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The Impact of COVID–19 on EU-China Trade Flows

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Abstract

COVID–19 is expected to have contributed towards changing the geographical structure of world trade, including trade between individual EU countries and China. This article presents the results of an analysis of the impact of the COVID–19 pandemic on Sino-EU trade flows. The research aims to ascertain whether European Union countries noted a strengthening of their competitive advantage in trade with China in any of the 21 HS sections by increasing the value of the normalized revealed comparative advantage index (NRCA). To identify and select the most significant NRCA observations, Chebyshev's inequality was used. The analysis was carried out for 2015 to 2020, with a particular emphasis on 2020, when the first effects of the COVID–19 pandemic were recorded.

EU-China trade relations have been the subject of numerous studies, but their nature has not yet been fully elucidated. This article tries to fill that gap. The analysis of mutual trade, especially at such an important moment from the socio-economic perspective, can bring significant results. The analysis revealed that the pandemic did not result in any decline in EU-China trade. In fact, global trade rose in 2020, with most of the 27 EU countries recording increases in both imports and exports. There were also no significant changes in the structure of the distribution of comparative advantage. However, in contrast to the previously analyzed years (2015–2019), in 2020, the NRCA index shows a flatter distribution, suggesting that most EU countries with the highest comparative advantages actually observed reductions in them.

Keywords: COVID–19, international trade, import, export, normalized revealed comparative advantage

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Introduction

Since the Second World War, China has grown stronger in military, political, and economic spheres, and in the last decade, its growth could be considered unprecedented in relation to the world's leading economies. Importantly, China has been attempting to limit its excessive dependence on the USA through consistent efforts to diversify its sources of imports, as well as its export destination markets.

In this regard, the European Union (EU) has become an important alternative for China. Therefore, China's cooperation – both economically and politically – with the Community is very important for both sides. Cooperation with China is also an opportunity for the EU to stimulate economic activity. Despite the many burdens in mutual relations, cooperation has gradually strengthened, especially since China joined the WTO (2001), and more than a decade later, when negotiations on *The Comprehensive Agreement on Investment* (CAI) began. The importance of these mutual relations is confirmed by the fact that the EU is currently China's largest trading partner, and the EU market is the second main destination for Chinese exports and the main source of imports. China, on the other hand, is the second-largest market for EU exports and the main source of imports (European Commission 2021a).

More recently, however, the EU-China relationship has been seriously tested by the COVID–19 pandemic. It led to a significant decline in world trade, and reductions in industrial production, services, and foreign investment flows. It was anticipated that the pandemic would result in significant changes in the geographical structure of world trade, including trade between the individual countries of the EU and China.

This article, therefore, presents the results of an analysis of the impact of the COVID–19 pandemic on Sino-EU trade flows. To this end, the main direction and advantages of bilateral trade between particular members of the EU and China have been identified. The aim of the research was to ascertain whether the EU countries recorded an increase in the competitive advantage in exports to China and how it changed over time. The index that was used to analyze the change in comparative advantage was the normalized index of revealed comparative advantage (NRCA). Statistical trade data from the Trade Map $3021 database was applied to conduct the analysis. The method used in this research made it possible to determine the relative competitiveness – and the changes caused by the COVID–19 pandemic – of the EU countries in the Chinese market. Identifying the comparative advantages of individual EU countries made it possible to determine which of them coped best with competition in the Chinese market, especially in such difficult conditions caused by the COVID–19 pandemic and its effects.

The research was also the basis for assessing the current competitive position of a given EU country – compared to other EU countries – and how it changed over time. This is particularly important as the EU has had a negative trade balance with China for over

two decades, perpetuating negative trade patterns. Thus, the results of the analysis presented in this work will help to explore the nature of mutual EU-China trade relations and thereby constitute a basis for building a long-term trade strategy that will enable progressive steps to be taken to overcome such negative trends.

The statistical analysis contained in the article focuses on the period between 2015 and 2020 and is used to measure and compare trends in trade before the COVID–19 pandemic and in the year when both sides felt the first effects of the pandemic.

Part one of this work focuses first on the introduction of those issues that are analyzed. This lays a foundation for part two, where the research methodology is presented. In this part, the author also provides a literature review. Part three focuses more specifically on Chinese-EU trade relations. More specific and detailed attention is paid to the actual trade turnover during the COVID–19 pandemic. Part four concentrates on the empirical analysis, and there is a closer examination of the factors that shape the revealed comparative advantages (RCAs) in EU exports to China. The final part draws on the most important conclusions from the analysis.

Methodology

The doctrine of comparative advantage is derived from classical economics and is attributed to the Ricardian concept of trade (Ricardo 1817). A comparative advantage results from differences in technology between countries. The second major trade theory of comparative advantage stems from the work carried out by Heckscher and Ohlin (Heckscher 1919; Ohlin 1933). They stated that there are similarities in technologies in different countries, and a comparative advantage is based on differences in factor prices, which enable goods and services to be produced and supplied at a lower opportunity cost. Both Ricardo and Heckscher and Ohlin support the idea that a comparative advantage is the main determinant in shaping a country's trade structure, leading to specialization based on supply and demand.

The measurement of comparative advantage was first introduced by Liesner (1958, pp. 302–316). However, the most frequently used model was that developed by Balassa (1965, pp. 99–123; 1989), which measures RCA. This index shows a country's relative position in the export of specific goods in comparison to a reference group of countries. The Balassa index is written as follows:

$$RCA = \frac{EX_{ij}}{\sum_{i=1}^{n} EX_{ij}} : \frac{EX_{iw}}{\sum_{i=1}^{n} EX_{iw}},$$

where:

RCA – Revealed comparative advantage index;
EX_{ij} – Value of exports from product/section *i* by country *j* to the market *m*;
EX_{iw} – Value of exports from product/section *i* from a group of countries to market *m*;
n – Number of products/sections.

