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# Evaluation of the Efficiency of the Bulgarian Economy Through the Input-Output Model

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## Abstract

The assessment of the development of a national economy is of particular importance not only in order to trace the past development of this economy. Such an assessment provides equally important information in relation to the designing (planning) of the future development of this economic system. The assessment of the development of the functioning of an economic system is a process that requires the application of an adequate methodology, accompanied by a correct selection of the methods and indicators that will be used. Depending on the objectives of the study and the available information, different aspects of the functioning and development of a national economy can be studied and evaluated. One of the categories frequently used for research is the efficiency, which is in the focus of the present study. The assessment of the efficiency of the Bulgarian economic system is made using the input-output model and the opportunities that the components of this model provide. The main advantage of the model used is that it can measure efficiency not only for the Bulgarian economic system as a whole, but also can analyze and assess the efficiency levels for each economic sector.

**Keywords:** efficiency, economic development, input-output model, matrix of full costs, Bulgaria

**JEL:** C33, O21

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## Introduction

There are many aspects in which the development of a national economic system can be assessed and each of them depends on the purpose of the study. The research on the efficiency with which the Bulgarian economy functions (as a whole system and by separate economic sectors) is a topic that has aroused the research interest for more than 30 years – and more specifically after the transition from a planned to a market economy. At present, there are many studies, respectively assessments given for the levels of efficiency with which the economy has functioned in recent years. And the main question that is put in front of

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the researchers is: "Is this system effective" (Popov, Simonova and Cherepanov, 2021). However, it is noteworthy that a large part of the formulated assessments and conclusions are not based on empirical researches, but rather are an expression of the personal opinion (sometimes too subjective) of a researcher.

This is one of the main reasons that provoked the author's interest in this topic. In this context, the main goal of the study is outlined as: *"conducting research, analysis and evaluation of the efficiency with which the Bulgarian economy operates". The economy of Bulgaria* is the object of this study, and its subject is *the efficiency of the functioning of the economy of Bulgaria, measured by the input-output model.*

## LITERATURE REVIEW

Understanding the processes that take place in the economy is one of the main tasks set by researchers working in this particular scientific field. This interest has existed for a sufficiently long period of time, as evidenced by the works of prominent economists, today perceived as the founders of the economic theory. An example of this statement is the fundamental work "Study on the Nature and the Causes of the Wealth of Nations" (Smith, 2006), whose author Adam Smith is not accidentally defined as the father of economics.

The modern economy operates in conditions of limited resources, on the one hand, and ever-increasing public needs, on the other. In this context, the main task the economic theory faces is to solve the problem of achieving an economic efficiency. In other words, the question that has to be answered is how to meet and satisfy the growing societal needs, using the limited resources available in the economic system.

For this reason, the need for research on the past development of economies is becoming more and more palpable. It is a question of this kind of researches which have as their result not only the finding of what has happened so far (analyzing the past), but also to give (provide) information about the reasons that underlie the events. And this information is extremely important and useful for the process of designing (planning) the future of the economic system.

This issue in Bulgaria was put on the agenda in the 80s of the 20th century by Acad. Evgeni Mateev in his work "Management, efficiency, integration. In search of solutions" (Mateev, 1976). It is there that the first question put is the one about the efficiency and optimal use of resources. It should be noted that Acad. Mateev emphasizes that efficiency is studied within the normative non-economic conditions - the dominance of public property and planning as a mechanism for achieving the goals of economic development. In his research, Acad. Mateev also considers the accelerated development of equipment and technologies.

Today, the question about the efficiency of the functioning of national economies should be considered in the context of a market economy, when the state (the government) withdraws from solving the issue of limited resources through direct management. In these socio-economic conditions, the efficiency with which resources are distributed, respectively the productivity of labor, are the result of the action of market forces, legally limited by the state (the government).

Another fact that makes an impression is treated by Prof. Dr. Ivan Iliev in his work *The Economy of Bulgaria in the Period 1949-2001*

(Iliev, 2004). Namely, after the transition to a market economy, there is a lack of solutions to important economic issues at the level of the national economy, and in most economic studies the issue of efficiency remains in the background.

