

Romania's Agriculture and its Role in the Convergence Process

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Abstract: - The importance of agriculture in Romania is linked to the fact that 45% of its population is in the rural area, mostly dependent on agricultural activities. This paper aims to determine in what extent agriculture influences the convergence process of Romania with the euro area. The structural convergence index is computed in order to assess the degree in which the structure of the Romanian economy resembles the one of the euro area in terms of both gross value added and employment. Research indicates that Romania has the lowest score in terms of structural convergence with the euro area. The main reason is the oversized agricultural sector which employs almost a third of the active population. The productivity of the Romanian agriculture is then assessed in order to identify its possible effect on the country's overall competitiveness and on the whole convergence process.

Key-Words: agriculture, structural and employment convergence, productivity, economies of scale.

1. Introduction

Economic integration in the EU of the Member States has a major impact on the structure and dynamics of macroeconomic indicators in these countries. Structural concordance between the Romanian economy and that of other EU countries is relevant for two major reasons. The structural convergence is part of the real convergence with the European economic model, a process that involves the convergence of income, productivity, occupational structure, relative prices and educational standards. First, structural convergence ensures a greater efficiency of common policies. Asymmetric shocks have a smaller impact in case of a high structural convergence (Marinas, 2006, pg.1). Countries with similar economic structure will have a high share of intra-industry trade, positively influencing the symmetry of shocks and business cycles consistency.

Second, resource allocation to sectors with low added value (eg agriculture) affects economic growth and income convergence towards the European average. As an economy advances, a migration of the labour force is desired towards the more productive sectors (industry and services), in order to increase the country's competitiveness.

This paper starts with the evaluation of structural convergence of Romanian economy to the euro area. The results show a significant difference in terms of structure. Of all EU member states, the Romanian economy is the most divergent and the main reason is the agriculture sector that has the biggest share in national GDP among EU28 member states. Apart the structural differences and the issues it raises, agriculture has a very low added value and this affects the country's overall performance.

After analyzing the structural differences and identifying agriculture to be the main reason we then turn to assessing the productivity of Romanian agriculture in European context and what are the implications on the country's economic performance and its convergence process with the European Union.

The importance of agriculture in the Europe economies drew particular attention to economic research papers, in terms of efficient allocation of resources but also in terms of the social role of the primary sector. Schultz's theory (1964) argued about the inverse relationship between land holding size and productivity

launching a long debate because of the general positive relationship belief. Since then, Rusu (2000), Aligică and Dabu (2003), Swinnen (2003) and Hartvigsen (2013) addressed the issue of area fragmentation from different angles: economic, social, political and legislative.

A similar approach had Mazoyer and Roudart (2002). They emphasized the direct link between farm size and the degree of technological endowment, using historical analyzes about the development of agricultural production systems. According to the results, productivity is determined by the ratio between the surface and workers but also by the use of fixed capital.

Swinnen and Ciaian (2008) examined the role of the agricultural sector on the economic growth process of the Romanian economy in the context of EU integration and the key issues that impede the convergence process. Similarly, Dachin (2011) evaluated empirically the oscillations of agricultural production and how they influence the GDP evolution, agricultural price volatility, and how the work of small farms have a counter-cyclical role in the economy in crisis conditions. Marinas (2006) analyzed the peculiarities of the structural adjustment process of the Romanian economy, compared to the evolution of other new Member States. Results indicate that a high degree of structural divergence may lead to a reduced impact of common policies and that structural changes can act as a source of economic growth and productivity improvement.

2. Romania's structural convergence with the euro area

One of the most used methods to measure the degree of convergence of economic structure is based on the Krugman index. Simply put, it is a comparison between the added value structure of two economies, calculated from the difference between the weights of sectors in total value added.

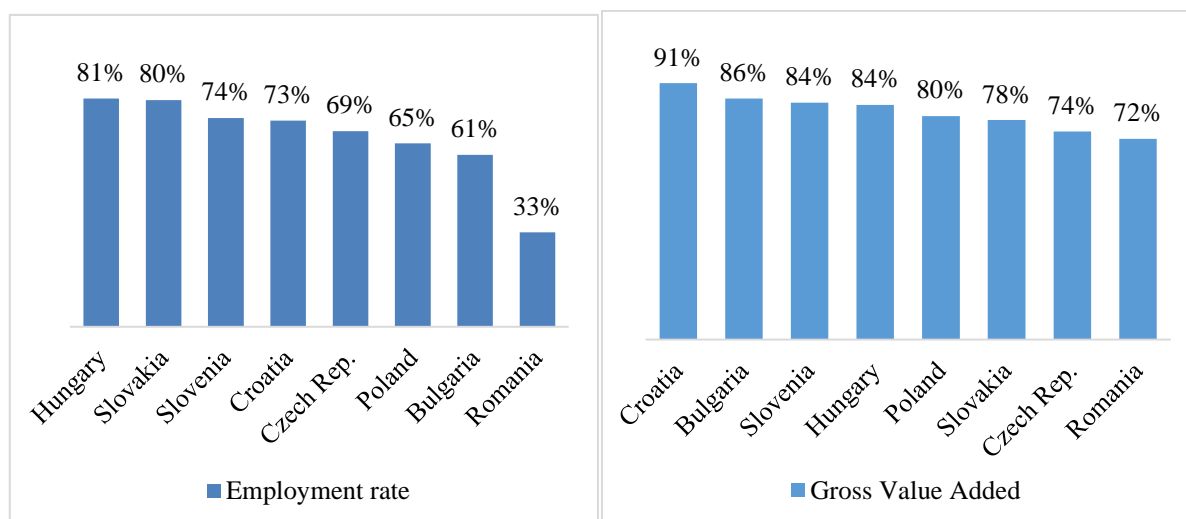
$$[1] \quad K_{A,B} = \sum |GVA_A^i(t) - GVA_B^i(t)|$$

