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**TOMASZ ROKICKI**

Warsaw University of Life Sciences – SGGW, Poland

## **FOREIGN TRADE IN LAMB MEAT BETWEEN EUROPEAN UNION COUNTRIES**

Key words: European Union, foreign trade, import and export, lamb meat

**ABSTRACT.** The main purpose of the paper was to present foreign trade in lamb meat concerning exchanges between the countries of the European Union. In a targeted manner, all EU member states were selected for research as of 31/12/2018 (28 countries). The research period concerned the years 2005-2018. The sources of materials were literature and Eurostat data. For analysis and presentation of materials, descriptive, tabular and graphical methods, dynamics indicators based on a constant and variable basis, the Gini concentration coefficient, Lorenz curve concentration analysis and Pearson's linear correlation coefficient were applied. The export of lamb meat in relation to other EU countries accounted for over 90% of total export of this type of meat. In the case of imports, it was just over 50%. There were countries only selling to other EU countries and those with buyers from outside the EU. The situation was similar in import. The concentration of lamb meat export and import decreased, faster for imports. There were also positive average relationships between foreign trade in lamb meat in relations with other EU countries and basic economic parameters.

### **INTRODUCTION**

Sheep are animals with a very high functional versatility. They provide wool, meat, milk, hides and manure. In countries of the European Union, the most important product is meat [Niżnikowski 1994]. In addition, the lamb meat market in the EU is important for the largest producers due to high demand and the highest prices in the world [Rokicki 2007]. In general, the price of sales is the main factor of competition on meat markets. However, more and more attention is paid to quality, which may favor the production of lamb meat. The proper promotion and education of the client is required [Anderson 2001]. Some consumers are already aware and expect the provision of healthy, safe food and a reduction of the adverse impact of agriculture on the natural environment. Sheep production and lamb meat meet the needs of the market [Klepacka-Kołodziejska 2007, Brodzińska 2009]. Lamb meat is most favorable in comparison to other types of meat in terms of composition, fatness, calorie content, health-promoting compounds (contains conjugated linoleic acid – CLA, preventing atherosclerosis, osteoporosis and obesity, and stimulates the immune system, having an anti-cancer effect) [Patkowska-Sokoła et al. 2000, Klepacki, Rokicki 2005, Schmid et al. 2006, Bodkowski, Patkowska-Sokoła 2013].

In the European Union, the market of sheep and lamb meat is covered by the Common Agricultural Policy (CAP). Despite the low level of consumption, the production of lamb meat did not cover reported demand within the EU. In the years 2007-2013, there were declines in production, but also in the consumption of this meat. The level of self-supply has increased to 90%. Therefore, it was necessary to import, mainly frozen meat, from outside the EU [Rokicki, Ratajczak 2018]. The main importers of lamb meat to the EU for years have been New Zealand (82-89% of total imports in 2007-2016), followed by Australia (6-11%) and South American countries, such as Chile (1-2%), Uruguay (0.6-1.7%) and Argentina (0.3-1%). For the import of lamb meat, so-called community tariff quotas are given. Until 2011, they were set annually, and since 2012, multiannual quotas have been in force, but they have not been used. The export of lamb meat to Asian and African countries also occurred on the market, also within the EU, but the volume was small [Rokicki 2017]. In the years 2003-2017, the export of sheep meat in the world increased by 29% from 854 thousand to 1100 thousand tones. Export from Europe accounted for 21% of its global volume. On the other hand, worldwide imports of sheep meat increased in the years 2003-2017 by 25% from 841 thousand up to 1050 thousand tones. Sales to Europe accounted for 34% of global imports in 2017 [FAOSTAT 2019].

The evolution of international meat trade has been explained among others by Richard Perren [2017]. According to him, capital investment and incentives from the government that enabled the emergence of the meat-exporting industry were of great importance. The use of refrigeration technology has had a large impact on the growth of the global meat trade [Jones 1929]. Changes on the side of agricultural production and the introduction of new breeds or cross-breeds of animals were also significant. As a result, consumer requirements regarding sheep meat could be met. Such actions were taken, among others, in New Zealand and Australia [Huttman 1978, Higgins 2004, Woods 2012, Ferguson et al. 2014]. These actions are continued, too. As a result, average carcass weight is increasing and the level of fat is decreasing. However, limitations and barriers in international trade have become a problem [Hall et al. 2000, Kidane 2003, Williams, Droulez 2010, Barendse 2014].

