

COMPARATIVE ANALYSIS OF THE GDP OF EUROPEAN COUNTRIES IN THE PERIOD 2017-2022

Ruxandra-Eugenia POP, Ancuta MARIN

Research Institute for the Economy of Agriculture and Development, 61 Marasti Boulevard,
District 1, 011464, Bucharest, Romania, Phone: +40213136087, Fax:+40213136096,
Mobile:+4087700676, Emails: pop.ruxandra@iceadr.ro, marin.ancuta@iceadr.ro

Corresponding author: marin.ancuta@iceadr.ro, ancuta.marin@yahoo.com

Abstract

The present paper presents a statistical analysis of the Gross Domestic Product/person, at the national level, in relation to the member countries of the European Union, using statistical data published by Eurostat, Naational Institute of Statistics (INSSE), FAOSTAT and the World Bank. Based on the data centralization, calculations were made to determine some absolute and relative statistical indicators, such as the absolute change, the dynamic index or the dynamic rate. The purpose of this paper is to analyze and observe GDP per inhabitant evolution, in the period 2017 - 2022, as well as the hierarchy of European member countries, according to this macroeconomic indicator. Going through the work, it can be observed that the order of each member state in different hierarchies based on the GDP level, nominal or real, differs, depending on the perspective from which the data is analyzed. Not always a country with a high level of GDP is characterized by a higher level of well-being of the population. Also, a country that has not yet reached economic maturity in terms of GDP level, may have advantages over the already mature European economic markets over a longer period of time.

Key words: statistical indicators, GDP, European Union, economic efficiency, population well-being

INTRODUCTION

GDP (gross domestic product) value, a reference macroeconomic indicator, at the level of a country's economy reflects the sum of all goods and services market value intended for final consumption, produced in all branches of the country's economy, in a certain period of time, usually 1 year. Depending on the geographical area on which the economic analysis is made, the GDP indicator can be calculated at the country, region or locality level. A GDP's country's higher value, compared to the level of this indicator registered in another country, reflects economic power. Due to each state particularities (area, population), GDP per person reflects the living standard for a country. Mathematically, we can calculate the GDP value using 3 methods: the income method, the expenditure method and the added value method [1].

In 2022, at the European level, the countries with the greatest contribution to the formation of the GDP recorded at the level of the European Union were: **Germany** (29.57%),

France (16.71%), **Italy** (12.08%), **Spain** (10.16%). Moreover, according to the Eurostat database, this hierarchy is preserved in all the years, between 2017 – 2022. **Romania** had a 1.43% contribution EU's GDP total value, a smaller value comparative to 2021 (1.63%), this value places Romania ahead countries like Portugal, Bulgaria, Greece, Hungary [4].

According to the statistical data, in 2022, **Romania's GDP** recorded approximately 286 billion euros, which represents a 19% increase compared to the same indicator value recorded in 2020, respectively, 240 billion euros [4]. Compared to 149.8 Billion Euro in 2014, in 2022, GDP was by 90% higher [9]. Moreover, according to the World Bank data, regarding Romania's GDP, it can be observed a constant annual increase, in 2017 – 2022 period, with the 2020 exception, when GDP's value decreases, compared to 2019, in the Covid-19 pandemic context [12].

GDP per person is a measuring indicator, obtained by reporting the total production value produced within a country, at the number of country's inhabitants. The average

value of GDP per person, at European level, in 2017-2022, was 31,396 euros/inhabitant. The trend for this parameter was increasing, excepting the 2020-2019 period, when, within the background of the Covid-19 pandemic, economic losses were recorded in all European countries [6]. In this context, the purpose of the paper is to comparatively study GDP in the EU, 2017-2022.

MATERIALS AND METHODS

In order to analyze the GDP per person level, both at national and European level, official reports of the World Bank data [12], the National Institute of Statistics [10], Eurostat [4, 5, 6], and Faostat [7], were used. Also, specialized national and international publications was studied in order to counter some possible causes that influence the evolution of the GDP per inhabitant, national and European level.

Last but not least, chronological series statistical indicators have been calculated using the formulas presented in Table 1.