RCA measurement has its critics, however. For example, Yeats (1985, pp. 61–73), Vollrath (1991, pp. 263–279) and Laursen (1998) point to the disadvantages of RCA, such as its staticity, or the problem of asymmetric distribution and the lack of a finite upper limit. Hoen and Oosterhaven (2006, pp. 677–691) also highlighted that using logarithmic transformation methods to interpret comparative advantage provides better results. Other authors mention the importance of simultaneous consideration on the import side (Lafay 1990, pp. 27–43; Vollrath 1991, pp. 263–279), especially when country size is important (Greenaway and Milner 1993, pp. 181–208). An RCA statistical error may also be the result of a state's protectionist policy. Customs duties, import restrictions, or import quotas, as well as export subsidies, can significantly modify export/import streams, leading to a distortion of trade patterns. Due to these limitations, the formula proposed by Balassa was modified several times by authors such as Vollrath (1991, pp. 263–279), Greenaway and Milner (1993), Dalum, Laursen, and Villumsen (1998, pp. 423–443), Laursen (1998; 2015, pp. 99–115), Proudman and Reding (1998), Hinloopen and van Marrewijk (2006), Hoen and Oosterhaven (2006, pp. 677–691), Yu, Cai, and Leung (2009, pp. 267–282), Yu et al. (2009, pp. 473–485), Latruffe (2010) and Wijnands and Verhoog (2016). While these methods contribute to developing some aspects of RCA, none of them can generally be used to compare space (regions/countries) with time (Fakhrudin, Fithra, and Banu 2019, pp. 105–145). The usefulness of the measure of comparative advantage has not yet been questioned in research.

This study examines the comparative advantage of EU–27 members using the NRCA index (Yu, Cai, and Leung 2009, pp. 267–282; Yu et al. 2009, pp. 473–485), which is a revised version of the RCA index. This index makes it possible to overcome some of the above-mentioned limitations of the original Balassa index. An important advantage of the NRCA index is that it allows for the changes in comparative advantage in section, time, and space to be measured. The formula of the NRCA index is given as follows (Fakhrudin and Hastiadi 2016, p. 6):

$$NRCA_k^i = \frac{\Delta X_{ik}}{X} = \frac{X_{ik}}{X} - \frac{X_k X_i}{XX},$$

where:

$NRCA_k^i$ – the difference in the comparative advantage of country *i* for product *k* in a specific market;
X_{ik} – Commodity exports *k* from country *i* to China;
X_i – Total exports from country *i* to China;
X_k – EU commodity exports *k* to China;
X – EU exports to China.

The range of NRCA values fluctuates around zero (neutral value) ranging from $-0.25 < NRCA < 0$ and $0 < NRCA < 0.25$. With a symmetrical measure of trade specialization, it is possible to explore the advantages and disadvantages on consistent terms; values above 0 reflect a comparative advantage, while values below 0 reflect a comparative disadvantage. It is assumed that when one country strengthens its comparative advantage – through an increased NRCA index – another country records a decrease. Importantly, this corresponds to the assumption that the state may have a comparative advantage in selected groups of goods only, which means that it cannot be competitive in terms of all goods. The analysis carried out in this work used 21 commodity sections (consisting of over 5,000 groups of goods) exported from the EU–27 to China.

Due to the fact that the NRCA analysis showed a large number of observations in which the NRCA values for exports oscillate close to zero (the neutral sphere), Chebyshev's inequality was used in the research. It makes it possible to select the most outstanding observations for NRCAs that exceed +/–2 standard deviations from the mean. For +/–2 standard deviations of the mean, 75% of the observations are within limits. For this analysis, only those observations were used whose values exceed the upper limit of the sum of the mean and twice the standard deviation (maximum 12.5% of the sample), i.e., only data that demonstrate a high comparative advantage of the selected EU countries (*Schwesernotes…* 2015).

The purpose of the analysis is to identify the comparative advantage of individual EU–27 countries in trade with China. The analysis was carried out for 2015 to 2020, with particular emphasis on 2020, when the first effects of the COVID–19 pandemic were recorded. Export data has been grouped into 21 sections according to the Harmonized Commodity Description and Coding System (HS) (World Customs Organization n.d.).

EU-China trade relations and COVID–19

China is the EU's largest source of imports and its second-largest export market. The main goods imported into the EU from China are industrial and consumer goods, machinery and equipment, and footwear and clothing. The main export goods to China are machinery and equipment, motor vehicles, planes, and chemicals. Services also have a large share in mutual trade, accounting for over 10% of total trade in goods, while exports of services account for 19% of total EU exports of goods (European Commission 2021a).

For this research, 2020 is particularly important given that most of the world, including the EU and China, were facing the effects of COVID–19. As a result, global supply chains were disrupted in many economies due to COVID–19 lockdown restrictions. It also affected the EU countries, where, according to estimates, the value of Chinese goods and services used in production amounted to USD 73.5 billion (for EU–14 – the countries of the old EU without the United Kingdom, data for 2015), which was respectively 10.8% of the value of Chinese input consumed in the world (Ambroziak et al. 2021, p. 19). Therefore, many companies are changing their strategy, realizing that locating their supplier base in only one country or region can be risky. For this reason, the "China + 1" concept is gaining popularity among countries dealing with strategic design and optimization of supply chains (Baroowa 2021). The concept is based on the idea of creating regional supplier bases as a viable alternative to China, and, due to its proximity to local supply and demand centers, the company is less dependent on intercontinental freight availability and prices. One of the expected trends in the future is the regionalization of supply chains, which potentially creates an opportunity for Eastern Europe countries, including Poland, to attract new foreign investments in production. China's position as the main supplier of goods may be threatened in this case.

As a result of the pandemic, the EU experienced a decline in industrial production, especially in the first quarter of 2020. The collapse mainly affected the automotive and clothing industries. After the first wave of the pandemic, however, there was a slight rebound, especially in Portugal, Italy, Hungary, and Slovakia. Ultimately, however, only one EU country recorded a positive GDP rate in 2020 – Ireland (Eurostat 2021a). In the EU, the reduction in economic activity resulted in a reduction in global trade turnover. China, on the other hand, is the only global economy that, despite a collapse during the first quarter, recorded economic growth in 2020 (2.3 percent of GDP) (International Monetary Fund 2021). Production in China was positively influenced by, among other things, pandemic-induced drops in natural resource prices.

