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Procedia - Social and Behavioral Sciences 81 (2013) 405 – 410

Procedia
Social and Behavioral Sciences1st World Congress of Administrative & Political Sciences (ADPOL-2012)

Macroeconomic Performance and International Competitiveness of the Agro-Food Sectors in the EU Countries: Implications for the Future CAP

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Abstract

The study is aimed at comparison of macroeconomic performance of agro-food sectors in the national economies of the EU countries and competitiveness of these sectors reflected by international trade specialization. To assess macroeconomic performance of the agro-food sectors we used data on employment, gross value added and output extracted from the Eurostat Database. To evaluate international competitiveness of the analyzed sectors revealed comparative advantage index (*RCA*) and revealed competitiveness index (*RC*) were calculated using the WTO database on exports and imports of agricultural products and food. Both relative macroeconomic performance and international competitiveness of the agro-food sectors differ considerably among the EU member state countries but the relationship between them is not very clear. However, it seems that as far as international competitiveness is concerned the CAP should be more oriented towards improving economic efficiency of the agro-food sectors, especially in the countries where the *RC* index is low.

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Selection and peer review under the responsibility of Prof. Dr. Andreea Iluzia Iacob.

Keywords: International Competitiveness, The EU Agro-Food Sectors, Macroeconomic Performance, The CAP;

1. Introduction

Intention to increase competitiveness of the EU economy has been emphasized in many policy agendas including recent Europe 2020 growth strategy for the coming decade (EC, 2010). The issue of competitiveness of the EU agriculture and food industries is also a subject of many debates on the future directions of the Common Agricultural Policy (CAP). The purpose of the paper is to compare macroeconomic performance of agro-food sectors in the national economies of the EU countries and competitiveness of these sectors reflected by international trade specialization. The key research question is whether differences in relative macroeconomic performance of the agro-food sectors in the EU member countries are related to the international trade competitiveness of that sectors, and what kind of policy implications can be pointed out when considering empirical relationship between these two types of economic features. Measurement of macroeconomic performance covers a wide range of indicators most often related to such key macroeconomic variables as GDP growth, jobs, or labor and capital inputs productivity. In

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this paper we also provide some insight into applicability of some of these indicators in explaining sources of sector competitiveness as revealed in international trade based on the example of agro-food sectors in the EU countries.

2. Data and methods

Due to the availability of consistent data needed for meaningful comparisons in order to illustrate macroeconomic importance and relative performance of the agro-food sectors in the EU27 countries we used three following indicators: share of agro-food sector employment in national employment (*SNE*), share of gross value added (*GVA*) created in agro-food sector in total *GVA* of the national economy (*SNGVA*) and share of the sector output in the total output of all NACE Rev. 1.1 activities (*SNO*). Values of these indicators were calculated as averages for the period 2004-2009 for three types of categories i.e. Agriculture, hunting and forestry; Fishing; and Manufacture of food products, beverages and tobacco as classified in the Eurostat Database. Then, to assess relative performance of the analyzed sectors two ratios were used, namely $PR_1 = SNO/SNE$ and $PR_2 = SNGVA/SNE$. Considering labor productivity macroeconomic performance of a particular agro-food sector can be viewed as relatively high when both ratios are above 1.

To evaluate international competitiveness of the analyzed sectors selected trade measures of competitiveness such as revealed comparative advantage index (*RCA*) and revealed competitiveness index (*RC*) were calculated as averages for the period of 2006-2010 for two types of trade categories i.e. agricultural products and food as defined in the WTO database. *RCA* for *i*-th country and *j*-th commodity can be described by the following formula: $RCA_{ij} = RXA_{ij} = (X_{ij}/X_{ik})/(X_{nj}/X_{nk})$, where *X* are exports, *k* denotes all commodities other than *j* and *n* denotes all countries other than *i*. Similar in nature to the *RXA* measure of comparative advantage is *RMA*, where *M* are imports instead of exports. Based on these two indices so-called revealed competitiveness index (*RC*) was then computed as follows: $RC_{ij} = \ln RXA_{ij} - \ln RMA_{ij}$ (Balassa, 1965, Latruffe, 2010, Laursen, 1998, Vollrath, 1991). Finally, using correlation as well as linear and logistic regression analysis we looked for relationships between values of macroeconomic performance indicators and international trade competitiveness measures. This approach was motivated by assumption that sector macroeconomic performance can have an influence on the revealed competitiveness level of a country in respective trade categories (Wijnands, Meulen van der, & Poppe, 2006).

