO tables the groups of countries are three (EU, Non-EU and RoW¹), and here the information for the countries out of the European Union is presented in one summarizing group – **Rest of the World**).

The data used for studying the expenditures in the industry, as well as its social impact, is provided by Eurostat, and is used without any additional modification. In the model national currencies are homogenized by purchasing power parities (PPPs) in order to compare the provided national data. For that reason, all the statistical information in the FIGARO tables is measured in what is known as purchasing power standard in the European Union (PPS) (Eurostat, 2008 and Eurostat-OECD, 2012). The purchasing power parties are in accordance with a review conducted by Eurostat-OECD that includes methodological developments regarding to the revised calculation method for particular health PPPs (Koechlin et al., 2014 and Lorenzoni et. al., 2017).

Measures, limitations and their interpretation

The testing of research hypotheses is related to the use of certain indicators based on the provided statistical data, as well as determining the limitations for their interpretation. Traditionally the efficiency in the healthcare industry is measured and

¹ According to the authors of FIGARO project the Non-EU countries is the group with the eighteen main trading partners for the European Union as a whole - Argentina, Australia, Brazil, Canada, China, India, Indonesia, Japan, Republic of Korea, Mexico, Norway, Russian Federation, Saudi Arabia, South Africa, Switzerland, Turkey, United Kingdom, United States of America. In the group RoW (rest of the world) is aggregated the information for all other trading partners. – Eurostat, What is the coverage of FIGARO tables; available online at: <https://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/figaro>; visited on : September 10th, 2022.

assessed by indicators as: total number of hospitalized patient; number of hospitalized patients due to diseases of the circulatory system; number of hospitalized patients due to cancer diseases; number of hospitalized patients due to respiratory system diseases (Mitkova et al., 2022, p.3). Beyond these indicators, which are aimed at the immediate activity of the industry, there is a need to study such indicators characterizing the industry's efficiency from an economic and social aspect. The selected indicators, as well as their relationship with the research hypotheses, are presented in Table 1 and the following exposition presents their nature and specifics.

Sum of elements by vector-column of the full cost matrix (E-A)⁻¹

The full cost matrix is calculated based on the information provided by the first quadrant of the symmetric input-output tables. This information, described by the elements x_{ij} , characterizes the amount of output created by industry i of the national economy, which is provided for use by the remaining industries j in the economy. When we divide each element x_{ij} to the amount of total product for the industry j ($\frac{x_{ij}}{x_j}$) as a result we have the information needed for building direct costs matrix. Each coefficient in this matrix ($a_{ij} = \frac{x_{ij}}{x_j}$) provides information about the volume of direct costs of product, created by industry i that is required to produce a unit of total product in industry j . These coefficients are used for building the direct costs matrix.

The full cost matrix is the inverse matrix of the (E-A) matrix, where E is the elementary matrix and A is the direct cost matrix. This inverse matrix has the form:

$$(E-A)^{-1} = \begin{pmatrix} 1 - \frac{A_{11}^1}{\Delta} & -\frac{A_{12}^2}{\Delta} & \dots & -\frac{A_{1n}^n}{\Delta} \\ -\frac{A_{21}^1}{\Delta} & 1 - \frac{A_{22}^2}{\Delta} & \dots & -\frac{A_{2n}^n}{\Delta} \\ \dots & \dots & \dots & \dots \\ -\frac{A_{n1}^1}{\Delta} & -\frac{A_{n2}^2}{\Delta} & \dots & 1 - \frac{A_{nn}^n}{\Delta} \end{pmatrix}$$

Each of its elements characterizes the full volume of costs (direct and indirect) necessary for an industry of the national economy to create its total output. Each vector-column of the matrix of full costs for a national economy (respectively, the sum of its elements x_{ij}) provides information about the material costs with which a unit of production is created in each of the industries of the national economy. In the present study, vector-column summation is performed for the healthcare industry using equation 1.

Equation 1: Sum of element by vector-column of the full costs matrix (E-A)⁻¹

$$MPC = \sum_{i=1}^n x_{ij}$$

where,

x_{ij} – volume of material resources, from all industries of the national economic system ($i = 1, 2, \dots, n$), necessary to create the entire volume of total product of healthcare industry.

The interpretation of the results follows the logic related to each cost, the performance is better the lower the result is. Theoretically the result values are numbers higher than 1, because they contain the unit of product produced.

Labor productivity

This is one of the traditional indicators for measuring the efficiency of the functioning of an economic system. In the present study, labor productivity is considered as a derivative of the interaction between two variables -

value added created in the healthcare industry and number of employees in the industry, and is calculated using **equation 2**.

Equation 2: Labor productivity

$$LP = \frac{VA}{Emp.} * 100$$

where,

LP – Labor productivity in healthcare industry;

VA – Volume of value added in healthcare industry;

Emp. – Number of employees in healthcare industry.

The obtained results should be interpreted as *“the volume of added value in the healthcare industry, created by one employee in the industry”* and the increase in the value of the indicator during the studied period is taken as a sign of increasing efficiency from the functioning of the industry.

Healthcare expenditures

The World Health Organization (2021) states that recurrent and capital expenditures from government budgets, external borrowing, grants (including gifts from international agencies and Non-Governmental Organizations (NGOs), as well as mandatory health insurance funds, make up the majority of the cost of healthcare. The sum of all public and private spending on all aspects of health is known as total healthcare expenditure. The amount of money that the government spends on healthcare with the intention of enhancing the nation's population's health is known as health expenditure. This covers loans and grants from outside sources, gifts from non-profit and international organizations, and social health insurance funds. The World Health Organization (2021) defines healthcare expenditure as the total of capital investments

in healthcare infrastructure and the final consumption of healthcare products and services.

All payments made for things like prescription drugs, hospital bills, lab fees, and consultation fees for doctors are included in the total amount spent on healthcare. Prepayments, payroll taxes, user fees, public insurance, and voluntary insurance all contribute to overall taxation in developing nations.

Amount of healthcare expenditures that creates a unit value added

The indicator measures the volume of expenditure that is necessary for a healthcare industry to create a unit of value added in it. Mathematically, the relationship between the two studied quantities is represented by the following **equation 3**.

Equation 3: Amount of healthcare expenditures that creates a unit value added

$$Exp. to VA = \frac{Exp.}{VA}$$

where:

Exp. – Volume of healthcare expenditures;

VA – Volume of value added in healthcare industry.

The obtained results are interpreted according to the logic that the increasing economic efficiency in healthcare industry is present when creating a unit of value added with decreasing costs.

Amount of healthcare expenditures per employee in the industry

The analysis of the results related to the costs of one employee in the healthcare industry (calculated according to **equation 4**) deviates from the theoretical requirements

for the behavior of the economic category “costs” already indicated in the research.

Equation 4: Amount of healthcare expenditures per employee in healthcare industry

$$Exp. to Emp. = \frac{Exp.}{Emp.}$$

where:

Exp. – Volume of healthcare expenditures;

Emp. – Number of employees in healthcare industry.

