



UNIVERSITAT
JAUME·I

Bachelor Thesis in Economics

Economic effects of the war in Ukraine. An international political economy approach

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Academic Year **2022/2023**

Abstract: This paper analyses selected effects of the war in Ukraine, presenting first an historical context of the relation between the two countries, how the conflict began, what possible reasons could have led this act of war and how Western countries responded by sanctioning Russia. The focus is put mainly on trade, food security, energy system, global supply chains and transports connectivity. Finding that even though Russia and Ukraine have a relatively small participation in global supply chains, they both source key raw-materials and goods that have put the value chains of several sectors in a very difficult position. Prices of commodities like oil and gas have increased significantly. Food security is a major concern, grains' prices have spiked affecting consumers directly, particularly on developing countries that rely on food imports from Ukraine. Inflation, shortages and geoeconomic fragmentation are among the conflict's consequences. Regarding transports and connectivity, the conflict has interrupted the normal flow of goods between Asia and Europe - obligating both sides to find alternatives routes- and Black Sea ports are now considered a "high risk area" increasing premium costs insurance on maritime transport.

Keywords: trade; food security; energy; global value chains; transports.

JEL Classification: F51, N70, Q02.

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1. Introduction

International trade is crucial for the development of a country. Globalization is the interconnectedness, integration and interdependence among countries and economies. It is based on the exchange of goods, services, capital, technology, and know-how across the globe. Its existence has permitted global supply chains to develop, which has allowed companies to optimize their production processes by accessing inputs from countries with comparative advantage and reducing costs. It has also allowed developing countries to access international markets and to turn its comparative advantages in sources of revenue.

An armed conflict disrupts the normal functioning of everything that globalization implies. Depending on the scale of the conflict more aspects will be affected. In the case of the war in Ukraine, since both Russia and Ukraine have important roles on the supply of several inputs and primary needs goods, it has had a direct effect on global geopolitics and international trade. Leading to changes in the trade of goods and services and its transports logistics, as well as investment, consumption, and economic development and worsening global economy.

The choice of the research line of this Bachelor Thesis has been based on the interest in the subject and its unquestionable economic relevance and topicality. The objective of this paper is to present an analysis of how the conflict has affected global trade, global value chains and transport connectivity. Given the topicality of the subject and the fact that the war has not finished, the analysis has its limitations. Many effects can manifest on the medium and long run, not only from the war itself but from the response countries have had to it. The access to statistical data is extremely limited, which has difficulted the developing of an econometric analysis, for this reason the geopolitical and economic analysis presented is mostly descriptive, but also aiming to develop an elaborated framework through which evaluate the effects of the Russian war in Ukraine.

2. Literature Review

Many studies have been done during 2022 with the objective to analyze and predict the effects of the Russian war against Ukraine. Some focus on the general effects, some on specific cases like food security, trade of essential commodities or on how it can affect regional and sectorial markets.

Several economies have been affected by the conflict in at least one of the three transmission channels of the crisis:

1. Rising food prices
2. Rising energy prices
3. Tightening financial conditions

Most economists agree on this statement and have made their own conclusions on how the war will affect the future of global economy, growth and particularly trade.

Prohovoros A. (2022) stated that the slowdown in business activity is due to its surge after two years of lockdown, which led to a shortage of energy, food and transport at the end of 2021, causing disruptions in world trade and accelerating inflation.

Consumption fell because life became more expensive and saving increased.

Investment decreased while lending rates rose with prices. Company profits all fell while uncertainty grew. All these problems existed before the war began and, the war and the consequent embargoes only exacerbated them. The fiscal measures to support households and businesses in Germany, for example, according to Prohovoros, compensated only for a small part of their losses. He also predicted that America and Europe will face a recession in 2022 and 2023 and that the energy war will cause the greatest damage to the European economy. In line with this idea, Sturm C. (2022) stated that the European Union has a strong dependency on energy imports from Russia which makes it extremely vulnerable to its disruptions supply. Sturm concludes her idea by affirming that it is necessary to take into consideration several aspects when partnering, a country's historical background and geographical location play an important role, and trade is not a solution to eliminate political and ideology differences.

K.A. Mottaleb et al. (2022) study the potential impacts of the war on wheat price, consumption, and calories intake. They report that the war has aggravated food security particularly in countries where the situation is already precarious, mainly because of the disruption of wheat production and export from Ukraine. Their conclusion is that, for the long-term, high reliance on imports for any commodity to meet food demand should be avoided since it is not a sustainable and reliable solution.

Ohran E. (2022) reports that global prices have skyrocketed as consequences of higher prices of commodities like natural gas and oil. As a response to the armed conflict, Western countries have decided to restrict Russia's access to financial markets and to freeze its gross international reserves, held overseas, to inhibit its ability to meet its financial obligations. Therefore, many international companies are leaving the

Russian market. Ohran believes that the war will disrupt supply chains through three channels:

- Trade routes between Europe and Asia will be disrupted as transit through Russia becomes harder.
- Air ties between Europe and Russia will be severely affected since the European Union decided to close their air space to Russian aircraft and cargo.
- Sea freight routes through the Black Sea will be cancelled due to Ukraine's decision to shut down commercial shipping from its ports and because the uncertainty and insecurity in the region.

Miller J. (2022) analyses how the war has shaken up global oil and gas trade, saying that the conflict and subsequent decision to block certain commodities from Russia have highlighted China's ability to set prices through monopsonic pricing power. China is nowadays paying less for gas imports from Russia than other competing countries, like India, and has been able to increase exports of energy and energy-related products.

According to Miller, from the Trade Data Monitor, the world is dividing itself in three poles:

- Asia: where intra-Asian trade is growing, and GDP is still growing fast.
- Europe-US: where most of the world's multinationals reside and GDP growth is lagging.
- Latin-America and Africa: still rich in resources but struggling against poverty and other structural problems, and with low energy demand.

The International Monetary Fund (2023a) highlighted the need to implement monetary policies that significantly reduce inflation, fiscal policies that aim at reducing public and private debt and geoeconomic fragmentation. Geoeconomic fragmentation is a policy-driven reversal of global economic integration, a strategy to reduce interdependencies especially on high-concentration markets.

3. Historical Context:

3.1 What has happened between Russia and Ukraine over the last 50 years?

The relationship between Russia and Ukraine over the past 50 years has been complex, with periods of cooperation and periods of conflict.

The period mentioned has been marked by a number of significant events and tensions. The reader can find a brief overview of some of the key developments:

- **Soviet Era (post-World War II until 1991):** Ukraine was part of the Soviet Union, a federal socialist state dominated by Russia for most of the 20th century. During this time, Ukraine was subjected to several policies that favored the interest of the Soviet Union and particularly Russia, Ukrainian nationalism was suppressed, and Russian language and culture promoted. Ukraine played a key role in the Soviet economy by being an important industrial and agricultural center and, being part of the Soviet Union had a huge impact on its own economy and society, because it had the chance to shape its economy and accomplish industrial development and urbanization. But the Soviet system also applied repression, censorship and limited Ukraine's autonomy and independence which, of course, contributed to a growing sense of mistrust and dissatisfaction towards the Soviet government.
- **Chernobyl disaster (1986):** occurred at the Chernobyl Nuclear Power Plant in Northern Ukraine, which was one of the several nuclear plants built by the Soviet Government. The disaster occurred during a safety test on the plant's reactor and resulted in the release of large amounts of radioactive material into the environment. The test involved shutting down the reactor's cooling system and seeing if the residual heat could be used to power the plant's turbines. However, a combination of design flaws, operator errors and inadequate safety protocols led to a sudden surge in power that caused the reactor to explode releasing radioactive debris. The explosion and subsequent fire led to the immediate death of two plant workers and other 29 workers died within a few weeks from acute radiation sickness. The radioactive release also led to the evacuation of nearby communities. The Soviet government initially downplayed the extent of the disaster and attempted to cover up the extent of the damage, which led to further mistrust and resentment towards the Soviet government in Ukraine. The effects of the Chernobyl's plant explosion were felt beyond the immediate vicinity of the plant. The radioactive cloud spread over large parts of Ukraine, Russia, and Belarus, and even as far as Scandinavia and Western Europe.
The disaster had a significant impact on global perceptions of nuclear power and safety, and it led to increased regulation of the nuclear industry. Its actual long-term health effects are difficult to quantify, but it is estimated that tens of

thousands of people may have died or suffered illnesses related to radiation exposure.

This event had, of course, a profound impact on Ukraine, both in terms of the human toll and the long-term environmental and health effects, it was a major booster of the growing discontent of the Ukrainian people under the Soviet system.

In the late 1980s and early 1990s, the sense dissatisfaction among Ukrainians called for greater autonomy, independence began to emerge and in 1991 Ukraine declared independence from the Soviet Union, which collapsed soon after.

- Independence and economic ties (1991-2004): as mentioned above, Ukraine declared independence and established a new government in 1991 but kept close economic ties with Russia, especially on the energy sector. The tension between the two nations emerged when Ukraine showed interest in joining NATO and Russia worried about the Russian-speaking minority in Ukraine.
- Orange Revolution (2004): Sparked by allegations of fraud in the presidential election held in 2004, in which a pro-Russia candidate was elected. Protests began in the capital city of Kyiv and eventually succeeded in forcing a new presidential election that was closely monitored by international observers, and that resulted on the election of Viktor Yushchenko who installed a pro-Western government , who was president until 2010.
- Gas disputes (2006-2009): there were a series of conflicts over the supply and transit of natural gas from Russia to Ukraine and other European countries in the period from 2006 to 2009. In January 2006, Russia temporarily cut off gas supplies to Ukraine citing unpaid debts and a dispute over pricing. The cutoff led to gas shortages in several European countries that relied on gas supplies from Russia through Ukraine. In late 2008, a similar dispute erupted between these countries, with Russia accusing Ukraine of failing to pay its gas bills and stealing off gas meant for European costumers. Again, Russia cut off gas supplies to Ukraine leading to shortages in several European countries during wintertime.

These disputes were driven by many different factors, including economic, political, and strategic considerations. Russia has tried for so long to maintain control over the supply and transit of natural gas to Europe, which is the key

market of its gas exports. Ukraine, on the other hand, has tried to use its strategic position as a transit country to negotiate better prices and terms for its own gas imports.

The tensions between Russia and Ukraine had significant economic and political consequences for both countries and for the European countries affected, and also uncovered the geopolitical conflict between the two, which has been characterized by historical and cultural ties as well as territorial disputes and strategic rivalries.

The disputes also highlighted the power of influence of both countries and their relationship over energy security and political stability in Europe.

- Euromaidan protests and Crimea annexation (2014): Ukraine experienced a new wave of protests, known as the Euromaidan, which led to the ousting of pro-Russian President Yanukovich. Russia responded by annexing Crimea, a region that historically had been part of the Russian Soviet Federative Socialist Republic (before the Soviet Union was founded) but was transferred to Ukraine in 1954. The annexation was widely condemned internationally and led to the imposition of sanctions against Russia.
- Conflict in eastern Ukraine (2014-present): after the annexation of Crimea, pro-Russian separatists launched a rebellion against the Ukrainian government with support from Russia. The conflict resulted in thousands of deaths and led to the imposition of more sanctions against Russia.
- Kerch Strait incident (2018): In November 2018, Russian naval vessels attacked and seized three Ukrainian naval vessels near the Kerch Strait, which connects the Black Sea and the Sea of Azov. The incident escalated even more the tensions between the two countries.

The conflict in eastern Ukraine has continued over the past 9 years and has resulted in the ongoing military clashes.

In October 2021, the White House based on its gathered intelligence, suspected a Russian invasion of Ukraine to happen in the near future. Biden's administration decided to reduce information-sharing constraints (regarding US intelligence) to its allies and the public with the objective of dissuade Russia from taking action against Ukraine. Commercial satellite imagery and public intelligence from November and December 2021 showed Russian missiles and other weaponry moving towards

Ukraine. By the end of 2021 more than one hundred thousand Russian troops were in position near the Russia-Ukraine border. Russia communicated with the US demanding to stop NATO for expanding closer to Russia (preventing Ukraine from joining NATO), but the US and NATO allies rejected these demands and threatened to impose severe economic sanctions if Russia attacked Ukraine. In late February 2022, many negotiations between Russia, the United States and European powers failed to become a resolution and therefore on February 24 Putin announced a full-scale land, sea and air invasion of Ukraine targeting Ukrainian military assets and cities.

