Impact of New Member Accession to the European Union on Food Trade

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Abstract:

Purpose: The main focus is on the export and import of agricultural products in the EU in the years 2002-2017 outside the EU (extra-EU).

Design/Methodology/Approach: This paper investigates the impact of EU (European Union) enlargement on food trade using descriptive statistics. First, EU-28 exports, imports, and trade balance of agricultural products outside the EU (extra-EU) are presented for 2002-2017.

Findings: The trade balance between EU countries for food, beverages, and tobacco are also presented. Accession has led to the elimination of trade tariffs and accelerated improvements in trade. The most exported products by EU countries were alcoholic beverages (spirits and liquors, wine, and vermouth), bakery products, and wheat. Most of the export of agri-food products is directed to other EU countries, Russia, China, and various countries in South America, Africa, and Asia. Imports to EU countries comprised mostly of vegetables and fruits, coffee, tea, cocoa, and various fish products.

Practical implications: The results will fill in the gap concerning the food trade of agricultural products in the EU.

Originality/Value: The new information about extra EU trade of agricultural products and a GARCH (Generalized Autoregressive Conditionally Heteroscedastic) model was presented.

Keywords: Trade balance, European Union, agricultural products.

JEL codes: Q13, Q17, Q18, F14.

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1. Introduction

The integration of new countries to the EU has caused the development of the competitiveness of economies. Trade liberalization between the EU countries caused both imports and exports to grow (Allaro, 2012). Many factors have an impact on the agri-food trade. Generally, the factors can be divided into external factors (exogenous) related to international policy and trade liberalization and internal factors (endogenous) linked with the efficient usage of production factors, size of production base, size of national demand, supply-demand compatibility (Marks-Bielska *et al.,* 2015). Another factor is that accession to the European Union allowed countries access to new markets spurred the agribusiness sector's modernization and allowed their producers to take advantage of lower relative production costs (Hamulczuk *et al.,* 2014).

Agriculture has been subsidized what increased the competitiveness of the whole food sector (Kułyk and Czyżewski, 2016; Czyżewski and Majchrzak, 2018). The accession of ten countries in 2004, primarily located in Eastern Europe, had a major impact on the balance of trade in agricultural and food products. Pawlak (2013) distinguished the many factors impacting agri-food products trade, including reducing internal price supports, customs tariffs in third countries, and growth in processing of agricultural products in global markets.

Implementing European Union regulations regarding food safety, consumer information, and the mandatory adoption of environmentally sustainable practices is a big hurdle for firms. In addition to the 2008 financial crisis, this set of regulations also presented a hurdle for food marketing. The investment was made to adapt to the regulations (Kapelko *et al*., 2016). The level of competitiveness in the food economy is a factor impacting the development of agri-food trade, and international trade is a factor impacting the development of the food industry from the other side. The balance of trade in agri-food products has a positive impact on the total trade balance in Poland. The trade of agri-food products is having an impact on the development of agriculture. Food industry enterprises are evolving into bigger entities, and economies of scale help reduce production costs (Mylon, *et al*., 2007; Czyżewski and Majchrzak, 2018).

The effect of EU enlargement is usually seen as positive for both existing members and those going through the accession process. Antimiani *et al.* (2012) suggest that EU enlargement fosters productivity gains, improves quality, stimulates demand, and encourages export competitiveness. Firms are producing for the domestic market the same product as those producing for export. Indeed, the export market is more competitive. For a small open economy, the international market brings the discipline of competition to all firms – exporters and domestic producers (Antimiani *et al.,* 2012).

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However, global food trade participation requires countries to abide by international rules and invest in promotion and monitoring systems (Schillhorn van Veen, 2005). Poorer small countries have difficulty adjusting to these kinds of market conditions because they do not usually have well-organized supply chains. One of the most important issues in the food sector is how food retail prices change consumer purchasing power. Because this is tied to income levels, food price inflation directly affects food security and poverty rates (Castellari *et al.,* 2018). More affluent countries and larger producers have access to capital, technology, and logistic systems to benefit from international trade. Shepherd and Wilson (2013) point out that while "internationally harmonized EU standards tend to have weak, or even slightly positive, trade impacts, whereas non-harmonized standards-those that are unique to the EU-tend to trade inhibiting."