Table 1. Statistical reference indicators

No.	Indicator type	Formula	Explanation
I Absolute indicators			
	Absolute modification ($\Delta^y_{t/t'}$)	$y_t - y_{t'}$	t' = the base period (the first interval, the first moment of the series) or $t' = t - 1$ the previous period
a.	Fixed Base Absolute Change ($\Delta^y_{t/t}$)	$y_t - y_1$	shows how many units has changed the level of a phenomenon in the current period compared to the recorded level of the phenomenon in the first series.
b.	Absolute chain-based modification ($\Delta^y_{t/t-1}$)	$y_t - y_{t-1}$	shows how much a phenomenon level has changed, in the current period compared to previous period.
II Relative indicators			
	Dynamics index ($I^y_{t/t'}$)	$(y_t/y_{t'}) * 100$	shows how many times has changed a phenomenon's level, in the current period

			compared to previous period level, considered a reference base
a.	Fixed base dynamic index ($I^y_{t/t}$)	$(y_t/y_1) * 100$	calculated as a percentage ratio between the level reached by a phenomenon in the current period and the registered level in the first series period
b.	Chain-based dynamics index ($I^y_{t/t-1}$)	$(y_t/y_{t-1}) * 100$	calculated as a percentage ratio between the level of the phenomenon in the current period and the level recorded in the previous period
	Dinamic rythm ($R^y_{t/t'}$)	$I^y_{t/t'} \% - 100\%$	shows by how many percentages the level of the phenomenon has changed in the current period compared to the level recorded in a previous reference base period
a.	Fixed base dynamics rhythm ($R^y_{t/t}$)	$I^y_{t/t} \% - 100\%$	shows by how many percentages the level of the phenomenon has changed in the current period compared last year recorded value, period considered as a reference base
b.	The dynamic chainbased rhythm ($R^y_{t/t-1}$)	$I^y_{t/t-1} \% - 100\%$	calculated as a percentage ratio between the absolute change with a chain base corresponding to a period and the level of the phenomenon recorded in the previous period

Source: Turdean M.S. et al, 2010 [13].

RESULTS AND DISCUSSIONS

GDP at the main components level (output, expenditure and income)

Between 2017 and 2022, the GDP's evolution was positive, at the level of all European countries, as can be seen in Figure 1.

