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## Article

# The Convergent Evolution of Romania's Gross Domestic Product in Relation to the Average Macro-Economic Result of the European Union Countries

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## THE CONVERGENT EVOLUTION OF ROMANIA'S GROSS DOMESTIC PRODUCT IN RELATION TO THE AVERAGE MACRO-ECONOMIC RESULT OF THE EUROPEAN UNION COUNTRIES

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### Abstract

Romania's economic growth is a target that can be achieved only within the accordance of all the economic sectors with the Europe 2020 Strategy. As provided in the Convergence Programme 2014-2020, this objective entails a series of steps that Romania must rigorously follow in order to be able to ensure a real converge process at the level of developed European Union (EU) countries from the Euro Area. This paper aims an overview presentation of the economy synthetized in its major result, respectively in the dynamics of the total Gross Domestic Product (GDP) /capita and agricultural Gross Domestic Product (GDP) /capita, and it also compares with the level of the EU 28 average and the level of the Euro Area average. There are calculated, using linear and quadratic functions, the Gross Domestic Product GDP trends, and, with the convergence equation, there are calculated the years that separate Romania from the level of other countries, through the application of annual growth rates. The calculations result shows a strong economic boost of Romania, the annual growth rates being high, both for Gross Domestic Product (GDP) / capita (US\$) and for agricultural Gross Domestic Product (GDP)/ capita (US\$), but also a pretty big gap between its development level and the EU 28 and the Euro Area average level.

**Keywords:** Gross Domestic Product (GDP), trend, comparison, convergence, Romania, European Union (EU), Euro Area.

**JEL Classification:** O11, O13, O57, C13, C15

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## Introduction

The economic convergence is one of the hopes for economic development of many countries, which includes also Romania. This could be achieved by "free movement, without limitation, of production factors between the European states and regions, in particular through capital market integration and through foreign direct investments (FDI)" (Iancu, 2014).

Economic convergence and convergence in general, at this stage of globalization have a well-defined place. Convergence is a key objective in important treaties between the EU countries, in studies and articles that analyze the economic development through a harmonious development (Council Regulation – EEC, 1987), to reduce disparities between developed and less developed countries and that ultimately aims the convergence process (Hooghe, 1996; Precup, 2014).

In order to reduce the disparities, the new convergence theory considers also the effects operationalization produced by the intangible factors, including those concerning economic policies (Iancu, 2007). In this sense, the article aims to analyze the relationship between the income convergence (using GDP in US \$ current prices) of the EU 28, Euro Area and Romania over the 2000-2014 period. The study also includes a confrontation of Romania's major macroeconomic result with that of some several important European countries for the same period, 2000-2014. Using the convergence equation it was possible to calculate the number of years for recovering the gaps between Romania and the countries studied, emphasizing the need for a higher economic growth (a higher growth rate than the one calculated for the period 2000-2014) in order to recover the existent gap.

The paper's first section describes the total GDP/capita and population evolution, the total GDP/capita and population trends, the link between the total GDP's annual growth rate and the population's annual growth rate at the EU countries level.

The second section of the paper reveals the agricultural GDP / capita evolution and the agricultural GDP/capita trends, taking into account the annual growth rates both for Romania and for the EU 28 and Euro Area.

The paper's third section presents the convergence evolution of the GDP/capita from Romania with the GDP/capita in some European Union countries and the EU average. The specifics of this research and the practical significance of this paper consist in a more accurate estimation of the number of years to reduce the disparities between Romania and developed EU countries.

## 1. Review of the scientific literature

At the level of the European Union (EU) a first stage of convergence presupposes the fulfilment, by all Member States, of some established conditions (the situation of public finances, price stability, exchange rate and long-term interest rate stability) for accession to the single currency (European Commission, 2014). Only few of the former socialist countries that have already joined the EU have remained outside of the Euro Area: Bulgaria, Czech Republic, Croatia, Poland, Romania and Hungary.

A first step of convergence to which Romania was heading was the nominal convergence criteria fulfillment for entering into the euro zone, established at Maastricht, regarding: the inflation rate; the long-term interest rate; the exchange rate towards the euro, the consolidated budget deficit and public debt.

In year 2015, the National Bank of Romania (BNR) analyzes highlighted that Romania fulfilled the nominal convergence criteria established in Maastricht 2008: the inflation rate benefitted from a rhythm level of Harmonized Index of Consumer Prices – HICP at the maximum permissible threshold of 1.2%, the long-term interest rates with a level of only 4.1%, were below the limit of 5.3%; the exchange rate RON to euro was placed in a 2.1-3.5% band compared to the accepted limit of 15%, the consolidated budget deficit reached only 1.8% of GDP, compared to the maximum value of 3%; the public debt was placed at a percentage value of GDP of only 39.8%, placed far below 60% (Isărescu, 2015).

Regarding the gap recovery of the economic growth of our country, in relation with the EU average, in a report of the research market company Business Monitor International (BMI), cited by Emerging Europe Monitor, it is mentioned that it could decrease and could ensure a sustainable convergence model at the end if it will be less and less conditioned by exports. In the same report, it was foreseen a macroeconomic growth by 3.4% and 3.6% in 2015 and respectively 2016, following that, in the next years, Romania to become a leader of the emergence phenomenon of the former socialist countries from Central and Eastern Europe, members of EU 28 (taking into consideration the GDP indicator).

In autumn 2014, the National Commission for Prognosis estimated an economic growth of 2.5% for the year 2015. This figure is close to the estimates made by the European Commission and the International Monetary Fund, 2.4% and 2.5% respectively, but below the growth forecast anticipated by the World Bank in June 2014, i.e. 3.4% (BMI, 2014).