Despite the pandemic, both China and the EU experienced an increase in exports to each other's markets. Despite the aforementioned declines in EU production in the automo-

tive industry, China's demand for EU cars grew. EU luxury goods were also popular in China. This was due to the changing patterns of consumption in the Chinese market. Chinese consumers' preferences moved towards more premium, greener, and healthier products (*2021 China…* 2021). It was also driven by Chinese government policy to activate internal demand, as well as the spread of Western consumption patterns, which also affect the demand for foreign products, including those from the EU.

On the other hand, Chinese exports benefited from rising European demand for medical, electronic, and entertainment goods. This was related to the widespread lockdown and the growing need for health care and home entertainment. Importantly, to combat the effects of the COVID–19 epidemic, the EU made it possible to exempt imports of necessary goods from import duties and VAT (European Commission 2021b).

A further important factor concerned the appreciation of the Chinese Yuan, whose reference rate increased by approximately 6%. It influenced trade conditions, particularly in terms of its impact on the growth of Chinese imports. Total imports and exports between China and the EU reached $709 billion in 2020 (trade between the EU and the US reached $671 billion) (*China overtakes US…* 2021). For trade between the EU and China, increases in tariffs in trade between the EU and the US (steel, aluminum, French cognac, and American motorcycles) were also important, which could have redirected global trade flows. Mutual relations between Brussels and Beijing were also supposed to be strengthened by the long-negotiated investment agreement (CAI). Negotiations ended in December 2020, and were to facilitate, among others, mutual access to markets.

When analyzing the global trade turnover between the EU and China, it should be emphasized that 2020 was another year in which the Community recorded a trade deficit. This deficit has been the hallmark of EU-China trade for more than two decades. From 2015–2019, this deficit accounted for between 28.7% and as much as 34% of total EU trade with China (31.7% on average). This means that the share of the deficit in the total trade turnover in 2020 – which amounted to 30.8% – is within this range (Eurostat 2021b).

As shown in Figure 1 above, the largest increase in EU-China turnover in 2020 compared to the previous year was recorded in section XVI (machinery/electrical), both in terms of imports and exports, where the increase in imports exceeded exports by a factor of nine. Imports from China also increased in sections such as XI (textiles), VI (chemicals and allied industries), XVIII (optic, photographic, medical or surgical instruments and apparatus), and XVII (transportation). The largest drops in EU exports were recorded in section XVII, despite an increase in Chinese demand for European cars. This was a result of a significant reduction in industrial production in the EU market. On the other hand, sections VI (chemicals and allied industries) and I (animals and animal products) experienced a significant increase in exports.

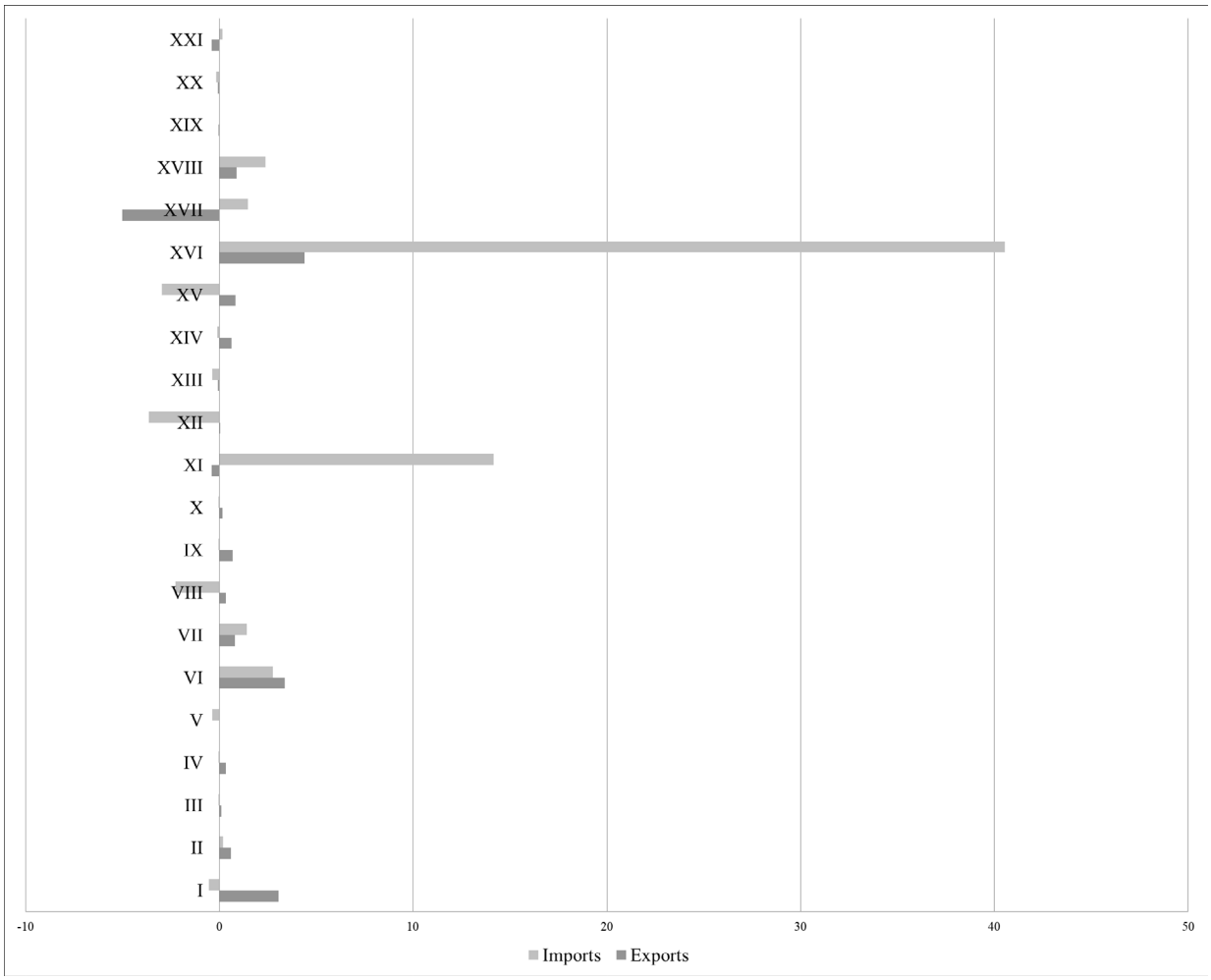

Figure 1. EU-Chinese trade by section (change between 2019 and 2020, USD bln)

Source: own calculation based on Trade Map (n.d.).