In the new trade model, an exchange between states occurs bilaterally. For example, in Romania, carcasses and processed products were imported, while live animals and semi-finished products were exported. It caused an imbalance. Only in the case of lamb and poultry meat was a positive trade balance achieved. The problem in this country was the underdeveloped meat processing industry [Moldovan 2010, Pirvutoiu, Popescu 2010, Stanciu et al. 2015, Soare 2016]. In general, the demand for lamb meat is influenced by the population and its income. Predictions about the development of sheep meat production in small and medium European countries failed to hold true in practice [Ali, Pappa 2015, Boutonnet 1999].

## MATERIAL AND METHODS

The main purpose of the paper was to show foreign trade in lamb meat regarding exchanges between the countries of the European Union. The specific objectives were: to determine the importance of importing and exporting lamb meat that takes place between EU countries in total foreign trade with this type of meat, showing trends and linking changes in lamb trade with the economic situation. The hypothesis was put forward in the paper, according to which foreign trade within the European Union was strongly concentrated in several EU countries. All European Union member states were selected for research purposefully as of December 31, 2018 (28 countries). The research period concerned the years 2005-2018. The sources of materials were literature and Eurostat data. For the analysis and presentation of materials, descriptive, tabular and graphical methods, dynamics indicators based on a constant and variable basis, the Gini concentration coefficient, the Lorenz curve concentration analysis, and Pearson's linear correlation coefficient were applied.

## RESULTS

In the years 2005-2018, the production of lamb slowly decreased (Figure 1). The same was true for internal consumption. The self-supply indicator, despite a decline in production, increased from 80 to 91% during the period under consideration. However, there was still a shortage which was supplemented by importing meat from non-EU countries. The volume of imported meat decreased quite proportionally to declines in consumption. Despite shortages, there was also meat export, which in the peak period amounted to 36 thousand tones (in 2013). Trade in live animals has been discontinued in the case of import. In export, live animals were sold, mainly to countries neighboring the EU, such as Switzerland and Balkan countries. Due to high requirements and the need to ensure animal welfare, the aim is to eliminate this type of trade.

Lower consumption of lamb meat within the EU occurred despite an increase in population. As a result, the consumption of this type of meat per capita decreased from 2.9 kg in 2005 to 1.7 kg in 2018. The fall was quite systematic. It should be emphasized that, in individual countries, there were differences in the consumption of lamb, which resulted from the tradition, culture and wealth of societies.

An important aspect affecting meat consumption and its popularity is price. Sales are based on the division of lambs into light lambs (up to 22 kg of live weight, obtained for the dairy farming of sheep) and heavy lambs (over 22 kg of live weight, for meat farming). In the years 2005-2018, the prices of lamb meat evened out in the case of given categories of lambs (Figure 2). During this period, prices of light lambs increased by 36%, while prices of heavy lambs dropped by 12%. As a result, in 2018, prices in both categories were at the same level. At the same time, the differences between individual countries decreased. Lower prices in the countries of Northern, Central and Eastern Europe have increased, while high prices have dropped from countries of Southern and Western Europe.

