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The Competitive Position of Poland in Bio-Based Products Trade on the European Union Market

Keywords: bio-products; competitiveness indices; trade; bioeconomy; comparative advantage

JEL: E6; F1; F15; Q17

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Abstract

Theoretical background: The strategies for the development of the European Union presented at the beginning of the new century portrayed bioeconomy as a modern concept of ensuring the sustainable and dynamic development of EU member states and bioeconomy itself became an important area of interest to the EU authorities. At present, the development of bioeconomy is a significant element of implementing the economic development strategies of respective EU member states.

Purpose of the article: This article aimed to examine the international competitive position of Poland in the bio-based products trade on the common EU market in comparison to other member states of the EU.

Research methods: The competitive position in bio-based products trade was evaluated based on the following indicators: balance of trade, Poland's share in EU exports and imports, trade coverage ratio, import penetration ratio, relative export orientation ratio, intra-industry trade intensity ratio, and export specialisation index. Groups of bio-based products identified based on an official classification of products according to CPA, version 2.1, consistent with NACE. The analysis was based on data derived from the Eurostat database for the years 2008–2017.

Main findings: The surveys imply that in 2008–2017, the competitive position of Poland improved mostly in the Forestry, Wood products, Paper and paper products, and Food sector, and in particular in the Tobacco products sector, which has been in line with the bioeconomy development strategy of the European Union.

Introduction

Bioeconomy is made of sectors being mainly producers of biomass that is a raw material for the production of food, animal feed, bio-based energy, bio-based materials and bio-based products. Biomass is sourced from products, wastes and residues deriving from agriculture, forestry, fishing and aquaculture as well as from industrial production and municipal management subject to their organic origin and biodegradability (Birch & Tyfield, 2012; Komor, 2018). Bioeconomy comprises diverse sections and divisions of the national economy linked with the value chain starting from the sector of producers of biomass supplied to industrial processors of food responsible for the production of food, animal feed, bio-based materials and bio-based energy. Next, agricultural raw materials and those deriving from forestry and fishing are used and processed mainly in the food industry, including in the production of beverages and tobacco, and in the animal feed industry. Textile, wood, paper-making and the chemical, cosmetic and pharmaceutical industries are equally important in terms of processing biomass into bio-based products. Such products very often constitute an important export offer of a given country, positively influencing its economic development, what confirms the thesis about the positive impact of economics activities supporting development based on the concept of bioeconomy (Gołębiewski, 2013; Scarlat et al., 2015; Adamowicz, 2017).

This article attempts to evaluate the international competitive position of Polish bio-based products on the internal market of the European Union in comparison to other member states of the European Union in 2008–2017. Competition on the internal market can be a competitive leverage on global markets (Mucha-Leszko, 2018), which is particularly important to countries with a gap in development, including Poland. The originality of the conducted research results from their concentration on one

of the new EU member states, for which bioeconomy plays an important role in the process of socio-economic development, and from the adopted scope of the analysis covering individual groups of bio-products: agriculture and hunting, forestry, fishing and aquaculture, food, beverages, tobacco, leather, wood products, paper and paper products. The above groups of products were classified as components of bioeconomy in the Report of the Joint Research Centre of the European Commission (M'barek et al., 2018). The research conducted so far has covered either only agricultural products with or without forestry, hunting and aquaculture products; or only food products; or collectively agri-food products (Chevassus-Lozza et al., 2008; Bielik & Qineti, 2009; Bojnec & Ferto, 2009; Jambor & Hubbard, 2013; Pawlak, 2013; Bojnec & Ferto, 2014a; 2014b; Carraresi & Banterle, 2015; Ignjatijević et al., 2015; Baráthová & Qineti, 2018; Cheptea & Huchet, 2018; Budzyńska & Nowak, 2019; Łukiewska, 2019; Matkovski et al., 2019; Szczepaniak, 2019; Andrei et al., 2020; Kowalska et al., 2021; Kuzmenko et al., 2022; Matkovski et al., 2022; Rumankova et al., 2022). However, there is a research gap when it comes to the analysis of individual groups of bioproducts according to the definition of "bioeconomy" adopted by the European Commission, which prompted the authors to undertake research in this area. The acceptance of the 10-year membership period for the analysis made it possible to evaluate the changes in Poland's competitive position in the trade of bioproducts on the common EU market. This study takes into account the diversity of bioproducts and analyzes their individual groups separately, thus, allowing the assessment of the international position of each of them.

