



ARE WE TRANSFORMING TOWARDS MORE BALANCED RELATIONSHIPS? PRODUCTION CONNECTIONS BETWEEN CHINA AND POLAND IN THE 21ST CENTURY

Ewa Cieřlik¹

Abstract

The trade relations between Poland and China have been highly unbalanced. Taking into account the fact that standard trade flows do not reflect the real position of the economy in production links, it was decided to analyse the value-added flows. The goal of the study is to identify the intensity of the value added flows between the Polish and Chinese industries. Two hypotheses were stated: 1) as a result of the introduction of the Belt and Road Initiative in 2013, the role of Chinese value added directed to Poland increased; 2) the role of Poland as a supplier of added value for Chinese production is gradually growing. The study utilizes the Inter-Country Input-Output Database in the output-input model. Results indicate that Poland has significantly worsened its position in global production links in relation to China in many industries and is still more dependent on value added coming from the EU than on the Chinese value added. The role of Polish value added in Chinese industries is low and has not increased since the BRI introduction. Moreover, it is difficult to conclude that the growing role of China in production links with Poland is the result of the BRI introduction, because no significant changes were observed after starting this strategy.

Keywords

Foreign Trade, Global Value Chains, China, Poland

I. Introduction

The New Silk Road initiative (also known in the literature as One Belt One Road and Belt and Road Initiative)² lasting for almost a decade is an enormous project of China, the framework of which is difficult to define unequivocally. It should be clearly emphasized that BRI is not a traditionally understood investment project with a separate budget and

¹ Poznan University of Economics and Business, Al. Niepodleglosci 10, 61-875 Poznan, Poland. E-mail: ewa.cieslik@ue.poznan.pl

² The name Belt and Road Initiative (BRI) will be used in this article, as it is currently most often used in official Chinese documents.

schedule, but rather a political and economic vision of the international expansion of Chinese companies, bringing together many different types of projects and sources of their financing (Wen, 2012) (Liu, 2016) (Xi, 2013). There are the five most important aspects of foreign policy that are to be related to the initiative. Among them are: policy communication, improved interconnections between countries, trade support, support for currency exchange, and strengthening people-to-people exchanges (Salvari, 2017).

The New Eurasia Land Bridge (NELB) is one of the BRI routes connecting Europe with China and at the same time the Pacific with the Atlantic Ocean. In fact, this corridor is a transcontinental railroad. Sometimes it appears in the literature under other names, including the Eurasian Northern Corridor or the Second Eurasian Land Bridge.

The creation of the NELB as part of the BRI resulted from several reasons.

First, this merger is part of the increasing pressure from China to integrate with European markets, especially those in Western Europe. Second, the creation of the route was facilitated by geopolitical conditions along the corridor (Russia and Central Asia). In recent years, China has deepened strategic cooperation between economies along the route, especially with Russia (Xinhua, 2019). In addition, the countries of Central Asia see many advantages and opportunities in the BRI to intensify trade and investment flows. Most of these economies have a positive attitude toward China (Chen and Jiménez-Tovar, 2017).

Third, the integration of the region is supported by the functioning of several regional institutions, such as the Shanghai Cooperation Organization, the “16 +1” format, the Collective Security Treaty Organization or the Eurasian Economic Union, which together help implement institutionalized dialogue and long-term planning. Therefore, this corridor stands out as an alternative to other overland routes through the Middle East and North Africa. For example, in the joint communiqué of the 14th meeting of the Council of Heads of Government of the Member States of the Shanghai Cooperation Organization in Tajikistan, it was indicated that the organization supports the initiative of the “Chinese Silk Road economic belt and its goals of promoting gradual sustainable economic growth in the interest of maintaining and supporting peace and stability in the region”. (Shanghai Cooperation Organization, 2018).

Fourth, NELB is part of an energy strategy and an alternative for China to strengthen its ties with Russia and the Central Asian economies to reduce dependence on supplies of raw materials from the Persian Gulf³ (Zhou and Esteban, 2018).

The NELB, apart from Poland, also covers other countries of the Visegrad Group, Slovenia, Ukraine, and Kazakhstan. Of these economies, Poland remains the strongest in terms of total GDP generated and trade flows with the world. It is also the most important trade partner for China in the region and a significant link with western Europe. Although the BRI, its assumptions and mission have evolved towards not only economic, but also technological, political, and cultural issues, the trade aspect and production connections within global value chains (GVCs) have remained one of the most important dimensions of the initiative. For many years, Poland has been recording a very deep trade deficit with

³ The China-Central Asia-West Asia Economic Corridor plays a similar role.

China and, at the same time, finding itself on the route, faced the opportunity to intensify relations with China and rebuild its exports and strengthen its position in the GVCs. Taking into account the contemporary fragmentation of production and the fact that standard trade flows do not reflect the real position of the economy in production connections, it was decided to analyze in the study the value-added streams in foreign trade. Therefore, the aim of the study is to identify the intensity of the flows of value added between the Polish and Chinese industries. Two hypotheses were posed: 1) as a result of the introduction of BRI, the role of Chinese added value directed to Poland increased; 2) the role of Poland as a supplier of added value for Chinese production is gradually growing. The main research subjects are Poland and China. Furthermore, the study was extended, in justified cases, to economies belonging to the NELB. Kazakhstan and Ukraine were deliberately excluded from the NELB value added statistics due to the lack of complete data. A multiregional input-output model was used, while the research period was limited to 2005–2016 (due to the limited availability of statistical data). The Inter-Country Input-Output Database was applied. On the other hand, the presentation of standard foreign trade figures was based on the UNCTAD data.

The article is divided into four parts. The first part reviews the literature on Poland's relations with China in the context of GVCs. The second part briefly presents the research method used. The third section describes the flows of value added on the Poland-China line in relation to selected NELB economies. The last part – conclusions – is devoted to an attempt to answer the hypotheses stated in the article.