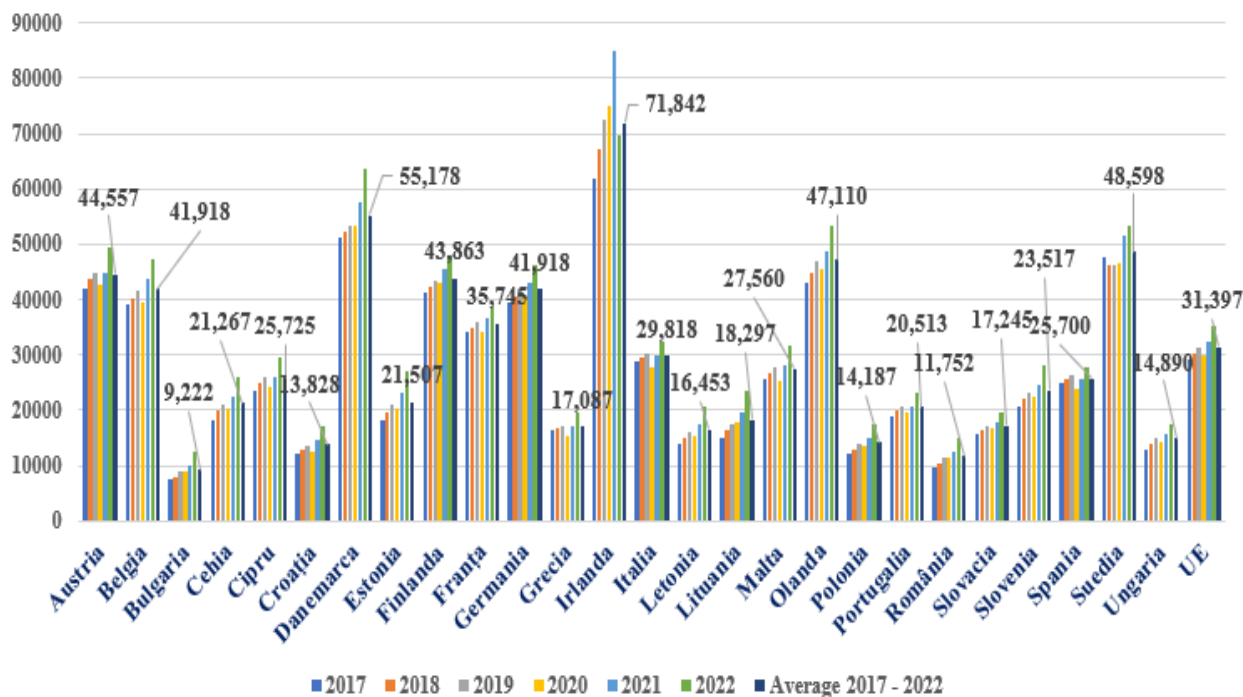


Fig. 1. GDP values (mil.euro), in EU., 2017 – 2022
 Source: own processing based on Eurostat Data [4].

Thus, based on Figures 1 and 2, we can observe each country's contribution in EU's GDP's total. It worth to note that, in the analysed interval, the largest share is brought by **Germany** (24.67%), **France** (17.28%), **Italy** (12.27%), **Spain** (8.33%) and **Netherlands** (5.92%). In 2021, Romania contributed with 1.66% to EU's GDP registered level, thus placing itself ahead of countries such as **Portugal** (1.46%), **Bulgaria** (0.47%), **Greece** (1.26%), **Hungary** (1.06%). It is also noted that the 2019 and 2020 transition, over the pandemic context, brought losses in all countries, with the Ireland exception. In Ireland, GDP followed an upward trend throughout 2019-2020, increasing by 5.9% compared to the 2019 value.

This can be explained by the presence of a large number of multinational companies, companies that hold property rights [2]. Production contracts associated with these property rights generate income for companies, increasing the level of gross domestic product.

In the same reference period, regarding this macroeconomic indicator, notable losses were recorded in **Spain** (-10.8%), **Greece** (-9%),

Italy (-8.9%), **Portugal** (- 8.4%), **Malta** (8.2%), **Croatia** (-8.1%) and **France** (-7.9%). As shown in

Figure 2, the most significant contribution to the GDP's formation at the European level was given by countries such as **Germany** (24.46%), **France** (16.72%), **Italy** (12.08%) and **Spain** (8.41%). At the opposite pole, there are countries like **Malta**, **Estonia**, **Cyprus**, **Croatia**, **Bulgaria** (0.53%). **Romania** registered a 1.81% contribution EU's GDP recorded value.

At the country level, **GDP** reflects its economic performance, while **GDP per person** reflects the living standard in a certain country or the labor force productivity [7].

Of course, interpreting the country's inhabitant's wellbeing by using the GDP per person indicator only has several limits. For example, the GDP per person indicator does not yet take into account the technology influence on the worker's output.

Although, if at a given time point, the GDP per worker values reaches the same level in two different countries, with the same share of labour in GDP, from a mathematical point of view, it could be stated that in both countries is a certain living standard.