In regard to the reasons why the Russian act of war against Ukraine began there are two points of view: the pro-West and the pro-Russian.

The pro-Russian motive for invading Ukraine is that Ukraine was being “westernized” and controlled by Western powers. That was using its military forces to oppress pro-Russia citizens in separatist regions and committing genocide against its own people. Russia has also claimed that Ukraine’s ambition to join a military alliance with NATO represents a threat to Russia’s national security and that it will bring NATO closer to Russian borders allowing the West to infiltrate Russia. The Russian government claimed that this threat to its national security was reason enough to activate its military forces against Ukraine and stop Ukraine’s plan to join the NATO. Russia also claimed that it considered negotiation with Ukraine before the invasion, but since Ukraine refused to negotiate, the Russian government decided to choose the least dangerous option for them, which was to invade Ukraine in order to avoid the pro-West government in Kyiv to proceed with its plans. Russia’s wishes are to install a new government in Ukraine and to sign a peace deal that will include a ban from joining NATO and the European Union.

The pro-West motive for the invasion is that Russia feels threatened by the fact that Ukraine is moving to be a free democracy, without Russian influence and seeking collaboration with the West, particularly in terms of trade, security, and politics. Western media believes that the reason why Russia began its act of war, is to remove the Ukrainian president and its government, and install a pro-Russian government to ensure its power of influence over the country.

3.2 Sanctions

Some of the restrictions imposed on Russia in response to the war of aggression against Ukraine and the illegal annexation of the Donetsk, Lugansk, Zaporizhzhia and Kherson regions of Ukraine are aimed at weakening Russia's economic base, depriving it of critical technologies and markets, and significantly reducing their ability

to wage war in this context. These sanctions are added to the already existing ones, imposed since 2014 on Russia, after the annexation of Crimea and the breach of the Minsk Agreements.

The EU has also adopted sanctions against Belarus in response to its involvement in the invasion of Ukraine and to Iran in relation to the use of Iranian drones in the Russian aggression against Ukraine.

The sanctions include economic sanctions, selective restrictive measures (individual sanctions), and measures related to visas. Individual sanctions are directed to persons responsible for supporting, financing, or carrying out actions that undermine Ukraine's territorial integrity, sovereignty, and independence or to who obtain benefit from these actions.

The EU has sanctioned more than 1,400 people and just over 200 entities.

3.2.1 Sanctions on Individuals and Entities

Among sanctions we can mention:

Sanctions to individuals: consist in travel ban (land, air, or sea) and the immobilization of their assets (involves the freezing of all EU bank accounts belonging to individuals - prohibition to make funds or assets available to them, directly or indirectly).	Sanctions to entities: consist in the immobilization of their assets (involves the freezing of all EU bank accounts belonging to entities - prohibition to make funds or assets available to them, directly or indirectly).
the president of Russia, Vladimir Putin.	banks and financial entities; SWIFT ban for Russian and Belarusian banks; banks can neither get foreign currency; nor transfer assets abroad; prohibited the sale, supply, transfer, and export of euro-denominated banknotes to Russia.
the Minister of Foreign Affairs of Russia, Sergei Lavrov.	all transactions with the National Central Bank of Russia are prohibited
the former President of Ukraine Viktor Yanukovich.	companies in the military and defense sectors
members of the Russian State Duma (lower house of Parliament).	companies in the aviation, shipbuilding, and machine building sectors
members of the National Security Council.	political parties
Members of the Council of the Russian Federation.	the All-Russian Popular Front movement
local ministers, governors, and politicians such as the mayor of Moscow.	the Wagner Group, a Russian-based private military entity
senior civil servants and high-ranking military personnel.	media organizations responsible for spreading propaganda and disinformation
prominent businessmen and oligarchs.	RIA FAN, a Russian media organization.
pro-Kremlin and anti-Ukrainian propagandists.	

persons who have responsibilities or participation in:	
▪ the atrocities committed in Bucha and Mariupol.	
▪ missile attacks against vital civilian infrastructure.	
▪ deportations and forced adoptions of Ukrainian children.	
▪ the recruitment of Syrian mercenaries to fight in Ukraine.	
▪ the manufacture and supply of drones.	

3.2.2 Sanctions on Imports and Exports

As part of the economic sanctions, the EU has imposed a series of import and export restrictions from Russia. The sell of certain products by European entities to Russia is not permitted (exports restrictions) and the sell of certain products by Russian entities to the EU is not permitted (imports restrictions).

The selection of banned products is designed to maximize the sanctions' impact on the Russian economy, limiting as much as possible the consequences for European businesses and citizens. The export and imports restrictions exclude essential products related to health, food, and agriculture with the intent to not harm the Russian population.

According to the European Commission, since February 2022, the EU has banned over €43.9 billion in exported goods to Russia and €91.2 billion in imported goods. This means that 49% of exports and 58% of imports are currently sanctioned, compared to 2021.

Export restrictions – EU to Russia	Import restrictions – Russia to EU
Cutting-edge technology (e.g., quantum computers and advanced semiconductors, electronic components, and software)	crude oil (from December 2022) - cap price applied: \$60 per barrel for crude oil; \$45 per barrel for discounted petroleum products; \$100 per barrel for premium petroleum products
Luxury goods (e.g., luxury cars, watches, jewelry)	refined petroleum products (from February 2023), with limited exceptions; also prohibited the related provision of technical assistance, brokering services or financing or financial assistance. Excluded crude oil or petroleum products purchased at or below the oil price cap.
Oil refining specific goods and technology needed for oil refining	coal and other solid fossil fuels
certain types of machinery and transportation equipment	steel , steel products and iron

energy industry equipment, technology, and services	gold , including jewelry.
aviation and space industry goods and technology (e.g., aircraft, aircraft engines, spare parts, or any kind of equipment for planes and helicopters, jet fuel)	cement, asphalt, wood, paper, synthetic rubber, and plastics
maritime navigation goods and radio communication technology	seafood and liquor (e.g., caviar, vodka)
a number of dual-use goods (goods that could be used for both civil and military purposes), such as drones and software for drones or encryption devices	cigarettes and cosmetics
civilian firearms and other army material	

From February 2022 to March 2023 other countries-imposed sanctions to Russia, some are:

- The United States banned the export of war technology products to Russia with the aim to limit Russia’s ability to advance and strengthen its military force. The ban limits US exports of semiconductors, sensors, navigation, encryption security, lasers, air and maritime technologies to Russia. The US government also banned Russian financial institutions and the Russian Central Bank from entering their dollar external reserves, meaning that Russian financial institution cannot make transactions in American dollars. The US also prohibited the import of Russian gas and oil.
- Canada cancelled all export permits that involved Russia.
- The UK has frozen assets of Russian banks and has banned Russian firms from borrowing money in its credit system. The UK, as the US, has also, banned all Russian oil and gas imports. The UK banned the Russian airline “Aeroflot” from operating in British airspace.
- Germany stopped the certification of Russia’s Nord Stream 2 gas pipeline projected, that intended to distribute gas to Europe.
- Switzerland and Japan froze assets of certain Russian individuals held in Swiss and Japanese banks.
- Belgium, Bulgaria, Czech Republic, Estonia, Finland, Ireland, Latvia, Lithuania, Moldova, Poland, Romania, and Slovenia have banned Russian planes from flying into their airspace.

3.2.3 Sanctions on Transport

Road transport

The EU has prohibited road transport operators from Russia and Belarus from entering the EU, even for transit goods. Which aim to restrict Russian industry’s possibility to

access key goods and disrupt road trade from and to Russia. However, the flow of some goods is permitted: energy, pharmaceutical, medical, agricultural and food products. The ban does not impede the entering or exit of humanitarian aid and of transports related to the functioning of diplomatic and consular representations of the EU and its countries in Russia.

Aviation sector

All Russian aircraft are banned from overflying EU airspace since February 2022, access to Russian carriers, including private aircraft, to EU airports and even EU airspace is denied.

As mentioned previously, insurance services, maintenance services and technical assistance related to aircraft goods and technology are also prohibited. The United States, Canada and the United Kingdom imposed similar restrictions. As most of Russia's current commercial air fleet is produced in the EU, the US or Canada, over time the unavailable access to spare parts technology is likely to result in the grounding of an important proportion of the Russian commercial aviation fleet, even for domestic flights.

Maritime transport

The EU has closed its ports to Russia's entire merchant fleet of over 2800 vessels. Excluding vessels carrying energy, pharmaceutical, medical, agricultural and food products, humanitarian aid, nuclear fuel, and other goods necessary for the functioning of civil nuclear capabilities, coal, and vessels in need of assistance seeking a place of refuge, or vessels making an emergency port call for reasons of maritime safety or saving life at sea.

The ban is also for those vessels who try to evade the sanctions by changing their Russian flag or registration to one of another unsanctioned state. Through the vessel's IMO number – a unique ID number assigned to each vessel by the International Maritime Organization – port authorities can check the registration of all the incoming vessels.

Throughout the paper the effects of these sanctions will be analyzed.

4. Trade and food security:

Human history has shown that an armed conflict has significant economic consequences. It can disrupt the movement of goods and services across borders that

can result in shortages of essential goods, higher prices, higher transportation costs and supply chain disruptions. It also can damage infrastructure that is crucial for trade like ports, airports, roads, and railways. A war generates the necessity to establish new air, land, and sea routes imperatively, something that, depending on the geographical location of the countries involved and its allies, can be rather complicated and risky, other than expensive. It reduces public and private sector incomes; internal debt usually grows despite the economic support received by possible allies. It increases government expenditures, especially on military operations, defense equipment and reconstruction that can lead to a public deficit. Reconstruction is huge cost of a conflict, it represents the destruction of the infrastructure already in place, a step back on the country's development and an investment on infrastructure that was there in the first place.

War causes uncertainty and instability that deters foreign direct investment (FDI) and domestic investment. Businesses will prefer to invest in areas or regions where there is not a conflict at sight. The investment decline will affect economic growth and development. Volatility in financial markets is also common during a war, investors perception changes as the risk of financial disruptions because of the war is higher, which leads to capital outflows and currency devaluation.

Russia and Ukraine are major exporters of several important goods and commodities and, disruptions to the supply of these commodities due to the armed conflict have resulted in price spikes felt across the globe. Prices of natural gas and oil have skyrocketed, agricultural costs have risen, and assets prices have fallen.

In a very general way, the impact of the war in Ukraine spread through three main channels:

1. High prices of commodities (particularly food and energy), which pushed inflation to go higher and as consequence reduced the value of incomes weighing down demand and household consumption.
2. Neighboring and partner economies faced disruptions in trade, supply chains and remittances. And a very significant increase in refugee flows.
3. Low business confidence and high investor uncertainty has pushed asset prices down.

4.1 An overview of Russia and Ukraine in international trade

Russia is a major producer and supplier of fossil fuels; it supplies 9% of the world's natural gas, 14% of global exports of coal briquettes and, 13% of crude petroleum. It is also a major exporter of refined petroleum products, accounting for 10 percent of global exports (data of 2019). Petroleum is an important asset. It is a primary source of energy for several sectors of the economy, and it is crucial for transportation. Gasoline, diesel, and jet fuels power most vehicles like cars, airplanes, ships, and trucks, therefore the transports sector relies heavily on petroleum to enable the movement of people and goods. It is also an important industrial input, it serves as a raw material to produce numerous products: plastics, fertilizers, synthetic fibers, chemicals, pharmaceuticals, lubricants, medical supplies, and equipment, etc. Oil-derived products are also used in the construction industry such as asphalt, bitumen, and roofing materials and for manufacturing a variety of infrastructure components such as pipes, cables, and coatings. Russia's substantial oil reserve provide the country a significant influence in international affairs and gives it the power to use its resources as a leverage. Also, disruption on its stability or ability to supply oil can have a huge impact on economies all over the globe.

Several countries in Europe and Central Asia (ECA region) have a strong dependence on energy imports from Russia, Russia is the EU's largest supplier of fossil fuels and a its second largest supplier of nuclear fuel. In terms of crude oil some high-income countries are very connected to Russia: Slovakia imports 97 percent of its crude oil from Russia, Finland its 82 percent and Poland its 71 percent.

