
Changes and Comparisons in Pattern of Polish Chinese Trade within the “16+1” Format

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Abstract:

Purpose: The CEE trade deficit with China has been persistent for a number of years and mechanisms have not yet been established to reverse the pattern. The aim of the research is to identify the most important bilateral trade advantages Poland's turnover with China in contrast to other countries of the "16 + 1" format.

Design/Methodology/Approach: This study examines Poland's comparative advantage and that of other selected CEE countries via the application of the normalized revealed comparative advantage index (NRCA). The research includes Chebyshev's inequality measurement to determine outstanding NRCA values for +/-3 standard deviations of the mean.

Findings: Perspective sectors where an intensification of Poland's exports to the Chinese market is possible, are those that possess a normalized comparative advantage (sector XVI - metals). Polish exporters to China should also seize the opportunity offered by changing the profile of Chinese consumers.

Practical Implications: This research, by identifying potential comparative advantages, can therefore provide further arguments relevant in determining Poland's trade policy, thus affecting change in negative trade patterns with China.

Originality/Value: This study provides a comprehensive analysis of Chinese trade patterns with the 16 CEE countries using NRCA and Chebyshev's inequality index that has so far not been investigated in any study.

Keywords: International trade, 16+1 format, normalized revealed comparative advantage.

JEL codes: F10, F140

Paper Type: Research article.

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1. Introduction

Trade relations with China are an important area of analysis from a Polish economy perspective, since the latter has consistently recorded a trade deficit with the PRC for a number of years with a deepening exchange asymmetry being observed. Currently, China is the country with whom Poland records its highest trade deficit and Polish imports from China exceed its analogous exports by a factor of twelve. Given that the prospects for foreign exchange with China are expected to increase, the analysis of mutual trade relations is of particular importance. This is backed by the growing scale of the local market, especially in the context of the enrichment of Chinese society and the rapid development of the economy.

In direct relation to the above, new perspectives in Polish-Chinese trade relations are supported by the Belt and Road Initiative (BRI), which is a transport, transmission (oil and gas pipelines) and telecommunications infrastructure. The development of China's economic cooperation is to be implemented, among others, through the construction of a roads network, which will connect them with Central Asia, Eastern and Western Europe. Due to their strategic location, countries in Central and Eastern Europe (CEE) are able to both benefit and play a significant role in this project. Much of this is due to the fact that, even before the announcement of BRI, CE countries had already commenced their cooperation with China under the so-called "16 + 1" format. As a result, the BRI and the "16 + 1" platform, jointly, create new opportunities in Polish-Chinese trade relations. It is therefore vital for Poland to take advantage of the above initiatives and to maintain its role. In order to achieve this, Poland must do more in terms of learning and understanding its current strengths and weaknesses in its trade with China.

The aim of the research is to identify the main direction and advantages in bilateral trade between Poland and China in contrast to that of the "16 + 1" format countries. The analysis seeks to answer whether Poland has strengthened its competitive advantage in any of the product categories via recorded increases in the normalized revealed comparative advantage index (NRCA). The research draws on commercial data from the Trade Map database (2019) in accordance with the Harmonized Commodity Description and Coding System (HS). There are 21 NRCA sectors in total and this enables product groups to be selected for more detailed analysis, which will be carried out in the stage of this research. This area of analysis will be carried out focusing on CEE countries belonging to the "16 + 1" format with a view to determining their relative competitiveness – as well as their changes – related to the Chinese market. Through the identification of comparative advantage and its growth potential according to sector, it is possible to provide more constructive arguments relevant to trade policy in Poland, which is of key importance in reducing negative patterns of trade with China.

The statistical analysis is focused on the period between 2007 and 2018, since it captures developments before the onset of the global financial crisis and up until the

year for which data was available. The analysis of mutual relations - covered in this work - will be discussed in light of the changes that have taken place between the 16 countries and China since 2001. This particular year is of importance since it was the year in which China joined the WTO, which obliged the PRC to gradually adapt to the rules of the organisation regarding trade policy (especially lowering customs tariffs). This facilitated access to the Chinese market, which was a critical determinant of export performance for CEE countries, but likewise for countries globally. At the same time the accession of a number of Central and Eastern European countries into the EU also increased Chinese interest in the region – potentially, as a bridgehead into eastern EU markets.

