

Article

# Some Insights into the Bilateral Value Chains—The EU and Russia

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**Abstract:** Russia and the EU represent two economic blocs with high-value bilateral trade, especially in several specific sectors. The Russia–Ukraine war has facilitated the escalation of protectionism against Russia, and the EU and Western partners have introduced a set of sanctions on the import of goods from Russia, but also on EU exports to Russia. This analysis aims to research in detail the characteristics of the global value chains (GVCs) of the EU and Russia, focusing on their interconnections. Russia is a resource-rich country whose exports are mainly based on resources and resource-related products. Therefore, forward participation in global value chains dominates, being 4.5 times higher than backward participation. In the EU and its member states, backward participation dominates, implying a high level of dependence of the production process in the EU on import of intermediates (i.e., production inputs) from abroad. The analysis indicates a high share of value added from Russia in the sector “mining and quarrying, energy producing products” in the EU final demand where almost one-fifth of foreign value added pertains to products from Russia. On the other hand, the sectors of electrical equipment, pharmaceuticals, chemical products and construction in Russia rely on value added imported from the EU.

**Keywords:** global value chains; trade; EU; Russia

**JEL Classification:** F13; F51



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## 1. Introduction

The development of global value chains (GVCs) was facilitated by the process of trade liberalization, higher level of openness to foreign investment and the widening of MNC activities and businesses. The process seemed to be endless until the 2010s when internationalization faced stagnation with a slowdown and oscillation in global trade and investment growth. The setback was aggravated by the COVID-19 pandemic in 2020 and 2021, followed by the Russia–Ukraine war (beginning in 2022).

In normal circumstances, the production process that depends on foreign inputs and/or produces intermediates for foreign partners is well established and takes place without any difficulties or delays. It includes many stages and partners located in different places both within a country and anywhere abroad. Different factors can influence the choice of location, such as: availability and/or costs of resources, vicinity to the final (consumer) market; technology development, etc. The COVID-19 pandemic temporarily closed borders and prevented the transport of goods between (and even within) countries. GVC activities slowed down, and the new challenges brought to light some new solutions for their future development. The nearshoring strategy, resilience and management of GVCs have been the most important issues in the last few years.

The situation was further complicated by the war between Russia and Ukraine which disrupted GVCs between the EU and those countries. Several key points need to be considered and discussed. The EU and its Western partners have imposed trade restrictions on imports from Russia to prevent it from continuing the aggression (by reducing its

earnings). This includes 10 packages that cover a large scope of products<sup>1</sup>. However, this is not the first time the relations with Russia have been strained. In fact, a similar situation happened in 2014 after the annexation of Crimea. These new protectionist measures are numerous and cover most of the trade. On the other hand, the EU is heavily dependent on energy imports from Russia. The EU imports over a third of its gas from Russia, making it the largest single supplier of gas. Russia and the EU also have close ties in oil trading, with Russia supplying crude oil to several EU countries. The energy relationship between the EU and Russia has been impacted by political tensions in recent years, and the EU has been trying to diversify its energy sources by reducing its dependence on Russia. By imposing trade bans, the EU planned to reduce its reliance on Russian gas by two-thirds by the end of 2022 as well as becoming independent of Russian fossil fuels by 2030. More recently, the EU has completely banned the import of seaborne crude oil (since December 2022) and other refined petroleum products (since February 2023) from Russia (European Council 2023).

After the escalation of protectionist measures, trade between the EU and Russia has changed in size and pattern. The value of imports from Russia fell by 82% from February 2022 to March 2023 (Eurostat 2023). The Russian share in the EU's extra-EU imports fell from 9.5 to 4.3% (between February and December 2023) and the Russian share in the EU's extra-EU exports dropped from 4 to 2%.

Most of the information about the effects of the sanctions is related to energy issues in terms of trade reorientation, reduction of energy use (during the winter 2022/2023) and price increases. In November 2022, Russia's share of EU gas imports was only 12.9%, whereas a year before it was above 40% (Eurostat 2023). This situation is accompanied by the growing importance of other suppliers: Norway, Algeria, LNG imports (from the US, Qatar and Nigeria). In 2022, consumer electricity prices were 35% higher than in 2021.

The area that remains uncovered or underexplored in published research is the EU–Russia interdependence in terms of participation in global value chains, i.e., the relevance of inputs from Russia for the production process in the EU and vice versa.

The aim of this paper is to analyse Russian involvement in the GVCs and the importance of the EU for production chains in Russia, and the importance of Russia for production chains in the EU. The source of data is the OECD database (i.e., international input–output tables), and the statistical analysis is based on secondary data. This analysis covers the very topical issue of Russia–EU interrelations. The novelty rests in providing a comparison between them and highlighting the differences in the scope and structure of GVC participation. Furthermore, the mutual importance of the EU and Russia in the production of selected sectors is investigated.

The contribution of this paper is in comparing GVC participation of the EU and Russia over a 20-year period and highlighting the differences between them. Additionally, we will focus on the characteristics of bilateral value chains. Especially important is the part of research focused on energy and mining, due to the EU's high level of dependency on imports from Russia.

Due to its abundance of resources, Russia's participation in GVCs is characterised by forward linkages, whereas in the EU (and its member states) backward participation dominates, implying a high dependence of the production process in the EU on the import of intermediates (i.e., production inputs) from abroad. The analysis indicates a high share of value added from Russia in the sector "mining and quarrying, energy producing products" in the EU final demand, while a very high share of EU value added in Russian final demand is in the sectors "electricity, gas, steam and air conditioning supply" and "transport equipment".

The paper is structured as follows: Section 2 presents an overview of researches related to GVC participation (focus on Russia); Section 3 presents an analysis of the trade and trade policy between the EU and Russia; Section 4 presents a research of the characteristics of GVC participation for Russia and the EU; and Section 5 offers the conclusion and policy recommendations.

## 2. Literature Review

GVC participation depends on the trade policy and trade relations of a particular country. In this part, the literature review starts with short notes about Russian trade policy, trade partners, trade structure and the specificities of participation in production chains. There will also be a review of the possible effects of trade sanctions imposed against Russia on its trade and GVC participation.

The important determinant of the trade policy is membership in the World Trade Organization (WTO). While the EU is one of the founders of the WTO (the EEC previously participated in the General Agreement on Tariffs and Trade, GATT) in 1995, Russia became a WTO member state relatively late, in 2012, and Tajoli (2022) highlighted very limited influence of WTO membership on Russian trade and GDP growth (in comparison with China). Fojtková et al. (2022) emphasized that Russia is the largest country in the world, with many mineral resources and materials; as such, the openness of its economy is lower than that of small open economies. Its export is highly focused on five partners: China, the Netherlands, Germany, Belarus and Turkey, while its most important partners in terms of imports are: China, Germany, Belarus, the US and Italy. Tajoli (2022) gives a comprehensive overview of Russia's position in world trade before and after the war with Ukraine. She points out the dominance of fuels, oil and gas in Russian trade. The second characteristic is low participation in global value chains (mainly in forward linkages).