Issues of food industry development and food security have been extensively described in the literature. However, less attention has focused on trade balance within the EU and particularly the accession of new countries on these issues. The balance of food trade will be analysed by evaluating food trade statistics and the use of autoregressive econometric models to determine if there are significant time trends in the trade since the large accession of countries into the EU in 2004.

2. Materials and Methods

The objectives of the research include: 1) evaluating the trade balance of agri-food products in the EU during the period from 2002-2017 outside the EU (extra-EU) and 2) describing the nature of trade in principal exported and imported agri-food products outside the EU (extra-EU). The authors of the paper tried to confirm the hypothesis that the integration of new EU members made exports and trade balance more competitive in international markets.

The analysis begins in 2005 with the integration of Poland and nine other countries into the EU. A GARCH model (Generalized Autoregressive Conditionally Heteroscedastic) supplemented by descriptive statistics analysis describes the changes in the balance of agri-food trade. GARCH models, introduced by Engle (1982) and Bollersley (1986), are designed to capture certain time series characteristics. In particular, they can describe the feature of volatility clustering and other typical features, such as excess kurtosis and fat-tails (Franses and Dijk, 2002). A GARCH model uses past squared observations and past variances to model the variance at time t. As an example, a GARCH (1,1) is:

$$\sigma^2_t = \alpha_0 + \alpha_1 y^2_{t-1} + \beta_1 \sigma^2_{t-1} \tag{1}$$

In the GARCH notation, the first subscript refers to the order of the y^2 terms on the right side, and the second subscript refers to the order of the σ^2 terms (Bollersley, 1986).

Changes in agri-food balances can be modeled as AR(p)-GARCH$(1,1)$, given by

$$y_t = \phi_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + e_t, \tag{2}$$

$$e_t \mid \psi_{t-1} \sim t(\upsilon, 0, h_t), \tag{3}$$

$$h_t = \alpha_0 + \alpha_1 e_{t-1}^2 + \beta_1 h_{t-1}, \tag{4}$$

where ψ_{t-1} denotes series history up to time $t-1$, $t(\upsilon, 0, h_t)$ is a Student t distribution with υ degrees of freedom $(\upsilon > 2)$, and h_t is the conditional variance. Given the regularity conditions, $\alpha_0 > 0, \alpha_1 \geq 0, \beta_1 \geq 0$, the required stationarity condition is $\alpha_1 + \beta_1 < 1$. Also, due to the presence of autocorrelation the roots of the polynomial $z^P - \phi_1 z^{P-1} - \phi_2 z^{P-2} - ... - \phi_p = 0$ lie inside the unit circle.

A commonly used test for GARCH models is the Lagrange multiplier (LM) test. The residuals e_t (in equation 1.2) from a preliminary OLS estimation can be tested for auto-regressive conditional heteroscedastic behaviour. The null hypothesis, where $\alpha_1 = \alpha_2 = ... = \alpha_q = 0$, is tested using the LM statistic (Bollersley, 1986) which has an asymptotic χ^2 distribution with q degrees of freedom (Bórawski and Kwiatkowski, 2007).

3. Results and Discussion

Figure 1 presents data on agricultural products' trade concentrating on exports and imports between the EU and the other countries outside the EU (extra-EU). The extra-EU trade of agricultural products accounted for 7.4% of the total EU-28 international trade. The analysis shows that the imports increased from 69.6 billion EUR to 138,1 billion EUR in 2002-2017 (98,4 % increase).

One of the most important factors shaping economic growth is increasing export. The world trade is increasing 6 percent per year, and it is faster than world output (IMF report, 2009; Ekananda and Parlinggoman, 2017). The export increased from 55,7 billion EUR to 137,2 billion EUR (146,3 % increase). These findings confirm our hypothesis that the trade balance was more competitive in international markets in the EU countries after integrating new members.