2. Literature Review

Comparative advantage is a doctrine embedded in classical economics, and its origins derive from the concepts of economists such as D. Ricardo (1817). Comparative advantage is also a determinant of a nation's trade structure. This leads to specialization in international trade and is driven by supply and demand. For this reason, it is still considered to be an indicator of specialization in international trade.

Comparative advantage can be conditioned by many factors. For example, Ricardo (1817) indicated that it is based on the technological superiority of a given country in the production of a certain good. This is supported by Heckscher (1919) and Ohlin (1933), who state that a country can gain a comparative advantage due to relative differences in physical capital. According to Edward and Schoer (2002), countries abundant in a given factor of production also have comparatively lower opportunity costs. In this regard Keesing (1966) states that human skills should also be considered as a factor of production factor, since countries relatively rich in this resource will have a comparative advantage in those products for which capital is used more intensively. Economies of scale, as indicated by Ricardian or Factor Proportions' models, can also lead to comparative advantage by reducing production costs. A comparative advantage may also result from a technological gap between countries or a product cycle that takes into account the nature and volume of demand (Vernon, 1961). Demand and market size can also affect comparative advantage – including, its impact on economies of scale. In addition, as claimed by Linder (1961), demand plays an important role in achieving success in international markets.

This approach points to the dynamic - not static - nature of comparative advantage. Krugman (1979) for example indicated that this was based on monopolistic competition in various products with growing revenues of scale. Other authors believe the dynamics of comparative advantage are endogenously determined by technological change and innovation (Redding, 2004; Jones, 2000). However, this could also be due to the role of input trade. Work carried out by Venables (2001) showed that the dynamics of comparative advantage can lead to friction in international trade and investment flows due to geographical location, institutions,

transport and information costs. However, Grossman and Helpman (1991) emphasized the role of knowledge transfer across borders, or, as Trefler (1995) pointed out, technological differences between countries (Widodo, 2009).

The measurement of revealed comparative advantage (RCA) was first introduced by Liesner (1958). Up until now, however, the most commonly used indicator in empirical trade analysis is based on the concept of the revealed comparative advantage indicator (RCA), developed by Balassa (1965), also known as the Balassa model of revealed comparative advantage (BRCA), or the Balassa index. At the same time, it should be noted that the use of this indicator has its limitations. The main criticism concerns RCA as a static export specialization index, such as the asymmetric value problem discussed by Laursen (1998).

Further critiques of the model include the problem of logarithmic transformation (Hoen and Oosterhaven, 2006) and also the importance of simultaneous consideration on the import side (Vollrath, 1991). Trading patterns can also be distorted by government interventions, thus leading to RCA statistical bias. For this reason, a number of authors - based on the RCA concept - presented comparative measures of commercial advantage, in which they propose their own solutions to the above problems. These measures included, among others: relative trade advantage (RTA), a logarithm of relative export advantage ($\ln RXA$) and revealed competitiveness (RC) (Vollrath, 1991), trade balance index (TBI) (Lafay, 1992), implicit revealed comparative advantage (IRCA) (Greenaway and Milner, 1993), symmetrical revealed comparative advantage (SRCA) (Dalum *et al.*, 1998; Laursen, 1998) weight revealed comparative advantage (WRA) (Proudman and Reding, 1998), monotonic transformation of Balassa index (Hinloopen and van Marrewijk, 2006) or additive revealed comparative advantage (ARCA) (Hoen and Oosterhaven, 2006). Although these indicators develop certain aspects of BRCA, Fakhruddin *et al.* (2019, p. 112) highlighted that: "*none of those indices could be the one that can be generally applied to comparison between spaces (either commodities, state or region) and time*". This is still the case even though the usefulness of the measure of comparative advantage measure has yet to be disputed in research.

3. Poland in the Background of 16 CEEC

The analysis of Polish-Chinese co-operation, since the initiation of the Belt and Road initiative, refers to the latter's mutual relations with China. The initiation of this co-operation was led by China in 2011 and the group of sixteen countries from the CEE region, of which Poland is a part². It was during the first official meeting between

²The "16 + 1" format outside of China and Poland also includes Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, North Macedonia, Montenegro, Romania, Serbia, Slovakia and Slovenia. In 2019, after Greece joined the initiative, the format changed its name to "17 + 1".

China and the government representatives of these countries (CEEC) in 2012 that the "16 + 1" format was created.

