Regression Evaluation of Agricultural Production with Direct Payments in the Slovak Republic

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DOI: https://doi.org/10.15414/isd2022.sP.06

Abstract
Research shows that there is a need to consider a system for allocating aid, which is currently linked mainly to the acreage of agricultural land. Research shows that the higher the area of agricultural land the farm manages, the higher the support in terms of direct payments. On the other hand, it should be emphasized that increasing direct payments increase the values of economic indicators as indicators of sales. On the other hand, in the case of economic indicators such as the economic result, the research results show that with increasing volume of direct payments, the given economic indicator does not increase. The given indicator is important from a macroeconomic point of view, because the given results pay income tax, which is one of the main revenues for the state budget. The question arises as to what a fair and cost-effective model for allocating direct payments is.

Keywords: direct payments, agricultural production, revenues, economical results

JEL Classification: Q18

1. Introduction
Membership in the European Union was one of the most important goals for Slovakia in the previous period. Integration with Western European markets has brought Slovak companies many advantages and opportunities, but also increased competition. Competition in conditions where our farmers and food producers cannot compete in accessing finance for development and innovation with their Western EU counterparts means, in particular, the risk of liquidation of our food industry due to surplus food production throughout Europe. Only small companies focused on specialized products with a gradual possibility of diversification of production by expanding the range of products and services or large companies with the input of foreign capital remained in such conditions. The barrier to their development is the lack of interest of policy actors in supporting this industry and their negative attitude to the national development policy of the food industry based on the production of domestic agricultural products.(Archibugi et.,2005)

The competitiveness of Slovak agriculture in the common market of the European Union is strongly influenced by the economic parameters of production. It is important to monitor the level of economic indicators especially in comparison with geographically close EU countries with a similar production structure (especially with the V4 countries, which had the same starting position). It is important for farmers to be able to make the most of their natural conditions and the corresponding production structure. The efficiency of the use of production factors and production consumption is a key parameter of competitiveness, which makes it possible to assess the ability of the agricultural sector to use its conditions and evaluate the efficiency of the choice of production structure. (Arnold, 2001)
The dimension of agricultural production in the twentieth year following the implementation of the Czechoslovak economic reform (1991) adapted to the changed economic environment. The sector's productivity was most affected by price and market liberalization and changes in support policies. The volume and composition of production were affected by the decline in domestic food consumption amid growing external competition, especially in the consumer processed food market. The disparity in the prices of agricultural products and the prices of production inputs had a significant impact, with an impact on the generation of income from agricultural production. Another factor, still active today, was the business strategies of multinational retail corporations, which significantly dominated the domestic consumer food market. (Petrasova and Valach, 2010)

The system of direct payments, which was created in the EU as a temporary solution to the situation of farmers in 1992, gradually increased in volume. Today, they account for 68% of the Common Agricultural Policy budget for 2014-2020. On the basis of the area they use alone, farmers in Europe are paid an average of € 40 billion a year.

Direct payments constitute a significant part of the EU expenditure on agriculture and represent direct subsidies to support the income of farmers based on pre-determined eligibility conditions. The payments are made in the form of current transfers to entities that directly farm land. The rules for direct payments are governed by Regulation (EU) No. 1307/2013 of the European Parliament and of the Council of December 17, 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No. 637/2008 and Council Regulation (EC) No. 73/2009 as amended.

The direct payment system is based on the principle of separating payments from production, and payments are made per hectare of the acreage of the applicant’s agricultural land. Payments are claimable, i.e. payments must be made if a farmer requests them and if he meets payment conditions. It is also possible to introduce several support regimes of payments tied to the year of submission of an application and to the actual production of an applicant’s units. In 2019 and 2020, direct payments could be made in the form of:

Decoupled direct payments:
- Single area payment scheme (SAPS) – temporary simplified regime of basic payment
- Payment for climate- and environment-friendly agricultural procedures
- Payments for young farmers

The provision of decoupled direct payments is governed by Slovak Government Regulation No. 342/2014 Coll. laying down rules for providing support in agriculture in connection with decoupled direct payment schemes, as amended.

Coupled direct payments:
- Payment for growing sugar beet
- Payment for growing hops
- Payment for growing selected fruits with high labour intensity
- Payment for growing selected fruits with very high labour intensity
- Payment for growing selected vegetables
- Payment for growing selected protein products
• Payment for growing tomatoes
• Payment for breeding ewes, ewe lambs and goats
• Payment for the fattening of selected categories of bovine animals
• Payment for cows reared within a system with market production of milk

The provision of coupled direct payments is governed by Slovak Government Regulation No. 36/2015 Coll. laying down rules for providing support in agriculture in connection with coupled direct payment schemes, as amended.