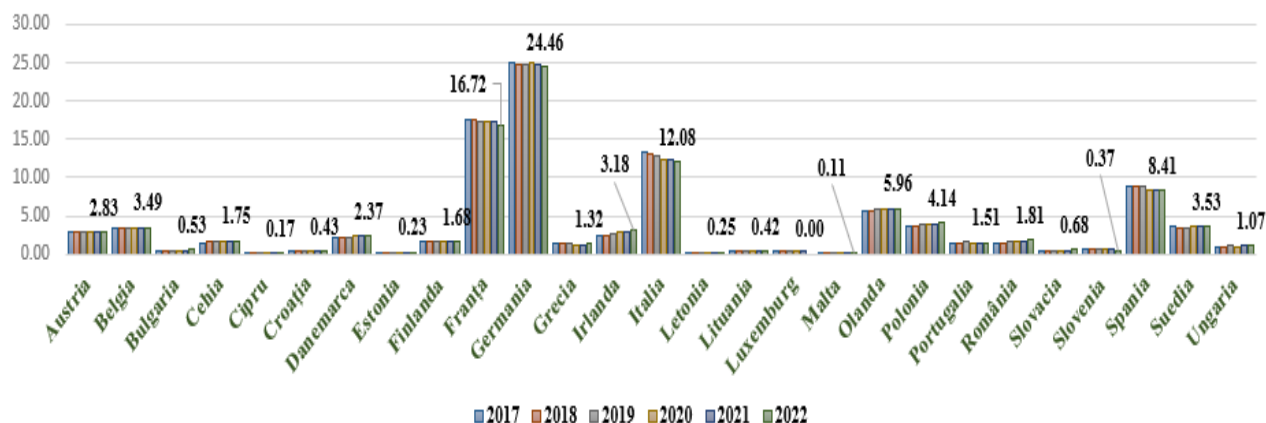


Fig. 2. EU country's contribution to GDP (%), 2007-2022
Source: own calculations based on the data from [4].

However, analysing the GDP from the efficiency's perspective, taking into account the volume of worked hours, it could also be stated that the population's well-being is higher in the country with a lower number of worked hours, because the inhabitants of that country enjoy more free time [8].

GDP value/person in Europe

Figure 3 presents the existing statistical data regarding the recorded level of GDP per person, according to market prices, in the period 2017 – 2022, in the member countries of the European Union. Thus, it can be observed that, in the period 2017 - 2022, the leading position is occupied by **Ireland** (with 130% above the average recorded at European level), followed by **Denmark** (with 76% above the average recorded at European level) and **Sweden** (with 55% above the European average). At the opposite pole, the countries with the lowest GDP per person compared to the European Union average are **Bulgaria** (with 71% below the European average), **Romania** (with 67.38% below the European average), **Croatia** (with 57.88% below the average European) and **Poland** (with 57.73% below the European average) [6]. In 2021, **Luxembourg** holds the leading position in terms of GDP per person in the European Union, (with 235.34% above the average recorded at the level of the European Union, in the same reference period), thus exceeding 2 and a half times average recorded at European level. A possible explanation for this derives from the fact that a large number of foreign residents are employed in

Luxembourg and therefore contribute to its GDP, but they are not included in the resident population. As for the year 2022, the economic statistical data regarding Luxembourg were not published yet [3].

In 2022, from provisional statistical data, regarding the first 3 quarters of 2022, the GDP per inhabitant values reached the highest value in **Austria** (38,382 euro), **Luxembourg** (29,453 euro), **Norway** (25,757 euro), **Ireland** (24,370 euro) or **Switzerland** (17,193 euro), thus exceeding the European average. In **Romania**, in 2022 first 3 quarters, GDP/person recorded value is below the European average (9,937 euro, with 65% less compared to the European level). In this ranking, **Romania** occupies the penultimate place, ahead **Bulgaria** (with GDP/person estimated at 7,718 euro) [6].

Regarding the 2017-2022 absolute change at GDP/person indicator level (with fixed and mobile base), we can state that significant increases were recorded in **Netherlands**, **Ireland**, **Luxembourg**, **Denmark** and **Belgium** (Figure 4). At the opposite pole we can mention countries like **Spain**, **Greece** and **Italy**. Regarding the GDP/person evolution, it can be state that in most countries case, signs of progressive economic growth appear. However, the negative economic effects brought by the Covid-19 pandemic are visible in 2020, when most countries recorded a lower GDP level comparative to 2019, with several exceptions: **Bulgaria**, **Denmark**, **Lithuania**, **Luxembourg** and **Sweden**. Also, we can observe that the most affected EU's

countries are Spain, Malta, Italy, Belgium and Austria. Moreover, a direct relationship can be observed between the countries with the

highest level of incidence rates of the Covid-19 virus and the economic repercussions in the reference time period.