It is not uncommon for there to be an inadequate and true understanding of the nature of the concept of efficiency, and very often, it is associated with effectiveness and/or effect. According to Manov (Manov, 2016, p.395), *"The efficiency, in contrast to the effect, is a relative quantity, indicating at the cost of what resource cost each unit of useful result is created. … Only an effective economic activity is considered to be one in which there is a favorable ratio between the useful result created by the economic activity and the costs with which this result is created."*

Today, efficiency is a key topic in the United Nations Sustainable Development Goals by 2030 (UNDP, 2015), which are a logical continuation of the Millennium Development Goals (United Nations Millennium Declaration, 2000). According to Kang and Song (Kang, L. & Z. Song, 2020), the main topic of the 21st century is to achieve the efficient functioning of the economy, which is subordinated to the idea of sustainability.

All of the above unequivocally proves the need for an adequate, objective and in-depth study of the efficiency of the Bulgarian economy. In addition, there is a need to apply such an approach with the accompanying instruments, which in their unity could be a response to the need for adequate and correct research and analysis of the past development of the economic system.

The choice of the research methodology, respectively of the instruments with which the evaluation of the efficiency of the functioning of the Bulgarian economy is carried out, is based on cybernetic knowledge. Its foundations were laid by Norbert Wiener in his work Cybernetics (Wiener, 1948) in the 1930s. At the same time Vasiliy Leontiev discovered the balance of inter-industry (inter-sectoral) relations, which earned him a Nobel nomination (Leontiev, 1958). The relation between cybernetics as a science and the input-output model (balance of inter-industry relations) *gives an opportunity to adapt and apply the cybernetic knowledge to the specifics of the economic systems*.

The theory of economic cybernetics based on the capabilities of the input-output model (balance of inter-sectoral connections) is presented in two fundamental studies: "Perspective planning, inter-sectoral connections and technical coefficients" (Mateev, 1963) and "Economic cybernetics and perspective planning" (Mateev, 1966). Further development of the theory of the use of the interaction of the balance of inter-sectoral relations and economic cybernetics is found in the next two works of Acad. Mateev: "Automated system for managing the national economy" (Mateev, 1974) and "Structure and management of the economic system" (Mateev, 1987).

Here, it is necessary to clarify that in parallel with the evolution and complexity of economic systems, evolution occurs in the input-output model as a tool for their study. This evolution in the instrument is a reflection of objective economic laws and research needs. It is noteworthy that this model is now used to study effectiveness in various aspects. For example, researches focusing on the efficiency with which water resources are used for the functioning of economic sectors are becoming more widespread (Hu, Z.N. et al., 2018). The model is also used by Zhaoguang and Zheng in their study of energy efficiency in the economies (Zhaoguang Hu

& Zheng Hu, 2013), as well as in the field of health (Perobelli, FS et al., 2015). And in the context of achieving and maintaining sustainable development, research interest in the development of input-output tables used for environmental (and/or bio) research is growing (Grealis, 2015).

The following exposition presents the research methodology based on the use of the input-output model.

## METHODOLOGY

The input-output model, although gaining "popularity" in recent decades, is still poorly understood, especially in terms of the opportunities it provides to researchers. On the one hand, these are opportunities aimed at studying the past economic development of a national economic system. On the other, it is about the opportunities that this model provides at the moment:

- for simulations of future development (Barker, 1999);
- for forecasting and designing (planning) of a necessary and desired future development;
- for forecasting the level of the necessary labor resources at a predetermined rate of economic growth or desired economic growth;
- for forecasting the required amount of investment at a predetermined rate of economic growth or desired economic growth;
- for calculation of multipliers of direct and indirect effects of exogenous factors;
- for assessing the links between the various sectors of the economy;
- for describing the production structure of the economy (Kratenab, K. & G. Streicher, 2009).

The present study is aimed at applying the input-output model in terms of the opportunities it provides to study the efficiency with which an economic system operates - regional, national, international (in this case that of the integration community of the European Union). This is the use of a model that is officially recognized and used by the European Statistical Office and for the use of which the relevant guide has been issued. (Eurostat, 2008).