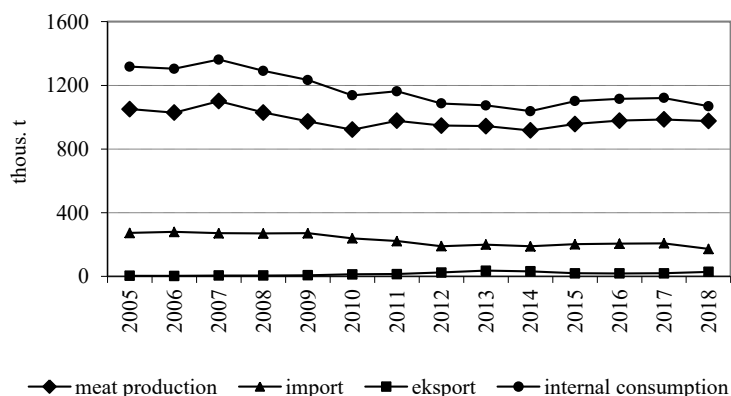


Figure 1. The balance of lamb meat in the European Union in 2005-2018

Source: own elaboration on the basis of Eurostat data

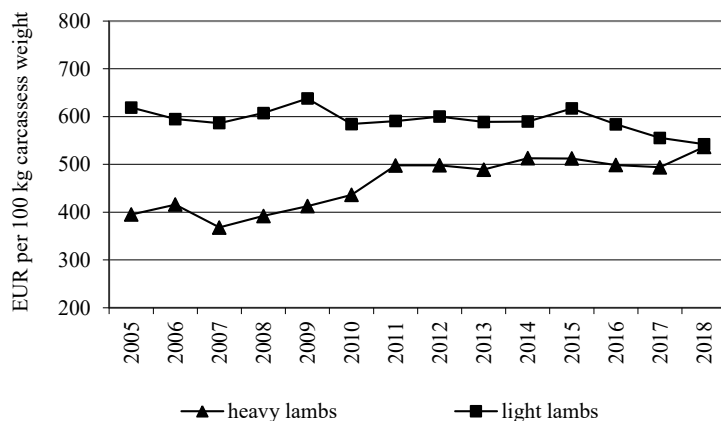


Figure 2. Prices of lamb meat in the European Union 2005-2013 (EUR per 100 kg of carcass weight)

Source: own elaboration on the basis of Eurostat data

The analyzed export and import of lamb concerns the following meat elements: fresh or chilled lamb and sheep carcasses and half-carcasses, fresh or chilled short lamb and sheep quarters, ridges and the best ends, legs, boneless cuts, boned cuts, frozen boneless sheep and lamb pieces as well as frozen boneless meat.

Within the EU, quite intense trade in lamb meat occurred between individual member states. In the case of exports, it was 98% in 2005 and 92% in 2018 of the total export of lamb meat from the EU. The importance of such exchanges in the EU internal market was, therefore, very large. However, there were differences in individual countries. For example, Austria, Belgium, Slovakia and Greece directed 100% of the export of lamb meat to other EU countries, and Romania and Italy around 65%. In the case of imports, the importance of trade in lamb meat between individual EU member states grew. In 2005,

Table 1. Dynamics of changes in the export volume of lamb meat to other EU countries in 2006-2018

Countries	Dynamics of changes in export volume of lamb meat to other EU countries in 2006-2018 (previous year = 100)												
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
United Kingdom	102	79	126	109	91	107	91	104	99	88	99	113	94
Ireland	96	95	85	94	86	110	111	96	93	110	115	109	96
Netherlands	116	113	82	100	132	142	99	113	96	102	132	116	92
Spain	135	95	84	89	149	102	104	99	98	97	104	92	127
Belgium	108	81	128	76	94	67	74	106	105	113	100	105	95
France	110	80	99	98	126	91	97	92	109	105	106	104	99
Romania	89	58	107	177	118	111	53	129	216	136	101	106	132
Greece	65	188	95	135	138	104	94	158	125	80	149	109	120
Germany	133	98	116	90	88	86	92	111	86	96	96	109	89
Italy	117	97	106	120	152	62	106	99	93	135	102	126	95

Source: own elaboration on the basis of Eurostat data

it accounted for 51% of total imports, and in 2018 as much as 59%. Differences between countries in this case were large. Only a few countries imported lamb meat exclusively from other EU countries, such as Romania, Slovakia, Lithuania, Luxembourg, Hungary and Austria. Most of the countries were dependent on imports from outside the EU, mainly from New Zealand. These countries include Great Britain (in 2018 as much as 85% of imports came from outside the EU), Malta (75%), the Netherlands (72%), Greece (58%), Cyprus (53%) and Germany (41%).

For determining the level of export and import of lamb meat, a quantitative measure in the form of tones was used. The top 10 exporters of lamb meat and its components to other EU countries included Great Britain (79 thousand tones in 2018), Ireland (49 thousand tones), the Netherlands (33), Spain (32), Belgium (12), France (8), Romania (6), Greece (5) Germany (5) and Italy (2). In 2018, this type of export, in all EU countries, amounted to 237,000. tones. In individual exporters, there were changes in the volume of meat sold to other EU countries (Table 1). There was big stabilization among the leading two exporters, because the changes in individual years were small. In other cases, there was a large variation. High increases dominated, as in the case of Greece (by 542% in 2005-2018), Romania (266%), the Netherlands (210%), Italy (116%) and Spain (74%). A large decrease was only registered in Belgium (by 50%). Interestingly, throughout the EU, in the years 2005-2018, there was an increase in exports of lamb meat within the Community by only 1%. This mirrors big changes in the structure of sellers and competition between countries, in this respect.