II. Polish-Chinese Relations in the Light of GVCs: Literature Review

Polish-Chinese relations can be characterized at various levels. They are governed by strategic partnerships, regional agreements, and institutions. They are also shaped within the framework of Chinese-EU relations and in relation to global power systems. However, due to the limited page count of the paper, a literature review was conducted focusing on economic issues and with regard to GVCs.

So far, there have been few studies on economic ties between Poland and China in the literature on the subject. Most often, Poland is one of the research objectives, next to other EU or CEE economies. Moreover, there are practically no publications that focus on the production links between Poland and China alone. Therefore, an additional goal of the article is to fill the research gap in this area.

It is quite popular in the literature on the subject to perceive the relations between CEE, including Poland and China, in the context of foreign trade or capital flows, and to add political issues to these aspects. However, these analyses ignore the flows of value added. Tinaping (2014) focuses on the asymmetry in trade between the CEE countries and China. Pay particular attention to the potential for complementarity and competitiveness of trade between economies. However, in this study, the case of Poland is discussed as one of many aspects. Other researchers have focused on the sources and scope of China's influence on the CEE region, especially in the context of growing economic ties. Pepermans (2018) argued that China uses economic and soft power to gain influence in the region, and Matura (2019) studied the limited political influence of Chinese diplomacy in the region. On the

other hand, Pavlićević (2019) presented an analysis comparing the economic, political, security, and soft power resources of China and the EU.

Matura (2017) focused on investment flows between China and the CEE, where Poland was also included. Tuszyński (2015) studied the policies of countries belonging to the “16+1” format compared to China, with particular emphasis on Poland. Much space was also devoted to economic cooperation in the context of complex political relations. A similar analysis was carried out by Jaklić and Svetličić (2019). Šebeňa (2018) analysed the impact of the intensification of trade and investment flows between China and the countries of the Visegrad Group on the exposure of the latter to China and the fluctuations resulting from changes in Chinese strategies. Fung et al. (2009) tried to answer the question of whether China, by attracting FDI, causes less investment to flow to the CEE economies. However, the study showed that the inflows of FDI to China not only do not displace the inflows of FDI into the CEE countries, but are also often moderately complementary. Szunomár and McCaleb (2018) focused on relations with China in the flagship industries of Hungary and Poland, and on the motivations of Chinese investors to locate their investments in the region. In the case of Poland, the automotive industry was presented in a more general way. The paper by Cieřlik (2014) presents only the Polish perspective in foreign trade with China, which focuses on Chinese sectors in which Polish exports would be the most promising. Whereas, Kamiński (2019) focused on the case of the Łódzkie Voivodeship in Poland and the success factors of the Łódzkie Voivodeship in building strong ties with China.

More narrow studies that focused on specific sectors related to China (or more broadly, Asia) can also be indicated. For example, Ando and Kimura (2013) analysed trade and production links between Asia and the countries of the Visegrad Group in 1995–2010 in the machinery sector. The survey showed fragmentation of production, which is shifting from Western Europe and connecting with Asia via the CEE.

The subject of relations between China and the CEE countries under the GVCs is discussed much less frequently in the literature on the subject. The monograph edited by Szunomár (2014) presents Chinese investments in CEE from various perspectives, including Polish. The publication touches on issues related to participation in global production connections. The authors show how the participation of CEE countries has changed over the years – at first the focus was on assembly operations, but over time more complex tasks were carried out and Poland became an important supplier of end products and parts. Éltető and Toporowski (2015) analysed in detail the trade between the economies of the Visegrad Group and Asia (including China). It was shown that the revealed indicators of comparative advantage and high technological intensity of production influenced the product specialization of the Visegrad Group in relation to Asian economies. In the article, it was argued that the inclusion of Poland and other economies of the Visegrad Group in the GVCs affected trade with Asia. Differences in the degree of integration of the Visegrad Group in GVCs were also highlighted. In the case of Poland, the industries related to the automotive industry were characterized by particularly favorable advantages over Asian countries after the 2008 crisis. However, both studies cited end in the first years after the 2008 crisis. More recent data on Poland’s connections under GVCs are provided in the

following works: Cieřlik and Michałek (2017), Przeddziecka (2018), or Kordalska and Olczyk (2019). However, these studies treat China as one of Poland's many partners. The relations of selected CEE economies in terms of value-added flows were analysed in more detail in the articles by Cieřlik (2019a, b) and Cieřlik (2020), where the focus was on production connections between China and selected CEE economies, including Poland, in terms of industry processing. In the work by Cieřlik (2020), these connections were developed to include the service aspect. All these studies indicate a significant asymmetry in the relations between European economies and China, in favour of the latter. This asymmetry occurs not only in the processing industry, but is also beginning to be noticed in service activities, including the more technologically advanced.

III. Methodology

In the following study, a variant of the input-output model was used. This made it possible to obtain information on the transformation of production connections between Poland and China and selected European economies in terms of flows of added value. The method is particularly useful when trying to define the shares of economies in global production connections, also in the sectoral/trade-specific/industrial dimensions⁴. The input-output model used is a combination of the approaches developed by the following authors: Hummels et al. (2001), Timmer et al. (2012), Koopman et al. (2014) or Johnson and Noguera (2012). However, these authors focused on the flows of value added between economies, ignoring individual sectors. On the other hand, in the approach used by the author of the work, the models mentioned above were extended to include a sectoral approach. Statistical data turned out to be a major limitation in the selection of sectors, but for those most strongly associated with global production connections, it was possible to construct measures related to added value. Due to the limited volume of the study, the model was not discussed. Details on the approach can be found in the works by Cieřlik (2019a, b) and Cieřlik (2020).

