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## Quantification of the effect of subsidies on the production performance of the Slovak agriculture

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### Abstract

Almost every country was heading a large portion of their income on agricultural subsidies. The agricultural subsidies are an essential aspect of agriculture and play an important role in international trade. A policy to support farming incomes in the European Union is called the Common Agricultural Policy. It is the complicated policy that includes many tools. An impact of policy of EU agricultural support on the economic performance of agricultural enterprises is therefore an interesting question, especially for policy makers. The agriculture in Slovakia has undergone significant changes, not only in terms of its position in the national economy, but also in terms of its importance at the regional level. There are still persistent differences between better and worse natural conditions as well as economic and social differences with a possible impact on the level of gross agricultural production in different regions of Slovakia. The aim of this paper is to quantify the dependence of agricultural production from the subsidies granted in the context of regions under the NUTS III classification. For the calculation, we used Pearson correlation coefficient that determines the direction and rate of statistical dependence force of two numeric variables. The analysis confirmed our assumption, the result of which is that between amount of gross agricultural production and the volume of subsidies granted is a strong correlation.

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## 1. Introduction

The current trend towards trade liberalization and growth of the global nature of the world economy triggered a series of discussions on whether globalization is a driving force for growth and development or a curse for the society. The agricultural sector is a central part of this issue because the provision of agricultural subsidies is without question the focal point of last trade negotiations. Matter of fact, most countries use some form of subsidies in order to protect its agriculture (Koo, Won and Kennedy 2006).

Almost every country was heading a large portion of their income on agricultural subsidies. The agricultural subsidies are an essential aspect of agriculture and play an important role in international trade. They are considered the most effective mechanism for accelerating the growth of the agricultural sector. They are paid to farmers and agribusiness operators to supplement their income in order to management of offer of agricultural commodities or influence of the cost and supply of these commodities in the international markets (Swain 2009).

The main argument for the granting of these subsidies is the fact that the domestic farmers were not able to compete with foreign imports without mentioned financial support of state. The removal of subsidies would contribute to increased the income disparities between rural and urban areas, and that would lead to exit of domestic farmers from the industry. The loss of domestic agricultural sector is considered to be undesirable fact for various reasons, including the increase in unemployment and the loss of traditional way of life. In addition, a country that is not self-sufficient in food production can be more vulnerable to commercial pressure and the global food crisis (Henningsen et al., 2009).

The term subsidy covers a wide range of economic interventions of the government and policies which are implemented. This huge segment affecting the agricultural sector is necessary to define, describe or classify so that we can might it to best analyze and understand.

At present, there is no uniform definition of subsidy. For the initial definition can be regarded as the definition used in OECD publications, which defines a subsidy as a "result of government activities that are beneficial to the consumer or the manufacturer in order to supplement their income or reduce costs" (OECD 2005, p. 16). This definition thus includes activities such as direct payments from the state budget, tax breaks and rebates or subsidies arising from the legal preferences beneficial for certain market participants (eg. the preferential access to the market, etc.).

A policy to support farming incomes in the European Union is called the Common Agricultural Policy (CAP). It is a complicated policy that includes many tools. In the last two decades, the CAP has undergone three major reforms. In 1992 MacSharry reform introduced a shift from price support to direct payments based on cultivated area and the quantity of farmed animals and also contributed to the reduction of intervention prices (Zhu et al. 2012; Folmer et al. 1995; Ingersent et al. 1998). The second reform entitled Agenda 2000 supported implemented direct payments. Intervention prices also continued to decline and these reductions were offset by the introduction of an annual direct payments (Zhu et al. 2012; Benjamin et al., 1999). Fischler reform, which was implemented in 2003 further weakened the link between subsidies and production by introducing the single payment scheme, which separates the direct payments from production (Swinbank and Daugbjerg, 2006). CAP reforms have undergone a long process from price support, direct subsidies linked to production to decoupled payments. An impact of policy of EU agricultural support on the economic performance of agricultural enterprises is therefore an interesting question, especially for policy makers.

The basic types of support in the agricultural sector include direct support and agri-environmental support. The list of current direct support in Slovakia is recorded by Agricultural Payment Agency. Slovak farmers can annually apply for this direct support, whose conditions for the provision re pursuant to the EU and SR legislation. It is the following direct support:

- from the European Agricultural Guarantee Fund (EAGF)
  - Single Area Payment Scheme (SAPS)
  - payment to dairy cow,
  - separate sugar payment,
  - separate fruits and vegetables separate payment;
- from the European Agricultural Fund for Rural Development (EAFRD)
  - support in less favored areas (LFA),

- agri-environmental payments,
- support in territories of European importance for agricultural soil,
- support for animals welfare,
- payment for first afforestation of agricultural land,
- forest-environmental payment,
- support in territories of European importance for forest land;
- from the state budget - transitional national payments
  - additional direct payments,
  - support for hop,
  - payment per big livestock unit (Agricultural Payment Agency 2015).