Regarding the real convergence and its assessment based on the discrepancies with the EU average of GDP per capita at the purchasing power standard (PPS), it is noticed a significantly progress of Romania in the last two years. In present, Romania is situated at about 54% to the EU 28 average, a percent significantly higher than in 2012, when it registered a percentage of 52.9% and in year 2011 (51.2%) (The Government of Romania, The Convergence Programme 2014-2017). Moreover, in the crisis years, the real convergence process of Romania's economy continued, for the entire period 2009-2013, the growth rate of GDP per capita being over 2 percentage points above the one recorded for the whole EU (table no.1).

**Table no. 1: Average annual growth rate for total GDP of Romania and EU, during 2009-2013 (%)**

Indicator	EU 28	Romania
Real growth	-0.3	-0.3
GDP deflator	1.1	4.4
Nominal growth	0.8	4.1
GDP/capita growth at PPS	0.5	2.6

*Source: Based on data from Eurostat, 2016 and  
The Government of Romania (The Convergence Programme 2014-2017), 2014*

This objective can be reached as long as the report towards the EU average of the GDP/capita exceeds 60%, for this standing out the experience of the new Member States which recently acceded at the currency or at the Euro zone.

In accordance with the economic developments estimated in this Programme, the real convergence of Romania could reach almost 65% in the year 2018, with the prospect that at the 2020 year's level the GDP/capita at Purchasing Power Standard in Romania to represent about 70% of the European average (table no.2).

**Table no. 2: Perspectives on GDP per capita at the Purchasing Power Standard, in Romania**

Specification	UM	2012	2018	2020
GDP per capita in PPS	Euro	13,500	18,200	20,250
Towards 2012	%	100.0	134.8	150.0
Towards % of EU average	%	52.9	64.2	69.5

Source: Based on data from Eurostat, 2016 and  
The Government of Romania (The Convergence Programme 2014-2017), 2014

## 2. The research methodology

The data sources were constituted by the World Bank and the Statistical Yearbooks of Romania, from which were extracted data regarding the GDP/capita (US \$ in current prices), population, agricultural GDP, the latest data were available for the year 2014. There were used also data at EU 28 level, EU Euro Area and for some countries, with a focus on the following indicators: total GDP; Agricultural GDP; Total GDP/capita; Agricultural GDP/capita (World Bank, 2015). In the article it was used the consumption method in the GDP estimation as a macroeconomic indicator formed by the sum of the market values and of all services and goods intended for final consumption, produced in all branches of the economy in a country in one year (GDP aggregated as sum of the expenditures for consumption of private households and private non-profits organizations, State expenditures, of gross expenditures for investments, investments for storage purposes, as well as export earnings less expenditures for imports):

$$\text{GDP} = \text{consumption} + \text{investments} + \text{exports} - \text{imports} \quad (1)$$

GDP/capita is determined by reporting the total GDP to the inhabitants' number and it is often adjusted. The adjustment highlights that different prices levels are masked in different countries and ultimately it can be compared the efficiency of different countries (Eurostat, 2015; National Institute of Statistics, 2014).

In order to measure the development rhythm and quantify the convergence process, specific convergence indicators were used (Iancu, 2005). For beta convergence ( $\beta$ ) that presumes the poor countries grow faster than the rich ones, such as the poor countries will eventually reach the richest ones in a determined horizon of time, the following indicators were used: the annual growth rate, trend equations (linear, polynomial of second degree), the period for the gap recovery (Iancu, 2005).

The equation in the conducted research in this article has used a simple chronological dependency with the visible sense of a temporal estimation of a classical unifactorial statistic regression:

- linear :

$$Y(t) = ax + b \quad (2)$$

where:

- a, b – equation's coefficients or parameters;
- a – parameter of explanatory and factorial variable defining the linear increase/decrease;
- b – free term or the constant;
- x – the hexogen chronological variable or the time expressed in years.

- and quadratic:

$$Y(x) = ax^2 + bx + c \quad (3)$$

where:

a, b – equation's coefficients and parameters;  
a – parameter of explanatory and factorial variable defining the quadratic increase/decrease;  
b – parameter of explanatory and factorial variable defining the linear increase/decrease;  
c – free term or the constant;  
x – the hexogen chronological variable or the time expressed in years.

The meaning of the equation is given by  $R^2$ , which represents the determination or the percent from total variance, explained by the independent variable x and r coefficient, which is the classic coefficient of correlation (Săvoiu, 2013; Drăghici and Necula, 2014).

The significance and validation of these indicators has been realized using the t test (Fischer, 1930). For Romania's convergence with EU, it was used the following equation for the convergence estimation:

$$t \text{ (years)} = (\log Y_{EU} - \log Y_{RO}) : [(\log(1+r_{RO}) - \log(1+r_{EU}))] \quad (4)$$

where:

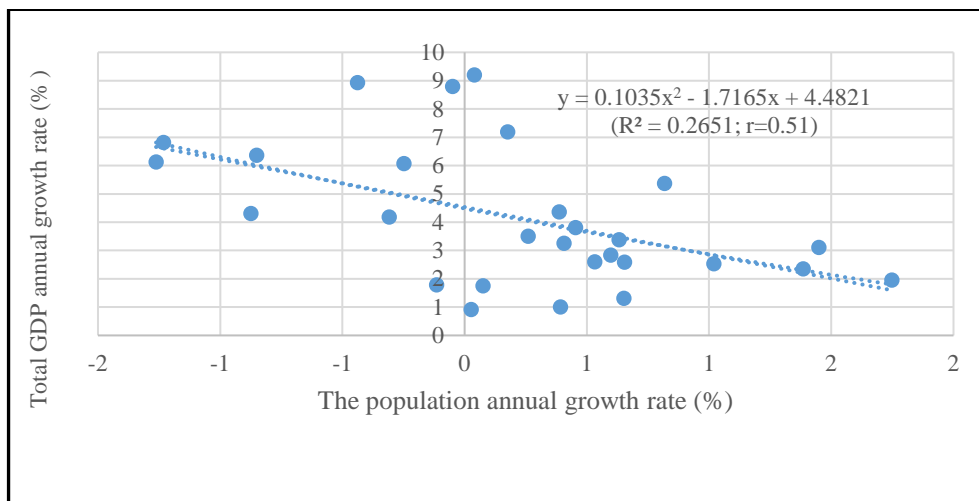
EU – European Union;  $Y_{EU}$  = GDP value in EU;  
 $Y_{RO}$  – GDP value in Romania;  
 $r_{EU}$  – annual rate for economic growth in EU;  
 $r_{RO}$  – annual rate for economic growth in Romania (Iancu, 2013).

