RELATIONSHIP BETWEEN SALARY AND ECONOMIC DEVELOPMENT IN THE AGRICULTURAL SECTOR IN BULGARIA

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ВРЪЗКА МЕЖДУ ЗАПЛАТА И ИКОНОМИЧЕСКО РАЗВИТИЕ В АГРАРНИЯ СЕКТОР В БЪЛГАРИЯ

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Abstract

The aim of the study was to analyze the relationship between salary and economic development in the agricultural sector in Bulgaria. The following statistics, concerning the agricultural sector, were used: average annual wages and salaries of the employees under labour contract; employed persons; Gross Value Added; expenditure on acquisition of tangible fixed assets and other subsidies on production. Correlation coefficients were calculated for the primary data and for the first, second and third differences. A regression model was developed and it showed that the average annual salaries in agriculture could be explained to some degree by its value in the previous period. The increases in the subsidies and in the investments significantly push salaries up, and vice versa.

Key words: salaries in agriculture; employed persons; investments in agriculture; correlations; regression model

JEL: Q10, C32

Introduction:

Agricultural sector in Bulgaria forms about 4.3% of Total Gross Value Added in Bulgaria in 2021 and provides employment for 6.3% of employed persons in the country. At the same time, wages in agriculture are about 29% lower than the national average (NSI).

Wages are an important source of income for households in Bulgaria. It has been found (Kolev and Tsoklinova, 2017) that the amount of GDP is influenced by the annual income of households, the inflation rate and interest rates on consumer loans.

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Also, the amount of remuneration is an important motive for changing jobs by employees (Petkova, 2020). The financial motive is important, but not the only factor for the motivation of the majority of people (Сюлча, 2020).

Wages in the agricultural sector are the subject of research by a number of authors. Gospodinova (2020) finds that wages in the agricultural sector in Bulgaria are growing faster than the rate of change in labour productivity. According to Atanasov and Georgiev (2013) the remuneration of labour must be consistent with the quantity and quality of work, the length of the working day, qualifications and others. The object of study (Kalchev, 2020) are also the features of taxation of income from agricultural activity of individuals.

The investment process in the Bulgarian agriculture is also of interest. According to a study, held by Uzunova-Kostova (2012), investing in the agricultural sector is associated with high risk and limited opportunities to minimize it. But on the other hand, it has been found (Anastasova-Chopeva, 2020) that since 2007 investment activity in the agricultural sector has shown a steady upward trend. As a consequence of some factors, such as market risk, limited access to land, lower labour productivity, low return on investments and others, agricultural holdings develop non-agricultural activities (Harizanova-Bartos, 2020).

The decrease of the labour resources in the agricultural sector in Bulgaria is a permanently established tendency, influenced by a number of factors, such as unfavorable demographic situation, quality of life in the villages; lower income; lack of financial resources (Anastasova-Chopeva, 2019).

The aim of the study was to analyze the relationship between salary and economic development in the agricultural sector in Bulgaria.

Materials and methods

The following statistics, published by the National Statistical Institute, concerning the agricultural sector, were used to achieve the aim of the study: Average annual wages and salaries of the employees under labour contract in agriculture, forestry and fishing (in BGN); Employed persons in agriculture, forestry and fishing (thousand persons); Gross Value Added (GVA) in agriculture, forestry and fishing (in million BGN); Expenditure on acquisition of tangible fixed assets in agriculture, forestry and fishing (thousand BGN) and Other subsidies on production (in million BGN). Data were gathered for the period 2003 – 2021, with the exception of subsidies, for which data were collected for the period 2003 – 2020.

The variable "Average annual wages and salaries of the employees under labour contract in agriculture, forestry and fishing" shows on average how much a person employed in the agricultural sector receives for one year for working under labour contract. Gross Value Added in agriculture generally shows the economic development in the sector. Expenditure on acquisition of tangible fixed assets is one of the indicators through which we can study the investments in the sector.

