10 Years of EU Membership: Diverging performances in NMS agriculture

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Abstract

More than 10 years have passed since the 2004 accession round to the European Union. The tenth anniversary provides a good opportunity for stocktaking and assessing the agricultural developments of the New Member States (NMS) in light of the latest data available. The aim of this paper is to assess agricultural performances of NMS and to identify the winners and losers of accession in this regard. By ranking individual country performances using Parallel Factor Analysis (PARAFAC), our results suggest that Poland and the Baltic countries can be treated as the winners of EU accession in agriculture, while Romania and Bulgaria proved to have used their potentials to the least. Results also suggest that focusing on high value added agri-food products proved to be a good strategy to reach development in the agriculture sector, while those countries concentrating on the production of agri-food raw materials turned out to be lagged behind.

Keywords: 10 years, New Member States, agriculture, performance
JEL code: Q18, C38

1. Introduction

10 New Member States (NMS) joined the European Union in 2004. The tenth anniversary provides a good opportunity for stock taking and analysing the winners of accession in the agricultural sector during the previous decade. Despite the apparent importance of the topic, there is a limited number of scientific papers dealing with the impacts of EU accession on NMS agricultural sector and even less on quantifying these effects.

The aim of this paper is to assess agricultural performances of NMS and to identify the winners and losers of accession in this regard. Which countries used the possibilities provided by the common market to the most? Which countries lacked behind? What are the reasons behind these changes? These are the questions the article aims to answer.

In order to achieve its aim, the paper is structured as follows. Section 2 presents a brief literature review on the topic, while Section 3 summarizes the method used for conducting the analyses. Section 4 analyses changes in agricultural performance and identify the winners of accession, while Section 5 gives results of our model runs. Section 6 seeks to identify some reasons behind different performances, while the last section concludes.

2. Literature review

Research on the lessons of EU accession on New Member States' agriculture is a relatively new but expanding field in the literature. Many books around the millennium have quantitatively estimated the impact of EU enlargement in agriculture on EU expenditures, on agricultural protection levels, on commodity markets and trade (see e.g. Tangermann and Banse 2000, Hartell and Swinnen 2000).

Hertel et al. (1997) were among the first to conduct a sectoral and economy-wide analysis of integrating NMS into the EU by using the GTAP model and found that accession would result in very substantial increases of both crop and livestock production in the NMS, while net budgetary consequences of integration for agricultural expenditure would be quite modest. Bchir et al. (2003) investigated the impact of EU enlargement on Member States with a CGE approach and analysed three scenarios. On the whole, they provisioned that EU accession would provoke huge swings on relative prices and big fluctuation in the real exchange rate, raising serious concerns for agriculture. They also forecasted that the impact of accession on EU15 members would be negligible, whereas NMS would face huge and not always beneficial consequences.

A few years after accession, Gorton et al. (2006) analysed the international competitiveness of Hungarian agriculture by calculating domestic resource cost (DRC) ratios and making estimations for 2007 and 2013. They projected that EU enlargement will have a negative impact on the international competitiveness of Hungarian agriculture by increasing land and labour prices. Similar estimations were conducted by Erjavec (2006), forecasting that the newly accessed countries will gain from higher prices and budgetary support, indicating real improvements in most agricultural sectors on recent production levels. Ivanova et al. (2007) analysed Bulgarian agriculture following EU accession by the AGMEMOD model and found that accession would have a very positive effect on the crop sector in Bulgaria, whereas the effect is the opposite on the livestock sector.

A large amount of literature is also dedicated to the analysis of trade impacts after 2004. Bojnec and Fertő (2008) analysed the agri-food trade competitiveness with the EU-15 of the newly accessed Member States and concluded that trade has increased as a result of enlargement, though there have been 'catching-up' difficulties for some countries in terms of price and quality competition, more so in higher value-added processed products. Artan and Lubos (2011) analysed the agrarian trade transformation in the Visegrad Countries and found that the value and volume of export and import operations increased significantly. Ambroziak (2012) investigated the relationship between FDI and intra-industry trade (IIT) in the Visegrad countries and found that FDI stimulated not only vertical IIT in the region but also horizontal IIT. He found that differences in country size and income were positively related to IIT as is FDI, while distance and IIT showed a negative relationship. Bojnec and Fertő (2015) analysed the price and quality competitiveness as well as comparative advantage in EU countries agri-food trade and found that new and old member states have become more similar in successful agri-food competitiveness and comparative advantages.

Policy-oriented analysis of the lessons of accession can be found in Möllers et al. (2011) who investigated the changes in agricultural structures and rural livelihoods in the NMS and reached several agricultural policy conclusions, especially regarding the ongoing debate of the Common Agricultural Policy. Gorton et al. (2009) analysed why the CAP does not fully fit the region and identified several reasons valid for the NMS. Csáki and Jámbor (2013) analysed the impacts of EU accession on NMS agriculture and concluded that EU accession has had an overall positive impact, although member states capitalised their possibilities in a different manner. Kiss (2011) echoed the above conclusion and added that accession has created an incentive to NMS agriculture but also had negative effects due to tough competition in the enlarged market. Szabo and Grznár (2015) analysed the Slovakian position in EU agriculture and ranked it in the last in their sample due to low input of fixed assets, intermediate product, livestock units, but also a lower volume of the provided subsidies than the advanced countries.

3. Methodology

In line with the aim of the chapter, an innovative tool (the agricultural performance index) is used to analyse the post-accession agricultural performance of the NMS. The agricultural performance index is similar to those generally applied by international organisations to measure and compare economic performance of a group of countries (e.g. Global Competitiveness Index, Environmental Performance Index, etc.). Just like in the associated reports, past performance is ranked through different indicators and then aggregated into one. A similar approach is applied here as 15 different agriculture-related indicators is captured and then aggregated to get the agricultural performance index. Except for Csaki (2004) who used a similar logic to assess the status of transition, this approach has not been used to the agri-food sector so far.

The paper analyses agricultural performance of NMS in 1999-2013. This period is subdivided into three equal periods (1999-2003, 2004-2008, 2009-2013) to better assess the impacts of EU accession. An average for all sub-periods is calculated for each of the 15 indicators and then averages of the first and last periods are compared. In order to manage negative results (i.e. negative changes in specific indicators in time), the value of the smallest average, pertaining to a country, is added to all countries' respective changes (changes from 1999-2003 to 2009-2013) and then final scores by country are given in percentage of the highest value. This method enables us to give 100 points to the best performing country (i.e. the country with the highest positive change for an indicator) and continuously less to those performing worse. As countries are ranked on the basis of their own performance, initial differences among countries do not play a role. The list of the 15 indicators selected is given in Appendix 1.