We adopt the notion that the healthcare expenditure should be perceived, from the position of the employees, as a measure of their capital availability. In other words, the higher level of healthcare expenditure should have as its direct result an improvement in working conditions; provision of all necessary (quantitative and qualitative) materials for the seamless delivery of healthcare services; renewal and modernization of the material base in healthcare facilities. Precisely because of the above, the interpretation of the obtained results will define as an increase in efficiency the tendency towards an increase in the healthcare expenditure incurred per employee in the industry.

In addition to the considerations already made, it is necessary to note that the topic is extensive enough for an independent study aimed at an in-depth analysis of the nature of the expenditure incurred. Thus, a more detailed answer can be obtained to the question of whether investing more money in the industry leads to improvement in its economic performance and strengthening its importance for the national economy.

Life Expectancy and Healthy Life Years

Within the framework of the present study, the two indicators should be analyzed both

separately and through their interdependence. Although the essence of the information presented by the indicators can be understood by their names, this does not negate the need for additional clarification. It is related to the necessary direction of development of trends for these indicators. Quite logically, in both cases, the increasing efficiency of the functioning of the healthcare industry is presented by a tendency towards an increase in the absolute values of the indicators.

Life expectancy is defined as the typical number of years people typically live before passing away. This figure does not indicate the reason of death, but rather that people in that demographic do pass away at a given age. The average number of years a person in a country spends living is their life expectancy.

The indicator life expectancy is defined by Eurostat as “the average further number of years that a person of a specified age can expect to live, assuming that the age-specific mortality levels remain constant” (Eurostat, 2020). The absolute data is based on Farr’s death rate method, that is mathematically presented by **equation 5**.

Equation 5: Life expectancy at birth

$$q_x = \frac{M_x}{(B_x + \frac{M_x}{2})}$$

where:

M_x - the number of deaths at the age of x to under $x+1$ years in the reported period;

B_x - the average population aged x to under $x+1$ in the base period;

q_x - death probability from age x to $x+1$

At the same time, however, there is a need for more intensively improving in the countries’ performance according to the healthy life years indicator. This will show that the services provided by the healthcare

industry lead not only to an increase in life expectancy (i.e. in quantitative terms), but also help to increase the quality of this life.

Share of industry's output for final consumption within the volume of the output for final consumption of a national economic system and Share of the value added of the industry within the total value added for a national economic system

The two indicators are presented here simultaneously, not only because of the same interpretation of the obtained results, but also because of the need for their additional analysis in their interrelationship. In both indicators, the increasing shares are indicators for increasing efficiency and strengthening the role of the industry in the development of the national economic system. When the indicators are considered in their interrelationship, increasing efficiency in the functioning of the healthcare industry is present if the trends of value added creation are growing faster compared to the trends of growth in the volume of output for final consumption of the healthcare industry.

Geometric mean

In order to provide a more general view of the data, the geometric mean is used in the analyses and assessments of part of the studied indicator. This function is well known as sample geometric mean (SGM) and it is used for the first time in 1821 by Cauchy (1821, pp. 341-353). The metric is a measure of central tendency which is applicable in different scientific fields – and economics is one of them. While the arithmetic mean finds the center by summing the values and dividing by the number of observations, the geometric mean finds the center by multiplying and then taking a root of the product (see equation 6).

Equation 6: Geometric mean

$$\overline{x_{gm}} = \sqrt[n]{\prod_{i=1}^n x_i} = \sqrt[n]{x_1 * x_2 * \dots * x_n}$$

In the study, the geometric mean function in Excel is used to outline the general trend in the processes (measured by different indicators) and is fed with information for the growth rates based on change from the previous year.

4. Results and discussion

The following exposition presents the results of the research in the frame of the study's hypotheses. The conclusions are formulated on a trend basis for the entire period, considering the extremes in values characteristic of 2020, when the healthcare industry is under pressure from the COVID-19 pandemic. Leite et al. (2021) state that the unexpected pandemic affected the healthcare industry in different aspects but mainly it affected its efficiency. In cases of a strong impact on the indicators by the pandemic, part of the conclusions are formulated for the period up to 2019, and another for the period after 2019.

Hypothesis 1: The implemented reforms in the healthcare industry lead to an increase in the efficiency of its functioning

Indicator 1.1: Sum of the elements by vector-column of the full costs matrix

The efficiency with which the healthcare industry operates, measured by the material costs for producing a unit of industry's output, is greatly affected by the impact of the global COVID-19 pandemic. The sums of the vector-column elements for each EU member-state (including the United Kingdom) in absolute

Table 3. Geometric means describing trends in indicator “sum of elements by vector-column of full cost matrix” for healthcare industry before and after COVID-19 - grouping countries according to their performance

Countries where the healthcare industry functions with increasing efficiency								
	Austria	Belgium	Bulgaria	Czech	Denmark	Estonia	Germany	Greece
Before COVID-19	1,31%	0,20%	-0,19%	-0,40%	2,52%	1,08%	1,39%	1,17%
After COVID-19	-0,05%	-0,10%	-0,51%	-0,44%	-0,04%	-0,37%	-0,11%	-0,29%
	Italy	Latvia	Lithuania	Netherlands	Poland	Portugal	Slovakia	Slovenia
Before COVID-19	0,34%	0,28%	-0,05%	0,58%	0,54%	0,81%	0,46%	1,64%
After COVID-19	-0,29%	-0,79%	-0,61%	-0,31%	-0,13%	-0,28%	-0,26%	-0,20%
Countries where the healthcare industry functions with a tendency towards insufficient efficiency improvement								
	Croatia	Cyprus	Hungary	Ireland	Luxembourg	Malta	Romania	Spain
Before COVID-19	-0,64%	1,95%	-1,48%	-1,11%	3,38%	1,43%	-0,65%	-0,37%
After COVID-19	-0,63%	0,07%	-0,99%	-0,64%	0,83%	0,82%	-0,28%	-0,26%
	Sweden	UK						
Before COVID-19	1,60%	-0,06%						
After COVID-19	0,06%	-0,03%						
Countries where the healthcare industry functions with decreasing efficiency								
	Finland	France						
Before COVID-19	0,13%	-0,27%						
After COVID-19	0,13%	0,18%						

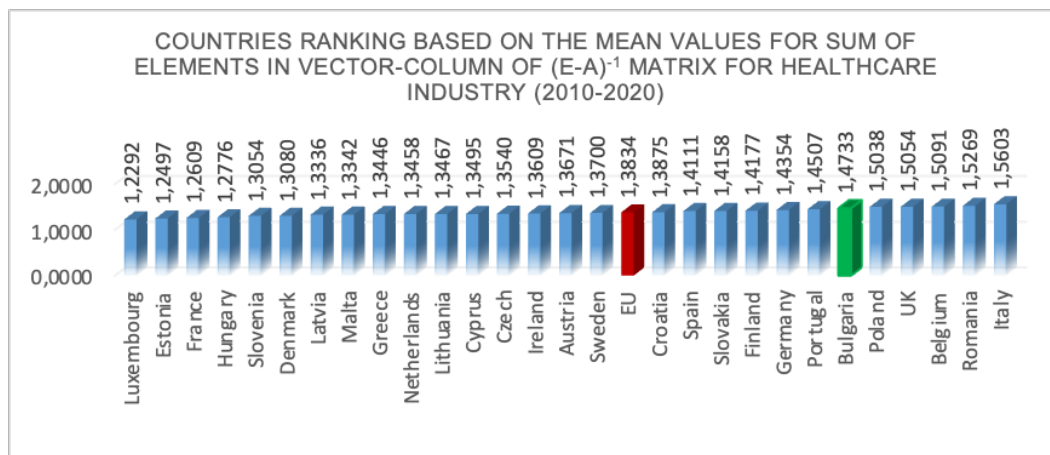
Source: Authors' calculations based on the information, provided by Eurostat

terms show a downward trend in the period up to 2018, albeit with some fluctuations. However, the overall trend as measured by the geometric mean shows changes in industry performance before and after the COVID-19 pandemic (data up to 2019 and beyond). In **Table 3** the summarized information about the trend in the development of the studied indicator is presented.

