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**THE COMPETITIVE POSITION OF CONCENTRATED APPLE
JUICE EXPORTED FROM POLAND**

Key words: concentrated apple juice (CAJ), foreign trade, CAJ export, competitiveness, competitive position of CAJ export

ABSTRACT. The objective of this research was to determine the competitive position of Concentrated Apple Juice (CAJ) exports from Poland in the years 2007-2022. The data used in this study were sourced from the Trade Map database (Trade statistics for international business development) and the Food and Agriculture Organization (FAO) of the United Nations (FAOSTAT). Global CAJ trade experienced a decline during this period. The average export volume from 2019 to 2022 amounted to 1.4 million tons, representing a 16% decrease compared to the average volume from 2007 to 2010. The major global CAJ exporters during the study period were China, Poland, and Turkey. China's share in global CAJ exports decreased from 49% to 29%, while Poland's share increased from 11% to 19%, and Turkey's share rose from 2% to 11%. Additionally, Ukraine's share increased from 2% to 6%, and Moldova's share increased from 1% to 4%. The highest net export orientation ratios were observed for Moldova, Hungary, Poland, and Ukraine, all exceeding 40%. Throughout the study period, the competitive position of CAJ exports from Poland, Turkey, Ukraine, and Moldova improved, while China's competitive position declined. This presents an opportunity for domestic producers due to the decreasing CAJ exports from China. However, there is also an increase in competitive pressure from other suppliers, primarily from Turkey, Ukraine, and Moldova.

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INTRODUCTION

The research aimed to ascertain the competitive position of Poland's Concentrated apple juice (CAJ) exports and their evolution during the period spanning from 2007 to 2022. Concentrated apple juice is a product derived from apples through physical methods, most commonly evaporation, which facilitates its transportation and storage. It serves as an intermediate product for the production of fruit juices. Poland is among the leading fruit producers in Europe [Kierczyńska 2010], with apple orchards dominating the national landscape [Kierczyńska 2016]. Fruit production has been on the rise in Poland [Kierczyńska 2017, Nosecka 2017], placing the country at the forefront of global apple producers, second only to countries with greater natural potential such as China, the USA, or Turkey. This heightened production is attributed to favourable climatic conditions and tradition [Kraciński, Wicki 2020]. Depending on harvest yields and the potential for dessert utilization, Poland directs between 36% [GUS 2018] and 70% [Nosecka 2022] of apple harvests towards processing. Trade in apples for juice production primarily occurs between neighbouring countries due to transportation costs, with significantly higher volumes during low-yield years [Kraciński 2015]. Although the share of fruits destined for CAJ production has decreased due to the growing importance of NFC (Non-Form Concentrate) juice production, CAJ remains the predominant fruit processing output. In recent years, 75% to 90% of apples processed have been allocated to CAJ production [Nosecka 2022].

In the seasons 2018/2019-2021/2022, Poland averaged a production of 296.3 thousand tons of CAJ, with the majority, i.e., 91% (including imported CAJ), being exported [Nosecka 2022]. The substantial role of CAJ exports in production utilization underscores the significance of international competitiveness analyses. The ability to sell CAJ significantly impacts agricultural producers engaged in apple cultivation.

Competitiveness can be viewed both as a characteristic and a process. The process involves the pursuit of competitiveness as a characteristic, which is an outcome or result [Gorynia 2009]. Competitiveness is relative and necessitates comparison with other objects, both within and across similar structures or levels of analysis [Olczyk 2008]. Competitiveness is currently assessed at various levels: global, regional, macro, meso, micro, and micro-micro [Gorynia 2009]. The meso level represents segments of the economy, often analysed at the level of industries and sectors. Regardless of the analytical level, individual economic entities engage in competition. Competitiveness can be examined from static and dynamic perspectives. In the dynamic view, competitiveness involves tracking the evolution of an object's states over time. Competitiveness can pertain to the domestic (internal) or foreign (external, international) market.