As already mentioned, the input-output model provides many opportunities for the researcher, depending on their research interests and research goals. The present study is carried out on the basis of the possibilities provided by the full cost matrix $(I - A)^{-1}$ with its main elements - the elements along the main diagonal of the matrix; the sums of the vector-columns of the matrix, and the ordinary scalars, and the value of the determinant of the direct matrix. The basic characteristics of this matrix, as well as the mathematical model of its calculation are derived by Kiranchev (Kiranchev, 2019) and will not be specified in the present study.

The analysis of the behavior of the determinant of the direct matrix assesses the economic efficiency with which the economy operates. The increase of the values of this indicator to the upper limit 1 gives information about the increasing efficiency of the functioning of the economy.

The analysis of the elements along the main diagonal of the full cost matrix provides information on the efficiency with which the sectors of the national economy use their own production in the process of their functioning. It is no coincidence that these elements are perceived as coefficients of the comparative efficiency of sectors. Theoretical limits range from 1 to plus infinity, and the closer the value

is to 1, the higher the efficiency with which the sector operates.

In connection with the derivation of the strategic priorities of the economic development of the economy, it is necessary to perform an analysis on the value of the sum of the elements by vector-columns of the matrix of the full costs of the input-output model. When the unit of final output is deducted from the amount received, the result gives an estimate of the full material costs with which a sector produces its gross output. This is the main advantage of this analysis, which is currently not implemented in economic practice in Bulgaria. And in relation to this indicator is a valid interpretation of the values, presented in relation to the values of the elements on the main diagonal of the matrix.

The ordinary scalars ($\frac{A_{ij}^{j}}{\Delta}$) are these elements out of the elements on the main diagonal of the matrix of the full costs. They should be perceived as specific coefficients of national efficiency. The reason for this is the fact that they assess the efficiency with which a sector of the economy uses the products created in the other sectors of the economy. From the standpoint of the management system, the analysis of ordinary scalars can be used to determine the direction of the process of economic restructuring.

Here it is important to point out that the matrix of the full costs of the input-output model is only one of the aspects that can be used to analyze the past development in an economic system. This conclusion is also valid with regard to the use of the elements of the matrix for analysis of the efficiency with which Bulgaria operates.

In this regard, the results obtained, allow the formation of an assessment that is not general, but a basis for continuing and deepening the research in this area in the future.

## DATA

The input-output model is a tool that is "fed" with a large amount of input information that needs further processing in order to construct a unified symmetric input-output table. Up to this moment the National Statistical Institute of The Republic of Bulgaria does not develop (construct) the symmetric input-output tables, and the European Statistical Office (Eurostat) provides only the basic information for "supply tables" and "use tables". The only organization that publishes national input-output tables is the World Input-Output Database (World Input-Output Database). In connection with previous research in this scientific field, the author of the study has constructed symmetric input-output tables for the studied period, which are also used in the present study. The tables are constructed according to the logic of model B development presented in the Eurostat Manual (Eurostat, 2008). Model B is applied in the construction of symmetric input-output tables in cases where each sector has its own specific mode of production, regardless of its product range.

The constructed input-output tables undergo another processing related to the aggregation of the sectors represented in them. This need is caused by the transition from 59-industry structure of the economy (used till 2008) to 65-industry structure (which is applied after 2008 up to the present moment). Through the aggregation of industries, up to 20 main economic sectors

are united (based on the proximity of their main activities).

The aggregation process begins with the creation of a conditional framework in which the number of rows coincides with the number of sectors which will be reached after aggregation. The number of columns is equal to the initial number of sectors that are aggregated. As for the sectoral information presented in the nomenclature of fifty-nine sectors, the number of columns will be fifty-nine. Accordingly, when processing the information presented under the new classification, there will be 65 columns.