In line with the aim of the paper, a more established methodology is also used to create a 2-dimensional performance map of NMS based on the 15 indicators. During the procedure of performance map building or classification of countries, researchers generally apply Principal Component Analysis (PCA), Hierarchical Cluster Analysis (CA) or Partial Least Squares Analysis (PLS). Other approaches to analyse performance data are the three-way factor analysis techniques, such as parallel factor analysis (PARAFAC). This is the generalization of PCA but while PCA works on two-dimensional matrices, this technique can be used to analyse three-dimensional matrices with three 'directions' or 'modes' of information. Therefore, it can be used to investigate similarities and differences between countries regarding several indices at different time intervals. The results of a three-way factor analysis can be presented in simple two-dimensional scatter-plots, which may be relatively easy to interpret. This method is highly suitable for our purposes.

The main advantage of the PARAFAC model is the uniqueness of the created components. Another major advantage is that PARAFAC models can be reliably estimated even if the ratio of the missing elements reaches 70%, while the two-way PCA becomes unstable even at 25-40% (Tomasi, 2006). No such test exists in a two-way PCA such as split-half which demonstrates the stability of the components as in PARAFAC modelling. The factors obtained by PARAFAC could be called three-way interactions in the context of variance analysis which cannot be modelled by a two-way PCA (Harshman-Lundy, 1984).

However, PARAFAC has some deficiencies too. We have to assume that there exists a common set of factors at all different modes. This assumption could not always be fulfilled. Certain validation techniques are required for a proper model fit. For example, the split-half technique and the use of different unfolding strategies provide confirmatory evidence for a unique and stable set of factor axis, but results will depend on the given strategy or the way we split the data. Another disadvantage of PARAFAC is that the calculation algorithm has a slow convergence rate and is very sensitive to missing values which also slow down the convergence (Harshman-Lundy, 1984).

The PARAFAC method was independently developed by Harshman, who generalized the work of Cattell, and by Caroll and Chang who generalized the idea of Horan (Harshman 1970; Horan 1969; Cattel 1944; Carrol and Chang 1970). The PARAFAC algorithm requires careful data pre-processing as data of m performance (2ndmode) indicators according to n countries (1stmode) across p time intervals (3rd mode) are organized into an n x m x p type X matrix (in our case the type is 10 x 15 x 3). The scalars n, m, p indicate the dimensions of three different modes. The pre-processing has two main phases. During the first phase the X matrix should be unfolded into a two-dimensional matrix according to the required mode (a given point of view). In our study, X is unfolded into a 10 x 45 matrix preserving the 1st mode (countries). After this comes the data scaling and centering (Carrol and Chang 1970).

Harshman (1970) defines three types of centering ((1-mode)fiber-, (2-mode)slab- and (3-mode) grand-mean centering). According to Bro (2003), fiber centering must be performed in one mode (across columns) and preserves the factor structure and does not wash out the differences in scale usage while slab- and grand mean centering does. In our case we try to apply single centering across the first and second modes as well as centering across the first mode and scaling within the second mode, but these do not improve the model fit. Finally, we just scaled the performance indicators to a 0-100 range along the countries, across the first mode, in order to adjust the individual-level scale differences. Proper scaling does not change the interpretation and parameters of PARAFAC, and even Harshman and Lundy (1984) found that fiber centering across levels of the 3rdmode over-emphasized object variation and decided to try an analysis of the data without any centering.

PARAFAC is one of the decomposition methods which decomposes the $X = \{x_{ijk}\}$ data matrix according to the following equation (Harshman and Lundy, 1984):

$$x_{ijk} = \sum_{r=1}^{q} a_{ir} b_{jr} c_{kr} + e_{ijk} \text{ , where } (\mathrm{i} = 1,...\mathrm{n}; \mathrm{j} = 1,...\mathrm{m}; \mathrm{k} = 1,..., \mathrm{p}) \text{ ,}$$

where a_{ir}, b_{jr}, and c_{kr} are the elements of A, B and C matrices, respectively, e_{ijk} are the error term of the estimations, which are contained by matrix E and q is the number of created factors. Matrix A is an n x q type matrix containing the scores of the countries of the q factors. Matrix B is an m x q type matrix containing the loadings of the performance indicators, and matrix C is a p x q matrix containing the loadings of the periods. These matrices were used to create the performance map. Moreover, *i* stands for indicators, *j* for countries and *k* for time periods.

The most applied method for validating the PARAFAC model is the split-half technique (Harshman and Lundy, 1984), during which we divide the data into two parts and perform the same analysis. After this the explanatory power of the two models fitted on the divided data should be approximately the same. In our case there is no point in dividing the dataset according to either the countries or the performance indicators. Validation of the model was done using different unfolding strategies. In the first phase, X was unfolded into a 10 x 45 matrix using the first mode, while in the second phase X was unfolded into a 15 x 30 preserving the second mode (performance indicators). Results regarding the performance map and model fit were almost the same while following these two different unfolding strategies. The performance map using PARAFAC method was created in R-project 3.0.2.