The negative balance decreased from -14 billion EUR in 2002 to -1 billion EUR in 2017. The main recipient of the EU exports of agricultural products in 2017 was the USA (16%), China (8%), Switzerland (6%), Japan (5%), Russia (5%), and Norway (4%). The main origin of EU imports was from Brazil (8%), the USA (8%), Norway (5%), China (5%), Argentina (4%), and Ukraine (4%). EU-28 exports in 2017 were

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for foodstuffs (the raw material of food before or after processing) (56%), animal products (22%), and vegetable products (22%). EU-28 imports in 2017 were for vegetable products (48%), animal products (20%), and foodstuffs (32%).

Figure 1. *EU-28 Exports, imports and trade balance of agricultural products in the years 2002-2017 between the EU and all countries outside the EU (extra-EU)(in billion EUR)*
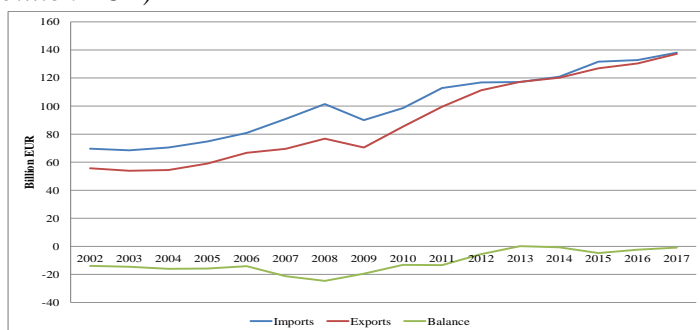
Source: Eurostat, International trade in goods. https://ec.europa.eu/eurostat/statistics-explained/index.php/International_trade_in_goods

The exports of foodstuffs increased from 31,2 billion EUR in 2002 to 77,0 billion EUR in 2017. The imports of foodstuffs increased from 25,3 billion EUR in 2002 to 44,1 billion EUR in 2017. Consequently, the trade balance for foodstuffs increased from 5,9 billion EUR in 2002 to 32,9 billion EUR in 2017. Most foodstuffs in 2017 were exported to the USA (20%), China (8%), Switzerland (6%), Russia (5%), Japan (4%), and Norway (4%). The highest import in 2017 was from Brazil (12%), Argentina (9%), the USA (8%), Switzerland (5%), and Thailand (4%).

EU-28 exports, imports, and trade balance for vegetable products also changed in the years 2002-2017. The exports of vegetable products increased from 13,1 billion EUR in 2002 to 30,3 billion EUR in 2017. The imports of vegetable products increased from 29,0 billion EUR to 66,8 billion EUR. The negative trade balance of vegetable products also increased from -15,9 billion EUR in 2002 to -36,5 billion EUR in 2017. The most important partners of EU-28 exports were in 2017:

- The USA (12%)
- Switzerland (9%)
- Russia (6%)
- Norway (6%)
- Saudi Arabia (5%)
- Algeria (4%)

The most important partners in imports of vegetable products in 2017 were the USA (10%), Brazil (8%), Ukraine (7%), Indonesia (6%), Vietnam (4%), and Turkey (4%). The EU-28 is also a big producer of animal products. The value of animal products exports in 2017 was 29.9 billion EUR, and the imports were 27.2 billion EUR. The most important partners of EU-28 exports in 2017 were China (15%), the USA (9%), Japan (8%), Hong Kong (6%), Switzerland (4%), and South Korea (4%). The highest imports to the EU-28 in 2017 came from Norway (24%), China (9%), the USA (5%), New Zealand (5%), and Argentina (4%).

For a new member state of the EU, the trade balance for agri-food products has been increasing since 2003. In 2009 there was a breakdown in exports due to the impact of the global financial crisis that forced many trading partners to limit expenditures temporarily. The global recession, which was in 2008, has determined the drop-in export growth, and the decline recorded since 1970 was -6,7% (WTO, 2009; Marinescu and Szeles, 2010).