### **3. Results of the research**

From the multitude of aspects that could have been thematically analyzed, the article authors have chosen a comparative analysis of total GDP/capita convergence (US\$ in current prices) and agricultural GDP/capita convergence (analogous in US\$ in current prices), at the level of the EU, Euro Area, plus a confrontation of the major macroeconomic result of Romania with the one of several important European countries, in the period 2000-2014. The study aimed calculating the number of years for the recovery of these discrepancies in order to sensitize the decision makers at the national level.

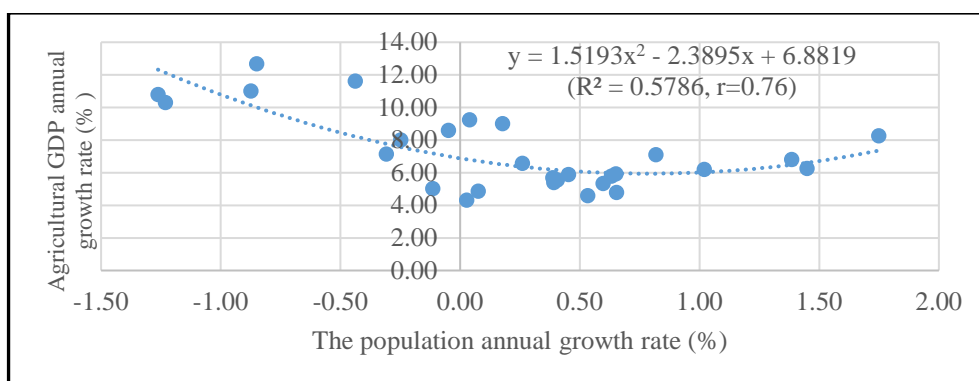
In the period under review, 2000-2014, there is a statistical link between the growth rate of total GDP and population decrease ( $r = 0.51^*$ , figure no. 1). The same tendency is observed at the agricultural GDP increase ( $r = 0.76^*$ , figure no. 2). Of course, these findings are punctual, representing on one hand, the introduction of modern technologies in all activity sectors, but also the population declining trend.

The analysis began by calculating the population's increase and the GDP/countries increase, the total GDP/capita evolution and trend, the agricultural GDP/capita evolution and the convergence trend established by linear regression of total GDP and agricultural GDP with some EU countries, Euro Area average and EU average (figure no. 2).



**Figure no. 1: The link between the total GDP's annual growth rate and the population's annual growth rate at the level of EU countries**

Source: Based on data from The World Bank, 2015



**Figure no. 2: The link between the agricultural GDP's annual growth rate and the population's annual growth rate at the level of EU countries**

Source: Based on data from The World Bank, 2015

Table no. 3 presents the increases, by countries, of both population and also of total GDP and agricultural GDP. It can be observed that among the countries with a higher annual rate of growth of GDP (over 10%) it is also Romania (12,68% annual rate for total GDP and 6,4% for agricultural GDP), along with Latvia and Lithuania, Estonia and Bulgaria.