At the meso level, competitiveness is most often measured by the export performance of a country [Olczyk, 2008]. The Institute of Agricultural and Food Economics – the National Research Institute (IERiGŻ-PIB) defined the competitiveness of the food sector

as the ability of domestic producers to position themselves in foreign markets and expand exports [Woś 2023]. The competitiveness of the horticultural sector was defined as an improvement in indicators relative to other net-exporting countries, without reducing domestic consumption and production [Nosecka 2017]. The competitive position is the outcome of the competitive process [Gorynia 2009], determining the position occupied by an entity [Urbaniak 2007]. Macroeconomic factors, such as inflation rates, unemployment, exchange rates, etc., also influence the competitive position [Bossak, Bieńkowski 2004], not just the efforts of sector enterprises. Competitiveness research employs a set of indicators, including market and trade shares, real exchange rates (RER), and foreign direct investments (FDI) [Frohberg, Hartman 1997]. Among these indicators, quantitative and cost-price measures are most commonly used in assessing competitive positions, particularly in the agricultural sector. Quantitative tools are used to measure competitive positions based on resource structure and productivity employed in the production of goods [Pawlak 2013].

The competitive position of CAJ was analysed using indicators such as Revealed Comparative Advantage (RCA) and market shares [Juan et al. 2013], with a focus on exports from China, Poland, and Germany. The analysis demonstrated that from 2005 to 2009, China exhibited the highest RCA and the highest and growing share in global CAJ exports. During this period, the competitive position of Poland, a primary Chinese competitor, declined. Competitive analyses of CAJ exports using RCA were also conducted for the years 2002-2014 [Kurmai 2016]. The findings revealed that China possessed the strongest comparative advantage in CAJ exports during the considered period. Poland, Hungary, Chile, Ukraine, Turkey, and Moldova also exhibited significant comparative advantages in CAJ exports. Subsequent analyses for the years 2002-2015 yielded similar conclusions [Kurmai 2016b]. China led in CAJ production and exports, with Poland being the leading producer and exporter among European countries. However, Poland's competitiveness in CAJ exports was lower than Hungary's. It was observed that the development of the sector in Europe, including Poland, was facilitated by trade barriers imposed in the EU and the USA, restricting CAJ imports from China [Kurmai 2016b]. Research on the competitiveness of trade between Turkey and the EU demonstrated comparative advantages in both cases, although the RCA value was higher for the EU [Sahinli 2013]. Analysing competitive positions using indicators such as trade balances, global export shares, and RCA from 2004 to 2015, it was found that CAJ exports from Poland were competitive. Poland exhibited average to strong comparative advantages in CAJ exports, while China had a strong advantage. The strongest comparative advantage, however, was observed in the case of Moldova and Ukraine [Kraciński 2018a]. The increase in CAJ exports from Poland was driven by higher apple harvests and the import of cheaper concentrate to Poland [Kraciński 2018b], yet the foreign trade balance in concentrated juices in Poland has consistently remained strongly positive [Bugała 2021].

Analysing the years 2002-2014, it was found that external conditions favoured CAJ production growth, though further increases in exports could be hindered by competition for apples between pressing plants and entities supplying fresh fruit to the market [Bugała 2014]. The direction and strength of linear correlations between apple production, CAJ export volumes, CAJ prices, and fruit for processing were also examined. Analyses for the years 2004-2014 revealed a strong positive correlation between apple harvests and CAJ export volume, as well as a negative correlation between purchase prices and production and export [Kierczyńska, 2015]. The fragmentation of fruit producers contributes to their weak position in the supply chain [Kierczyńska 2019].

The research objective was to determine the competitive position of Poland's CAJ exports and its changes from 2007 to 2022.

MATERIAL AND METHODOLOGY OF RESEARCH

The data used in this study were sourced from the Trade Map database (Trade statistics for international business development) and the Food and Agriculture Organization (FAO) of the United Nations (FAOSTAT). The research period spanned from 2007 to 2022. Trade data were available up to the year 2022, while data on apple harvests were available up to 2021. The research period was divided into four sub-periods to mitigate fluctuations in trade caused by variations in apple production. It is worth noting that CAJ exports are strongly correlated with apple production [Kierczyńska 2015]. During seasons of lower apple harvests, both CAJ production and exports tend to decline. The competitive position was determined using three indicators: share in global exports, gross export orientation ratios, and net export orientation ratios.

One of the fundamental quantitative measures of the ex-post competitive position of products is the share in exports (MS):

$$MS = \frac{X_{ic}}{X_{iw}} \times 100\%$$

X_{ic} – export of products i from country c ,

X_{iw} – exports of products i , in the world or group of countries.