Vladimir (2019) provided a quantitative assessment of participation in GVCs for EU member states and Russia. He applied the data from the World Input–Output Database (WIOD) and discussed the terms of Trade in Value Added (TiVA) and key GVC indicators. He established that the level of the EU's GVC participation ranges between 20 and 25%, which he defined as optimal. For the resource-based economies, this range should be higher. Russia should exploit its possibilities of including mineral and raw material resources in GVCs in the interest of all the participants.

Sidorova (2018) analyzed Russia's participation in GVCs using WIOD and TiVA databases. She warns that Russia is one of the world's major energy suppliers and that the priorities of its industrial and economic policy must be reconsidered. She emphasizes that it is necessary to push the micro-level (Russian companies) inclusion in GVCs, not only at the lower level (resources), but also moving upward the GVC by taking part in the upper level (R&D, marketing, etc.). Russia's main energy companies are an important part of European GVCs; however, these interconnections are affected by vulnerabilities.

Fojtková et al. (2022) analyzed Russian participation in GVCs in 2009 and 2015, pointing out the dominance of forward linkages and low participation in GVCs. Chernova et al. (2018) and Volgina (2018) pointed out that Russia is a specific country because it supplies other countries with energy and minerals as intermediates that other countries use in their production processes. What is important, as Volgina (2018) calculated, is that focusing highly on one sector does not mean any loss for Russia. She developed a model to measure the gains from trade in value added<sup>2</sup> and found that Russia recorded net gains for the period 2005–2015.

Regarding the specific sectors, Tajoli (2022) analyzed the EU's energy dependence on imports from Russia (imports from Russia represent 29% of total crude oil import; 43% of natural gas imports and 54% of solid fossil fuel imports), but also pointed out the importance of EU and UK markets for Russian energy exports (these represent 63% of Russia's fossil fuels exports). Similarly, Winkler et al. (2022) researched the impact of war on global value chains and pointed out the situation with Russian exports and imports in specific sectors, such as energy, metal products, transport and business services (as seller), and of electronics, transport equipment, and business services (as buyer). The impact on the other countries depends on the substitutability of inputs from Russia. Some of Russia's key export products (e.g., rare metals) are difficult to replace in the short run, suggesting a severe impact on GVCs. "Power relations also matter, with certain GVCs consisting of many competing suppliers globally (e.g., apparel), while in others global suppliers have large market power (e.g., semiconductors)" (p. 60) Regarding the energy sector, Bulgaria,

Lithuania and Finland had the highest share of imports of energy from Russia in their total imports from Russia.

KSE (2022) highlights the high exposure of some sectors in Russia: manufacturing of transportation equipment, chemicals, food products and IT services due to a high share of imports from the EU. The EU's embargo on Russian petroleum products in 2023 will be more complex and more disruptive than the measures implemented in 2022. Milov (2022) also pointed out "instruments like 'import substitution' and 'pivot to Asia' are only working to a very limited extent and have no capacity to substitute the extent of de-globalization of Russia inflicted by the Western sanctions".

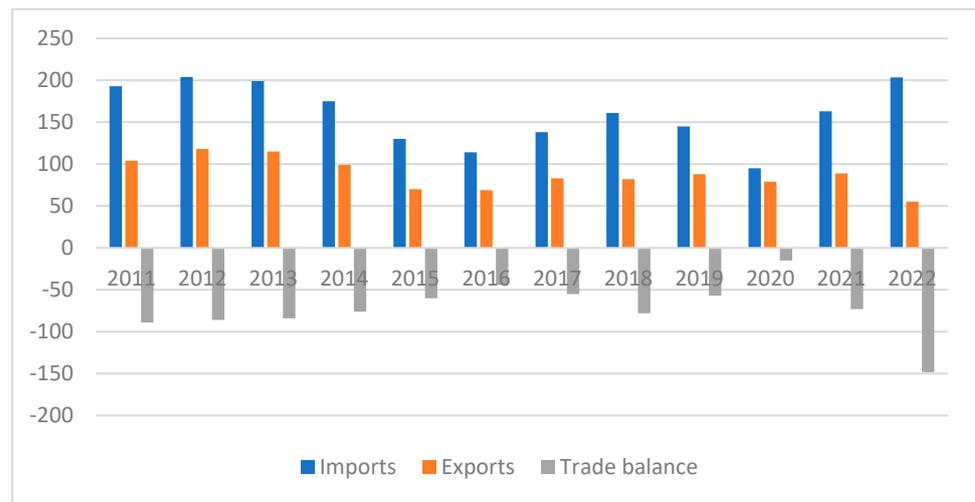
As a consequence of the trade sanctions imposed against export to and import from Russia, Felbermayr et al. (2023) researched the implications of possible decoupling of value chains between the East and the West. They applied the general equilibrium trade model calibrated with the latest version of the GTAP database and found that the doubling of import tariffs will result in the elimination of bilateral import. Import values will increase due to the changes in price levels in imposing countries, whereas export values will decrease. The result will be a loss of welfare for all countries involved. They also pay special attention to Russia and warn that the trade war with Russia will damage the Russian economy because of its small relative economic size. Based on the energy sector (which constitutes a large proportion of Russian exports), they calculated that bilateral exports from Russia to the EU, the US and its allies have decreased by almost 57%. However, Russia will compensate for a part of its exports to the West by reorienting to other trade partners (China). Simachev et al. (2020) analyzed the interconnections between Russia and the Baltic states. The focus is on studying the factors in the transformation of the Baltic–Russia GVCs amid COVID-19. They pointed out that regionalization (driven by individual companies, regional (local) governments, and Russia–Baltic cross-border co-operation initiatives) should be a viable prospect for the transformation of global value chains in Russia and the Baltics. From this review we found a very small number of papers related to research of some aspects of GVC participation. We established that the area of GVC involvement and EU–Russia bilateral interdependence is an unexplored area.

### 3. Trade Relations between the EU and Russia

Before focusing on the participation in GVCs only, it would be useful to study the value and structure of bilateral trade between the EU and Russia.

Russia was EU's fifth-largest trade partner for extra-EU exports and third for extra-EU imports. However, the situation has significantly changed since February 2022. i.e., Russia's share in extra-EU exports fell from 4.0% in February 2022 to 1.8% in March 2023 and the share of extra-EU imports from Russia fell from 9.5% to 1.9%. EU had a deficit in trade with Russia (Figure 1) during the decade of 2013–2022, being at its lowest in 2020 (EUR 16 bn) and increasing in 2022 (EUR 148 bn) due to the sharp energy-price increase.