Although trade has been limited in many sections, there has been an increase in trade globally. As a result, China has become the EU's largest trading partner. In 2020, EU imports from China increased by 5.6%, while the corresponding exports increased by 2.2%, which is a worse result compared to 2019, when the corresponding data were, respectively, 5.9% and 5.4% (Eurostat 2021b). The growth of Chinese exports was facilitated, among others, by an improvement in consumer sentiment in the EU market. It was also caused by growing capital expenditure in China itself, the aim of which was to improve the economic situation after the COVID–19 crisis.

When analyzing individual EU countries' changes in trade with China in 2020 compared to 2019 (Figure 2), most experienced increases in both import and export categories, despite the pandemic. This was the case for 13 EU economies: Cyprus (149%; 10%), Slovenia (74%; 5%), Belgium (23%; 11%), the Netherlands (22%; 116%), Lithuania (16%, 29%), Bulgaria (15%; 5%), Malta (15%; 36%) Denmark (15%; 4%), Sweden (12%; 12%), Hungary (4%; 41%), Latvia (2%; 28%), Germany (2%; 8%) and Italy (2%; 3%). Seven

countries significantly improved their trade balance with China, including two countries increasing exports, with imports at a constant level: Estonia (49%; 0%) and Luxembourg (2%; 0%). The remaining five increased exports, which limited purchases on the Chinese market. This concerned Poland, where the highest increase in exports within this group was recorded (26%; –12%), Slovakia (24%; –45%), Spain (23%; –12%), Ireland (21%; –24%) and the Czech Republic (5%; –32%). Three EU countries experienced a decline in exports, which, compensated for a significant decline in imports: Finland (–13%; –48%), Austria (–8%; –40%) and Greece (–2%; –6%). Four countries observed a deterioration in their trade balance with China: Croatia (–18%; 55%), Romania (–13%; 13%), France (–14%; 10%), and Portugal (–3%; 6%).

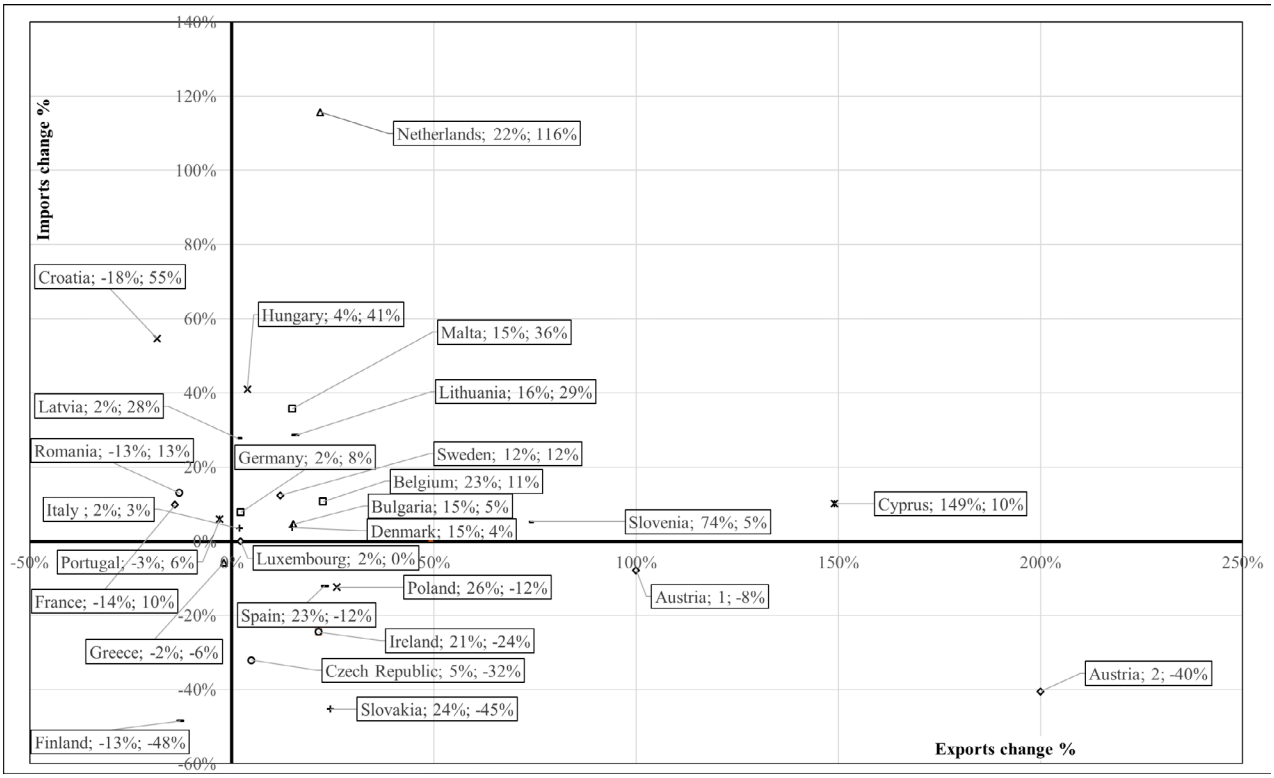

Figure 2. EU's trade with China in 2020 (change between 2019 and 2020, in %)

Source: own calculation based on Trade Map (n.d.).

Later in this work, the results of the analysis of the RCA of the 27 EU countries' trade with China are presented. This allows for an assessment of change across countries and which industries were least affected by the COVID–19 pandemic.

Empirical results

Before the results of the analysis are presented, it is first necessary to calculate the shares of each product group in total EU exports with China with the use of the NRCA index (as of 2020).

