THE DETERMINANTS OF GROWING AGRI-FOOD EXPORT: THE CASE OF CEE COUNTRIES

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ABSTRACT

The aim of this study is to analyse the determinants of the growing agri-food export in the CEE countries. Using the SYS-GMM estimation, we control for the endogeneity problem. As the explanatory variables we use the variable that have been empirically proven as determinants of the agri-food export and available for observed countries. The obtained results show that the trade liberalisation increases the agri-food exports, while the EU enlargement indirectly affects the agri-food exports which is an important statement for policy-makers.

Introduction

Despite the fact that the share of the agri-food export in total merchandise export has been declining, food is still an important element of world trade. The current food trade pattern has been broadly dictated by developed countries. However, the role of transition countries has been increasing. Consider the constant growth of the agri-food export, the CEE countries may become major agri-food exporters in Europe. On this subject, Tangermann (1994) highlights two vital factors; the improvement of product quality using the new production technologies, and a growth in the quantity of exports as a consequence of trade liberalization.

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The agricultural sector of the most of CEE countries has been broadly underdeveloped, consider production for the domestic as well as foreign market. In the Western Balkan (WB) countries the value added (VA) in agriculture is still twice higher than the VA in manufacturing of food and beverage (F&B). The experience of CEE countries reveals that production, price and trade significantly change after the EU enlargement as well as during the pre-accession period (Mizik and Meyers, 2013). The agri-food export has been continuously increasing. However, an inability to meet certain standards for quality and safe agri-food products, underdeveloped infrastructure and lack of capacity slows down their integration into global markets.

The export-led growth from agriculture may provide optimal resource allocation for CEE countries that have a comparative advantage in the agri-food production. In these countries the agri-food export become a generator of growth. The main objective of this paper is to investigate the agri-food export determinants in CEE countries, which included each of the following aims:

- to review the theory and evidence regarding the determinants of the agri-food export,
- to analyse the agri-food sector in the observed countries,
- to answer the question whether EU accession as well as other determinants affect the agri-food export,
- to discuss political implications.

We assume that the EU enlargement directly or indirectly affect the agri-food export of observed countries. The paper is structured as follows. Section 1 presents the literature survey on the agri-food determinants. The brief characteristics of the agri-food sector in CEE countries are shown in Section 2. The underlying model and data set are presented in Sections 3. Section 4 explains the used methodology and empirical results, while Section 5 concludes.

Literature review

The literature emphasizes foreign income as the most important determinant of international trade (Baiardi et al., 2015). GDP per capita of EU as the largest importer has been increasing. Ševela (2002) show that the trade between the countries depend on the strength of both economies and closeness of the economies. To analyse the impact of closeness of the economies, we employ a variable that measure the economic distance, while as a proxy of the strength of economy we use a gross production index.

Luckstead and Devadoss (2019) argue that trade liberalisation increases the agri-food exports. We can say that for CEE countries the EU accession leads to the expected liberalization. Bielik et al. (2013) notice that the EU enlargement influenced the

structure of Czech and Slovak agricultural trade. Smutka et al. (2016) show that after the EU accession an increase in the agri-food trade of the Czech Republic be achieved by the growth in the prices as well as by the greater share of the semi-processed and finalized products. The Western Balkan (WB) countries mainly export raw materials and semi-processed products. To answer the question whether trade liberalization and the EU membership affect the agri-food export, we employ three variables; the openness, export structure and EU dummy.

Following Arize et al. (2000) there is no consensus reached in a theory about an influence of the exchange rate (EXR) volatility on the international agri-food trade. Kandilov (2008) shows a significant negative relationship between the EXR volatility and trade flows especially in the agricultural sector. Erdem (2010) finds that high level of the EXR uncertainty implies smaller agricultural trade volumes. We measure the effect of the true EXR uncertainty on the agri-food export.

Considering the issue of prices, we may say that the lower price elasticity is associated only with processed goods (Baiardi et al., 2015). Unfortunately, for the observed countries there is no available data on prices for certain products, hence we use an aggregate price index.