**Table no. 3: The GDP and population growth, period 2000-2014**

Country, Region	Total GDP					Agricultural GDP					Population				
	2000	2014	Annual growth rate			2000	2014	Annual growth rate			2000	2014	Annual growth rate		
			2000- 2009	2010- 2014	2000- 2014			2000- 2009	2010- 2014	2000- 2014			2000- 2009	2010- 2014	2000- 2014
	Bill. US\$	Bill. US\$	%	%	%	Bill. US\$	Bill. US\$	%	%	%	Mil. Pers.	Mil. Pers.	%	%	%
Austria	196.4	436.9	8.15	1.90	5.88	3.6	6.1	4.0	2.3	3.8	8.01	8.53	0.45	0.51	0.45
Belgium	237.9	531.5	8.22	1.87	5.91	3.1	3.7	1.3	-2.4	1.3	10.25	11.23	0.58	0.69	0.65
Bulgaria	13.1	56.7	16.45	1.84	11.01	1.7	3.0	4.9	4.9	4.3	8.17	7.22	-1.03	-0.59	-0.88
Cyprus	9.9	23.2	11.09	-1.92	6.26	0.4	0.5	5.5	-1.0	3.1	0.94	1.15	1.62	1.11	1.45
Czech R.	61.5	205.3	14.36	-0.04	8.99	2.1	5.6	6.6	12.4	7.2	10.26	10.51	0.20	0.09	0.18
Germany	1,950	3868.3	6.43	2.51	5.01	20.6	26.4	2.2	1.8	1.8	82.21	80.89	-0.04	-0.27	-0.12
Denmark	164.2	342.4	7.69	1.38	5.39	4.1	4.7	-3.0	1.2	1.0	5.34	5.64	0.38	0.41	0.39
Spain	595.4	1381.3	10.80	-1.62	6.20	24.5	34.8	4.1	-1.2	2.5	40.26	46.40	1.58	-0.09	1.02
Estonia	5.7	26.5	14.78	6.15	11.62	0.3	0.9	6.4	10.0	8.9	1.40	1.31	-0.51	-0.34	-0.44
Finland	125.5	272.2	8.03	1.60	5.68	4.2	7.7	4.7	3.3	4.4	5.18	5.46	0.34	0.46	0.39
France	1,368.4	2,829.2	7.82	0.99	5.32	32.1	47.4	2.3	0.1	2.8	60.91	66.21	0.67	0.45	0.60
UK	1,554.8	2,988.9	4.52	5.25	4.78	14.3	20.4	0.0	3.6	2.6	58.89	64.51	0.62	0.69	0.65
Greece	130.5	235.6	10.86	-6.52	4.31	8.0	9.0	3.0	-1.9	0.9	10.92	10.96	0.27	-0.44	0.03
Croatia	21.8	57.1	12.47	-1.85	7.13	1.4	2.5	9.5	-4.0	4.2	4.43	4.24	0.01	-1.03	-0.31
Hungary	47.2	138.3	11.90	1.29	7.99	2.7	6.2	6.0	7.5	6.1	10.21	9.86	-0.21	-0.35	-0.25
Ireland	99.8	250.8	10.00	1.28	6.80	2.8	3.9	-6.6	14.1	2.4	3.81	4.61	1.97	0.29	1.38
Italy	1,142	2,141	7.5	-0.42	4.59	32.5	46.6	3.2	2.7	2.6	56.94	61.34	0.41	0.86	0.53
Lithuania	11.5	48.4	13.97	5.25	10.78	0.7	1.7	4.2	7.7	6.1	3.50	2.93	-1.12	-1.38	-1.26
Luxembourg	21.4	64.9	10.00	5.18	8.25	0.1	0.2	-0.3	7.1	2.0	0.44	0.56	1.48	2.34	1.75
Latvia	7.9	31.3	14.17	3.66	10.30	0.4	1.0	10.0	-0.6	6.8	2.37	1.99	-1.11	-1.30	-1.23
Malta	4.0		8.28	4.46	7.09	0.1		6.7		5.4	0.38	0.43	0.88	0.77	0.82
Netherlands	412.8	879.3	8.47	4.46	5.55	10.3	16.1	3.7	0.3	3.2	15.93	16.85	0.42	0.36	0.41
Poland	171.9	545.0	10.91	4.54	8.59	5.7	18.5	9.1	6.8	8.8	38.26	38.00	-0.03	-0.03	-0.05
Portugal	118.4	230.1	8.36	-1.14	4.86	4.2	5.4	2.7	0.7	1.7	10.29	10.40	0.30	-0.42	0.07
Romania	37.4	199.0	18.11	3.52	12.68	4.5	10.7	9.4	0.3	6.4	22.44	19.91	-1.07	-0.42	-0.85
Slovakia	29.1	100.2	13.17	2.49	9.23	1.3	4.4	9.7	15.1	9.2	5.39	5.42	0.00	0.13	0.04
Slovenia	20.3	49.5	10.57	-0.30	6.56	0.7	1.1	3.9	3.5	3.5	1.99	2.06	0.28	0.17	0.26
Sweden	259.8	571.1	5.75	5.86	5.79	4.9	7.9	2.8	-0.2	3.4	8.87	9.69	0.52	0.82	0.63
Euro area	6487	13,410	7.94	0.77	5.32	154.9	221.2	2.5	1.9	2.6	321	339	0.49	0.19	0.38
EU	8,819	18,514	7.58	1.69	5.44	200.4	291.9	2.2	2.5	2.7	488	508	0.35	0.19	0.29
Worldwide	33,292	77,845	6.72	5.42	6.26	1323.3	*	3.4	6.3	4.6	6116	7261	1.25	1.19	1.23

*Source: Based on data from The World Bank, 2015*

Noteworthy are total GDP/capita growth rate oscillations, for the three analysed periods, i.e.: 7.58% for the period 2000-2009; 1.69% for the period 2010-2014 and 5.44% for the entire period. For the same periods of time, the annual growth rate of the agricultural GDP/capita had very close values: 2.2%, 2.5% and 2.7%. Instead, the demographic increases have not followed the GDP trend; on the contrary, countries listed previously presented annual decreases, around 1%. Countries with more significant population increase (over 1% annual growth rate) are Spain, Cyprus, Ireland and Luxembourg.



### 3.1. The total GDP per capita analysis

Following the data in table no. 4, it can be observed that at the EU's total GDP level it is registered a continuous increase that reaches a maximum in 2008 with 109.7% higher than in the year 2000. In year 2014, the level of GDP has an increase of 101.5% compared to the year 2000, but with a decrease of -3.9% less in relation to year 2008. The adjustment using the linear regression indicates an increasing trend, reaching in the year 2014 at a value of 39,711 US\$/capita, 9% more than the real level. The trend of total GDP was pursued also for the Euro Area, with a maximum point in the year 2008, with an annual growth rate until 2014 of 4.92%. The adjustment using the linear regression demonstrates an increasing trend, and the big difference between the adjusted GDP and the real GDP is of 4253 US\$/capita.

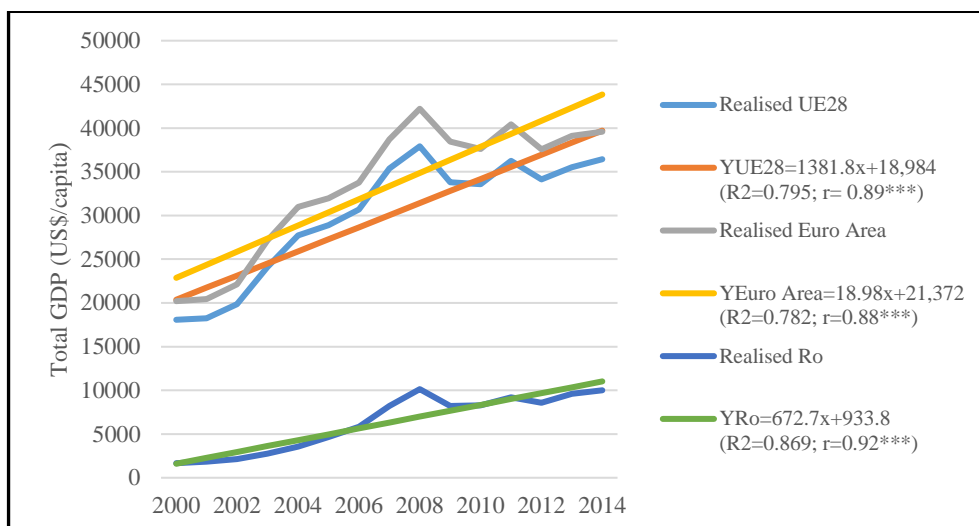
**Table no. 4: Total GDP evolution (US\$/capita in current prices) of Romania and EU, between 2000 and 2014 and the data adjustment with the linear equation**

