The Common Agricultural Policy of the European Union – the present and the future

EU Member States point of view

INSTITUTE OF AGRICULTURAL
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The Common Agricultural Policy of the European Union – the present and the future

EU Member States point of view

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Abstract

In this article, attention is focused on the prices of production factors (capital, labour and land) and their relationships. We indicate here their exogenous character based on the author's analytical approach. In addition, we derive the dependencies, while drawing from the theory of microeconomics and the producer choice theory. Empirical verification for the selected EU countries covered the pairs of levels of these prices in the agricultural sector. Finally, these relationships determine the production techniques and their changes, that is, the relationships of the involved production factors necessary to obtain a certain production level[8].

Keywords: production factors, Total Factor Productivity (TFP), microeconomic behaviour

JEL codes: D33, D24, D01

7.1. Introduction and analytical basis

In order to identify the exogenous factors which are of our interest from the point of view of the set objective and which influence the production techniques, we are starting with the definition of the production efficiency (PE), which is exceptionally given here in current prices. In an analytical way, it can be noted as a quotient between income and the cost of using production factors (capital, labour and land for the given level of the agricultural production on a producer or agriculture scale at current prices [Bezat-Jarzębowska and Rembisz, 2013]:

$$EP = \frac{p_i y_i}{K_i c_K + L_i c_L + Z_i c_Z}$$

[8] This article is a continuation of the studies carried out by the Team under the Multi-Annual Programme 2015--2019 at the IAFE-NRI. The issue of the exogenous factors was discussed in more detail in the monograph by Rembisz W., Waszkowski A., *Egzogenne uwarunkowania produkcji w rolnictwie - ceny czynników produkcji i wybrane wskaźniki makroekonomiczne,* Program Wieloletni 2015-2019, nr 69, IERiGŻ-PiB, Warszawa. The article presents a synthetic approach to the above-mentioned monograph, presented at the Conference organised by the IAFE-NRI and entitled "The Common Agricultural Policy of the European Union – the present and the future" which was held on 5-7.12.2017.

where:

i – means the agricultural producer,
p – prices of agricultural products,
c_K – price of the capital factor,
c_L – price of the labour factor,
c_Z – price of the land factor.

In analytical terms, the time subscript *t* is omitted.

Assuming the zero profit conditions and the homogeneity of the function at the given time, the above equality, in the conditions of competitive equilibrium in the product market, may be noted as:

$$p_i y_i = K_i c_K + L_i c_L + Z_i c_Z$$

When both sides of the statement are converted to a logarithm, this enables an approximate notation[9] of the production efficiency in value terms as a sum:

$$lnp_i + lny_i \approx lnK_i + lnc_K + lnL_i + lnc_L + lnZ_i + lnc_Z$$

Determining the ∂ partial derivatives and omitting the time indices allows to make the following notation:

$$\frac{\partial y}{y} - \left\{\frac{\partial K}{K} + \frac{\partial L}{L} + \frac{\partial Z}{Z}\right\} = \left\{\frac{\partial c_K}{c_K} + \frac{\partial c_L}{c_L} + \frac{\partial c_Z}{c_Z}\right\} - \frac{\partial p}{p}$$

In analysing the above identity, we can divide it [Bezat-Jarzębowska and Rembisz, 2016]. The left side of the equation is responsible for the endogenous, conventional factors dependent on agricultural producers in the sense of choices they made to maximise their own objective function. These factors are related to the production efficiency and its changes in the sense of TFP. The factors listed on the right side of the equation are the exogenous factors. These are the relationships between product prices (prices which are either paid or received) and prices of the production factors (in fact, their services from the given factor involvement) identified in the market of production factors as we showed above (this is equivalent to the idea of price scissors).

The obtained exogenous dependencies are the indices of the most important economic parameters, important from the point of view of the agricultural producer. As a sector, agricultural producers are price-takers. The price scis-

[9] This is a sort of approximation, assuming that we deal with the sum of two-factor production functions expressed as $p_1 y_1 = K_i c_K$, $p_2 y_2 = L_i c_L$ and $p_3 y_3 = Z_i c_Z$, while $p_i y_i = \sum_{i=1,\ldots,3} p_i y_i$, i.e. the identity is an approximation of two-sided conversion into a logarithm assuming the sum of one-factor production functions.

sors arrangements indicated in the above inequality are determined by market mechanisms, self-regulatory processes on the demand and supply sides, and are susceptible to the impact of the pursued economic policy or intervention measures. In this context, and in line with the Jovens' interpretation, producers adapt to prices. This relationship is not transitive – the prices of products do not adapt to the costs of production in the free competitive market. It happens where intervention measures are applied, for example, in agricultural markets.