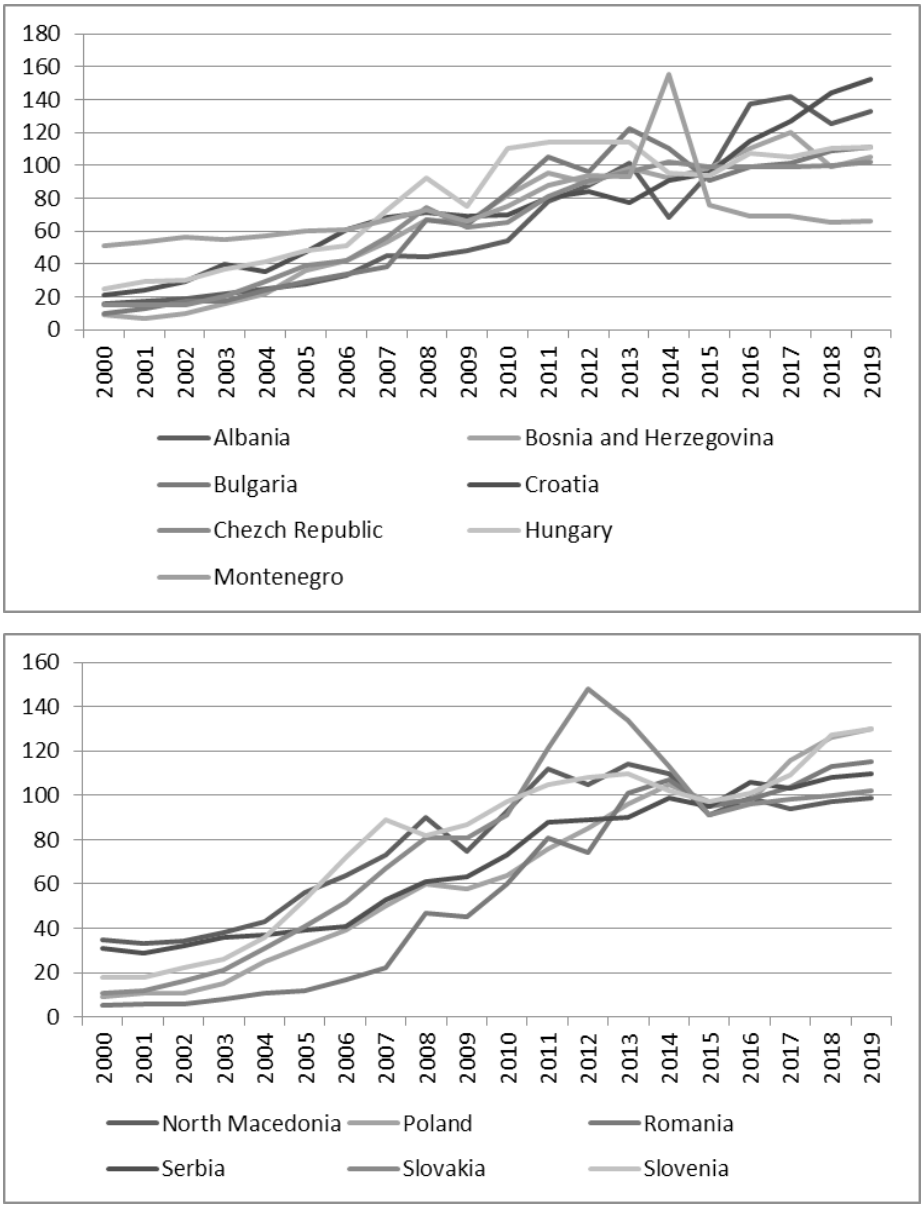
Innovation may affect the level of trade in several ways. Ghazalian and Furtan (2007) conclude that R&D increases the agri-food exports. Unfortunately, there are no available data of R&D capital stock for the observed countries, hence we use labour productivity as a proxy for innovation.

Earlier studies have argued that only the largest and the most efficient companies are capable of exporting. However, the experience shows that a large number of SMEs are also involved in internationalization. Therefore, we did not include the number of enterprises in agribusiness as a determinant of the model.

Brief characteristics of agri-food sector in CEE countries

The CEE countries are relatively small economies, which when taken together constitute an important market. Agribusiness, the sector that already existing favourable climate and long tradition, as well as a wealth of various types of arable land, has been additionally improved by the market opening; the openness index arises from 67.9% in 2000. to 131.2% in 2020.

Figure 1. Agri-food export value index (2014-2016=100)



Source: FAO Statistics Division

All countries we observed (see Table 1) were socialist states, belong(ed) to the group of transition countries, are the EU members or candidates and have experienced a similar agri-food export patterns (see Figure 1). According to the latest available World bank data the food exports share of total merchandise export for obtained countries was 9,9%; the lowest in Slovenia (4%), the highest in Serbia (19%). Although all observed countries

have experienced GDP per capita growth, the economic distance between them and Germany as the most developed EU country is still large and continues to growth.

Table 1. Export structure, economic distance and consumer price since 2000.