The sectors that will be aggregated in the model are marked with 1, and all other sectors that will not be processed are marked with 0. An example can be given with the aggregation of the first three sectors of the national economy in the fifty-nine sectoral structure of the national economic system, and aggregation of the last two sectors. (see **Table 1**)

**Table 1.** An example for sectoral aggregation

| Sectors | 1 | 2 | 3 | ... | 15 | ... | 34 | ... | 58 | 59 |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 1 | 1 | ... | 0 | ... | 0 | ... | 0 | 0 |
| **2** | 0 | 0 | 0 | … | 0 | … | 0 | … | 0 | 0 |
| **3** | 0 | 0 | 0 | … | 0 | … | 0 | … | 0 | 0 |
| **…** | … | … | … | … | … | … | … | … | 0 | … |
| **15** | 0 | 0 | 0 | … | 1 | … | 0 | … | 0 | 0 |
| **…** | … | … | … | … | … | … | … | … | 0 | … |
| **34** | 0 | 0 | 0 | … | 0 | … | 1 | … | 0 | … |
| **…** | … | … | … | … | … | … | … | … | … | ... |
| **58** | | | | | | | | | 1 | 1 |
| **59** | 0 | 0 | 0 | … | 0 | … | 0 | … | 0 | 0 |

**Source:** Table devised by the author

The newly created aggregation matrix is used to multiply from the left to the first quadrant of the constructed symmetric input-output table. The result is a new table that has the structure of the aggregation matrix - in the example case with nineteen rows and fifty-nine columns. In the next step, the newly obtained table (with nineteen rows and fifty-nine columns) is multiplied from the right by the constructed transposed aggregation matrix. The result is a new table with nineteen rows and nineteen columns. The information from the new table feeds the first quadrant of the new aggregate symmetric input-output table.

The performed aggregation of the elements of the first quadrant sets the requirement for performing such aggregation with respect to the elements of the second and third quadrants of the inter-sector balance model (input-output model). Their aggregation is carried out by summing up the data for the merged sectors. Thus, the information on the volume of the final production of the aggregated first sector, for example, is obtained as a sum of the volumes of the final production of the

combined first, second and third sectors of the fifty-nine industry structure of the economy.

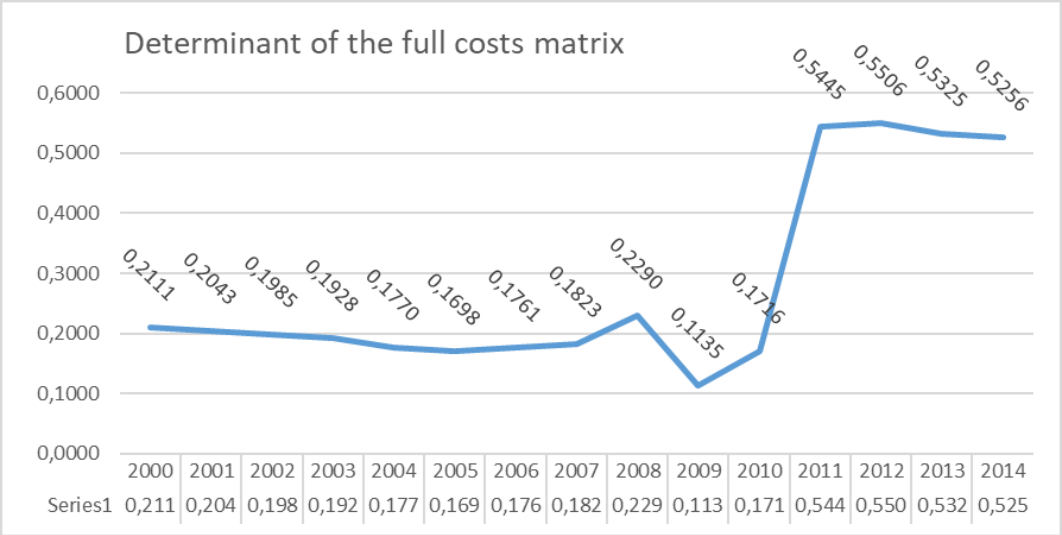
A necessary clarification is related to the studied period, which is based on data from 2000 to 2016. The last study year is determined by the characteristics of the model itself. According to the methodology for construction and use of the table, the time for collecting and providing the information is n + 3 years. The constant nature of the model allows to be used for formulation of conclusions for a period of 5 years. In June 2016, Eurostat published an official document announcing that the data presented in the 2014 table were updated and should be considered consolidated for the period 2014-2016. This means that the analyzed data can be accepted valid until the end of 2021.