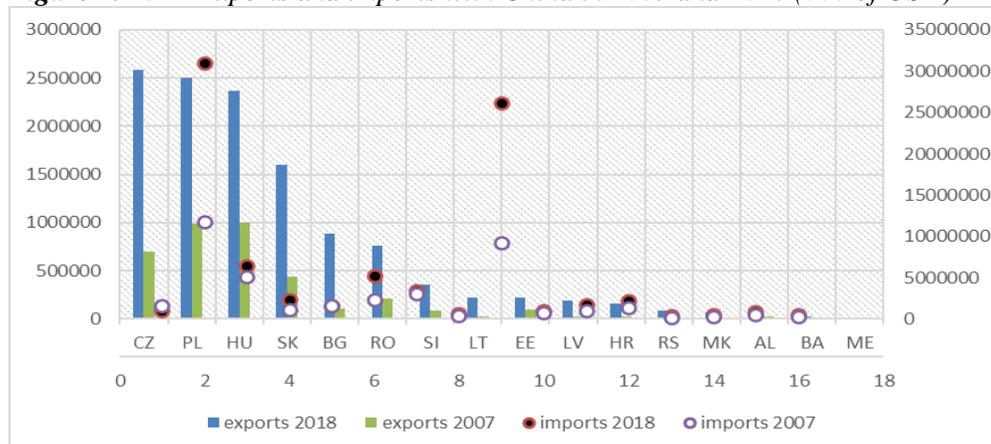
This format is characterized by a low degree of institutionalization, which is why the main decision-making roles are played by heads of states at summit meetings. The government in Beijing is obliged to provide preferential terms of financing for investment projects implemented by the sixteen countries, utilising Chinese factors of production. For the countries of Central and Eastern Europe, this is a logical and beneficial strategy in building and further strengthening their bilateral relations with China. This approach creates opportunities for them, especially in light of the substantial money reserves available to China, which are willingly spent on intergovernmental (so-called Government-to-Government) infrastructure projects and seed capital for start-ups.

Chinese financial support has already allowed some of the sixteen countries to avoid possible breaches of EU restrictions on levels of allowed public debt. This capital, in the form of foreign direct investments (FDI) or portfolio investments, is the subject of competition among companies in Central and Eastern Europe (Belt and Road, 2016). For this reason, the sixteen countries competing for Chinese support do not lead a common policy towards Beijing (Szczudlik, 2016). They are also independent sovereign states. However, this co-operation is also hampered by the fact that there are significant differences between the Central and Eastern European countries classified as "16 + 1". Some of them belong to the EU (11 countries) and some do not. There are also countries within the EU that belong to the euro area (5 countries) and there are those that operate their own currencies and are outside it. Moreover, these countries differ significantly in terms of economic structure.

Mutual relations between China and CEE countries are largely based on trade flows. Despite this, trade issues were given relatively low priority in bilateral and multilateral contacts with the Chinese partner. The CEE countries mostly focused on attracting Chinese direct and infrastructure investments, occupying an important place under the "16 + 1" format. Consequently, the use of new opportunities to support local exporters, together with a Chinese partner, was uneven and relatively small (one exception was Hungary, which managed to deepen significantly cooperation with Chinese public financial institutions, creating a credit line for exporters worth USD 200 million, as well as signing a currency swap agreement, reducing the risk in commercial transactions). As a result of the lack of these initiatives, CEE countries are constantly showing trade imbalances in exchange with China. As the following chart depicts (No. 1), Poland, the Czech Republic and Hungary were China's most important trading partners out of the group of sixteen. In 2007, over 65% of all Chinese exports to CEEC countries was conducted with these three markets - of which, Poland accounted for 29.4%, Czech Republic (23%) and the Hungary (12.8%). In 2018, the share of these countries rise to 75.2%, though the share of Poland had increasing significantly (36.7%). The Czech Republic had

increased its share of trade marginally (30.9%), while Hungary observed a deterioration in trade (approx. 7.6%).

Figure 1. 16+1 Exports and imports with China in 2007 and 2018 (000 of USD)



Source: Author’s own calculations on the basis of Trade Map 2019.