Where $K_{A,B}$ is the Krugman specialization index which shows how divergent economies of countries A and B are. GVA^i represents the share of gross value added of sector i in total gross value added. The share of gross value added can be replaced by the percentage of people employed in sector i in total occupied population nationwide.

The economic structure of euro area is chosen as a benchmark as it represents the core of the European Union, producing 73% of gross value added in the EU28. In addition, the differences between the euro area and EU28 are very small, both in terms of GVA and employment rate (the difference between the weights of the three sectors analyzed is less than 0.2 pp in terms of GVA, and less than 3.7pp for employment).

Krugman index is essentially the sum of the weights differences in economic sectors of the two countries. A higher value means a higher degree of divergence between the structures of the two economies. The values it can take are between zero, in which case the two economies have identical structure and 200, an extreme case in which all economic activity in each country is concentrated in maximum $(n + 1)/2$ sectors where n is the total number of sectors analyzed. Due to the fact that for the countries analyzed in this study (Bulgaria, Czech Republic, Croatia, Hungary, Poland, Romania, Slovenia and Slovakia) the Krugman index of convergence with the euro area is less than 50 for all years analyzed, we calculated an index of convergence equal to 100% minus Krugman index value. The rationale is that the Krugman index value is inversely proportional to the degree of convergence, while the index we calculated is directly proportional to the degree of convergence. In other terms, as the value of the convergence index increases, so does the convergence degree.

Figure 1. Structural convergence index with the euro area in 2013



Source: own computation based on Eurostat data;

Figure 1 illustrates the values of the convergence index with the euro area for Romania and neighboring Member States that have been under communist rule. Two of them, Slovenia and Slovakia have adopted the euro in 2007 and 2009. First it can be noticed that in terms of gross value added, the countries have a higher convergence with the euro area than in terms of employment rate. Moreover, although members of the Eurozone, Slovenia and Slovakia do not have the highest degree of convergence with it. Romanian economy structure resembles the least of all the economic structure of the euro area. Regarding the GVA, the convergence score is close to that of others' states, while in terms of employment rate there are major differences.

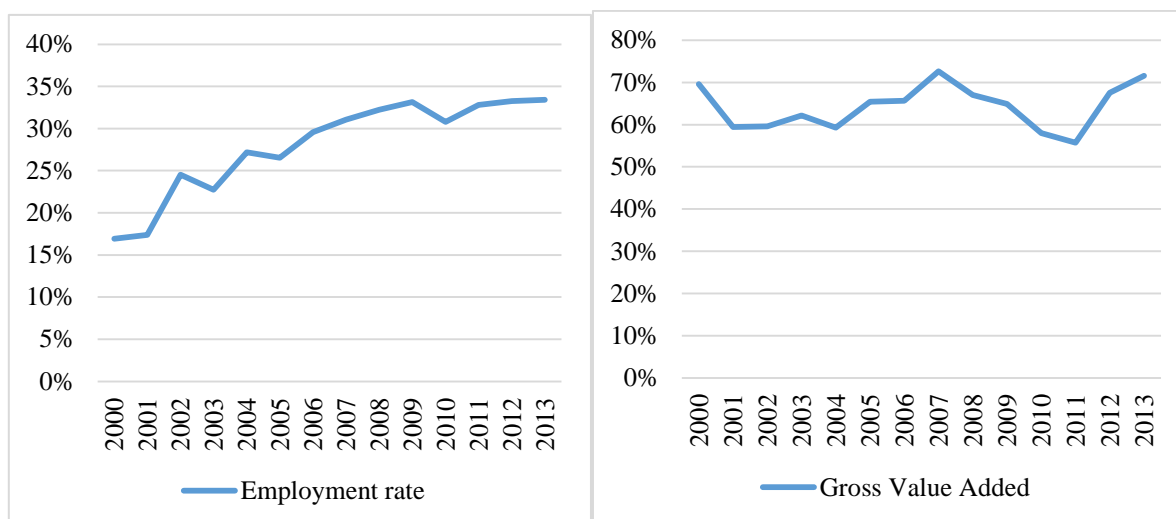
Table 1. Comparison between Romania and EU28 economic structures in GVA and employment (2013)

	Gross Value Added			Employment rate		
	Agriculture	Industry	Services	Agriculture	Industry	Services
EU28	1.70%	24.60%	73.60%	3.30%	21.40%	75.30%
Romania	6.20%	34.40%	59.40%	30.20%	27.90%	42.00%

Source: Eurostat

Difference between the two economies totals 28 percentage points for GVA shares and 67 percentage points for employment shares. Looking at the causes of the structural difference it can be noticed that both agriculture and industry occupy a higher share in Romania than in the euro area (Table 1). The employment rate in agriculture in Romania is over nine times higher than in the euro zone, amounting to 27 percentage points in absolute terms.