The real values of the average annual wages and salaries of the employees, Gross Value Added, subsidies and expenditure on acquisition of tangible fixed assets in agriculture were calculated by dividing their nominal values to the consumer price index (CPI), expressed as a coefficient by dividing CPI to 100, calculated as an average for the respective year (CPI, 1995 = 100; Source: NSI). The applied methodology was according to: https://www.dallasfed.org/research/basics/nominal.aspx.

Correlation coefficients were calculated for the primary data (in real values where applicable) and for the first, second and third differences. An autoregressive model was developed, using natural logarithms of the variables, and its diagnostics were checked, with the statistical software Microfit 5.5. The method of ordinary least squares was applied.

The study assumed that current wages in the agricultural sector were influenced by the level of wages, formed during the previous period, subsidies in agriculture, employed persons in the sector and expenditure on the acquisition of tangible fixed assets in agriculture (investments).

The model had the following form:

$$dlnWages_t = c_0 + c_1 dlnWages_{t-1} + \sum_{i=0}^{1} c_2 dlnInvestments_{t-i} + c_3 dlnEmployed_{t-1} + \sum_{i=0}^{1} c_4\, dlnSubsidy_{t-1} + e_t$$

where:

c_0 – constant of the model; **c_1**, **c_2**, **c_3** and **c_4** – coefficients of the variables;

d – first difference of the variable;

lnWages – logarithm of average annual wages and salaries of the employees under labour contract in agriculture, forestry and fishing;

lnSubsidy – logarithm of other subsidies on production;

lnEmployed – logarithm of employed persons in agriculture, forestry and fishing;

lnInvestments – logarithm of expenditure on acquisition of tangible fixed assets in agriculture, forestry and fishing;

e – error of the model.

Augmented Dickey-Fuller (ADF) test was applied in order to check the stationarity of the variables.

Result and discussions

During the period 2003 – 2021 the increase of average annual wages in agriculture, calculated on the basis of 2003, was by 445% (in nominal terms: from 2424 BGN in 2003 to 13204 BGN in 2021). In real terms, the increase was 196%.

Employed persons in agriculture decreased significantly during the period under review: from 285.9 thousand persons in 2003 to 193.6 thousand persons in 2021, or a decrease of 32%.

With regard to Gross Value Added in agriculture, there was an increase of 49%, calculated on the basis of 2003 (in nominal terms: from 3332.4 million BGN in 2003 to 4949.6 million BGN in 2021). In real terms, however, there was a decrease of 19% for the period 2003 – 2021.

During the period 2003 – 2021, the increase in expenditure on acquisition of tangible fixed assets in agriculture on the basis of 2003 was 363% (in nominal terms: from 265536 thousand BGN in 2003 to 1229035 thousand BGN in 2021). In real terms, the increase was 151%.

During the period 2003 – 2020 the increase of other subsidies on production in agriculture, calculated on the basis of 2003, was by 1594% (in nominal terms: from 135.4 million BGN in 2003 to 2294.1 million BGN in 2020). In real terms, the increase was 850%.

The correlation dependences between the primary data and the first, second and third differences of the studied variables are examined (Table 1). The presented variables are not stationary at level, so the correlations calculated on the basis of the primary data are scrutinized to assess whether this corelations are true or spurious.

There may be a discrepancy between the signs of the correlation coefficients between the primary data and their differences. Mills (2011) studied the relationship between tobacco consumption and savings and found a discrepancy between the correlations in the primary data and the correlations between some of their differences.