These three countries were also the main suppliers of goods to the Chinese market among the sixteen countries. In 2007 the share of these three economies accounted for almost 72.3% of exports of all CEE countries (Hungary - 26.9%, Poland - 26.6%, the Czech Republic - 18.8%). In 2018, the exports of these three countries fell by almost 10 percentage points to approximately 62% (Czech Republic - 21.4%, Poland - 20.7%, Hungary - 19.6%), while, during the same year, Slovenia also became an important supplier of goods to the Chinese market. Slovenian exports to China accounted for over 17% of the total exports from the group of sixteen. These four countries, alone, now account for 89% of total exports. Additionally, Slovenian exports to China now exceed those go to the Czech Republic.

From 2007³ to 2018, CEEC imports from China grew very dynamically. The average annual growth rate in this entire period was 18%, though these dynamics were particularly more intense during 2007-2010 period (25%). Between 2011 and 2018 the rate had dropped significantly to 7%. In the case of Poland, the corresponding dynamics amounted to 25% (2007-2010: 29%, 2011-2018: 11%) and was higher than the average for the sixteenth countries. The average annual export dynamics of CEEC to China were higher than the dynamics of Chinese exports to CEEC markets. During the period 2007-2018 this amounted to 27%, with a much higher growth rate recorded in the 2007-2010 sub period of 36%, in 2011-2018 this rate decreased to 9% per annum. Poland recorded lower growth rate of exports to the Chinese market in relation to the other sixteenth countries, amounting to 19% in the period 2007-2018, with 28% estimated in the 2007-2010 sub period, and in the years 2011-2018: 7%. The above trends in the average annual growth rate of imports and exports,

³Change between year 2006 and 2007.

which were favourable for the sixteen countries, slightly improved their mutual relations over time. However, due to the large disparities in mutual trade, those between China and the CEEC group have remained unbalanced. In 2007, China's exports were almost 11 times greater than those of the sixteen countries. By 2018, this value had fallen to six. What is worth mentioning is that Poland had the largest trade deficit with China, followed by Czech Republic, both in 2007 and 2018. In 2018, the value of the Polish deficit accounts for almost 40% of the deficit, for all CEEC countries in trade with China (this means an increase of 10 percentage points compared to 2007). The Czech Republic deficit with China, in 2007 accounted for over 23% of deficit of 16 countries, in 2018 it was already 32.5%. In total, the all 16's countries almost doubled the value of the deficit with China in the analyzed period. Only in the case of Slovenia and Estonia deficit slightly decreased.

The large trade imbalance has changed the existing development model implemented under the Format 16 + 1, which is currently focused on increasing connectivity and increasing investment in infrastructure such as railways, highways, tunnels, bridges, power plants, electricity networks, industrial and logistics parks, seaports and airports. Some of these activities take place within the BRI initiative. At the same time, due to China's growing demand for products such as metals, minerals, chemicals and food, as well as beverages from Central and Eastern Europe, a gradual return towards balancing mutual trade is anticipated. This will be determined by those industries in CEE countries that are most competitive on the Chinese market. It is also important whether this competitiveness changes over time and how Poland compares with other CEE countries. This is a development that needs to be monitored, especially in light of the decrease (as a share of 16 countries) in Polish exports to the Chinese market (a fall of almost 6 percentage points in the period 2007 - 2018), while Chinese exports to the Polish market increased (more than 7 percentage points). Given the above, further research needs to be conducted into which of the sixteen countries constitute the largest competition for Polish exports to China.

4. Methodology

This study examines the comparative advantage of Poland and other CEEC via the application of the normalized revealed comparative advantage index (NRCA), first presented by Yu *et al.* (2009; 2010). This index avoids some of the negative aspects associated with the original RCA that have been highlighted in the above methodological notes. NRCA is an export specialization indicator, which enables compared changes in comparative advantage to be measured not only the subject, but also in time and space. Therefore, NRCA can be used for time series and panel data studies across countries. As emphasized by Ul Hassan and Ahmad (2018) the index "*calculates the degree of deviation of a country's actual exports from its comparative-advantage-neutral level in terms of its relative scale with respect to the world exports market and thus provides a proper indication of the underlying comparative advantage*". Therefore, the NRCA index formula is a modified version

of Balassa's revealed comparative advantage index, and is given (Fakhrudin and Hastiadi, 2016) as:

$$NRCA_k^i = \frac{\Delta X_{ik}}{X} = \frac{X_{ik}}{X} - \frac{X_k X_i}{XX} \quad (1)$$

$NRCA_k^i$ - is the difference in the comparative advantages of country i for product k in a specific market;

X_{ik} - is a commodity export k of country i to China;

X_i - is the total export of country i to China;

X_k - is the 16's commodity exports k to China;

X - is the 16's exports to China;

XX - is the 16's export to a specific market.

