Total factor productivity analysis in Kosovo agriculture

Iliriana Miftari*, Nedka Ivanova, Dmitry Zvyagintsev, Ekrem Gjokaj, Muje Gjonbalaj*

*University of Prishtina "Hasan Prihtina"-Faculty of Agriculture and Veterinary Department of Agricultural Economics

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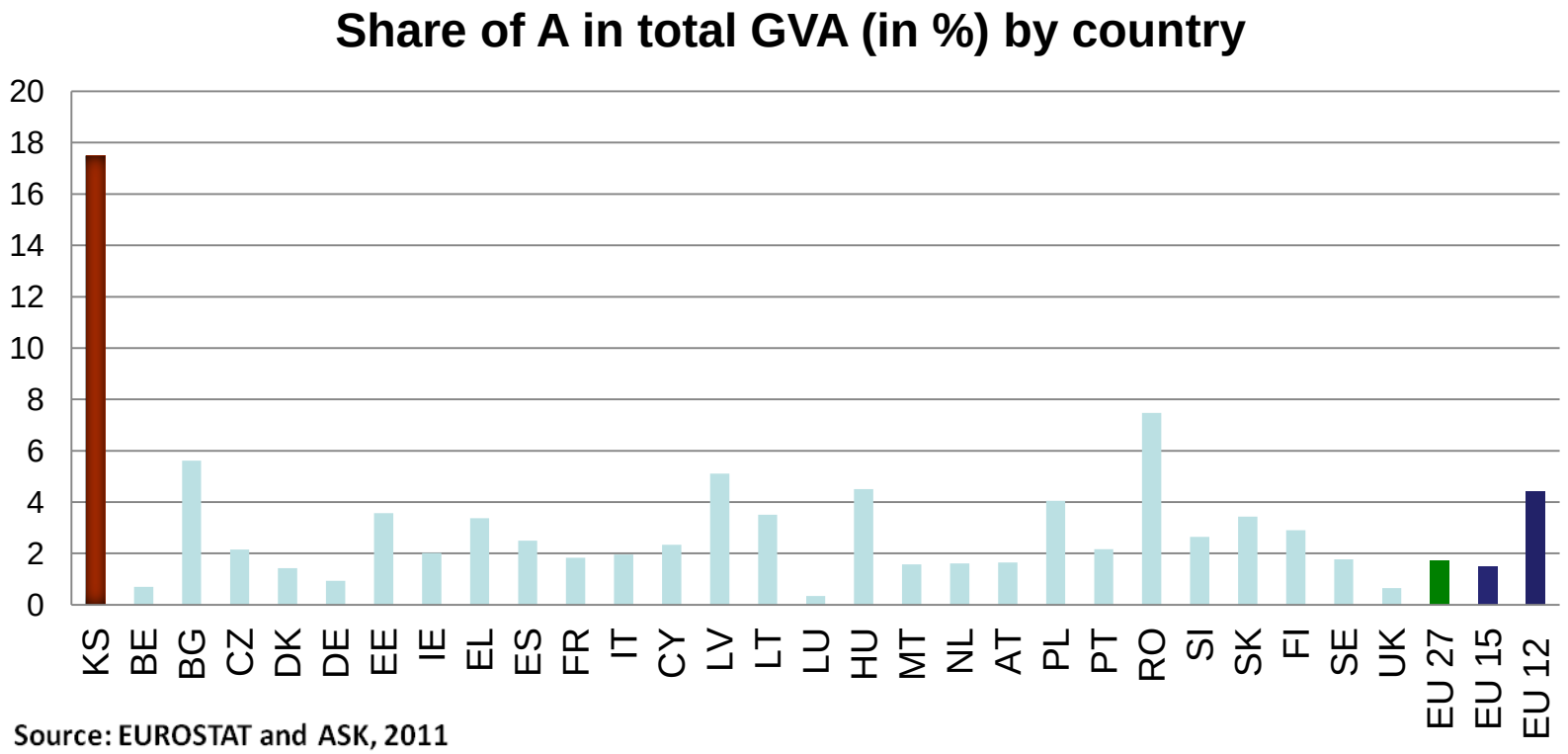
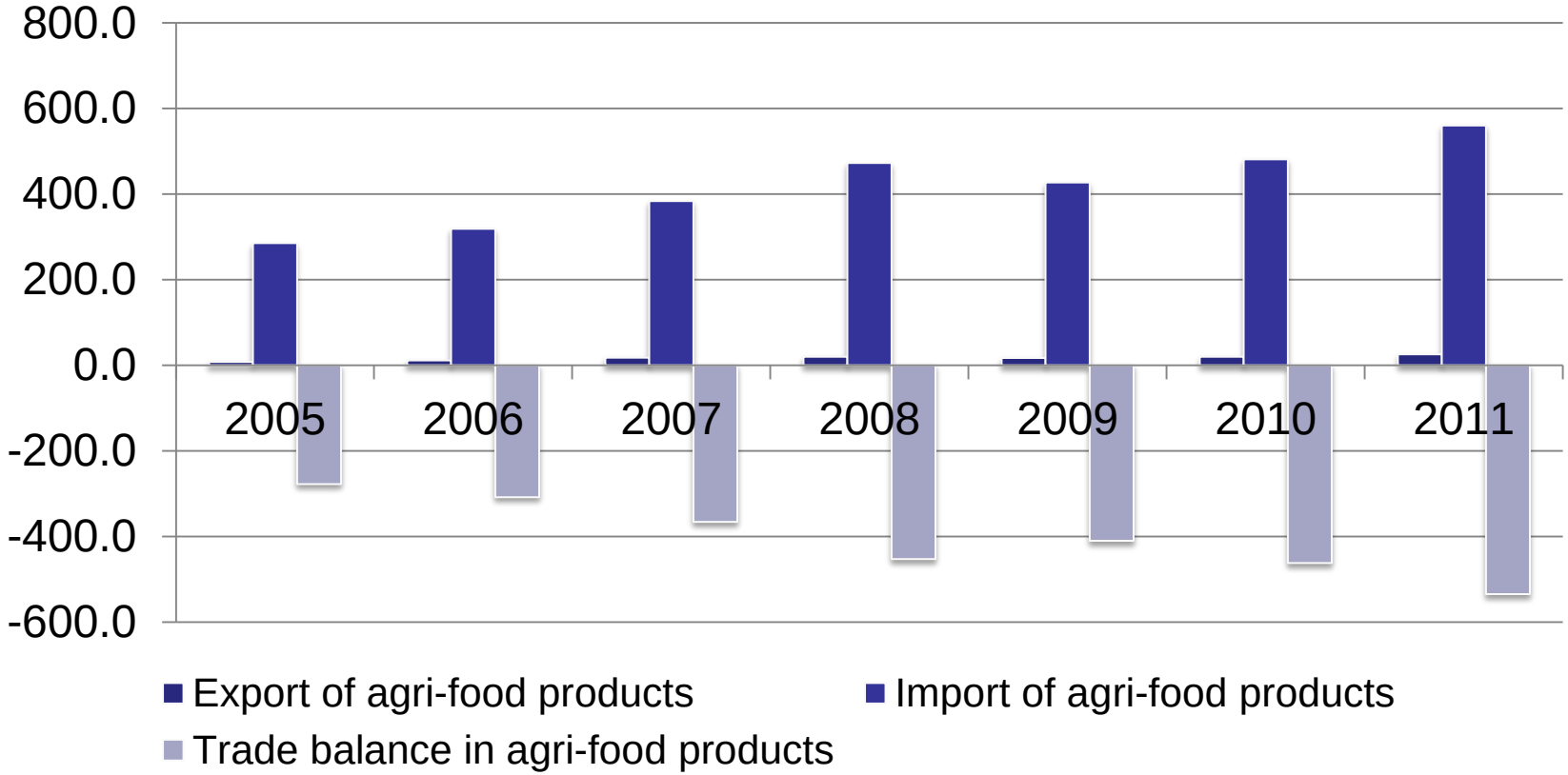
Background information