In the case of import, a similar statement was made as concerning export. Up to 10 leading importers of lamb meat and its components from other EU countries were France (79 thousand tones in 2018), Germany (26 thousand tones), Italy (21), Belgium (18), the

Table 2. Dynamics of changes in the import volume of lamb meat to other EU countries in 2006-2018

Countries	Dynamics of changes in the import volume of lamb meat to other EU countries in 2006-2018 (previous year = 100)												
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
France	103	87	105	95	93	94	101	98	99	91	95	102	98
Germany	114	101	96	106	142	126	86	122	115	107	111	123	106
Italy	113	89	94	101	104	104	95	104	104	100	101	102	102
Belgium	102	99	103	107	103	121	99	113	96	99	102	110	98
Netherlands	97	101	157	97	107	107	94	129	75	114	145	100	123
United Kingdom	99	97	100	85	101	94	112	108	71	78	98	142	109
Sweden	117	97	121	110	86	117	111	132	104	98	112	110	95
Portugal	96	94	81	151	88	94	88	112	115	89	113	119	122
Spain	144	95	86	142	90	100	93	110	111	102	112	124	88
Ireland	118	109	133	139	79	104	109	122	104	106	78	129	105

Source: own elaboration on the basis of Eurostat data

Netherlands and the United Kingdom (11 each), Sweden (8), Portugal (6) Spain (6) and Ireland (5). In 2018, this type of import, in all EU countries, amounted to 207,000. tones. In particular years, there were changes in the volume of imports in EU countries (Table 2). Quite small fluctuations occurred in the case of France and Italy. In other countries, there were bigger changes in the import of lamb meat. In the years 2005-2018, the highest increase was recorded for Germany (by 298%), the Netherlands (218%), Ireland (203), Sweden (167) and Spain (112). Imports across the EU have decreased by 1%. As in the case of export, the market was characterized by high competition and there was an exchange of suppliers and recipients according to the attractiveness of the commercial offer. This situation indicates the operation of market mechanisms in the case of trade in lamb meat on an EU scale.

The Gini coefficient was used to determine the degree of concentration of lamb meat exports in EU countries in relation to other Member States. The data concerned the year 2018, and the number of observations was 28. The Gini coefficient calculated from the sample was 0.81, and the estimated coefficient for the population was 0.84. This signifies a very high concentration of lamb meat exports and diversity in EU countries. This variation is additionally presented by the Lorenz concentration curve (Figure 3). In 2005, Gini coefficients were higher than in 2018 (0.84 and 0.87 respectively). This means a slight decrease in the concentration of lamb meat exports. The same was done with the import of lamb meat from other EU countries. In 2018, the Gini coefficient calculated from the sample was 0.75, and the estimated coefficient for the population 0.78. In 2005, higher results were 0.84 and 0.87, respectively. There has been a decrease in concentration in the import of lamb meat. The trend was positive, but the indicator was still high.

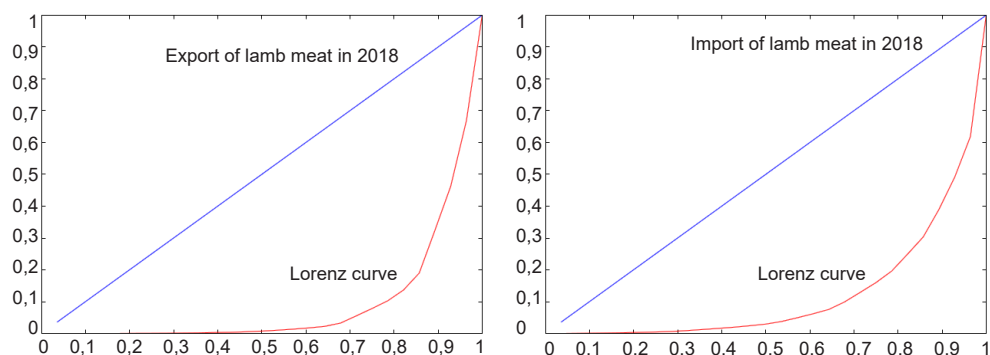


Figure 3. The Lorenz concentration curve for the export and import of lamb meat between EU countries in 2018