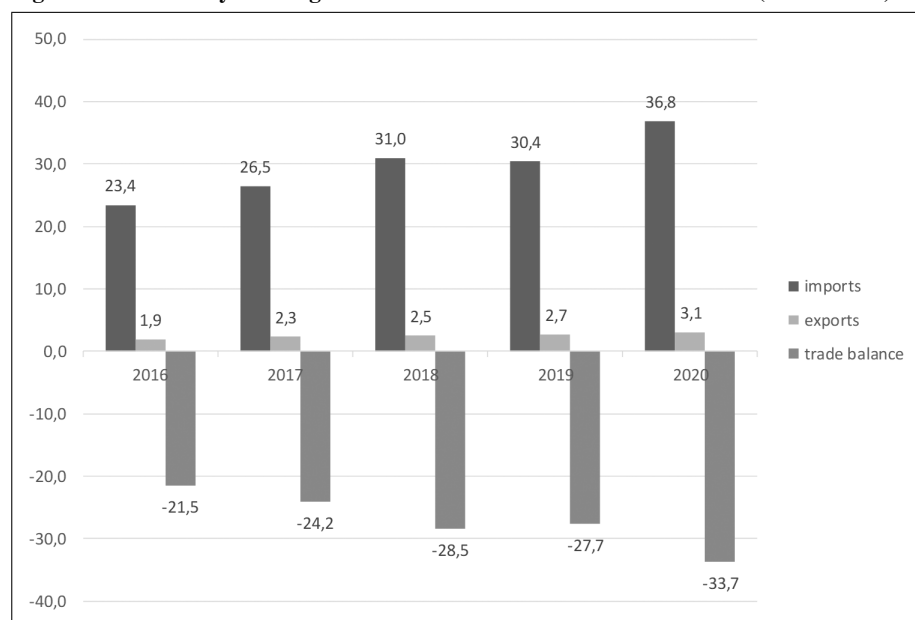
The model provided the empirical measure of participation in vertically specialized trade and allowed us to answer many research and policy questions. Data referring to trade in value-added statistics is collected by the Inter-Country Input-Output Database. The database provides information up to 2016. Data was collected and then two important measures were constructed: (1) an indicator that helps us to assess if a country is likely to be upstream or downstream of the global value chain (applying foreign value added embodied in the country's gross exports and domestic value added embodied in the gross exports of trade partners), and (2) an indicator that helps us to assess the extent to which a country is involved in the global production chain.

⁴ The expressions are used interchangeably.

IV. Flows of Added Value Between Poland and China

When examining the trade flows between China and Poland in recent years, a deep deficit in the case of Poland is clearly visible. In 2020, according to Chinese customs statistics, it was \$ 22.4 billion, while according to UNCTAD data, it was \$ 33.7 billion. Among the NELB economies, Poland was responsible for the highest imports of goods from China in 2020 (37% of NELB imports from the People's Republic of China) and was in fifth place (together with Hungary) in terms of exports of goods to China (11%)⁵. Therefore, Poland was characterized by the deepest trade deficit with China among the economies under discussion (UNCTAD, 2021).

Figure 1: Commodity exchange between Poland and China in 2016–2020 (USD billion)



Source: own calculations based on data (UNCTAD, 2021)

In 2020, Polish merchandise exports to China were dominated by two product groups (according to the SITC Rev. 3 classification): machinery and transport equipment (41% of all exports to China) and manufactured goods (21%). However, when analysing the structure of Polish exports to the PRC in terms of technological advancement (according to Lall's classification), the medium technology manufactures: engineering (24% of total exports to China) and primary products (21%) dominated in 2020. This structure proves the still low technological advancement of Polish exports to the Chinese market (UNCTAD, 2021).

⁵ Ukraine and Kazakhstan exported the most.

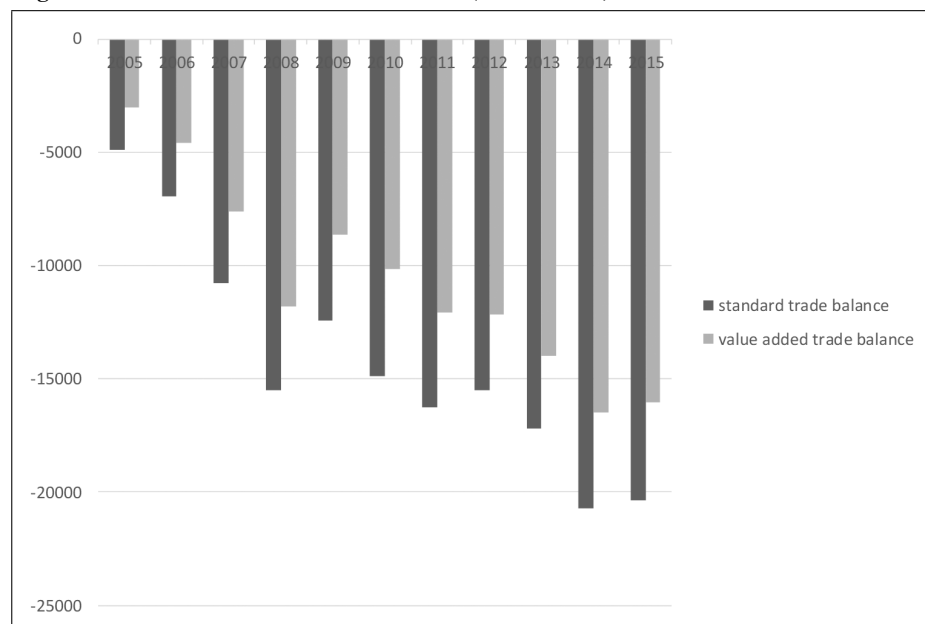
In the case of Polish imports of goods from China, machinery and transport equipment were absolutely dominant (55% of total imports from China going to the Polish market) in 2020. Miscellaneous manufactured articles (27%) and manufactured goods (12%) also had a significant share. On the other hand, the remaining product groups did not play an important role. Taking into account the technological advancement of Chinese products imported to Poland (according to Lall's classification), the structure was dominated by high technology manufacturers: electronic and electrical (37%), followed by medium technology manufacturers: engineering (19%), low technology manufacturers: textile, garment, and footwear, and low technology manufacturers: other products (15% each) (UNCTAD, 2021).