Figure 2. Evolution of structural convergence index with the euro area



Source: own computation based on Eurostat data;

The evolution over time reveals that in terms of employment rate, the convergence index had a growing trend. The convergence index values in GVA followed a more complex pattern, reaching a maximum in 2007, before the onset of the financial crisis, declined until 2011 and then growing back to reach 72% in 2013.

The changes in the structure of gross added value consisted in reducing the weight of the agricultural sector, from 12% in 2000 to 6% in 2013. Industry and services have evolved around a horizontal trend.

Greater changes took place in the employment figures. The share of people employed in agriculture fell from 45% in 2000 to 30% in 2013, which in absolute terms means a reduction from 4.8 million to 2.6 million people. Services have experienced an opposite trend: the share increased from 28% in 2000 to 42% in 2013. Due to the massive decline in the total number of persons employed in total economy (from 10,8 million in 2000 to 8,6 million in 2013), in absolute terms the increase was relatively small, from 3.0 million to 3.6 million people employed in services.

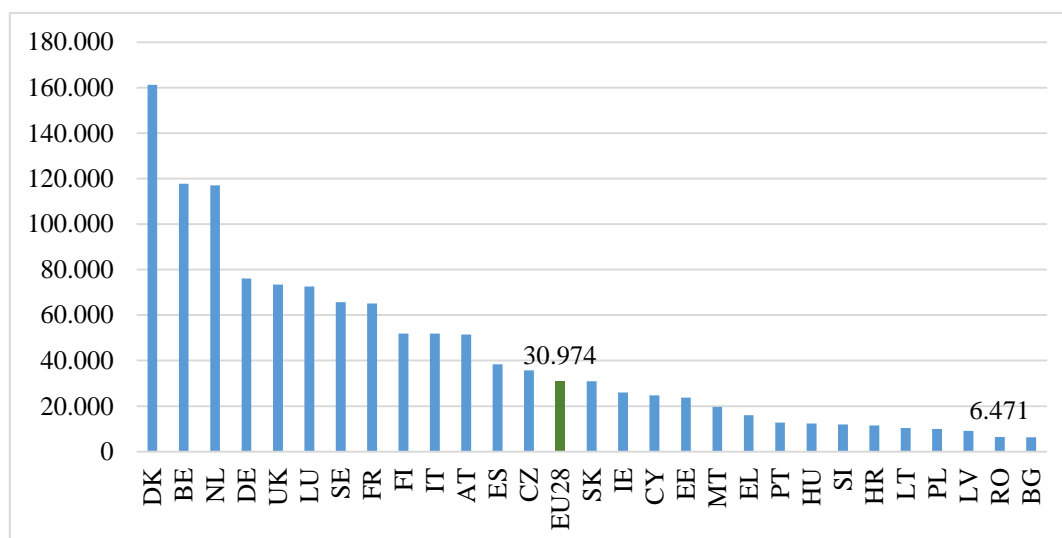
3. Productivity of Romanian agriculture

Romania has the second lowest GDP per inhabitant in Europe and this reflects the low productivity of its economy. Out of 28 member states, Romania holds the 23rd position in the Competitiveness Index made by the World Economic Forum¹. The low competitiveness of the country compared with the euro area is due to a very low productivity of agriculture. One way to evaluate the performance of agriculture involves dividing the output to input factors.

Standard output (SO) is a measure of the production or the business size of an agricultural holding. It is based on the separate activities or 'enterprises' of a farm and their relative contribution to overall revenue. This indicator reflects the performance of a country's agriculture in absolute terms. In 2010 in the European Union, the countries with the highest standard output were France (51 bill. Euro), Italy (49 bill. Euro), Germany (41 bill. Euro), Spain (34 bill. Euro), UK (20 bill. Euro), Poland (19 bill. Euro), the Netherlands (19 bill. Euro) and Romania (10 bill. Euro).

But these numbers show the whole production of a country, which uses a specific set of inputs to generate this output. Therefore, to properly reflect the agricultural performance of a country the national output must be divided by the inputs in agriculture. The labor input is measured using annual working units (AWU), an indicator which takes account of part-time and seasonal work. One AWU corresponds to the input, measured in working time, of one person engaged in agricultural activities in an farm on a full-time basis over an entire year. Thus labor productivity is measured by the standard output (SO) divided by the annual working units (AWU).