Literature review

Prospects for the development of European bioeconomy were presented, for the first time, during two conferences – pioneering in this area – in 2005 and in 2007, the findings of which were a continuation to the assumptions of the Lisbon strategy (EC, 2000). These events gave rise to a discussion on the shape of the European policy regarding the development of bioeconomy (EC, 2005). The year 2012 saw a real breakthrough when the European Commission published a strategy document *Innovating for Sustainable Growth*. *A Bioeconomy for Europe* presenting the idea and underlining the significance of bioeconomy in the development of EU member states (EC, 2012). The report identified several priorities to provide a basis for the development of a more innovative, resource-efficient society to ensure food security based on measures protecting the natural environment and, at the same time, allow using renewable sources in other industries. It postulated a necessity to support the development of industries and implement high technologies responsible for producing renewable sources and allowing the conversion of such sources into products of higher value added such as food, animal feed, bio-based products and bio-based energy. In 2018, the bioeconomy development strategy was updated and presented

by the European Commission as a document titled *A Sustainable Bioeconomy for Europe: Strengthening the Connection between Economy, Society and the Environment: Updated Bioeconomy Strategy*. It contained recommendations following from a review of previous effects of the implementation of the strategy, a set of measures to support the development of bioeconomy, including reinforcement and increase in the scale of bio-based sectors (EC, 2018).

Currently, the discussion concerning the directions of development of the European Union focuses on the fact that in order to stay competitive in the international arena and ensure welfare to its residents, the Community should make more extensive use of renewable sources to achieve the assumed level of climate neutrality. In turn, resource-efficient industries in the European economy, the manufactured range of bio-based products, and bio-based energy will contribute to green growth and improvement in competitiveness. In addition, it is important that, for remaining competitive and retaining the existing and newly formed jobs, the European bioeconomy sectors should rely on innovativeness and further diversification in their development. The bio-economy development strategy assumes a considerable growth in the development of bio-economy stemming from sustainable primary production, bio-based product manufacturing processes and industrial biotechnologies used and biorefineries that will lead to the emergence of new bio-industries, the transformation of the existing sectors and opening new markets for bio-based products (Chyłek, 2016).

In order to meet the expectations, the EU bioeconomy development strategy should be based on competitive sectors forming a sustainable economic system. However, due to the diversity in the conditions of development of respective EU countries, including the development of bioeconomy sectors, it is subject to many different processes and is not uniform. Nevertheless, an analysis of the competitiveness of the bioeconomy, despite its links to the micro- and macro-economic level, is primarily associated with the competitiveness survey of industries and sectors at the meso-economic level. In this case, reference literature uses the term "industrial economics" to denote a scientific sub-discipline at the meso-economic level (Gorynia & Łaźniewska, 2009).

A significant aspect of analyses concerning bioeconomy is the assessment of its competitiveness. Since competitiveness is an ambiguous and multifaceted term, a single universal definition of this phenomenon does not exist and a single method for measuring it has not been developed (Nosecka & Pawlak, 2014; Jarosz-Angowska et al., 2020). Widely interpreted competitiveness can be defined as an ability to compete – that is, an ability to operate and survive in a competitive environment – and an ability to design and sell products of a specific sector offering quality and other attributes that are more attractive than the corresponding attributes offered by competitors. It is also the ability of an industry (sector) to increase its market share and compete with foreign competitors on foreign and national markets at arm's length (Carraresi & Banterle, 2008; Gorynia & Łaźniewska, 2009; Dzikowska & Gorynia,

2012). The definition of "international competitiveness" refers, in the first place, to the specific country's international trade performance, and notably the ability of domestic businesses to enter foreign markets, and the possibility of developing efficient exports and increasing the share in export markets (Pawlak, 2004; Mucha-Leszko et al., 2009; Misala, 2011; Wosiek, 2016).