When considering the classification of goods, SITC Rev. 3, Poland recorded the largest trade deficit in the field of machinery and transport equipment (USD 18.9 billion), and then in miscellaneous manufactured articles (almost USD 9.5 billion) in 2020. Only mineral fuels, lubricants, and related materials had a slight trade surplus. On the other hand, in the classification of goods in terms of technological advancement, a particularly high trade deficit was recorded in the Polish trade of high technology manufacturers: electronic and electrical (USD 13.4 billion) (UNCTAD, 2021).

If standard trade statistics on exports and imports of finished products are adjusted by value added, then the Polish deficit, covering both goods and services, will decrease significantly. It was estimated that in 2015 (the last available data on value added flows), it was lower by about 40% in relation to the standard formula for its calculation. If the goods themselves are taken into account, the Polish trade deficit with China decreases by about 1/4 (Figure 2). Furthermore, it should be taken into account that Poland is an important supplier of added value for the main European exporter to China, Germany (in 2015 it was ranked 7th)⁶. In 2020, China remained the most important trade partner for the European Union, including the main source of imports for the EU (it accounted for 22.4% of extra-EU imports) and the third export market, behind the U.S. and the United Kingdom (10.5% of extra-EU imports) (Eurostat, 2021).

⁶ Poland was followed by the Czechia and Hungary, taking respectively 13th and 18th places among suppliers of foreign value added for Germany. Poland was the 7th provider of added value in manufacturing. It is responsible for 7% of foreign value added in wood and products of wood and cork, for 6% in wood and paper products; printing as well as for 5% food products, beverages and tobacco; transport equipment; motor vehicles, trailers and semi-trailers; other manufacturing; repair and installation of machinery and equipment; and construction. On the other hand, China relies on the German added value in the field of motor vehicles, trailers and semi-trailers (10% of foreign added value) and transport equipment (8%), i.e. two industries closely related to Poland. This allows supposing that through German production, Polish added value goes to the Chinese market (OECD, 2021).

Figure 2: Poland's trade balance with China in 2005–2015, taking into account standard flows of goods and flows in relation to value added (million USD)



Source: own calculations based on data (UNCTAD, 2021) and (OECD, 2021)

When analysing the flows of the added value of countries along the NELB (excluding Kazakhstan and Ukraine) in 2005–2016, most of them were characterized by a much higher share of foreign value added embodied in their gross exports from China (FVA). The exception was Poland, whose FVA in 2005 and 2009 was lower than that of the Chinese. However, this level did not last for a long time. In the case of the PRC, a significant reduction in FVA was observed, especially after the global financial and economic crisis of 2008. However, such a tendency was not noticed in the analysed CEE economies – their FVAs fluctuated. In 2016, Poland had the lowest FVA (26.9% of gross exports), which was approximately 10% higher than in the case of China (Table 1).

In the case of the domestic value added embodied in the gross exports of partner trade (DVA) of both Poland and other CEE economies on the route discussed, it is difficult to indicate a uniform trend. In recent years, these economies (with the exception of Slovakia) have decreased the DVA or remained at a similar level at best. The biggest reduction was made by Hungary, which in the analysis period was characterized by the lowest DVA. Only the aforementioned Slovakia increased DVA by less than 1% between 2005 and 2016. In 2016, the highest value of DVA was observed in Poland (DVA accounted for 28.01% of gross exports). However, as in the case of FVA, it was incomparably less favourable than in China (52.94%). Every year the PRC increased the share of production that went to their trading partners. Between 2005 and 2016, this share increased by more than 11.5% (Table 1).

Table 1: FVA and DVA of the NELB economies in selected years 2005–2016 (in % of gross exports)

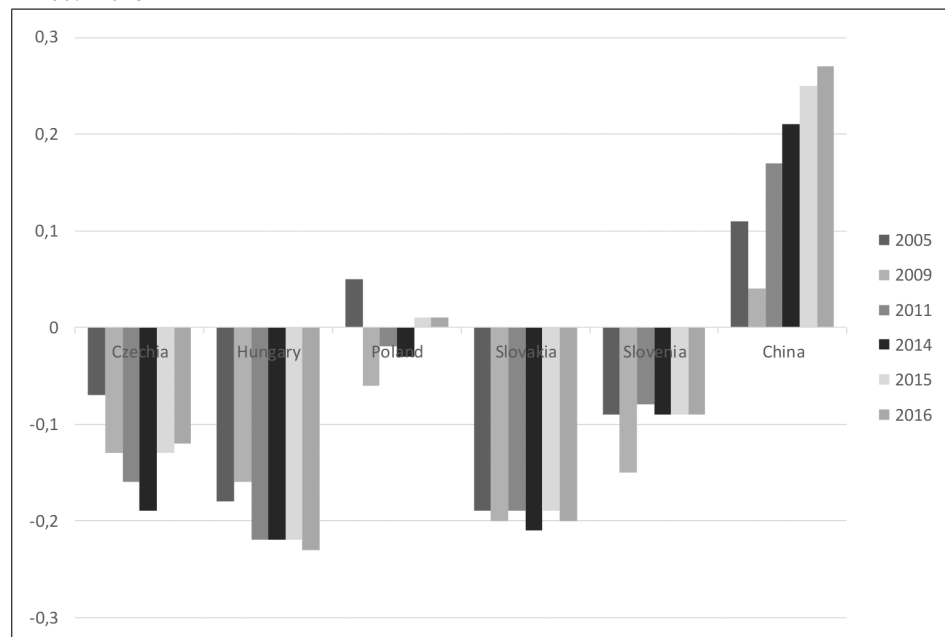
	FVA						DVA					
	2005	2009	2011	2014	2015	2016	2005	2009	2011	2014	2015	2016
Czechia	34.43	39.39	45.09	46.61	39.28	37.67	25.52	23.00	23.35	21.30	22.20	21.96
Hungary	44.01	39.91	48.48	47.31	43.10	44.14	19.91	18.70	19.07	18.38	14.72	14.74
Poland	24.68	27.89	32.29	32.98	26.64	26.90	31.45	20.50	29.65	28.57	28.45	28.01
Slovakia	42.99	44.35	46.73	48.19	44.78	44.51	17.90	17.90	21.49	20.14	19.54	18.79
Slovenia	33.28	37.52	34.40	36.11	32.46	31.55	21.48	18.20	24.62	23.91	21.06	20.35
China	26.27	32.11	21.74	19.53	17.32	16.65	41.37	36.83	44.31	48.07	50.24	52.94