In terms of coal, Latvia and Moldova rely significantly on its imports from Russia (100 percent and 96 percent respectively), also developing countries such as Belize (99 percent) and Algeria (94 percent). As for the developing countries of the ECA region, some rely on Russia for more than 60 percent of their consumption of petroleum and coal products, for example: Uzbekistan with 71 percent and Tajikistan with 62 percent.

In terms of natural gas, Lithuania and Czech Republic rely on Russia for 90% of its consumption of natural gas, and Kyrgyzstan imports from Russia go as high as 94%. And outside the ECA region, some economies also show high dependence on Russian natural gas: Taiwan 29% and Togo 24%.

Figure 4.1 presents the exports of Russia in 2021, being crude petroleum (\$113B), refined petroleum (\$81.8B) and petroleum gas (\$37.7B) the top 3 products exported on

this year. Total exports value is \$484B for 2021. Other products exported on a high volume were gold, coal briquettes (\$19.1B each) and platinum (\$12B).

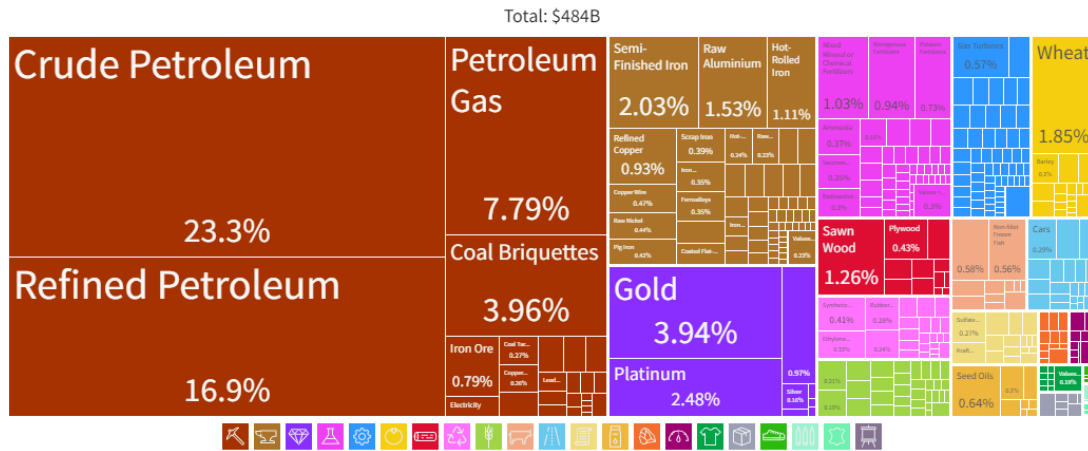


Figure 4.1 Russian exports in 2021
Source: Observatory of Economic Complexity

Figure 4.2 presents Russian export destinations in 2021:

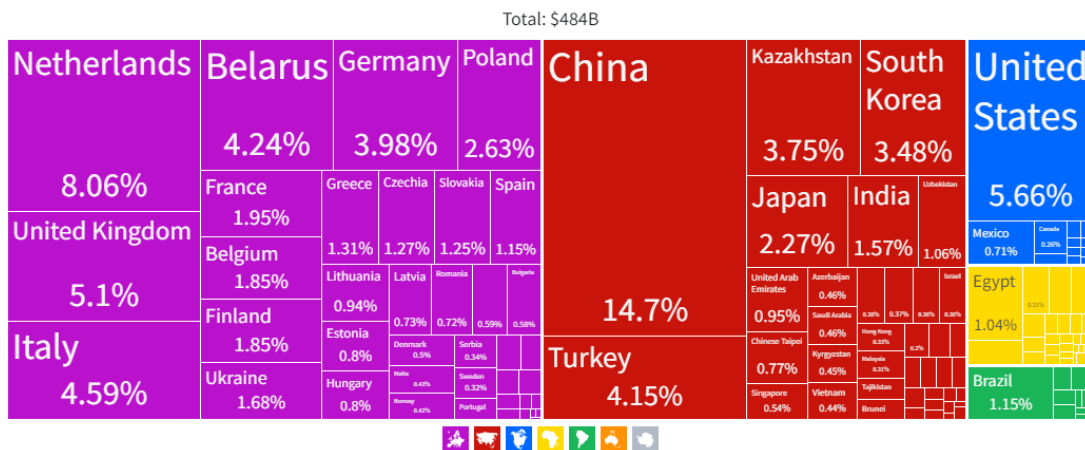


Figure 4.2 Russian export destinations in 2021
Source: Observatory of Economic Complexity

China is Russia's biggest client, representing 14.7% of Russian exports, the second largest are the Netherlands with 8.06%, then comes the United States (5.66%) and the United Kingdom (5.1%).

The European Union imports around 36.5% of total Russian exports, which evidences the huge dependence of the Union on Russian commodities and the high level of trade. Reason why the war in Ukraine has shocked on an important scale the economic situation in Europe.

In terms of services, see Figure 4.3 on 2019¹ Russia's export services had a value of \$50.4B, being the top services exported Miscellaneous business, professional and technical services (\$12.6), air transport (\$10.3B), personal travel (\$6.22B) and sea transport (\$5.07B).



Figure 4.3 Russian service exports in 2019
Source: Observatory of Economic Complexity

As a result of Russia's act of war against Ukraine, supply and commodity prices were shocked having wide-range and long-term consequences. Production, consumption, and trade has changed, countries have shifted to new suppliers and have been working on self-sufficiency.

The characteristics of trade, consumption and production of the countries involved determine the effects of the war on trade flows. Net exporters benefit from the higher value of energy and agricultural commodities. Higher prices of some commodities used as inputs, reduce competitiveness of goods and services, making those less profitable

¹ The selected data is from 2019 since the Observatory of Economic Complexity had available until 2020 and data from this year might be altered because of the global crisis caused by the Pandemic.

to produce and export. In example, the higher cost of fertilizers reduces agricultural yields, potentially affecting the terms-of-trade gains of agricultural exporters.

Therefore, net importers of energy and agriculture are definitely worse off due to higher prices of the commodities they import. Some may have had the ability to expand their exports in manufacturing and services sectors if they're relatively more competitive than other countries, and somehow equilibrate their trade-balance or they might have been able to invest on their own industries to reduce their dependence on foreign products.

Russia and Ukraine are key providers of inputs into industrial value chains, such as argon, titanium sponge (used in aircraft industry), neon (used in the manufacture of semiconductors). Ukraine is also a provider of several low-tech products to the European automobile value chain.

The next figure presents Ukraine exports in 2021:

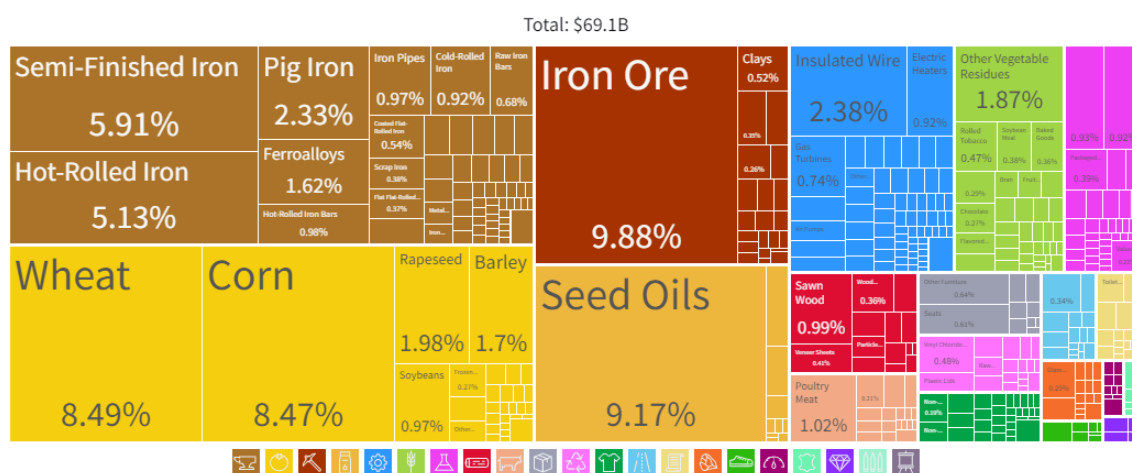


Figure 4.4 Ukraine's exports in 2021
Source: Observatory of Economic Complexity

Iron ore is the top product exported by Ukraine, representing 9.88% of its total exports (\$6.83B), second product is Seed oils (\$6.34B) with 9.17% and then comes wheat (\$5.87B) and corn (\$5.86B) with 8.49% and 8.47% respectively.

Regarding the exports destinations of Ukraine in 2021 (Figure 4.5); China is the most important buyer of Ukrainian products (11.7%), same as the Russian case. Poland is the second (7.23%) and Turkey is the third (5.96%).

the war could cause deep shortages in the supply of these products. This shortage scenario hasn't materialized, trade values have sharply increased, but the data reveals that this increase is driven mainly by the higher prices of those commodities. Figure 4.6 shows the development of trade value, volume and unit value of the products mentioned above and of some its substitute products between January 2022 and October 2022. The first observation is, that even though the changes are significant, they are lower than predicted at the beginning of the war. This is due, on a certain way, to export restrictions and other governmental interventions. The prices of the selected commodities have increased. The variation observed is from 1.1% (rice) to 24.2% (maize), so its commercialization has been affected by the war. The increase on unit value has gained new trading levels, mostly higher, in relation to the beginning of the year. Trade volume variation are not proportional to unit value variations, which indicates that in some cases trade value has increased because of higher unit value instead of for higher volume traded.

Simulations run by the WTO have estimated that if it wasn't for the export restrictions of food, the price of wheat could have increased by up to 85%, especially in low-income regions, while in fact it increased by 17%. Therefore, the impact of the war has been considerably minor than expected.

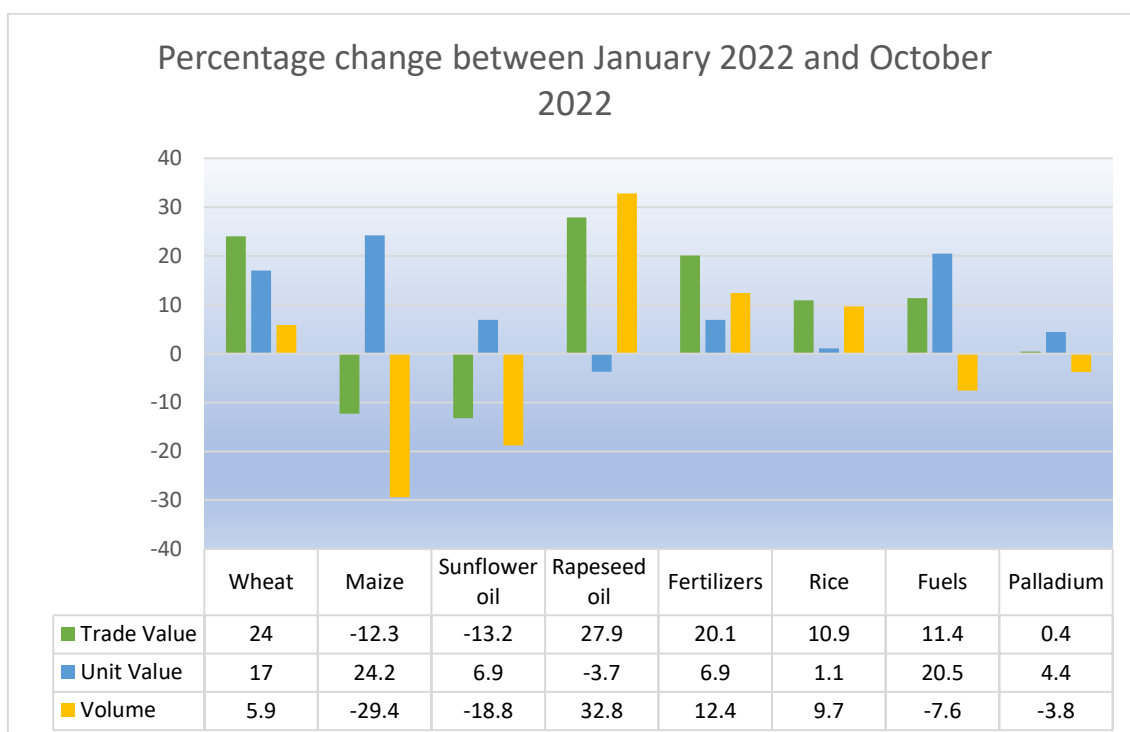


Figure 4.6 Change in trade value, trade volume and unit value of world trade by product (January-October 2022)

Source: Own elaboration based on data from the WTO.