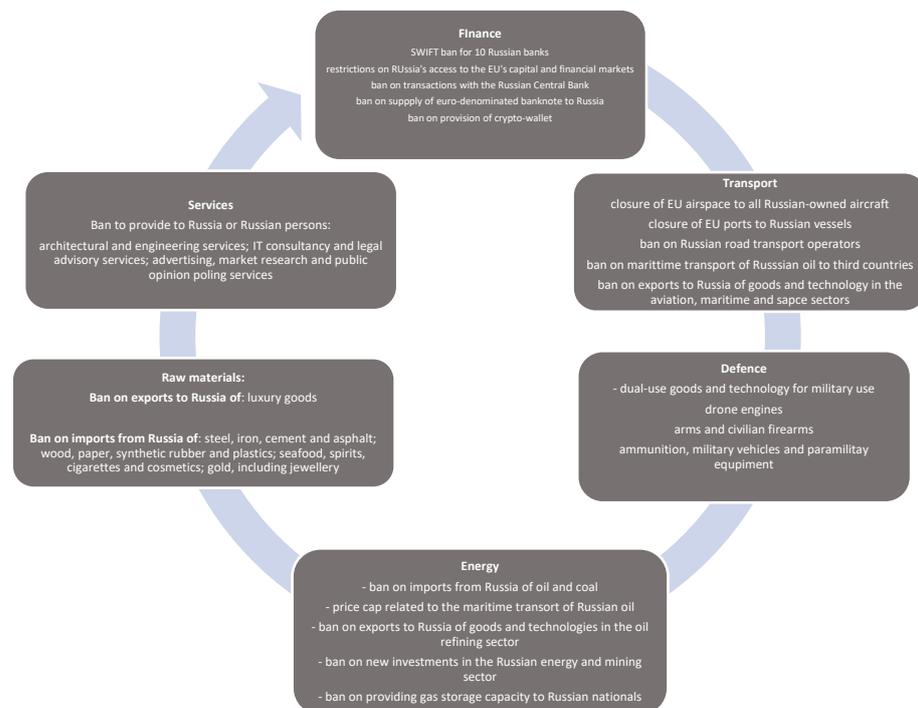
Russia was one of the EU's most important suppliers of coal, gas and especially oil, i.e., almost half of the EU fuel imports and three-quarters of its crude oil imports came from Russia in 2020 (European Parliamentary Research Service 2022). In 2021, the EU imported energy from Russia at a value of EUR 99 bn (representing 62% of EU imports from Russia), but this had a decreasing trend (i.e., in 2012, imports were EUR 157 bn) (WEF 2022). In the first quarter of 2023, in comparison with the same period of 2021, the share of Russia in imports of specific products sharply declined—the highest drop was recorded for coal, from 45% in 2022 to almost zero in 2023; there were also drops for petroleum oil (−25 percentage points, pp), fertilizers (−23 pp), nickel (−20 pp), natural gas (−16 pp) and iron & steel (−8 pp) (Eurostat 2023).



**Figure 1.** EU trade in goods with Russia 2013–2022 in EUR bn. Source: Eurostat (2023) and Eurostat (2022).

The trade policy between the EU and Russia was determined by the Partnership and Cooperation Agreement between the EU and Russia that was in force from 2012. The economic relations between Russia and the EU were hindered by the restrictions from 2014 (Russian annexation of Crimea), worsening after the Russia–Ukraine war started in 2022.

Since the beginning of the Russian invasion on Ukraine (February 2022), the European Commission has applied trade restriction measures in the form of import and export bans on two countries (Russia and Belarus) under the common foreign and security policy (Figure 2). In September 2022, Russia cut off most of the natural gas flows to Europe, Russia’s largest customer. On the other hand, the EU imposed a ban on most Russian oil imports, as well as a price cap on Russian oil.



**Figure 2.** EU’s economic sanctions against Russia, February 2022–June 2023. Source: European Council (2023).

A detailed list of implemented measures within a time framework is provided by the [European Council \(2023\)](#) and in Table 1, while their main features are presented in Table 2.

**Table 1.** EU sanctions against Russia-timeline, values, coverage (after 10th packages of sanctions).

	<b>Import from Russia-Bans on</b>	<b>Export to Russia-Bans on</b>	<b>Other-Bans on</b>
1st package, 23 February 2022			<ul style="list-style-type: none"> <li>– Targeted sanctions against the 351 members of the Russian State Duma and an additional 27 individuals</li> <li>– Restrictions on economic relations with the non-government-controlled areas of Donetsk and Luhansk oblasts</li> <li>– restrictions on Russia’s access to the EU’s capital and financial markets and services</li> </ul>
2nd package, 25 February 2022			<ul style="list-style-type: none"> <li>– Freeze the assets of Vladimir Putin, President of the Russian Federation, and of Sergey Lavrov, Minister for Foreign Affairs of the Russian Federation.</li> <li>– Restrictive measures imposed on the members of the National Security Council of the Russian Federation and on the remaining members of the Russian State Duma who supported Russia’s immediate recognition of the self-proclaimed Donetsk and Luhansk “republics”.</li> </ul>
3rd package, 28 February 2022			<ul style="list-style-type: none"> <li>– A ban on transactions with the Russian Central Bank</li> <li>– The EU has excluded seven Russian banks from SWIFT.</li> <li>– €500 million support package to finance equipment and supplies to the Ukrainian armed forces</li> <li>– A ban on the overflight of EU airspace and on access to EU airports by Russian carriers</li> <li>– New sanctions on an additional 26 persons and one entity</li> <li>– The EU has also introduced a ban on: <ul style="list-style-type: none"> <li>– Investing, participating or otherwise contributing to future projects co-financed by the Russian Direct Investment Fund</li> <li>– Selling, supplying, transferring or exporting Euro banknotes to Russia or to any natural or legal person or entity in Russia</li> </ul> </li> </ul>
4th package, 15 March 2022			<p>Ban on:</p> <ul style="list-style-type: none"> <li>– All transactions with certain state-owned enterprises</li> <li>– The provision of credit rating services to any Russian person or entity</li> <li>– New investments in the Russian energy sector</li> <li>– Trade restrictions for iron, steel and luxury goods</li> <li>– Sanctions on an additional 15 individuals and 9 entities</li> </ul>
5th package, 8 May 2022	Coal and other solid fossil fuels other goods such as wood, cement, seafood and liquor	Jet fuel and other goods	<p>Ban on:</p> <ul style="list-style-type: none"> <li>– All Russian vessels from accessing EU ports</li> <li>– Russian and Belarusian road transport operators from entering the EU</li> <li>– Deposits to crypto-wallets</li> </ul>

Table 1. Cont.