Transitional national payments
• Complementary national payment for livestock units
• Complementary national area payment
• Complementary national payment for hops

Additional domestics payment per area and per hops was not granted in 2019 and 2020. The provision of transitional national payments is governed by Slovak Government Regulation No. 152/2013 Coll. on the conditions for the provision of subsidies in agriculture in the form of transitional national payments, as amended. (Green Report, 2021)

2. Data and Methods

In the paper was used the method of regression analysis to evaluate the dependence between indicators. The goal of regression analysis is to find an equation that expresses the relationship between variables. Another goal may be to determine the size of the coefficients of the relationships between the variables, and the goal may also be to predict the value of the dependent variable. The correlation coefficient quantifies the degree of strength of the dependence between the two quantitative variables. Regression analysis assumes that the variable Y is random and the variable X is fixed. Pearson’s correlation coefficient was used in the analysis, which expresses the degree of linear dependence of two variables. The numerical values of the given coefficient range from +1 to -1.

Interpretations of the correlation coefficient according to Hinkle, Wiersma, & Jurs (2003).

Table 1 Size of Correlation Interpretation

| Value of Pearson Correlation Coefficient | Interpretation of Coefficient                  |
|----------------------------------------|-----------------------------------------------|
| .90 to 1.00 (-.90 to -1.00)             | Very high positive (negative) correlation     |
| .70 to .90 (-.70 to -.90)               | High positive (negative) correlation          |
| .50 to .70 (-.50 to -.70)               | Moderate positive (negative) correlation      |
| .30 to .50 (-.30 to -.50)               | Low positive (negative) correlation           |
| .00 to .30 (.00 to -.30)                | Little if any correlation                     |

Source: Hinkle, Wiersma, & Jurs (2003), https://oak.ucc.nau.edu/rh232/courses/EP5525/Handouts/Correlation%20Coefficient%20Handout%20-%20Hinkle%20et%20al.pdf
3. Results and Discussion

Development of basic economic indicators in comparison with the development of direct payments

Table 2 shows the development of basic economic indicators in comparison with the development of direct payments together for the Slovak Republic. The data are for primary agricultural production together. The data were drawn from the Green Reports for individual years.

The table shows that the indicator of animal production recorded a declining trend in the observed period 2005-2020. The reason was the fact that the number of animals in Slovakia has been declining for a long time. The situation has long been caused by the negative result of livestock production. Almost all bands in the conditions of the Slovak Republic show a loss.

Table 2 Development of chosen economical indicator in the Slovak agriculture

| Indicators (in mil. Euro) | 2005     | 2006     | 2007     | 2008     | 2009     | 2010     | 2011     | 2012     | 2013     |
|---------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Plant production          | 964,38   | 980,02   | 1 066,55 | 1 150,30 | 850,59   | 867,88   | 1 202,66 | 1 195,79 | 1 210,88 |
| Animal production         | 980,81   | 965,08   | 997,21   | 1 077,24 | 813,36   | 805,17   | 876,9    | 959,27   | 952,11   |
| Agricultural production   | 2 034,49 | 2 030,70 | 2 156,58 | 2 333,37 | 1 740,14 | 1 761,19 | 2 174,87 | 2 272,67 | 2 285,04 |
| Total intermediate consumption | 1 593,04 | 1 559,12 | 1 670,28 | 1 775,51 | 1 567,97 | 1 525,16 | 1 760,96 | 1 818,82 | 1 809,33 |
| Gross value added at basic prices | 576,25   | 628,66   | 589,59   | 669,06   | 290,1    | 361,48   | 534,41   | 578,24   | 597,63   |
| Consumption of fixed capital | 232,72   | 245,54   | 263,19   | 248,12   | 196,67   | 230,64   | 276,01   | 285,54   | 334,62   |
| Net value added at basic prices | 343,52   | 383,12   | 326,4    | 420,93   | 93,43    | 130,84   | 258,4    | 292,7    | 263,01   |
| Direct payments           | 204,52   | 229,6    | 258,58   | 370,4    | 364,1    | 337,6    | 365,2    | 365,19   | 354,03   |

Table 3 Development of indicators Agricultural production and Direct payments in the Slovak agriculture

| Indicators (in mil. Euro) | 2005     | 2006     | 2007     | 2008     | 2009     | 2010     | 2011     | 2012     | 2013     |
|---------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Agricultural production   | 2 034,49 | 2 030,70 | 2 156,58 | 2 333,37 | 1 740,14 | 1 761,19 | 2 174,87 | 2 272,67 | 2 285,04 |
| Direct payments           | 204,52   | 229,6    | 258,58   | 370,4    | 364,1    | 337,6    | 365,2    | 365,19   | 354,03   |

Other indicators have positive trend especially direct payments. Direct payments as only one indicator increased by index 2,19.