Trade volume of wheat rose, indicating that there were several suppliers that had the ability to fill the gaps left by Russia and Ukraine, and that importers of wheat had the adaptability to switch rapidly to those new suppliers. The case of Ethiopia is a good example: in 2019 its imports of wheat came on 14% from Russia and 31% Ukraine (45% combined). Ethiopia's imports from Ukraine, after the war started, fell 99.9% and from Russia fell around 75%. The total value of Ethiopia's imports of wheat rose 39% (WTO, 2022) and wheat price during the ten first months of the war increased 37%, meaning that Ethiopia was able to maintain its import volume of the commodity. That was possible thanks to its market access to other suppliers: the United States and Argentina covered the loss of supply from Russia and Ukraine.

Sunflower oil trade, on the other hand, is highly concentrated and alternative suppliers are not available. Russia and Ukraine had a combined global market share of 45 per cent in 2019 (WTO, 2022). Since substitution across suppliers is considerably more difficult, substitution across products was the option available. Rapeseed oil is a substitute for sunflower oil, between January and October 2022 the trade volume of rapeseed oil grew 32.8 percent while the trade volume of sunflower oil decreased 18.8 percent. This steep decline is due to the high global market share that Russia and Ukraine had. Rapeseed oil unit value decreased 3.7 percent and sunflower oil unit value increased 6.9 percent, sunflower oil's trade value decreased indicating that even if the unit value increased, the lower volume had a major impact on its trade value.

In the case of fertilizers and palladium neither substitution across suppliers nor across products is achievable in a short period of time. This highlights that high shares in international trade normally represent concentration, which can limit other countries' potential and opportunity to access the market and emphasizes the need to have more diversified trade systems.

Since the beginning of the war there have been many interventions by the hand of several governments to try and contain the spreading of its consequences. As mentioned in section 3.2, restrictions targeting Russian exports have been imposed by several countries. The United States on March 2022 prohibited imports of alcoholic beverages, fish, seafood, and its different preparations. On the same month, the G7 countries revoked Russia's Most-Favored-Nation status at the WTO which could result on further tariff increases on specific products. Colombia, for example, decreased to zero import duties on corn, seeds and resinoid oils, among other food products, to alleviate the pressures in national food markets. Governments from every continent have increased subsidies for farmers and fertilizers producers and have subsidized

food purchases by citizens. Azerbaijan decided to cover the difference in domestic and international prices of wheat and flour products in order to offer economic support to consumers. The Philippines announced reductions of taxes on food imports to curb the price pressures.

Net importing countries of food usually are also predominantly low-income countries; consumption baskets of poorer people are dominated by food. If the food price rises, the poor are affected on a major scale, and this threatens millions to fall into poverty. Food crises are devastating for the poorest and most vulnerable since food accounts for at least half of total expenditures of household in low-income countries.

Trade measures have had a visible effect on food prices, as said previously, Russia has also imposed restrictions on wheat exports to countries outside the Eurasian Economic Union. Egypt has also taken measures to protect its economy since 80% of its imports of wheat come from Russia and Ukraine. Egypt was the first largest wheat importer in 2019 (WTO, 2022), the value of Egypt's wheat imports rose to 90% from March to November 2022 and the 42% price increase during this period suggests that the import volume rose 34%. On a more detailed description, Egypt's volume import of wheat from Ukraine decreased approximately 81% during the same period, increasing imports of wheat from Russia and sourcing from other supplier such as the European Union and the United States.

In the case of fuels, trade volume declined by 7.6 percent. This data is consistent with what the International Energy Agency reports: global energy efficiency investment is increasing, with governments, households and industries investing \$560 billion on 2022, there is an important wave of energy saving awareness that is pushing citizens to better manage their energy use and make decisions considering efficiency. But there are also several barriers to this progress, one is that those investments in energy efficiency are highly concentrated in advanced economies. Another is that a significant part of the reduction of energy demand comes from the slowing down of business and from consumers renouncing energy services to save money.

4.2 Economic outlook comparison

To understand the impacts of the war further and better, a comparison of trade volume and commodity price projections made on World Economic Outlook reports by the International Monetary Fund (IMF) in October 2021, October 2022 and April 2023 is presented as follows.

The October 2021 IMF's forecast considered expectations on the slowing down of the pandemic and the withdrawal of existing restriction measures, but also presented new pandemic waves as a potential risk to the global economic activity. The global economy grew -3.1 percent in the year 2020. IMF projected a growth for global economy of 5.9 percent in 2021 and 4.9 percent in 2022 (real GDP growth, percent change).

With the forecast of October 2022, the IMF faced the challenge to present a projection considering not only pandemic recovery difficulties, but also the tightening of financial conditions in many regions and Russia's invasion of Ukraine. The IMF considered that the global economy's future health and stability relied on the successful calibration of the monetary policies implemented, on the course and duration of the war in Ukraine and on the possibility of pandemic-related supply shocks, especially in China (prolonged Covid-19 outbreaks and lockdowns were frequent in this country during 2022). Global growth in 2021 was 6.0 percent, 0.1 percent higher than what the IMF predicted a year earlier, and for 2022 and 2023 it forecasted 3.2 percent and 2.7 percent respectively. On The World Economic Outlook is stated that more energy and food price shocks could prolong the high inflation duration, the tightening of financial conditions could spread emerging market debt and the uncertainty around gas supplies by Russia could depress output in Europe. Also, that the resurgence of Covid-19 was still a threat to international stability and, geopolitical fragmentation could jeopardize trade and capital flows. Monetary policy was considered by the IMF as an important measure to restore price stability.

The April 2023 IMF World Economic Outlook reports a growth of 3.4 percent in 2022, 0.2 percent higher than their prediction in October 2022. The forecast is for global growth to fall to 2.8 percent in 2023 and recover up to 3.0 percent in 2024. The outlook reflects the tight policy measures to reduce inflation, the ongoing war in Ukraine and the growing geoeconomic fragmentation. Commodity prices that rose significantly after Russia's invasion of Ukraine have moderated but the war continues, and could intensify, leading to more food and energy spikes and shortages, pushing inflation up. Core inflation could be more persistent than anticipated needing tighter monetary policies to tame it.

The above mentioned International Monetary Fund's predictions not only consider the impact of war on global growth, and particularly trade volume and commodity prices (analyzed on this paper). But it is important to clarify that the war has played a special role in the revisions, especially since in the first report (October 2021) there were no expectations of an armed conflict in the region.

The global trade volume of goods and services, refers to the total value of goods and services exchanged between two countries over a certain period. It represents the aggregate value of exports and imports of goods and services across international borders. Trade volume is influenced by many factors including economic growth, consumer demand, technological development, trade agreements, government policies and exchange rates. Changes in global trade volume can indicate shifts in economic activity, in competitiveness and in foreign relations. Reason why a war can influence trade volume and its growth over the years.



*Figure 4.7 Trade volume of goods and services 2010-2026.
Source: Own elaboration using IMF's World Economic Outlook datasets.*

The pandemic brought a huge slow down on the growth of global trade volume of good and services, falling to around -8 percent. The recovery during 2021 is significant as well, reaching a percentage change of around 10 percent. The forecast made in October 2021 was more optimistic since the Russian war against Ukraine was not on the map yet. On this forecast it was predicted that global trade volume would grow 6.14 percent in 2022 and 4.52 percent in 2023. The outlook made one year later, October 2022, presents a growth of 4.29 percent for global trade volume in 2022 and 2.51 percent in 2023, 1.85 percent and 2.01 percent respectively lower than the growth projected a year earlier.

In April 2023 the forecast for global trade volume is even lower, 2.41 percent, indicating that the war, among other factors, is still affecting expectations and therefore the economic recovery and outlook.

In 2021, the year before Russia’s invasion of Ukraine, commodity prices including fuel and non-fuel prices indices increased more than 50 percent. In October 2021, the IMF projected a slight commodity price falls in 2022 and some falls in the year to follow (1.2 percent in 2022 and 5.1 percent in 2023). The forecast for 2022 was revised upwards in October 2022 with an increase of 41 percent, and for 2023 the forecast was for prices to fall less than 1 percent. In April 2023, the IMF reports the increase of commodity prices in 2022 was around 33 percent and it expected a decrease of 23 percent for 2023, being the most optimistic forecast out of the three in question. Figure 4.8 presents the annual percentage change of commodity prices including fuel and non-fuel prices indices for the period 2000-2026 based on the IMF predictions commented above.

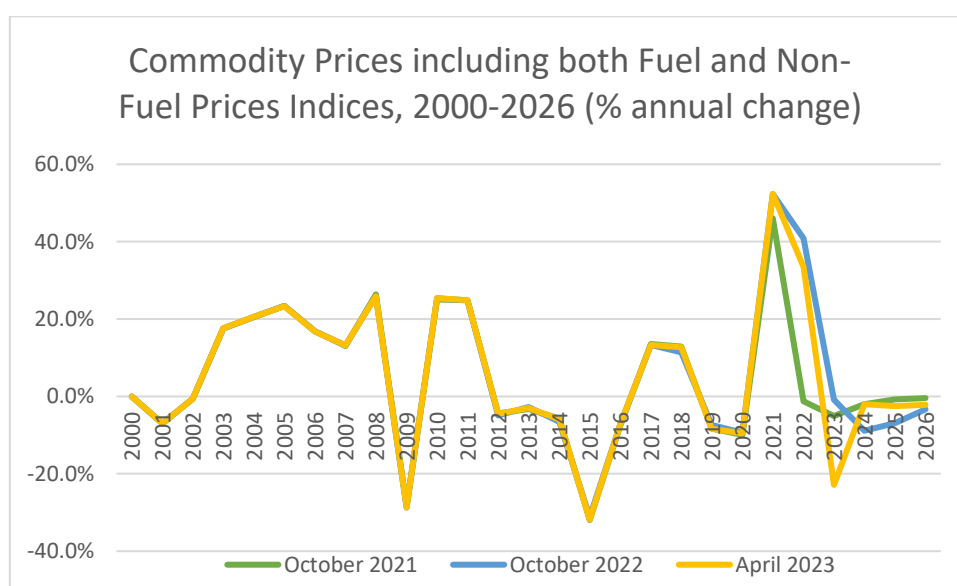


Figure 4.8 Commodity Prices, annual percentage change (2000-2026).
Source: Own elaboration using IMF’s World Economic Outlook datasets

In the April 2023 World Economic Outlook, the IMF reported that crude oil prices retreated by 15.7 percent between August 2022 and February 2023 as demand was weakened by the slowing global economy. China experienced its first annual decline in oil consumption of this century in the middle of repeated shutdowns because of COVID-19 new outbreaks in the country and an unsteady real estate market.

5. Energy system

5.1 Energy trilemma

The armed conflict started in February 2022 has triggered a shift on energy policy makers' focus from environmental issues to energy security and affordability. This indicates the existence of an energy trilemma.

The energy trilemma is a framework of three objectives that energy policymakers need to balance and consider when making decisions, and which is often used as a guide in designing energy policies. The trilemma comprises:

- Sustainability: decarbonizing energy.
- Security: ensuring the security and reliability of energy supplies.
- Equity: minimizing the cost of energy to make it more accessible and affordable to consumers.

Clearly, this balance must be approached differently depending on the geographical area, government policies, the economic capacity of the energy exploitation sectors, among other things.

In recent decades, developed countries have been promoting the strengthening of their energy policies, placing sustainability above equity and energy security, especially since the Paris Agreement at COP21 in 2015. By contrast, in developing countries, equity and energy security are above sustainability. Consequently, the economic reality of each country requires a different approach to the trilemma, even when international agreements seek to establish the priority scale of these three dimensions, which is orienting its policies to reduce environmental impact, the countries realities are the ones that will prevail in designing its energy policies.