Research methods

The international competitive position of Poland in the bio-based products trade was assessed based on the Classification of Products by Activity (CPA), version 2.1. (Commission Regulation No. 1209/2014), consistent with NACE – the official classification of economic activity. The analysis referred to the following CPA sections, classified – according to the Report of the European Commission's Joint Research Centre (M'barek et al., 2018) – as non-hybrid bio-based products: products of Agriculture, hunting and related services (Section A01); products of Forestry and related services (Section A02); Fish and other fishing products; aquaculture products; support services to fishing (Section A03); Food products, Beverages and Tobacco products (Sections C10+C11+C12); Leather and related products (Section C15); Wood and wood products, except furniture (Section C16); Paper and paper products (Section C17). The competitiveness of Poland on the common EU market was analysed based on the following indicators (Bombińska, 2002; Jagiełło, 2003; Olczyk, 2008; Pilarska, 2017; Łukiewska, 2019; Kasztelan et al., 2021): balance of trade, Poland's share in EU exports and imports, trade coverage ratio, import penetration ratio, relative export orientation ratio, intra-industry trade intensity ratio, and export specialisation ratio. These indicators are commonly used in the assessment of international competitive position, however, they were rarely used to analyze individual groups of bioproducts. The above-mentioned indicators were calculated for all member states of the European Union and provided a basis for a ranking of EU countries. The tables show the position of Poland in relation to other EU member states according to respective indicators. Data input for the analysis derives from Eurostat.

Results

The analysis started with an assessment of the balance of trade (Figure 1), and the percentage share of exports (Figure 2) and imports (Figure 3) of Poland respectively in the exports and imports of the European Union for respective groups of bio-based products.

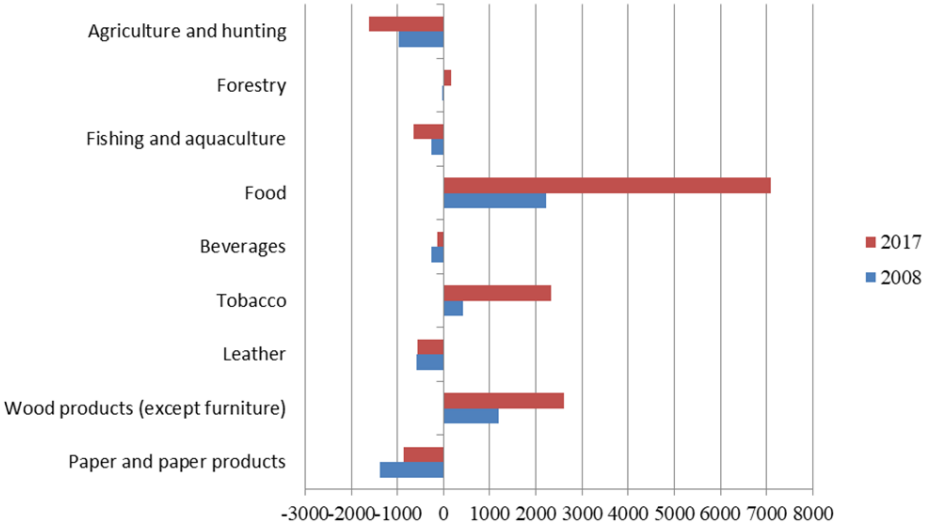


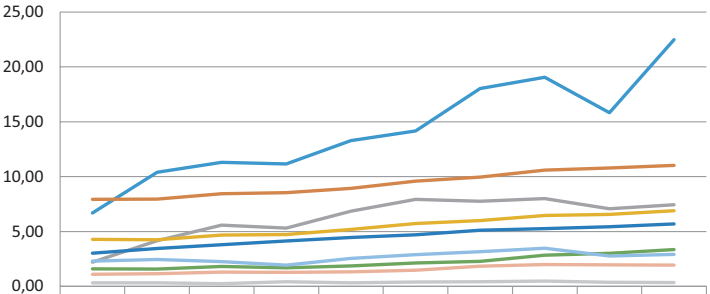
Figure 1. The balance of trade of Poland for selected groups of bio-based products in 2008 and 2017 in MEUR

Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

Poland has a positive balance of trade for Food products, Tobacco, Wood products and products of Forestry (Figure 1). In these groups of bio-based products, the rate of increase was faster for exports than for imports in 2008–2017, which increased the positive balance of trade. The balance of trade was worse for Agriculture and hunting and for Fishing and aquaculture. Imports of products of agriculture and hunting in 2017 increased by 75% in comparison with the year 2008 – from EUR 2,346 million to EUR 4,111 million. The growth rate for imports of this group of products was faster in Romania, Bulgaria and Latvia only.

In 2008–2017, the significance of Poland in EU exports of all groups of bio-based products increased, notably with reference to Tobacco products. In the period under review, the share of exports of Polish tobacco in EU exports of this commodity increased from 6.69% to 22.49% (Figure 2). This was due to the high dynamics of Polish exports of Tobacco products (479%), which increased from EUR 573 million to EUR 2,751 million. The only countries with higher dynamics were Croatia (1,025%) and Estonia (573%), but they had little share in EU exports – 0.7% and 0.1%, respectively, in 2017. Data provided in Figure 2 implies that the share of Polish exports in EU exports of the products of Forestry increased significantly in 2017 compared to the year 2008 (Polish export increased up to EUR 237 million, and the export dynamics in the period under review was 397%), Wood products (export increased up to EUR 3,511 million, with the dynamics of 163%), Paper and paper products (EUR 3,820 million, 178%), Leather (EUR 1,662 million, 385%), and Food (EUR 16,932 million, 232%). Such a significant increase in the share of exports of Polish bio-based products in EU

exports, despite the considerable export dynamics, can be observed for the products of Agriculture and Forestry (exports worth EUR 2,494 million in 2017, with 180% export dynamics), Beverages (EUR 591 million of exports, 223% dynamics) and the lowest – for Fishing and aquaculture (EUR 29 million, 210%). This is due to a faster growth rate of the corresponding exports in other EU member states.



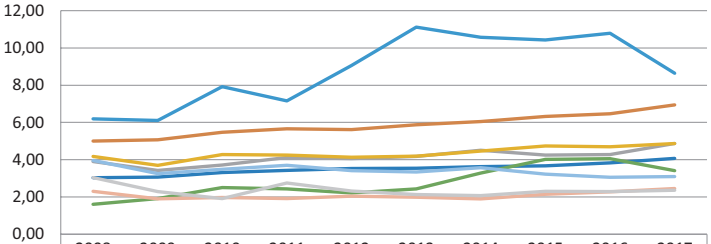
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Tobacco	6,69	10,40	11,30	11,15	13,29	14,16	18,03	19,07	15,82	22,49
Wood products (except furniture)	7,93	7,96	8,45	8,54	8,93	9,60	9,96	10,60	10,79	11,02
Forestry	2,20	4,16	5,57	5,31	6,85	7,93	7,75	8,00	7,07	7,45
Food	4,29	4,25	4,66	4,73	5,18	5,72	5,99	6,47	6,56	6,89
Paper and paper products	3,02	3,44	3,79	4,14	4,45	4,71	5,11	5,27	5,42	5,69
Leather	1,58	1,58	1,82	1,69	1,86	2,13	2,28	2,85	3,00	3,35
Agriculture and hunting	2,29	2,44	2,26	1,93	2,55	2,90	3,16	3,47	2,75	2,92
Beverages	1,10	1,14	1,30	1,27	1,33	1,48	1,85	1,99	1,95	1,92
Fishing and aquaculture	0,31	0,33	0,24	0,43	0,33	0,39	0,42	0,48	0,37	0,34

Figure 2. Percentage share of Poland's exports in EU exports of selected groups of bio-based products in 2008–2017*

*the share of respective groups was presented in an ascending order, according to data for 2017
Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