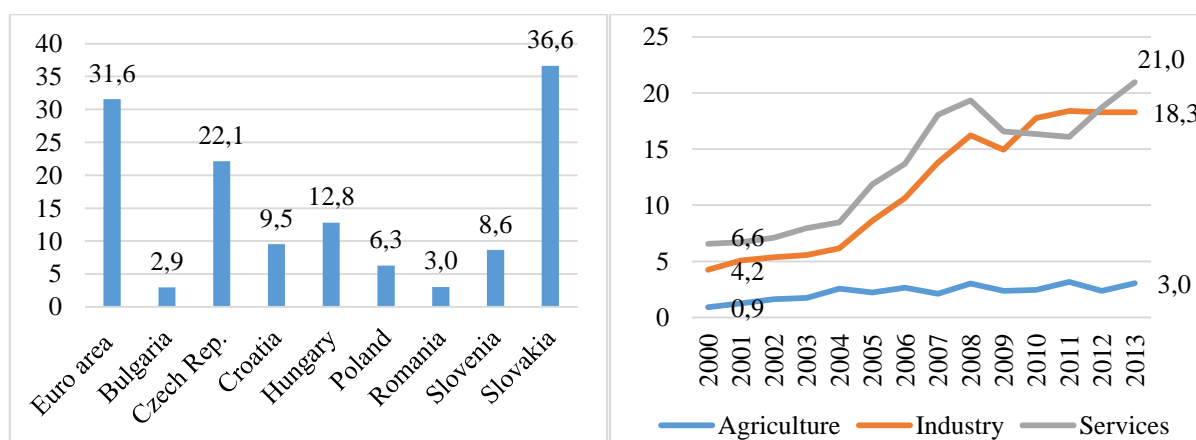
Figure 3. Standard output (euro) / Annual work unit in 2010



Source: own computation based on Eurostat data;

On average, the annual production value of a full-time worker in Romanian agriculture is 6471 euros. In the European Union it is the second most unfavorable performance after the one of Bulgaria (6,240 euros / AWU). Labor productivity in France, Sweden, UK, Germany, the Netherlands, and Belgium is over ten times higher, while the EU28 average is five times higher than the one in Romania.

Figure 4. Gross value added per person employed in agriculture (international comparison in the left chart; comparison with industry and services within Romania in the right chart)

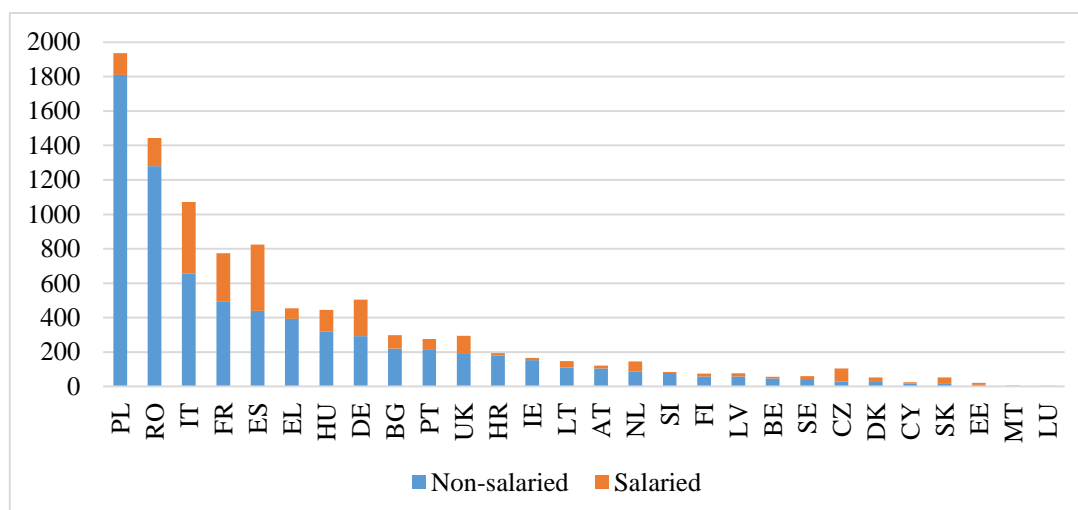


Source: own computation based on Eurostat data;

Another indicator of performance is the gross value added per employed person. Figure 4 (left chart) shows the relative GVA per employed person in Romania, the neighboring countries and the euro area average. A farmer in Romania, on average, brings an added value ten times smaller than a farmer in the euro area. This can be explained by the large numbers of auto-consumption agricultural units and by the very low agricultural mechanization. In national context agriculture productivity is also very low: 6 times lower than in industry and 7 times lower than in services (figure 4, chart on the right).

Agriculture, although employs 30% of total employment, generates only 6% of gross value added because most are working in the family farms where much of the production is used for own consumption. Only Poland engages more people in agriculture than Romania. In 2014 there were about 1.4 million people, equivalent full-time workers, in Romanian agriculture, out of which only 11% are officially employed.