	Import from Russia-Bans on	Export to Russia-Bans on	Other-Bans on
6th package, 30-31 May 2022	Crude oil, petroleum products, delivered from Russia to member states. A temporary exception for crude oil delivered by pipeline will be introduced.		<ul style="list-style-type: none"> <li>– A SWIFT ban for an additional three Russian banks and one Belarusian bank</li> <li>– Suspension of broadcasting in the EU for three more Russian state-owned outlets</li> </ul>
7th package (“Maintenance and alignment” package), 21 July 2022		<ul style="list-style-type: none"> <li>– Reinforces export controls of dual use goods</li> </ul>	<ul style="list-style-type: none"> <li>– A new prohibition introduced on purchase, import or transfer of Russian-origin gold, including jewelry</li> <li>– Extends the existing port access ban to locks</li> <li>– Clarifies existing measures, for instance in the field of public procurement, aviation and justice</li> <li>– Sanctions an additional individuals and entities.</li> </ul>
8th package			<ul style="list-style-type: none"> <li>– Price cap related to the maritime transport of Russian oil for third countries</li> <li>– Additions to the list of restricted items which may contribute to Russia’s military and technological enhancement</li> <li>– Additional restrictions on trade and services with Russia</li> <li>– An additional 30 individuals and 7 entities</li> </ul>
9th package		Drone engines dual-use goods and technology	<ul style="list-style-type: none"> <li>– Investments in the mining sector</li> <li>– Transactions with the Russian Regional Development Bank</li> <li>– The provision of advertising, market research and public opinion polling services</li> </ul>
10th package	Asphalt and synthetic rubber	Critical technology and industrial goods	<ul style="list-style-type: none"> <li>– Provision of gas storage capacity to Russians</li> <li>– Transit through Russia of EU exported dual use goods and technology</li> </ul>

Source: [European Council \(2023\)](https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/history-restrictive-measures-against-russia-over-ukraine/), Timeline-EU restrictive measures against Russia over Ukraine, <https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/history-restrictive-measures-against-russia-over-ukraine/> (accessed on 7 February 2023).

Table 2. EU sanctions against Russia—values and coverage (after the 10th package of sanctions).

	Bans on Import from Russia	Bans on Export to Russia
Value in EUR bn	91.2	43.9
Share of total (%)	58	49
Products	Oil, coal, gold, steel, cement, rubber, vodka and caviar	Microchips, drones, trucks, chemicals, radio systems and banknotes
		Prohibition of export of luxury products worth more than EUR 300 each

Source: [Euronews \(2023\)](https://www.euronews.com).

EU’s sanctions against Russia include:

- Sanctions against individuals and entities—assets freeze/travel ban
- Economic sanctions: finance, transport, energy, defence, raw materials, services
- Restrictions on media ([European Council 2023](https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/)).

[Euronews \(2023\)](https://www.euronews.com) warns that key Russian products such as gas, uranium and diamonds have remained intact. The latest measures (early 2023) included the price cap for petroleum

products: traded at a discount to crude oil, it is set at USD 45 per barrel; traded at a premium to crude, it is set at USD 100 per barrel (European Council 2023).

The first impact of trade sanctions is on the price of imported energy. As a result, in 2022, consumer electricity prices were 35% higher than in 2021. The EU responded with three main measures: (1) reducing electricity use by 10%; (2) capping revenues of electricity suppliers to 180 EUR per MWh and (3) securing a solidarity contribution from fossil fuel businesses (profit increase by more than 20%). (European Council 2023). The increase in food prices is also important because a quarter of the global wheat supply came from Russia and Ukraine.

## 4. Research

### 4.1. Methodology and Data

The complexity of global value chains, its coverage and specificities are presented by Gereffi and Fernandez-Stark (2011), Tagliani and Winkler (2016) and Hernández and Pedersen (2017). The World Bank (2020) also focused on GVCs, pointing out that they account for almost half of all trade, peaking at the value of 52% of global trade. They are at a crossroads now due to many reasons: global growth and investments have slowed down, while the push toward international trade liberalization is stalled, etc.

To evaluate the countries' /sectors' participation in GVCs, it is necessary to distinguish between domestic value added, contained in the export of a particular country/sector, and the foreign value added (FVA) share of the export. GVC participation is measured by backward (share of foreign value added in exports) and forward linkages (the share of domestic value added in foreign exports). The sum of backward and forward participations equals the participation of a country/sector in the GVC (Koopman et al. 2010; Stephenson 2013; Javorsek and Camacho 2015; Borin and Mancini 2019)<sup>3</sup>.

The calculation of trade in value added and the participation of European countries in GVCs is broadly recognized in literature (Leitner and Stehrer 2014; Amador et al. 2015; Cieřlik et al. 2016; Timmer et al. 2016).

OECD (2013a) pointed out that the highest level of value creation in a GVC is often found in upstream activities such as new concept development, R&D or the manufacture of key parts and components, and in downstream activities such as marketing, branding or customer service. It found that a larger stock of knowledge-based capital stimulates larger value added in exports, but it also found that the coefficient for economic competencies appears to be the largest and most significant among all three subgroups. Countries with higher investments in R&D and rich with knowledge-based capital can be expected to achieve significantly more value added in industries with high knowledge intensity than in those with low knowledge intensity and consequently high GVC participation.

In this analysis, we will employ data from OECD (2021)—Trade in Value-Added database.

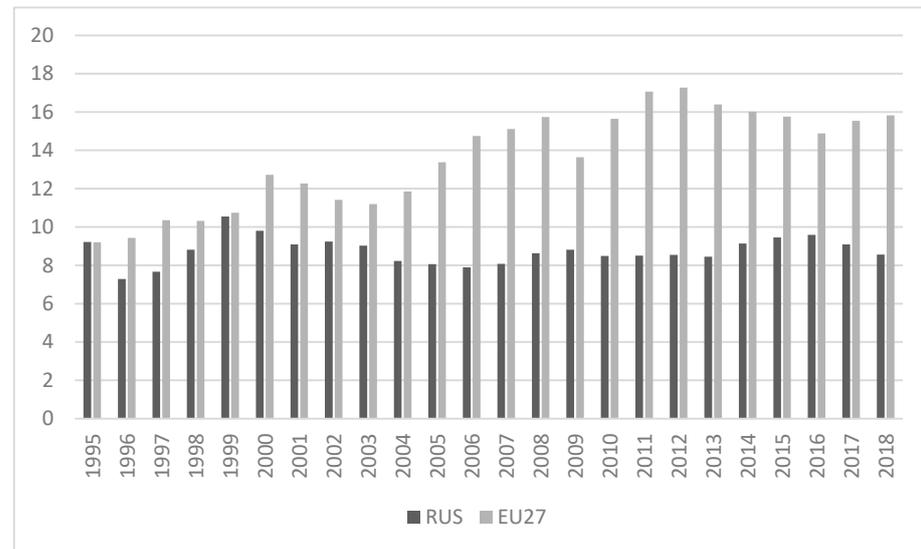
The focus is on the calculation of GVC participation—at the total as well as sector level. The selected sectors are energy and mining.

OECD (2013b) pointed out that Russian participation in GVCs in 2009 was characterized by downstream links (forward participation) due to a high level of exports of natural resources to other countries<sup>4</sup>. The mining sector has a higher GVC participation index: 75% of domestic demand came from domestic sources and only 25% from foreign sources. According to WTO (2022) data, the FVA share in exports was 8.5% in 2010 and 8.6% in 2018 indicating the unchanged shares of foreign value added. In 2018, the GVC participation index was 45.6 for Russia where forward participation contributes with 37.1% and backward with 8.6%. It is quite different from Europe and Asia where backward participation is higher than forward. Europe has the highest level of GVC participation of 48.8%.