The adaptations are related to an improvement in the efficiency, especially to an improvement in the productivity of individual (endogenous) factors. As we have shown, the relationships of prices of the production factors and their changes are not, in fact, dependent on the agricultural producer and in each market model they are exogenous for the agricultural producer. The above-mentioned improvement in the efficiency of the production process may take place as a result of substitution, for example, of involving the labour factor with increasing the involvement of the capital factor [Rembisz, 2005] and by making progress understood as an increase in innovation, knowledge, managerial and organisational skills.

7.2. Relationships of prices of the capital, labour and land factors – hypothetical approach

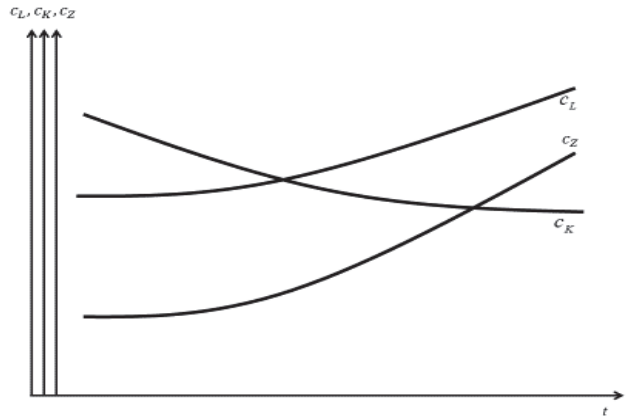
As a result of the assumptions showing the price evolution for the labour, capital and land factors, hypothetical Figure 1 was adopted. It shows the relationship of prices of the production factors: the price of the labour factor whose remuneration increases, the capital factor which becomes relatively cheaper and the price of the land factor. The final relationships should be referred to prices of services of these factors in the production process.

The adopted hypothetical assumptions related to prices of the production factors are also justified by the theories and observations of the economic growth and development. They also stem from the relationship of their scarcity as a fundamental economic right.

As a result of the non-agricultural demand for the land factor, i.e. urbanisation processes, residential housing, environmental, tourism and recreation issues, etc., it is becoming increasingly scarce also in absolute terms as far as the agricultural use is concerned. Similar dependencies are observed in the non-agricultural demand for the labour factor. On the other hand, the increase is characteristic of the supply of the (real) capital factor which makes it relatively and also absolutely cheaper and cheaper. This results in an increase in its use in agriculture. Together, this leads to changes in production techniques, generally towards those which are more and more capital inten-

sive while labour- and land-saving. We do not analyse this here. We refer only to price-related (production factor prices), exogenous determinants of these production techniques changes.

Figure 1. Hypothetical assumption as to the price evolution for the labour, capital and land factors



Source: own study.

7.3. Relationships of prices of the capital, labour and land factors – empirical approach

As shown in Figure 1, the hypothetical relationships of prices of the capital and labour factors and of the land and capital factors have been verified empirically. The following time series were used for this purpose:

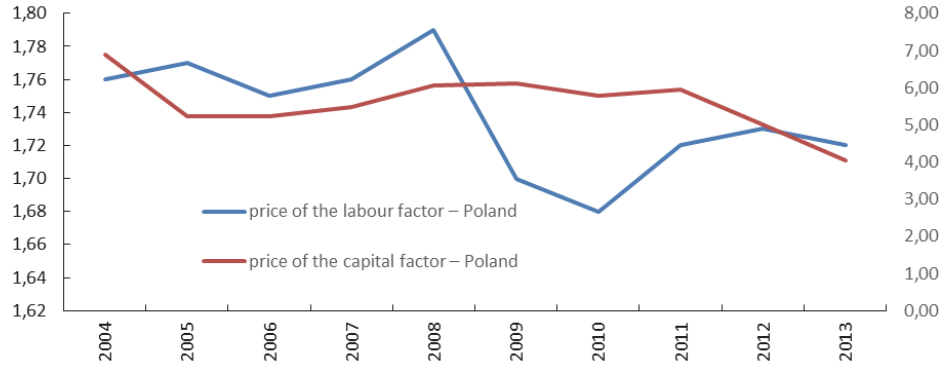
- Price of the capital factor c_K – defined on a proxy basis as the baseline interest rate on the alternative involvement basis (in terms of lost profits [Kleinhanss, 2014]); based on the Eurostat database;
- Price of the labour factor c_L – defined as the average hourly remuneration expressed in EUR; based on the Eurostat database;
- Price of the land factor c_Z – for 2005, 2007, 2010 and 2013; taken from the Eurostat database.