Compared to other EU member states, Poland is a significant importer of Fishing and aquaculture products. It accounted for nearly 9% of EU imports of such products in 2017 (Figure 3). Imports of Fishing and aquaculture products increased from EUR 276 million in 2008 to EUR 683 million in 2017, and the import growth rate in the period under review was 247%. Poland also has a significant share in EU imports of Paper and paper products, which increased by almost 2 pp in the period under review. The value of Polish imports of such products increased from EUR 3,527 million to EUR 4,680 million. In turn, imports of Wood and wood products decreased from EUR 960 million to EUR 894 million, and those of the products of Forestry – from EUR 92 million to EUR 83 million, and the share of these two groups of products decreased accordingly in EU imports. In the period under review, imports of all other groups of products noted the most dynamic increase for Tobacco and tobacco products (increase by 185% from EUR 144 million to EUR 412 million), Leather (increase by 120% from EUR 1,012 million to EUR 2,222 million) and Food products

(increase from EUR 5,058 million to EUR 9,836 million – by 94%; only Croatia noted a higher increase – by 126%), while the imports of Beverages increased less dynamically (from EUR 536 million to EUR 727 million).



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fishing and aquaculture	6,19	6,11	7,92	7,16	9,05	11,12	10,57	10,43	10,79	8,64
Paper and paper products	5,00	5,07	5,47	5,66	5,61	5,87	6,05	6,32	6,47	6,94
Agriculture and hunting	3,91	3,43	3,72	4,12	4,07	4,18	4,51	4,24	4,29	4,87
Leather	4,18	3,70	4,27	4,25	4,14	4,20	4,46	4,74	4,70	4,87
Food	3,04	3,07	3,32	3,43	3,52	3,55	3,63	3,67	3,83	4,07
Tobacco	1,61	1,92	2,50	2,43	2,23	2,43	3,29	4,02	4,06	3,42
Wood products (except furniture)	3,96	3,26	3,48	3,71	3,41	3,35	3,58	3,22	3,06	3,09
Beverages	2,31	1,90	1,98	1,92	2,05	1,99	1,90	2,15	2,28	2,46
Forestry	3,04	2,29	1,92	2,75	2,31	2,13	2,08	2,31	2,29	2,37

Figure 3. Percentage share of Poland's imports in EU imports of selected groups of bio-based products in 2008–2017*

*the share of respective groups was presented in an ascending order, according to data for 2017
Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

Table 1. Position of Poland among EU member states for respective groups of bio-based products according to trade coverage ratio (TCR) in 2008 and 2017

Specification	Agriculture and hunting	Forestry	Fishing and aquaculture	Food	Beverages	Tobacco	Leather	Wood products (except furniture)	Paper and paper products
2008									
Value	58.8	64.9	5.1	144.0	49.3	397.0	42.6	223.5	60.7
Rank	15	18	27	4	15	3	20	7	16
2017									
Value	60.7	286.2	4.3	172.1	81.3	666.8	74.8	392.7	81.6
Rank	17	8	27	2	11	1	12	4	12

Notes:

$$TCR = \frac{X_{ij}}{M_{ij}} \times 100$$

X_{ij}, M_{ij} – intra-community export/import of "i" product for "j" country

Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

An export specialisation of a specific product can be expressed using the trade coverage ratio (TCR) (Table 1). Analysing this ratio, it can be concluded that, in the years under review (2008–2017), Poland's exports were higher than imports, which improved its position in the ranking of Food, Tobacco and Wood products except furniture. In addition, Poland became a specialised producer and exporter of the products of Forestry. The TCR for the products of Forestry considerably exceeded 100 and Poland moved up from position 18 to 8, which testifies to a considerable prevalence of export over import compared to other business partners in the European Union. It should be noted that Poland has an advantage over other EU member states in exports of Tobacco, which in 2017 were six times higher than the corresponding imports, and which placed Poland first in the EU ranking.