### 4.2. Results

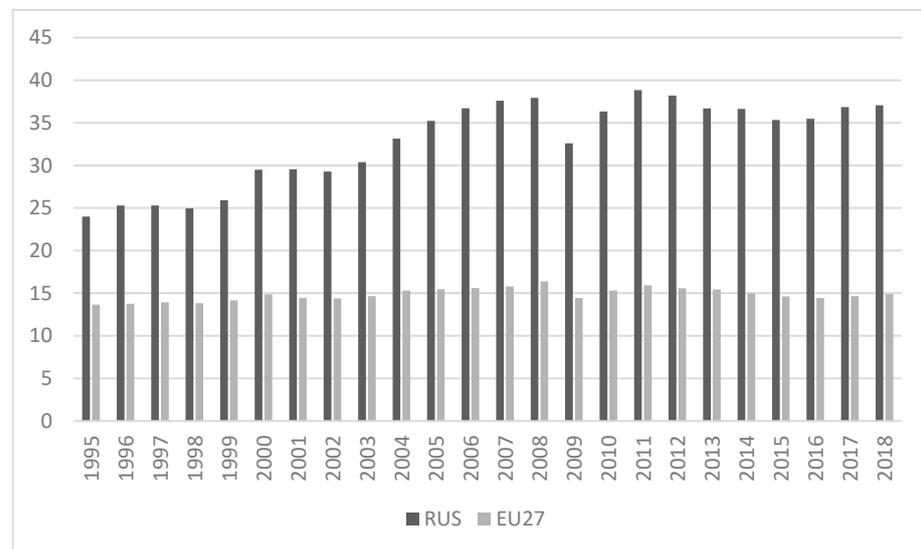
Figure 3 shows that Russia and the EU27 had the same level of backward participation in 1995, which then started to increase in the EU, while backward participation in Russia

grew until 1999 and then started to decline until 2005, after which its value ranged between 8 and 10%.



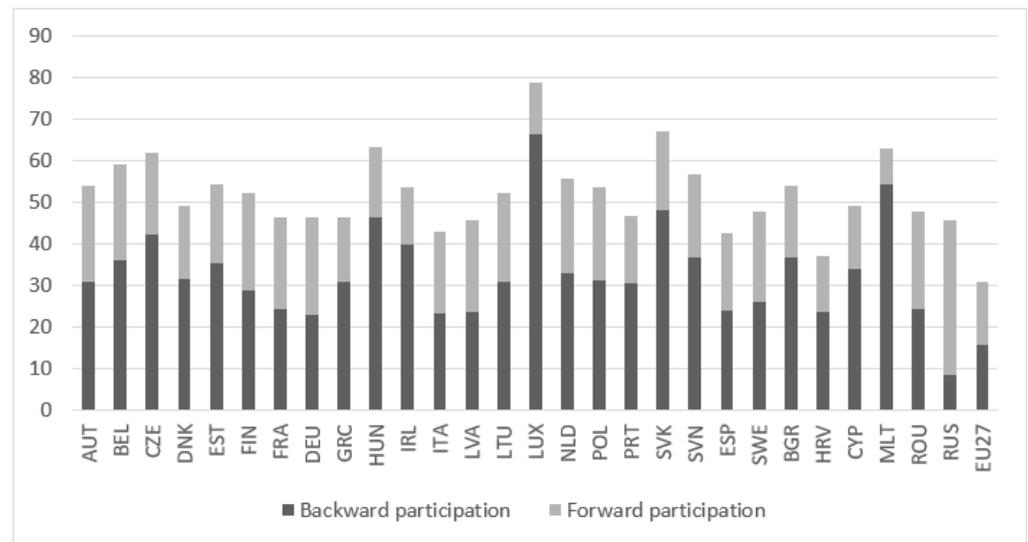
**Figure 3.** Backward participation in GVCs from 1995 to 2018 (partner-world). Source: OECD (2021).

According to Figure 4, forward participation dominated in Russia: it increased from 24% to 37% (in 2007), after which it varied from 32.6 to 37.1%. Forward participation for the EU27 is at the level of 15%. Since the EU27 covers only non-EU trade, it is important to provide a detailed analysis of the participation of EU member states in GVCs.



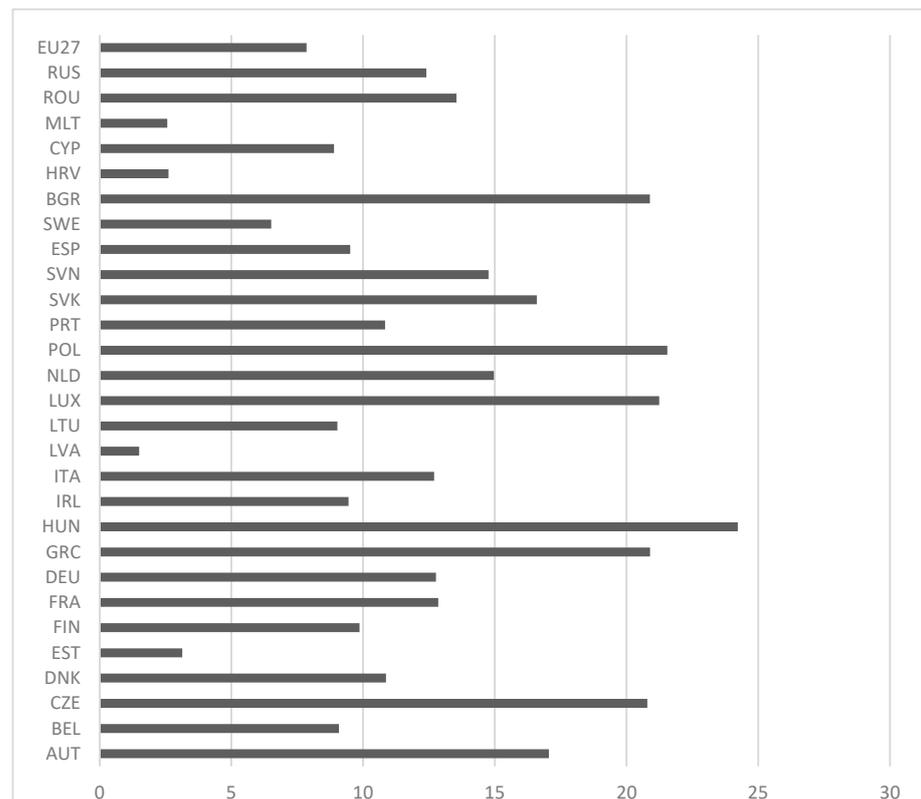
**Figure 4.** Forward participation in GVCs from 1995 to 2018 (partner-world). Source: OECD (2021).