Source: own calculations based on data (OECD, 2021)

Based on DVA and FVA calculations, the relative position of Poland and the CEE countries included in the NELB route in the GVCs was estimated. The GVCs index of countries' positions shows a pessimistic picture of them. All economies, with the exception of Poland in selected years, were in the downstream market segment, i.e. they remained more dependent on foreign value added than they provided to other countries themselves. Between 2005 and 2016, no country improved its position in the GVCs. Furthermore, the position indicators in the GVCs do not confirm the thesis that after the 2008 crisis the position of CEE economies in the GVCs was strengthening. China, on the other hand, in all the years analysed was not only in the upstream market, but also strengthened its position every year (making its economic partners more and more dependent on its added value). The year 2009 was an exception, when the position of the PRC in the GVCs dropped significantly (Figure 3).

Taking into account the share of the PRC as a value-added supplier for Poland and other surveyed countries, it can be seen that it has been increasing every year (except for 2011 and 2012). In 2005, only 3.88% of the total FVA going to the economies in question came from China, while by 2015 this share had increased to 8.45%. The initiation of BRI maintained the upward trend in the influx of Chinese value added to the discussed countries, but did not result in a sharp jump in the FVA. In 2015, Poland had the largest share of China in its FVA (9.57% of the total FVA), which significantly exceeded the share of Chinese value added that went to all CEE economies discussed that belong to the NELB. In the years 2005–2015, among all the countries discussed, Poland increased its dependence on Chinese added value the most (increase by 6.60%). The growing role of China in Polish exports was also reflected in the annual promotions of the PRC among FVA suppliers. Even at the beginning of 2005, the PRC was quite a distant supplier of value added (Tables 2 and 3).

Figure 3: Relative position of Poland and selected economies covered by the NELB in GVCs in 2005–2016



If the relative position indicator is below 0, it means that the economy is in the downstream market in GVCs. If the relative position indicator is higher than 0, it means that the economy is in the upstream market in GVCs.

Source: own calculations based on data (OECD, 2021)

Table 2: The share of China in the total FVA used in Polish gross exports and selected economies covered by the NELB in 2005–2015 (share in the total FVA)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Czechia	3.43%	3.89%	5.44%	6.15%	8.12%	8.32%	8.64%	8.23%	7.88%	8.02%	8.94%
Hungary	6.01%	5.70%	6.19%	6.65%	7.75%	8.09%	7.31%	6.55%	6.21%	6.04%	6.80%
Poland	2.97%	3.48%	4.51%	5.40%	6.06%	6.12%	5.97%	6.61%	7.23%	8.34%	9.57%
Slovakia	2.60%	3.39%	4.92%	5.13%	5.20%	5.38%	5.57%	5.95%	6.98%	7.99%	8.45%
Slovenia	2.19%	2.39%	2.82%	3.29%	3.52%	3.76%	4.03%	4.74%	4.45%	5.39%	6.38%
TOTAL	3.88%	4.13%	5.16%	5.75%	6.77%	6.99%	6.85%	6.83%	6.99%	7.53%	8.45%

Source: own calculations based on data (OECD, 2021)

Table 3: China's position among FVA suppliers for Poland by selected sectors in 2005–2015

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	RAZEM										
<i>Total</i>	8	8	5	4	4	3	3	3	3	3	2 (1. Germany, 3. Russia)
<i>D29T30: Transport equipment</i>	9	8	5	5	4	5	5	4	3	2	2 (1. Germany, 3. Italy)
<i>D29: Motor vehicles, trailers and semi-trailers</i>	10	8	5	5	4	4	5	4	3	3	2 (1. Germany, 3. Italy)
<i>D30: Other transport equipment</i>	7	7	5	4	4	4	4	4	4	3	3 (1. Germany, 2. U.S.)
<i>D26: Computer, electronic and optical products</i>	2	2	2	1	1	1	1	1	1	1	1 (2. Germany, 3. U.S.)
<i>D27: Electrical equipment</i>	5	5	3	2	2	2	2	2	2	2	2 (1. Germany, 3. Italy)
<i>D26T27: Computers, electronic and electrical equipment</i>	2	2	2	2	2	2	2	1	1	1	1 (2. Germany, 3. U.S.)
<i>D13T15: Textiles, clothing, leather and related products</i>	5	4	3	3	2	2	1	1	1	1	1 (2. Germany, 2. Italy)
<i>D10T33: Manufacturing</i>	7	5	5	4	4	3	3	3	3	2	2 (1. Germany, 3. Russia)
<i>D28: Machinery and equipment, n.e.c.</i>	7	5	4	4	3	4	3	3	2	2	2 (1. Germany, 3. Italy)

The calculations took into account 63 economies (excluding China) that were available in the OECD databases. In 2015, the table was supplemented with the leaders among FVA suppliers. Breakdown of sectors according to ISIC Rev. 4.