The 3 dimensions of the dilemma are so intertwined that any change in one of them will cause a change in their prioritization, changes are of course linked to the reality of the countries affected by them. In fact, there are some events that can affect that balance, causing a harmonized global response instead of several individual responses.

Since the objective of this case study is the Russian invasion of Ukraine, it is important to analyze how this event has shocked the energy system and its policy makers. This event has revealed how fragile energy security is; we've observed how coal plants are being commissioned, while renewable projects are under pressure and energy

consumers are assuming its costs. Consequently, the trilemma finds itself in a transition stage, where the order of priorities has been forced to change. For the energy sector, since the beginning of the war, it has been a complex and difficult period, evidence of that is how the trilemma has been opposing its priorities with respect to the past.

The Russian invasion of Ukraine has not only caused a reconsideration of this prioritization, placing energy security as the top priority worldwide but has also revealed the different perceptions of the trilemma throughout the world. Added to this, a fourth dynamic is observed: the need for government intervention, which highlights the differences in perception and in the ability to manage the trilemma. Access to financing is also an important topic of debate, especially in the Global South. Southern countries are demanding the support of developed countries since they perceived them as responsible for the current environmental problems. Experts consider that 2023 in we will witness more debates on the rebalancing of the energy trilemma from a global perspective, with several key issues to master in policymaking, decision making and academic debate.

It is estimated that the EU will continue with the objective of reducing its dependence on Russian energy imports. Therefore, the need to ensure an adequate supply for the winter of 2023/24 will require a focus on access to alternative sources of natural gas, in the short term, accelerating and concretizing the EU plans for an energy transition. As is the REPowerEU plan, based on the idea that a faster decarbonization of the European energy system can provide more energy security in the long term, helping the region to achieve its climate ambitions.

However, there are two key issues in the 2023 scenario: one that energy security issues continue to distract politicians from long-term sustainability goals, and two that longer-term goals, primarily to reduce demand for gas, undermine efforts to secure new supplies in the near term.

The struggle to balance the energy trilemma is also observed in other regions. Some Asian countries have been forced to reconsider their energy strategy, because of high energy prices and lower availability of liquefied natural gas (LNG), which has been absorbed by the European market. Making the development of domestic coal resources a priority, although environmentally damaging compared to other energy sources, since cost and availability outweigh the climate impact, at least in the short term. On the other hand, the EU has reactivated its search for new gas suppliers in Africa, and developed new projects, for export, generating income, and for the

domestic market, providing internal access to energy, which makes it clear that the priorities of the trilemma are considered and there is an effort to find a new balance.

As the role of hydrocarbons is reconsidered and it becomes clear that they may remain important to the global energy system for longer than many predicted, the sustainability element of the trilemma adjusts to deal with it. Alternatively, the development of carbon removal technologies will become a growing issue in 2023 and with a medium-term perspective that facilitates a more orderly transition to a carbon-free energy system in the long term.

The rebalancing of the energy trilemma to focus on energy security has also revealed key risks in the energy transition, as an example, the relations between the world two largest emitters, China and the US. Both increasingly competitive and assertive in their race to be the technological leader of the energy transition, so much so, that the US has drastically limited the transfer of technology to China. While this will have a negative impact on China's ability to develop certain technologies, it also highlights the importance of China in the supply of critical minerals and materials. Its mastery of extraction and processing of key inputs for energy transition technologies is becoming a main element of the energy trilemma and geopolitical debate, which is an additional destabilizing factor to solve the rebalancing problem.

5.2 Oil market

Oil markets were subject to major shocks during 2022, to name a few:

- ❖ The Russian invasion of Ukraine in late February.
- ❖ The consequent sanctions, embargoes, and limitations of Russian oil imports and its price.
- ❖ Control of oil prices from consuming nations (led by the US) by a massive release of strategic stocks.
- ❖ Recessionary and inflationary pressures on the global economy.
- ❖ The massive transformations in crude and products trade flows.

Over the years, oil markets have been subject to both supply and demand shocks, especially in 2022 when there was an increase in government intervention in global energy markets. The increase in government interventions has incremented key uncertainties in the physical market, as well as oil futures witnessed a drop in liquidity along with the rising costs of using these markets for risk management. These shocks and the high uncertainties influenced market balances and expectations. The global oil

market adapted quickly, and supplies were little affected, running a surplus of around 500,000 b/d in 2022, (a deficit of -2.3 mb/d in 2021).

This is due to some factors that contributed to a fairly balanced market in 2022, particularly in the third and fourth quarters, such as:

- The easing of supply cuts by OPEC+.
- The release of Strategic Petroleum Reserve by the US Department of Energy.
- Russia's ability to redirect its exports away from Europe.
- Weak demand growth.

In 2023, in addition to pressures on global oil demand, uncertainty is growing about the length and duration of the global recession. Although inflation is expected to decline in 2023, it remains uncertain when central banks will be able to ease monetary policy, as well as implement policies to promote growth.

In terms of petroleum products, the focus in 2023 will remain on jet fuel. Although jet fuel demand at the end of 2022 improved marginally from 2021, estimated at around 20% below pre-pandemic levels. The recovery is expected to accelerate in 2023, even despite significant difficulties facing the airline industry. Europe is still heavily dependent on Russian diesel imports (accounting for an average of 45% of the total in 2022). In February 2023, the embargo on imports of Russian products forced Europe to seek supplies in other regions to replace almost 500.000 b/d of lost Russian diesel imports. Even the economic downturn is unlikely to solve Europe's diesel supply shortfall, inventories remain well below their average for the last five years.

From a supply side, Russia will remain in the spotlight in 2023. In 2022, Russia redirected sanctioned crude particularly to India, China, and Turkey, allowing it to maintain its domestic production close to pre-war levels.

From a geopolitical point of view, it can be seen that:

- OPEC+ cohesion is now stronger, and the group can respond in a timelier manner.
- Most of the OPEC+ producers outside the Middle East are producing at maximum capacity and below quotas.
- US policy toward the use of SPR (Strategic Petroleum Reserve) is to influence market equilibrium and expectations.

- Risks outside of Russia in places like Libya also remain unpredictable, with a long-sSpeculated return of Iranian production completely off the table in 2023.
- A massive and structural transformation in trade flows of crude oil and its products happened in 2022. US, West African and Middle Eastern crudes reached the Mediterranean and European market while, on the other hand, because of the sanctions Russian crude had to compete in Asia with Middle Eastern and West African crudes, as well as other sanctioned crudes like Iranian and Venezuelan.
- Europe has increased its imports of non-Russian goods by drawing supplies from more distant places, including Middle East, India, China, and Brazil.

These changes in trade flows have accelerated and consolidated in what goes of 2023, with broad implications for market structure, geopolitical relations, and the dominance of the dollar in oil trade.

5.3 European gas market

European gas demand collapsed in 2022 due to mild temperatures, high gas prices and changes in consumer behavior (figure 5.1). Estimates indicate that the total demand of the European Union fell by approximately 10% in 2022, which represents a decrease of around 50 billion cubic meters of this input. Nevertheless, as of December 2022. European average for gas storage has remained above the average for the last 5 years. Despite a sharp decline in 2022, a further reduction in gas demand is needed in 2023 in preparation for winter 2023/2024 and even for winter 2024/2025.

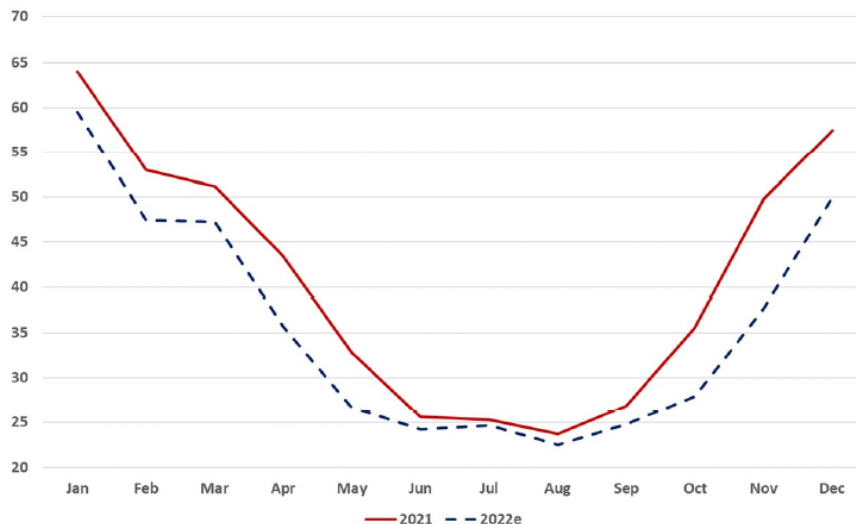


Figure 5.1 Monthly gas demand in EU27 + UK, billion cubic meters (2019-2022)
 Source: Oxford Institute for Energy Studies based on data from Eurostat, IEA, EntsoG, GRTgaz, Terega, THE, SNAM, Enagas, NationalGrid and Fluxys.

To compensate for the lack of supplies from Russia, several factors have intervened, such as:

- national and European Union policies
- non-Russian suppliers
- the weather
- the actions of consumers
- the markets themselves

Most of manufacturing production (except for the chemical sector) have had a strong output in 2022 which suggests that registered prices have not had an impact as dramatic as might have been expected, with a significant shift towards alternative energy sources and an important improvement in the efficiency of several operations. However, after more than a year of high prices, it is not clear how easy it could be to further reduce gas use without reducing production. Besides, it seems likely that most of the decline is due to measures to reduce consumption (as opposed to demand destruction), which means that when gas/electricity prices fall, either as a result of market rebalancing or as a result of government support measures, a significant proportion of the gas demand in the industrial sector (which seems to have decreased by 15-20% in 2022) could return in a few weeks, as the Oxford Institute of Energy studies reports that happened in October 2022, when gas prices reached their lowest levels in months and fertilizer producers restarted production in Europe.

Warm weather in winter 2021/2022 and in winter 2022/2023 has limited the need to use gas for space heating during winter season. Mild temperatures and also increasing gas prices have significantly impacted the demand response from small residential and

commercial consumers, a sector generally quite inelastic in the short term. The demand response by small businesses has mainly been in the form of lower production and fuel switching and lower energy consumption in the construction sector. Besides, the participation of consumers in the measures to save energy will be essential throughout the coming years. There are two main uncertainties: first, government intervention to subsidize energy bills and campaigns to save energy, which should send the right signals to keep consumption low; and second, temperatures: cold weather can wear down consumers' willingness to reduce their energy consumption for heating.

Finally, contrary to the trends observed in the industrial and heating sectors, the gas used for the generation of electricity increased during 2022. Three main elements influenced the need to use more gas in the electricity sector (despite consumption reduction targets): The continued rise in demand during the first 8 months of the year - prior to the energy saving measures -, the economic slowdown, which began to take effect as of September 2022 and the low availability of both nuclear and hydraulic energy.

As Figure 5.2 shows, 30% of gas is used for electricity and heat generation, 24% is used by households, 22.6% is used by industry and 10.6% by the service industry. Other energy and non-energy use represents just over 11%.

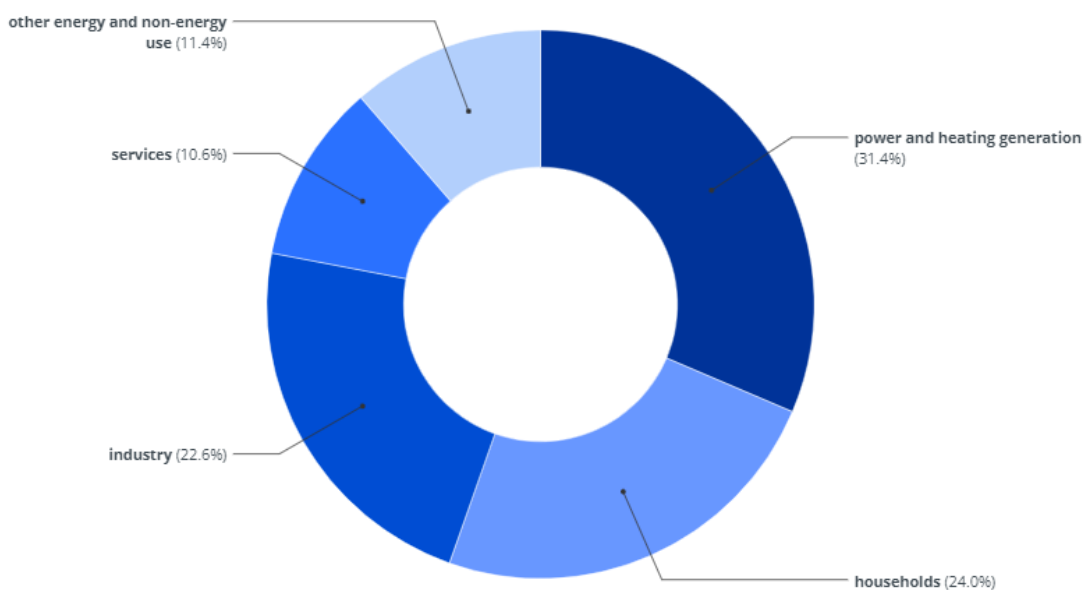


Figure 5.2 EU's Gas Consumption in 2021.
Source: European Council based on Eurostat data.