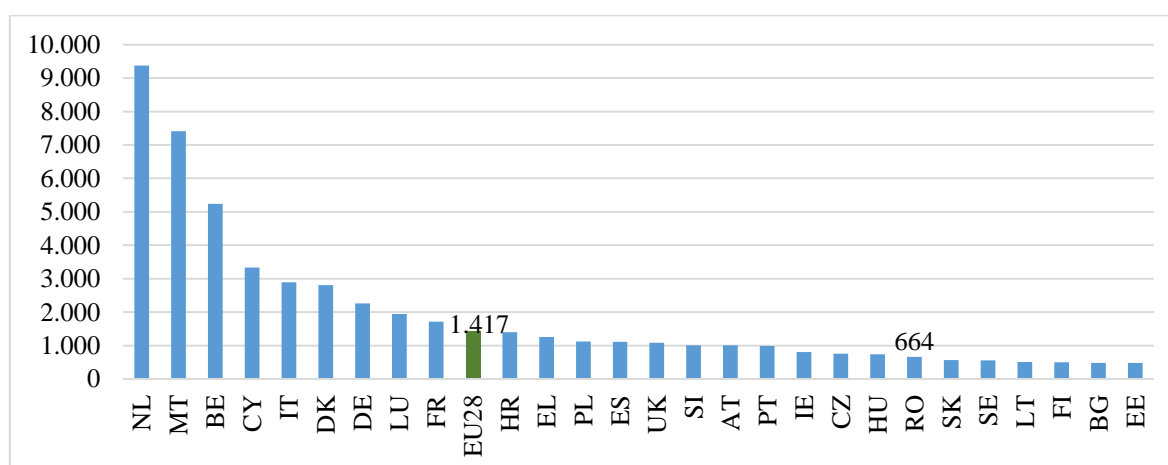
Figure 5. Labor force input in agriculture in 2014 (1000 AWU)



Source: Eurostat;

This situation also reflects the social role of agriculture in Romania. A high percentage of indigenous people in rural areas depend on auto-consumption goods resulted from agricultural activities, produced in the absence of other employment opportunities and in conditions of insufficient income. Also, over the years, on the path of transition to a market economy, subsistence agriculture mitigated unemployment amid deindustrialization of the Romanian economy. (Gibeah et. all, 2009).

Figure 6. Standard output (euro) per hectare in 2010



Source: own computation based on Eurostat data;

Agricultural productivity can be assessed in connection with the surface. Dividing the standard output by the number of hectares used in agriculture production per hectare is obtained, an indicator expressed in euros. The score obtained is better than in labor productivity. The economic value produced by a hectare in Romania is only half the EU average. Moreover, the land is more productive in Romania than in only other 6 Member States. The relative higher productivity indicates natural comparative advantages of Romania in relation to other Member States: climate, soil quality, large plain surfaces etc. At the same time, a major disadvantage is that the agricultural area is excessively fragmented, causing decreasing returns to scale. This situation has its roots in i) the application of Land Law (18/1991) that involved a process of de-collectivization of land, when former owners received no more than 10 hectares per family and ii) the excessive regulation of land transactions until 1997 (Oțiman , Steriu, 2012).

According to Eurostat data, the average size of farms in Romania in 2010 is much lower than the European average (3.4 ha to 33.1 ha), which determines the non-commercial profile of local production units. Moreover, out of the total 5,955,770 European farms which uses more than 50% of production for auto-consumption, 3,589,530 are localized in Romania (approximately 60.3%). Also, according to the National

Statistics Institute (Household Budget Survey), in 2013 consumption from own resources accounted for approximately 61.3% of total consumption expenditure and 165% of the expenditure for food and beverages consumed in rural households. These data reflect the fact that the high number of small farms contribute significantly to food security of the rural population (Otiman, Steriu 2012, p.27), despite the fact that excessive division of agricultural areas causes high rates of auto-consumption, low productivity and lack of real possibilities of horizontal and vertical integration in production pathways (in order to enter the markets for agricultural commodities and food).

Figure 7. Share of holdings with more than 50% of production self-consumed by the holder

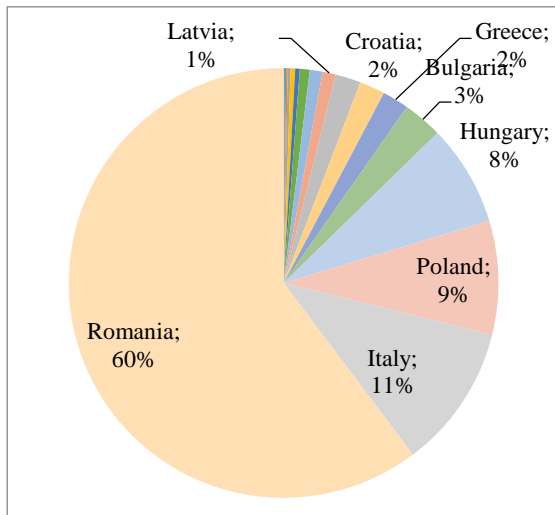
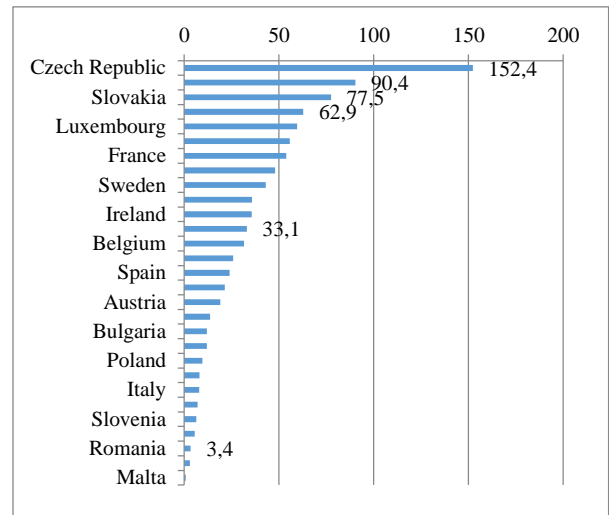