Table 2. Position of Poland among EU member states for respective groups of bio-based products according to import penetration ratio (IPR) in 2008 and 2017

Specification	Agriculture and hunting	Forestry	Fishing and aquaculture	Food	Beverages	Tobacco	Leather	Wood products (except furniture)	Paper and paper products
2008									
Value	9.3	3.8	73.8	14.7	6.3	ND	69.4	15.9	52.4
Rank	21	17	3	26	28	ND	21	23	18
2017									
Value	13.7	2.3	84.7	23.0	10.1	ND	126.1	15.2	45.2
Rank	20	23	5	24	25	ND	10	24	16

Notes:

X_{ij}, M_{ij} – see above

Q_{ij} – value of production of "i" product in "j" country

ND – no data

Source: Authors' own calculations based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

Analysis of the import penetration ratio (IPR) at the level of respective groups of bio-based products informs about the share of imports of the analysed products in the supply on the internal market in Poland (Table 2). The growing part of domestic consumption is satisfied by imports of products of Agriculture and hunting, Fishing and aquaculture, Food, Beverages and Leather. As for the products of Forestry, Wood products as well as Paper and paper products, Poland reduced the dependency of internal consumption on imports, and clearly began specialising in these groups of products.

Table 3. Position of Poland among EU member states for respective groups of bio-based products according to relative export orientation ratio (REO) in 2008 and 2017

Specification	Agriculture and hunting	Forestry	Fishing and aquaculture	Food	Beverages	Tobacco	Leather	Wood products (except furniture)	Paper and paper products
2008									
Value	37.9	38.9	35.8	90.6	18.4	ND	81.8	137.9	93.4
Rank	23	23	15	15	24	ND	21	12	16
2017									
Value	46.4	100.1	33.5	129.6	45.8	ND	145.9	163.8	108.3
Rank	21	14	19	13	23	ND	15	11	14

Notes:

REO = $(\frac{X_{ij}}{Q_{ij}} \div \frac{X_{iEU}}{Q_{iEU}}) \times 100$

X_{ij}, Q_{ij} – see above; X_{iEU} – intra-community exports of "i" product in all EU countries

Q_{iEU} – the value of production of "i" product in EU countries

ND – no data

Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

This is corroborated by the calculation of the relative export orientation ratio (REO) for the above-mentioned groups as an expression of the degree of openness of Polish national economy in comparison to the average degree of openness of the national economies of all EU member states (Table 3). The value of REO exceeding 100 – which implies that production is export-oriented and competitive on the EU market – was recorded for Forestry, Wood products, and for Paper and paper products. As a matter of fact, an increase in the export specialisation measured with REO can be noted for all groups of bio-based products, except Fishing and aquaculture, and it is notably high with reference to Polish Food and Leather products. By contrast, in comparison to other member states of the European Union, Poland ranks low for production and export of products of Agriculture and hunting (23rd in 2008 and 21st in 2017); however, this can be evaluated positively given its growing specialisation in the area of highly processes bio-based products such as Food. This can be associated with a growing demand for Polish agricultural commodities and, hence, a limitation on their exports. Even a slight improvement in the position of Poland in relation to other countries on the European market – being a very difficult, challenging and highly competitive market – should be given a positive evaluation.

Table 4. Position of Poland among EU member states for respective groups of bio-based products according to intra-industry trade intensity ratio (IIT) in 2008 and 2017

Specification	Agriculture and hunting	Forestry	Fishing and aquaculture	Food	Beverages	Tobacco	Leather	Wood products (except furniture)	Paper and paper products
2008									
Value	74.1	78.7	9.6	82.0	66.0	40.2	59.7	61.8	75.5
Rank	11	6	26	9	12	15	18	17	14
2017									
Value	75.5	51.8	8.3	73.5	89.7	26.1	85.6	40.6	89.9
Rank	13	12	26	19	6	15	7	21	7

Notes:
$IIT_i = \left(\frac{[(X_i+M_i)-|X_i-M_i|]}{X_i+M_i}\right) \times 100$
X_i – intra-community export of "i" products of a specific country
M_i – intra-community import of "i" products of a specific country

Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

The definition of intra-industry trade stipulates that a lower intra-industry trade ratio (IIT) means that we are rather dealing with inter-industry trade than intra-industry trade. The intensity of intra-industry trade in respective groups of bio-based products between Poland and other EU countries is presented in Table 4. Simultaneous exports and imports can be observed in the following groups of products: Paper and paper products, Beverages, Leather, products of Agriculture and hunting, and Food. Production and demand in these groups of products in Poland complements their production and demand in other EU countries and thus intra-industry specialisation is growing. For agricultural products the increase in the significance of intra-industry trade is affected by choices and preferences of consumers and interest in products imported from other countries.

