

The relationship between agricultural subsidies and labour productivity in EU countries

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Abstract

The agricultural sector plays an important role in the European Union, and agricultural subsidies represent one of the key instruments of the Common Agricultural Policy aimed primarily at stabilising farmers' income. However, their impact on labour productivity remains an open and widely debated issue. The purpose of this paper is to examine the existence, direction, and strength of the relationship between subsidies and labour productivity in European Union countries over the period from 2015 to 2024. The analysis is based on secondary data obtained from the EUROSTAT database and includes a sample of 21 EU Member States. The methodological approach includes descriptive statistical analysis, correlation analysis, and simple linear regression analysis. The results of the descriptive analysis indicate substantial heterogeneity among EU countries in terms of both subsidy levels and productivity. The correlation analysis reveals a weak but statistically significant negative relationship between subsidies and labour productivity. Regression results confirm this finding, showing that higher levels of subsidies are, on average, associated with a slight decrease in productivity, while subsidies explain only a small share of productivity variation. These findings suggest that subsidies, when observed at an aggregate level and without distinguishing their specific forms and purposes, do not automatically contribute to higher labour productivity. The results indicate that labour productivity is influenced by a range of structural and economic factors, and that the effects of subsidies should be considered within a broader analytical framework.

Key words: Subsidies, Labour productivity, European Union, Common Agricultural Policy

Introduction

Agriculture plays a significant role in the economy of the European Union, both in ensuring food security and in preserving rural areas and employment. There are numerous specific characteristics of agriculture that lead to a slower inflow of capital and the development of productive forces, resulting in a certain lag in agricultural development (Božić et al., 2011). Due to the specific features of agricultural production, agriculture in the European Union is largely supported by public subsidies through the Common Agricultural Policy (CAP). Within the EU budget for the 2021–2027 period, €386.6 billion has been allocated to the agricultural sector (European Parliament, 2021). Although the primary objective of subsidies is to stabilise farmers' income, they may have diverse, and even opposing, effects on productivity, which justifies the need for their further examination.

The existing literature on the impact of subsidies on labour productivity includes both theoretical and empirical studies. Theoretical frameworks suggest that subsidies may have a negative effect on labour productivity. Farms may begin to invest in activities aimed at obtaining eligibility for subsidies, which are relatively less productive (Baumol, 1990; Alston & James, 2002). Subsidies may also lead to technical inefficiency if they are internalised by farms, as higher profits can result in complacency, reduced effort, and a lower willingness to seek methods for improving cost efficiency (Leibenstein, 1966). On the other hand, it is argued that subsidies may also have a positive impact on labour productivity, since farmers may be more willing to expand production through certain activities or to engage additional factors of production that they would otherwise consider too risky (Roche & McQuinn, 2004). Empirical studies conducted in European Union countries employ various methodological approaches to examine the relationship between subsidies and labour productivity, including descriptive statistical measures, correlation analysis, and regression analysis.

The subject of research in this paper is the relationship between subsidies and labour productivity in the countries of the European Union over the period from 2015 to 2024. The paper focuses on analysing the relationship between the level of subsidies and the level of labour productivity in agriculture, bearing in mind that productivity represents a key indicator of the efficiency of the use of production factors in agriculture. Although subsidies represent one of the most important instruments of the European Union's agricultural policy, their impact on labour productivity is not unequivocally defined. Theoretical literature indicates that subsidies may have a positive effect on the volume of agricultural production, while at the same time exerting a negative effect on farm productivity (Hennessy, 1998; Ciaian & Swinnen, 2009). The negative impact of subsidies is reflected in the distortion of efficient resource allocation, a reduction in

incentives for rational farm management, and the maintenance of inefficient farms. The positive impact of subsidies on labour productivity is manifested through the alleviation of credit constraints, risk reduction, and the encouragement of investment in modern technology and mechanisation.

The aim of this paper is to examine the existence, direction, and strength of the relationship between subsidies and labour productivity in the countries of the European Union, based on available statistical data. The paper seeks to assess whether subsidies contribute to an increase or a decrease in the productivity of the agricultural sector, as well as to compare the results of the empirical analysis with theoretical assumptions and previous findings in the literature.

Material and Methods

In this paper, statistical data obtained from the EUROSTAT database were used, relating to agriculture in the countries of the European Union. The analysis covers the period from 2015 to 2024. The sample includes 21 out of the total 27 European Union member states, while the remaining countries were excluded from the analysis due to the lack of complete and comparable data for the observed period (Czechia, Germany, Cyprus, Malta, Romania, and Slovenia).

For the purposes of the research, data on agricultural subsidies, labour productivity, agricultural labour force, and the total value of agricultural production were used. Agricultural subsidies and production value data were derived from the Economic Accounts for Agriculture, while labour input data were obtained from Agricultural Labour Input Statistics (European Commission, 2025; European Commission, 2026). Labour productivity was calculated as the ratio between the total value of agricultural production and the labour force engaged in agriculture (AWU). The collected data were processed using descriptive statistical measures in order to examine the basic characteristics of the data and differences among the observed European Union countries. In addition to descriptive statistical analysis, correlation and regression analyses were applied to examine the relationship between subsidies and labour productivity.