Figure 2 presents the balance of Extra-EU 28 trade of food, drinks, and tobacco by a member state in 2016 (million EUR). Green colors are marked countries with the best trade balance: France, Poland, and Italy. The trade balance of agri-food products is susceptible to financial shocks. The crises in 2008 worsened the trade balance of some EU countries and resulted in a switch to focusing more on customers within the EU. Since 2010, however, the trade-in agri-food products has been increasing (Kacperska, 2014).

Political crises between the EU and Russia have led to establishing an embargo, resulting in significant decreases in food products exported to Russia. Another problem affecting exports has been the instability in the Middle East and North Africa. These problems have resulted in price reductions for many agricultural products and significantly impacted farm incomes (Bórawski *et al.,* 2015).

All countries that became full members of the EU in 2004 (Cyprus, Czech Republic, Estonia, Lithuania, Latvia, Malta, Poland, Slovakia, Slovenia, and Hungary) have experienced increasing trade balances. Bulgaria and Romania joined the EU in 2007, and their trade balances increased from 71.5 million EUR to 479.4 million EUR and from -572 million EUR to 1.146.2 million EUR, respectively, in 2016. Croatia joined the EU only in 2013, and its trade balance had already increased from 161.8 million EUR in 2013 to 348.2 million EUR in 2016.

Overall, the EU trade balance for food, beverages, and tobacco changed considerably during the period from 2005 to 2016, negatively affecting the trade balance from 2005-2011, but a positive balance every year since then. Only eleven countries (Austria, Bulgaria, Croatia, Denmark, Estonia, France, Hungary, Ireland, Latvia, Lithuania, Malta, and Poland) had a positive trade balance in food, beverages, and tobacco throughout the entire period from 2005-2016. These countries had good

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competitive positions at the beginning of integration and have generally improved
their balance of trade positions over these eleven years.

Several countries (Bulgaria, Czech Republic, Greece, Italy, Romania, and Slovakia)
had negative trade balances in the early years, but their trade balances were positive
by 2016. These countries have enhanced their competitive position in the food sector.

Figure 2. *The balance of Extra-EU 28 trade of food, drinks and tobacco by member
state in 2016 (million EUR)*
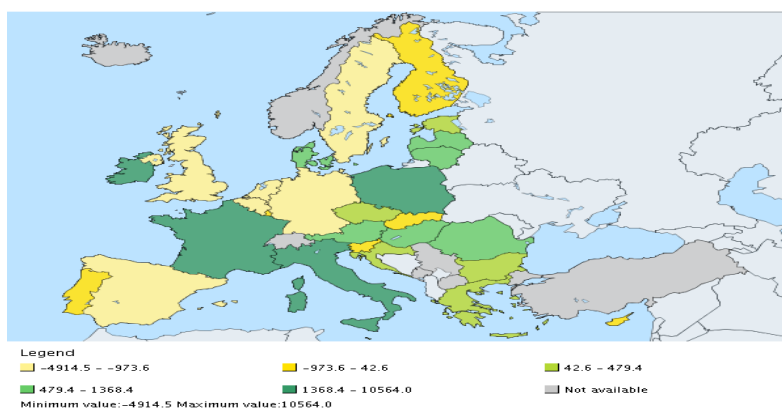
Source: *Eurostat, http://ec.europa.eu/eurostat/tgm/print.*

A negative trade balance of food, drinks, and tobacco existed in 11 EU countries
(Belgium, Cyprus, Finland, Germany, Luxemburg, the Netherlands, Portugal,
Slovenia, Spain, Sweden, and the United Kingdom) during the years 2005-2016.
These countries did not improve their competitive position after the expansion of the
EU in 2004. A negative trade balance is about comparative advantage, which is
worse, not an absolute advantage in agricultural trade.