Figure 5 indicates GVC participation of the EU member states where the index varies from 37 (in Croatia) to 78.6 (in Luxembourg). Backward linkages dominated in almost all of the EU member states, except in Germany (backward 22.9 and forward participation 23.4). In Russia, forward participation dominated and total GVC participation was 45.6. The EU27 had a lower GVC participation because it only takes into consideration external EU trade and not intra-EU trade. The average participation of EU member states is 52.8%.



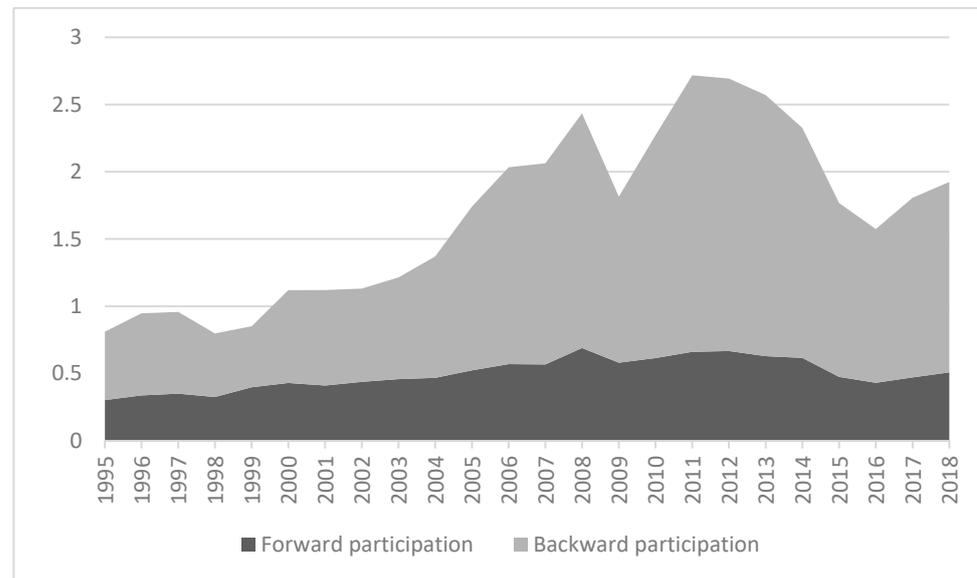
**Figure 5.** GVC participation of EU member states, Russia and the EU27 in 2018. Countries: AUT = Austria; BEL = Belgium; CZE = Czech R.; EST = Estonia, FIN = Finland; FRA = France; DEU = Germany; GRC = Greece; HUN = Hungary; IRL = Ireland; ITA = Italia; LVA = Latvia; LTU = Lithuania; LUX = Luxembourg; NLD = Netherlands; POL = Poland; PRT = Portugal; SVK = Slovakia; ESP = Spain; SWE = Sweden; BGR = Bulgaria; HRV = Croatia; CYP = Cyprus; MLT = Malta; ROU = Romania, RUS = Russia. Source: [OECD \(2021\)](#).

All countries have increased their participation in GVC from 1995 to 2018 (Figure 6). Hungary, Poland, Luxembourg, Bulgaria, Czech Republic and Greece have increased their GVC participation by more than 20 pp, while the increase was lowest in Latvia, Malta, Estonia and Croatia—below 5 pp. Russia increased GVC participation by 12.4 pp.

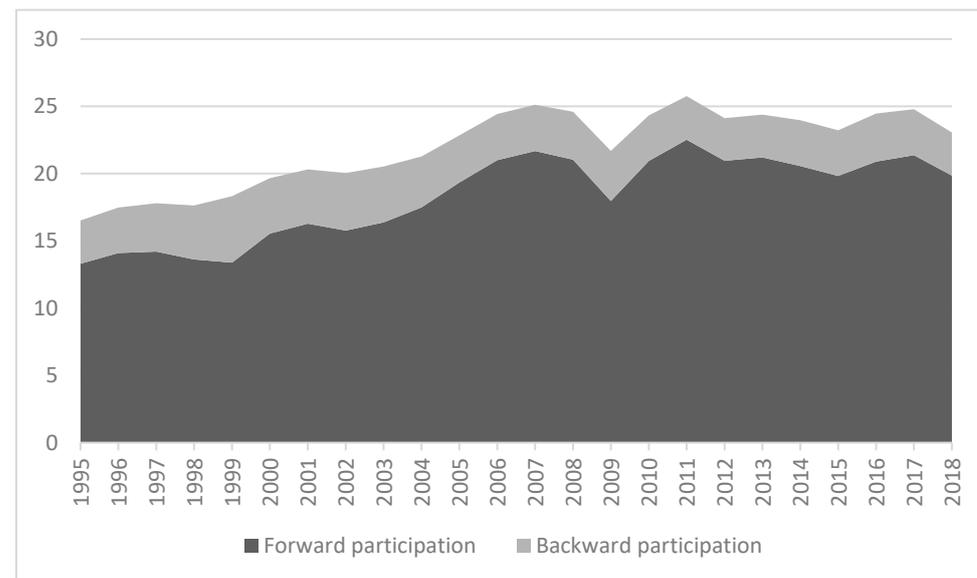


**Figure 6.** Difference in GVC participation in 2018 compared to 1995 (in pp). Source: [OECD \(2021\)](#).

If we focus our analysis on GVC linkages only between the EU and Russia, we derive the results shown in Figures 7 and 8.



**Figure 7.** GVC participation of the EU—partner Russia. Source: [OECD \(2021\)](#).



**Figure 8.** GVC participation of Russia - partner EU27. Source: [OECD \(2021\)](#).

Total participation in the value chain with Russia is very low for the EU—less than 3%, with dominant backward participation, meaning imports of VA from Russia, imports of production inputs, intermediates, resources, etc.

Figure 8 highlights the domination of forward participation of the Russian economy in production chains with the EU27, i.e., Russia exports a lot of intermediates and resources to the EU. The level of participation in the value chain is higher for Russia (about 25%) than for the EU (below 3%).

In the bilateral trade of the EU with Russia, it is important to analyze the interconnections in sectors such as energy and mining due to the high EU dependency on imports from Russia (before sanctions against Russia were imposed), but also, on the other hand,

the sectors such as transport equipment and computers and electronics where the Russian production process depends on imports from the EU (Table 3).