Nowak et al. (2015) argue that to evaluate the performance and effectiveness of agriculture is quite complicated, not only due to the instability of climatic conditions but also due to the wide variety of households in view of their economic strength and production profile. The effect of these subsidies on the agricultural production is a major theme in agricultural economy for several decades. According to Rizov et al. (2013) the impact of subsidies on agricultural production, input allocation and income distribution is well documented in the literature. On the other hand significantly less attention has been devoted to the impact of subsidies on the productivity of farms. Most previous studies analyzed either the effects of subsidies on productivity (Guan and Oude Lansink 2006; Bezlepkina and Oude Lansink 2006; Skuras et al. 2006) or the efficiency of agriculture (Piesse and Thirtle 2000; Giannakas et al. 2001; Karagiannis and Sarris 2005; Hadley 2006, Kleinhanß et al. 2007).

## 2. Material and Methods

The aim of this paper is to quantify the dependence of agricultural production from the subsidies granted in the context of regions under the NUTS III classification.

We defined the following hypothesis:

- H1: There is a statistically significant dependence, between the amount of gross agricultural production and the volume of subsidies granted in the Slovak regions.

The gross agricultural production can be defined as the sum of sales outside the company, the sum of the intra-firm turnover increased by the difference in stocks at the beginning and end of the year. It shall be reported in physical units as well as in financial terms.

To fulfill the objective, we used secondary data published by the Statistical Office of the Slovak Republic. We used the latest available data from 2009 to 2013. In the analysis was applied NUTS III classification. We examined a given dependence for the whole Slovak Republic as well as for individual regions of Slovakia. In the analysis were used the following abbreviations of Slovak regions: Bratislava region (BA), Trnava region (TT), Trencin region (TN), Nitra region (NT), Žilina region (ZA), Banska Bystrica region (BB), Presov region (PO), Kosice region (KE).

In this paper, we used a simple regression analysis model, which describes the linear relationship between a pair of numeric variables and this dependency is displayed using the regression line. The intensity of dependence was measured through correlation analysis. For the calculation, we used Pearson correlation coefficient that determines the direction and rate of statistical dependence force of two numeric variables. Pearson correlation coefficient is in the range from -1 to 1. In this paper, we also used the method of analysis and synthesis.

For Pearson correlation coefficient is valid following relationship:

$$r_{x,y} = \frac{\overline{x \cdot y} - \overline{x} \cdot \overline{y}}{\sqrt{\overline{x^2} - (\overline{x})^2} \cdot \sqrt{\overline{y^2} - (\overline{y})^2}}$$

where:

- $x^1, y^1 \dots x^n, y^n$  are the measured values of the independent random selection of size n of the two random variables X, Y from the two-dimensional normal distribution;
- $\bar{x}, \bar{y}$  are the sample average.

The correlation coefficient ( $R$ ), was interpreted according to following table:

0,1 > R	trivial correlation
0,1 - 0,29	small correlation
0,3 - 0,49	medium correlation
0,5 - 0,69	strong correlation
0,7 - 0,89	very strong correlation
0.9 < R	almost perfect correlation (Rimarcik 2007).

Pearson correlation coefficient also indicates the direction of a linear relationship as follows:

- R > 1 there is a direct linear relationship between variables;
- R < 1 there is a indirect linear relationship between variables;
- R = 0 variables are not linearly dependent (Rimarcik, 2007).

### 3. Results and Discussion

The agriculture in Slovakia has undergone significant changes, not only in terms of its position in the national economy, but also in terms of its importance at the regional level. There are still persistent differences between better and worse natural conditions as well as economic and social differences with a possible impact on the level of gross agricultural production in different regions of Slovakia. The highest volume of gross agricultural production achieve in the long term Nitra Region, followed by Trnava region and Banska Bystrica region. On the other hand, the lowest volume of gross agricultural production in the long term achieve Žilina region, followed by Bratislava region and Presov region.

Table 1. Amount of gross agricultural production in various regions of Slovakia from 2009 to 2013 (in thousands EUR)

	2009	2010	2011	2012	2013
BA	101 356	109 015	138 185	153 079	138 520
TT	321 405	375 330	464 800	436 295	478 839
TN	165 339	148 874	182 689	186 526	227 787
NT	455 944	481 816	630 763	643 210	701 636
ZA	100 120	104 557	119 019	132 231	125 327
BB	155 669	168 870	220 342	270 097	199 870
PO	119 322	114 376	141 847	157 243	151 644
KE	170 636	153 005	193 254	234 551	196 565

Source: Statistical Office of the Slovak Republic.