Years	EU 28		Euro Area		Romania		Total GDP share Ro	
	Achieved	Adjusted	Achieved	Adjusted	Achieved	Adjusted	EU 28	Euro Area
	US\$ /capita	US\$ /capita	US\$ /capita	US\$ /capita	US\$ /capita	US\$ /capita	%	%
2000	18,072	20,366	20,203	22,870	1,668	1,604	9.2	8.3
2001	18,242	21,748	20,440	24,368	1,840	2,276	10.1	9.0
2002	19,843	23,129	22,125	25,866	2,125	2,949	10.7	9.6
2003	24,090	24,511	27,151	27,364	2,775	3,622	11.5	10.2
2004	27,719	25,893	30,970	28,862	3,553	4,295	12.8	11.5
2005	28,883	27,275	31,972	30,360	4,676	4,968	16.2	14.6
2006	30,704	28,657	33,783	31,858	5,829	5,640	19.0	17.3
2007	35,371	30,038	38,696	33,356	8,214	6,313	23.2	21.2
2008	37,916	31,420	42,211	34,854	10,136	6,986	26.7	24.0
2009	33,815	32,802	38,470	36,352	8,220	7,659	24.3	21.4
2010	33,595	34,184	37,603	37,850	8,297	8,331	24.7	22.1
2011	36,244	35,566	40,430	39,348	9,200	9,004	25.4	22.8
2012	34,147	36,947	37,587	40,846	8,577	9,677	25.1	22.8
2013	35,509	38,329	39,103	42,344	9,587	10,350	27.0	24.5
2014	36,423	39,711	39,589	43,842	9,997	11,023	27.4	25.3
Rate (%)	5.13	X	4.92	X	13.64	X	8.09	8.31

Source: Based on data from The World Bank, 2015

In Romania, the level of increases is particularly, and the end of the period, i.e. year 2014 form the chronological analysis, brings an increase of 499.2% compared to the year 2000, this increase peak being in year 2008, followed by decreases quite important due to the strong economic crisis with which Romania was also confronted. Data from the year 2014 demonstrate however an important level of increase in relation to year 2009 (+ 21.6%), reaching a level close to the year 2008 with -1.38% less. Adjustments using the linear equation also indicates an increasing trend, the value in the year 2014 is with 10.2% higher relative to the value achieved in the same year. Regarding Romania's GDP shares in the EU GDP and Euro area GDP, it can be seen that since 2007 have stabilized somewhere between 20% and 27% for both categories. The share's maximum is achieved in 2014, when Romania's GDP had a share of 27.4% of EU GDP and 25.3% of Euro area GDP.

In the figure no. 3, it can be observed very large differences between the average of EU's total GDP, Euro Area GDP and Romania's total GDP level, for both achieved and adjusted values.



**Figure no. 3: Total GDP/capita trend in Romania and at the EU level, established by linear regression, period 2000-2014**

Source: Based on data from The World Bank, 2015

In the year 2014 the difference between EU GDP and GDP of Romania is of 26,426 US\$/capita, i.e. EU GDP value is 3.6 times higher in relation to the value of the Romania's GDP. The figure shows the linear equation, the value of the determination coefficient at EU level and the value of the correlation coefficient. At the EU level, the determination coefficient recorded a value of 0.795, indicating that 79% of the linear equation values variations are given by the trend of the studied years. Also, it can be noticed that the value of the determination coefficient of determination at the level of Romania is of 0.869, indicating that 86.9% of the linear equation values variations are given by the trend of the studied years. All linear equations resulted as having very high determinations and being highly significant.

### 3.2. The agricultural GDP per capita analysis

The data from table no. 5 present the evolution of the agricultural GDP in the EU, the Euro area and at the level of Romania.

**Table no. 5: The agricultural GDP/capita (US\$/capita in current prices) evolution and the data adjustment with the linear equation**

Years	EU 28		Euro Area		Romania		GDP share Ro	
	Achieved	Adjusted	Achieved	Adjusted	Achieved	Adjusted	EU 28	Euro Area
	US\$/capita	US\$/capita	US\$/capita	US\$/capita	US\$/capita	US\$/capita	%	%
2000	411	436	482	511	201	291	48.8	41.6
2001	412	448	481	524	267	315	64.7	55.4
2002	415	459	486	537	267	340	64.3	54.9
2003	485	471	570	550	359	364	73.9	62.8
2004	557	482	638	563	497	389	89.2	77.9

Years	EU 28		Euro Area		Romania		GDP share Ro	
	Achieved	Adjusted	Achieved	Adjusted	Achieved	Adjusted	EU 28	Euro Area
	US\$/capita	US\$/capita	US\$/capita	US\$/capita	US\$/capita	US\$/capita	%	%
2005	497	494	582	575	443	413	89.2	76.2
2006	498	505	575	588	510	438	102.3	88.6
2007	577	517	669	601	449	462	77.8	67.1
2008	599	529	698	614	665	487	111.1	95.3
2009	485	540	578	627	496	511	102.5	85.9
2010	523	552	611	639	520	536	99.4	85.2
2011	587	563	679	652	675	560	115	99.4
2012	552	575	636	665	456	584	82.7	71.7
2013	583	586	676	678	593	609	101.7	87.7
2014	574	598	653	691	536	633	93.3	82.1
Rate (%)	2.43	X	2.19	X	7.28	X	4.74	4.98

Source: Based on data from The World Bank, 2015

Thus, some important aspects can be observed:

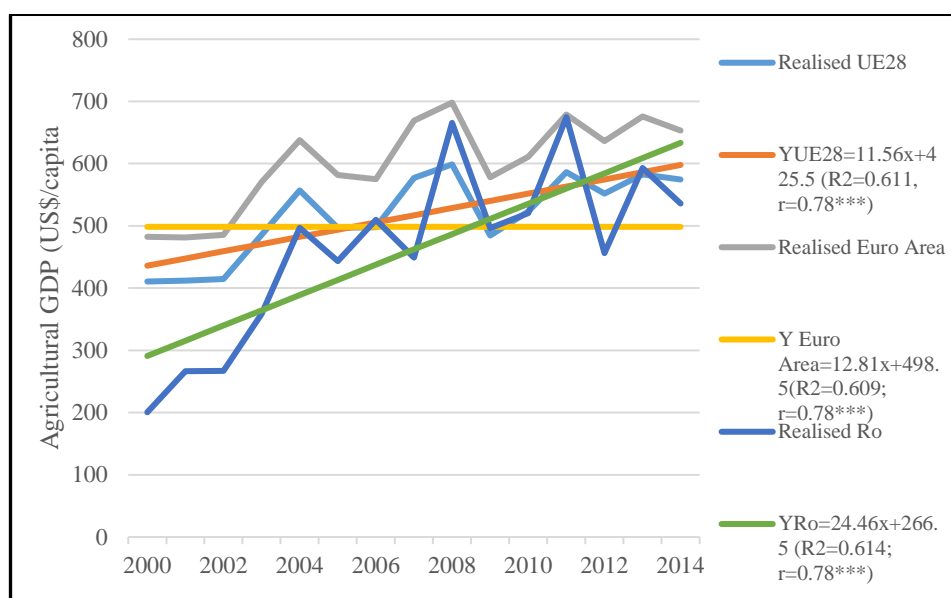
- At the level of the agricultural GDP of EU, a continuous increase that reaches a maximum in 2008 of 599 US\$/capita, with 45.7% more compared to year 2000. In the year 2014 the GDP's level is with 39.7% over the 2000 year level, but with less -4.17% compared to year 2008. The adjustment using linear regression indicates an increasing trend, reaching at the level of year 2014 a value of 598 US\$/capita, with 4.2% more than the real GDP level. It can be seen that, in comparison with total GDP, a greater homogeneity of data, and data does not record values increases so high compared to those previously studied.

- Regarding the Euro Area, there are also increases, with a maximum in 2011 of + 40.9% compared to the first year, and at the end, year 2014, a plus of 35.5% towards year 2000. The difference between 2011 and 2014 years lies at around -46 US\$/capita. Adjustments using the linear equation also show an ascending trend, the value in 2014 being with 5.8% higher relative to the value achieved in the same year of comparison.

- Unlike the total GDP/capita, the agricultural GDP/capita of Romania does not register so great differences compared to the EU 28 and the Euro Area, the increase between 2000 and 2014 has an annual rate of 7.28%, much higher compared to the EU and the Euro Area, i.e. 2.43% and 2.19% respectively. If in the year 2000 the agricultural GDP recorded a value of 201 US\$/capita, being less than 50% compared to the other two categories, in the year 2011 it recorded a maximum of 675 US\$/capita (over the EU average level), to fall by the year 2014 at 536 US\$/capita, representing 93.3% of the EU average and 82.1% of the Euro Area average.

It can be seen the differences in the level of agricultural GDP, from the figure no. 4, in both real and adjusted values. The figure shows the linear equation  $Y_{EU\ 28} = 11.56x + 425.5$  and the determination coefficient at EU level ( $R^2 = 0.611$ ,  $r = 0.78^{***}$ ). The determination coefficient which recorded a value of 0.611, indicating that 61.1% of the values variations of linear equation are given by the trend of the studied years.

The figure no. 4 also shows the linear equations:  $Y_{Euro\ Zone} = 12.81x + 498.5$ , ( $R^2 = 0.609$ ,  $r = 0.78^{***}$ ) and  $Y_{Ro} = 24.46x + 266.5$  ( $R^2 = 0.601$ ,  $r = 0.78^{***}$ ).



**Figure no. 4: The agricultural GDP trend in Romania and at EU level, established by linear regression, period 2000-2014**

Source: Based on data from The World Bank, 2015

A resolution of problems that occur in the way of the economic development is foreseen in the Cohesion Policy 2014-2020 through an investment by 325 billion euro in the Member States, in the cities and regions of Europe, in order to achieve common objectives at EU level relating to economic growth and employment, completed by objectives like to combat climate change, social exclusion and energy dependency. The estimated worldwide impact will likely reach more than 500 billion euros taking into account the contribution of the Member States and the leverage of financial instruments. (European Commission, 2013):

- Investments will be made in all EU regions and will be pursued the level adaptation of national contribution (level of co-financing rate) and the level of assistance at the development level of each region: less developed regions (GDP < 75% of EU-27 average); transitional regions (GDP between 75% and 90% of the EU-27 average); more developed regions (GDP > 90% of EU-27 average).
- The resources orientation toward the main growth sectors. About 66 billion euros will be priority directed towards projects for trans-European networks in transport and environment infrastructure base, through the Cohesion Fund.
- For taking responsibility and tracking results, will be established clear, transparent and measurable goals and objectives.
- In order to ensure more effective investments some conditions will be introduced before accessing the funds.
- Also, it is foreseen a common strategy for a better coordination and less overlapping of effort, the basis being assured by the Common Strategic Framework providing a better coordination between the European investment and the structural funds.

### 3.3. The Romanian GDP per capita convergence with EU countries GDP and EU average GDP

In table no. 6 it can be observed the evolution of total GDP per capita in some countries from EU, including Germany, the country with a high standard of living, to which it can be observed oscillations between years, with an average of 37,568 US\$/capita and an annual growth rate of 5,14%.

