

THE PLACE OF AGRICULTURE IN ECONOMIC GROWTH

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Abstract

Agriculture - economic growth relationship is the subject of many studies, with different methodology, content and perspectives. In this context, the paper presents an econometric analysis of macroeconomic level in order to measure the contribution of agriculture to economic growth equation and evaluating the causal relationship with industry. The econometric analysis undertaken, using OLS method (Ordinary Least Square or the method of least squares) and TSLS method (Two Stage Least Square or the method of least squares in two-stage). Contribution of agriculture is defined in terms of the agricultural GDP (gross domestic product) and the economic growth in terms of evolution of real GDP. The results reveal that agriculture occupies a secondary place in economic growth. Regarding the links between agriculture and industry, they are in favor of industry. Why? Because, in the agricultural GDP equation, the industrial GDP coefficient has a negative sign (-), and in the industrial GDP equation, the agricultural GDP coefficient is positive (+). Therefore, the industrial sector has greater benefits from industry-agriculture relationship and by effect of agriculture-growth relationship. Developing the agricultural sector deserves a priority position since growth in this sector helps the industry to grow further. However, capital investment in agriculture releases farm labor that often is not absorbed by the economy and emphasizes the degree of rural poverty. Thus, encouraging the industrial development by increasing agricultural sector, the position of rural poverty can increase. This reality indicates that agricultural development should not be hampered in favor of concentrating resources for industrial development and must be found an optimal balance between industry and agriculture, so the rural poverty to be alleviated and the economy to record a sustainable growth.

Key words: agriculture, economic growth, gross domestic product, benefits

The objective of the paper is the answer to the questions:

- What is the role of agriculture in economic growth?
- What is the causal relationship of agriculture – economic growth and agriculture - industry?

MATERIAL AND METHOD

This paper uses econometric analysis as research method. The econometric analysis undertaken, uses OLS method (Ordinary Least Square or the method of least squares) and TSLS method (Two Stage Least Square or the method of least squares in two-stage).

The used material for the calculation of indicators was taken from the National Statistics Institute of Romania (INS) and field studies. The field studies were performed on the economy of Dorna Basin Region-Romania.

RESULTS AND DISCUSSIONS

Dorna Basin is located in northern Romania. It has an area of 222.19 km² representing 0.63% of the country surface. Within this zone are covered 9 communes with 49 villages and an urban center represented by Vatra Dornei City. This localities are administratively part of Suceava County. The economy is dominated by tourism, food industry, wood industry and agriculture. Agriculture is specific to mountain areas in Europe that is based on forage crops and livestock.

To achieve the work objective, the authors considered the region's economy as a sum of results that form the GDP equation. The GDP was calculated on the total region and to simplify the econometric analysis, it was considered that GDP has only two incorporation sources, namely the agriculture and industry (by industry being understood all branches of the local economy, except agriculture).

Therefore, the sectoral economic performance in terms of GDP (y) were evaluated

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through the report that is created between capital (K) and labor (L).

$$Y_{j,i} = F(k_{j,i}, L_{j,i}) \quad (1)$$

j = agriculture
i = industry

Capital and labor were considered as a limited given (as a resource) defined by an opportunity cost. The opportunity cost answer the question: Which cost of the possible costs multitude is optimal to perform? For example, the capital has a yield in agriculture and other in industry. The same for the labor.

Starting from these considerations, capital and labor were considered mobile across sectors. This can be seen by considering the total derivative of the equation:

$$dy_j = \frac{\partial F}{\partial K_j} dk_j + \frac{\partial F}{\partial L_j} dl_j$$

$$\frac{dy_j}{y_j} = \frac{\partial F}{\partial k_j} \frac{K_j}{y_j} \frac{dk_j}{k_j} + \frac{\partial F}{\partial L_j} \frac{L_j}{y_j} \frac{dL_j}{L_j} \quad (2)$$

or, in terms of estimated parameters:

$$\dot{y}_j = \beta_k \dot{k}_j + \beta_l \dot{l}_j, \quad (3)$$

where:

\dot{y}_j, \dot{k}_j și \dot{l}_j are the growth rates of sector j output, respectively, the growth rates of capital and labor used in sector j.

β_s - is the input elasticity coefficients.

In order to highlight the links between agriculture and industry it were used the relationships:

-for the agricultural GDP,

$$\dot{y}_a = \beta_0 + \beta_k \dot{k}_a + \beta_l \dot{l}_a + \beta_i \dot{y}_i + \beta_t \dot{l}_t + e \quad (4)$$

where: coefficient β_0 is the constant term and the other β_s coefficients are the elasticities of variable to be estimated.

- for the industrial GDP

$$\dot{y}_i = \alpha_0 + \alpha_k \dot{k}_i + \alpha_l \dot{l}_i + \alpha_a \dot{y}_a + \alpha_t \dot{y}_t + e \quad (5)$$

where: α_0 is the constant term and α_s represent the elasticities of variable to be estimated.

The main estimated variables were:

- agricultural GDP (InGDPagr);
- industrial GDP (InGDPind);
- labor employed in agriculture (InLagr);
- labor employed in industry (InLind);
- gross capital formation in industry (InGCFind);
- gross capital formation in agriculture (InGCFagr).