Country	VA in agriculture / VA in manuf.of F&B		Economic Distance*		Consumer prices, food indices	
	2000	2019	2000	2019	2000	2019
Albania	6.16	3.08	32 796	39 500	62.8	113.5
Bosnia and Herzegovina	4.45	1.76	31 910	38 899	71.0	101.1
Bulgaria	6.08	1.55	30 989	36 000	58.9	114.4
Croatia	1.25	0.88	25 925	30 853	73.6	104.3
Czech Republic	0.84	0.77	22 510	24 216	74.9	110.9
Hungary	1.28	1.74	25 766	29 216	49.1	114.6
Montenegro	5.21	5.22	30 369	36 550	75.5	104.9
North Macedonia	3.35	3.31	31 467	38 732	74.9	100.9
Poland	0.93	0.77	27 473	29 216	71.4	115.8
Romania	1.69	1.38	30 146	33 177	85.6	110.1
Serbia	2.65	1.49	31 587	37 483	28.3	107.1
Slovakia	0.71	1.55	25 846	25 997	70.5	109.6
Slovenia	1.17	1.04	18 499	20 427	66.2	110.1

**Calculated in 2010 constant EUR . Source: own calculation based on FAO Statistics*

Following Grujić et al. (2019) the high share of the higher processing agri-food products leads to an increasing value of surplus in balance of payments. After the EU enlargement, the countries have been experienced growth of the agri-food exports achieved by the growth in the prices as well as by the greater share of the semi-processed and finalized products in the total agri-food export. To examine the agri-food export strucutre, we compare the VA in agriculture with VA in manufacture of F&B for each observed country. It would be desirable that this coefficient be less than one, which means that there is a high degree of processing food. However, the most of observed countries have a coefficient greater than one, except Croatia, the Czech Republic and Poland. The WB countries are in an unfavourable position relative to new EU members; mainly exporting raw materials and semi-processed products. When we compare the agriculture VA per worker, we may say that the Czech Republic, Slovakia, Hungary and Slovenia are the most productive countries, while the lower productivity per worker is recorded in Albania, Serbia and Romania. The food prices have been increasing in all observed countries.

Model and data

In order to analyse the determinants of the agri-food exports, we employ the following model:

$$y_{(i,t)}=\beta y_{(i,t-1)}+\theta^{\prime} (L)\, x_{(i,t)}+\gamma_t+\alpha_i+\varepsilon_{(i,t)} \quad (1)$$

for

$$i=1,\ldots,N \text{ and } t=q+1,\ldots,T$$

where y_(i,t) is the food export of country i at time t, x_(i,t) is a vector of the explanatory variables, θ(L) is a vector of associated polynomials in the lag operator, q is the maximum lag length, γ_t stands for the time-specific effect, α_i is an unobserved country-specific effect, and ε_(i,t) is the white error term. As the explanatory variables we use the variable that have been empirically proven as determinants of the agri-food export, available for observed countries. All variables are annual and transformed into a natural logarithm covering the period 2000-2019.

Export value index is used as a proxy for dependent variable. Value indices represent the change in the current values of export from the country i in year t. Gross production index is used as a proxy for supply of the country i in year t. The openness index is calculated by taking the sum of import and export divided by total GDP of the country i in year t. As the measures of closeness of the economies we employ the economic distance variable that we calculate as a difference between GDPpc of Germany and the country i in year t. The economic distance is a proxy for difference in economic development.

Table 2. The determinants of agri-food export

Variable	Sign	Source
Export value index from the previous period Gross production index (2014 – 2016 = 100)	(+) (+)	FAO Statistics FAO Statistics
$\text{Openness} = \frac{\text{Export} + \text{Import}}{\text{GDP}}$	(+)	WordBank Data
Economic distance = GDPpc of Germany – GDPpc of country *i*	(-)	WordBank Data
$\text{Export structure} = \frac{\text{VA in Agriculture}}{\text{VA Manufacture of F\&}B}$	(-)	FAO Statistics
Consumer price	(-)	FAO Statistics
Productivity	(+)	FAO Statistics
EXR volatility	(-)	WordBank Data
EU Dummy	(+)	Europa.EU

Source: own calculation based on FAO Statistics

As a measure of the export structure we use coefficient that compare the VA in agriculture with VA in manufacture of F&B. The lower coefficient means that there is a high degree of processing food. The EXR volatility is measured by the conditional variance of the monthly real EXR derived from a GARCH (1,1) model as proposed by Balaban et al. (2019). As a measure of price level we use consumer prices, food indices (2015=100). An agriculture VA per worker is used as a measure of productivity. Consider that EU enlargement leads to the expected liberalization, we employ a dummy that takes the value 1 in the case that observed country is the EU member, and 0 for another. We expect that the coefficient of a dummy variable would be significant. The expected signs of all variable are presented in Table 2.