Final verification covered the years between 2004 and 2013, which results straight from the data availability.

The following empirical figures show the price of the capital factor and the price of the labour factor for the selected EU countries[10].

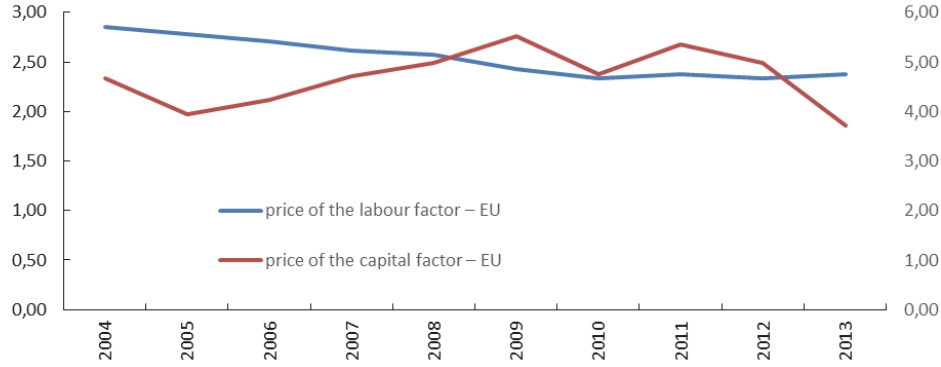
[10] Empirical studies on this issue were presented in more detail in the monograph by Rembisz W., Waszkowski A., *Egzogenne uwarunkowania produkcji w rolnictwie - ceny czynników produkcji i wybrane wskaźniki makroekonomiczne,* Program Wieloletni 2015-2019, nr 69, IERiGŻ-PiB, Warszawa.

Figure 2. Labour factor price and capital factor price in agriculture in Poland



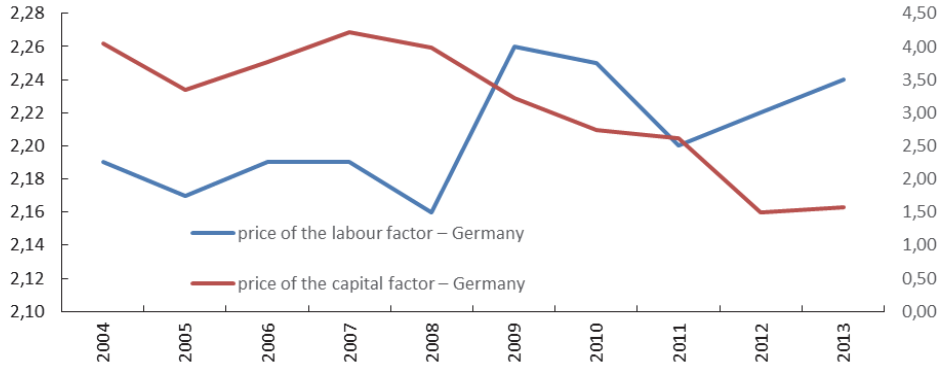
Source: own study based on the Eurostat data.