According to methodological benchmarks, the analysis led to the following results:

$$\text{InGDPagr} = +0.301 \text{InGCFind} - 0.446 \text{InLagr} - 0.297 \text{InGDPind} + 0.152 \text{dummy} + 4.289 C - 0.253 \text{AR} \quad (6)$$

$$R^2 = 0.80 \quad (7)$$

$$\text{DW} = 1.13 \quad (8)$$

$$\text{InGDPind} = +0.135 \text{InGDPagr} + 0.158 \text{InGCFind} + 0.096 \text{InLind} + 0.016 \text{dummy} + C - 0.253 \text{AR} \quad (9)$$

$$R^2 = 0.94 \quad (10)$$

$$\text{DW} = 1.02 \quad (11)$$

The estimates results made by TSLS (the method of least squares in two stages) for both agricultural GDP, as well as industrial GDP are shown in the table below:

Table1

Estimates obtained using the TSLS Method - 1

Agricultural GDP		Industrial GDP	
Capital	0.475	Capital	2.365
Labor employed in agriculture	-0.429	Labor employed in agriculture	1.847
Industrial GDP	-0.829	Industrial GDP	1.511
Free term	2.440	Free term	-6.476
Dummy	0.366	Dummy	0.744 (1.818)
R ² , DW	0.67; 1.96	R ² , DW	0.65; 2.10

Source: own calculations

According to the data in *table 1*, that presents the equation of agricultural GDP and industrial GDP into a systemic approach, we note that the sign of the coefficients for all considered variables are kept and generally, the results obtained using this procedure (TOLS method) confirmed those obtained using the OLS method.

Follows:

- The capital (+0.475 in agricultural GDP and 2.365 in industrial GDP) is the main factor of economic growth. The variable "labor" (-0.429 in agricultural GDP and +1.847 in industrial GDP) also has a positively influences on GDP growth, but at a slower rhythm. Hence, results the fact that labor relative to capital has a secondary role in economic growth (capital determines investment, investment leads to technical progress, technical progress determines competitiveness and economic growth);

- The variable labor employed in agriculture has a negative sign in each estimated equation, which means that an increase of employment in agriculture is no longer justified. Moreover, agriculture's GDP growth is inversely related to employment growth (-) and directly related to capital increase (+).

Analyzing the impact of agricultural GDP and industrial GDP on total GDP growth, using the methodology described above, resulted the following (*table 2*):

- The sign of the coefficient is positive for the industry and negative for agriculture;
- Total GDP is positively influenced both industry and agriculture;
- The industrial GDP growth influence the total GDP growth at a rate higher than the increase of agricultural GDP (the ratio is 0.755 / 0.198);
- The relative importance of agriculture decreases as the total GDP increase;
- The relative importance of industry increases as the total GDP increase.

Table 2

Estimates obtained using the TOLS Method - 2

Total GDP	
Industrial GDP	0.755
Agricultural GDP	0.198
Free term	0.047
R ² , DW	0.85; 1.84

Source: own calculations

The results showed that the industrial sector benefit more from relationship industry - agriculture.

Agricultural development through investments in capital (capital is the main engine of economic growth) increase the demand of agriculture for industrial goods and by effect, the industry develops faster.

Thus, agricultural growth deserves priority positions since the growth in this sector help industry to grow further. However, capital investment in agriculture frees farm labor that often is not absorbed by the economy and rural poverty worse. Thus, by encouraging industrial development through the improving of agriculture, the position of rural poverty may increase.

This fact indicates that agricultural development should not be curbed in favor of concentrating resources for industrial development and must be found an optimal balance between industry and agriculture, so the rural poverty to be alleviated and the economy to register a sustainable growth.

Basically, the results obtained in this paper represent information that substantiates the investments guidance policies in economy and that fight against underdevelopment. Thus, defining objectives and strategies of Dorna Basin Region development should focus on:

I. Increasing of income and improving of life quality by promoting diversification of economic activities, namely by stimulating and promoting investment in the area and development of capital markets (cheaper credit).

II. Transforming agriculture in a efficient and diverse activity by stimulating the investment in the field.

III. Attracting and retaining the young people in rural areas, to reduce the average age of the rural population, to ensure optimal human resources in rural areas.

IV. Developing human potential through continuous training, support and involvement of local people in the process of economic development.

V. Supporting the development of technical and social infrastructure through investment and "disability compensation".

VI. Providing alternative income through the efficient use of local resources and stimulating tourism activities and crafts.

CONCLUSIONS

Dorna Basin is located in northern Romania. It has an area of 222.19 km² representing 0.63% of the country surface. Within this zone are covered 9 communes with 49 villages and an urban center represented by Vatra Dornei City. This localities are administratively part of Suceava County.

The capital (+0.475 in agricultural GDP and 2.365 in industrial GDP) is the main factor of economic growth. The variable "labor" (-0.429 in agricultural GDP and +1.847 in industrial GDP) also has a positively influences on GDP growth, but at a slower rhythm.

Results showed that the industrial sector benefit more from relationship industry - agriculture. The agricultural growth deserves priority positions since the growth in this sector helps industrial and service sector to grow faster (the multiplier effect is higher from agriculture to industry and services, and not vice versa).

Based on the game of economic growth determinants in Dorna Basin Region were formulated measures that may underlie the development.

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