Source: own elaboration

In order to establish the relation between the export volume and the import of lamb meat in relation to other EU countries and the basic parameters of the economy, Pearson's linear correlation coefficients were calculated (Table 3). The  $p = 0.05$  was assumed as the limit value of significance level. Significant results were marked with a bold font in the table. Correlation coefficients were calculated for EU countries in individual years as well as the entire period between 2005-2018. In the paper, the correlation, which does not indicate that a given factor affects another, only that there is a strong or weak relationship between them, was examined.

There were significant average and highly positive correlations of the amount of export and import of lamb meat with GDP (Gross Domestic Product) value and the value of exports and imports of goods and services. These dependencies were particularly strong and increased in the case of lamb meat import. This means adjusting the volume of imports of this type of meat to basic economic indicators. In the case of economic parameters per person (GDP and household consumption), there were no significant dependencies in the volume of export and import of sheep meat in relation to other EU countries. Only in the case of lamb meat export, were there significant weak positive relationships with household consumption per capita over a few years for export and import.

Already, historical data from the 1920s and 1930s showed that the market for sheep meat and trade of it were variable. The individual preferences of consumers, the possibility of selling to other countries and the price obtained were of great importance [IEC 1935]. In many domestic markets seasonality also exists, which is associated with larger periodic trade in lamb meat. For example, in Greece, most lamb meat is eaten in spring and summer, that is during Easter and the tourist season [Klonaris 2002, 2014]. An explanation of this phenomenon would require a very thorough analysis.



Table 3. Pearson's linear correlation coefficients between the volume of lamb meat exports and imports and the parameters of the economy

Parameters	Pearson's linear correlation coefficients in years													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Correlation coefficients between the volume of lamb meat exports to other EU countries and basic economic parameters														
GDP value	<b>0.45</b>	<b>0.48</b>	<b>0.47</b>	<b>0.45</b>	<b>0.43</b>	<b>0.47</b>	<b>0.44</b>	<b>0.46</b>	<b>0.46</b>	<b>0.48</b>	<b>0.51</b>	<b>0.45</b>	<b>0.43</b>	<b>0.43</b>
p value	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.00</b>
Household consumption per capita	<b>0.45</b>	<b>0.46</b>	<b>0.48</b>	<b>0.39</b>	<b>0.31</b>	<b>0.32</b>	<b>0.30</b>	<b>0.33</b>	<b>0.32</b>	<b>0.36</b>	<b>0.42</b>	<b>0.38</b>	<b>0.37</b>	<b>0.36</b>
p value	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>	<b>0.04</b>	<b>0.11</b>	<b>0.09</b>	<b>0.13</b>	<b>0.08</b>	<b>0.09</b>	<b>0.06</b>	<b>0.03</b>	<b>0.04</b>	<b>0.06</b>	<b>0.06</b>
Export value	<b>0.40</b>	<b>0.43</b>	<b>0.40</b>	<b>0.39</b>	<b>0.40</b>	<b>0.42</b>	<b>0.40</b>	<b>0.40</b>	<b>0.41</b>	<b>0.41</b>	<b>0.44</b>	<b>0.42</b>	<b>0.42</b>	<b>0.41</b>
p value	<b>0.03</b>	<b>0.02</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>
Import value	<b>0.46</b>	<b>0.49</b>	<b>0.46</b>	<b>0.45</b>	<b>0.45</b>	<b>0.47</b>	<b>0.43</b>	<b>0.45</b>	<b>0.45</b>	<b>0.46</b>	<b>0.49</b>	<b>0.48</b>	<b>0.45</b>	<b>0.44</b>
p value	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>
Correlation coefficients between the volume of lamb meat imports to other EU countries and basic economic parameters														
Value of GDP	<b>0.53</b>	<b>0.54</b>	<b>0.55</b>	<b>0.56</b>	<b>0.57</b>	<b>0.60</b>	<b>0.62</b>	<b>0.60</b>	<b>0.63</b>	<b>0.61</b>	<b>0.60</b>	<b>0.64</b>	<b>0.69</b>	<b>0.70</b>
p value	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Value of export	<b>0.44</b>	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.44</b>	<b>0.46</b>	<b>0.49</b>	<b>0.47</b>	<b>0.50</b>	<b>0.50</b>	<b>0.51</b>	<b>0.55</b>	<b>0.59</b>	<b>0.61</b>
p value	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Value of import	<b>0.47</b>	<b>0.46</b>	<b>0.48</b>	<b>0.48</b>	<b>0.49</b>	<b>0.51</b>	<b>0.54</b>	<b>0.53</b>	<b>0.56</b>	<b>0.55</b>	<b>0.56</b>	<b>0.60</b>	<b>0.64</b>	<b>0.66</b>
p value	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