Almost every country is heading a large part of its resources to agricultural subsidies. Similarly, the highly subsidized is also the EU's agricultural sector. EU measures in the field of agriculture are an integral part of the Common Agricultural Policy, which emphasizes on agricultural productivity, an adequate standard of living for farmers, support the stability of the markets, particularly on stabilizing imports and exports, security of food supplies and ensuring the adequate prices for consumers (European Commission 2012).

The Slovak Republic as an EU member state manages its agriculture under the regulatory framework of the Common Agricultural Policy. It includes also policy of subsidies in order to protect a given sector and to ensure the above objectives. The following table 2 shows the volume of subsidies granted in the regions of Slovakia in the monitored period. The highest volume of agricultural subsidies in the monitored period were provided to enterprises

of Nitra region, followed by the enterprises of Trnava region and Banska Bystrica region. On the other hand, the least subsidies from the total amount were provided to enterprises of Bratislava region, Trencin region and Kosice region.

Table 2. Volume of subsidies granted in individual regions of Slovakia from 2009 to 2013 (in EUR)

	2009	2010	2011	2012	2013
BA	16754329	12870811	15630554	14853717	6258129
TT	60093754	53579046	47601138	46074208	29887342
TN	31789369	30993675	25097396	22933722	19238990
NT	60992770	54663893	57403316	50547358	42335497
ZA	47094997	45160724	36777508	33442385	27771768
BB	48011517	46183308	36600225	36231963	29802381
PO	48705682	42895581	37227616	35644511	25592137
KE	33937908	30354965	29034617	27535837	21839652

Source: Statistical Office of the Slovak Republic.

In this paper, we have defined the following hypothesis, which was: "there is a statistically significant dependence between the amount of gross agricultural production and the volume of subsidies granted in the Slovak regions". Our analysis identified the following facts. There is a strong correlation (multiple R = 0.528209729) between the amount of gross agricultural production and the volume of subsidies granted. The analysis confirmed a direct linear relationship. The variability of the values of the dependent variable was explained to 27%. This model is statistically significant (significance F = 0.000459637) and we can accept this hypothesis.

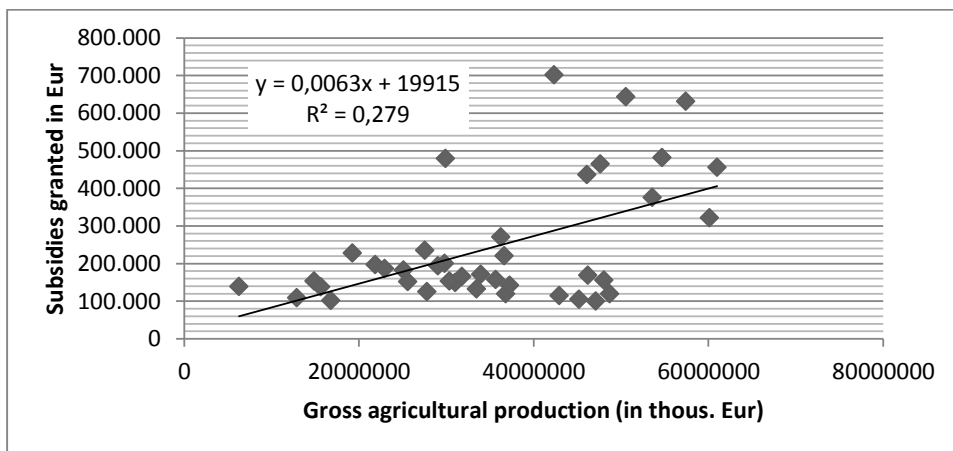


Figure 1. Quantification of dependence of gross agricultural output from subsidies granted in Slovakia

Source: Own processing.

#### 4. Conclusion

Agriculture is one of those economic sectors in which subsidies are the most widespread. These can have far-reaching consequences for production and trade in the agricultural sector. The granting of subsidies can potentially generate direct and indirect economic effects. Between the direct effects can be included their impact on output

growth and placement of investment. Economic theory predicts that agricultural subsidies help to increase the performance, reduce world prices but on the other hand also disrupt international markets and reduce economic efficiency. There are also other factors, which have a direct impact on the performance and efficiency to a limited extent. For example, the effective management of the agricultural entity even in worse economic or weather conditions can be a good inspiration not only to other companies in the neighbourhood. The validated effective elements in the management could be applied in the entities operating in better conditions and so they can contribute to an even higher performance of the individual entities or agriculture as a whole (Adamisin et al. 2015).

The subject of the analysis was to test the hypothesis of the existence of a statistically significant dependence between the amount of of gross agricultural production and the volume of subsidies granted in the regions of Slovakia. The analysis confirmed our assumption, the result of which is that between amount of gross agricultural production and the volume of subsidies granted is a strong correlation.

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