The conditions of $NRCA > 0$ indicates that countries actual exports of a certain commodity are higher than its neutral level of comparative advantage (Hassan and Ahmad, 2018). This is in line with the assumption that no country has a comparative advantage in all goods. The following research was conducted on the basis of 16 countries. The analyzed group consists of 21 commodity aggregations exported by 16 countries to China. Due to the large number of particular export values relative to the entire export volume to China, all calculated NRCA values fall into the neutral sphere. This research therefore includes Chebyshev's inequality measurement to determine outstanding NRCA values for ± 3 standard deviations of the mean (Schweser, 2015, p. 136). The percentage of the observations that lie with k standard deviations of the mean is at least $1 - 1/k^2$ for all $k > 1$. For ± 3 standard deviations of the mean 89% of observations lie within. This inequality applies to any distribution.

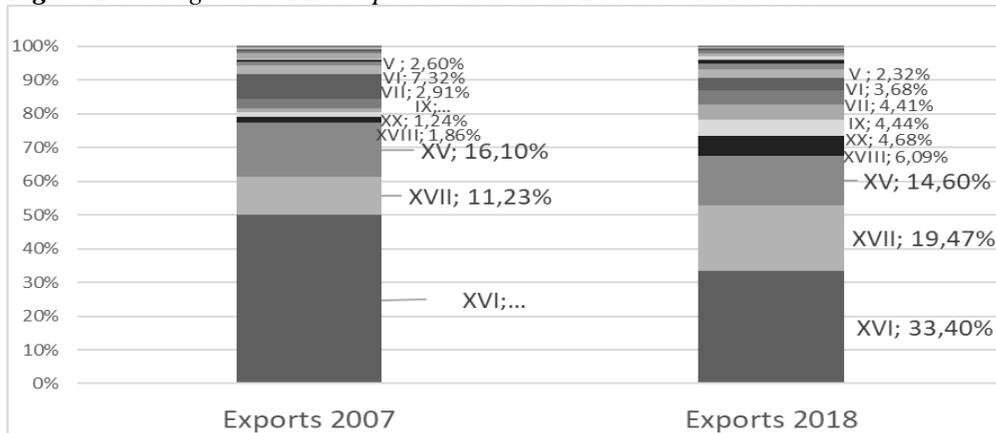
This study has investigated the comparative advantage of CEEC in exports with China. For measuring of comparative advantage Normalized Revealed Comparative was used. Twenty-one sectors were used for measuring NRCA in years 2007 and 2018. These sectors included (Tables 1 and 2): animals and animal products (I), vegetable products (II), animal or vegetable fats and oils and their cleavage products (III), foodstuffs (IV), mineral products (V), chemicals and allied industries (VI), plastics and rubbers (VII), raw, hides, skins, leather and furs (VIII), wood and articles of wood (IX), pulp of wood and other fibrous cellulosic material (X), textiles and textile articles (XI), footwear/ headgear (XII), stone/glass (XIII), pearls, precious or semi-precious stones, precious metals and articles thereof; imitation jewellery; coin (XIV), metals (XV), machinery/electrical (XVI), transportation (XVII), optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and

accessories thereof (XVIII), arms and ammunition (XIX), miscellaneous and manufactures articles (XX), works of art, collectors' pieces and antiques (XXI).

5. Empirical Results

In 2007 the countries of Central and Eastern Europe exported machinery/electrical goods (sector XVI) to China and these accounted for almost 50% of their outflows (see chart 2). In 2018 the share of goods from this sector decreased to approximately 33%. Metals (XV) also contributed a large share of the CEE sixteen exports. This share dropped slightly from 16% to 14.5% during the same period. In respect of the transportation sector (XVII), a significant increase in exports was observed to China from 11% in 2007 to 19.5% in 2018. In total, these three sectors (XVI, XV and XVII) still accounted for over 67% of the 16's exports to China in 2018, compared with 77% in 2007.