An increase in MS is interpreted as an improvement in the competitive position [Zawiślińska 2003]. This measure is often utilized to determine competitive positions. When assessing agricultural products, it is also essential to consider other factors contributing to a decline in MS , such as reduced yields influenced by independent factors (e.g., weather conditions).

To determine the significance of CAJ exports in the apple production of various countries, the gross export orientation ratio (E_{bo}) and (E_{no}) was calculated:

$$E_{bo} = \frac{E_{bk} \times W}{P_{jk}} \times 100\%, \quad E_{no} = \frac{E_{nk} \times W}{P_{jk}} \times 100\%$$

where:

E_{bk} – CAJ gross export from country k ,

E_{nk} – CAJ net export from country k ,

W – conversion coefficient,

P_{jk} – harvest of apples from country k .

The coefficient W reflects how many kilograms of apples were used to produce one kilogram of CAJ. In the study, a coefficient of 7 was adopted. In practice, depending on the characteristics of the raw material, this coefficient can vary from 8.6 to 6.5 kilograms of apples per kilogram of CAJ [Kowalczyk 2004]. An increasing coefficient can be interpreted as an improvement in the competitive position of CAJ exports.

This coefficient signifies the efficiency of apple utilization in CAJ production, with a higher value indicating a more efficient conversion of apples into CAJ and potentially indicating an enhanced competitive position in the CAJ export market.

RESULTS OF RESEARCH

Global trade in CAJ during the years 2019-2022 averaged 1.42 million tons, with a total value of USD 1.76 billion. Compared to the average values from the years 2007-2010, the export volume was 16% lower. The export volume exhibited variability in individual years, but a clear downward trend in trade volumes was observed. By establishing a linear trend function ($R^2 = 0.45$), it was determined that from 2007 to 2022, CAJ exports decreased on average by 1.87 thousand tons annually.

This analysis highlights the decline in global CAJ exports over the specified period, with a consistent decrease in trade volumes, as indicated by the linear trend function. During the analysed period, China held the top position among the largest exporters (Table 1). However, their export volume decreased significantly. Compared to the years 2007-2010, China's exports in the years 2019-2022 decreased by a remarkable 51%. China's share in the global export volume dropped by 22 percentage points (p.p.), which can be interpreted as a decline in their competitive position in international markets. This decline in China's export share can be primarily attributed to the increasing domestic demand for Concentrated Apple Juice (CAJ), resulting in a downward trend in foreign sales [Nosecka 2017].

Table 1. The biggest CAJ exporters and their share in export (MS)

Country	Concentrated apple juice exporters							
	thousands tons	%	thousands tons	%	thousands tons	%	thousands tons	%
	2007-2010		2011-2014		2015-2018		2019-2022	
World	1,693	100.0	1,506	100.0	1,511	100.0	1,423	100.0
China	823	49.0	562	37.0	548	36.0	406	29.0
Poland	188	11.0	230	15.0	257	17.0	275	19.0
Turkey	38	2.0	55	4.0	67	4.0	161	11.0
Ukraine	42	2.0	80	5.0	70	5.0	85	6.0
USA	13	1.0	17	1.0	35	2.0	48	3.0
Austria	81	5.0	72	5.0	71	5.0	64	4.0
Moldavia	19	1.0	30	2.0	38	2.0	51	4.0
Chile	38	2.0	63	4.0	65	4.0	51	4.0
Hungary	44	3.0	48	3.0	49	3.0	40	3.0
Italy	51	3.0	42	3.0	36	2.0	32	2.0

Source: own elaboration on the basis of data from Trade Map

Poland ranked second in terms of export volume among global exporters during the study period, experiencing a 46% increase in exports. Poland's share in global exports grew by 8 p.p. to 19% in the years 2019-2022, indicating an improvement in its competitive position. Only Turkey saw a more significant increase in CAJ export shares (9 p.p.) during the same period, becoming the third-largest global CAJ exporter. The combined exports from China, Poland, and Turkey accounted for 59% of the world's trade volume in CAJ during the years 2019-2022.

Among the major CAJ exporters, competitive positions, as measured by MS, also improved for Ukraine (by 4 p.p.) and Moldova (by 3 p.p.), as well as the USA (by 2 p.p.). Turkey, Ukraine, and Moldova, which are countries with lower production factor costs, hold the most significant advantages for domestic producers in the group of major CAJ exporters. Additionally, these countries aspire to either join the European Union or gain unrestricted access to the European Single Market (ESM).