## RESULTS AND DISCUSSION

The results on the study of Bulgaria through the input-output model are presented by elements of the matrix of full costs $(I - A)^{-1}$ and the determinant of the direct matrix. The studied sectors of the national economy in twenty-sectoral aggregation are: "Agriculture, forestry and fishing"; "Mining industry"; "Manufacturing industry"; "Production and distribution of electricity and heat and gaseous fuels"; "Water supply; sewerage, waste management and remediation activities"; "Construction"; "Trade; repair of motor vehicles and motorcycles"; "Transport, warehousing and post office"; "Hotels and restaurants"; "Financial and insurance activities"; "Real estate operations"; "Professional activities and research"; "Administrative and support service activities"; "Government activities"; "Education"; "Human health and social work"; "Culture, sport and entertainment"; "Other activities"; "Activities of households as employers; undifferentiated activities of households for the production of goods and services for own consumption", and "Activities of extraterritorial organizations and services". Here it should be noted that the last two sectors do not present data, which can be analyzed because of the specifics of the activities in them and the unavailability to collect the necessary data.

### *Analysis of the value of the determinant of the direct matrix*

As can be seen from the data, presented in **Figure 1**, during the studied period the Bulgarian economy is forming an upward trend in the efficiency with which it operates. Based on the interpretation of the theoretical limits, in which the determinant of the direct matrix may vary, the approach to the upper limit 1 is a signal of improving in efficiency performance of the economy. Logically, the data shows that in the years of the financial crisis (2007-2009), the Bulgarian economy operates with lower levels of efficiency than in the years after 2010. Thus, for example, in the first post-crisis year 2009 the value of the determinant is the lowest for the entire studied period - 0.113. Only two years later, in 2011, the value of the indicator increased almost fivefold, reaching a level of 0.5445. A reason for that fact could be found in the fact that the input-output tables contain data with high levels of constancy, which need time to change due to external factors.