Figure 3 below presents the changes in these shares between 2015 and 2020. The individual sections are presented by share of a given section in EU exports to China (as of 2020). The largest share in EU exports to China was held by goods from section XVI (machinery/electric), where a systematic increase in this share could be observed, from 31.3% (2016) to 33.8% (2020). Second place was taken by goods from section XVII (transport). Its share in exports to China ranged from 21% to 23.2%; in 2020, there was a significant decrease in this share by more than 3 percentage points (up to 17.9%). Goods from the chemical section (VI) took third place. There was a systematic increase in the share of exports to China, from almost 10% in 2015 to 12.6% in 2020 (despite COVID–19, this upward trend was maintained).

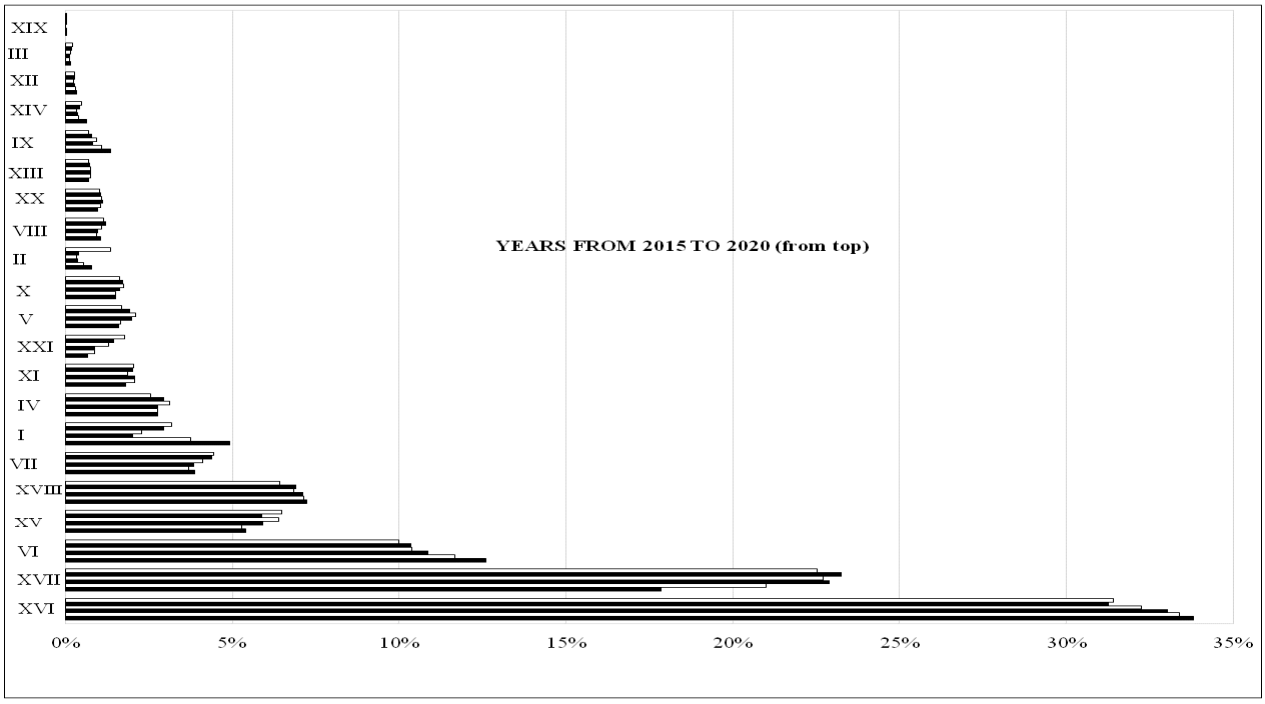

Figure 3. Share of individual sections in EU exports to China, 2015–2020 (in %)

Source: own calculation based on Trade Map (n.d.).

The next item was base metals (XV), whose share varied from 5.3% to 6.5%. Data for 2020 revealed a marginal increase of 0.1% percentage points, raising outflows to 5.4%. In 2020, products from the optical industry (XVIII) were in fifth place in EU exports to China. The share of these products in outflows also grew, from 6.4% in 2015 to 7.2% in 2020. The next position was plastic (VII), which in 2020 also recorded a slight in-

crease to almost 3.9%, while between 2015 and 2019, its share in exports ranged from 3.7% to 4.5%. Seventh place went to products from section I, i.e., live animals and animal products, which in 2020 increased to almost 5%. Before 2020, exports ranged from 2% to 3.7%. The last section (IV) was food, which exceeded the 2% share of EU exports to China in 2020. Data for 2020 (2.8%) were within the range of fluctuations observed between 2015 and 2019 (from 2.6% to 3.1%).

Other commodity groups (thirteen sections, including XI, XXI, V, X, II, VIII, XX, XIII, IX, XIV, XII, III, and XIX) did not exceed a 2% share in EU exports to China in 2020. Only five were outside the ranges observed from 2015 to 2019, three of which were lower than the previously set limits (a difference from 0.2 to 1.1 percentage points), and two exceeded these fluctuations (the difference from 0.3 to 0.6 percentage points). Based on the above data, it cannot be concluded that the pandemic significantly affected the structure of EU exports to China.

Table 1 below presents data on the value of the RCA for 21 product sections for the EU–27 for 2015–2020. The analysis took into account changes in the NRCA over time, which allowed for an assessment of COVID–19 in EU trade patterns with China.