Table 3 Development of indicators Agricultural production and Direct payments in the Slovak agriculture

| Indicators (in mil. Euro) | 2014     | 2015     | 2016     | 2017     | 2018     | 2019     | 2020     | Index 2020/2005 |
|---------------------------|----------|----------|----------|----------|----------|----------|----------|-----------------|
| Agricultural production   | 2 273,79 | 2 043,96 | 2 273,15 | 2 267,01 | 2 159,03 | 2 059,29  | 2 209,64  | 1,09            |
| Direct payments           | 370,86   | 385      | 408,1    | 410,53   | 448,33   | 490,63   | 448,03   | 2,19            |

Source: Green Reports, 2005 – 2021, own calculation

Indicator Agricultural production has an unbalanced development as indicator Direct Payments. The minimum value of Agricultural production was achieved in 2009 (financial crises in the World) and maximum value in 2013. Development of both indicators has different trend.
In evaluation of the relationship between direct payments and the determinant of agricultural production, there is little or any correlation based on Pearson's correlation coefficient. The dependence between agricultural production and direct payments has a slightly increasing trend.
Table 4 Development of indicators Revenues, Costs, Economical Results and Direct payments in the Slovak agriculture

| Indicators (in mil. Euro) | 2005   | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|--------|------|------|------|------|------|------|------|------|------|
| Revenues                 | 2098.82| 2268.84| 2366.00| 2718.90| 1775.80| 2019.00| 2167.30| 2362.90| 2349.10| 2285.00|
| Costs                    | 2108.68| 2225.39| 2355.57| 2664.20| 1879.30| 2032.90| 2135.50| 2327.90| 2351.60| 2289.70|
| Economical results       | -9.86  | 43.45| 10.43| 54.70| -103.50| -13.90| 31.80  | 35.00  | -2.50  | -4.70 |
| Direct payments          | 204.52 | 229.60| 258.58| 370.40| 364.10| 337.60| 365.20| 365.19| 354.03| 370.86|

| Indicators (in mil. Euro) | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Index 2020/2005 |
|--------------------------|------|------|------|------|------|------|-----------------|
| Revenues                 | 2349.10| 2285.00| 2230.70| 2231.50| 2389.40| 2908.50| 3005.50 |
| Costs                    | 2351.60| 2289.70| 2193.90| 2181.10| 2329.20| 2809.00| 2938.90 |
| Economical results       | -2.50 | -4.70| 36.80| 50.40| 60.20| 99.50| 66.60 |
| Direct payments          | 354.03| 370.86| 385.00| 408.10| 410.53| 448.33| 490.63 |

Source: Green Reports, 2005 – 2021, own calculation

Indicator Economical Results have an unbalanced development as indicator Direct Payments. The minimum value of Economical Results was achieved in 2009 (financial crises in the World) and maximum value in 2019. Development of both indicators has different trend.

Figure 3 Development of indicators Economical Results and Direct payments in the Slovak agriculture in mil. Euro (year 2005-2020)

Source: Green Reports, 2005 – 2021, own calculation
In evaluation of the relationship between direct payments and the determinant of Revenues, there is moderate positive correlation based on Pearson's correlation coefficient. The dependence between agricultural production and direct payments has a slightly increasing trend. With the increase in direct payments by one unit, agricultural production will increase by an average of 0.12 Euro. Direct payments account for 34.12 % of agricultural production variability.

Figure 4 Regression between indicators Economical Results and Direct payments in the Slovak agriculture (in mil. Euro)

*Source: Green Reports, 2005 – 2021, own calculation*

Figure 5 Regression between indicators Revenues and Direct payments in the Slovak agriculture (in mil. Euro)

*Source: Green Reports, 2005 – 2021, own calculation*
Table 4  Value of Pearson Correlation Coefficient

| Indicators     | Value of Pearson Correlation Coefficient |
|----------------|------------------------------------------|
| Agricultural production | 0,258982                                  |
| Economical Results    | 0,432792                                  |
| Revenues              | 0,584110                                  |

Source: Green Reports, 2005 – 2021, own calculation

4. Conclusion

Research shows that there is a need to consider a system for allocating aid, which is currently linked mainly to the acreage of agricultural land. Research shows that the higher the area of agricultural land the farm manages, the higher the support in terms of direct payments. On the other hand, it should be emphasized that increasing direct payments increase the values of economic indicators as indicators of sales. On the other hand, in the case of economic indicators such as the economic result, the research results show that with increasing volume of direct payments, the given economic indicator does not increase. The given indicator is important from a macroeconomic point of view, because the given results pay income tax, which is one of the main revenues for the state budget. The question arises as to what a fair and cost-effective model for allocating direct payments is.

It is also important for Slovak agriculture that it is constantly disadvantaged in terms of the amount of support for farmers. In addition to European-funded support, farmers in Western Europe also receive domestic support. Slovak farmers also receive much less funding from European sources per hectare, such as in Finland, Greece, Luxembourg, Belgium, the Netherlands and other countries. Slovakia achieves the level of the EU average of 84.7% per 1 ha of agricultural land (compared to the EU-15 it is only 75.6%). It is important that in one economic area, which is linked by uniform commodity prices, all businesses have the same conditions for doing business (support mechanisms, tax and social security contributions). It is also very important to emphasize that the Slovak Republic has a lower natural soil fertility compared to most EU countries, which also causes lower incomes for farmers from primary agricultural production.

Acknowledgements

This paper was created within the project The Erasmus+ Programme of the European Union, Jean Monnet Centre of Excellence project "Centre of Excellence for European Agri-Food Chain – CEEAG" No. 611446-EPP-1-2019-1-SK-EPPJMO-CoE.

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