Descriptive statistics on Extra- EU 28 balance of trade from 2002-2017 can be found
in Table 1. The highest trade balances in agri-food products were for France (6,837.9
Million EUR), Ireland (1,186.5 Million EUR), Denmark (1,042.7 Million EUR), and
Poland (1,040.7 Million EUR). The countries with the lowest balance of trade in agri-
food products during this period were the United Kingdom (-4,404.4 Million EUR),
the Netherlands (-2,701.8 Million EUR), Spain (-2,691.5 Million EUR), and Germany
(-2,142.1 Million EUR). The countries with the highest relative variability in trade (as
measure by the coefficient of variation) were Greece (11,9%), the Czech Republic
(6,9%), Slovakia (4,7%), and Romania (4,1%).

GARCH models are among the most effective time series forecasting methods. They can be used for one-dimensional, stationary series, and the predictions are short-term (Box and Jenkins, 1976). The Kalman filter test was used to test the hypothesis that there is no serial correlation in the data series. The degrees of freedom is equal to 2.97, 2.88, and 2.91. The conditional t-distribution is distinctly fatter-tailed than the normal, in the two cases where $1 \beta \alpha >$ the conditional variance depends more on the agri-food trade balance volatility observed in the previous period (Bórawski and Kwiatkowski, 2007). The GARCH model analysis results are shown in Table 2. 13 of your 28 countries could not generate a coefficient. There are some limitations of GARCH estimation using 11 years of data.

Table 1. *Extra EU 28 trade balance in food, drinks, and tobacco, 2002-2017 (Million EUR)*

Country	Average	Median	Minimal	Maximal	Stand deviation	Coefficient of variation	Skewedness	Curtosis
EU (28 countries)	-2629,8	-3986,7	-14096.0	10806,0	9536,1	3,6	0,1	-1,6
Austria	634,6	708,5	240,2	948,0	217,9	0,3	-0,4	-0,9
Belgium	-2030,2	-2015,9	-2407,3	-1455,2	285,6	0,1	0,4	-0,6
Bulgaria	317,8	261,4	-20,6	737,1	259,5	0,8	0,3	-1,3
Cyprus	-83,1	-72,4	-166,6	-30,6	36,8	0,4	-0,7	0,3
Croatia	133,7	89,6	-2,6	348,2	116,5	0,9	0,9	-0,7
Czech Republic	9,2	-11,7	-68,8	129,8	64,4	6,9	0,6	-1,0
Denmark	1042,7	1066,1	595,3	1434,1	340,1	0,3	-0,0	-1,8
Estonia	187,6	199,2	39,9	287,9	70,9	0,4	-0,6	-0,3
Finland	-67,3	-34,9	-328,0	29,0	115,2	1,7	-1,5	0,8
France	6837,9	6356,5	10,6	10845,0	3446,5	0,5	-0,4	-0,8
Germany	-2124,1	-2573,8	-3676,8	-1,8	1208,0	0,6	0,4	-1,2
Greece	16,9	31,3	-275,5	305,1	202,6	11,9	-0,1	-1,4
Hungary	643,5	661,4	412,5	922,6	163,3	0,3	0,0	-1,0
Ireland	1186,5	1160,7	1,0	2410,3	761,9	0,6	-0,1	-0,9
Italy	216,0	-128,9	-437,1	2046,3	841,6	3,9	1,2	-0,1
Latvia	452,4	418,7	53,6	848,4	293,6	0,6	0,0	-1,5
Lithuania	851,0	785,6	96,4	1717,7	508,6	0,6	0,3	-0,9
Luxemburg	-60,8	-55,3	-109,3	-36,6	20,4	0,3	-1,1	0,6
Malta	85,2	74,4	15,9	146,8	41,2	0,5	0,2	-1,0
Netherlands	-2701,8	-2687,1	-3570,6	-1753,6	646,5	0,2	0,0	-1,6
Poland	1040,7	993,2	235,7	1969,6	618,5	0,6	0,2	-1,4
Portugal	-268,9	-236,3	-655,7	324,0	299,5	1,1	0,3	-0,7
Romania	173,1	39,7	-809,6	1146,2	715,8	4,1	0,1	-1,4
Slovakia	4,8	2,7	-21,0	42,6	22,3	4,7	0,5	-0,9
Slovenia	-229,3	-250,1	-444,2	-36,9	105,1	0,5	-0,1	0,1
Spain	-2691,5	-2656,9	-4711,9	-1091,7	1230,9	0,5	-0,4	-1,1
Sweden	-1815,7	-1757,9	-3888,9	-2,6	1047,4	0,6	-0,3	-0,2
United Kingdom	-4404,4	-5144,8	-6483,4	-4,5	2142,3	0,5	1,5	0,7