Figure 2. Changes in CEEC exports to China in 2007 and 2018 in %



Source: Author's own calculations on the basis of Trade Map 2019.

In 2018, sector XVIII (optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof) contributed more than a 6% share in similar exports, which represented an increase of over 4 percentage points when compared to 2007. In addition, miscellaneous and manufactured articles (XX) grew 3.5 percentage points from 2007 to almost 5%. The shares of sectors XX, IX, VII and VI in 2018 accounted for approximately 4% of exports. Most of them increased their share when compared to 2007 - except for sector VI, which decreased from 7.3% to 3.7%. This suggests that the CEE sixteen are an important source of raw materials for China - primarily in metals. However, during the period analysed, there was an observed inexpensive tendency to reduce the share of machinery and electrical goods being processed. Oppositely, an increase in the share of exports of transport goods is a positive development and is probably the result of a transfer of German production in this industry to selected CEE countries.

In order to verify the sectors in which the CEE sixteen have recorded comparative advantages in their trade with China – in addition to change over time - the results of this analysis are presented on the following Table 1:

Table 1. *Sector Specific Normalized Revealed Comparative Advantage (NRCA) for 16 CEEC in trade with China in 2007 and 2018*

SECTORS	COUNTRY	2007	COUNTRY	2018
I	Poland	0,0035	Poland	0,0051
II	Estonia	0,0015	-	-
III	Czech Republic	0,0054	-	-
VI	Poland	0,0361	Hungary	0,0081
VII	Czech Republic	0,0054	Poland	0,0081
VIII	-	-	Czech Republic	0,0018
IX	Romania	0,0076	-	-
X	Poland	0,0023	Czech Republic	0,0096
XII	Slovakia	0,0020	Slovakia	0,0020
XIII	Czech Republic	0,7852	Poland	0,0028
XVI	Hungary	0,0937	Czech Republic	0,0431
XVII	Slovakia	0,0648	Slovakia	0,0674
XVIII	Czech Republic	0,0097	-	-
XIX	Poland	0,000000198	Serbia	0,000055918
XX	Poland	0,0039	Poland	0,0063
XXI	Poland	0,000053462	Poland	0,000095590

Source: Author’s own calculation on the basis of Trade Map 2019.

Table 1 lists the observations for each sector separately in accordance with Chebyshev's inequality model/index/equation. The results show which country revealed an NRCA that is above a standard deviation of 3, which is above the mean NRCA for all sixteen countries for each given sector. If the distribution is flat, then there is no result of any significance. Following the application of the Chabishev's model/index/equation, across individual commodity sectors, it was possible to measure and analyse the evolution of NRCA values.

In 2007, Poland was the leading exporter of goods in five sectors (I, VI, X, XIX, XX and XX) when compared alongside other countries of the sixteen format. In sector I (animals and animal products), Poland supplied over 74% of goods. Importantly, despite a decrease in the share of these products, down to 60% in 2018, Poland still managed to maintain its advantage as the main supplier. It is worth noting, however, that the share of products from sector I only represented 1.3% of the sixteen CEEC total to China in 2018, but which had increased from 0.7% in 2007. Poland also

managed to maintain its advantage in the year 2018 in the supply of goods from sectors XX (miscellaneous and manufactures articles) and also in XXI, which are works of art, collectors' pieces and antiques.

However, in the case of goods from sector XX, there was a significant drop in the share of exports in these types of goods to China, falling from 58.2% in 2018 to 34.2% in 2007. The share of goods from sector XXI in both of the analysed years remained relatively stable at 59.2% in 2007 and 57.8% in 2018. These types of goods constitute a very small percentage of the total CEEC exports to China, oscillating between 0.02% (2007) and 0.03% (2018). On the other hand, the share of analyzed exports of goods from sector XX increased from 1.2% (2007) to 4.7% (2018). In 2018, Poland lost its distinctive position in the supply of chemicals and allied industries (VI), pulp/wood and other fibrous cellulosic material (X) as well as arms and ammunition (XIX). This illustrates that there has been a decrease in the share of Polish exports (as a proportion of CEEC exports to China) over the years analysed in the following categories of selected goods: sector VI from 75.9% to 20.7%, sector X 52.4% to 15.3%, sector XIX 100% to 0%. The values provided for the above sectors, while significant in terms of change, represented a small share of the total CEEC trade to China, which was - in most sectors - limited during the analysed period (sector VI - 2007: 7.3%; 2018: 3.7%, sector X - 0.9%; 1.8%, sector XXI - 0.00003%; 0.6%). In the case of sector VI in 2018, Hungary was ahead of Poland, accounting for almost 42% of the exports to China. In sector X the Czech Republic (75.8%) dominated and, in sector XIX, Serbia (91.7%).