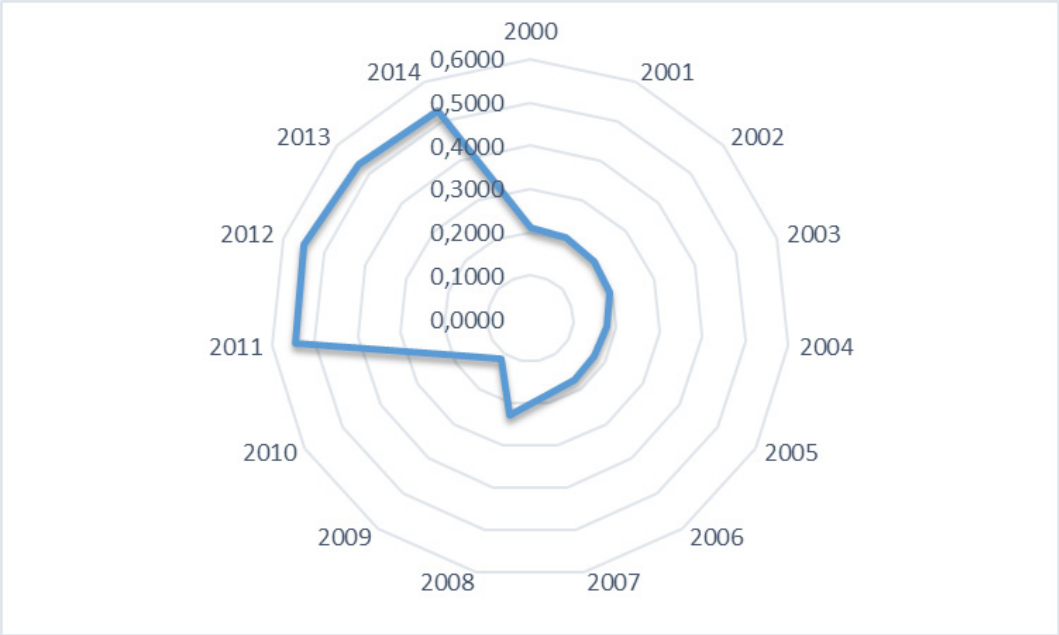



*Source:* Figure based on author's calculations

**Figure 1.** Determinant of the direct matrix of the Bulgarian economy for the period 2000-2016

**Figure 1** makes it possible to visually trace the emerging trend towards increasing the efficiency with which the economic system of Bulgaria as a whole operates, assessed by the determinant of the direct matrix. In order to achieve an even better understanding by the reader, the author introduces **Figure 2**, again related to the commented indicator. The center of the radial diagram is the point, where, in theory, the economic system would function most inefficiently. At the same time, as the economic system approaches the edges of the radius, the efficiency with which this system operates increases. It is practically impossible for any country to be in this edge in a given period of time. And the reason for this is that the objective laws, under which economic systems operate do not allow the creation of a useful (positive) result (unit of final product) without the investment of any resource (no matter how much the resource quantity limits to 0).

As it can be seen in **Figure 2,** at the beginning of the studied period, the Bulgarian economy has been "working" more inefficiently than at the end of this period of time. From 2000 up to 2008 the determinant's values are approximately equal. Slow decreasing at the efficiency level is observed in 2009 and 2010, and the significant increase in the efficiency is detected for first time in 2011 and this trend continues until the end for the period that is in the scope of the research.




**Source:** Figure based on author's calculations

**Figure 2.** Degree of deviation of the values of the determinant of the matrix of total costs of Bulgaria from the point of optimal efficiency

However, the data about the indicator determinant of the direct matrix are not enough to give an unambiguous assessment of the levels of economic efficiency of the Bulgarian economy. In order to achieve an in-depth and correct assessment, it is necessary to analyze those elements of the matrix which in detail provide information for analysis and assessment of the state (efficiency) of the individual economic sectors.

### *Analysis of the values of the elements along the main diagonal of the matrix $(I - A)^{-1}$*

As was already mentioned, the elements along the main diagonal of the full costs matrix of the input-output model are used to study the individual efficiency of a given sector. The data in **Table 2** show the efficiency improvement rate of the elements of main diagonal for the period 2000 – 2016 by using a growth rate on a constant basis. The negative rates are an indicator of the decrease in the efficiency levels of some sectors.

It is important to point out that there is an increase in efficiency in those industries that have a large share in the total volume of final output and gross output for the national economy. Increasing their efficiency, logically, leads to a more significant (tangible) increase in the overall efficiency with which the economy operates.

**Table 2.** Efficiency improvement rate for the economic sectors of Bulgaria, based on the changes in the coefficients of the main diagonal of the matrix of full costs, calculated by using the growth rate on a constant base (2016 compared to 2000)

| Economic sectors | Efficiency improvement rate |
|---|---|
| Agriculture, forestry and fishing | 15,41% |
| Mining industry | -0,10% |
| Manufacturing industry | 15,05% |
| Production and distribution of electricity and heat and gaseous fuels | 7,30% |
| Water supply; sewerage, waste management and remediation activities | 2,99% |
| Construction | 5,72% |
| Trade; repair of motor vehicles and motorcycles | 5,67% |
| Transport, warehousing and post office | 15,68% |
| Hotels and restaurants | 0,17% |
| Financial and insurance activities | 11,96% |
| Real estate operations | 0,26% |
| Professional activities and research | 14,64% |
| Administrative and support service activities | -1,08% |
| Government activities | 8,27% |
| Education | -0,58% |
| Human health and social work | -0,13% |
| Culture, sport and entertainment | -4,33% |
| Other activities | -1,65% |

*Source:* Author's calculations

Among the surveyed twenty sectors, 15% of them functioned with unchanged levels of efficiency for the entire study period. In 5 (five) of the other sectors, forming 25% of all surveyed, there is a decrease in the levels of efficiency with which they operate. This negative fact is most pronounced in the "Culture, sports and entertainment" sector, where the efficiency with which it operates decreases by 4.33%. The "Administrative and support service activities" sector decreased its efficiency by 1.08% in 2016 compared to 2000, while the "Other Activities" sector decreased it by 1.65%. The "Education" and "Human health and social work" sectors are the other two sectors that are declining in the levels of efficiency with which they operate.