As can be seen, although experiencing the pressure of the health crisis, and probably because of it, in a large part of the countries the healthcare industry functions with higher efficiency after 2019. The negative values embody the average geometric tendency towards a decline in material costs for producing a unit of product in the healthcare

industry. From the data, it is noticeable that a large number of countries have managed to reduce their costs, respectively increase their efficiency. The healthcare industry in Bulgaria falls precisely in this first group of industries, as overall for the entire studied period (2010-2020) it marks one of the best performances after those of Lithuania and Latvia.

Part of the countries show a tendency to improve their performance according to the indicator, but it is not enough to report the presence of efficiency. We are talking about those countries in which the healthcare industry in 2020 shows a tendency to decrease the average material costs compared to the period 2010-2019, but this decline does not lead to a general decrease in costs at the



Source: Authors' diagram based on authors' calculations

Figure 1. Countries ranking based on the geometric mean values for the labor productivity in healthcare industry (2010-2020)

end of the studied period compared to its beginning. These countries also fall here, in which there is also a deterioration in the trend towards lowering the costs of creating a unit of production in the healthcare industry. The healthcare industry in Finland and France functions inefficiently, as the indicator considers an increase in material costs for the production of a unit of product in the industry.

The trend emerging in the behavior of the studied indicator should also be compared with its current state, expressed through its average values for the studied period. At the present moment, the healthcare industry in the Bulgarian economic system functions with levels of material costs higher than the average for the European Union. (see **Figure 1**) At the same time, economies characterized as well-developed and efficient operate with an average volume of material costs higher than the values for Bulgaria (e.g., Finland, Belgium, Italy).

As a summary, it should be pointed out that there is an increasing efficiency in Bulgarian healthcare industry, characterized by the

decrease in the material costs used by it for creation of a unit total product, as shown in **Table 3**. Of course, it is necessary to make a clarification that when analyzing costs we are talking about such processes that healthcare industry cannot influence on. And while the market prices of resources are formed outside and independently of the healthcare industry, the possibilities for improvement and technical-technological innovation that lead to a reduction in the physical volume of the necessary material resources remain within the scope of its impact.

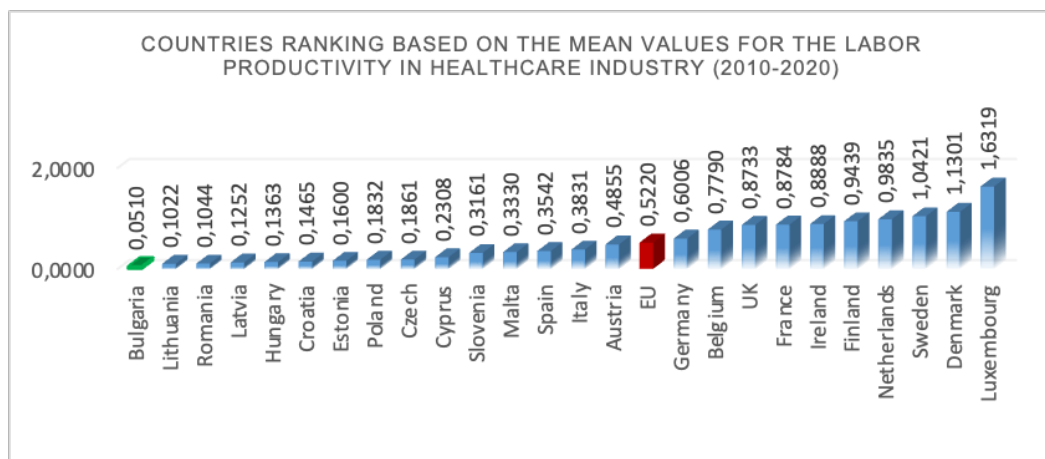
Indicator 1.2: Labor productivity

With few exceptions, the labor productivity indicator for the healthcare industry during the research period 2010-2020 shows an upward trend, which is also a signal of an increase in the overall efficiency with which the industry functions. In **Table 4** the average values for the member states of the European Union (including the United Kingdom) are presented, while the initially provided information for Greece and Slovakia is missing.

Table 4. Geometric mean rate of change of labor productivity in the healthcare industry for the period 2010-2020 (%)

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark	Estonia	
Geomean	2,28%	0,79%	7,25%	1,95%	-2,87%	7,77%	-0,67%	8,62%	
	Finland	France	Germany	Hungary	Ireland	Italy	Latvia	Lithuania	
Geomean	1,44%	1,39%	1,93%	4,82%	0,99%	0,94%	9,02%	8,85%	
	Luxembourg	Malta	Netherlands	Poland	Romania	Slovenia	Spain	Sweden	UK
Geomean	2,32%	3,91%	0,90%	3,03%	7,47%	1,16%	-0,22%	0,45%	2,39%

Source: Authors' calculations based on the information, provided by Eurostat



Source: Authors' diagram based on authors' calculations

Figure 2. Countries ranking based on the mean values for the labor productivity in healthcare industry (2010-2020)

In relation to the rest of the countries, the performance of the healthcare industry is declining in Cyprus (average decrease of 2.87%); Denmark (average decrease of 0.67%) and Spain (average decrease of 0.22%). For the same period, the largest increase of labor productivity of the healthcare industry is outlined in Latvia (an average increase of 9.02%); Lithuania (average increase of 8.85%) and Estonia (average increase of 8.62%).

The healthcare industry in Bulgaria functions with high efficiency, according to

the labor productivity indicator. Average for the studied period, an increase of 7,25% in the value added created by a person employed in the industry is outlined. Based on the results obtained during the research, in **Figure 2** the comparison between the performance of the healthcare industry in Bulgaria and the other EU member-states is presented, as well as the position of the industry compared to the average values for the community.