Table 1. Correlation matrices

	Variable	**Salaries**	**Expenditure on acquisition of tangible fixed assets**	**Employed persons**	**Subsidy**	**GVA**
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	0.721	1			
	Employed persons	-0.753	-0.835	1		
	Subsidy	0.963	0.799	-0.767	1	
	GVA	-0.479	-0.673	0.798	-0.605	1
First difference	First difference					
	Variable	Salaries	Expenditure on acquisition of tangible fixed assets	Employed persons	Subsidy	GVA
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	-0.010	1			
	Employed persons	0.210	0.088	1		
	Subsidy	0.298	-0.424	0.064	1	

	GVA	0.283	0.093	0.496	0.264	1

Second difference	Second difference					
	Variable	Salaries	Expenditure on acquisition of tangible fixed assets	Employed persons	Subsidy	GVA
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	0.207	1			
	Employed persons	-0.109	0.274	1		
	Subsidy	0.250	-0.546	-0.117	1	
	GVA	0.156	0.218	0.604	0.249	1
Third difference	Third difference					
	Variable	Salaries	Expenditure on acquisition of tangible fixed assets	Employed persons	Subsidy	GVA
	Salaries	1				
	Expenditure on acquisition of tangible fixed assets	0.236	1			
	Employed persons	-0.198	0.320	1		
	Subsidy	0.199	-0.598	-0.257	1	
	GVA	0.118	0.194	0.631	0.222	1

Source: Own calculations.

The following conclusions can be drawn from Table 1:

- The correlation coefficients between the expenditure on acquisition of tangible fixed assets and salaries are positive in all correlation matrices, except in the first difference matrice, which means that as investments increase, salaries in the agrarian sector also increase.

- The correlation between the salaries and the number of employed persons in the agricultural sector is positive only in the first difference matrice, and in the other correlation matrices it is negative. So we assume that the relationship between the two indicators is negative. Therefore, as the number of employed persons decreases, the salaries increases. The observed inverse relation between these variables was in accordance with the economic theory: a reduction in labour supply increases the price of labour, and vice versa.

- The correlation between subsidies and salaries is positive in all correlation matrices, meaning that as subsidies increase, salaries tend to increase as well.

- The correlation coefficients between salaries and GVA is negative in the primary data matrice, but positive in the first, second and third differences. Therefore, we can conclude that the relationship between salaries and GVA is generally positive, albeit weak: as GVA increases, so do salaries.

- The correlation coefficient between the number of employed persons and the expenditure on acquisition of tangible fixed assets is strong and negative in the pri-

mary data, and from the first to the third difference matrices the correlation is positive, with each subsequent difference the the coefficient becomes higher and higher. There fore we assume that the correlation between the two indicators is positive: with an increase in the expenditures, the number of employed persons increases, albeit slightly, which is probably due to the fact that in order to exploit the investment inputs, work force is needed.

- The correlation between the expenditure on acquisition of tangible fixed assets and subsidies is positive only in the primary data and negative in the first, second and third difference, with each subsequent difference the correlation coefficient becomes increasingly significant in value. Therefore, we can assume that the relationship between the two indicators is negative: as investments decrease, subsidies increase. This is probably a consequence of replacing one financial resource (investments) with another (subsidies). But the reasons why investments in the sector decline as agricultural subsidies rise remain a source of discussion.

- The correlation between GVA and expenditure on acquisition of tangible fixed assets is negative in the primary data and positive from the first to third differences, although the values of the correlation coefficiens are low. Therefore, we cannot agree that there is a negative correlation between GVA and investments. Rather, we can assume that overall the relationship between them is positive, albeit very weak.

- The correlation between the number of employed persons and subsidies is positive, albeit very weak, at first difference. In the rest of the correlation matrices, the relation is negative, indicating the presence of negative correlation between them. Therefore: as the number of employed persons decreases, the subsidies increase, which probably means that the subsidies to some extent serve to compensate for the decrease in the number of persons employed in agriculture.

- The correlation between the number of employed persons and GVA is positive and significant in value in all correlation matrices. Therefore, with an increase in the number of employed persons, GVA increases, and vice versa. This clearly shows the role of the human factor for the development of the agricultural sector.

- The correlation between GVA and subsidies is negative in the primary data, while from the first to the third difference matrices, the correlation coefficients are positive, although low in value. Therefore, we can assume that there is a weak positive correlation between the two indicators: as subsidies increase, GVA shows a tendency to increase.