Source: *Own calculations based on Eurostat.*
https://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tet00063&language=en

Croatia, Poland, and Bulgaria (new member countries that have exhibited positive and generally increasing balances of trade in agri-food products) exhibit serial correlation at the 20% level of significance. Additional years of data may result in more robust GARCH model results. Empirical results on the balance of agri-food product trade are characterized by increased conditional variance following a negative shock (for

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example, the financial crises in 2008). Several eurozone countries worsened their trade balance considerably (for example, the United Kingdom, Belgium, Cyprus, Croatia, the Czech Republic, the Netherlands, and Portugal).

4. Conclusions

The impact of EU accession on food trade and food safety reveals a broad distribution of agri-food trade across EU countries. Newer members have generally been net exporters of food products. The agri-food trade balance has increased for most of the newer members of the EU over time.

Table 2. *GARCH model in the years 2002-2017 in selected the EU countries*

Country	Coefficient	Stand error	z	P value
EU (28 countries)	0,439	1,841	0,238	0,812
Austria	0,879	1,289	0,681	0,496
Bulgaria	0,791	0,575	1,376	0,169
Cyprus	0,524	0,885	0,592	0,554
Croatia	0,973	0,518	1,876	0,061
Czech Republic	0,337	0,428	0,786	0,432
Denmark	0,833	1,231	0,677	0,498
France	0,647	0,744	0,869	0,385
Germany	0,689	0,733	0,941	0,347
Hungary	0,407	0,808	0,504	0,614
Lithuania	0,767	1,027	0,746	0,455
Malta	0,670	0,661	1,01	0,311
Poland	0,889	0,567	1,568	0,117
Romania	0,369	0,673	0,549	0,583
Spain	0,886	1,184	0,749	0,454
Sweden	0,283	0,633	0,446	0,655

Source: *Own calculations based on data obtained from Eurostat.*

Integration has resulted in higher food consumption and food exports (Bórawski *et al.,* 2020). The EU had improved the balance of agri-food products trade with outside countries with imports increasing only 98,4% while exports increased by 146,3%. The most important trade partners on the export side of agricultural products were in 2017 the USA (16%), China (8%), Switzerland (6%), Japan (5%), Russia (5%), and Norway (4%). The most important trade partners on the import side took Brazil (8%), United States (8%), Norway (5%), China (5%), Argentina (4%), and Ukraine (4%). The development of the EU's food trade is possible because the European single market has been created, and the European Union has faced the challenges arising from the regulation of the free movement of goods (Pappalardo *et al.,* 2013; Zarbà *et al.,* 2020). The free circulation of goods is developing well not only for individual products but also for the food market. One of the concerns is the relations between member states of the European Union with third countries (Prestamburgo and Sgroi, 2018; Sgroi *et al.*, 2018). Brexit will create additional problems in the food trade.

The EU is self-sufficient in food. However, to develop trade, the global food supply, food security, and sustainability are routinely carried out for food systems. This will

help investigate where and when criticality for supply and demand is likely to occur (Auestad and Fulgoni, 2015; Martindal, 2020). The European and international trade of agricultural products has increased sharply during the past decades. The development could be achieved thanks to trade liberalization, population growth, urbanization, and changing diets (Anderson, 2010; Schwarz *et al.,* 2015).

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