Table 5. Geometric mean rate of change in the volume of expenditures required to create a unit of value added in the healthcare industry

Geo mean	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark	Estonia	Finland	France
	-0,35%	0,54%	-1,55%	-0,49%	1,06%	-1,41%	1,07%	-0,81%	-0,32%	-0,08%
Geo mean	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands
	-0,47%	0,72%	-2,40%	-0,68%	-0,20%	-2,01%	-2,01%	-2,02%	-1,85%	-0,57%
Geo mean	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK		
	-0,17%	-0,87%	-5,45%	-3,25%	-0,87%	-0,04%	2,60%	-0,81%		

Source: Authors' calculations based on the information, provided by Eurostat

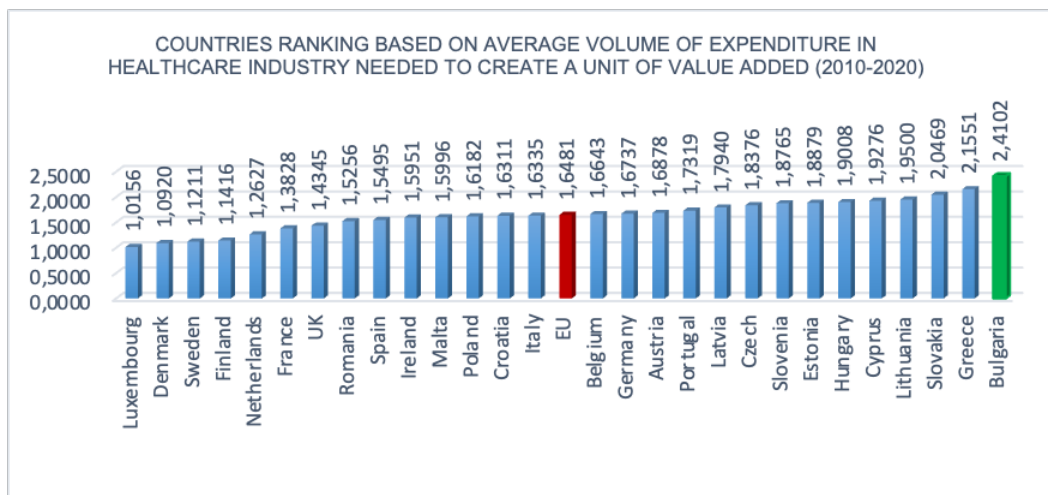
As can be seen from the data, despite the upward trend in labor productivity (as an average growth rate), Bulgaria performs the most unsatisfactorily, based on the average values for the indicator labor productivity, followed by Lithuania and Romania. The industry in Luxembourg, Denmark and Sweden functions most effectively. A general conclusion that can be formulated regarding this indicator is that now the healthcare industry in Bulgaria functions with low levels of efficiency compared to the performance of the industry in other countries. Nevertheless, it outlines the positive trend of an accelerated growth rate, which, if maintained in the future, will shorten the distance to the average European levels.

Indicator 1.3: Amount of healthcare expenditure that creates a unit value added

As already stated, the healthcare expenditure indicator is closely related to the economic and social aspect of the functioning of a country. The following statement presents the economic effect that spending has on the efficient functioning of an economy. The social aspect is considered within the proof of a second research hypothesis.

The analysis of the results within this indicator outlines the presence of an effective functioning of the healthcare industry in a large part of the national economies. Based on the geometric mean values presented in **Table 5**, it can be concluded that in some of the most developed member states of the European Union, such as Belgium, Denmark and Sweden, there is a general trend towards a decrease in efficiency, measured by the costs for creation of a unit of value added. As for the rest of the national economies, the averages illustrate a decline in the volume of expenditure that is required to create a unit of value added.

At the same time, when we compare the general trends for the expenditure for creation of a unit value added and the average costs for this period in healthcare industry, the lowest levels of efficiency in Bulgaria are outlined. This is visible from the comparative analysis, presented visually in **Figure 3**. And while in Bulgaria the decline in costs is expected to continue in the future, in countries such as Greece, Cyprus and Belgium the trend towards decreasing efficiency (based on the expenditure for creation of a unit value added) is expected to be maintained in future.



Source: Authors' diagram based on authors' calculations

Figure 3. Average volume of healthcare expenditure needed to create a unit of value added (geometric mean for 2010-2020)

The expectations raised regarding the “behavior” of healthcare industry in Bulgaria, however, should not be perceived as certain facts, the fulfillment of which is a matter of time. In harmony with the conclusions made for the previously analyzed indicator, here as well as there are many endogenous and exogenous factors, the influence of which has to be analyzed (e.g., relation between direct and total costs in the industry; absolute volume of material costs and volume of total costs in the industry).

It could be pointed out that in the case of maintaining the trend of reduction of the coefficients of direct and total costs, with which a unit of total production is created, with an increase in the technical-technological level in the healthcare industry, the result will be an increase of the efficiency that it functions with. And this increasing efficiency can be realized in several directions. Once, along the lines of reducing the volume of costs while keeping the volume of value added unchanged. A second time, by increasing

the volume of value added created in the healthcare industry while maintaining the level of costs. And a third and optimal option, increasing the volume of value added created in the industry with a simultaneous reduction in the volume of costs.

Indicator 1.4: Amount of healthcare expenditure per employee in the industry

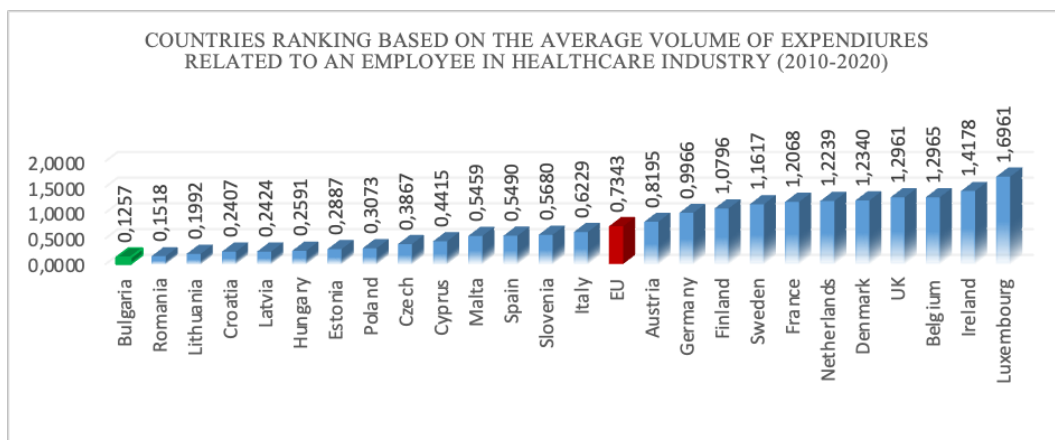
The effective functioning of the healthcare industry is directly related not only to the useful result of its functioning (in this study expressed by value added), but also to the way in which this useful result is created (types of expenditures made) and especially the social scope and impact of the industry.

By examining the interrelationship between healthcare expenditure and value added in the industry, the efficiency from an economic point of view was analyzed. The exposition within indicator 1.4 covers the aspect related to the way in which this beneficial result is created and its social impact. For that reason, we analyze the existing relation between

Table 6. Geometric mean rate of change in the expenditures related to an employee in healthcare industry (2010-2020 in %)

Austria	Belgium	Bulgaria	Croatia	Cyprus	Denmark	Estonia	Finland
1,93%	1,33%	6,03%	3,07%	-2,38%	0,40%	7,42%	1,05%
France	Germany	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg
1,17%	1,85%	2,31%	0,31%	0,52%	8,90%	6,66%	-1,45%
Malta	Netherlands	Poland	Romania	Slovenia	Spain	Sweden	UK
3,23%	0,58%	3,57%	6,95%	1,57%	-0,22%	3,34%	1,36%

Source: Authors' calculations based on the information, provided by Eurostat



Source: Authors' figure based on authors' calculations

Figure 4. Average volume of expenditures related to an employee in healthcare industry (geometric mean for 2010-2020)

healthcare expenditure and the number of employees in the industry.