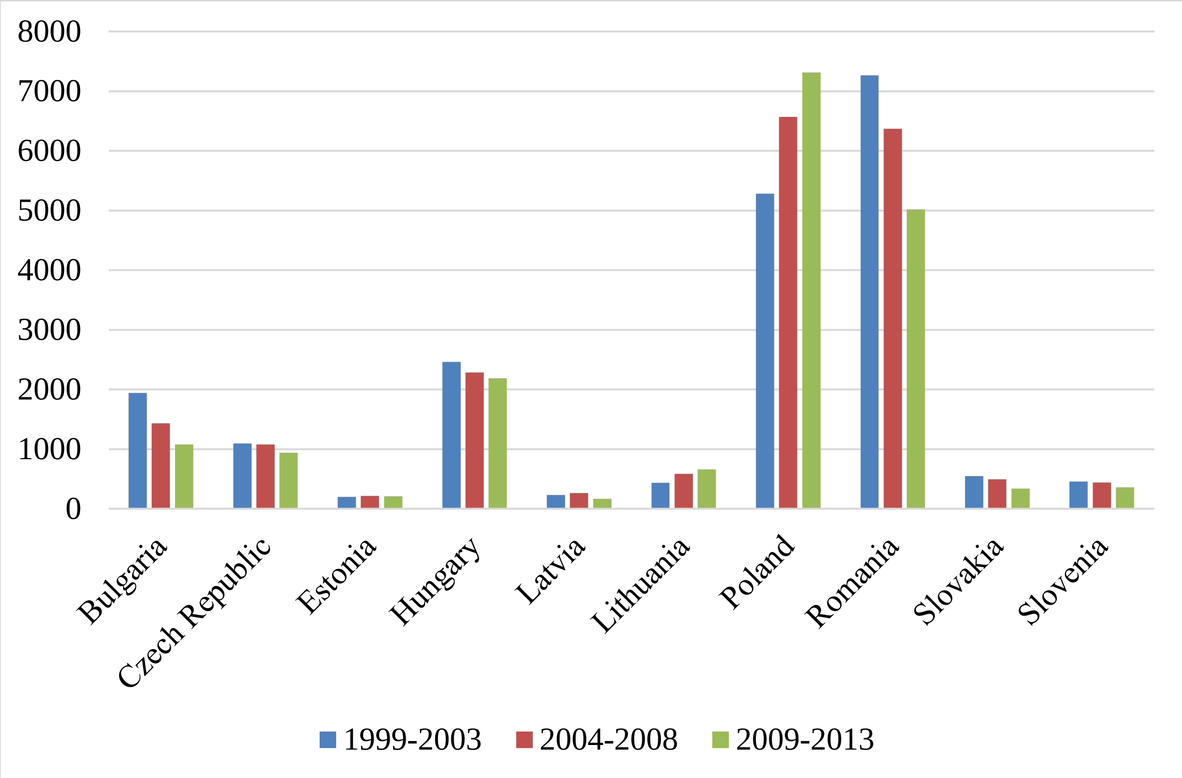
By using the methods above, the paper can identify the winners and losers of EU accession in the NMS agricultural sector as countries possessing the highest values are treated as the winners (i.e. the best performing countries), while those with the lowest values, the losers (i.e. the worst performing countries). What is more, PARAFAC enables us to identify the reasons behind different country performances. Moreover, the application of PARAFAC in econometrics is extremely rare. Only Gallo (2015) proposed an application of the PARAFAC model for 26 EU countries regarding agricultural production divided in 7 macro-categories over the years 2001-2005 in order to study the agricultural structure.

As a major source, the paper uses the Eurostat database but FAO and World Bank datasets are also used in some cases. Note that Cyprus and Malta are also excluded from the analysis because of the marginal importance of their agricultural sector compared to other NMS. Croatia is also excluded on the basis that her 2013 accession does not allow any impact analysis considering the timeframe of the sample. We are also aware that the 2007 accession of Bulgaria and Romania slightly changes the interpretation of our results, though we still think that the performance of these countries are comparable to other NMS based on historical and geographical reasons.

4. Agricultural performance indices

The first indicator describing the performance of agriculture is gross value added at real prices. There are very significant differences in this regard among NMS (*Figure 1*). On one hand, Poland had a gross value added of 7313 million euro on average in 2009-2013, while Latvia could only reach 160 million euro at the same time. What is more important, only Estonia, Lithuania and Poland could increase gross value added in agriculture after accession, while huge falls is observable in the other end (including Bulgaria's sharply decreasing performance of 44% from the first to the last period analysed).

Figure 1 **Agricultural gross value added in real terms in the NMS, 1999-2013 (million euro)**



Source: Own composition based on Eurostat (2015) data

Figure 1 also indicates that Lithuania became the first in agricultural gross value added performance (showed the highest increase from 1999-2003 to 2009-2013), thereby received a score of 100. On the other end, Bulgaria showed the biggest fall here and got zero points (see first column of *Table 1*).

Table 1 **Summary of agricultural performances in NMS**

Country/ Index	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15
Bulgaria	0	44	73	6	0	0	28	6	0	7	17	33	53	76	56
Czech Republic	37	25	26	27	96	31	48	47	38	21	18	28	28	59	29
Estonia	67	77	100	3	73	82	84	100	39	100	100	0	100	100	35
Hungary	37	41	36	38	38	45	23	31	37	17	3	62	19	25	45
Latvia	22	82	73	0	63	67	85	55	9	15	78	12	57	69	38
Lithuania	100	100	69	79	28	78	79	52	89	58	41	53	45	81	33
Poland	98	48	53	100	100	100	100	63	100	46	17	92	30	56	81
Romania	17	0	32	49	59	13	0	0	14	18	35	100	17	0	89
Slovakia	7	25	25	23	44	14	23	35	13	25	32	62	0	27	100
Slovenia	27	7	0	88	64	43	43	5	23	0	0	57	3	52	0

Note: The detailed list of indices can be found in Appendix 1.

Source: Own composition

Agricultural performance can also be measured by sector. Indices 2-7 actually capture country performances by their diverging sector outputs. For instance, Lithuania doubled her cereals output from 1999-2003 to 2009-2013, thereby obtaining 100 points for the second index (see second column of *Table 1*). For the same index, Romania got zero points as her respective change for the same period was the lowest (-20%). Similarly, Estonia increased her industrial crop output to the most in the period analysed (+173%), while Slovenia actually showed a decrease in this regard (-19%) – thus Bulgaria got 100 points and Slovenia zero here (check the third column of *Table 1*).