Table 1. NRCA index for the EU–27 in trade with China, 2015–2020

Sections	2015	2016	2017	2018	2019	2020
XVI	GER (0.02839)	GER (0.01562)	GER (0.02198)	GER (0.02308)	IRL (0.01547) GER (.01824)	IRL (0.00178) GER (0.00179)
XVII	GER (0.03705)	GER (0.04686)	GER (0.0356)	GER (0.03788)	GER (0.04528)	GER (0.00546)
VI	BE (0.00924)	BE (0.00772)	BE (0.00956)	BE (0.00745)	BE (0.00779)	BE (0.01027)
XV	POL (0.00356)	POL (0.00225)	BG (0.00258) POL (0.00287)	BG (0.00281)	BG (0.0012) POL (0.00284)	–
XVIII	GER (0.00727)	GER (0.00638)	GER (0.0078)	GER (0.00725)	GER (0.00727)	GER (0.00087)
VII	BE (0.00238) NL (0.00261)	BE (0.0024) NL (0.00205)	BE (0.00207)	BE (0.00223)	BE (0.00255)	BE (0.00233)
I	DK (0.0128)	DK (0.00394) ES (0.004)	–	DK (0.00303)	ES (0.00725)	ES (0.00148)
IV	FRA (0.00471)	–	FRA (0.00667)	NL (0.00616)	NL (0.00641)	NL (0.00074)
XI	ITA (0.00504)	ITA (0.00495)	ITA (0.00474)	ITA (0.00578)	ITA (0.0057)	ITA (0.00052)
XXI	BE (0.00341) GER (0.00408)	BE (0.0026) GER (0.00335)	BE (0.00179) GER (0.00539)	GER (0.00632)	GER (0.0037)	GER (0.00026)
V	NL (0.00478)	NL (0.00409)	NL (0.0052)	ES (0.00644)	ES (0.00462)	ES (0.00032)
X	FIN (0.00362)	FIN (0.00373)	FIN (0.00402)	FIN (0.00517)	FIN (0.00094)	FIN (0.0004)
II	DK (0.00457) FRA (0.00406)	NL (0.0009)	NL (0.00089)	NL (0.00082)	FRA (0.00145)	FRA (0.00039)

Sections	2015	2016	2017	2018	2019	2020
VIII	ITA (0.00346)	ITA (0.00285)	ITA (0.003)	ITA (0.00314)	ITA (0.00041)	FRA (0.00033) ITA (0.00026)
XX	ITA (0.00172)	ITA (0.00196)	ITA (0.00243)	ITA (0.00241)	ITA (0.0231)	ITA (0.0002)
XIII	ITA (0.00037) AT (0.00032)	ITA (0.00039) AT (0.00033)	ITA (0.00039) AT (0.00032)	ITA (0.00039) AT (0.00033)	ITA (0.00049)	ITA (0.00003)
IX	–	FIN (0.00135)	FIN (0.00176)	–	–	BE (0.00199)
XIV	BE (0.0025)	BE (0.00228)	BE (0.00132)	BE (0.00139)	BE (0.00089)	BE (0.0002)
XII	ITA (0.00151)	ITA (0.00144)	ITA (0.00129)	ITA (0.00145)	ITA (0.00149)	ITA (0.00015)
III	ES (0.00085)	ES (0.00089)	ES (0.00083)	ES (0.00062)	ES (0.00062)	ES (0.000005)
XIX	ITA (0.000001)	ITA (0.000002)	ITA (0.000001)	GER (0.000001)	ITA (0.000002)	AT (0.0000005) ITA (0.0000004)

Source: author's own calculations based on the Trade Map (n.d.).

Table 1 above contains NRCA values selected for individual sections – in accordance with Chebyshev's inequality. The use of Chebyshev's inequality allowed the capture of outliers of the NRCA index that are above the second standard deviation around the mean (lying above the upper limit) for all twenty-seven countries for each of the twenty-one sections. Importantly, Chebyshev's inequality can be applied to any distribution. Its use allows changes in the NRCA value for individual sections to be analyzed. It also makes it possible to identify within particular sections those countries that are outside 75% of all observations around the average. If the analyzed distribution is flat (within two standard deviations of the mean), there are no outlier results, which means that it is not possible to select a country that has a significant comparative advantage over the remaining twenty-seven.

The main emphasis was placed on analyzing changes in NRCA indicators in 2020 compared to previous years (2015–2019). This allowed for a preliminary determination of whether the COVID–19 pandemic had a significant impact on the EU's trade flows with China. In the table, individual sections are presented according to the order of the share of a given section in EU exports to China (as of 2020).

In the three sections that accounted for the highest share of EU exports to China (64%), no significant change was observed in the structure of the countries that obtained the highest NRCA share, i.e., they recorded a comparative advantage in trade in goods classified under these sections. For section XVI (machinery/electronics), Germany showed a comparative advantage over the entire analyzed period. In 2020, a decrease in this indicator can be observed in relation to those values obtained in previous years. In 2020, relatively high NRCA values in section XVI were also recorded in Ireland, but this fact should not be associated with the COVID–19 pandemic, as Ireland stood out a year earlier in terms of NRCA among the other twenty-seven countries, just behind Germany.

In the case of exports in section XVII (transport), Germany also had a dominant position, which did not change in 2020. However, as with products from section XVI, in 2020, there was a decrease in the value of the NRCA index against the background of the entire period under review. In the case of chemical products (VI), relatively high NRCA rates were recorded for Belgium throughout the entire period. By analyzing the development of the NRCA index for Belgium in 2020, the country strengthened its comparative advantage compared to previous years.

For section XV (base metals), high NRCA values characterized Poland between 2015 and 2017 and in 2019. Bulgaria also managed to gain a comparative advantage in 2017, 2018, and 2019. Importantly, both countries recorded a significant deterioration in the NRCA index in 2020, losing their advantage. Analyzing the development of the NRCA index for section XVIII (which includes optical, photographic, cinematographic, measurin3.g, control, precision, medical or surgical instruments and devices), Germany achieved the highest values in the entire period. However, in 2020, the value of the indicator decreased compared to previous years.

In the case of section VII (plastic, rubber and articles made of them), Belgium had a comparative advantage in the entire period, and in 2020, no significant changes were recorded compared to the previous year. In 2015 and 2016, the Netherlands also recorded high NRCA values for these products. However, in the following years, this indicator decreased significantly, and the country lost its comparative advantage, which it had not regained by 2020.

In the case of section I (live animals and animal products), Denmark achieved the highest NRCA values for most of the analyzed years (2015, 2016, and 2018). In 2016, the next country to show a comparative advantage in this product category was Spain. After a break in 2017 and 2018, it again recorded a high index in 2019. Importantly, it maintained this index in 2020.

In the last section to exceed 2% of total EU exports to China, sector IV (food products), France had an advantage in 2015 and 2017, although it lost it to the Netherlands in 2018. The Netherlands maintained high NRCA rates until 2020.