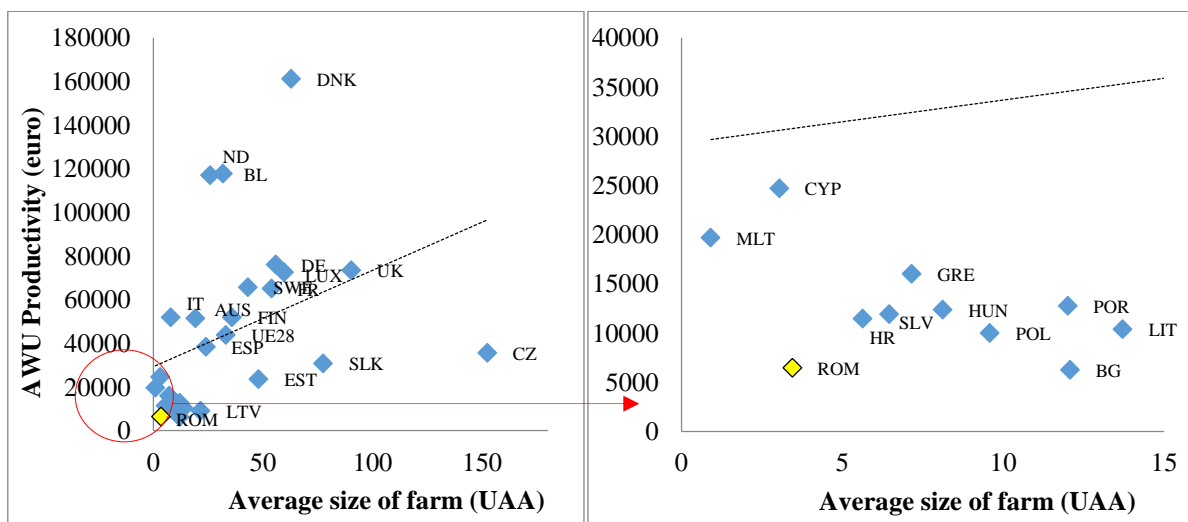
Figure 8. Average size of farm (utilised agricultural area – ha, 2010)



Source: own computation based on Eurostat data;

At the European level there is a direct link between farm size and productivity (shown in figure 9). As the farm is greater, the greater its productivity. This can be explained by the fact that a small farm has low financial resources, which rarely allow it to buy equipment. Then, even if they could afford to buy equipment, it would not be cost effective given the small size of the farm and its production possibilities. Thus, in these units, much of the work is done manually by workers.

Figure 9. Labor productivity (in euro/AWU) and average size of farm in EU28 in 2010

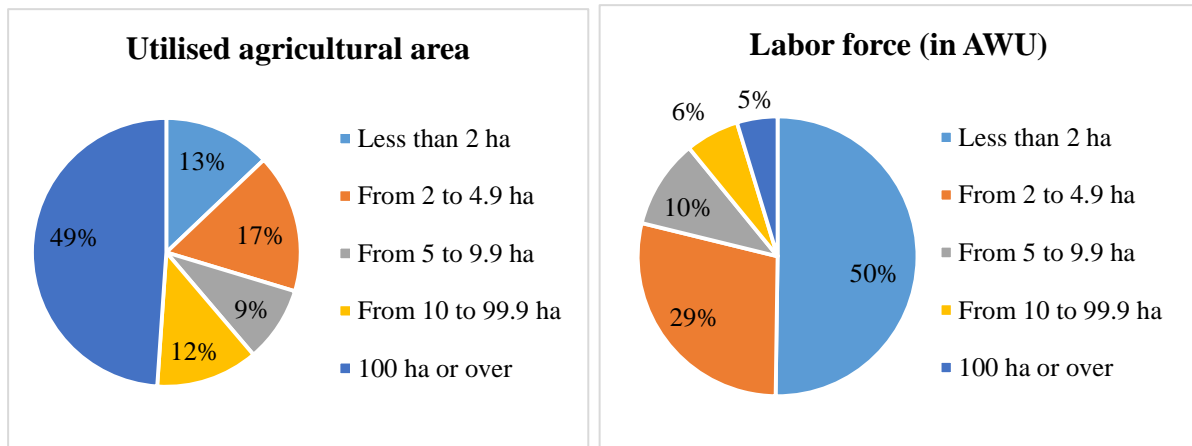


Source: own computation based on Eurostat data;

The relationship between the utilized agricultural area (UAA) and the number of persons employed can be seen in figure 10. Small farms, with a size of up to 2 hectares, occupy in total only 13% of the total land used for agriculture, but employ half of all people employed in agriculture. In contrast, large farms of over 100

hectares uses half of the country's agricultural land and employs only 5% of the population employed in agriculture.