Source: own calculations based on data (OECD, 2021)

Poland, like other NELB economies, relies most on the domestic value added in the export of services (especially in education, healthcare, or security), which is a natural phenomenon, as services are more difficult to be traded abroad and usually are characterized by higher shares national added value. Sectors outside the service department, the export of which is highly dependent on foreign added value, were chemicals and nonmetallic mineral products, followed by transport equipment and computers, electronic, and electrical equipment. Interestingly, the export of motor vehicles, trailers and semitrailers was not at the forefront of sectors using foreign value added (OECD, 2021).

It can be seen that over the years, China's position in production connections with Poland has strengthened. Ultimately, China was the second (after Germany) supplier of added value for Poland in 2015. Only in the computers, electronic, and electrical equipment, as well as textiles industries, wearing apparel, leather, and related products took a leading role. However, after the introduction of BRI, a sudden jump in the role of China in Polish exports of the analyzed sectors was not observed; the trend of strengthening the role of China in the Polish production chain was simply continued (Table 3).

When analysing individual sectors, it is possible to point to a few in which the dependence of Polish exports on Chinese added value exceeds 10% of the total FVA. The largest number of such sectors among the economies covered by the NELB was observed in Poland. In the case of exports of products related to widely understood electronics and electrical products, China was among the leading suppliers of FVA for Poland (19.72% of the total FVA). In particular, the sector of computer, electronic and optical products was characterized by a very high dependence on the PRC (24.79%), which was also a leader among suppliers of added value. Another sector that was highly dependent on Chinese added value was electrical equipment (15.67%). Other Polish industries that depended heavily on China's added value were textiles, clothing, leather and related products (21.12%) (Table 3, Table 4).

Among the industries in which Poland also made its gross export quite dependent on the value added coming from China, one should also mention: manufacturing, where 10.17% of the total FVA came from China, machinery and equipment, n.e.c., where Poland imported from China 10.9% of total FVA, and other manufacturing; repair and installation of machinery and equipment (12.86%). In the case of the automotive industry, the shares of the Chinese FVA for Poland did not exceed the 10% threshold. Polish export transport equipment (8.91% of total FVA) was the most dependent on Chinese added value among all NELB countries. Also in the production of motor vehicles, trailers, and semi-trailers, Poland was characterized by the greatest dependence on FVA from China (Table 4) (OECD, 2021).

To better illustrate the production connections between Poland and China, the share of added value from the EU-28 is also shown. Poland was the least dependent on the EU FVA, reaching the level of 55.41% in 2015⁷. For all the industries in question, the share of FVA from the EU-28 far exceeds that of China. However, there are several areas where the difference between EU-28 and Chinese FVAs is not that high, and the PRC is

⁷ In 2015, Hungary's exports were the most dependent on the EU FVA, bringing as much as 65.08% of the total foreign value added from EU countries.

among the most important suppliers of FVA among single economies. The most important competitors for the Chinese FVA turned out to be the value added coming from Germany, and to a lesser extent Italy, the US and Russia also participated in the FVA (Tables 3 and 4). Interestingly, the CEE region does not play a significant role in the Polish gross export. NELB economies accounted for 5.57% of the value added flowing to Poland, which was a much lower indicator than the Chinese value added absorbed by Polish exports (9.57%) (OECD, 2021).

In the case of Poland, the smallest difference between the EU-28 FVA and the Chinese FVA in 2015 was in the export of coke and refined petroleum products, computer, electronic and optical products, and textiles, clothing, leather and related products. Especially in the case of the last two industries, China turns out to be an important competitor to the EU-28. For the first-mentioned industry, both the added value from the EU-28 and China was small, as Poland in this sector relies on a very fragmented structure of value-added suppliers. Only in the production of paper products and printing, EU economies realize more than 2/3 of foreign added value (Table 4) (OECD, 2020).

Although a gradual increase in the dependence of Polish gross exports on the positive value flowing from China has been observed, such a reverse phenomenon has not been observed. Poland is characterized by a small share of its value added in Chinese gross exports⁸. Additionally, they fluctuated slightly in the analysed period but did not increase spectacularly. Since 2010, the share of Polish added value in gross exports from the PRC has been gradually (but very slowly) growing. In 2015, China relied only on 0.26% of the FVA from Poland, which, compared to 9.57% of the share of Chinese added value in Polish exports, is a trace value. Furthermore, in 2015 Poland was responsible for the largest part of FVA going to China from the NELB countries, which gave it a distant 39th position out of the 63 analysed economies. It is also difficult to talk about intensifying the export of value added from Poland to China after the introduction of BRI (OECD, 2021).

⁸ The most important suppliers of value added to the PRC were South Korea, the U.S. and Japan. These economies realized 11.41%, 11.17% and 9.33% shares in FVA, respectively. In 2015, the EU-28 accounted for 13.72% of FVA flowing to China, of which Germany was the most important supplier, followed by France and Great Britain, which was still part of the EU structures at that time (OECD, 2021).

Table 4: Share of China and the EU-28 in the total FVA going to Poland by sectors in 2015 (%)

	China	EU-28
Total	9.57	55.41
D01T03: Agriculture, forestry and fishing	5.84	58.35
D05T09: Mining and quarrying	7.85	53.64
D05T06: Mining and extraction of energy producing products	8.11	55.01
D07T08: Mining and quarrying of non-energy producing products	7.75	53.22
D09: Mining support service activities	7.75	50.92
D10T33: Manufacturing	10.17	54.91
D10T12: Food products, beverages and tobacco	5.40	58.42
D13T15: Textiles, clothing, leather and related products	21.12	47.51
D16T18: Wood and paper products; printing	6.93	63.61
D16: Wood and products of wood and cork	8.78	58.98
D17T18: Paper products and printing	5.61	66.89
D19T23: Chemicals and non-metallic mineral products	5.46	50.90
D19: Coke and refined petroleum products	2.32	16.91
D20T21: Chemical and pharmaceutical products	5.15	58.53
D22: Rubber and plastic products	7.10	62.17
D23: Other non-metallic mineral products	8.23	55.69
D24T25: Basic metals and fabricated metal products	6.95	54.76
D24: Basic metals	5.62	47.94
D25: Fabricated metal products	7.81	59.20
D26T27: Computers, electronic and electrical equipment	19.72	48.24
D26: Computer, electronic and optical products	24.79	42.02
D27: Electrical equipment	15.67	53.20
D28: Machinery and equipment, nec	10.90	58.50
D29T30: Transport equipment	8.91	61.26
D29: Motor vehicles, trailers and semi-trailers	8.67	64.66
D30: Other transport equipment	9.96	46.21
D31T33: Other manufacturing; repair and installation of machinery and equipment	12.86	56.10