The regression model was analyzed. It was found that none of the variables, included in the regression model, were stationary at level according to the ADF test with included intercept and a linear trend at 5% significance level, meaning that the inclusion of the first difference of the time series in the regression was an appropriate decision.

Table 2. Estimates of the regression model with dependent variable $dlnWages_t$

Variable	Coefficient	Standard Error	t-Statistic	Probability
c_0	0.019415	0.01058	1.8351	0.100
$dlnWages_{t-1}$	0.50325	0.15703	3.2048	0.011
$dlnInvestments_t$	0.077271	0.026251	2.9436	0.016
$dlnInvestments_{t-1}$	0.034742	0.023502	1.4782	0.173
$dlnEmployed_{t-1}$	0.15197	0.083947	1.8103	0.104
$dlnSubsidy_t$	0.047237	0.010837	4.359	0.002
$dlnSubsidy_{t-1}$	0.015416	0.012738	1.2103	0.257
R^2	0.84658	Adjusted R^2	0.7443	
Standard error of regression	0.016536	F-statistic / Probability	8.2770 / 0.003	
LM-test (F-statistic / Probability):	2.4861 / 0.154	Heteroscedasticity (F-statistic / Probability):	0.0068114 / 0.935	
Jarque-Bera test ($\chi 2$ test / Probability):	0.81946 / 0.664	Ramsey RESET test (F-statistic / Probability):	0.50004 / 0.500	
CUSUM и CUSUMSQ	Fall between the 5% critical bounds.			

Source: Own calculations with the software Microfit 5.5.

Table 2 represented the statistics of the model with the dependent variable dlnWages. Its F-statistic was 8.2770, significant at 1% level. The coefficient of determination (R^2) was high (0.84658); the Adjusted R^2 was 0.7443.

The following conclusions could be drawn from the presented estimates of the variables in the model:

The lag of the average annual salaries in the agricultural sector was significant at 5% level, which meant that the dependent variable could be explained to some degree by its value in the previous period. The relationship between subsidies in the current period ($dlnSubsidy_t$) and the dependent variable was highly significant and positive (coefficient of 0.047237, $p < 0.01$), which meant that an increase in the subsidies led to an increase in the average annual salaries, and vice versa. The coefficient in front of the first lag of the employed persons was positive but not significant ($p > 0.05$). The relation between the average annual salaries and the expenditure on acquisition of tangible fixed assets in agriculture in the current period was significant and positive (coefficient of 0.077271, $p < 0.05$), which meant that an increase in the the investments in the agricultural sector led to an increase in the average annual salaries, and vice versa.

Conclusions

The following conclusions can be drawn from the correlation analysis:

- There is a positive correlation between investments and salaries in the agricultural sector.
- The relation between salaries and number of employed persons is negative. The observed inverse relation between these variables was in accordance with the economic theory: a reduction in labour supply increases the price of labour, and vice versa.
- The correlation between subsidies and salaries is positive in all correlation matrices, meaning that as subsidies increase, salaries tend to increase as well.
- The relation between salaries and GVA is generally positive, albeit weak: as GVA increases, so do salaries.
- The correlation between the number of employed persons and investments is positive: with an increase in the investments, the number of employed persons increases.
- The relation between the investments and subsidies is negative: as investments decrease, subsidies increase. This is probably a consequence of replacing one financial resource (investments) with another (subsidies).
- The correlation between GVA and investments is positive, albeit very weak.
- There is a negative correlation between the number of employed persons and subsidies in agricultural sector. This probably means that the subsidies to some extent serve to compensate for the decrease in the number of persons employed in agriculture.
- The correlation between the number of employed persons and GVA is positive and significant in value in all correlation matrices. This clearly shows how important is the human factor for the development of the agricultural sector.
- There is a weak positive correlation between GVA and subsidies: as subsidies increase, GVA shows a tendency to increase.

The regression analysis showed that the average annual salaries in agriculture could be explained to some degree by its value in the previous period. The increases in the subsidies and in the investments significantly push salaries up, and vice versa.

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