**Table no. 6: The total GDP evolution (US\$/capita, in current prices) in Romania and some EU countries, between 2000 and 2014**

Country. Region	UM	2000	2007	2010	2014	Average	Standard Deviation	(C%)	Rate
						US\$ /capita	US\$ /capita	%	%
Germany	US\$/ capita	23719	41815	41788	47822	37568	8557	22.8	5.14
France	US\$/ capita	22466	41601	40706	42733	36242	7994	22.1	4.7
Hungary	US\$/ capita	4620	13831	13009	14029	11175	3438	30.8	8.26
Italy	US\$/ capita	20059	37716	35878	34909	32097	6617	20.6	4.04
Poland	US\$/ capita	4493	11248	12597	14343	9888	3752	37.9	8.64
Euro Area	US\$/ capita	1668	8214	8297	9997	6313	3226	51.1	13.6 4
UE	US\$/ capita	20203	38696	37603	39589	33355	7574	22.7	4.92
World	US\$/ capita	18072	35371	33595	36423	30038	6930	23.1	5.13
Germany	US\$/ capita	5443	8617	9472	10721	8161	2005	24.6	4.96

Source: Based on data from The World Bank, 2015

Germany reaches a level double in 2014 compared to the first year 2000, 2014 being also the year when GDP recorded the highest value. The variation coefficient has a value of 22.8%, which is considered high. France is also a country that far outstrips the EU average level, reaching in 2014 a value of 42,733 US\$/capita (C=22.1%), while the EU average is located at 36,423 US\$/capita. A level closer to our country has Hungary, that records increases with an annual growth rate of 8.26% (C%=30.5, very high). It can be seen that annual growth rate is the highest in Romania, the reason being the strong economic boost in the last years.

In table no. 7 are calculated the years to achieve our country convergence with the level of the other studied countries. At a level of an annual growth rate by 13.6% (the average for the period 2000-2014), Romania will converge at the level of total GDP of Germany in 20 years, of France in 17.8 years and of Hungary in 7 years. At the average level of the EU total GDP (US\$/capita), Romania could converge in 16.6 years. Following the convergence variants, where the annual growth rate would reach 20%, Romania could reduce the gap, the convergence with the level of Germany reaching in 11.8 years, France in 10.6 years, 3.2 with Hungary and 3.6 years with Poland.

**Table no. 7: The calculation of the number of years for achieving the convergence of total GDP/capita of Romania with total GDP/capita of some EU countries**  
US\$/capita, in current prices)

The initial level of GDP (2014)			GDP /capita (2014)	Discrepancies (GDP Ro at GDP UE countries)	Annual growth rates in Romania-variants				
Country, Region	Total GDP/capita (2014)	The annual growth rate in EU countries an EU28 (2000-2014)			0.08	0.1	0.136 (real 2000-2014)	0.18	0.2
Germany	47822	0.0514	9997	1 to 4.7	58	34	20	13.5	11.8
France	42733	0.047	9997	1 to 4.2	46	29.4	17.8	12.1	10.6
Hungary	14029	0.0826	9997	1 to 1.4	-	21	7	3.9	3.2
Italy	34909	0.0404	9997	1 to 3.4	-	22.4	14.2	9.9	8.7
Poland	14343	0.0864	9997	1 to 1.4	-	29	8.1	4.3	3.6
Euro Area	39589	0.0492	9997	1 to 3.9	47	29.1	17.3	11.7	10.2
UE	36423	0.0513	9997	1 to 3.6	48	28.5	16.6	11.1	9.7
World	10721	0.0496	9997	1 to 1.1	2.4	1.4	0.8	1.4	0.5

Source: Based on data from The World Bank, 2015

Analyzing the data from table no. 8, Italy is the country with the highest agricultural GDP/capita 760\$/capita in the year 2014 (C%=12.5), followed by France with 715.9US\$/capita, being known the development of these countries in the agricultural sector where the growth rates for these two countries are 2.06% and 2.22% respectively. For the period 2000-2014, higher growth rates can be observed at Hungary, of 6.34% (C%=38.0). In Romania the annual growth rate for the analyzed period is of 7.28% (C%=30.2). The variation coefficient and the standard deviation showing big differences between the results obtained for all three countries.

**Table no. 8: The agricultural GDP evolution (US\$/capita, in current prices), in Romania and some EU countries, period 2000-2014**

Country, Region	UM	2000	2007	2010	2014	Average	Standard Deviation	(C%)	Rate
						US\$/capita	US\$/capita	%	%
Germany	US\$/capita	251	345	301	326	312	51	16.3	1.90
France	US\$/capita	526	749	725	716	664	89	13.4	2.22
Hungary	US\$/capita	265	551	463	626	486	126	26.0	6.34
Italy	US\$/capita	571	793	706	760	727	91	12.5	2.06
Poland	US\$/capita	148	387	373	486	316	120	38.0	8.85
Euro Area	US\$/capita	201	449	520	536	462	140	30.2	7.28
UE	US\$/capita	482	669	611	653	601	73	12.2	2.19
World	US\$/capita	411	577	523	574	517	66	12.8	2.43
Germany	US\$/capita	216	264	285	...	244	79	32.4	3.33

Source: Based on data from The World Bank, 2015

Analyzing the discrepancies between agricultural GDP of Romania and agricultural GDP of other EU countries (table no. 9), it can be observed:

- the discrepancies between Romania and France is 1 to 0.6; between Romania and Italy is 1 to 1.4, between Romania and Hungary the discrepancy is 1 to 1.2; between Romania and the EU average the discrepancy is 1 to 0.5.
- at an annual growth rate of the agricultural GDP/capita of 7.2% in Romania, the other countries keeping the current rate, Romania could converge in 6.1 years with France, in 7.1 years with Italy, in 19.2 years with Hungary and in 4.2 years with the EU average.
- for an average annual growth rate of 0,15%, Romania would converge to the EU average for agricultural GDP/capita in 0.5 years, the gaps being much reduced for this annual growth rate.