Three key factors could make 2023 an even tougher test:

- Natural Gas supply is likely to be considerably lower in 2023, inclusive, it could fall to zero, increasing the deficit in Europe and the world.
- LNG (liquified natural gas) supplies remains tight. EU is prepared to add 40 bcm import capacity by the end of 2023 but during the year, is only expected to come onto to the market around 20bcm. Thanks to the unusual decline in Chinese demand for gas, Europe was able to secure higher LNG imports in 2022. But a recovery in Chinese import demand would intensify competition for LNG cargoes, complicating supply for Europe.
- Unusually mild temperatures seen in winter 2022/2023 may not be repeated, this climate condition allowed to reduce gas demand in about 10 bcm but it is uncertain to experiment the same phenomenon during the next winter period.

In conclusion, a key to consider in 2023 will be nuclear energy supply as a substitute of gas in the generation of electricity, the willingness and ability to adapt of large and small consumers to the new energy saving requirements (particularly during the cold days of winter), and finally, the magnitude of the impending economic recession. Even though, the main drivers in Europe are quite similar, country-specific factors are different and therefore also their gas consumption, including the role of gas in their energy mix, their access to alternative fuels and the scope of support in governments measures to protect their domestic consumers from the strong impacts of the shocks witnessed recently.

While the European Union remains dependent on imports of fossil fuels, it has been working hard on diversifying its gas suppliers (figure 5.3). The diversification requires an important investment in liquified natural gas terminals, new pipelines, and several other related infrastructures.

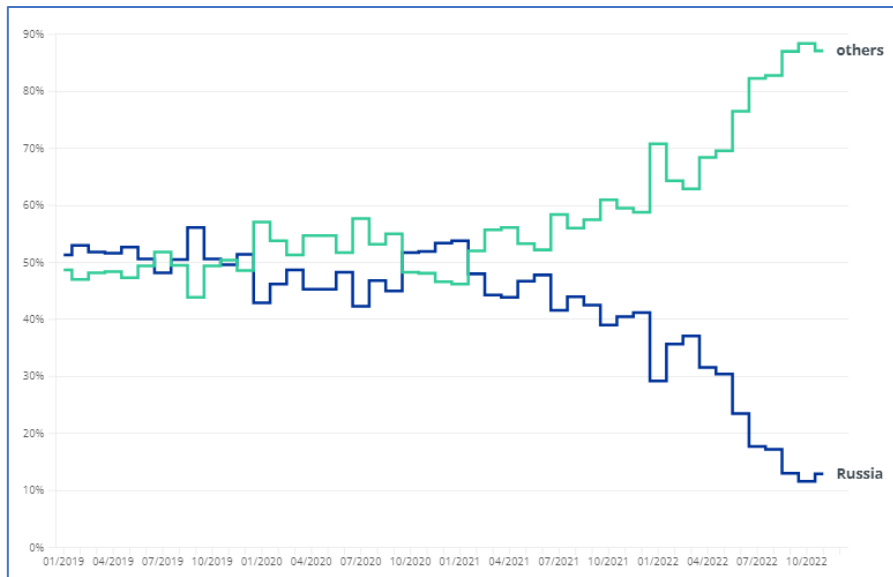


Figure 5.3 European Union's diversification of gas supply (January 2019- November 2022)
Source: European Commission

Russia's share of the market was around 50% until the second half of 2021. Since then, the share of Russian gas started to decline rapidly, and the market shares of other suppliers started to grow. This process sped up in 2022. Since June 2022, Russia's share of EU gas imports is below 20%. In November, it was 12.9%.

Among the other sources that the EU has found for its gas imports are Norway and Algeria and for its LNG the United States, Qatar, and Nigeria.

The IEA reports that EU's total demand is 395 billion cubic meters (bcm), the supply-demand gap is 57 bcm. 30 bcm of the total gap are covered by measures already in motion (switching to fuels, improve efficiency, finding renewable energy and rely on hydraulic and nuclear energies).

The IEA has identified possible actions to cover Europe's gas demand and reduce the excessive stress on European consumers and international markets. The analysis includes realistic measures that could be implemented to reach a more secure and balanced gas market also being consistent with the climate goals of the European Union.

The key policy actions to reduce demand and cover the 27 bcm gap left are:

- incentivize faster improvements in energy efficiency.
- allow for more rapid deployment of renewables.
- accelerate the electrification of heat.
- encourage behavior changes among consumers.

6. Effects on the global value chains of industrial sectors

Two recent disruptive events have impacted global and local energy systems: the pandemic and the Russia/Ukraine war, each on its own way. The pandemic was primarily an energy demand shock that induced a global and rapid change. The war was an energy production, supply, and trade shock. Demand was affected on a secondary level through national and individual actions and decisions to for example reduce import dependency, sanction Russia, and anticipate supply interruptions. During the pandemic oil prices fell significantly while, on the contrary, they rose to over 100 \$/barrel after the war began.

The war directly affected the energy supply; the sanctions imposed to Russia, for example, have obstructed it. The COVID-19 and war-related shocks in the energy sector have impacted especially consumers in oil-importing countries and have shifted the international authorities' focus from mitigating climate change to protecting vulnerable consumers from the rising energy prices. The increase of oil prices impacts different sectors and industries, including the powering sector particularly in developing regions, where there is not an alternative and greener source of electricity.

The sectors mainly affected by the conflict and its consequent rising of energy prices are:

- Transportation
- Fishing Industry
- Construction Industry
- Heavy Industries (Metallurgy and Chemical Industry)

In addition to the higher prices of energy, for those industries also several inputs have suffered an increase on their market value (metals and agricultural products). As mentioned in section 2, Russia is a big exporter of some of the main industrial metals like aluminum, palladium, and nickel. Even if the import volume of these commodities coming from Russia has decreased, the rise of its international price made imports from other suppliers still expensive, since the shock is on supply and production. The industries that have seen a major impact on their ability to buy the raw materials needed are the metal industry, transport equipment, the fabrication of electric material and machinery, electronics, agricultural business, and the automobile industry adding more pressure to the semiconductor shortage situation, going on since 2020. Those sectors rely particularly on imports from Russia of metals (palladium, iron, steel,

copper, aluminum, nickel), chemicals (fertilizers), fuels (crude oil, petroleum products and natural gas), and other commodities. China, Germany, and the United States are among Russia's largest trade partners to import Russian commodities crucial to their industries, and to export goods produced through their global value chains. In any case, since those three partners play an important role on global economy and have access and funds to rapidly switch to other suppliers, the Russian trade partners that resented disruptions on Russia's supply the most are the members of the Eurasian Economic Union, such as, Armenia, Belarus, Kazakhstan and Kyrgyzstan, and other members of the Commonwealth of Independent States, such as, Moldova, Tajikistan, and Uzbekistan.

6.1 Global Value Chains

Nowadays companies separate their operation system in different locations all around the world. One product can be designed in one place, assembled in another with components that can come from several different places, all of this creates what it is known as global value chains, chains of production spread across the globe. The challenge of this system is that for it to work, there must be a certain stability across trade partners and on transport connectivity. Therefore, an armed conflict compromises its functionality, depending on the role the countries involved play on the different stages of the global chains.

Ukraine's Role

Ukraine's participation in global value chains is limited so the magnitude of the war's impact on other countries related to those value chains will depend on the role that Ukraine plays, either as a supplier or consumer of inputs. Ukraine is a small supplier on world scale but plays an important role in some manufacturing sectors. Ukraine produces several automobile components, so the conflict affects their supply in global value chains. Neon is one of the inputs that Ukraine exports and that is key in the manufacturing of semiconductors. Ukraine exports 70 percent of the world's neon gas so dependence on this country for neon in semiconductors production is high. As for other industries, Ukraine supplies several inputs that are crucial for:

- Steel industry:**
- Iron ores
 - Ferro-silico manganese
 - Pig Iron

Metal industries:

- Aluminum oxide
- Titanium ore

Heavy Manufacturing:

- Rolled iron products

Transport vehicles:

- Axles
- Wheels
- Ignition sets

Europe relies on imports from Ukraine of agglomerated and non-agglomerated **iron ores**, with Poland and Czech Republic being two big importers. But, as iron and steel are used in many manufactured goods, the potential for supply chain disruptions is not that high. In 2019 Ukraine supplied 1.78 percent of world's non-agglomerated iron ore and 7.9 percent of agglomerated iron ore (WB, 2022). Indicating that potential disruption is more likely on the agglomerated iron ore supply. Russia is also a supplier of agglomerated iron ore, having a share of 8.4 percent on global exports, thus potential for disruptions for this product increases if substitute supplier alternatives are limited. The price of this product has maintained its value over 2022.

Ferro-silico manganese is used in the production of stainless steel and cast iron and is often used in the production of automobile parts. According to the Observatory of Economic Complexity, Ukraine is its second largest exporter with 14.9 percent of world's exports in 2021 (the first is India). Being Turkey, Germany, Poland, and Egypt its main importers and, Europe as a whole sourcing 49 percent of its ferro-silico manganese from Ukraine.

Pig iron, also known as crude iron, is an intermediate good used by the iron industry in the production of steel. Ukrainian pig iron's main destination is the United States, followed by Europe (Italy and the Netherlands as top European importers). Turkey and China are also important destinations for Ukraine. Ukraine is the third largest supplier, representing 22.5 percent of the global share. Russia is the first (28.5 percent) and together they source more than half of the world's pig iron (OEC, 2023).

Aluminum oxide has a wide range of applications, it is used in the production of body armor, glass, paint, fiber and many other. It is used a tool to eliminate water from gas streams and as a filler for bricks and plastics. The Observatory of Economic Complexity reports Ukraine's aluminum oxide was almost exclusively exported to

Russia (95.6 percent) in 2021. The importance of Ukraine capability to export this input is extremely low on a global scale.

Based on data provided by the OEC, Ukraine is the seventh largest exporter of **titanium ore**, exporting mainly to Russia (19 percent), Mexico (16.6 percent) and China (16.1 percent). The main European union importers of the input are Czech Republic (14.1 percent) and Spain (2.49 percent). Titanium ore is widely used in aerospace and aviation, medical and dental products, electronics, and it has high-performance automotive applications.

Ukraine is a major supplier of specifically two **rolled iron products**:

- Semi-finished products of iron/non-alloy steel, containing by weight <0.25% of carbon, of rectangular (incl. square) cross-section, the width measuring < twice the thickness. HS code 720711.
- Semi-finished products of iron/non-alloy steel, containing by weight <0.25% of carbon, of rectangular (other than square) cross-section. HS code 720712.

Both products have many uses, therefore it is hard to define their importance for specific supply chains. Europe relies heavily in Ukraine as the source of these products, also Turkey and Nigeria.

On a global scale Ukraine does not have a huge importance on the market of **ignition and wiring sets**, its exports represent the 3.41 percent of the world's share. However, it is an important supplier for some European countries, such as Germany (23.9 percent), Poland (17.6 percent), Romania (15.2 percent), Hungary (14.1 percent) and Czech Republic (13.5 percent), according to the OEC data for 2021.

Axles and wheels are specific inputs used in railways and trams. **Axles** are used to attach the **wheels** to cars and to transmit power and wheels are typically attaches to axles. The OEC reports that Ukraine was the fifth largest exporter of axles and wheels in 2021, representing 6.79 percent of total global exports. The first and second largest were the United States (12.5 percent) and Germany (11.7 percent).