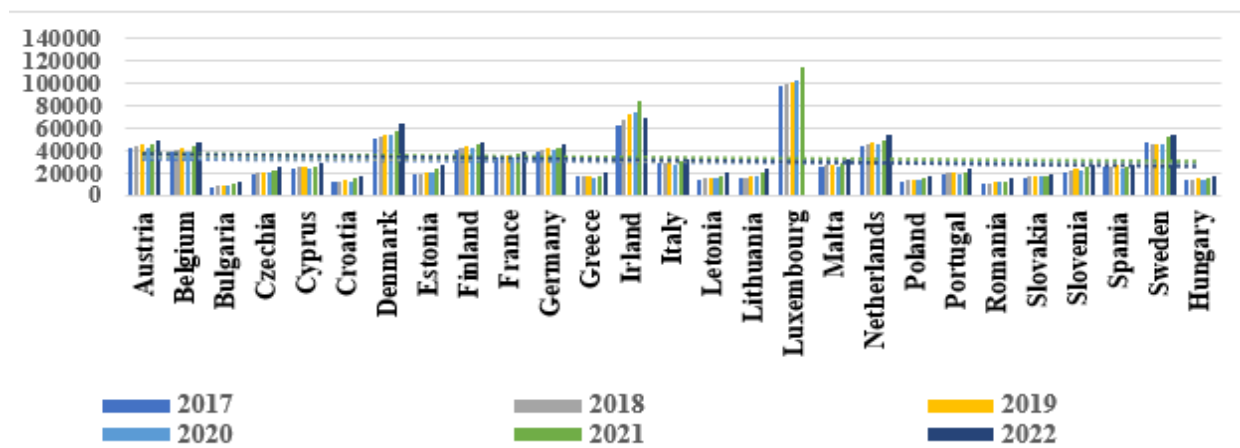


Fig. 3. GDP/person values (euro), in EU, 2017 – 2022
 Source: own processing based on Eurostat Data [6].

Regarding Romania’s situation, GDP registered a constantly increasing trend between 2017-2022, but with an exception for the 2019-2020 transition period.

Figure 4 shows the dynamic rhythm level, obtained by using the calculation formula described in the “Materials and methods” section.

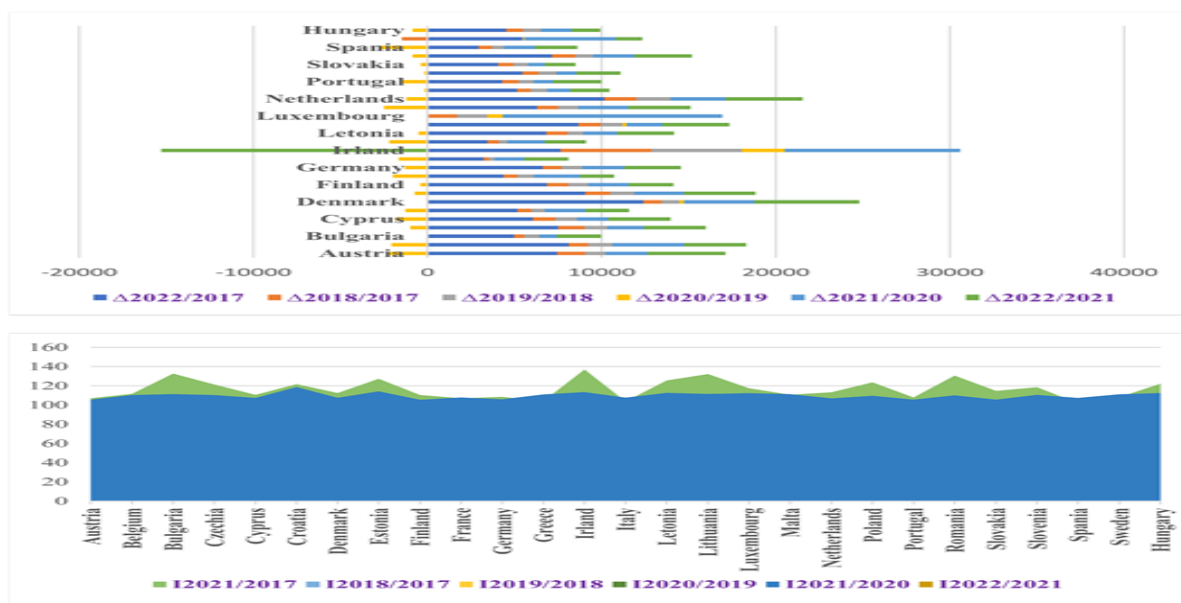


Fig. 4. Statistical indicators for GDP / person (euro, %) evolution
 Source: own calculation.