The starting point for the analysis is our position that, although the indicator characterizes a type of cost, the need of its increase when related to the employees in the industry is an objective requirement. Only then, the industry is able to meet the needs of the patients in the best possible way. And as directions of this better functioning are outlined: the possibility funds to be directed not only to hiring more health workers, but also to increasing their salaries (considered as a motivator for work), and to technological renewal and innovation activity, as well

as to the implementation of actions for the prevention of a large part of the diseases.

The data available make it possible to study the trends in the development of the indicator, presented in **Table 6**. As can be seen, Latvia (8,90%), Romania (6,95%), Lithuania (6,66%), and Bulgaria (6,03%) are the countries with the highest growth rate of healthcare expenditure per employee in the industry. At the same time, with a negative average growth rate is the research indicator in Spain (-0,22%) and Luxembourg (-1,45%).

In most of the studied countries, there is a permanent trend towards increasing the efficiency of the functioning of the healthcare

industry, based on this indicator. Fluctuations in other countries were most clearly visible in 2011, 2012 and 2014.

Comparing the geometric mean rates of change in the studied indicator with its geometric mean absolute values, presented by **Figure 4**, it is noticeable that, although with one of the best trends in development, now the healthcare industry in Bulgaria functions with the lowest degrees of efficiency compared to other member states of the European Union. These obtained results, assessed through the “filter” of the research methodology, give reason to define the need of follow-up actions aimed at increasing healthcare expenditure in Bulgaria, with the requirement to be directed to the medical staff in the industry.

The analysis of the results for each indicator within the framework of the first research hypothesis and their analysis in relation to each other give reason to **accept the first research hypothesis as proven**.

Hypothesis 2: The implemented reforms in the healthcare industry lead to an increase in the health status of the population

The social aspect of healthcare is important for creating effective strategies for economic and social growth. For that reason, it is necessary all future decisions to be made based on an adequate analysis of indicators that characterize the state of the economy in a social aspect. Numerous scholars, as Nayar and Ozcan (2008); Ferrier and Trivitt (2013) and Wu et al. (2019) point out the need of such analysis. They are focusing their attention on the relation between efficiency in healthcare industry and quality of its social impact. Furthermore, the “aging of the population,” or the noticeable trend of rising the share of older people in the age structure of practically all countries, has been

the dominant demographic trend in recent decades. UN (UN, 2017) predictions state that this process will continue and that by 2050, the proportion of the aged population will reach 16%. A research on the efficiency of the healthcare system, which directly affects the human potential and maintaining the longevity of the population at the regional level, is of scientific interest in light of the ongoing trend of population aging. This part of the research aims to study the effectiveness of the functioning of the healthcare industry, from the position of the health status of the population in a country using the indicators life expectancy and healthy life years, as well as the interrelationship between them.

Indicator 2.1: Life expectancy

It is challenging to comprehend the elements that affect life expectancy because a wide range of dietary, social, genetic, behavioral, and ecological factors affect people’s health and lifespan. Three main factors in general are affecting the life expectancy: social factor (healthcare expenditure); economic factor (economic growth); and environmental factors (CO2 emissions, and sanitations).

The scope of the present study allows to analyze the absolute values of the indicator (see **Table 7**), which is of particular importance for tracing its behavior (development trend) from the beginning of the period until the onset of the COVID-19 pandemic and thereafter.

In the period 2010-2019, there is a tendency to increase the expected life years in all member states of the European Union. The highest average rates of increase were found in the Baltic States - Lithuania (0.46%), Estonia (0.43%) and Latvia (0.39%). The lowest rates are reported in Croatia, Germany and the United Kingdom – 0.11%. The onset of the COVID-19 pandemic negatively affected

Table 7. Geometric mean rate of change of life expectancy indicator before and after COVID-19

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark
Before COVID-19	0,18%	0,25%	0,19%	0,27%	0,11%	0,23%	0,30%
After COVID-19	-0,85%	-1,58%	-2,00%	-1,02%	0,12%	-1,26%	0,12%
	Estonia	Finland	France	Germany	Greece	Hungary	Ireland
Before COVID-19	0,43%	0,26%	0,16%	0,11%	0,15%	0,26%	0,27%
After COVID-19	-0,13%	-0,12%	-0,84%	-0,25%	-0,37%	-1,05%	-0,24%
	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland
Before COVID-19	0,19%	0,39%	0,48%	0,26%	0,19%	0,16%	0,23%
After COVID-19	-1,56%	-0,26%	-1,83%	-0,60%	-0,72%	-0,97%	-1,92%
	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
Before COVID-19	0,25%	0,28%	0,32%	0,25%	0,21%	0,22%	0,11%
After COVID-19	-0,98%	-1,85%	-1,03%	-1,23%	-1,90%	-0,96%	n/a

Source: Authors' calculations based on the information, provided by Eurostat

the indicator, which is visible not only from the official absolute values, but also in the rate of change of the indicator in 2020 compared to 2019, as can be seen in **Table 8**. With the exception of Cyprus and Denmark, life expectancy in all other EU member states is falling. This decline is most clearly noticeable in Bulgaria (-2.00% or -0.7 years), Poland (-1.92% or 1.5 years) and Spain (-1.90% or 1.6 d.). Here it should be noted that the object of analysis, conclusions and future decisions in the field of healthcare should be the absolute values (see **Table 8**) and more precisely the need to take measures to increase them.

The data from **Table 8** show that at the beginning of the research period, the country with the lowest life expectancy is Latvia (73.1 years), and Spain (82.4 years) is the country with the highest value. In the presented "ranking" in 2010, Bulgaria occupies 25th place with a value of the life expectancy indicator of 73.8 years. At the end of the studied period, the most "efficient" performance is outlined in Ireland, where life expectancy increases - up to 82.6 years, which is also its highest value.

With eight places in the ranking, Denmark also rises, increasing the life expectancy of the population in the country by 2.3 years. Unfortunately, in 2020 Bulgaria is the member state of the European Union with the lowest life expectancy value - 73.6 years.

The obtained results are clear proof of the lack of synergistic development of the healthcare industry that cannot lead to an increase in the efficiency of its functioning. This inefficiency is manifested by the fact that there is an improvement in the performance of the healthcare industry, as measured by the economic aspect of its functioning (presented in the testing of the first research hypothesis). At the same time, one of the indicators that directly characterizes the impact that the industry has on the population in Bulgaria shows deteriorated results.