Methodology and results

Eq. (1) accounts for dynamic effects because of the first explanatory variable; the lagged value of dependent variable. However, in both fixed and random effects settings, a main problem arises from the fact that the lagged dependent variable is correlated with the disturbance. To ensure the reliability and consistency of our results, we employ instrumental variables within the SYS-GMM estimation procedure (Blundell and Bond, 1998). With this approach, every regressor is instrumented, including both the level and first difference equations in a stacked system, which allows to overcome potential issues of endogeneity bias. A relatively small number of observations do not seem to have important effects on the properties of the SYS-GMM estimator; when series are persistent, the estimator shows the lowest bias and highest precision.

Table 3. CIPS Panel Unit Root Tests in Panel Data

Variable	Statistics
Agri-food export	-1.9427**
Gross Production Index	-1.6128*
Openness index	-1.6894*
Economic distance	-2.1702**
Export structures	-1.8038*
EXR volatility	-3.0417*
Consumer prices	-2.1652**
Productivity	-1.6011*

Note: * $p < 0.05$ **$p < 0.01$ *** $p < 0.001$. According to obtained results we may reject accept H1: stationarity The CIPS test is based on individual CADF regressions with l=2 lags of differences including an intercept only. The outcomes are not very sensitive to the choice of the number of lagged differences l.

Source: own calculation, R

In the case when T>N, we should consider a problem of stationarity. To determine which generation of unit root test we perform two cross-section dependence tests; Breusch – Pagan LM and Pesaran CD tests (the results are available on request). The results of the applied tests indicate significant cross-sectional dependence. Consequently, we apply the second generation panel unit root tests that allow for cross-sectional dependence, proposed by Pesaran (2007). On the basis of the common unobserved factor assumption for the error process, the CIPS test indicates the stationarity of all observed variables (see Table 3). Then, we apply the SYS-GMM methodology on Eq. (1) (see Table 4).

Table 4. Determinants of agri-food export – SYS-GMM methodology

Variable	Statistics
Agri-food export(-1)	0.844890***
Gross Production Index	0.442575
Openness index	0.839936*
Economic distance	-3.637718
Export structure	-0.285064

Variable	Statistics
Volatility	-0.007401
Consumer prices	0.659988
Productivity	0.481683
EU dummy	0.105747
Diagnostic tests:	
Root MSE	0.108543
Sargan	6.387498
AR(2)	-0.062719

Note: Sargan test examine over-identifying restrictions, root MSE measures the differences between values estimated by a model and the values observed, AR test confirms the absence of serial correlation. Sargan test has a null hypothesis (Ho): The Instruments as a group are exogenous. The higher the p-value of Sargan statistic the better. It is recommended that sargan p-value should be greater than 0.25.

Source: own calculation, Eviews 11

Based on the obtained results, we can say that the expected signs for all observed variables were achieved. However, only a few variable are statistically significant; the agri-food export from previous period, openness and economic distance. The model works well in several diagnostic dimensions.

Conclusions

In observed CEE countries the agri-food export has been constantly growing since 2000. The literature emphasizes foreign income as a crucial determinant of trade in general. Available data show that GDP per capita of EU have been increasing. Bearing in mind that the export market is almost the same for all observed country, we did not include a variable that measure GDP per capita in the model.

The economies of the CEE countries are relatively small economies, which when taken together constitute an important market. Agribusiness, the sector that already existing favourable climate, long tradition, and has been additionally improved by the market opening. The most authors consider that trade liberalisation increases the agri-food exports. Our results may confirm this fact; openness is significant variable that positively affects the agri-food export in observed economies. For policy makers this fact may be interpreted as a demand for further liberalization that should leads to specialisation in certain industries depending on the relative factor endowments.

We expect that the EU enlargement leads to necessary liberalization in the WB countries changing the agri-food export structure including a higher share of semi-processed and finalized products. According to our results the EU dummy variable is not statistically significant, that means that the EU accession does not affect the agri-food export. However, we should be careful with this statement. We may only conclude that the EU membership has no effect on the value of the agri-food exports in observed countries. According to available data, the new EU members have better agri-food structure than

the WB countries and are economically closer to the most developed EU members. Taking into account that the economic distance of observed countries as a proxy of reverse economic "closeness" has a negative impact on the value of the agri-food export we may draw a conclusion that the EU accession indirectly affects the agri-food exports which is an important statement for economic policy-makers.

Other variables do not affect the agri-food export; supply of observed country measured by gross production index, export structure, the "true" EXR uncertainty; consumer price, and productivity.

As a limit of this research we state the possibility of occurrence an aggregate bias. Accordingly, for further research, we suggest using a disaggregated level of exports as a dependent variable.

Conflict of interests

The authors declare no conflict of interest.

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