In the group of major exporters, the competitive position of CAJ exports from Austria and Italy decreased by 1 p.p. In the case of Austria, the export was based on imports carried out by entities domiciled in that country. CAJ exports from Italy were based on the production of locally sourced lower-quality apples. Italy is a significant producer and exporter of high-quality dessert apples. The majority of CAJ produced in Italy originates from fruits that do not meet the requirements of the dessert apple market [Kraciński, Wicki 2020].

The Gross Export Orientation Ratio (E_{bo}) and net (E_{no}) relate the volume of CAJ exports to apple production within a country. These ratios allow us to determine what percentage of the country's apple production is allocated for export in the form of CAJ. In cases where there are significant differences between the values of the gross and net ratios, it can be assumed that either CAJ or apples are being imported. Typically, the import of CAJ occurs, and re-export takes place.

The highest Gross Export Orientation Ratios (E_{bo}) and Net Export Orientation Ratios (E_{no}) were observed during the study period in Poland, Moldova, and Hungary (Table 2). In the case of Poland, the share of apples exported in the form of CAJ decreased compared to the beginning of the research period, which can be attributed to the increasing significance of dessert apple production and sales, concurrent with rising domestic apple production during that time. Nevertheless, the importance of CAJ exports remains high, exceeding 50% in the case of the Gross Export Orientation Ratio. During the study period, Poland also recorded slightly lower E_{no} ratios which indicate the occurrence of CAJ imports. The value of export orientation indicators in the case of Poland did not demonstrate a declining trend throughout the entire period. Lower indicators for the latest research sub-period in relation to the years 2007-2010 may be interpreted as a decline in the competitive position of concentrated apple juice (CAJ) exports. However, it should be noted that the proportion of apples destined for processing is correlated with the size of the harvest. In the case of abundant harvests, a larger share of apples is allocated for processing and can

Table 2. The gross export orientation coefficient (E_{bo}) and net (E_{no}) in selected countries

Country	Export orientation coefficient							
	gross	net	gross	net	gross	net	gross	net
	2007-2010		2011-2014		2015-2018		2019-2021	
China	18.8	18.8	10.2	10	9.6	10	6.5	6
Poland	62.9	51.7	55.2	39	54.5	41	51.3	44
Turkey	10.4	8.9	13.7	11	15.4	13	25.3	18
Ukraine	36.7	30.5	51.1	49	40.8	39	42.8	40.0
USA	2.1	-65.1	2.6	-60	4.9	-	6.3	-254
Austria	127.5	-49.7	181.5	-41	206.5	-27	194.4	-40
Moldavia	58.9	57.1	68.1	68	56.5	56	59.1	58.7
Chile	17.9	17.7	26.7	27	26.8	27	23.3	22
Hungary	54.9	47.2	58.4	54	63	56	58.7	49
Italy	15.8	13.8	12.9	11	10.7	8	9.7	7

Source: own elaboration based on data from Trade Map and Faostat

consequently be exported in the form of concentrated apple juice (CAJ), as it cannot be absorbed in the fresh market.

Among the largest apple concentrate (CAJ) exporters, the highest share of apple production exported in the form of concentrate was recorded in Moldova, where 57% to 68% of apple production was exported as CAJ. The E_{no} and E_{bo} indicators were similar, indicating that the production in this country has a strong export-oriented focus and is competitive in foreign markets. In the case of Hungary, there was relative stability in the indicators at a high level. A portion of Hungary's apple exports, representing a few percent of their apple harvest, was carried out through the import of CAJ or apples. The E_{no} and E_{bo} indicators were also high (30-52%) in Ukraine, and their values were similar in the compared subperiods. Similar values of E_{no} and E_{bo} indicators were also observed in China, but their values steadily declined from just under 19% in the years 2007-2010 to 6.5% and 6% in the years 2019-2022, confirming that a decreasing portion of Chinese apple production is exported in the form of CAJ, thus reducing the competitiveness of exports from this country.