Indicator 2: Healthy life years

The study of the indicator healthy life years is also carried out within two conditionally distinguished periods - before and after COVID-19. From the standpoint of

Table 8. Countries ranking in 2010 and 2020 based on the absolute values of the indicator life expectancy, and changes in it (2010 and 2020; ranking position and years)

	2010	2020	Δ		2010	2020	Δ		2010	2020	Δ
Austria	10	13	-3	France	3	5	-2	Malta	5	5	0
	80,7	81,3	0,6		81,8	82,3	0,5		81,5	82,3	0,8
Belgium	14	17	-3	Germany	13	15	-2	Netherlands	7	11	-4
	80,3	80,8	0,5		80,5	81,1	0,6		81	81,4	0,4
Bulgaria	25	28	-3	Greece	11	11	0	Poland	21	23	-2
	73,8	73,6	-0,2		80,6	81,4	0,8		76,4	76,5	0,1
Croatia	20	21	-1	Hungary	24	24	0	Portugal	16	15	1
	76,7	77,8	1,1		74,7	75,7	1		80,1	81,1	1
Cyprus	5	2	3	Ireland	8	1	7	Romania	26	27	-1
	81,5	82,4	0,9		80,8	82,6	1,8		73,7	74,2	0,5
Czech	19	20	-1	Italy	2	5	-3	Slovakia	23	22	1
	77,7	78,3	0,6		82,2	82,3	0,1		75,6	77	1,4
Denmark	18	10	8	Latvia	28	25	3	Slovenia	17	18	-1
	79,3	81,6	2,3		73,1	75,5	2,4		79,8	80,6	0,8
Estonia	22	19	3	Lithuania	27	26	1	Spain	1	2	-1
	76	78,9	2,9		73,3	75,1	1,8		82,4	82,4	0
Finland	15	9	6	Luxembourg	8	8	0	Sweden	4	2	2
	80,2	82	1,8		80,8	82,2	1,4		81,6	82,4	0,8

Source: Authors' calculations based on the information, provided by Eurostat

the information that the indicator provides, it should be perceived as a measure of the life quality of the population in a country, as well as a measure of the effectiveness of its healthcare system. It is noteworthy that in the years before the onset of the COVID-19 crisis, there is a downward trend in the healthy life years indicator in large part of the studied countries. This trend is observed mostly in the Scandinavian and Baltic countries (see **Table 9**).

In contrast to the life expectancy indicator, in the year after the onset of the COVID-19 disease, there is a tendency to increase the values of the predictive indicator in a large part of the member states of the European Union. Many factors could lead to this

positive trend: awareness of the need for disease prevention and adequate prophylaxis; increasing the quality and efficiency of medical care; increasing in the investments and quality of the healthcare infrastructure. The data for Bulgaria, however, show the presence of insufficient effectiveness of the measures aimed at increasing the healthy life years of the population in the country and by 2020 they have decreased by 1.06% or 0.2 years.

Regarding this indicator, the statement suggests that the analysis of all research and policies should focus on its absolute values (see **Table 10**). From the data presented, it can be seen that in Bulgaria there is a drop in healthy life years by 0.5 years, or a drop

Table 9. Geometric mean rate of change of healthy life years indicator before / after COVID-19

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark
Before COVID-19	-0,53%	-0,16%	0,22%	-0,31%	-0,38%	-0,23%	-0,57%
After COVID-19	2,44%	2,24%	-1,06%	1,92%	0,64%	-0,65%	-1,53%
	Estonia	Finland	France	Germany	Greece	Hungary	Ireland
Before COVID-19	-0,08%	-0,82%	0,26%	1,44%	-0,15%	0,79%	0,52%
After COVID-19	3,23%	0,89%	0,78%	-0,90%	-0,15%	1,30%	-4,89%
	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland
Before COVID-19	1,01%	-0,35%	-0,43%	-0,50%	0,39%	0,05%	0,38%
After COVID-19	-0,44%	0,56%	-1,22%	1,12%	-3,69%	0,16%	-0,32%
	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
Before COVID-19	0,23%	0,53%	0,82%	1,37%	0,95%	1,42%	-0,81%
After COVID-19	0,84%	-0,50%	0,89%	6,90%	-5,15%	-0,82%	n/a

Source: Authors' calculations based on the information, provided by Eurostat

of 1 position in the ranking of all EU member states.

At the beginning of the research period, Malta is with the highest healthy life years value (70.7 years), and Slovakia (52.2 years) is with the worst performance. At the end of the period, Sweden is the country with the highest values for the indicator healthy life years (66.1 years), and Latvia is at the bottom of the ranking (54.8 years). As for the performance of Bulgaria, the country is at the top of the ranking, ahead of a large number of developed countries with initial values of 65 years, which reach 65.6 years. The greatest improvement in absolute values is reported in Slovenia, where the healthy life years indicator increased by 11.2 years. The most serious deterioration is present in Luxembourg – a drop of 2.2 years.

The indicators studied in their dependence

Within the framework of the considered research hypothesis, it is necessary to examine the indicators in their interrelation. As a result of this analysis, information is

generated regarding the overall impact of the functioning of the healthcare industry in a national economy. The starting point of the analysis is the perception of the thesis that in order to characterize the functioning of the healthcare industry as effective, the existence of a proportional increase in both indicators is necessary, and the optimal condition is defined as the pre-emptive development of the healthy life years indicator compared to life expectancy.

It is of particular importance to consider the negative impact on both indicators caused by the COVID-19 pandemic, which leads to radical changes in 2020 compared to the trends in the other years of the study period. For this reason, we believe that it is possible the average data to be skewed by this effect. And abstracting from this, there are all reasons to assess the functioning of the healthcare industry in Bulgaria as effective from the standpoint of quantitative (life expectancy) and qualitative (healthy life years) indicators, characterizing its direct impact on the population. In addition, the data about

Table 10. Countries ranking in 2010 and 2020 based on the absolute values of the indicator healthy life years, and changes in it (2010 and 2020; ranking position and years)

	2010	2020	Δ		2010	2020	Δ		2010	2020	Δ
Austria	17	21	-4	France	13	10	3	Malta	1	2	-1
	60,1	58,7	-1,4		62,6	64,6	2		70,7	70,5	-0,2
Belgium	10	11	-1	Germany	20	7	13	Netherlands	15	18	-3
	63,3	63,8	0,5		58,3	65,7	7,4		60,7	61,1	0,4
Bulgaria	7	8	-1	Greece	2	6	-4	Poland	16	23	-7
	65	65,6	0,6		66,9	65,9	-1		60,4	62,3	1,9
Croatia	19	22	-3	Hungary	23	14	9	Portugal	22	20	2
	59	58,5	-0,5		57,5	62,5	5		58	59,7	1,7
Cyprus	8	13	-5	Ireland	3	5	-2	Romania	24	19	5
	64,7	62,9	-1,8		66,4	66,2	-0,2		57,4	59,9	2,5
Czech	10	16	-6	Italy	12	3	9	Slovakia	28	27	1
	63,3	61,6	-1,7		63	68	5		52,2	56,7	4,5
Denmark	14	23	-9	Latvia	26	28	-2	Slovenia	27	9	18
	62	58	-4		54,8	53,4	-1,4		53,9	65,1	11,2
Estonia	25	24	1	Lithuania	18	26	-8	Spain	9	4	5
	56,2	57,6	1,4		59,8	56,8	-3		64,2	66,3	2,1
Finland	21	25	-4	Luxembourg	5	12	-7	Sweden	4	1	3
	58,2	56,9	-1,3		65,5	63,3	-2,2		66,1	72,7	6,6