The  $p = 0.05$  was assumed as the limit value of significance level. Significant results were marked with a bold font

Source: own elaboration

## CONCLUSIONS

The lamb meat market is characterized by a shortage. The decrease in the production of this type of meat was also correlated with smaller consumption. As a result, supply increased. Despite shortages, intra-Community sales accounted for over 90% of total exports of lamb meat. There were differences in individual countries, since some countries were only exporting to other EU countries (e.g. Austria), and some selling outside the European Union (e.g. Italy). In the case of imports, the importance of purchases from other EU countries was smaller, because it accounted for slightly more than 50% of the total import of lamb meat. Diversity was, however, very large. There were countries very dependent on imports from outside the EU, like the United Kingdom, but also buyers only on the EU market, e.g. Romania.

In the case of export and import of lamb meat in relation with other EU countries, a very high concentration was found in several countries. Thus, the research hypothesis put forward in the paper was confirmed. The concentration, however, decreased, more slowly for exports, and faster for imports. Comparing data only from 2005 and 2018, it can be concluded that the import and export volumes of lamb meat in relation to other EU countries have not changed. Changes occurred in individual countries, and their cumulative dynamics in 2005-2018 often exceeded 100%. Such a situation proves high competitiveness and the operation of market mechanisms in the case of trade in lamb meat on an EU scale.

Average positive relations were found between economic parameters (GDP, value of exports and imports of goods and services) and the volume of export and import of lamb meat in relation with other EU countries. In the case of import, these dependencies were particularly strong and, in subsequent years, increased, which means adjusting the volume of imports of this type of meat to basic economic indicators.

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## HANDEL ZAGRANICZNY MIĘSEM JAGNIĘCYM MIĘDZY KRAJAMI UNII EUROPEJSKIEJ

Słowa kluczowe: Unia Europejska, handel zagraniczny, import i eksport, mięso jagnięce

### ABSTRAKT

Celem głównym pracy było przedstawienie handlu zagranicznego mięsem jagnięcym dotyczącego wymiany między krajami Unii Europejskiej. W sposób celowy wybrano do badań wszystkie kraje członkowskie Unii Europejskiej według stanu 31.12.2018 roku (28 państw). Okres badań dotyczył lat 2005-2018. Źródła materiałów stanowiła literatura przedmiotu, dane Eurostat-u. Do analizy i prezentacji materiałów zastosowano metody opisową, tabelaryczną, graficzną, wskaźniki dynamiki o podstawie stałej i zmiennej, współczynnik koncentracji Giniego, analizę koncentracji za pomocą krzywej Lorenza, współczynnik korelacji liniowej Pearsona. Eksport mięsa jagnięcego w relacji z innymi krajami Unii Europejskiej stanowił ponad 90% całkowitego eksportu tego rodzaju mięsa. W przypadku importu było to nieco ponad 50%. Występowały państwa sprzedające tylko do innych krajów UE oraz mające odbiorców też spoza Wspólnoty. Podobnie było w imporcie. Zmniejszała się koncentracja eksportu i importu mięsa jagnięcego, przy czym szybciej dla importu. Stwierdzono też dodatnie średnie związki między handlem zagranicznym mięsem jagnięcym w relacjach z innymi krajami UE a podstawowymi parametrami gospodarki.

AUTHOR

TOMASZ ROKICKI, PHD

ORCID: 0000-0003-3356-2643

Warsaw University of Life Sciences – SGGW

Department of Logistics

166 Nowoursynowska St., 02-787 Warszawa, Poland