Agriculture in the economy

- The average share of the agriculture, forestry, hunting and fishery sector in gross value added (GVA) for 2006-2011 was 15.6%.



Trade: agri-food trade balance



Share of agri-food import in total imports of goods is 22.6%, while for the export 8.1%

Source: SAK, 2005-2011

Land use and farm structure

- The total agricultural land of Kosovo amounts to 563,000 ha of which 294,000 ha (52.2%) are arable land, 6000 ha (1.1%) land under permanent crops (orchards and vineyards), and 263,000 ha (46.7%) land under permanent grassland (meadows and pastures).

- The total Kosovo's farm land is used by 185,765 farms out of which 185,424 (99%) are small farms.

- The agricultural sector in Kosovo possesses unfavorable farm structure, with an average utilized agricultural area (UAA) per holding of 1.5 ha.

Agricultural output

- In general the total agricultural output in Kosovo did not show a high degree of variation for the period of time 2005-2011, with an average value for total agricultural output 577, 31 million Euros.

- The contribution of the crop output to the value of the total agricultural output was significantly higher compared to the livestock output.

- In average the agricultural output producer prices are significantly higher in Kosovo and in other Western Balkan (WB) countries, compared to the prices of EU countries, which indicates weak price competitiveness.

Introduction

- Productivity measurement and the interpretation of its behavior are of extreme interest of business firms and policy makers.

- Several studies have estimated the development of TFP for agriculture in China after reforms started (Huang and Rozzelle, 1996; Fan, 1997; Jin et al. 2002), and all show that in the first years (1978-84) rose from 5-10%.

- There is much less evidence on TFP developments in other transitional countries and based on available studies the TFP developed very differently.

- Macours and Swinnen (2000) found out that TFP in Central Europe (Czech Republic, Hungary, Poland, Slovakia) has declined in the first years of transition by -2.3%, but recovered strongly from 1992-95 with an average of 4.5%.

  In the Balkan countries (Albania, Bulgaria, Romania, Slovenia) similar results were found with even more pronounced pattern. The annual TFP fell around 7% over the first three years, but increasing by same percentage three years afterwards (Cungu and Swinnen, 2003).

Objectives

- The main objective of the study was to assess agriculture Total Factor Productivity (TFP) and estimate the change in TFP for each farm in the sample in respect to the average TFP.
- These results were further used for classification of the farms in respect to their productivity by the basic characteristics of farms (size, specialization), as well as analysing the different option for policy support in order to improve their productivity.

Methodology

Productivity indicator used:

Multifactor productivity indicators or total factor productivity

Data availability for agriculture in Kosovo determined the approach and limited options to be used in estimation of the TFP.

In this regard, production function approach (exact (parametric) approach) is the only one used, based on the Solow's classic paper (1957).

Model specification

- a ***Cobb-Douglas*** production function is assumed and its stochastic form could be expressed as:

$$Y_i = \beta_1 X_{2_i}^{\beta_2} X_{3_i}^{\beta_3} e^{u_i}$$

where Y=output; X_2 labour input; X_3 capital input; u=stochastic disturbance term and e=base of natural logarithm (Gujarati, 2004).

The relationship between output and two inputs is nonlinear, with the log-transform of this model we obtain:

$$lnY_i = ln\beta_1 + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + u_i = \beta_0 + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + u_i$$

where $\beta_0 = ln\beta_1$

- Using a linear presentation and taking into account inputs that are commonly used in the estimation of agricultural production functions, the estimated function could be presented as follow:

$$\ln(OUTPUT_i) = \alpha + \beta_1 lnCAP_i + \beta_2 \ln LAB_i + \beta_3 lnINCON_i + \beta_4 S + u_i$$

The first input is the capital denoted with *CAP, LAB* stendss for total labour input expressed in Annual Work Unit (AWU), *INCON* expresses total intermediate consumption in EUR calculated from total specific costs including inputs produced on the holding and overheads arising from production, *S* stay for the amount of subsidy received by farmers.

- After obtaining the production function estimated (based on the best fit received) the change in TFP for each farm in the sample in respect to the average TFP was estimated as follow:

$$\Delta TFP = (\log Y - \log \bar{Y}) - \left(\frac{1}{\alpha_7}\right)\left(\varepsilon_K(\log K - \log \bar{K}) + \varepsilon_L(\log L - \log \bar{L}) + \varepsilon_M(\log M - \log \bar{M})\right) + u)$$

Where:

Bar accent - stays for the sample mean of the relevant indicator

α is used for the output elasticity of the respective input

u - stays for the Solow's residual.

Data

- The data used in the analysis is Farm Accountancy Data Network (FADN).

- For 2013, the annual sample covers approximately 400 farm holdings.

- The collected data refer to physical and structural data (e.g. location, crop areas, livestock, labour force) and economic and financial data (e.g. the value of production of the different crops, stocks, sales and purchases, production costs, assets, subsidies).
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Results

- Estimated *Cobb-Douglas* production function

	Coefficient value	**t-ratio**
Constant	2.607**	5.467
LnCAP	0.295**	8.231
LnLAB	0.083	1.789
LnINCON	0.471**	11.583
S	0.000	1.635
R^2	*0.582*	

Note: **Significant at the 1% level. * Significant at the 5% level.

- The results of the estimation revealed that all inputs incorporated in the production function showed *decreasing returns to scale (0.849)* meaning that doubling the inputs will less than double the output.

- The change in TFP for each farm in the sample was calculated based on the elasticity estimates of *Cobb-Douglas* production function.

- The change of TFP was strongly negatively correlated with the total UAA, Person's correlation coefficient was statistically significant for both supported and non-supported farms (r=-0.492, P=0.000).

- No significant differences were observed in changes of total factor productivity and farm specialization (ANOVA, p-value 0.498).

Thank you for your kind attention!