Data presented on Table 6.1-1 shows that Moldova is the country most dependent on Ukraine, no matter the product. It relies on Ukraine for industrial products, intermediate and capital goods and for more than a quarter of its agricultural imports (WB, 2022). As seen in Figure 2.5 of section 2, Poland and Czech Republic are the Ukraine's trade partners from the European Union that are the most vulnerable to disruptions in supply from Ukraine. In terms of intermediate goods Senegal and Georgia are among the top 3 countries most dependent on Ukraine. Generally, most of the countries relying on

Ukraine for the imports of goods (whether they are agricultural, intermediate, industrial, or capital) belong the Eurasian region East Asia.

Table 6.1-1 Top ten countries relying the most on Ukraine's exports (2018-2020, share of merchandise imports)

Agricultural products			Industrial products			Intermediate goods			Capital goods		
Importer	UKR %	UKR Rank	Importer	UKR %	UKR Rank	Importer	UKR %	UKR Rank	Importer	UKR %	UKR Rank
Moldova	26%	1	Moldova	7%	7	Moldova	14%	1	Moldova	4%	5
Georgia	19%	2	Belarus	3%	5	Senegal	9%	4	Belarus	3%	6
Tunisia	15%	1	Georgia	3%	9	Georgia	8%	4	Georgia	2%	13
Belarus	15%	2	Russia	2%	11	Belarus	7%	3	Armenia	1%	14
Azerbaijan	15%	2	Senegal	2%	15	Russia	7%	3	Russia	1%	22
Armenia	11%	2	Azerbaijan	2%	14	Bulgaria	5%	7	Kyrgyzstan	1%	14
Egypt	10%	4	Bulgaria	2%	18	Lebanon	5%	8	Uzbekistan	1%	14
India	8%	5	Hungary	2%	16	Ethiopia	4%	7	Azerbaijan	1%	21
Turkey	7%	4	N. Macedonia	1%	22	Cameroon	4%	7	Kazakhstan	1%	17
Lebanon	7%	2	Serbia	1%	19	Egypt	3%	9	Tajikistan	1%	19

Source: Own elaboration from World Bank calculations based on data from the UNCOMTRADE.

WB notes: agricultural and industrial products are defined according to the WTO product grouping classification; intermediate and capital goods are defined according to UNCTAD's SoP definition.

On the other hand, Ukraine is an export destination mainly for Eastern Europe and Central Asia. Belarus export 14 percent of its industrial production to Ukraine followed by Benin and Lithuania at 6 and 4 percent respectively (WB, 2022). So, Ukraine economic stability and financial capabilities are crucial for its trade partners, particularly those who export a big part of their products to it.

Russia's Role

Russia is an important exporter of primary and intermediate goods and services, inputs used upstream in the global value chains. Meaning its position in GVCs is on the early stages of production. The commodities that drive this upstream connection with GVCs are the ones mentioned above: energy (petroleum), metals and chemicals. Russia's importance on the international production system is, as stated, as a supplier of raw material and not so much as a buyer of final and semi-final goods.

The sanctions and restrictions activated after the armed conflict began, have disrupted Russian trade and logistics, leading to input shortages and the rising of commodity

prices that have echoed over GVCs, particularly in regional economies that are highly dependent on Russian supplies. Even though Russia's among the largest trade partners we can find China, Germany and the United States, the actual countries that are more vulnerable to such disruptions in trade and supply are neighboring economies. Examples of regional dependence include the imports of cereal, wood products, fertilizers, metals, mechanical goods (water wheels and hydraulic turbines) and vehicles. Specific bans imposed on exports to Russia have jeopardized Russia's production capabilities of electronics, aviation, automobiles, transport equipment, iron, and steel. Russian logistics have also suffered from the restrictions and therefore there have been delays on goods flow between Europe and East Asia and an increase on freight prices globally.

Russia's trade partners on the supply side, meaning those who have Russia as a target for their products have suffered the consequences of the war. Russian import has been directly disrupted via trade and logistics and on a secondary level via macroeconomic channels (public debt and decreasing domestic consumer demand).

Global market concentration plays an important role when trying to assess the war's impact on GVCs. Russian inputs' substitutability depends on whether they are differentiated or homogenous. Some supplier or products cannot be replaced on the short run, because of the nature of the product and because of the market concentration, which both motives are related to each other. Markets that are highly concentrated in Russia as a supplier will suffer more deeply than others in which concentration is lower. Russia exports several goods that are hard to substitute.

The metal exports of Russia are mostly:

- Copper
- Nickel
- Aluminum
- Iron
- Steel
- Palladium

All these metal products are used in several sectors abroad, such as construction, machinery, metals, transport, and electronics.

The trade disruptions consequence of the Russian invasion of Ukraine have given away the vulnerabilities that countries face when relying on concentrated suppliers for their imports. In the short run seems difficult to replace Russian and Ukrainian inputs so, for the longer-term and in the event of future disturbances, firms and policy makers

should focus on strengthening supply chain resilience to shocks, in example, by diversifying firms' global supplier base and finding new energy sources.

7. The specific case of transports and connectivity

The war and resulting sanctions have disrupted Russian and Ukrainian trade connectivity affecting the logistics of other regions as well. Russia and Ukraine play a special role in the connectivity between Europe and East Asia, the conflict has complicated the commercial flow between the two regions and therefore has created the need to look for alternative routes to allow the flow trade to continue, which, in turn, has increased transport costs and has disrupted supply chains, making final products more expensive to consumers. Russia's connections to European ports have been cut, and therefore commodity exports to other regions have been interrupted. Disruptions to global and regional supply chains have caused input shortages and an increase on prices. Sectors that rely critically on inputs coming from Ukraine have suffered the consequences since Ukraine's Black Sea ports have been blocked, destructed, or occupied, limiting the country's routes to export its commodities. The conflict has brought closures of air space that result in longer routes and higher prices for air freight, especially between Europe and East Asia.

Russia's invasion of Ukraine has significantly affected the maritime transport sector; commercial ships have been hit during the conflict, freight transport redirected, and vessels diverted. Important routes in the Black Sea are blocked or occupied, and even if they are transitable, the uncertainty and instability of the area has brought shipping companies to suspend shipments to and from Ukraine and Russia. According to the Atlantic Council Russian naval ships have hit at least 10 commercial ships since the war started.

UKRAINE

Before the war, Ukraine exported more than 90% of its agricultural products via the Black Sea, between 2018 and 2019 over 50 million tons of grain were shipped from its ports, of which a big portion was destined to Europe, China, and Africa. Now Ukrainian ports are unable to operate, vessel traffic is not insured, and most ports are taken by Russian military forces. The main Ukraine's ports are in the Odessa area and are the following:

- Yuzhny >60 million tons in 2020
- Odessa >20 million tons in 2020
- Chomomorsk >20 million tons in 2020

Given the volumes implicated, re-routing goods to road and rail is not sufficient since it is impractical and very expensive to move such volumes on trucks over long-distances to EU countries and railways to Europe are interrupted. This situation has started a search for alternate trade routes for Ukrainian goods that has rapidly increased the demands on land and maritime transport infrastructure and services, which all has exacerbated congestion at other ports and terminals, putting the normal functioning of maritime connectivity and logistics, as well as maritime safety and security, at risk. For Ukraine's trading partners, many commodities now must be sourced elsewhere and further away, therefore causing an increase on vessel global demand and of the costs of shipping worldwide. Even if the war ends, and normal traffic resumes, transport costs in the Black Sea region would still be higher because it is likely that a premium war-risk will be applied by marine insurers. As a solution to this maritime trade disruption Ukraine is using the Danube with river ports to supply its commodities. The Insurance Marine News reports that in May 2023, Ukraine exported more the 3m tons of food. In 2021 the three Ukrainian Danube ports river processed a total of 5.5m tons of all cargo. Although the flow of exports via the Danube is growing, several infrastructure improvements are needed; the canals are not deep enough, there is no infrastructure at ports to load large ships and the costs of logistics compared to Black Sea ports is higher. Ukraine has been investing in increasing the depth of one its Danube canals (from 3.9 meters to 6.5 meters).

Both Russian and Ukrainian role in supply chains and food security have had serious consequences to the most vulnerable and dependent economies. In addition to that, the higher energy costs have led to higher freight prices, increasing shipping cost for all sectors and regions. Taken altogether, these higher costs and instability in the energy, food and industrial sectors imply higher prices for consumers and threaten to widen the poverty gap, particularly in developing countries.

The war in Ukraine is not the only issue that the maritime transport sector has been facing. The Covid-19 pandemic, port congestions, the sustainability requirements to switch to low carbon fuels, among others, have been disrupting its normal functioning. Although, it is important to highlight that the war in Ukraine has been a shock and has strongly contributed to the higher shipping costs, see Figure 7.1.

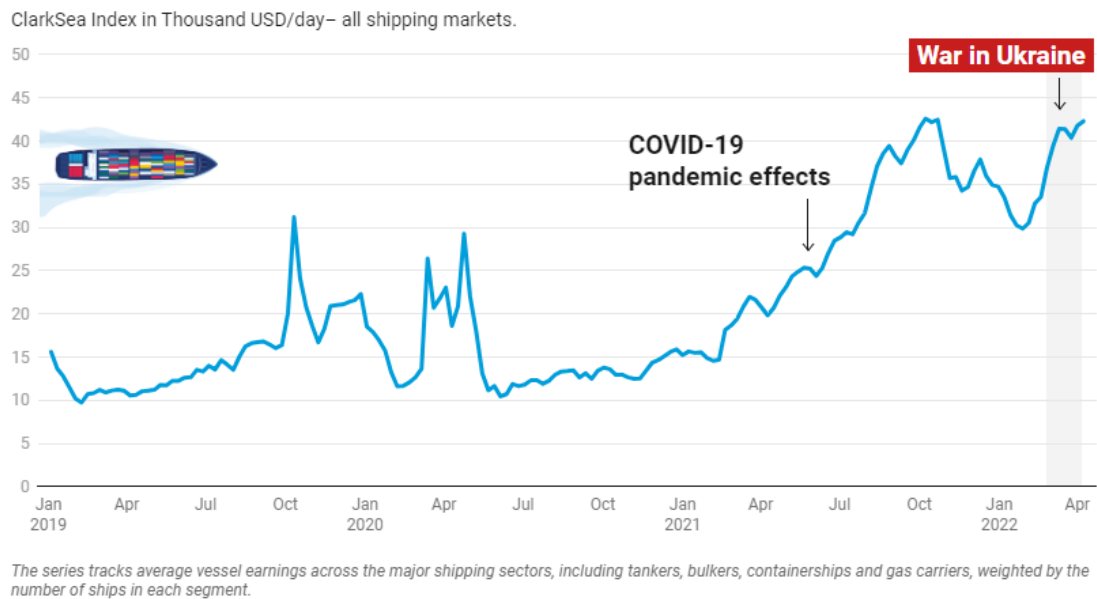


Figure 7.1 Shipping prices, all markets. (Jan. 2019-Apr. 2022)
 Source: UNCTAD, based on data from the Clarkson Research Shipping Intelligence Network

By the end of the second quarter of 2022, the UNCTAD reports that the global average price for very low sulfur fuel oil (used for ships) reached over 1,000 dollars per ton, a 64 percent increase since the beginning of the year and consequently the average fuel surcharges applied by container shipping companies have risen close to 50 percent since the beginning of the war.

Trading patterns of grain have shifted, dry bulk vessel calls have seen small increases at Bulgarian and Romanian ports, reflecting the re-routing efforts. Part of the Ukrainian grains are being transported by rail and then trans-shipped at ports in Bulgaria and Romania.

RUSSIA

The shipping connectivity of Russia has been severely limited by the sanctions. According to the WB container traffic from and to Russia goes through Baltic ports (40 percent of total volume) as well as the Black Sea and Far East ports (30 percent each). As ports are closed and carriers discontinued shipping services to its ports, ships have had to re-route. Traffic to the Northwest is directly affected by the European sanctions. Cargo destined to Russia is now piling up at ports in Hamburg (Germany), Rotterdam (Netherlands), Constanta (Romania) and Istanbul (Turkey). Shipping is facing delays and demurrage charges at ports adding pressure to warehousing and storage capacity and therefore rising costs. As for Russian Black Sea and Far East ports, Russia might

still be able to connect through them to countries and operators that are not joining the sanctions, like China.