Table 5. Position of Poland among EU member states for respective groups of bio-based products according to export specialisation index (XSI) in 2008 and in 2017

Specification	Agriculture and hunting	Forestry	Fishing and aquaculture	Food	Beverages	Tobacco	Leather	Wood products (except furniture)	Paper and paper products
2008									
Value	67.5	57.9	9.2	128.3	33.4	187.4	52.2	259.9	89.1
Rank	15	20	22	7	25	7	20	9	11
2017									
Value	58.6	134.3	7.4	138.8	39.5	451.2	72.1	240.5	112.2
Rank	18	11	23	6	24	2	13	9	6

Notes:
$XSI = \left(\frac{X_{ij}}{X_{tj}} \div \frac{M_{iEU}}{M_{tEU}}\right) \times 100$
X_{ij} – see above
X_{ij} – total intra-community exports of "j" country
M_{iEU} – intra-community imports of "i" product to the market of all EU countries
M_{tEU} – total intra-community imports to the market of all EU countries

Source: Authors' own study based on (Eurostat, https://ec.europa.eu/eurostat/data/database).

The export specialisation index (XSI) (Table 5) compares the share of exports of the analysed group of bio-based products in Poland's total exports with the share of imports of the analysed group of bio-based products in total imports of all EU member states. This ratio illustrates to what extent Poland's specialisation and exports meet the requirements of the whole group. Analysing the export specialisation index, it can be concluded that Polish exports satisfy the demand of EU countries, notably in the following groups of products: Tobacco, Wood products, Food, Forestry products, and Paper and paper products. These are the most competitive divisions of Polish exports of bio-based products in which Poland has been consistently building its competitive position on the common European market since it joined the EU. In the analysed period (2008–2017), Poland moved up in the ranking of European Union's member states according to XSI for all bio-based products, except products of Agriculture and hunting and Wood products.

Discussion

Our studies refer to studies of other authors on the competitive position and comparative advantage of agri-food products on the EU's internal market; however, subject to certain reservations.

Firstly, the objective scope of studies described by this paper is unique; it refers to the so-called bio-based products identified on purpose, the groups of products for analysis were selected based on a strategic document of the European Commission (M'barek et al., 2018), and a similar objective scope of the study is difficult to find in other works. Researchers usually analyse and evaluate the competitive position of agri-food products as a whole (Budzyńska & Nowak, 2019; Carraresi & Banterle, 2015) but do not take groups such as Forestry, Wood products, Paper and Leather into account. They most often analyse respective sections of Agricultural products, for example, Grains, Dairy products, Meat products, and Fruit and vegetables; including Processed foodstuffs (Pawlak, 2013; Łukiewska, 2019; Szczepaniak, 2019). Many studies analyse selected groups of products, for example, Dairy products (Bojnec & Ferto, 2014a) and Forestry products (Bojnec & Ferto, 2014b). An additional difficulty in comparing the results of studies is that the analysed product sections can be classified by different nomenclatures, e.g. by HS, CN or SITC chapters.

Secondly, the spatial range of the research differs significantly. Looking for comparative advantages, most researchers refer to a specific country or region as other EU member states or the so-called EU average. Studies on the competitiveness of agri-food trade in countries including Romania (Andrei et al., 2020), France (Cheptea & Huchet, 2018), the Czech Republic (Rumankova et al., 2022; Kuzmenko et al., 2022) noted Poland's high potential and improved position compared to the analysed countries, whereas other countries that together with Poland acceded

to the EU in 2004 have not been that successful, for instance, Hungary (Jambor & Hubbard, 2013). Also, studies on the competitiveness of selected groups of countries, for example, Central and Eastern Europe (Bojnec & Ferto, 2009; Bielik & Qineti, 2009), the Balkan Region (Matkovski et al., 2019; 2022) or the Danube Region (Ignjatijević et al., 2015) saw the increasing potential and competitive strength of Poland but more in a regional context – as a member of CEFTA (Central European Free Trade Agreement) and V4 (Visegrad Group). Studies concerning comparative advantages of EU member states in external agri-food trade outside the European Union corroborate Poland's strong position on the global market (Bojnec & Ferto, 2014a; Szczepaniak, 2019). Bojnec and Ferto reported that Poland was more competitive in dairy products trade on the extra-EU market than on the intra-EU market.