Within the values presented in the previous paragraph, it is necessary to focus on the trend that has emerged in the last two sectors. These are 2 (two) sectors that are crucial for achieving a high standard of living among the country's population. In this context, the overall state and functioning of the "Human health and social work" sector should be assessed as worrying. Ivanov (Ivanov, 2013) points out the existing negative trends in his research in 2013, where he outlines the discrepancies between the practice in the field of Bulgarian healthcare and the global trends in the field of healthcare.

Many of the problems in the field of education are outlined by Zareva (Zareva, 2007). They are a direct consequence of the deteriorating efficiency with which the sector operates. But at the same time they are a prerequisite for deepening this declining efficiency.

The economic sectors of the national economy of Bulgaria, in which an increase in the levels of efficiency is reported, are 12 (twelve) or 60% of all surveyed industries. Among them with the best performance compared to the start year are: "Transport, storage and post", "Agriculture, forestry and fisheries" and "Manufacturing" with an efficiency increase of about 15%. The "Professional and research activities" and "Financial and insurance activities" sectors have insignificantly lower values.

When examining the efficiency with which a national economic system operates, special attention should be paid to the field of the electricity sector. And the reason for this is the fact that electricity is a specific resource, without which it is not possible to carry out any activity – neither social, or economic by their nature. For this reason, in the focus of the strategic management of the Bulgarian economy, as one of the key priorities of future development, the goal of increasing the efficiency with which the electricity sector operates should be put. And the achievement of the desired results cannot be done without solving the existing problems, some of which are outlined by Marinov and Donchev (Marinov, M. & Donchev, N., 2020, p.33).

The analysis, based on the elements along the main diagonal of the matrix $(I - A)^{-1}$ shows that the sector of the Bulgarian economy that operates with the highest degree of efficiency is "Hotels and restaurants" with a value of 1,0004, which tends to the lower limit of 1. At the same time, according to this indicator, although improving its performance, the sector "Agriculture, forestry and fisheries" has the lowest efficiency value - 1.1886. It is necessary to clarify here that the nature of the activities falling within a given sector largely determines its economic behavior. Values close to 1 are more likely to be reported in those sectors that provide their product to the population than to other economic sectors

### *Analysis of the values of the sums by vector-columns of the matrix $(I - A)^{-1}$*

The analysis through the sum of the vector-column of the matrix of the full costs for each sector of the Bulgarian economy gives information about the necessary material conditions for the creation of a unit of final production in this sector. Here it is necessary to clarify that the conclusions made about the economic efficiency of Bulgarian sectors through this element of the matrix does not cover the state of the economy, presented in the quadrant of the value added of the input-output model. In other words, the state of the labor force employed in the economic sectors, as well as the added value they create, remains outside the analysis. This is due to the limited scope of the current study, on the one hand, and the results obtained can be used as a guide for future research in this area.

The analysis of the data shows that for the whole studied period there is an increase in the efficiency with which the economic sectors in the Bulgarian economy function. This increased efficiency is expressed in the reduction of the sum of the full material costs with which their final production is created (produced). Of course, this trend should be interpreted in the context of constantly evolving techniques and technologies,

and the intensified innovation process and technological renewal worldwide. The advantages of an economic system that global technological progress brings are indisputable, but as Loukil (Loukil, 2019) points out, the access to foreign technology is not equivalent to its effective use. The ability to increase the efficiency of the functioning of economic sectors based on technology depends on the ability of the entire economic system to adapt and use them effectively. It is this ability that is one of the factors for increasing the national competitiveness of an economic system.

The performance of the "Real estate operations" sector can be assessed as "the best", where significantly low levels of total material costs are reported for the whole period - 1.2251 for 2000 and 1.0370 for 2016. The functioning of the "Trade, repair of motor vehicles and motorcycles" sector with coefficients of total material costs in 2000 - 2.7046, and in 2016 - 1.9089 is assessed as the most inefficient, for the same period of time. The following **Table 3** presents the improvement in the efficiency of the functioning of the economic sectors at the end of the studied period compared to the beginning of this period, by using a growth rate on a constant basis.