In 2018, Poland gained an advantage in the export of goods from sectors VII (plastics and rubber) and XIII (stone/glass). Poland's share in the export of goods from sector VII was the highest among all CEE countries and amounted to 39% in 2018 (2007 - 24.4%). The country also obtained the highest share in corresponding exports from sector XIII, amounting to 52% (2007 - 15.1%). However, the share of goods from sectors VII and XIII in total CEEC exports to China was also limited and in 2018 amounted to 4.4% and 0.9%, respectively. In 2007 the values for these goods stood at 2.9% (VII) and 1.6% (XIII).

In 2007, the Czech Republic stood out as one of the key suppliers in the export of goods from the following sectors to China and accounted for the following shares:

- III Animal or vegetable fats and oils and their cleavage products (75.7%);
- VII Plastics and rubber (37.3%);
- XIII Stone & glass (78.5%);
- XVIII Optical & photographic eq. (37.3%) .

In 2007, these four categories accounted for almost 4% of the total CEEC exports to China. In 2018 the leading export sectors in the Czech Republic were VIII (raw, hides, skins, leather and furs), X (pulp/wood) and XVI (machinery & electrical eq.). Of importance is the latter (XVI), which accounts for an almost 33.5% share in total

CEEC trade to China. The share of the two remaining sectors (VIII and X) stood at 0.4% and 1.8%, respectively. This suggests that there has been substantial change and greater specialisation in the Czech Republic’s trading patterns.

The case of Slovakia reveals that it managed to sustain strong NRCA values for the same two sectors in both of the analysed years (XII - footwear/headgear and XVII - transportation). Slovakia exported over 82% of the total CEEC goods from sector XII and 69.6% from sector XVII. Transport goods are of particular relevance as they represent over 11% of CEEC’s total exports to China. In 2007, significant NRCA values were also recorded for Estonia in animal or vegetable fats and oils etc (II. 35.2% share of CEEC export of these products). Romania was dominant in the export wood and associated items (IX. 68.3%), Hungary (machinery/electrical XVI) and Slovakia (optical, photographic, cinematographic (XII. 82.3%). It should be emphasised, that even though the share of Estonia’s and Romania’s shares in total CEEC exports to China was relatively low (0.4% and 1.2%, respectively), those goods in which Hungary dominates accounted for 50% of the corresponding exports.

Table 2. *Sector Specific Normalized Revealed Comparative Advantage (NRCA) for 16 CEEC in trade with China in 2007 and 2018*

2007					2018				
Sectors	Country	NRCA	Country	NRCA	Sectors	Country	NRCA	Country	NRCA
VI	Poland	0,03612	-	-	-	-	-	-	-
XV	Poland	0,0475	-	-	XV	Bulgaria	0,0443	Poland	0,0252
XVI	Hungary	0,0937	Czech Republic	0,0273	XVI	Czech Republic	0,0431	-	-
XVII	Slovakia	0,0648	-	-	XVII	Slovakia	0,0674	Hungary	0,0224

Source: Author’s own calculation the basis of Trade Map 2019.

Table 2 compares country values to the mean of all given NRCA sectors, which comprises of 336 observations and reveals the sectors in which countries record an export advantage within the group of sixteen, compared. Table 2 reveals that, in 2007, Poland gained a normalized comparative advantage over China in sectors VI (chemicals and allied industries) and XV (metals). Exports from these sectors constituted 7% and almost 15% of the total exports to China of all CEE countries, respectively. During that year, the largest Polish exporters from the chemical industry were: Zakłady Azotowe “Puławy” S.A., Zakłady Azotowe w Tarnowie–Mościcach S.A., “CIECH” S.A., Zakłady Chemiczne ZACHEM S.A., Zakłady Azotowe Kędzierzyn S.A., or “Cortex Chemicals” Sp. z o.o.