Results and Discussion

Descriptive statistical indicators of agricultural subsidies in the countries of the European Union are presented in Table 1. The average value of subsidies amounted to €253 million, while the median was lower, at €129 million, indicating a pronounced right-skewed distribution. This relationship between the arithmetic mean and the median suggests that most of the observed countries

received lower levels of subsidies, while a limited number of countries recorded significantly higher amounts, which raised the average value. The high value of the standard deviation (€310 million), as well as the wide range between the minimum (€0.09 million) and maximum (€1.203 million) values, indicate substantial heterogeneity in the level of agricultural subsidisation among the European Union countries. The positive value of the skewness coefficient (1.78) confirms the pronounced right skewness of the distribution, while the value of the kurtosis coefficient (2.39) points to a moderately pronounced concentration of data around the mean, with the presence of extreme values.

Tab. 1 - Descriptive statistical analysis of subsidies

Descriptive statistical measure	Subsidies
Number of observations	210
Missing data	0
Mean	253
Median	129
Standard deviation	310
Minimum value	0.09
Maximum value	1203
Skewness coefficient	1.78
Kurtosis coefficient	2.39

Source: authors’ calculation according to data from the EUROSTAT database (2025)

Labour productivity in this paper is measured as the ratio of the total value of agricultural production to the labour force engaged in agriculture (AWU). An Annual Work Unit (AWU) represents full-time equivalent employment, i.e., the total hours worked divided by the average annual hours done in full-time jobs in a given country. One annual work unit corresponds to the work performed by one person employed full-time on an agricultural holding (Eurostat, 2026). Since agricultural output data were expressed in million euros and labour input data were reported in thousand annual work units, the labour productivity indicator is expressed in thousand euros per AWU.

Descriptive statistical indicators of labour productivity are presented in Table 2. The average value of labour productivity amounts to 70.5 thousand euros per AWU, while the median is 52.7, indicating a moderately right-skewed distribution. This relationship between the arithmetic mean and the median suggests that most countries achieve low to medium levels of labour productivity, while a smaller number of countries record significantly higher values that raise the overall average. The standard deviation is 58.4, while the values range from

a minimum of 11.5 to a maximum of 252, indicating pronounced differences in productivity levels among the observed European Union countries. The positive value of the skewness coefficient (1.28) confirms the presence of right skewness in the distribution, while the relatively low value of the kurtosis coefficient (0.662) points to a flatter distribution compared to the normal distribution, without strongly pronounced extreme values.

Tab. 2 - Descriptive statistical analysis of labour productivity

Descriptive statistical measure	Labour productivity
Number of observations	210
Missing data	0
Mean	70.5
Median	52.7
Standard deviation	58.4
Minimum value	11.5
Maximum value	252
Skewness coefficient	1.28
Kurtosis coefficient	0.662

Source: authors’ calculation according to data from the EUROSTAT database (2025)

In order to examine the relationship between subsidies and labour productivity in the countries of the European Union for the 2015–2024 period, a correlation analysis was conducted using the Pearson’s correlation coefficient (Table 3). Within the correlation analysis, the following hypotheses were tested:

- H₀: “Subsidies do not have a statistically significant impact on labour productivity in the countries of the European Union.”
- H₁: “Subsidies have a statistically significant impact on labour productivity in the countries of the European Union.”

Tab. 3 - Correlation analysis results

		Productivity
Subsidies	r	-0.149
	df	208
	p – value	0.031

Source: authors’ calculation according to data from the EUROSTAT database (2025)

The results obtained in this paper indicate a weak negative correlation between subsidies and labour productivity in agriculture ($r = -0.149$). The

calculated p-value is 0.031, which is lower than the 5% significance level (0.05), allowing the conclusion that there is a statistically significant relationship between subsidies and agricultural productivity. Accordingly, this result enables the rejection of the null hypothesis at the 5% significance level, thereby confirming the existence of a statistically significant relationship between the observed variables.

The negative sign of the correlation coefficient indicates that, in the observed sample and period, higher levels of subsidies are not associated with higher levels of productivity, but rather with a slight decrease in productivity. This result suggests that subsidies, when observed at the aggregate level, do not automatically function as a factor that increases agricultural production productivity in the EU countries. These findings are consistent with the empirical literature, which often reports a negative impact of CAP subsidies on labour productivity, such as the negative effect of subsidies on the efficiency of French agricultural holdings specialised in cereal, oilseed, and beef production (Latruffe et al., 2009), as well as the negative effects of coupled subsidies on the efficiency of arable farms in Germany, the Netherlands, and Sweden (Zhu & Oude Lansink, 2010).

However, given the low absolute value of the correlation coefficient, it can be concluded that the relationship between subsidies and productivity is weak, and that labour productivity was simultaneously influenced by a larger number of other factors, such as production structure, technological level, labour input, and the total value of agricultural production. These results are in line with theoretical and empirical studies indicating that subsidies may have both positive and negative effects on productivity, depending on their form, allocation mechanisms, and the structural characteristics of agriculture.