Thirdly, the timeline of the researchers' analyses is different, which affects the outcomes of their studies, as the competitive position in trade is very dynamic and can significantly change year on year depending on various, often unpredictable factors such as war or epidemics. In the agri-food trade, these factors also include weather conditions and natural disasters.

Fourthly, the selection of ratios for evaluating the competitive position differs among researchers; hence identical trade statistics can be interpreted differently, depending on which ratio was selected.

In general, the top-ranking EU exporters of agri-food products, irrespective of the study scope, are the Netherlands, Germany and France. From 2007 to 2015, these countries accounted for 45.3% of EU exports of food products (Łukiewska, 2019, p. 171). Poland, together with Spain, Belgium and Italy, is a country that, next to the above-mentioned trio, has a more than average significance in the intra-EU agri-food export. The largest importers are the United Kingdom, although this country shows a comparative advantage for many groups of products (Baráthová & Qineti, 2018); before Brexit, considerable volumes of agri-food export from Poland were destined for the United Kingdom. It should be emphasized that Poland is definitely the largest exporter of foodstuffs among new member states, which is corroborated by other authors' analyses. Studies by Kowalska et al. (2021) imply that Poland ranked best for the international trade in agri-food industry products among the V4 countries. They were conducted from 2001 to 2019 using indices such as import-export coverage, which revealed comparative advantages and the intensity of intra-industry trade Grubel–Lloyd Index. The analysis of Poland's position on the global markets performed by Szczepaniak shows that the export value of the majority of Polish agri-food products increased from 2004 to 2017. The highest – higher than average – increase was noted for Grains and Tobacco and tobacco products exports. By contrast, according to HS nomenclature, the most important group of imports was Fish and seafood. The products with comparative advantages include Live animals, Meat and edible meat offal and meat preparations, and Fruit and Vegetable preparations (Szczepaniak, 2019).

Considering the limitations mentioned at the beginning of the Discussion and the above-quoted results of studies conducted by other authors, the gener-

al conclusions from our research are consistent with the results of other studies conducted; generally, Poland ranks quite well compared to the countries of the European Union.

Conclusions

The position of Poland in the bio-based products trade on the common European market in the years under review – 2008–2017 – improved for most groups of bio-based products, however, to a different extent. Poland turns out to be the least competitive in the trade of products of Fishing and aquaculture. Despite having access to the Baltic Sea, Poland has an insignificant share in exports of these products to the EU market even though the share in the EU imports of this group of products increased to nearly 9%, which – considering the trade coverage ratio – places Poland next to last in the EU. Poland scores poorly for Agriculture and hunting. Although this division features a high level of employment in comparison to other EU countries, Polish agricultural products lose their competitiveness on the EU market, which is illustrated by Poland's share in EU imports growing faster than its share in EU exports and by an increasingly negative balance of trade as well as deteriorated export specialisation in this group of products.

Following its accession to the European Union, Poland had to adapt to the difficult competitive environment of the common market, which was a full success for products of Forestry, Wood products, and Paper and paper products. Poland clearly specialised in these groups as shown by the relative export orientation and export specialisation ratios. Based on the analysed ratios, in the area of Food products, Poland had the best results in Tobacco trade, but the share of this group in the division of bio-based products is not very significant. By contrast, the position of Poland in the trade of Food and Beverages deserves a positive evaluation.

To sum up, it should be highlighted that the competitive position of Poland in the trade of bio-based products on the common EU market improved to the highest extent in relation to significantly processed bio-based products such as Wood products, Paper and paper products, and Food products. The improvement was smaller for less processed products such as products of Agriculture and hunting, and Fishing and aquaculture. The observed trend can be evaluated positively in the context of the economic development of Poland.

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