In respect of the above, the export of most products from the Polish chemical industry, but in particular their quality and competitiveness, depends on world market prices. Hence, the fall in world prices, due to higher transport costs, reduced the profitability of Polish exports to China. This is possibly one of the reasons explaining why the export advantage in sector VI could not be maintained in 2018. During this particular year however, Poland still had a comparative advantage in exports from sector XV, though the country’s NRCA value was lower than that of

Bulgaria, which had a comparative advantage. KGHM Polska Miedź is one of the world's major copper producers and it is also the largest Polish exporter to China.⁴ Relatedly, Bulgaria's exports from sector XV is also dominated by one large-sized company – a subsidiary of TNC, which also produces copper (Zhelev, 2018). According to Zhelev (2018), metals from this group, and in which Bulgaria is more internationally competitive than China, represents a potential area for further expansion and intensification. This strategy would be appropriate, especially given that China is the world's largest consumer of products from this industry.

In 2007, the results of this research revealed that the Czech Republic and Hungary both recorded comparative advantages in the exports of machinery and electrical products (sector XVI), though only the Czech Republic was able to maintain this advantage until 2018. In the case of Czech Republic, one of the factors influencing its comparatively higher NRCA values could be the rapid development of the ICT industry caused by, among others, the inflow of FDI as well as the development of domestic IT companies. Many leading ICT and software companies are located in the Czech Republic (Microsoft, Skype, Red Hat, IBM etc.) and many Czech software firms are well-known worldwide (AVG, Avast or Social Bakers) (Castro, Vlačkova and Hnat, 2017).

The Czech Republic is often regarded as the most successful CEE country in terms of attracting foreign investment, thanks to its strong automotive cluster (Belt and Road, 2016). In 2018, this sector (XVI) was responsible for almost 33.5% of all CEEC exports to China. On the other hand, Hungary, like Slovakia, had a comparative advantage in 2018 in sector XVII (transportation). This is a sector that accounted for almost 20% of total CEE exports to China in 2018 (an increase of 8.3 percentage points compared to 2007). Hungary has been specialising in the production of transport vehicles since Soviet times, and boasts a long history of auto parts and electronics manufacturing (Belt and Road, 2016). In the case of Slovakia, the country has had a comparative advantage since 2007 in the export of goods from this sector (XVII). However, when analysing the high NRCA values for this country, one should take into account its participation in German-centered supply and value chains whose final products often re-exported to China. According to leading experts from CEIAS (2019), not counting foreign-owned automobile producers, Slovakia's exports to China was minimal.

⁴In 2018, KGHM and China mine metals concluded an agreement, which covers the years 2019-2023 and will replace the previous one, from June 2016. The value of the agreement ranges from PLN 6 billion to PLN 14.46 billion, depending on final orders (Graniszewska, 2018).

6. Conclusions

Despite the declared intensification of cooperation between China and the CEEC, the latter are still losing out to Chinese competition. This is evidenced by the deficit that each of them has in exchange with the PRC.

During the period analysed, there was an unfavorable decrease in the share of highly processed goods exported from sector XVI (machinery/electrical). A positive trend, however, could be found in goods exported from sector XVII (transportation), which in 2018 accounted for almost a fifth of CEEC exports. Metals, of which the country is one of the world's major consumers, accounted for a large proportion of exports to China. As research shows, it is in these sectors that 16 countries have achieved a disclosed comparative advantage. More significant NRCA results for Poland were only evident in products exported under sector XV (metals).

However, the value of this advantage (0.252) was lower than the NRCA obtained in the same sector by Bulgaria (0.443). This means that Poland has an advantage in goods with low levels of processing and relatively little added value. The countries that gained an advantage in the field of highly processed goods are the Czech Republic (sector XVI) and Slovakia and Hungary in sector XVII. In the case of Slovakia, this advantage may, however, result from participation in German-centered value chains with final products often re-exported to China. Importantly, during the period analysed, is to note that Poland lost its comparative advantage in goods from Sector VI (chemicals and allied industries).

The perspective sectors where intensification of Poland's exports to the Chinese market is possible are those that possess a comparative advantage. Polish exporters to China should seize the opportunity offered to them by changing the profile of Chinese consumers. This is particularly important given the expanding middle class in Chinese society and the related higher demand for high quality products. For this reason, Poland should be seeking new trade patterns with China, which involve higher value-added goods and services with higher levels of technological content, especially given that the country ranks high in terms of manufacturing and automation.

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