Figure 3. Labour factor price and capital factor price in agriculture in the EU



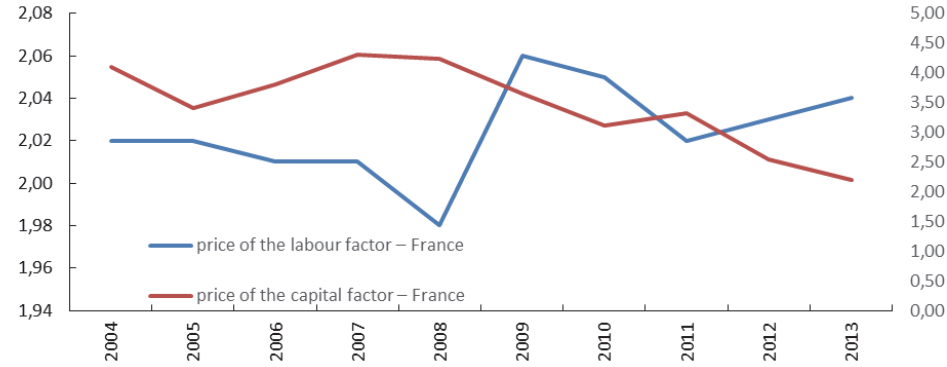
Source: own study based on the Eurostat data.

Figure 4. Labour factor price and capital factor price in agriculture in Germany



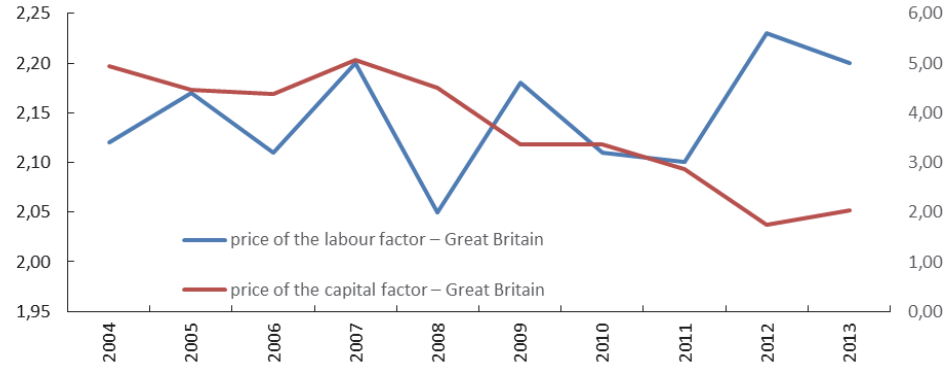
Source: own study based on the Eurostat data.

Figure 5. Labour factor price and capital factor price in agriculture in France



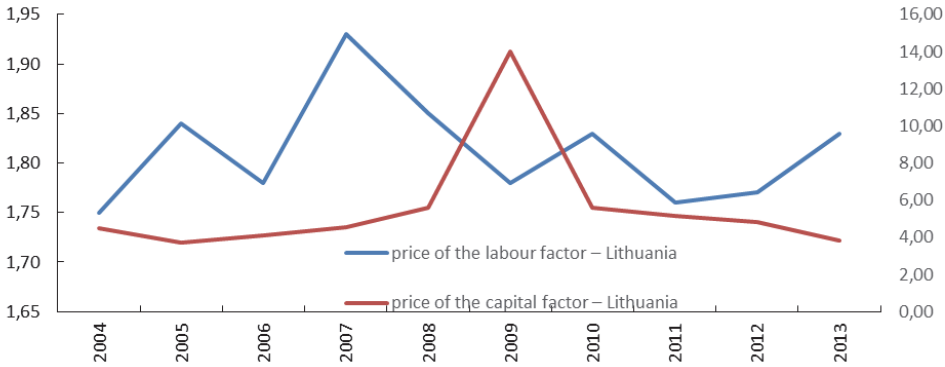
Source: own study based on the Eurostat data.

Figure 6. Labour factor price and capital factor price in agriculture in Great Britain



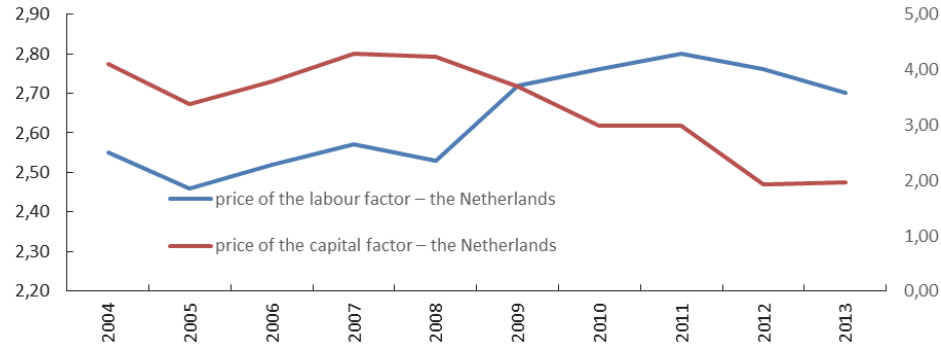
Source: own study based on the Eurostat data.