3. Results and discussion

3.1. Relative macroeconomic performance of the agro-food sectors in the EU member countries

Average shares of the agro-food sector in the total national output, *GVA* and employment in the EU27 member countries for the period 2004-2009 vary very considerably. Basic descriptive statistics for these variables are presented in table 1.

Table 1. Descriptive statistics for shares of the agro-food sectors in national output, *GVA* and employment in the EU27 member countries

Variable	Min	Max	Mean	Median	St. dev.
Share in national output	1.2% (LU)	15.2% (RO)	7.2%	7.0% (PT)	3.1
Share in national <i>GVA</i>	1.2% (LU)	15.8% (RO)	5.5%	4.9% (PT)	3.0
Share in national employment	2.7% (UK)	33.8% (RO)	9.5%	7.0% (ES)	6.9

Examining the levels of the analyzed variables it can be concluded that macroeconomic importance of the agro-food sectors in the EU national economies differs quite widely across the countries.

On average it is rather low, even if, for countries like Romania, Bulgaria, Poland and Lithuania the shares of this sector in national output and employment (above 10 and 15%, respectively) can be considered as significant. In general, the agro-food sector contributes more to total employment and total output than to total *GVA*. Its share in *GVA* is on average only 5.5%, what means that other sectors are much more important for the EU national economies from the value added creation standpoint. Comparing the output, *GVA* and employment indicators it also

seems to be obvious that productivity and efficiency of the agro-food sectors in the EU countries must be very different.

Values of the PR_1 ratio in the EU countries ranged from 0.38 (Luxembourg) to 1.62 (the Netherlands). The median value of this ratio accounted for 0.89. In 12 out of the 27 EU countries the agro-food sector's share in total employment is lower than its share in total output. This is especially true in case of such countries as the Netherlands, the UK, Denmark, Belgium, France, and Sweden where the agro-food sector macroeconomic performance can be deemed as relatively high. In Luxembourg, Romania, and Slovenia this share is more than two times higher than the share in output, which indicates low economic efficiency.

The PR_2 ratio levels of agro-food sector performance across the EU countries were in the range from 0.35 (Portugal) to 1.11 (the UK) whereas its median value accounted for 0.66. The fact, that for each country (apart from the UK) the share in total GVA is lower than the share in total employment means that labor employed in the agro-food sectors generate less value added than in other sectors of the EU national economies. The UK, the Netherlands, Slovakia, Spain and Czech Republic are best example of countries where relatively low share of people employed in the agro-food sector concentrated mostly on the production of processed food is associated with relatively high contribution to the national GVA.

3.2. International competitiveness of the agro-food sectors in the EU member countries

Figure 1 contains values of the revealed competitiveness index (RC) for agricultural products and food trade categories ordered from the lowest to the highest by country. Basic descriptive statistics for these variables are included in table 2.