Service sectors other than D31T33 are not included. Breakdown of sectors according to ISIC Rev. 4. EU-28 means all countries of the community, excluding the respondent.

Source: own calculations based on data (OECD, 2021)

V. Conclusion

The presented study on production connections between China and Poland shows not only the growing influence of China on Polish production in the most internationalized sectors of the economy (most strongly included in GVCs), but also the growing role of the PRC in other sectors. It is difficult to unequivocally answer the question whether the introduction of BRI had a direct (any) impact on these increases or whether they result from the trend of stronger links between Polish production and exports and China, which has been maintained for several years.

Based on the test results, the following findings can be made.

First, Poland has significantly worsened its position in GVCs in relation to China, not only in general terms, but also in relation to the sectors analysed. Moreover, even in its flagship industries, the country has been unable to maintain high positions in the GVCs and is increasingly dependent on foreign (including Chinese) added value. Ultimately, Poland did not show a tendency to improve its GVC positions, which means that backward linkages (high FVA levels) dominate and Poland's overall position in GVCs barely fits into the upstream market segment. However, many sectors, especially the more technologically advanced ones, have found themselves in the downstream market, and their position is deteriorating.

Second, Poland is still more dependent on FVA coming from the EU-28, especially from the economies of Western Europe, than on the Chinese FVA. However, the PRC is increasingly ahead of individual EU countries as a supplier of added value for individual Polish sectors. Moreover, Poland shows the lowest dependence on the EU FVA among the NELB economies analyzed, which, however, does not mean a direct interchangeability between the EU-28 FVA and the Chinese FVA (the decrease in the EU-28 FVA is not fully compensated by the Chinese FVA) (OECD, 2021).

Third, there are relatively weak production links in terms of added value between Poland and other economies in the NELB corridor. Poland has made its industries much more dependent on the added value of the EU-15 or China than on the countries in the region.

Fourth, it is difficult to conclude on the basis of the analyses carried out that the growing role of China in production links with Poland is the result of the introduction of BRI. No significant changes were observed after starting this strategy. The greater presence of China in Polish gross exports constitutes a general tendency of the Chinese economy to integrate more into production chains rather than the effect of the initiative.

Ultimately, on the basis of the conducted research, it is not only difficult to positively verify the hypotheses posed in the paper: (1) as a result of the introduction of BRI, the role of Chinese added value directed to Poland has increased; 2) the role of Poland as a supplier of added value for Chinese production is gradually increasing, and even less is it focused on sustainable relations between Poland and China in terms of production connections. The gap between the export of Polish value added to China and the import of this value from China to Poland is still great, and the institutional solutions introduced have little impact on this imbalance. Some people see the Comprehensive Agreement on Investment of the EU with China as a possibility of greater balance in relations, but there is also a lot of controversy on this matter.

In the end, it is worth emphasizing that the analysis conducted is not without flaws, among which the following should be mentioned: reliance on a specific method (application of a different method may result in slightly different results), limited statistical data (with a high probability that the pandemic had an impact on production, but there are no data for this period)⁹ and the limited nature of the economic activities analysed (services that are increasingly included in GVCs were excluded from the analysis).

Acknowledgments

The article is the result of the research project ‘Chinese New Silk Road strategy: implications for production linkages between China and Central and Eastern Europe’ financed by the National Science Centre, Poland (UMO-2016/23/D/HS4/02748).

References

- Ando, M. and Kimura, F. (2013). Production Linkage of Asia and Europe via Central and Eastern Europe. *Journal of Economic Integration*, 2(8), 204–240.
- Beijing Review. (2017). Keywords to Understand The Belt and Road Initiative. *Beijing Review*, 27 7.
- Chen, J. and Jiménez-Tovar, S. (2017). China in Central Asia: Local Perceptions from Future Elites. *China Quarterly of International Strategic Studies*, 3(3), 427–445.
- Cieřlik, A. and Michaćek, J. (2017). *Globalne łańcuchy wartořci dodanej i eksport pořredni: przypadek Polski*. Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu.
- Cieřlik, E. (2014). Prospects for trade growth between Poland and China. *Studia Ekonomiczne*, Issue 4.
- Cieřlik, E. (2019a). Looking for the sectoral interdependence: evidence from the Visegrad countries and China. *Quality and Quantity*, Tom 53, 2041–2062.
- Cieřlik, E. (2019b). Towards more (un)balanced trade. Production linkages between China and the Visegrad countries: country-level and sector-level analysis. *European Planning Studies*, 27(8), 1523–1541.
- Cieřlik, E. (2020). Does China use its trade potential in the Belt and Road Initiative properly? The relations between Chinese value added and trade potential in the European countries: bottom-up analysis. *China Economic Journal*, 13(3).
- Éltető, A. and Toporowski, P. (2015). Ties of Visegrád countries with East Asia-trade and investment. *Institute of World Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences*.
- Eurostat. (2021). Retrieved July 20, 2021, from <https://ec.europa.eu/eurostat>.
- Fortwengel, J. (2011). Upgrading through Integration? The case of the central Eastern European automotive industry. *Transcience Journal*, 2(1).