For the remaining thirteen sections, which had a share of less than 2% in EU exports to China, there were no significant changes in the development of the NRCA index, especially in 2020 compared to 2019. In 2020, all countries maintained their advantage, 12 of which achieved lower values compared to the previous year. In 2020, for the first time, positive NRCA outliers were recorded for three countries: Belgium (IX – wood and articles made of wood), France (VIII – leather and articles made from it), and Austria (XIX – weapons and ammunition). Each of these countries gained a comparative advantage in exports to China for the first time in the years analyzed.

An analysis of the above data cannot lead to the conclusion that the COVID–19 pandemic had any significant impact on changes in the distribution of benefits from trade with China in 2020. The countries that obtained the highest NRCA values in 2019 slightly weakened their comparative advantage in 2020. This observation includes 19 of the 24 countries. However, this does not apply to Belgium, which strengthened its advantage in 2020 in the chemical products section, or the three previously mentioned countries (Belgium, France and Austria), which gained a comparative advantage for the first time in 2020.

Conclusion

The study is an attempt to ascertain how the pandemic helped shape trade between the EU and China, especially in terms of EU exports to China. The research showed that the pandemic led to reduced EU-China trade in many sections. On the contrary, it revealed that global bilateral trade increased in 2020, and a sizeable number of the 27 EU countries recorded increases in both imports and exports. However, there were no significant changes in the structure of the distribution of comparative advantages, neither in relation to 2019 nor in the previous analyzed years (2015–2018). Importantly, 20 of the 22 countries with a strong comparative advantage in 2019 maintained it in 2020. However, most of the economies with the highest NRCA values in 2019 revealed slightly weakened comparative advantages in absolute terms in 2020. It means that the comparative advantage spread over the remaining countries from the reference group. This demonstrates that compared to the previous analyzed years, in 2020, the NRCA index shows a flatter distribution. As might be expected, this was the cause of the slowdown in most EU economies due to the COVID–19 pandemic. This trend was particularly evident in the case of the German economy, which was heavily affected by the pandemic, and which gained a comparative advantage in trade with China in the main EU export sections (XVI and XVII, which account for around 50% of EU exports to China). Declines in outflows were mainly felt in the transport section, which saw a significant drop in the share of EU exports to China.

It can therefore be concluded that despite the COVID–19 pandemic, EU-China trade turnovers increased, which was due not only to the increase in EU exports, but, above all, imports. Chinese exporters are making a rapid recovery from the pandemic and fulfilling overseas orders. Chinese exports accelerated because, among other things, EU countries have started lifting restrictions on the coronavirus. In 2020, the EU also introduced some commodity trade facilities to counter the effects of COVID–19. These activities, as well as the growing needs in this area, contributed to an increase in the sale of medical equipment and articles related to health protection. The strong

trade performance indicated that a jump in imports shows that domestic investment spending remains strong. The growth in Chinese exports is most likely caused by the recent strength of retail sales in export markets, such as the EU.

One of the expected trends in the future is the regionalization of supply chains, which is expected to create opportunities for the Eastern European countries, including Poland, to attract new foreign investments. While there is currently no apparent impact of the COVID–19 pandemic on EU-China trade patterns, it may have far-reaching consequences in the future, especially for China as a "global factory."

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References

2021 China Outlook (2021), "The Deloitte Research Monthly Outlook and Perspectives", issue 61, https://www2.deloitte.com/cn/en/pages/about-deloitte/articles/deloitte-research-issue-61.html (accessed: 10.05.2021).

Ambroziak, Ł., Chojna, J., Gniadek, J., Kępka, H., Strzelecki, J. (2021), *Szlaki handlowe po Pandemii Covid–19*, PISM, Warszawa.

Balassa, B. (1965), *Trade liberalization and revealed comparative advantage*, "The Manchester School of Economic and Social Studies", 33 (2), pp. 99–123, https://doi.org/10.1111/j.1467-9957.1965.tb00050.x

Balassa B., (1989), *Comparative Advantage, Trade Policy and Economic Development*, Harvester Wheatsheaf, New York.

Baroowa, S. (2021), *Adopting a China+1 Strategy in ASEAN. Diversifying Supply Chain to Minimize Risks*, https://www.dezshira.com/multimedia/view/adopting-china-1-strategy-asean-diversifying-supply-chains-minimize-risks.html (accessed: 15.03.2021).

China overtakes US as EU's biggest trading partner (2021), BBC, https://www.bbc.com/news/business-56093378 (accessed: 8.04.2021).

Dalum, B., Laursen, K., Villumsen, G. (1998), *Structural change in OECD export specialization patterns: de-specialization and stickiness*, "International Review of Applied Economics", 12, pp. 423–443, https://doi.org/10.1080/02692179800000017

European Commission (2021a), *China*, https://ec.europa.eu/trade/policy/countries-and-regions/countries/china/ (accessed: 10.04.2021).

European Commission (2021b), *COVID–19: Waiving VAT and customs duties on vital medical equipment*, https://ec.europa.eu/taxation_customs/covid-19-taxud-response/covid-19-waiving-vat-and-customs-duties-vital-medical-equipment_en (accessed: 11.05.2021).

Eurostat (2021a), *Real GDP growth rate – volume*, https://ec.europa.eu/eurostat/databrowser/view/tec00115/default/table?lang=en (accessed: 22.05.2021).

Eurostat (2021b), *China-EU – international trade in goods statistics*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=China-EU_-_international_trade_in_goods_statistics (accessed: 5.06.2021).

Fakhrudin, U., Hastiadi, F.F. (2016), *Impact Analysis of Normalized Revealed Comparative Advantageon ASEAN's Non-Oil and Gas Export Pattern Using Gravity-Model Approach*, "Working Paper in Economics and Business", vol. V, No. 3.

Fakhrudin, U., Hastiadi, F.F., Haidir, B.M. (2019), *Impact Analysis of Normalized Revealed Comparative Advantage on ASEAN's Non-Oil and Gas Export Pattern Using a Gravity Model Approach*, [in:] F. Hastiadi (ed.), *Globalization, Productivity and Production Networks in ASEAN*, Palgrave Macmillan, Cham, pp. 105–145, https://doi.org/10.1007/978-3-030-16510-9_5

Greenaway, D., Milner, C. (1993) *Trade and Industrial Policy in Developing Countries: A Manual of Policy Analysis*, The Macmillan Press, London, https://doi.org/10.3998/mpub.14118

Heckscher, E. (1949), *The Effects of Foreign Trade on the Distribution of Income*, [in:] H.S. Ellis, L.M. Metzler (eds.), *Readings in the Theory of International Trade*, Blakiston, Philadelphia, pp. 272–300.