**Table 3.** Foreign value added in domestic final demand, partner shares—selected sectors.

	1995	2000	2005	2010	2015	2018
Share of the FVA from the EU in the FVA of Russian final demand						
<b>Agriculture, hunting, forestry and fishing</b>	24.7	19.6	16.4	16.8	10.3	10.4
<b>Manufacturing</b>	33.3	45.9	42.2	39.2	32.9	34.5
Computer, electronic and electrical devices	23.2	47.4	42.9	31.7	23.0	23.7
Transport equipment	34.7	45.6	27.5	38.7	32.4	39.2
Electricity, gas, steam and air conditioning supply	35.3	39.5	41.4	43.9	33.3	33.1
<b>Mining and quarrying, energy producing products</b>	8.0	7.8	7.1	4.7	4.5	2.5
Share of FVA from Russia in the FVA of the EU final demand						
<b>Agriculture, hunting, forestry and fishing</b>	0.6	1.7	1.9	1.4	1.5	1.7
<b>Manufacturing</b>	4.4	4.0	6.6	7.1	5.0	5.1
Computer, electronic and electrical devices	0.8	0.4	0.7	0.8	0.8	0.6
Transport equipment	1.3	0.8	1.1	1.8	2.5	1.9
Electricity, gas, steam and air conditioning supply	13.9	11.9	15.5	17.1	11.6	11.0
<b>Mining and quarrying, energy producing products</b>	10.5	11.5	15.1	14.9	17.2	19.9

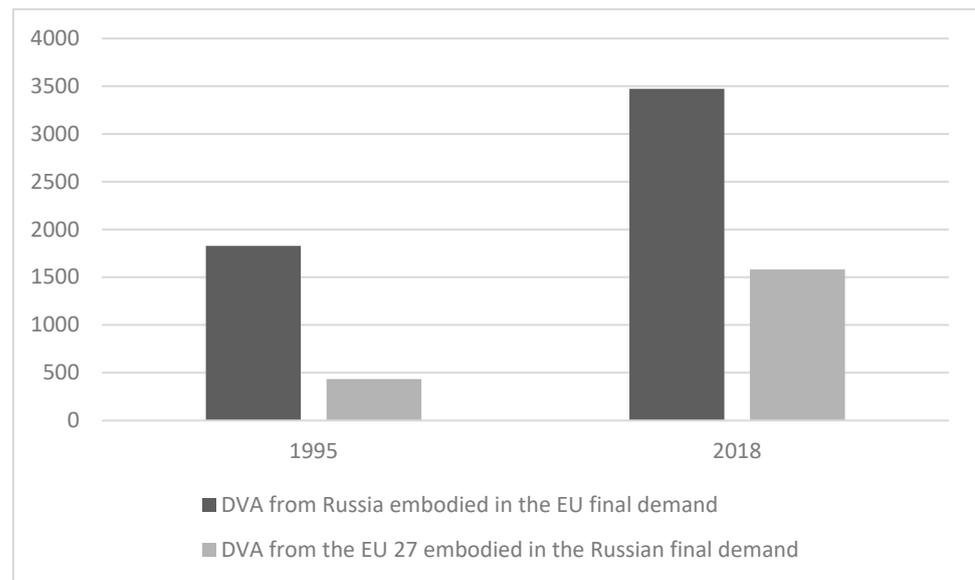
Source: OECD (2021).

The analysis covers the indicator—share of FVA in domestic final demand.

By analysing the share of the FVA from the EU in the total FVA in Russian final demand, very high shares of the EU in analysed sectors are evident (except the mining sector)—the EU had the highest share in “transport equipment” and “electricity, gas, steam and air conditioning supply” (more than 30% of FVA came from the EU). Shares of FVA from the EU in total FVA in Russian final demand in the sector “electricity, gas, steam and air conditioning supply” ranged between 33.1 (in 2018) and 41.4 (in 2005) indicating that more than one-third of FVA in that sector came from the EU. On the other hand, the share of Russian value added in total FVA of the EU ranged between 11 (2018) and 17.1% (2010), i.e., it had a declining trend.

In the sector “mining and quarrying, energy producing products” the share of foreign value added that came from the EU into Russia, in the total FVA of the particular sector, decreased from 8% in 1995 to 2.5% in 2018. The opposite trend appeared for FVA from Russia in the total FVA in the EU final demand—the share ranged between 10.5 (1995) and 19.9% (2020) indicating that one-fifth of the FVA in that sector originates from the Russian economy. In the first half of 2022, Russia benefited from growing prices of fossil fuels on the global market. However, due to the imposed sanctions against import from Russia, targeting oil imports (that came into force in December 2022), Russia’s revenues dropped, according to the International Energy Agency, in January 2023 (compared to January 2022) by over a quarter, and in February 2023 the drop was even more significant (more than 40%). The International Monetary Fund predicts that Russia’s economy could grow by 0.7% in 2023 mainly owing to the export of oil—Russia is exporting 8.3 million barrels of oil a day—the highest level since April 2020 (BBC 2023). The biggest importers are India and China.

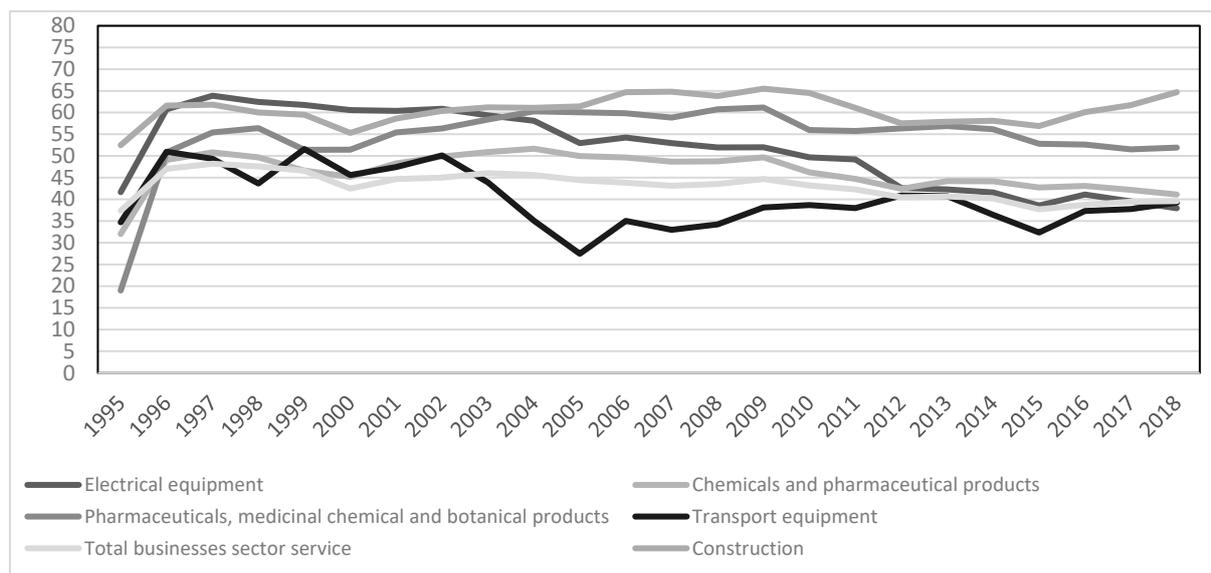
To exemplify this, despite the small share of Russian value added in total FVA in the EU final demand (sector “electricity, gas, steam and air conditioning supply”)—Figure 9, the value of Russian FVA in the EU final demand is several times higher than the EU value added in the FVA in Russian final demand. Two years are presented for comparison—1995 and 2018 (Figure 9).