**Table no. 9: The calculation of the number of years for achieving the convergence of agricultural GDP/capita of Romania with agricultural GDP/capita of some EU countries (US\$, in current prices )**

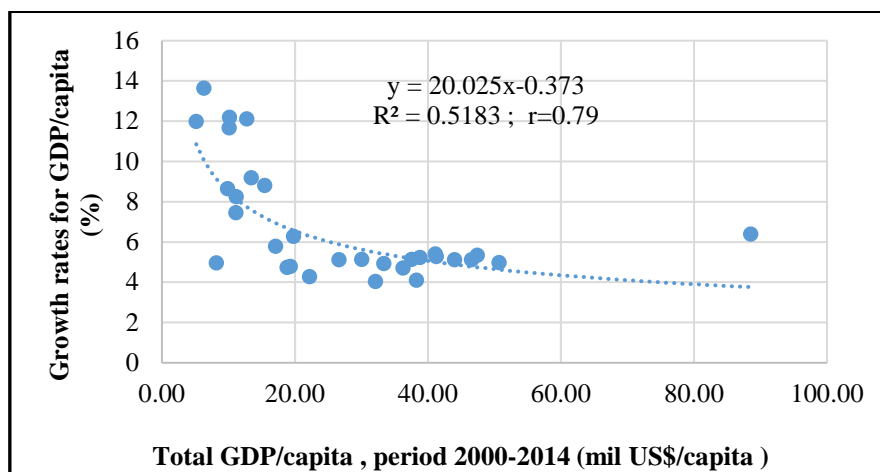
The initial level of GDP ( 2014)			GDP /capita (2014)	Discrepancies (GDP Ro at GDP UE countries)	Annual growth rates in Romania-variants				
Country, Region	Total GDP/capita (2014)	The annual growth rate in EU countries an EU28 (2000-2014)			0.03	0.05	0.072 (real 2000-2014)	0.1	0.15
					No. of years for achieving the convergence				
Germany	326	0.019	536	1 to 0.6					
France	716	0.022	536	1 to 1.3	38	10	6.1	3	2.4
Hungary	626	0.063	536	1 to 1.2			19.2	4.6	0.1
Italy	760	0.021	536	1 to 1.4	38	12.2	7.1	4.6	2.9
Poland	486	0.089	536	1 to 0.9					
Euro Area	653	0.022	536	1 to 1.2	24	7.2	4.2	2.6	1.6
UE	574	0.024	536	1 to 0.5	12	2.7	1.5	0.9	0.5
World	285	0.033	536	1 to 0.53					

Source: Based on data from The World Bank, 2015

At the level of the European Union level, there are big gaps between the former socialist countries, among them also Romania, and the West European countries from the European Union. There is although a visible tendency of reducing those discrepancies.

In the period 2000-2014 the first places regarding the size of the annual growth rate of GDP/capita are occupied, in order by: Romania (1); Lithuania (2); Estonia (3); Bulgaria (4); Latvia (5); Slovakia (6); Czech Republic (7), Poland (8); Hungary (9) and Croatia (10). These group of countries has an average growth rate of 10.3% and an average GDP of 10554 US\$/capita. The next group of 18 countries has an average annual growth rate of 5.12% and an average GDP of 37369 US\$/capita.

Thus, by a power function  $Y = 20.025x^{(-0.373)}$  it can be expressed this link, that has a significant correlation coefficient ( $r = 0.79***$ ), indicating a high intensity of the identified link. This shows that as the GDP/capita increases, the annual growth rate decreases (figure no. 5).



**Figure no. 5: Correlation between the annual growth rate of GDP/capita and the GDP/capita value at the EU level during 2000-2014**

*Source: Based on data from The World Bank, 2015*

These data come to support the convergence, expressed in terms of GDP/ capita, i.e. lower income countries approach the higher income countries, through the increasing of the annual growth rate.

## Conclusions

Romania has had significant growth within the total GDP and agricultural GDP, but gaps in the past have made our country level to be far lower than the average of EU and the majority of EU countries, in particular for total GDP. According to estimates made by BMI experts, the GDP level will continue to grow at the level of the years 2015 and 2016, with percentages ranging from 3.4% and 3.6% and the estimate submitted by the Commission for Prognosis ranks the same indicator between 2.4% and 2.5%.

The analysis made with the simple or linear regression validates an increasing trend of total GDP at both EU 28 level and for Romania, the recorded total GDP increases for Romania showing oscillations up to + 500% from the base year 2000. As regards the evolution of the agricultural GDP/capita, it can be observed at the EU level values increases, but with greater uniformity compared to total GDP/capita, while at the Romanian level oscillations reach a maximum in 2011, hovering, in 2008-2009, 2011 and 2013 over the Euro Area average.

The calculations regarding the convergence of total GDP of Romania with total GDP of EU identify very large differences between our country and other countries, Romania being able to reach their level, following increases of both variables, in 7 years (Hungary) and 20 years (Germany). The EU average can be reached in 9.7 years in case of an annual growth rate of 0.2%. The convergence of agricultural GDP of Romania with agricultural GDP of EU indicates greater alignment with France, with which we could converge after 6.1 years, while convergence with EU or Euro Area average is much reduced, in the case of an annual growth rate of 0.15%, the convergence being obtained in 1.6 years with Euro Area and



0.5 years with EU 28. The convergent evolution of the Romania's GDP compared with the EU countries GDP requires strategic solution for the economic growth process optimization, the resulted discrepancies requesting finding some solutions that can increase the convergence degree.

It is necessary the implementation and compliance with the development conditions of the Convergence Programme and the Development Strategy to be able to converge in a reduced period of time with the developed European countries, both from economic and agricultural points of view. It can be added also that for accession to the single currency, Romania must ensure a sufficiently higher degree of convergence of income per capita, because according to the governor of the National Bank of Romania, if there is a big gap of convergence it exists the risk to complicate the management of economic cycles in the absence of an independent monetary policy (Isărescu, 2015).

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