Thus, it can be seen that, in terms of the dynamics recorded at the GDP/person level, regarding 2021 compared to 2017 evolution, countries such as **Bulgaria (67.12%)**; **Romania (56.99%)**, **Lithuania (57.99%)** can be mentioned. The weakest dynamics were

recorded in countries such as Sweden (11.38%), Spain (11.77%), Italy (11.92%) and France (12.34%). The agriculture’s sector contribution to GDP’s formation, at the European countries level, is presented in Figure 5 [5].

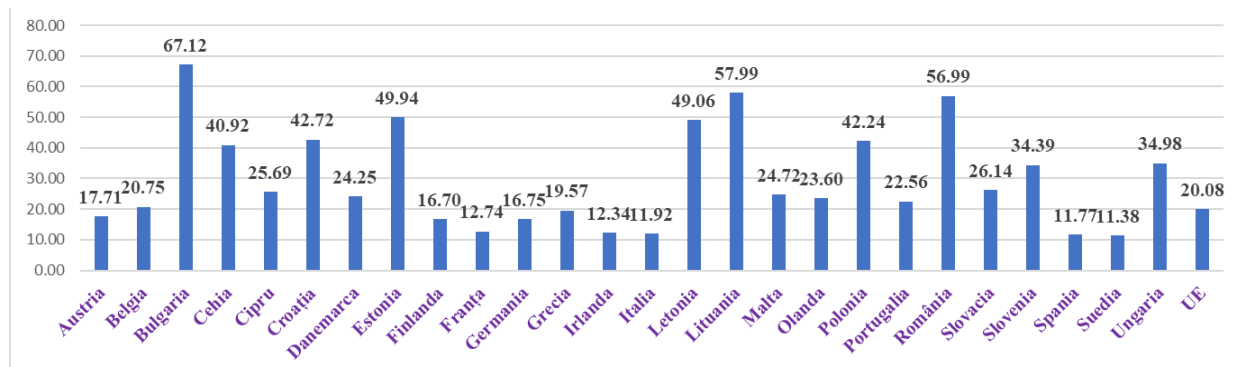


Fig. 5. Growth rate of GDP/person (%), 2022/2017, in the EU
 Source: [5].

Agriculture sector contribution's to the EU GDP

It can be observed that, at the European level, Romania is the country with the largest agriculture sector share, in achieving the GDP (3.76%), along with Greece (3.55%) and Bulgaria (3.43%). Thus, within the Balkan countries, agriculture is a basic economic activity, due to the favourable climatic characteristics, traditions and specific are customs. However, the values presented in Figure 6 refers to each individual state GDP, but without showing the state economic power or the sector's efficiency. For example, although agriculture practiced in *France* registers a weight of only 1.40%, the value of agriculture's sector was estimated in 2022 at

43,511.18 mil. euro, the highest Europe's recorded value. Secondly, follows Italy, with an agricultural activity estimated at 38,360 mil. euro in the same reference year. In *Germany*, the same reference sector reached the threshold of 30,943.39 mil. euro. We also mention several registers competitive values, in *Spain* (28,529.39 mil. euro), *Poland* (12,103.63 mil. euro), *Netherlands* (11,863.39 mil. euro), *Romania* (10,767.57 mil. euro). Therefore, in terms of European economic powers, Romania occupies the *7th place*, ahead to Greece, Austria, Denmark. From the same perspective, the lowest values of the agriculture's sector were recorded in Malta, Ireland and Luxembourg.