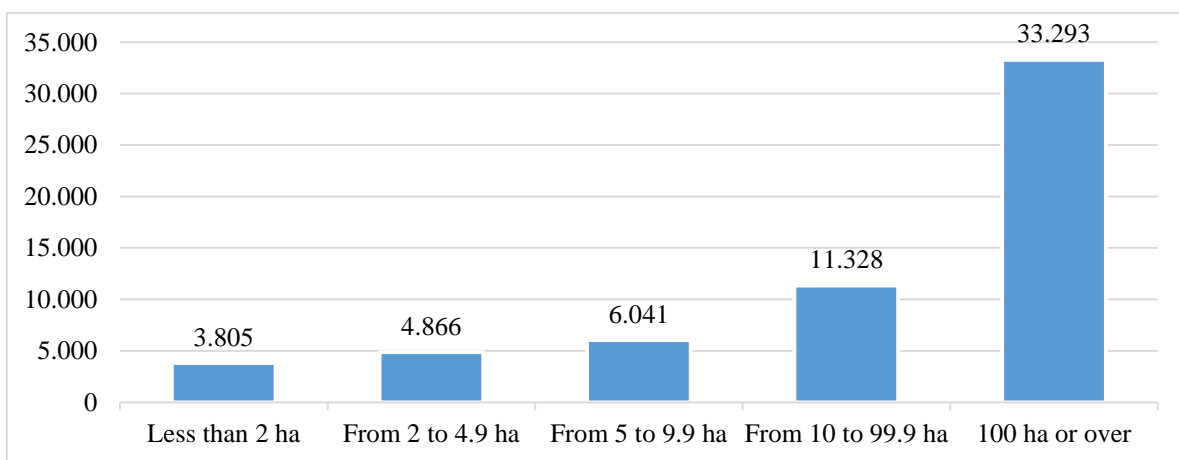
Figure 10. Utilized agricultural area and labor force input in Romania agriculture by size of farm in 2010



Source: own computation based on Eurostat data;

Figure 11 illustrates the labor productivity in agriculture according to farm size. As expected, small farms are less productive (almost nine times) than large farms of over 100 hectares. This confirms that small farms are very poorly mechanized and require additional labor. As farm size increases so does labor productivity, a sign that more machines and less work force is used as the farm size increases.

Figure 11. Standard output per annual work unit in Romania in 2010



Source: own computation based on Eurostat data;

According to results, there is a Pearson correlation coefficient of 0.382 (weak direct link) between the average size of holdings and the ratio of output and total employment in EU farms. These results indicate that there are other factors that influence labor productivity in European farms.

Another factor that determines the productivity of labor in farms in Romania is the training of managers of agricultural production units. Eurostat data shows that 97.5% of farm managers in Romania (covering over 72.4% of UAA) have only practical agricultural experience. Only 2.5% of holdings managers are graduates of agricultural education, compared to the European average of 34.2% (MARD, Raport Strategic de Monitorizare, 2014). Studies show that management skills are an important factor for generating gains in competitiveness. However the impact of schooling on agricultural productivity is higher in economies using modern methods of production, compared to those based on a traditional structure (Luke Cionga , Giurcă 2012, p.66).

Table 2. Agricultural training of farm managers (share of total holdings and utilised agriculture area - 2010)

	Practical experience only		Basic training		Full agricultural training	
	Total number of holdings	Utilised agricultural area	Total number of holdings	Utilised agricultural area	Total number of holdings	Utilised agricultural area
Romania	97,5%	72,4%	2,1%	11,7%	0,4%	15,9%
UE28	65,8%	45,2%	21,4%	26,3%	12,8%	28,5%

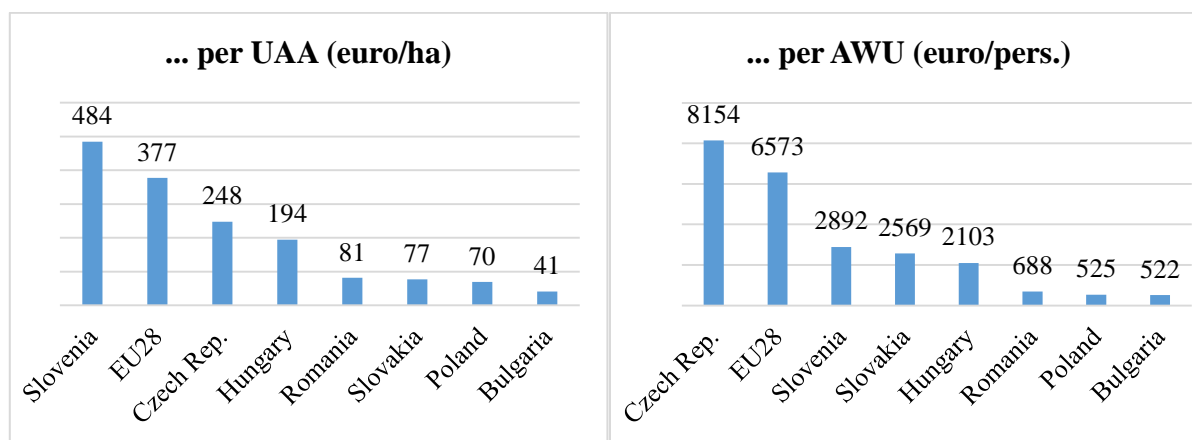
Source: Eurostat;