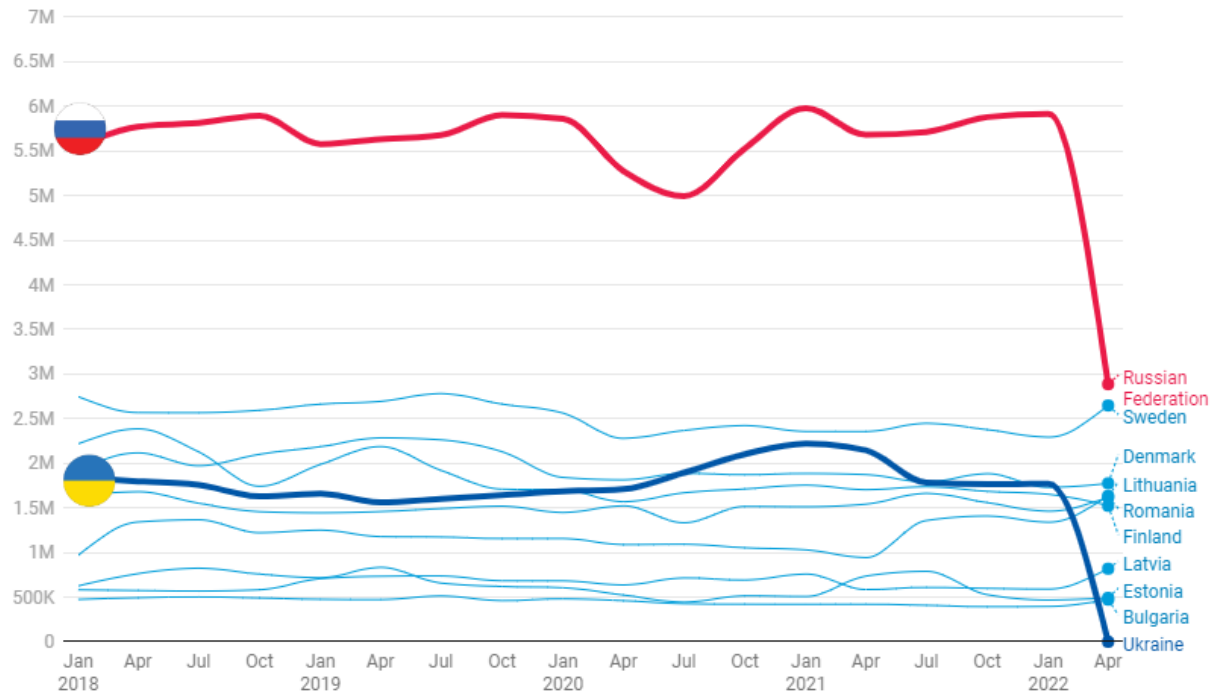


Figure 7.2 Container shipping fleet deployment in selected countries, in TEU capacity.
 Source: UNCTAD, based on data provided by MDST Transmodal.
 Note: TEU capacity is the annualized vessel carrying capacity in twenty-foot equivalent unit.

Russia counts with a very strong domestic aircraft logistics system to serve Russian and Centre Asia customers, but it will suffer the consequences of the sanctions in the medium-term. Logistics operations and movement of goods did not suffer from the exit of European operators from Russia in the immediate term. However, the Russian aircraft operations rely on Western transport and cargo equipment and Western information technology systems, meaning that at some point the equipment might need maintenance which may be compromised and unavailable given the sanctions. Airbus and Boeing, for example, have decided to stop operations in Russia including spare parts deliveries. This decision will affect Russia’s current commercial air fleet with planes mainly built in the US, the EU and Canada.

EUROPE

As mentioned in paragraph 3.2, in response to the war, the European Union adopted multiple sanctions that include the ban on Russian-flagged vessels entering EU ports. The European Sea Ports Organization has highlighted the importance of Europe’s ports in keeping supply chains operational and the necessity to set up new routes for Ukrainian exports.

One of the spillovers of the war and sanctions is the connectivity between Europe and China. The land main connection between Europe and Asia are two rail routes: the Trans-Siberian Rail and the Trans-Kazakhstan Rail. 3 percent of total China-Europe container trade is moved through this rail link. Since 2013, Kazakhstan has become a key transit area with two important border crossings with China: the Alashankou/Dostyk crossing and the Khorgos/Altynkol crossing. At Khorgos Gateway (China), rail cargo is transferred between trains as the rail gauge in Kazakhstan, Russia, and other former Soviet states is wider than the Chinese and European rail gauge. Rail connections continued to operate after the war began but sanctions from the EU have added procedures and requirements when entering its market. Under the sanctions, logistics and industrial operators may decide to not operate in Russia or Russia could even decide to be a no-transit zone for railways, as it did for aviation. This disruption on railways would be significantly difficult to face for Germany, Poland and Austria and the absence of that transport alternative could not be absorbed by the sea freight, whom are already at full capacity. The airfreight could not absorb the demand either since it is also facing severe consequences. The EU, Canada, and US closure of airspace to Russian aircraft and reciprocal closure of Russian airspace to aircraft from those countries, has importantly reduced international and cargo flights from and to Russia. The closedown of airspace means longer routes – and more fuel – and rising freight rates between Europe and East Asia.

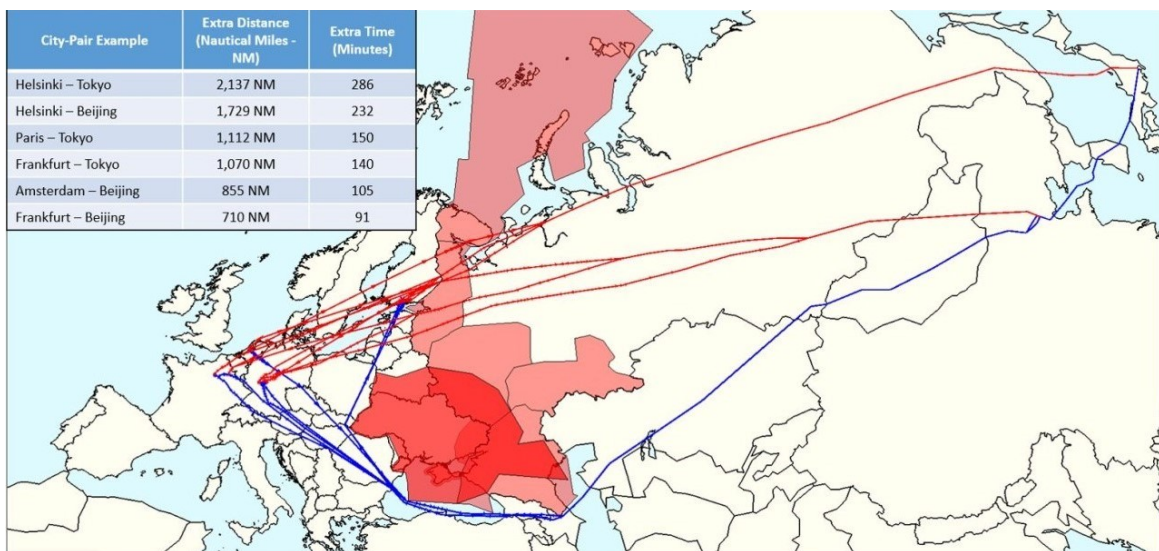


Figure 7.3 Detours on the Europe-Asia routes, with increases in distance and time.
Source: Eurocontrol

Figure 7.3 shows how air routes connecting Europe and Asia have been modified to avoid Russian airspace.

Given the situation, policy action is needed for global trade to flow smoothly in the future. The United Nations Conference on Trade and Development has suggested six recommendations to maritime transports to overcome the challenges its facing and bring it back to normality:

1. Ukraine plays an important role in global food security therefore, to overcome the food crisis, Ukraine's production needs to be reintegrated and also Russian grains and fertilizers – despite the war.
2. Lower transactions costs for food and fertilizers coming from Russia.
3. Ensure collaboration among vessel flag States, port States and industry continue to provide services.
4. Make sure that Ukrainian ports are open to international shipping to allow Ukraine's grain to reach international markets and more importantly without premium-risk extra costs.
5. Invest in transport services, trade and transit facilitation, leverage economies of scale, better infrastructure and digitalization are needed to reduce transport costs.
6. Support developing countries in their process to overcome the challenges posed by the Covid-19 pandemic, climate change and the Russian war.

8. Conclusion

The Russian invasion of Ukraine is an ongoing event and therefore a topical subject. Uncertainty and volatility are present since the situation is constant change, and the academic world has been studying it for a short period of time.

The sanctions applied particularly by the EU have had controversial effects. The purpose of the sanctions is to support Ukraine and its people, to take short-term measures regarding food security, supply of essential commodities and self-efficiency, and to attack Russia financially and economically. However, the effectiveness of the sanctions in some cases is questionable. They've had undesired consequences, an important example is the undefined cut of Russian gas supply, which disrupts supply chains and deteriorates households and business' economy. Even though, Russia's and Ukraine's participation in the global value chains is relatively small, both countries are important providers of key inputs that put at risk the normal functioning of the global supply chains.

The European Union tried to cut its trade relations with Russia, but the reality is that Russia is still its fifth trade partner and its most important supplier of energy, sourcing more than 90 percent of its natural gas and oil. The high European dependency on Russian supply of energy commodities makes it hard for the EU to cut relations completely and therefore gives Russia a negotiation power. The sanctions to Russia not only affect Russia, but they've also had a huge impact on European businesses and companies that used to trade or work with Russia and inside the Russian market, having to find a way to continue their operations or other markets to access.

In terms of the transport and logistic sector, the war has had its consequences too. The main effect is the reorganization of international routes, either by train, aviation, trucks, or vessels, to avoid the area of conflict. Which translates to longer and more expensive trade routes. On top of that, fuel prices have risen significantly, adding more pressure to the shipping and transport companies. Nearshoring and reshoring might become a solution to these disruption in the medium-term, evidencing the already ongoing tendency of a geoeconomic fragmentation.

The war in Ukraine may reshape global value chains. This reshaping may be induced by geopolitical risks, those risks rise insurance premiums and firms must cover those costs and adjust their production and trade structure to pursue economic efficiency. This geopolitical risk does not mean deglobalization, it only indicates the need to trade relationships with new suppliers. Relocating production to developing countries- with a comparative advantage and low geopolitical risk- is expensive yes, but in the long run it may result as a beneficial investment. The relocation would mean that some economies will lose, and some will win. The point is that policy makers and firms should focus on strategies to strengthen global value chains and to mitigate, if possible, world tensions.

The world has witnessed in the last few decades an economic and commercial maelstrom - together with the sanitary and logistical collapse, the energy crisis, and the climate changes – that has accelerated the process to a greater autonomy and positioning of non-Western powers, moving the “operations’ center of the world” from the US and Europe closer the Pacific (especially China, India, and Russia). This shift has already materialized in some ways, like the price of raw materials presented in currencies other than the dollar (Saudi Arabian oil is quoted in yen) and the reduction of foreign exchange reserves in Western countries.

In the very likely event that the war between Ukraine and Russia is prolonged, and also in the event of future conflicts, it is necessary to encourage domestic production, investment in innovation and intensify relations with neighboring countries to design, as far as possible, local global value chains and thus guarantee a resilient, safe and sustainable two-way supply flow. The diversification of business partners is also a key solution, it is important to have different alternatives at hand in order to not be victims of disruptions on supply, regardless of their nature.

Given the topicality of the subject-matter it resulted difficult to find open access databases to carry out a quantitative analysis with suiting modeling methodology, which could be an extension of this analysis.

Possible future lines of investigation should focus on evaluating the real effectiveness of the sanctions carried by the EU. When the war ends, it'll be important to study how it has re-shaped worldwide geopolitics and trade, if governments have shifted towards more protective trade policies or not, and if the EU will be, in fact, able to reduce its dependency from Russia. There are many lessons to be learned by the conflict and all should be kept in mind in the event of future international conflicts with the ability to influence the world's economic system.

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