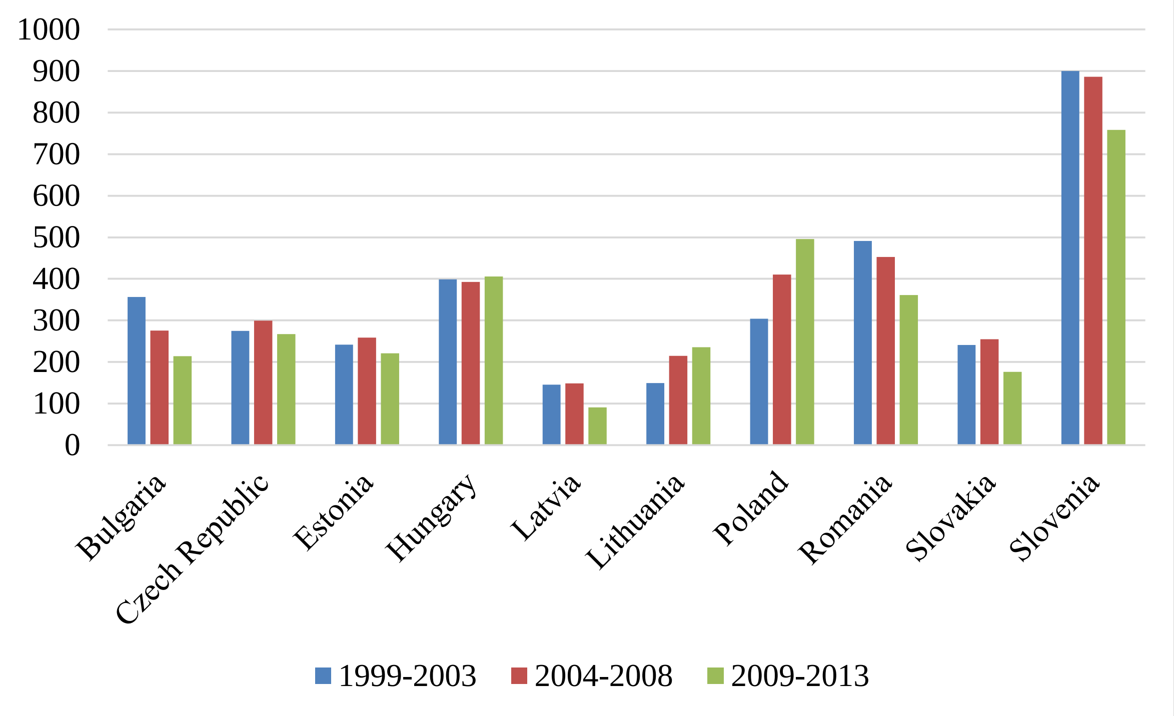
Another common way to analyse agricultural performances is to check real farm incomes (Index 8). Although farm income increased in each and every country in the region, Estonia experienced the biggest increase of farm incomes after accession (222%), while farmers' income increased the least in Romania (+16%).

Another group of indicators measures agricultural productivity. The first such indicator is gross value added per hectare that measures land productivity (Index 9). Contrary to *Figure 1*, it is evident that gross value added per hectare was the highest in Slovenia in all periods analysed, while the lowest in Latvia. However, in terms of changes, Poland could increase her per hectare output by 59% from the first to the last period, while the respective change for Bulgaria was -37% - thereby Poland got 100 points for Index 9 and Bulgaria got zero.

Agricultural productivity can also be measured per worker (Index 10). Results suggest that Estonia actually more than doubled her gross value added per worker, while Slovenia even experienced some decrease with respect to this index.

The remaining indices capture agricultural productivity by sector. As evident from *Table 1*, Estonia leads the line here in most cases, while relatively low values can be seen for the Czech Republic and Hungary.

Figure 2 **Agricultural gross value added per hectare in real terms in the NMS, 1999-2013 (euro/ha)**



Source: Own composition based on Eurostat (2015) data

The agricultural performance index is calculated by summing up the 15 indices. There exists a huge competition among NMS regarding their final ranks (*Table 2*). Poland became the first, preceding Estonia and Lithuania – all obtained scores around 1000. Latvia reached the fourth position, while the Czech Republic got to the fifth. On the other hand, Hungary, Slovakia, Slovenia, Romania and Bulgaria lagged behind. Note that their score does not even reach 50% of the winners. On the whole, Poland and the Baltic countries were the winners of EU-accession in agriculture while countries whose score was below 500 seem to have used their possibilities of EU accession the least in the agricultural sector.

Table 2 **The agricultural performance index of the NMS**

Country/Index	Total Score	Rank
Poland	1083	1
Estonia	1060	2

Lithuania	983	3
Latvia	724	4
Czech Republic	559	5
Hungary	496	6
Slovakia	452	7
Slovenia	443	8
Romania	413	9
Bulgaria	399	10

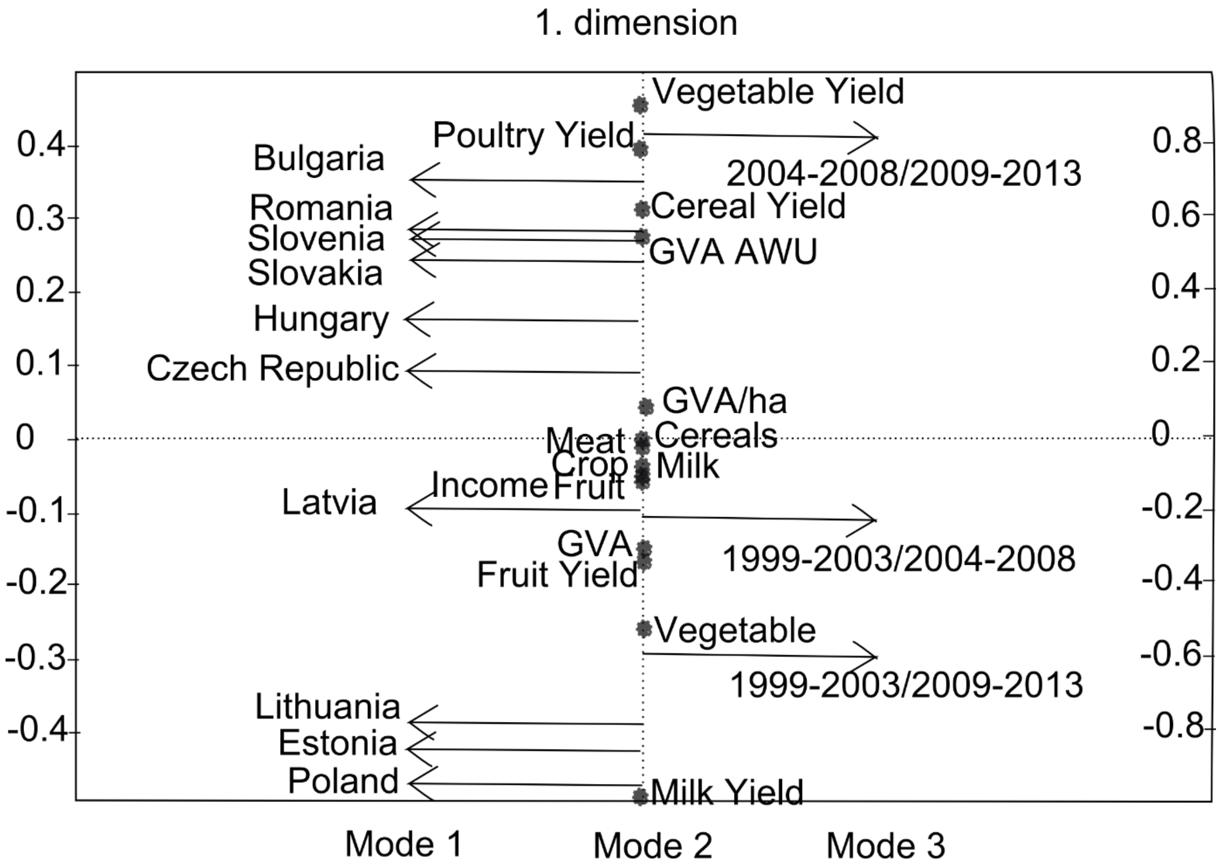
Source: Own composition

We are aware that our approach has many limitations. First, it is evident that the selection of indices can alter the final performance of the countries. Second, ranks can also change by the selection of new periods to compare. Third, we are not aware whether these changes would anyway have happened or they are an effect of EU accession. Fourth, there might be some correlations between the selected indicators which can overrepresent the performances. However, we believe that our selection of 15 different indices shows trends close to reality.