Figure 7. Labour factor price and capital factor price in agriculture in Lithuania



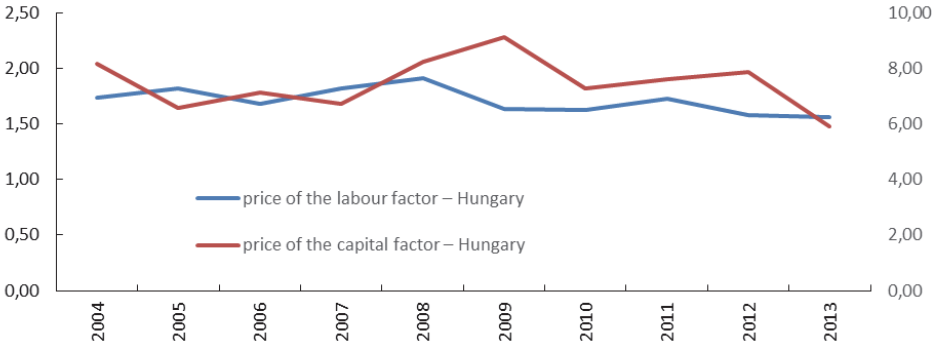
Source: own study based on the Eurostat data.

Figure 8. Labour factor price and capital factor price in agriculture in the Netherlands



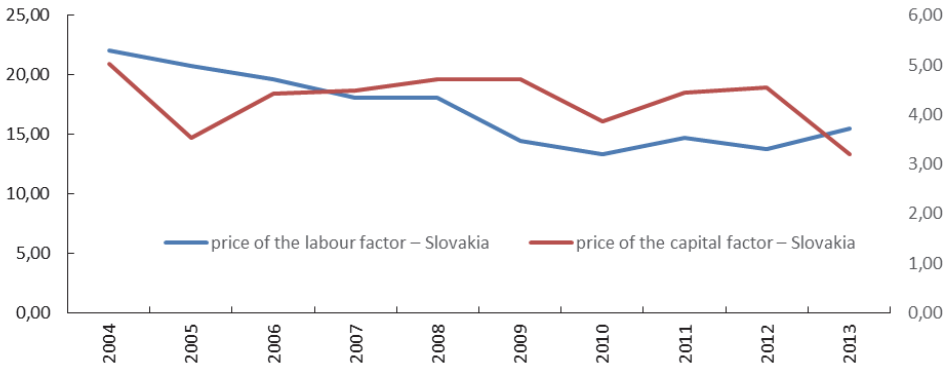
Source: own study based on the Eurostat data.

Figure 9. Labour factor price and capital factor price in agriculture in Hungary



Source: own study based on the Eurostat data.

Figure 10. Labour factor price and capital factor price in agriculture in Slovakia



Source: own study based on the Eurostat data.

The above-mentioned visualisations confirm the adopted hypothetical assumptions that were derived from the theoretical and analytical approaches. As we have shown, we verify the indicated dependencies as regards the trends. In Figures 2-10, it can be observed that the price of the labour factor in relation to the price of the capital factor is higher and higher. The opposite directions are clearly visible since 2008. This may indicate the occurrence of substitution processes in the economy in the context of production techniques. This is, naturally, consistent with the assumptions adopted. This is also confirmed by the growth models in agriculture [Rembisz and Floriańczyk, 2014]:

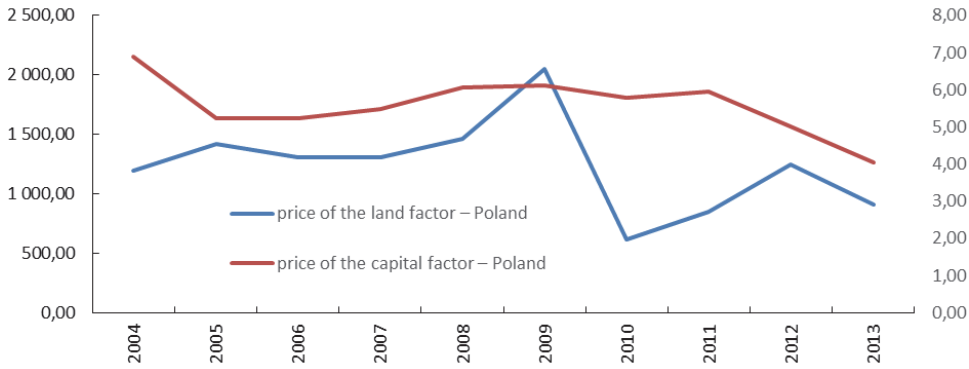
- models based on the intensification theory [Woś and Tomczak, 1983],
- Hayami-Ruttan models,
- Kuznetz models in broader terms.

In this context, we conclude that the amount of the capital factor is increasing. This is due to the economic and industrial development. Therefore, in accordance with the principle of the level of scarcity, the capital factor is becoming cheaper and cheaper in absolute terms and in terms of the price of the labour factor. This is due to the fact that it becomes more expensive as a result of the general development. This determines the decrease in its availability for the agricultural sector due to the competitive employment outside that area.

These price relationship changes are also determined by an improvement in the productivity of both production factors. By assumption, the increase in the productivity is, in fact, due to the rise in the price of the given factor(s) provided that the assumption stating that the endogenous relationships are induced by the exogenous relations is fulfilled.

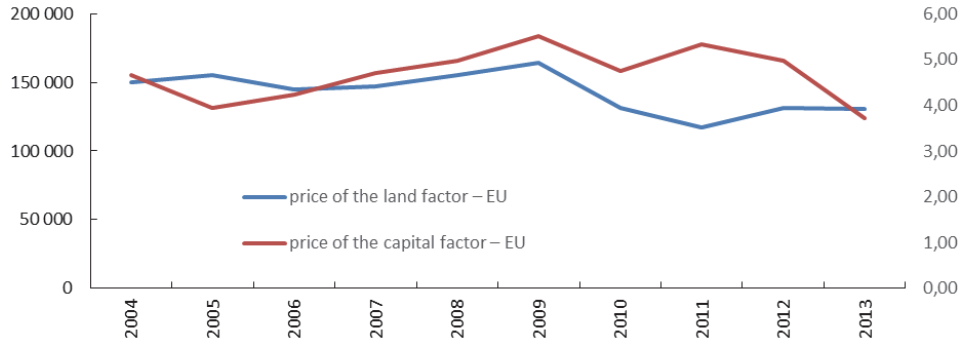
The price relationships of the capital and land factors are presented in the following Figures 11-18.

Figure 11. Land factor price and capital factor price in agriculture in Poland



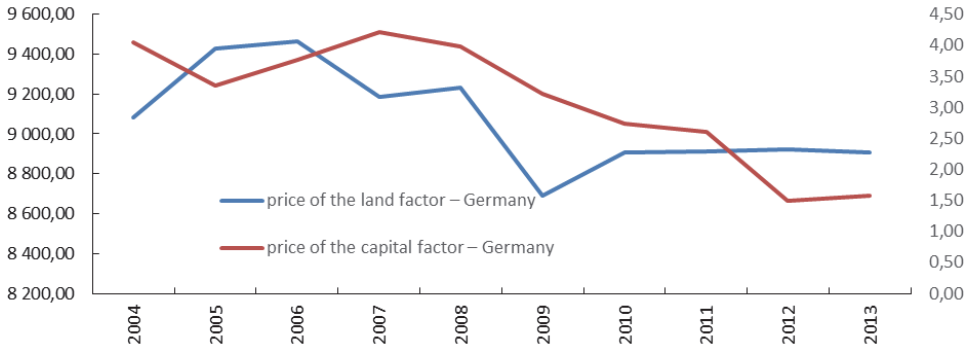
Source: own study based on the Eurostat data.