The results of the correlation analysis provide a basis for further examination of the relationship between subsidies and productivity through the application of regression analysis.

In order to examine the impact of subsidies on labour productivity in more detail, a simple linear regression analysis was conducted, in which agricultural productivity was treated as a dependent variable, while agricultural subsidies were used as the independent variable. The results of the regression analysis are presented in Table 4. The results show that the estimated regression model is statistically significant at the 5% level ($F = 4.72$; $p = 0.031$), indicating that subsidies have had a statistically significant impact on labour productivity in the observed sample. The coefficient of determination (R^2) is 0.022, which means that subsidies explain only 2.2% of the variability in labour productivity, suggesting that productivity was simultaneously influenced by a larger number of other factors. The table shows that the estimated regression coefficient for the subsidy variable (“estimate”) has a negative sign and amounts to -0.028 , and it

is statistically significant at the 5% level ($p = 0.031$). This implies that an increase in the level of subsidies was, on average, associated with a slight decrease in labour productivity. More precisely, an increase in subsidies by one unit is associated with a decrease in productivity of approximately 0.028 units.

Tab. 4 - Regression analysis results

Model fit measures						
			Overall model test			
Model	R	R ²	F	df1	df2	P
1	0.149	0.0222	4.72	1	208	0.031
Model coefficient – productivity						
			95% confidence interval			
Predictor	Estimate	SE	Lower	Upper	T	P
Intercept	77.59	5.16	67.41	87.77	15.02	<0.001
Subsidies	-0.028	0.0129	-0.0535	-0.00261	-2.17	0.031

Source: authors’ calculation according to data from the EUROSTAT database (2025)

The results obtained indicate that subsidies, when observed at the aggregate level and without distinguishing their forms and purposes, do not act as a factor that increases labour productivity; on the contrary, they may have a slight disincentive effect. This finding is consistent with part of the theoretical and empirical literature, which emphasises that subsidies may lead to allocative and technical inefficiencies, particularly when they are not directly targeted at investment and technological improvement. The results of the regression analysis confirm the findings of the previous correlation analysis and point to the existence of a weak but statistically significant negative relationship between subsidies and labour productivity in the countries of the European Union during the observed period.

Conclusion

This paper analysed the relationship between subsidies and labour productivity in the European Union countries over the 2015–2024 period, using data obtained from the Eurostat database for a sample of 21 EU Member States. The results revealed a weak negative but statistically significant relationship between agricultural subsidies and labour productivity. Regression analysis

further confirmed that subsidies explain only a small proportion of the variation in labour productivity.

The findings suggest that labour productivity is a complex phenomenon influenced by numerous economic and structural factors, and that the effects of subsidies cannot be considered in isolation from the broader context of agricultural sector development. Therefore, subsidies alone cannot be regarded as a decisive factor in increasing labour productivity.

However, several limitations of this study should be acknowledged. Agricultural subsidies were analysed as an aggregated variable, while labour productivity was used as a specific indicator of agricultural productivity. In addition, the analysis relied on a pooled dataset and a simple regression model without controlling for country-specific effects, potential endogeneity, or other determinants of labour productivity. Furthermore, structural differences among EU countries may influence the observed relationship between subsidies and labour productivity. Therefore, the results should be interpreted as evidence of an association rather than a causal relationship.

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Сажетак

Пољопривредни сектор има важну улогу у Европској унији, а пољопривредне субвенције представљају један од кључних инструмената Заједничке пољопривредне политике, првенствено усмјерен на стабилизацију прихода пољопривредника. Међутим, њихов утицај на продуктивност рада у пољопривред и даље остаје отворено и често расправљано питање. Циљ овог рада је да испита постојање, смјер и јачину везе између субвенција и продуктивности рада у земљама Европске уније у периоду од 2015. до 2024. године. Анализа је заснована на секундарним подацима преузетим из базе података EUROSTAT и обухвата узорак од 21 државе чланице ЕУ. Методолошки приступ укључује дескриптивну статистичку анализу, корелациону анализу и једноставну линеарну регресиону анализу. Резултати дескриптивне анализе указују на значајну хетерогеност међу земљама ЕУ у погледу нивоа субвенција и продуктивности. Корелациона анализа открива слабу, али статистички значајну негативну повезаност између субвенција и продуктивности рада у пољопривреди. Резултати регресионе анализе потврђују овај налаз, показујући да су виши нивои субвенција, у просјеку, повезани са благим смањењем продуктивности, при чему субвенције објашњавају само мали дио варијације продуктивности. Ови налази указују на то да субвенције, посматране на агрегатном нивоу и без разликовања њихових конкретних облика и намјене, не доприносе аутоматски већој продуктивности рада. Резултати показују да је продуктивност рада у пољопривреди под утицајем низа структурних и економских фактора, те да се ефекти субвенција морају посматрати у ширем аналитичком оквиру.

Кључне ријечи: субвенције, продуктивност рада, Европска унија, Заједничка пољопривредна политика

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