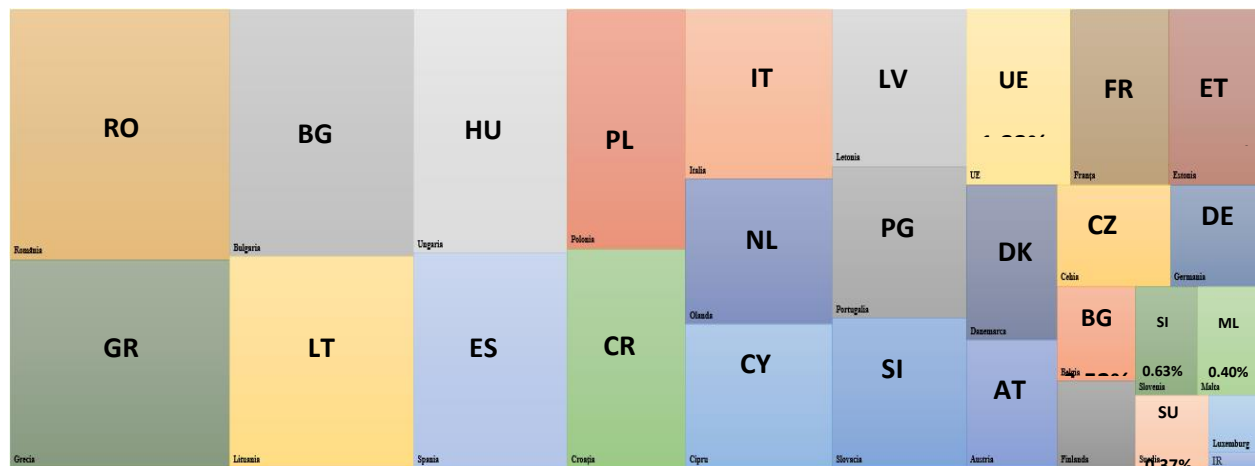


Fig. 6. Agriculture's contribution to GDP (%), between 2017-2022, by country
 Source: author's processing based on Eurostat Data [5].

CONCLUSIONS

Following the present research, it can be noticed a surprising ranking of the EU's states members, especially regarding GDP per

person indicator, but also regarding the dynamic of this macroeconomic parameter. From the EU's GDP's share contribution perspective, it can be stated that the highest threshold of economic efficiency is registered

in countries like *Germany* (29.57%), *France* (16.71%), *Italy* (12.08%), *Spain* (10.16%). Thus, these countries are characterized by high economic power and an already matures markets in terms of their development degree, with a main actor's role, in international trade relations. In this hierarchy, Romania occupies the 15th place, with a share contribution of 1.81% in the EU's achieved GDP, close to the Czech Republic. Romania's place is ahead of countries like Portugal, Bulgaria, Croatia, Greece.

In terms of GDP per person, in market prices, we can observe a surprising ranking. Thus, the greatest economic powers in Europe (*Germany, France, Italy, Spain*) give up the leading places, in Luxembourg, Ireland and Sweden favour. A possible explanation for this situation derives from the fact that a large number of foreign residents are employed in Luxembourg and therefore they contribute to country's GDP, but they are not included in the resident population. Regarding the Ireland top position in Covid-19 pandemic context, many multinational companies have their headquarters on its territory, companies that holds property rights. Production contracts associated with these property rights generate incomes for companies, increasing the level of GDP. In *Romania*, the 2017-2022 time period GDP/person level was 37% of the EU's level recorded average, in front of Bulgaria. GDP/inhabitant's level is an indicator whose reflects the population's living standard. The Covid-19 pandemic affected the level of 2020 registered GDP's value, compared to the values recorded in 2019, in the case of most European states, even in the case of the strongest. However, countries such as Luxembourg, Ireland, Denmark, Sweden or Bulgaria made an exception to this phenomenon.