Figure 12. Land factor price and capital factor price in agriculture in the EU



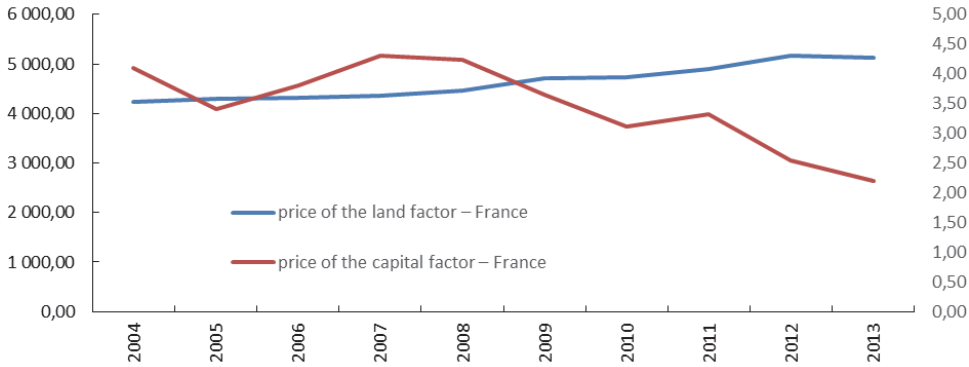
Source: own study based on the Eurostat data.

Figure 13. Land factor price and capital factor price in agriculture in Germany



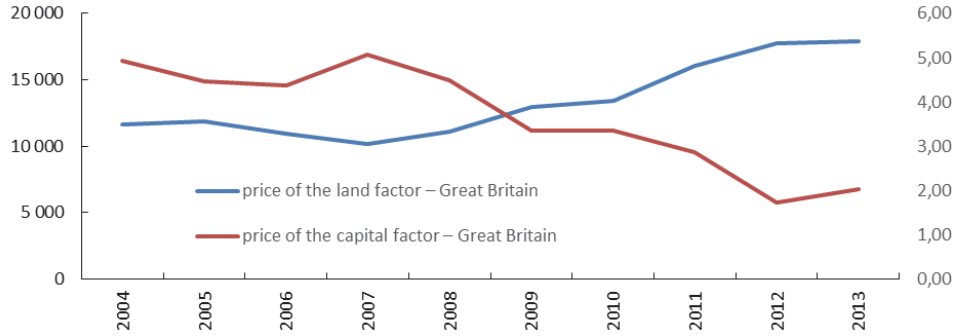
Source: own study based on the Eurostat data.

Figure 14. Land factor price and capital factor price in agriculture in France



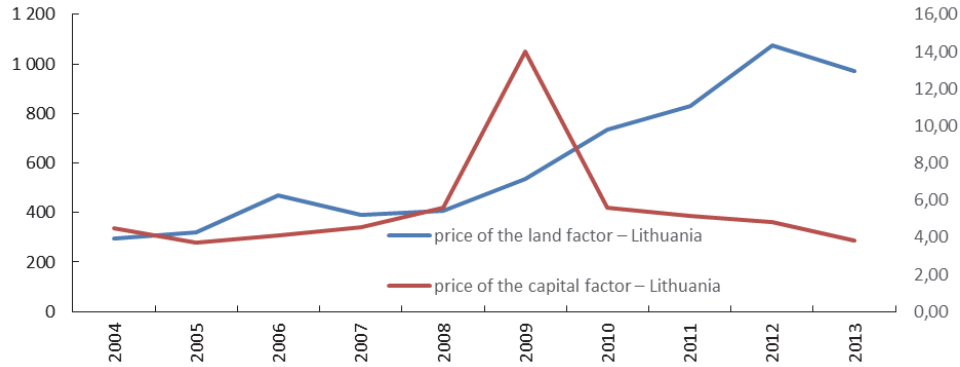
Source: own study based on the Eurostat data.