5. Internal reasons behind - PARAFAC results

This section moves forward and gives results of our model runs. It is clear from above that we have 10 countries, 15 indicators and three time periods, so altogether three categories. The pre-component plot, which was introduced by Gallo (2015), is a very powerful tool for visualizing the created PARAFAC factors (the columns of the A,B,C matrices). *Figure 3* shows us the first dimension (1st column of A,B,C matrices) which accounts for 83% of the variance. The first mode separates Baltic counties and Poland from the other countries.

Figure *3* Per-component plot for the 1st dimension of NMS agricultural performances

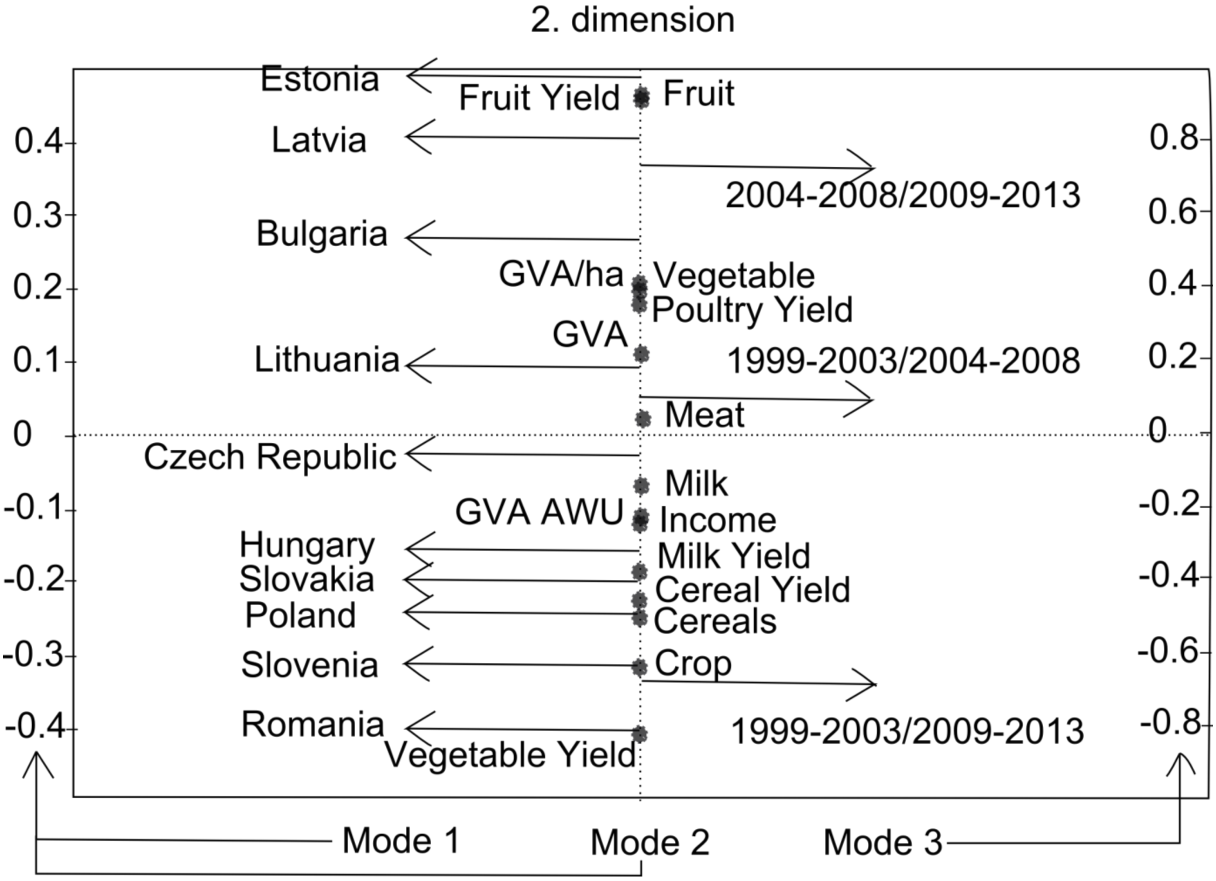


Source: Own composition

The 1st dimension in the second mode can be associated with milk and fruit yields and high gross value added which were responsible for the respective country performances as well as the separation of Baltic countries and Poland from the others.

Taking the third mode into consideration, it seems that rank-leading countries had a long term vision and strategy as PARAFAC suggest that they outperformed all others mainly based on their first to third period averages. However, those countries showing some positive changes right after accession but not in the third period (Latvia, Czech Republic) seem to have been stucked in the middle, while those lagging behind just showed some development from the second to the third period.

Figure *4* Per-component plot for the 2nd dimension of NMS agricultural performances