**Figure 9.** Domestic value added embodied in foreign final demand-electricity, gas, steam and air conditioning supply. Source: [OECD \(2021\)](#).

On the other hand, there are specific sectors where the EU had a high share of FVA in final demand.

Figure 10 shows the sectors (electrical equipment; pharmaceutical, medicinal chemical and botanical products; chemicals and pharmaceutical products, transport equipment, total business services and construction) that saw (in the entire period) a high share of FVA from the EU in final demand. The VA from the EU, in 2018, represents more than 60% of total FVA in construction; this is followed by pharmaceuticals, medicinal chemical and botanical products (51%). Transport equipment and total business services from the EU represent approximately 40% of the total FVA in Russian final demand. The highlighted sectors were highly dependent on imports from the EU. The imposed sanctions reduced or prevented imports from the EU, but the Russian economy did not face the expected negative consequences. Russia has reoriented its trade to the countries that did not limit the trade with Russia, i.e., the trade with China has increased by 23% annually on average in the last five years (except the pandemic years) and 27% since the invasion of Ukraine started. Trade with India, an important market for oil exports, has increased by 250% since 2021. On the other hand, from March 2022 to March 2023, Turkey increased electronic exports to Russia by 85% and it has become Russia's most important supplier of sensitive products: integrated circuits and semiconductors ([Voanews 2023](#)). The G7 members exerted pressure on Turkey to stop shipping or transiting goods to Russia that are subject to sanctions or export controls and Turkey has agreed to halt its transit of sanctioned goods to Russia. Additionally, Russia's imports of high-tech goods from China, i.e., trucks, excavators, and vehicle parts, grew significantly in 2022. It also receives most of its electronics and semiconductors from Chinese companies, allowing it to bypass the imposed sanctions from the EU.



**Figure 10.** Foreign value added (from the EU) in domestic final demand. Source: [OECD \(2021\)](#).

## 5. Discussion and Policy Implications

Participation in global value chains could result in: export increases; a higher level of specialization; development of trade in tasks (not just in goods and services); and technology development and diffusion. Depending on their characteristics, countries can be positioned downstream or upstream in production chains.

The comparison of GVC participation of the EU and Russia highlighted the differences between them, which have arisen from the specificities of their economic structures. Russia is a resource-rich country whose exports are mainly based on resources and resource-related products. Therefore, forward participation in global value chains dominates; it is 4.5 times higher than backward participation. In the EU and its member states, backward participation dominates, implying a high dependence of the production process in the EU on import of intermediates (i.e., production inputs) from abroad. In the last 20 years, the EU has increased (almost doubled) its backward participation in GVCs while its forward participation stagnated by around 15%. At the same time, Russia has slightly decreased its backward participation but significantly increased its forward participation in GVCs. The results about GVC participation confirm the [Tajoli \(2022\)](#) findings, only with new data on trade added. This research indicates the changes in production value chains with Russia focusing more on the import of necessary electronic and high-technology components from China and Turkey. In addition, the EU's dependence on energy imports from Russia shows a decreasing trend.

The analysis indicates a high share of value added from Russia in the sector “mining and quarrying, energy producing products” in the EU final demand where almost 20% of foreign value added is covered by products from Russia. The opposite is true for the sectors “electricity, gas, steam and air conditioning supply” and “transport equipment” where the value added from the EU represents more than 30% of foreign value added in Russian final demand. There are also sectors in Russia, such as electrical equipment, pharmaceuticals, chemical products and construction, that depend on a high share of EU value added (around or above 50% of total FVA). This shows that Russian export still relies on resources (oil and gas) and underlines how dependent Russian production is on the export of high-tech intermediates.

The discussion on the obtained results is limited due to the aggregation of data available at the [OECD \(2021\)](#), making it impossible to disaggregate data and provide an analysis at the product level (for example focusing just on gas, or just on energy). This would greatly contribute to this analysis. The second limitation concerns the time period

for which data are available. The last year for which data are available (international input-output tables) is 2018, which is quite a long time ago considering the current circumstances. Despite these limitations, the obtained results and the circumstances of imposed sanctions against Russia have yielded several lessons/implications: the EU needs to find new sources (partners) for the import of goods that used to be imported from Russia until 2022 in order to maintain its level of production. There is a special issue of energy supply, where the EU is highly dependent on imports from Russia. It is certainly important to highlight the process of green transition (European Commission 2022), in which the EU aims to decouple the production process from the increase in resource use and through which it wants to become a climate-neutral continent by 2050. In this sense, investments in renewable energy sources and savings in energy use at the economy and household level are highly supported, and the support is continuously increasing.

However, Russia is only partially isolated and the impact of sanctions on its economy and trade will be partial because it has successfully turned to co-operation with countries that did not impose sanctions, primarily China, so it is expected that this will intensify trade with partner countries and also create value chains with producers from those countries. China is Russia's strategic trade partner (for gross exports and imports; and also for trade in value added). Their interrelationship is influenced by the economic interests of both countries as Fojtíková et al. (2022) point out. Even Vladimir (2019) stresses that Russia should increase participation in GVC and Sidorova (2018) indicates the necessity to move the GVC for Russia upwards; however, both suggestions will stay "on hold" considering the current situation.

The imposed sanctions are partially effective, albeit without major losses for the Russian economy. The Russian economy showed a high level of resilience and reorientation of trade to other partners. Therefore, it seems that the KSE (2022) projected disruption to the Russian petroleum products will not happen. Efficiency will be low as long as there are countries from which Russia can buy products that it previously imported from Western partners and as long as it has an export market secured. In order for Russia to experience the negative impact of the sanctions, the united action of the other countries is necessary. However, at the moment, this is not a certain scenario.

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## Notes

- <sup>1</sup> A detailed list of implemented measures under 10 packages is explained by the European Council (2023).
- <sup>2</sup> The measurement includes comparison of national shares in global exports with national DVA shares in global DVA. If the share of national exports in global exports is lower than the share of national DVA in global DVA, it means the country has clear gains from trade in value added.
- <sup>3</sup> The forward GVC participation is calculated as the ratio between domestic export of intermediates and the value of other countries' exports. Backward GVC participation is the ratio between imported intermediates from foreign countries and the value of domestic gross export (WTO 2021; OECD 2021; World Bank 2020). GVC participation is the sum of forward and backward participation.  $GVC\ participation = DVA/EXP + FVA/EXP$  (1), where DVA is the share of domestic value added (intermediate export) in foreign export, EXP is gross export, FVA is the share of foreign value added (intermediate import) in domestic exports. The data for DVA and FVA are taken from OECD (2013b, 2021) and GVC participation is calculated by the authors following the Formula (1).
- <sup>4</sup> Other countries intensively use Russian intermediates in their exports—forward participation.

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