Among the largest exporters, the United States and Austria were included, but these were re-exporting countries where the volume of imports exceeded the volume of exports. Re-exporting is carried out to achieve trade profit. Lower prices for imported CAJ compared to those exported from Poland ensure the economic feasibility of "import for export" [Nosecka 2023a]. Companies in re-exporting countries import cheaper CAJ or CAJ with lower quality parameters and blend it with domestic concentrate [Kraciński 2018b]. In the trade flows of CAJ, the size and international character of processing companies, which produce and export in one country or partially relocate production to branches in other countries, such as Poland's Austria Juice or Dohler, are also significant.

The analysis of export orientation indicators in the studied period does not allow for unambiguous conclusions about the change in the competitive position of all analysed countries. This is certainly a result of the overlap of crop variability and demand situations in the markets. Therefore, the reduction of indicators in the case of Poland in relation to previous periods is not interpreted as a decrease in the competitive position of CAJ exports.

SUMMARY

In the case of participation in global exports (*MS*), the competitive position of CAJ exports from Poland increased, but the export orientation indicator decreased in the years 2019-2021 compared to the years 2007-2010. Conversely, the competitive position of CAJ exports from China, as measured by both their share in global exports and export orientation indicators, declined. During the studied period, the competitive position of CAJ exports from Turkey, Ukraine, and Moldova increased. Moldova's sales did not represent

a significant share in global proceedings due to its small production capacity, which is a consequence of its country size. However, exports from Moldova were characterized by the lowest prices, resulting from lower production and raw material costs. Exports from Moldova, similar to Ukraine and Turkey, may be more competitive in global markets than exports from Poland. Exports from Moldova and Ukraine partly find their way into Poland. In 2019, the largest CAJ imports to Poland were recorded from Moldova [Bugała 2020]. In the case of Ukraine, the increased imports in 2022 were a result of the wartime situation [Nosecka 2023b]. However, it is not predetermined whether the situation with increased CAJ imports to Poland will repeat in the future and whether imports will continue to grow, displacing the production of CAJ from apples produced in Poland. In the case of preferences in accessing the EU market or the membership of these countries in the EU, competitive pressure from imports can have significant implications and negatively impact the domestic market by displacing suppliers from marketplaces.

A systematic decline in CAJ exports from China, assuming the demand remains constant, creates favourable opportunities for other exporters, including Poland. However, the increasing competitive position of CAJ exports from Turkey, Moldova, and Ukraine poses growing competition for CAJ exported from Poland. The future will depend on non-economic factors such as the shaping of EU agricultural and trade policies and the potential expansion of the group, as well as access to the Single European Market.

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POZYCJA KONKURENCYJNA ZAGĘSZCZONEGO SOKU JABŁKOWEGO EKSPORTOWANEGO Z POLSKI

Słowa kluczowe: zagęszczony sok jabłkowy (ZSJ), handel zagraniczny, eksport,
konkurencyjność, pozycja konkurencyjna eksportu

ABSTRAKT. Celem badań było określenie pozycji konkurencyjnej eksportu z Polski zagęszczonego soku jabłkowego (ZSJ) w latach 2007-2022. Do badań wykorzystano dane z bazy Trade Map (Trade statistics for international business development) oraz Światowej Organizacji ds. Wyżywienia i Rolnictwa (FAOSTAT). Stwierdzono, że w badanym okresie światowe obroty ZSJ zmniejszyły się. Przeciętny wolumen eksportu w latach 2019-2022 wyniósł 1,4 mln ton i był o 16% niższy w porównaniu do średniego wolumenu w latach 2007-2010. Największymi światowymi eksporterami ZSJ w badanym okresie były Chiny, Polska i Turcja. W światowym eksporcie ZSJ udział Chin zmniejszył się z 49 do 29%, natomiast zwiększył się w krajach, takich jak: Polska – z 11 do 19%, Turcja – z 2 do 11%, Ukraina – z 2 do 6% i Mołdawia – z 1 do 4%. Najwyższe wskaźniki orientacji eksportowej netto odnotowano dla Mołdawii, Węgier, Polski i Ukrainy (ponad 40%). W badanym okresie nastąpił wzrost pozycji konkurencyjnej eksportu ZSJ z Polski, Turcji, Ukrainy i Mołdawii, natomiast obniżała się pozycja konkurencyjna eksportu z Chin. Szansą dla krajowych wytwórców jest malejący eksport ZSJ z Chin, ale odnotowuje się zwiększoną presję konkurencyjną innych dostawców, w tym głównie z Turcji, Ukrainy i Mołdawii.

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