Figure 15. Land factor price and capital factor price in agriculture in Great Britain



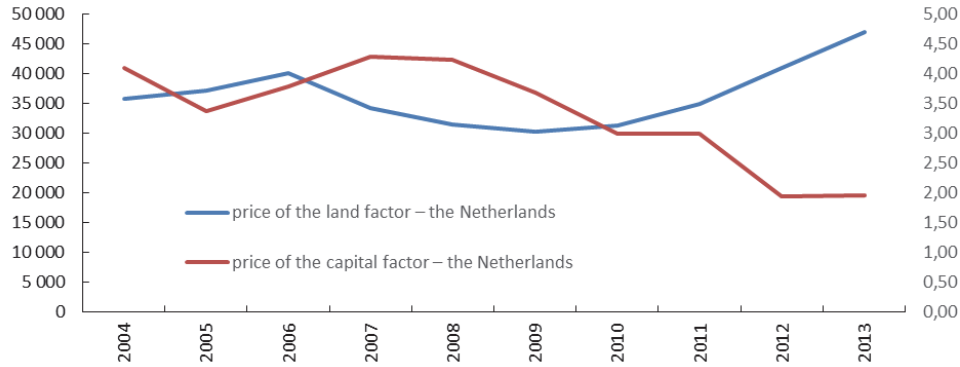
Source: own study based on the Eurostat data.

Figure 16. Land factor price and capital factor price in agriculture in Lithuania



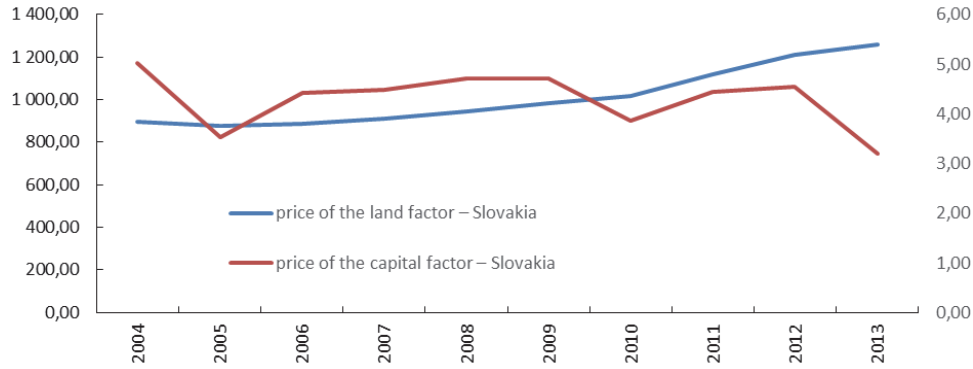
Source: own study based on the Eurostat data.

Figure 17. Land factor price and capital factor price in agriculture in the Netherlands



Source: own study based on the Eurostat data.

Figure 18. Land factor price and capital factor price in agriculture in Slovakia



Source: own study based on the Eurostat data.

Also, in the case of the price relationships of the land and capital factors, the empirical charts obtained are in line with the analytical assumptions and hypotheses derived. As a general rule, the trends in the price changes of both factors are opposite – the time series charts intersect. The reasons should be seen in the same areas and theories as for the price relationships of the capital and land factors.

7.4. Summary and conclusions

In the article, the main focus is on the analytical identification of the exogenous factors, based directly on the theory of microeconomics and production function. It was indicated that the price relationships of the capital, labour and land factors determine the production techniques. Based on the author's model approach, the assumptions were adopted as to the price relationships of these factors and were subsequently empirically verified for the selected EU countries.

Empirical analyses were carried out for the average values of the EU countries and for Poland, Germany, France, Great Britain, Lithuania, the Netherlands and Slovakia. In the case of the first pair of price relationships, we expected the falling price of the capital factor in relation to the price of the labour factor. As to the trends, these assumptions are best illustrated by the time series for the Netherlands, France and Great Britain, and thus the developing countries with a dominant share of the service sector in production. In the case of Hungary and Slovakia, these changes start evolving according to the expectations derived from the theoretical approach only after 2013. Poland is not an exception – the expected trends as to the falling price of the capital factor have been observed since 2009, while the price of the labour factor has been rising since 2008. For the second pair of price relationships: the capital factor and the land factor, we also did not observe any deviations from the derived hypotheses. For each ana-

lysed country, these price scissors “are opening” to the outside of the coordinate system. This is clearly an exogenous determinant of changes in the production techniques implicitly consistent with the views contained in the literature. It must also be added that the the second endogenous determinant of changes in the production techniques are changes in the productivity of the production factors. These are issues to be discussed on a different occasion.

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