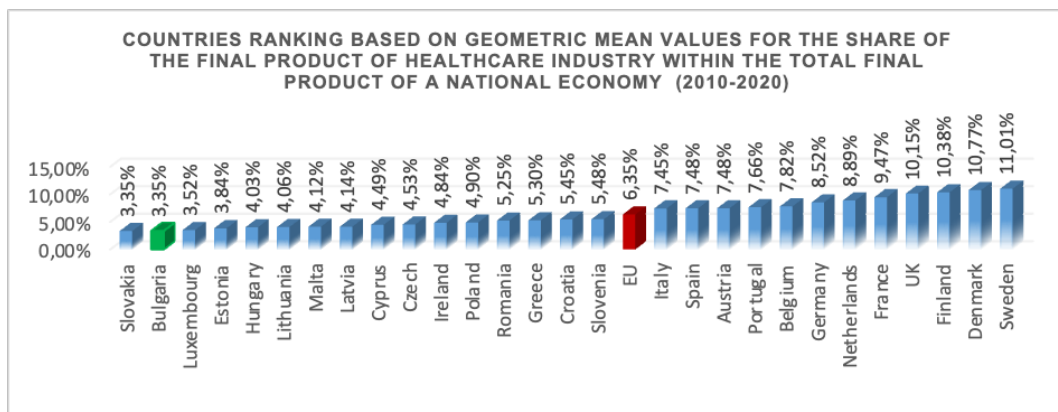
Source: Authors' calculations based on the information, provided by Eurostat

the average geometric rates of development of the two indicators reveal the presence of an anticipatory positive development in the qualitative indicator (healthy life years) compared to the quantitative one (life expectancy).

It is what has just been stated that gives grounds for the **second research hypothesis to be accepted as proven**, complementing the need to carry out additional actions in the future that will lead to even more accelerated development of the industry, respectively its positive immediate impact on society.

Hypothesis 3: The implemented reforms in the healthcare industry lead to an increase in the importance of the industry for the country's economy

In the study of the efficiency with which the healthcare industry of the Bulgarian economic system functions until now, the analysis of its internal efficiency (within the first research hypothesis) and its direct (social) impact on the quality of life of the population (second research hypothesis) was presented. The following presentation focuses on the importance of the industry as an element of higher systems, which for it are both the socio-economic system of Bulgaria and that of the European Union. In this way, it becomes possible to examine and evaluate



Source: Authors' figure based on authors' calculations

Figure 5. Geometric mean values for the share of the final product of healthcare industry within the total final product of a national economy (mean values for the period 2010-2020; in %)

the importance of the industry (element) within the whole.

Indicator 3.1: Share of industry's output for final consumption within the volume of the output for final consumption of a national economic system

The share of the final output created by the healthcare industry in an economy within the total final output of the same economy is the first indicator that measures the importance level of the industry. Not only the economic theory, which indicates that the higher the share of a certain industry in the vector of final production of the economy, the more significant this industry, but also the specific nature of healthcare industry confirms this statement.

The data presented in **Figure 5** show that the average share for the period that the final output of the industry forms within the final output of the EU as a whole (6.35%). The developed Scandinavian countries are

characterized by shares above these average values: Sweden (11.01%), Denmark (10.77%), Finland (10.38%), as well as some countries from Central and Western Europe (e.g. France, Austria, Germany). Within the framework of the Bulgarian economy, the healthcare industry forms an average share of its final production of 3.35%, and this value ranks the country together with Slovakia at the bottom of the ranking made by the authors.

Analyzing the obtained results for Bulgaria at the same time with the values for the indicators already studied (within the first and second research hypotheses), they (values) are not surprising. The conclusion has already been formulated several times, that the healthcare industry in Bulgaria is just beginning to show rates of development that would lead to an increase in its efficiency. Confirmation of this statement is also found in the data presented in **Table 11**, which reveal the average geometric rates of change in the studied indicator for the period 2010-2020.

Table 11. Geometric mean rates of change of the final product of healthcare industry within the total final product for the country (period 2010-2020; in %)

Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark
3,98%	2,99%	7,95%	3,72%	3,00%	5,37%	2,02%
Estonia	Finland	France	Germany	Greece	Hungary	Ireland
8,41%	3,73%	2,46%	3,85%	-3,08%	4,69%	4,06%
Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland
1,23%	7,49%	7,91%	6,19%	10,25%	2,62%	4,52%
Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
2,07%	10,36%	4,25%	4,44%	1,90%	3,26%	4,09%

Source: Authors' calculations based on the information, provided by Eurostat

The analysis of the geometric mean values presented in the table show that in all the studied countries there is an upward trend. The rates achieved are not identical for each member state, and it seems that these rates are gradually slowing down in already well-developed countries. At the same time, in the countries where the industry still does not form a significant share in the total final production, the average measured trend outlines a tendency towards development at an accelerated pace. Thus, for example, Romania is characterized by an average growth rate of the industry's share of 10.36%. For Bulgaria, this rate is 7.95%, and the Baltic States are developing as well (Estonia [8.41%]; Latvia [7.49%], Lithuania [7.91 %] and Luxembourg [6.19%]).

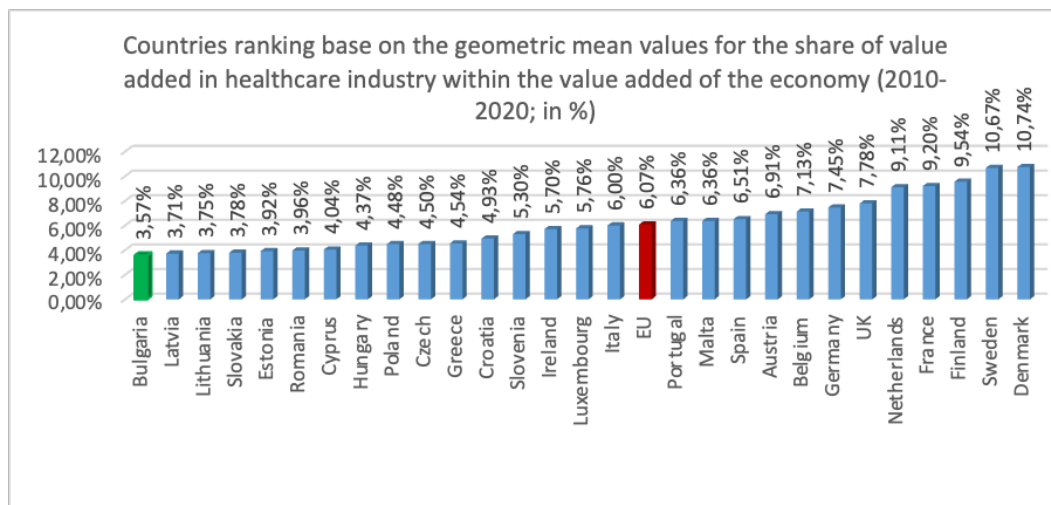
Accepting the hypothesis that in the future the rates of development will remain approximately the same (as direction and speed), it is quite possible for the healthcare industry in Bulgaria to develop itself efficiently enough to reach not only the average values for the European Union, but also those that characterize developing countries. A very important clarification to be made here is that the presented data provide information only about the quantitative aspect of the development. The studied indicator does not

have the characteristics necessary to cover the qualitative dimension of the efficiency with which the industry functions.