Hinloopen, J., Marrewijk, C. van (2006), *Comparative Advantage, the Rank-size Rule and Zipf's Law*, Tinbergen Institute Discussion Paper No. 06–1001/1, Amsterdam, https://doi.org/10.2139/ssrn.943370

Hoen, A.R., Oosterhaven, J. (2006), *On the measurement of comparative advantage*, "Annals of Regional Sciences", 40, pp. 677–691, https://doi.org/10.1007/s00168-006-0076-4

International Monetary Fund (2021), *People's Republic of China*, https://www.imf.org/en/Countries/CHN (accessed: 7.05.2021).

Lafay, G. (1990), *La Measure des avantages comparatifs reveles*, "Economie Prospective Internationale", 41, pp. 27–42.

Latruffe, L. (2010), *Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors*, "OECD Food, Agriculture and Fisheries Working Papers", No. 30, https://doi.org/10.1787/5km91nkdt6d6-en

Laursen, K. (1998), *Revealed Comparative Advantage and the Alternatives as Measures of International Specialisation*, "DRUID Working Papers", 98–30, DRUID, Copenhagen Business School, Department of Industrial Economics and Strategy/Aalborg University, Department of Business Studies.

Laursen, K. (2015), *Revealed comparative advantage and the alternatives as measures of international specialization*, "Eurasian Business Review", 5, pp. 99–115, https://doi.org/10.1007/s40821-015-0017-1

Liesner, H.H. (1958), *The European Common Market and British Industry*, "Economic Journal", 68 (270), pp. 302–316, https://doi.org/10.2307/2227597

Ohlin, B. (1933), *Interregional and International Trade*, Harvard University Press, Cambridge.

Proudman, J., Redding, S. dan, (1998), *Openness and Growth*, The Bank of England, United Kingdom.

Ricardo, D. (1817), *On the Principles of Political Economy and Taxation*, John Murray, London.

Schwesernotes 2016 Level I CFA Book 1: Ethical and Professional Standards and Quantitative Methods (2015), Kaplan, Inc., USA.

Trade Map (n.d.), https://www.trademap.org/Index.aspx (accessed: 25.05.2021)

Vollrath, T.L. (1991), *A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage*, "Weltwirtschaftliches Archiv", 127, pp. 265–280, https://doi.org/10.1007/BF02707986

Wijnands, J.H.M., Verhoog, D. (2016), *Competitiveness of the EU food industry. Ex-post assessment of trade performance embedded in international economic theory*, LEI Wageningen UR, Wageningen, https://doi.org/10.18174/369980

World Customs Organization (n.d.), *What is the Harmonized System (HS)?*, http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx (accessed: 5.02.2021).

Yeats, A.J. (1985), *On the appropriate interpretation of the revealed comparative advantage index: implications of a methodology based on industry sector analysts*, "Weltwirtschaftilches Archiv", 121, pp. 61–73, https://doi.org/10.1007/BF02705840

Yu, R., Cai, J., Leung, P.S. (2009), *The normalized revealed comparative advantage index*, "The Annals of Regional Sciences", 43 (1), pp. 267–282, https://doi.org/10.1007/s00168-008-0213-3

Yu, R., Cai, J., Loke, M.K., Leung, P.S. (2009), *Assessing the comparative advantage of Hawaii's agricultural exports to the US mainland market*, "Annals of Regional Sciences", 45 (2), pp. 473–485, https://doi.org/10.1007/s00168-009-0312-9

Wpływ pandemii COVID–19 na wzorce handlu UE-Chiny

Można oczekiwać, że trwająca obecnie pandemia COVID–19 przyczyni się do zmiany struktury geograficznej handlu światowego, w tym wymiany między poszczególnymi krajami UE a Chinami. W niniejszym artykule przedstawiono więc wyniki analizy wpływu pandemii COVID–19 na chińsko-unijne przepływy handlowe. Celem badania było uzyskanie odpowiedź na pytanie, czy kraje Unii Europejskiej odnotowały wzmocnienie przewagi konkurencyjnej w handlu z ChRL w którymkolwiek z 21 sektorów HS poprzez zwiększenie wartości znormalizowanego wskaźnika ujawnionej przewagi komparatywnej (NRCA). Ze względu na dużą liczbę obserwacji, których wartości NRCA dla eksportu oscylują w pobliżu zera (sfery neutralnej), w badaniach wykorzystano nierówność Czebyszewa, co pozwoliło na wyodrębnienie tych najbardziej odstających obserwacji. Analiza prowadzona była dla lat 2015–2020, ze szczególnym uwzględnieniem roku 2020, w którym odnotowano pierwsze skutki pandemii COVID–19.

Stosunki handlowe UE-Chiny były przedmiotem licznych badań, ale ich charakter nie został jeszcze w pełni wyjaśniony, o czym świadczy utrzymujący się przez ponad dwie dekady znaczący deficyt handlowy Wspólnoty. Ten artykuł próbuje wypełnić istniejącą lukę. Analiza handlu UE-ChRL, zwłaszcza w tak kluczowym, z perspektywy historii społeczno-gospodarczej okresie, może

przynieść istotne rezultaty. Niniejsza analiza wykazała, że pandemia nie spowodowała spadku wymiany handlowej UE-Chiny. W rzeczywistości światowy handel wzrósł w 2020 r., a większość z 27 krajów UE odnotowała wzrost zarówno w imporcie, jak i eksporcie. Nie nastąpiły również istotne zmiany w strukturze rozkładu przewag komparatywnych. Jednak w przeciwieństwie do wcześniej analizowanych lat (2015–2019), w 2020 r. indeks NRCA wykazuje bardziej płaski rozkład. Sugeruje to, że większość krajów UE o najwyższych przewagach komparatywnych faktycznie odnotowała ich redukcję.

Słowa kluczowe: COVID–19, handel międzynarodowy, import, eksport, znormalizowana ujawniona przewaga komparatywna