⁹ McKinsey has calculated that medical devices, wooden products, and fabricated metal products were particularly vulnerable to COVID-19 shocks. On the other hand, the lowest exposure to shock was found in, among others, communication equipment (the smallest exposure from 23 analysed industries), but also transport equipment or computers and electronics. Due to the fact that these industries in Poland are strongly included in the GVCs, no significant changes in the position of the country in these production connections should be expected (McKinsey Global Institute, 2020).

- Fung, K., Korhonen, I., Li, K. and Ng, F. (2009). China and Central and Eastern European Countries: Regional Networks, Global Supply Chain or International Competitors?. *Journal of Economic Integration*, 24(3), 476–504.
- Hummels, D., Ishii, J. and Yi, K. (2001). The nature and growth of vertical specialization in world trade. *Journal of International Economics*, Tom 54, 75–96.
- Jaklič, A. and Svetličič, M. (2019). China and Central and Eastern European Countries within “16+1”: Group or Bilateral Relations?. *Entrepreneurial Business and Economic Review*, 7(2).
- Johnson, R. and Noguera, G. (2012). Proximity and production fragmentation. *American Economic Review*, 102(3), 407–4011.
- Kamiński, T. (2019). What are the factors behind the successful EU-China cooperation on the subnational level? Case study of the Lodzkie region in Poland. *Asia Eur J*, Issue 17, 227–242.
- Koopman, R., Wang, Z. and Wei, S. (2014). Tracing value-added and double counting in gross exports. *American Economic Review*, 104(2), 459–494.
- Kordalska, A. and Olczyk, M. (2019). Polska gospodarka na tle najnowszych ogólnoswiatowych trendów w globalnych łańcuchach wartości. *Kongres Ekonomistów Polskich*.
- Liu, Z. (2016). Yīdài yīlù chāngyì bèijīng xià de “16+1 hézuò” (一带一路倡议背景下的“16+1合作”). Retrieved December 11, 2019, from <http://16plus1-thinktank.com/1/2016-1111/1250.html>.
- Matura, T. (2017). Chinese Investment in the EU and Central and Eastern Europe. W: *China's at Traction: The Case of Central Europe*. Budapest Business School, University of Applied Sciences.
- Matura, T. (2019). China-CEE trade, investment and politics. *Eur-Asia Stud*, Issue 71, 388–407.
- McKinsey Global Institute. (2020). *Risk, resilience, and rebalancing in global value chains*.
- OECD. (2020). *Measuring Trade in Value Added*. Retrieved February 3, 2020, from <https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm>.
- OECD. (2021). *OECD Stats*. Retrieved February 4, 2021, from <https://stats.oecd.org>.
- Pavličević, D. (2019). A power shift underway in Europe? China's relationship with Central and Eastern Europe under the Belt and Road Initiative. W: *Mapping China's "One Belt One Road" Initiative*. Palgrave.
- Pepermans, A. (2018). China's 16+1 and Belt and Road Initiative in Central and Eastern Europe: economic and political influence at a cheap price. *J Contemp Cent East Eur*, Issue 26, 181–203.
- Przedziecka, E. (2018). Poland in Global Value Chains. *International Business and Global Economy*, Issue 37, 27–40.
- Radło, M. (2020). *Inicjatywa Pasa i Szlaku. Chińska ekspansja, nowe łańcuchy wartości i rosnąca rywalizacja*. Warszawa: Oficyna Wydawnicza SGH.
- Salvari, B. (2017). China Expands Tianxiaism Along the Modern Silk Road. *Kultura-Historia-Globalizacja*, Tom 22.

- řebeřa, M. (2018). Chinese Trade and Investment in the Visegrad Countries: Mapping Increased Exposure and Volatility. *China-CEE Institute Working Paper*, Issue 11.
- Shanghai Cooperation Organisation. (2018). *JOINT COMMUNIQUÉ on the results of the seventeenth meeting of the Council of Heads of Government (Prime Ministers) of the Member States of the Shanghai Cooperation Organization*. Retrieved March 3, 2020, from <http://eng.sectsco.org/documents>.
- Szunomár, A. and McCaleb, A. (2018). Chinese and Other East Asian Foreign Direct Investment in Central and Eastern Europe: Motives, Location Choices and Employment Approaches. *CESifo Forum*, 19(4/18), pp. 9–14.
- Szunomar, A. (2014). *Chinese investments and financial engagement in Visegrad countries – Myth or reality?* Institute of World Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences.
- Timmer, M., Los, B., Stehrer, R. and De Vries, G. (2012). Fragmentation, incomes and jobs. An analysis of European competitiveness. *WIOD Workin Paper*, Tom 9.
- Tinaping, K. (2014). China-V4 trade relations 2000–2012 – an overview current trends and perspectives in development of China-V4 trade and investment. *Current Trends and Perspectives in Development*, 4–23.
- Tuszyński, R. (2015). Polish perspectives on CE-China 16+1 cooperation: the unexpected Ukrainian factor. *Europolity*, 9(1).
- UNCTAD. (2021). *UNCTAD Stats*. Retrieved August 15, 2021, from <https://unctadstat.unctad.org>.
- Wen, J. (2012). 再创丝绸之路新辉煌. Retrieved December 11, 2019, from <http://lilun.dbw.cn/web/detail/,P=0,ID=6O0R254113VV5417.shtml>.
- Xi, J. (2013). *Speech by Chinese President Xi Jinping to Indonesian Parliament*. Retrieved December 11, 2019, from http://www.asean-china-center.org/english/2013-10/03/c_13306-2675.htm.
- Xinhua. (2019). *China, Russia agree to upgrade relations for new era*. Retrieved February 3, 2020, from http://www.xinhuanet.com/english/2019-06/06/c_138119879.htm.
- Zhou, W. and Esteban, M. (2018). Beyond Balancing: China's approach towards the Belt and Road Initiative. *Journal of Contemporary China*, 27(112).