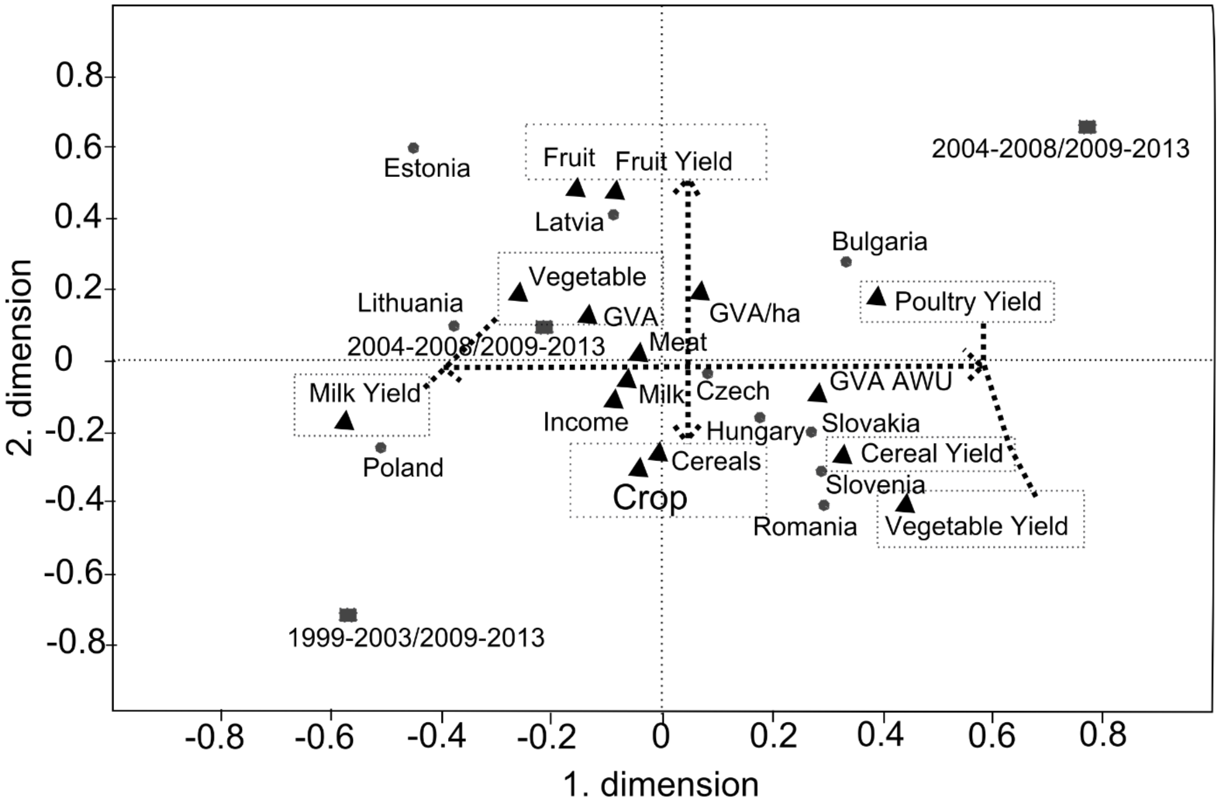


Source: Own composition

Regarding the second dimension (2nd columns of A,B,C matrices) and the first mode, it is obvious that Baltic countries and even Bulgaria were separated from all other countries. PARAFAC runs suggest that these countries outperformed all others mainly based on their second to third period averages. Indicators from the second mode tell us the reason behind this phenomenon (again fruit yield, vegetables, and high GVA/ha).

Similar conclusions can be drawn if analysing the three components together in both dimensions *(Figure 5).* On one hand, it seems that winners of accession had outstanding milk and fruit yields and high gross value added. On the other hand, it appears that those lagging behind had high cereal and poultry yields and above average productivity. Without going too far, it seems evident that those countries focusing on high value added products (milk, fruit, vegetables) were the winners of accession, while countries concentrating on bulk cereals (even with high yields) proved to have lost with this strategy. This is consistent with the majority of literature on the field (Csaki-Jambor 2013).

Figure 5 **Performance map of the NMS based on the analysed indicators**



Source: Own composition

6. Possible external reasons behind

There can be many external reasons behind the different performances described above. First of all, these countries have different initial conditions. Different distribution of agricultural land quality and quantity together with the differences in agricultural labour and capital endowment definitely had an impact.

Table 3 **Changes in factors of production in the NMS, 1999-2013**

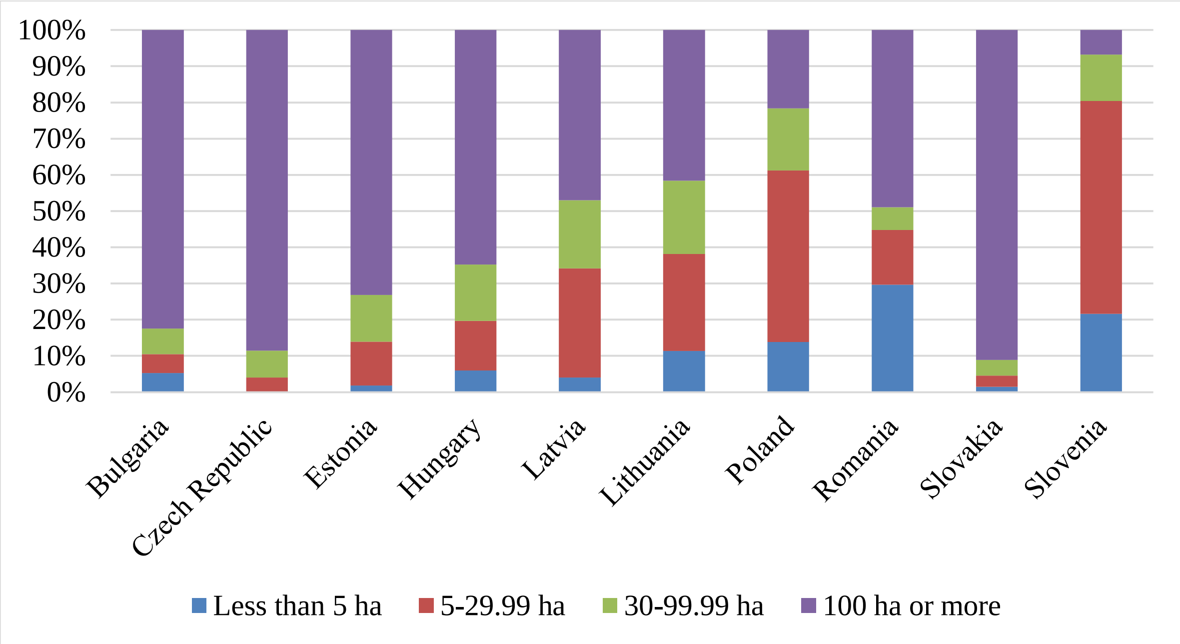
Country	Utilised Agricultural Area (1000 ha)			Agricultural labour (1000 AWU)			Gross fixed ag. capital (million euro)		
	1999-2003	2009-2013	Change	1999-2003	2009-2013	Change	1999-2003	2009-2013	Change
Bulgaria	5482	5058	-8%	770	377	-51%	160	122	-24%
Czech Republic	4038	3524	-13%	165	108	-34%	340	462	36%
Estonia	881	950	8%	57	25	-56%	76	138	82%
Hungary	6169	5428	-12%	654	440	-33%	911	725	-20%
Latvia	1763	1833	4%	146	87	-41%	101	156	54%
Lithuania	3066	2800	-9%	194	145	-26%	211	308	46%
Poland	17543	14789	-16%	2414	1979	-18%	696	901	29%
Romania	14802	13897	-6%	3175	1692	-47%	694	799	15%
Slovakia	2315	1928	-17%	136	62	-54%	153	125	-18%
Slovenia	507	474	-7%	104	80	-23%	211	193	-9%
NMS total	56566	50680	-10%	7815	4995	-36%	3553	3928	11%

Source: Own composition based on Eurostat (2015) and FAO (2015).