In the second part of this paper, different statistical indicators were calculated (absolute change, dynamic index, dynamic rate), in order to obtained a detailed analysis of the GDP/person dynamic evolution, between 2017 and 2022. Thus, the most dynamic economic markets in Europe were showed in countries such as Bulgaria or Romania, and

the least dynamic economic markets are represented by economic powers, such as Germany or France. Thus, there is a chance that in the future, using the right strategies and policies and by keeping the same market dynamics, that Romania could approach a highest contribution share or value, in terms of GDP, considering that for Romania, GDP growth rate is almost 5 times higher than the same parameter registered, for example, in France. Regarding the agriculture's sector and the economic efficiency, it can be stated that in countries like *Romania, Bulgaria, Greece or Lithuania*, the share of agriculture in achieving the GDP is higher, at the European level. However, from the agriculture's perspective, at European level, countries such as France, Italy, Germany, Spain, Poland and the Netherlands have still the most competitive markets. In this sense, Romania ranks the 7th place.

Of course, the GDP's single approach, in order to describe the well-being level for a certain nation, in all its expression, has several limitations. Over time, this topic generated multiple controversies, even among international famous economic specialists [11]. GDP's amount does not take into account other particular importance aspects, in a complex, modern society, for the population's living standard characterization, such as: the number of worked hours, the share of free time, social inequality, the environment status, the country's available natural resources, the performance of the banking credit system, the natural disaster impact, as well as others.

ACKNOWLEDGEMENTS

The present research is part of the Internal Research Plan of the Research Institute for Agricultural Economics and Rural Development (ICEADR Bucharest).

REFERENCES

- [1] Aceleanu, M., Şerban, A.C., 2019, Macroeconomics, Economic Theory Collection (Macroeconomie, Colecția Teoriei economice), Academy of Economic Studies Publishing House, Bucharest, pp. 14-20.

[2]European Commission Country profiles: Ireland, Trade and economy, https://european-union.europa.eu/principles-countries-history/country-profiles/ireland_en, Accessed on 7th March, 2023.

[3]European Commission Country profiles: Luxembourg, Trade and economy, https://european-union.europa.eu/principles-countries-history/country-profiles/luxembourg_en, Accessed on 7th March, 2023.

[4]European Commission Database Eurostat, GDP and main components (output, expenditure and income), Time series 2017 – 2022, [https://ec.europa.eu/eurostat/databrowser/view/NAMQ_10_GDP\\$DEFAULTVIEW/default/table](https://ec.europa.eu/eurostat/databrowser/view/NAMQ_10_GDP$DEFAULTVIEW/default/table), Accessed on 7th March, 2023.

[5]European Commission Database Eurostat, Gross value added of the agricultural industry - basic and producer prices, Time series 2017 – 2022, https://ec.europa.eu/eurostat/databrowser/view/TAG00_056/default/table, Accessed on 7th March, 2023.

[6]European Commission Database Eurostat, Main GDP aggregates per person, Time series 2017 – 2022, [https://ec.europa.eu/eurostat/databrowser/view/NAMQ_10_PC\\$DEFAULTVIEW/default/table](https://ec.europa.eu/eurostat/databrowser/view/NAMQ_10_PC$DEFAULTVIEW/default/table), Accessed on 7th March 2023.

[7]Faostat, <https://www.fao.org/faostat/en/#home>, Accessed on 7th March, 2023.

[8]Le dictionnaire de politique "Toupictionnaire", Productivité globale des facteurs, <https://www.toupie.org/Dictionnaire/Pgf.htm>, Accessed on 1st of March, 2023.

[9]Manescu, C., Cristina, A.-F., Sicoe-Murg, O., Gavruta, A., Mateoc, T., Toth, A., Mateic-Sirb, N., 2016, Analysis of the importance of agriculture sector in Romanian economy, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.16(1), 271-277.

[10]National Institute of Statistics, NIS, www.insse.ro, Accessed on 1st of March, 2023.

[11]Smith A., 2011, The Wealth of Nations. Economy Collection (Avutia Natiunilor, Colectia de Economie, Translated Edition, Publica Publishing House, 2011, pp. 21 – 35.

[12]The World Bank Data, regarding GDP values in Romania, <https://data.worldbank.org/country/romania?view=chart>, Accessed on 7th March, 2023.

[13]Turdean, M.S., Prodan, L., Statistics, Course support (Statistica, Suport de curs), http://file.ucdc.ro/cursuri/F_1_N13_Statistica_Prodan_Ligia.pdf, pp. 33-39.