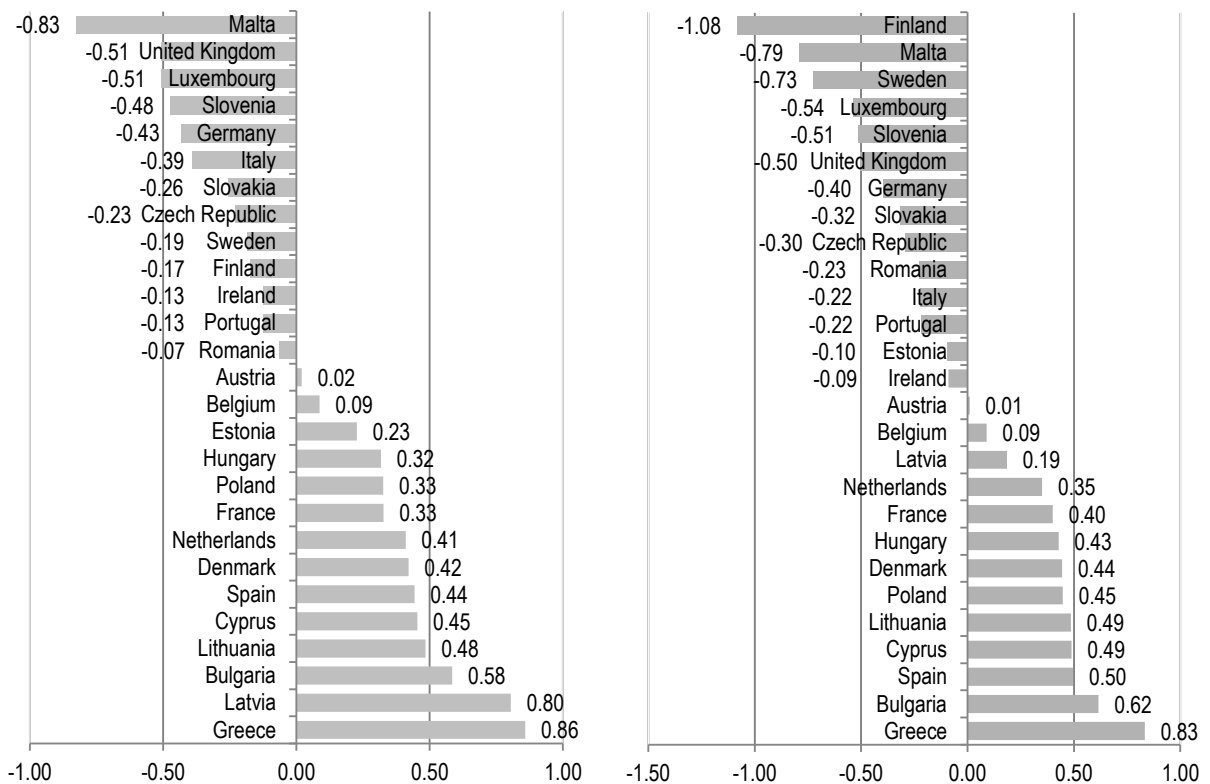


Figure 1. Revealed competitiveness index (RC) for the agricultural products (left) and food (right) trade categories in the EU27 member countries

Table 2. Descriptive statistics for the RC index values for the EU27 member countries

Variable	Min	Max	Mean value	St. dev.
RC for agricultural products	-0.83 (MT)	0.86 (GR)	0.05	0.44
RC for food products	-1.08 (FI)	0.83 (GR)	-0.03	0.49

As it can be noticed the RC values calculated for both trade categories differs very considerably across the EU27 member countries. Regarding agricultural products trade category the RC values are negative for 13 countries and positive for 14 of them with positive mean value equal to 0.05. A similar picture emerges when the RC for the food trade category is considered. The RC values are negative for 14 countries and positive for 13 of them. The country ranking is not much different than in case of the RC for the agricultural products category. The only country which switched from the positive to the negative RC is Estonia. In fact, the RC values for agricultural products and food trade categories are rather strongly correlated (correlation coefficient equals 0.87 and is statistically significant at $\alpha \leq 0.01$). However, it should be noticed that the range of values is wider, the mean value is negative and standard deviation slightly higher. Also the distribution is more skewed to negative values. This implies that revealed competitiveness in food trade category for the EU-27 as a whole is rather weaker than in agricultural products category. It is also worth to mention that among countries with positive values of both the RC for agricultural products and food trade categories are mainly those countries where the agro-sector is more important from the economic standpoint.

3.3. Relationships between relative macroeconomic performance and international competitiveness of the agro-food sectors in the EU countries

The first step in looking for existence of relationships between macroeconomic performance indicators and international trade competitiveness measures was testing for correlations. Table 3 includes values of the estimated correlation coefficients for all considered variables.

Table 3. Correlation coefficients between the analyzed sectorial macroeconomic performance indicators and international trade competitiveness measures for the agro-food sectors in the EU27 member countries

Type of indicator	Agricultural products			Food		
	RCA	RTA	RC	RCA	RTA	RC
Share in national output (SNO)	0.36*	0.45**	0.58***	0.38*	0.48**	0.56***
Share in national GVA (SNGVA)	0.15	0.26	0.36*	0.16	0.28	0.34*
Share in national employment (SNE)	0.19	0.28	0.35*	0.18	0.26	0.32
SNO/SNE	0.00	-0.05	-0.02	0.07	0.01	0.02
SNGVA/SNE	0.25	-0.26	-0.26	0.20	0.22	-0.23

***, **, * – denote statistical significance at the levels of $\alpha \leq 0.01$, $\alpha \leq 0.05$ and $\alpha \leq 0.1$ respectively