As evident from *Table 3*, Poland and Romania had the biggest agricultural land, labour and capital endowment in the NMS. However, only Estonia and Latvia could increase their agricultural land area from 1999-2003 to 2009-2013, while agricultural labour decreased in each and every NMS. On the other end, agricultural capital increased in all countries but Bulgaria, Hungary, Slovakia and Slovenia. It can be observed from *Table 3* that mainly those countries, where changes in factors of production were better than the regional average, performed better.

Besides initial conditions, another factor behind different country performances lies in farm structures (*Figure 6*).

Figure 6 **Share of farms by UAA in the NMS in 2010 (%)**



Source: Own composition based on Eurostat (2015) data.

On one hand, the majority of land was cultivated by small farms only in Latvia, Lithuania, Poland, Romania and Slovenia. In Poland and Slovenia, small scale farms dominated agriculture during the socialist period and they have not been changed much after 1990 (Csáki and Jámbor, 2013). On the other hand, large farms ruled land use in the other five countries. Values of Czech Republic and Slovakia (around 90% for large farms) show an extreme dominance of large scale farming. However, medium-scale farming is missing in most cases. These land use patterns stayed relatively stable if comparing these results to pre-accession levels. Concerning the impact of farm structures on post-accession performances, it is evident that in Poland and Slovenia small scale agriculture proved to be beneficial, while the dominance of large scale farming seemed to have detrimental impacts on country performances except for Estonia.

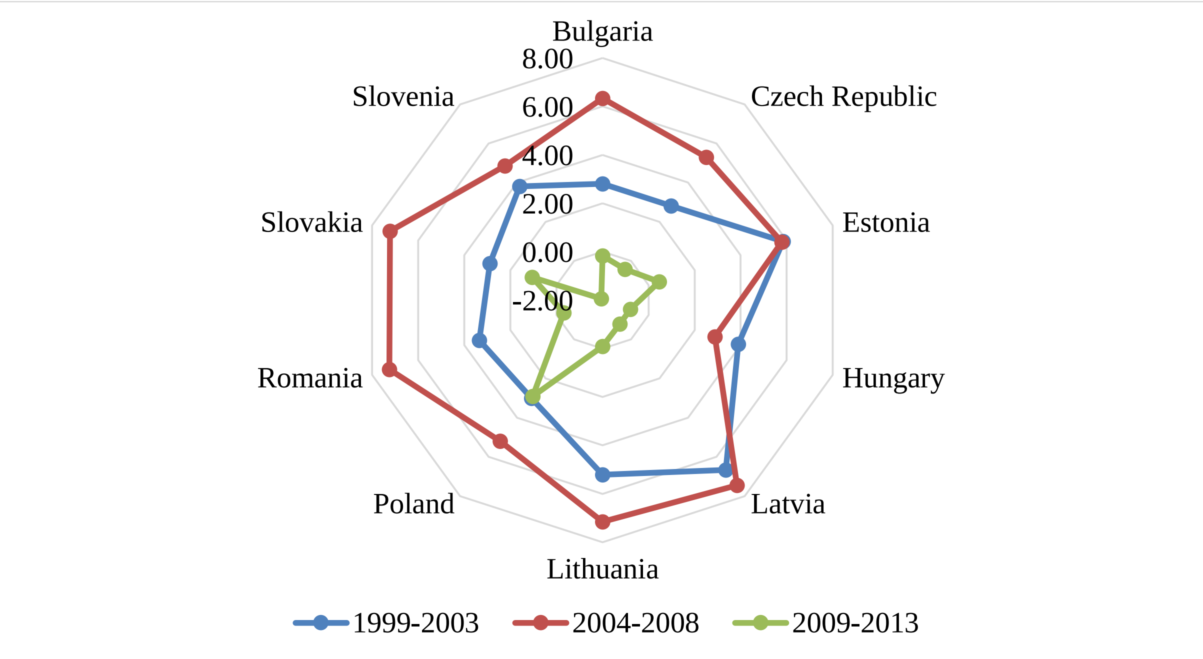
Differently implemented land and farm consolidation policies had also diverse effects on post-accession country performance. Restrictive pre-accession land policies and the lack of land and farm consolidation (e.g. in Hungary) has negatively influenced the capacity to take advantage of the enlarged markets by significantly constraining the flow of capital outside the agricultural sector (Ciaian et al. 2010). Conversely, liberal land policies (e.g. in Baltic countries) helped the agricultural sector to obtain more resources and utilise the possibilities created by the accession better. In other words, those countries with restrictive land policies, as also suggested by Swinnen and Vranken (2010), performed worse.

The magnitude of privatisation in the agri-food sector and the type of foreign ownership also affected post-accession performances. After the collapse of the Soviet markets there was a massive privatisation of the agri-food sector in the majority of NMS. Those countries giving ownership of food processing companies to local farmers (e.g. Czech Republic, Poland) performed better, while the rapid rise of foreign ownership together with fast privatisation resulted in worse performances in the long run (e.g. Bulgaria, Hungary, Romania).

The ways in which the countries used EU-funded pre-accession programmes such as SAPARD, ISPA and PHARE was also important. Those who focused on competitiveness enhancement and production improvement were better in realising the benefits after accession. On the contrary, delays in creating the required institutions as well as the initial disturbances of implementation resulted in the loss of some EU funds in a number of countries (Csáki-Jámbor, 2013).

The diversity of the macro environment also had an impact (*Figure 7*). Annual average GDP growth in the NMS was the highest in Latvia for the first two periods and Poland for the third, while the lowest in Bulgaria, Hungary and Slovenia in the three respective periods. Note that it was only Estonia and Poland whose annual GDP growth remained positive in the third period when the effects of the 2008 economic crisis was the biggest.