Therefore, when we are formulating the conclusion for the existence of a trend towards increasing efficiency and importance of the healthcare industry for the Bulgarian economy, it is necessary to make one clarification. Namely, that the achievement of absolute (comprehensive) efficiency, as well as the determination of the industry as important for the economy of Bulgaria, is possible only when taking into account the presence of an effective manifestation of it, assessed also through the qualitative results of its functioning (partially examined through the indicators of a second research hypothesis).

Indicator 3.2: Share of the value added of the industry within the total value added for a national economic system

The last indicator studied in relation to the third research hypothesis, is aimed at the value added created by the healthcare industry. Value added has already been considered in relation to research on the efficiency with which the healthcare industry functions. Here the indicator is used to assess the degree of importance of the industry for the economy



Source: Authors' figure based on authors' calculations

Figure 6. Countries ranking base on the geometric mean values for the share of value added in healthcare industry within the value added of the economy (2010-2020; in %)

of Bulgaria, through the analysis of its share in the total value added for the economy, as well as through the analysis of trends in its development.

The analysis of the share of the value added created in the healthcare industry of an economic system, studied through the geometric mean values for the indicator, is graphically represented by **Figure 6**.

The obtained results show that Bulgaria is the country where the industry creates the lowest share of value added for the economy [3.57%]. Considered as absolute values, there is a steady trend towards an increase in the values of the indicator, as well as the share [from 3.43% in 2010 to 4.63% in 2020]. At the beginning of the research period, only in the economic systems of Slovakia and Latvia the healthcare industry forms a lower share of value added [respectively 3.40% and 3.41%]. The highest share in 2010 is in Denmark [11.56%], followed by Sweden [10.27%].

In the countries ranking presented in **Figure 6**, it is clear that the general trend

remains unchanged. Denmark continues to be a leader in it throughout the period, although in 2020 the share of the value added in its economy decreased to 10.75%. As for the trends in the development of the indicator for the rest of the member states of the European Union, it is presented in **Table 12** through the geometric mean values of the change in the value added for each country.

The value added created by the healthcare industry in the economy of Romania grows the fastest [10.00%], followed by the Baltic States with growth rates ranging from 8.70% to 9.37%. At the same time, in the significantly more developed Scandinavian and Central European countries, slower rates are reported, which can be explained by the achieved efficiency of the functioning of the industry, close to the optimal one, after which development is possible, but with a much slower pace.

Analyzing the data for the healthcare industry in Bulgaria, it is striking that this indicator (similar to the other analyzed

Table 12. Geometric mean rates of change of the value added share of healthcare industry within the value added of the economy (2010-2020; in %)

Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark
4,07%	2,35%	7,92%	3,46%	2,22%	6,18%	1,89%
Estonia	Finland	France	Germany	Greece	Hungary	Ireland
9,37%	3,20%	2,25%	4,01%	-3,78%	5,51%	4,13%
Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland
1,44%	8,73%	9,12%	5,41%	9,49%	2,94%	4,69%
Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
2,48%	10,00%	6,07%	4,58%	1,94%	3,10%	4,30%

Source: Authors' calculations based on the information, provided by Eurostat

indicators) shows a trend of significant development compared to the other investigated countries. The average geometric rate of change in value added of the healthcare industry in Bulgarian economy is 7.92%, which gives reason to conclude that in the future the industry will become increasingly important for the successful development of the economy. As a direction to increase the efficiency with which the industry functions, the recommendation can be made to carry out specific actions that lead to an anticipatory growth of the value added share compared to the industry total, intermediate and final product.

The analysis of the data according to indicators 3.1 and 3.2 and the results obtained, respectively their interpretation, give grounds to claim that the healthcare industry in Bulgaria is gaining more and more importance for its development - both in economic and social aspects – with which the **third research hypothesis can be considered proven.**

5. Conclusion

On the basis of the conducted research, the following conclusions can be drawn. **First**, healthcare industry in Bulgaria functions with a tendency to reduce the material costs

needed for creating a unit of its total product. Maintaining this trend in the future (to the optimal levels) will result in lower than average cost levels for the European Union as well as some of the developed member states.

Second, the healthcare industry in Bulgaria currently operates with the lowest geometric mean levels of labor productivity, accompanied by one of the highest mean rates of increase in the absolute values of the indicator. Linking this trend with the tendency to reduce material costs, the expected future result will be an increase in the value added in the industry, and accordingly an increase in labor productivity in it.

Third, the healthcare industry in Bulgarian economy creates a unit of value added with the highest healthcare expenditures among all the member states of the European Union, which makes it the most ineffective in comparison. At the same time, for the entire studied period 2010-2020, a positive general trend in the studied indicator is outlined, characterized by a decrease in the volume of the healthcare expenditures that are necessary for the industry to create a unit of value added.

Fourth, the low levels of healthcare expenditure directed at the medical staff

in the industry, from the standpoint of the research methodology, can be assessed as a source of insufficient efficiency in the industry. These results, in addition to the results from the study of the previous indicator (indicator 1.3), require additional in-depth studies on the direction of realization of expenditures in the healthcare industry. On the other hand, the results obtained, as well as the tendency to increase the average rate of change of the indicator, open the research field, revealing the need to carry out a deep analysis on the degree, direction and strength of impact of these expenditures on the population's health, measured by indicators such as life expectancy, healthy life years, etc.

These conclusions, related to the first hypothesis of the study, are accepted by the authors as enough for its acceptance.

Regarding the indicators life expectancy and healthy life years, the analysis and its results lead to the **fifth** conclusion. The Bulgarian performance at the moment can be defined as unsatisfactory (on the basis of comparison with other EU member states). Of course, the fact that the COVID-19 crisis that has occurred leads to a further deterioration of the results, should also be taken into account. However, evaluating the indicators, outside of the comparative analysis, it should be pointed out that the functioning of the healthcare industry in Bulgaria after 2010 resulted in the positive trend in the development of life expectancy and healthy life years indicators. The conclusion made is leading to the acceptance of the second research hypothesis.

Sixth, healthcare is such a specific industry that reflects on the social and economic development of the society. As the social aspect was already presented, the economic performance of the country, related

to the healthcare industry, is studied within the third and last research hypothesis. When we compare the performance of the industry in Bulgaria with the industry in each EU member state, it could be concluded that although the healthcare industry in Bulgaria is with the lowest share of the final product created, and value added created, the main trends for these indicators are positive, leading to sustainable increase of the shares.

Based on the last conclusion, the third research hypothesis also can be accepted.

The acceptance of the three hypotheses leads to the conclusion that the reforms carried out lead to positive changes in the healthcare industry. However, the study showed that there are still a number of problems in the healthcare industry in Bulgaria. In most of the surveyed indicators, the country is among the last places in the EU. This requires the investment of additional funds in the industry, which should lead to better, more affordable and more effective treatment of patients and to faster development of the healthcare industry compared to the average European levels.

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