The lack of equipment and machinery in Romanian farms is a factor that limits the performance of the agricultural sector and the analysis of gross fixed capital formation in Romanian agriculture shows, not surprisingly, that Romania scores very low compared to other EU countries.

Although agriculture represents 6.2% of the whole economy and occupies one third of the total employed population, it receives only 2.9% of the total gross fixed capital formation (GFCF). Divided by the utilized agricultural area (UAA), the amount of GFCF amounts to 81 euros per hectare, the fifth lowest in the European Union. But the situation has been worse in the past. Real progress has been made and this is due to the highest growth rate of GFCF in Europe. The amount in 2012 is 2.5 times higher than the one in 2005, Romania speeding up the catching-up process with the core of the European Union, which, in the same period advanced only by 17%.

In terms of gross fixed capital formation per average equivalent full-time employee (annual working unit - AWU), the distance from the EU28 average is remarkable: Romania scores almost ten times lower. The main reason for the difference between the per area score and the per employee score has to do with the very high number of small, subsistence farms. As argued above, these units cannot afford to invest in fixed assets.

Figure 12. Gross fixed capital formation in agriculture in 2012



Source: own computation based on data from Eurostat and *Agriculture in the European Union, statistical and economic information report 2013*, EU, DG AGRI.

According to Otiman (2012, p.16) the structure of fixed capital stock in Romanian farms is very different (unfavorable) from the one in countries with a developed agriculture, such as France. While in France the "active" fixed capital (tractors, equipment, plantations, breeding livestock and infrastructure) accounts for 80% while the land for only 20%, in Romania the situation is almost the opposite. Although the agricultural land at market value is worth 5-6 times lower than in France, it has a share of 67% in the fixed capital stock while directly productive fixed assets represent only 33%. These large gaps in „active” capital endowment between the farms in Romania and the ones in the euro area leads not only to unequal levels of competitiveness but also to asymmetric productive structures.

One possible solution to overcome some of the problems of the Romanian agricultural sector is to build up associations of farmers. This measure would concentrate supply and increase the production capacity of farms by sharing fixed capital, it would lead to land consolidation and further integration of actors in agri-food chains, with direct effects on competitiveness and positioning on agri-food markets. According to the National Institute of Statistics the number of cooperatives in Romania increased from 127 in 2010 to 356 in 2012, an

increase of about 180% in just 2 years (Barna, 2014, p.84) amid financial support from the National Rural Development Programme 2007-2013².

But for the agricultural sector to reduce the productivity gap with the modern European agriculture it is necessary both to implement agricultural policies aimed to restructure and consolidate small and uncompetitive farms (tax incentives, agricultural credit guarantee etc.) and to increase the absorption of structural funds for rural development. The funds have the ability to stimulate the investment process and the structural convergence of farms to European standards, since they offer support both in improving the stock of fixed capital and training activities for managers of farms.

4. Conclusions

Nowadays, Romanian agriculture is at an early stage of compatibility with the modern production methods specific to the more developed members of the European Union. Empirical analysis shows large gaps with the euro area farms in terms of productivity of inputs, mainly due to fragmentation of agricultural land, fixed capital shortages and lack of human capital with adequate training. Moreover, agricultural loans are few and difficult to access, there are institutional bottlenecks and a large amount of bureaucracy related to the European structural funds for rural development, which further hinder the convergence process of the Romanian agricultural sector.

The slow process of restructuring the agricultural sector affects the country's competitiveness through low production levels, increased production volatility (depending on weather conditions), low productivity of resources, especially labor. The issues arising from the current structure of agriculture are also present at the microeconomic level. Low labor productivity has direct effects on the quality of life of rural population (about 45% of the total population), usually generating low income and subsistence economic activity. All this affects the entire process of convergence with the euro area. Therefore, the importance of transition to a new phase of development for the agricultural holdings is mandatory. Significant efforts are needed to restructure the agricultural sector, both in financial terms and institutionally, in order to benefit in the long term from the comparative advantages that the Romanian economy holds.

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Notes

- (1) The Global Competitiveness Report 2014–2015: Full Data Edition is published by the World Economic Forum within the framework of The Global Competitiveness and Benchmarking Network
- (2) The association in groups of at least five producers of vegetables and fruits creates the opportunity of accessing the European Agricultural Guarantee Fund (EAGF) for funding of 75% of the costs to build a warehouse, as follows: 50% support and 25% national funds;

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