Figure 7 **Annual GDP growth in the NMS, 1999-2013 (%)**



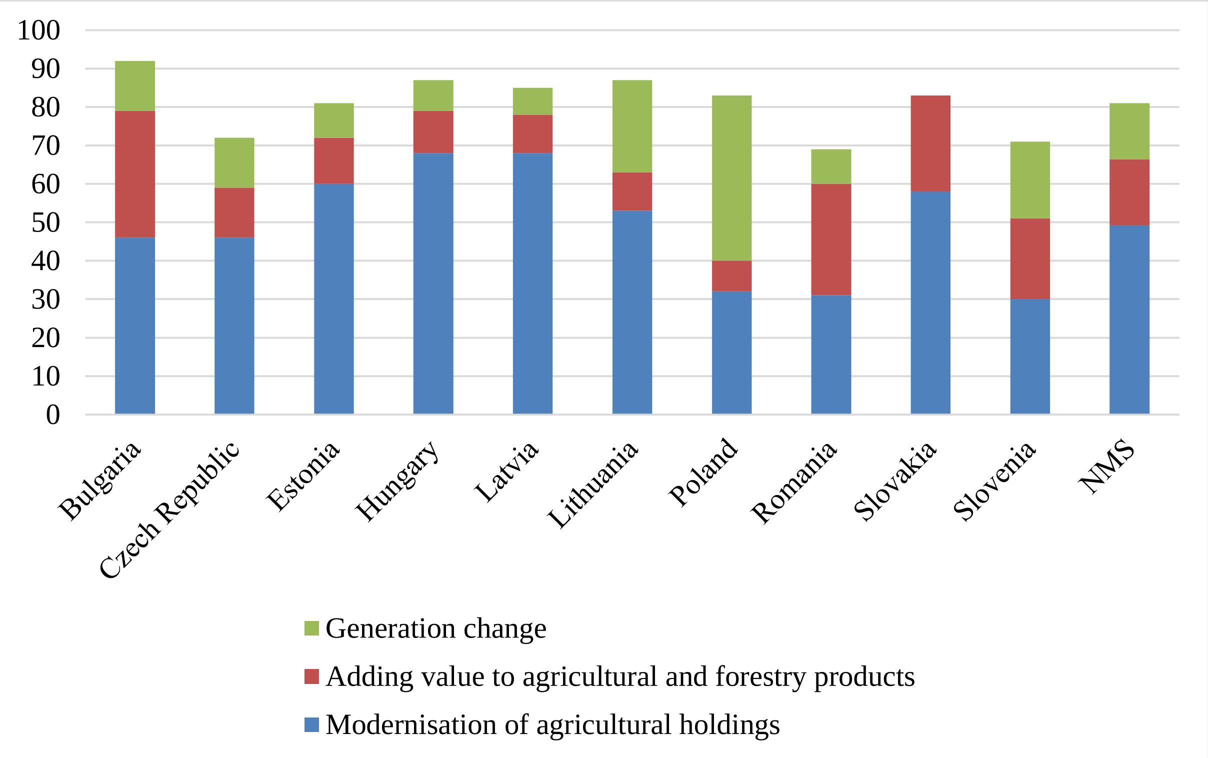
Source: Own composition based on World Bank (2015) data.

Volatility and transparency of agricultural policies were probably the most important reasons behind different performances. Changing agricultural policies, usually taking a u-turn after elections, were very much against the long-term growth of the agri-food sector. Those countries with reliable and transparent policies (e.g. Poland) could reach better results than those with fire-brigade agri-food policy making during the past decade (e.g. Hungary). The consistency of agri-food policy making is also reflected in the existence of long-term agriculture and rural development strategies of which the majority in the region was in lack (Potori et al. 2013).

The focus of total payments on agriculture also determined agri-food performances. Before accession, payments in favour of competitiveness enhancement definitely proved to be beneficial. On one hand, those countries, where agricultural subsidies to farmers remained at a lower level (e.g. Poland), have gained much with the accession which has provided visible incentives for production and led to an increase of agri-food trade balance. On the other hand, those countries providing initially high and uneven price and market support (e.g. Bulgaria, Romania, Hungary) were considered to lose with accession as it has brought hardly any price increase. Agricultural policy aimed to enhance competitiveness was a failure and resulted in a situation where the majority of farmers were not prepared for the accession (Csáki-Jámbor, 2013, Popp-Jambor, 2015).

Regarding the focus of total payments on agriculture, a different picture appears after accession. Interestingly, those countries that spent less than the regional average on value added generally performed better (*Figure 8*). On one hand, Bulgaria, Romania and Slovakia spent more than a quarter of their axis 1 funds to agricultural value added growth which, from 10 years hindsight, was a mistake. The reason probably lies in the low effectiveness of these payments – value added does not necessarily mean enhanced competitiveness if the product structure is mis-selected.

Figure 8 **Distribution of the most important first axis payments in the programming period 2007-2013 by NMS (percentage)**



Source: Own composition based on RDR (2013).

The other side of the story is that countries, which invested in agriculture for enhancing generation change (by spending on young farmers and early retirement) generally performed better. Poland actually spent 43% while Lithuania 24% of their respective axis 1 payments to fostering generational change which proved to be beneficial.

7. Conclusions

The article analysed the post-accession agri-food performance of NMS on the occasion of the 10th anniversary of EU accession. By selecting 15 indices measuring agricultural performance, it turned out that Poland and the Baltic countries were the winners of EU accession while other countries except the Czech Republic appear to be the losers. According to our PARAFAC model, it turned out that those countries focusing on high value added products (milk, fruit, vegetables) were the winners of accession while countries concentrating on bulk cereals (even with high yields) have lost with this strategy. The second part of the article identified some possible external reasons behind changes. It turned out that post-accession performance in the agri-food sector differed to a great extent. Although all countries gained with EU membership, NMS used their possibilities to a different extent.

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***Appendix 1* Definition of indices**

Name	Definition	Unit of Measurement
Gross Value Added	Gross Value Added at real prices for agriculture.	million euro
Cereals Output	The total output of the cereals sector at real prices.	million euro
Industrial Crop Output	The total output of the industrial crops sector at real prices.	million euro
Fruits Output	The total output of the fruits sector at real prices.	million euro
Vegetables Output	The total output of the vegetables sector at real prices.	million euro
Meat Output	The total output of the meat sector at real prices.	million euro
Milk Output	The total output of the milk sector at real prices.	million euro
Farm Income	Indicator A: Index of the real income of factors in agriculture per annual work unit	1999=100
Land Productivity	Gross Value Added divided by Utilised Agricultural Area	euro/ha
Labour Productivity	Gross Value Added divided by Annual Working Units	euro/capita
Cereal Yields	Harvested production per unit of harvested area for crop products.	tonnes per ha
Fruit Yields	Harvested production per unit of harvested area for fruit products.	tonnes per ha
Vegetables Yields	Harvested production per unit of harvested area for vegetable products.	tonnes per ha
Milk Yields	Milk given by a cow per year.	tonnes per animal
Poultry Yields	The size of the animal when slaughtered.	kilograms per animal

Source: Own composition