The only variable correlated at statistically significant levels with all calculated international trade competitiveness measures is the share of the agro-food output in total national country output (SNO). Statistically significant (at the lowest confidence level) are also correlations between RC and shares of the agro-food sectors in national GVA for both trade categories and in total employment for agricultural products category. The highest values of statistically significant correlation coefficients are for the RC index, therefore, this variable was chosen as the most promising one in the second step of testing for existence the presumed relationships using multiple regression analysis. In this analysis two types of regression models were examined in order to separate variables representing the shares of the agro-food sectors in national output (SNO), GVA (SNGVA) and employment (SNE) from the variables calculated as ratios i.e. $PR_1 = SNO/SNE$ and $PR_2 = SNGVA/SNE$. In case of the model including macroeconomic importance and performance indicators such as SNO, SNGVA and SNE it appeared that the last one was statistically insignificant as an explanatory variable, so it was eventually omitted in the final estimation of the model parameters. The results included in table 4 suggest that competitiveness of agro-food sectors in international trade depends on their shares in total national output (positive influence) and in total national GVA (negative influence). The same refers to the macroeconomic performance ratios PR_1 and PR_2 .

Consistent observations can be made regarding the results of logistic regression analysis (table 5). In this case dependent variable (*RC*) was treated as binary one taking value of 0 for $RC \leq 1$ and 1 for $RC > 1$. It turned out that the higher share of agro-food sector output in total national output and the level of related sectorial performance ratio the higher the probability of gaining comparative advantage in agricultural products and food trade by a country. The opposite is true in case of share of agro-food sector in total national GVA.

Table 4. Parameters of linear multiple regression models of revealed competitiveness (*RC*) values on the levels of the analyzed sectorial macroeconomic performance indicators for the agro-food sectors in the EU27 member countries

Item	Agricultural products				Food			
	$RC = f(SNO, SNGVA)$		$RC = f(SNO/SNE, SNGVA/SNE)$		$RC = f(SNO, SNGVA)$		$RC = f(SNO/SNE, SNGVA/SNE)$	
	β (SE)	<i>t</i>	β (SE)	<i>t</i>	β (SE)	<i>t</i>	β (SE)	<i>t</i>
Constant	-0.80	-	0.42	-	-0.97	-	0.34 (0.30)	1.15
(β_0)	(0.15)	5.20***	(0.27)	1.57	(0.17)	5.66***		
β_1	0.28	5.49***	1.08	0.33	0.33		1.36 (0.54)	2.51**
	(0.05)		(0.49)	2.21**	(0.06)	5.60***		
β_2	-0.22	-	-2.05	-	-0.26	-	-2.44 (0.86)	-2.83***
	(0.05)	4.16***	(0.78)	-2.64**	(0.06)	4.34***		
R^2	0.62		0.23		0.62		0.25	
<i>F</i>	19.21***		3.50**		19.30***		4.02**	

β – coefficient, SE – standard error, *t* – value of *t* statistic

***, **, * – denote statistical significance at the levels of $\alpha \leq 0.01$, $\alpha \leq 0.05$ and $\alpha \leq 0.1$ respectively

Table 5. Parameters of logistic regression models of revealed competitiveness (*RC*) values on the levels of the analyzed sectorial macroeconomic performance indicators for the agro-food sectors in the EU27 member countries

Item	Agricultural products				Food			
	$RC = f(SNO, SNGVA)$		$RC = f(SNO/SNE, SNGVA/SNE)$		$RC = f(SNO, SNGVA)$		$RC = f(SNO/SNE, SNGVA/SNE)$	
	β (SE)	p-value	β (SE)	p-value	β (SE)	p-value	β (SE)	p-value
Constant	-8.33	0.02	1.52(1.74)		-6.91		1.67 (1,79)	0.36
(β_0)	(3,41)			0.40	(2.76)	0.02		
β_1	3.46	0.02	11.68 (4.87)		2.69		10.04 (4.44)	0.02
	(1.32)			0.02	(1.00)	0.01		
β_2	-3.01	0.02	-18.18 (7.50)		-2.32		-17.18 (7.36)	0.03
	(1.22)			0.00	(0.92)	0.02		
χ^2	23.13		11.19		19.24		10.18	
P-value	0.00		0.00		0.00		0.01	

β – coefficient, SE – asymptotic standard error

4. Conclusion

It appeared from the analysis that while both relative macroeconomic performance and international trade competitiveness of the agro-food sectors differ considerably among the EU member state countries the relationship between them is not that obvious as it could be expected. Nevertheless, an observed positive influence of both a high share of agro-food sector output in national output and a high macroeconomic performance regarding the output to labor ratio on revealed competitiveness in agricultural products and food trade can be treated as an evidence that productivity constitutes a fundamental factor in building comparative advantage. The obtained results also suggest that as far as international competitiveness is concerned the CAP should be more oriented towards improving economic efficiency of the EU agro-food sectors. This refers especially to the countries where the *RC* index is low.

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