**Table 3.** Efficiency improvement rate for the economic sectors of Bulgaria, based on the changes in the sums of vector-columns of the matrix of full costs, calculated by using the growth rate on a contant base (2016 compared to 2000)

| Economic sectors | Efficiency improvement rate |
|---|---|
| Agriculture, forestry and fishing | 14,94% |
| Mining industry | 12,66% |
| Manufacturing industry | 30,07% |
| Production and distribution of electricity and heat and gaseous fuels | 36,47% |
| Water supply; sewerage, waste management and remediation activities | 51,72% |
| Construction | 42,13% |
| Trade; repair of motor vehicles and motorcycles | 29,42% |
| Transport, warehousing and post office | 40,31% |
| Hotels and restaurants | 37,55% |
| Financial and insurance activities | 28,17% |
| Real estate operations | 15,36% |
| Professional activities and research | 42,03% |
| Administrative and support service activities | 58,38% |
| Government activities | 46,47% |
| Education | 23,12% |
| Human health and social work | 38,01% |
| Culture, sport and entertainment | 37,41% |
| Other activities | 40,00% |

*Source:* Author's calculations

The "Administrative and support service activities" sector has the best performance in terms of improving the efficiency of the creation of its gross output - 58.38%, and the performance of the sector "Mining industry" industry can be defined as the most unsatisfactory - 12.66%.

### *Analysis of the values of ordinary scalars of the matrix (I - A)$^{-1}$*

This direction of the economic analysis of the efficiency with which the Bulgarian economy functions (by economic sectors) has as its main task to outline the directions for further analysis in the future. The studied information shows that in almost all economic sectors there is a decrease in the amounts of total costs by vector-order.

This suggests that future research should focus on the reasons for this decline and outlining the possible ways for improving the performance of the Bulgarian economy. One of the possible ways for solving the problem is the achievement of a more efficient use of resources by the economic sectors, which would lead to a reduction in the volume of intermediate consumption in the economy. This, logically, leads to the need of additional analysis on the intermediate consumption and final production for the Bulgarian economy – both in terms of relative share in gross output and in terms of growth rates of both types of output. Moreover, the criterion for the presence of efficiency should be the presence of a predominant increase in output for final consumption over the intermediate output.

## CONCLUSION

The analysis of the information provided by the symmetric input-output tables provides basis for formulation of the following conclusions.

First of all, the determinant of the matrix (I-A)$^{-1}$ shows an increase in the efficiency with which the Bulgarian economy (as a whole) functions. The reference point for this conclusion are the values, which in the years after 2009 are closer to 1.

Secondly, the study of the other elements of the full cost matrix leads to results which show that in a large part of the sectors of the Bulgarian economy there is an increase in the levels of efficiency. However, some industries are still underperforming.

Third, in the focus of Bulgaria's economic policy, priority should be given to three key sectors: "Production and distribution of electricity and heat and gaseous fuels", "Education", and "Human health and social work". This need stems from the specifics of the goods that these sectors create, and which (goods) are directly related to achieving not only economic well-being in society, but also to raising the standard of living and personal well-being of individuals in this society.

Fourth, it should be noted that although the trends in the development of the sectors of the economy point to increasing efficiency, the global economic crisis of 2008 is reflected in the studied data. Unlike most of the developing countries, in Bulgaria the impact of the crisis is manifested with a lag in time and the first clear manifestations can be found not so much in 2009 as in 2010 and 2011.

Fifth, in the field of future research in this scientific area the question of the reasons should be raised, which are leading to unsatisfactory efficiency of the economy as a whole, in conditions of relatively efficient sectors. In other words, it is necessary to identify those weaknesses in the economic system that limit its future development.

Last but not least, as a field for future analyses in the field of evaluation of the

efficiency of the functioning of the Bulgarian economy, the possibility for its study as part of the higher system of the integration community of the European Union stands out. In this way, an assessment can be obtained on a comparative basis for the performance of Bulgaria in terms of efficiency compared to that of the European Union as a whole and its individual Member States.

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