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Ozili, Peterson K

2024

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MPRA Paper No. 120781, posted 09 May 2024 14:13 UTC

Global Economic Consequences of Russian Invasion of Ukraine

Peterson K. Ozili

Abstract

This paper investigates the global economic consequence of the Russia-Ukraine war over a four-month period from December 2021 to March 2022. Russia invaded Ukraine on the 24th of February 2022. The study used the Pearson correlation and two-stage least square regression methods to assess the impact of Russian invasion of Ukraine on the global economy. It was observed that stock prices plunged on the day of the invasion. The Russian invasion of Ukraine and the COVID-19 pandemic jointly led to a significant increase in the world price of food and crude oil. The rise in the world food price index after the invasion was driven by a significant increase in the price of dairy and oils. The rise in inflation in Russia and Ukraine after the invasion was followed by a rise in inflation in countries that imposed severe sanctions on Russia, and in countries that were not involved in the conflict in any way.

JEL code: H56, N44, D74, F51.

March 2024

Published in book: **Dealing With Regional Conflicts of Global Importance**

<https://doi.org/10.4018/978-1-6684-9467-7.ch010>

1. Introduction

This paper investigates the global economic consequence of Russia's invasion of Ukraine. There is a need to determine the effect of the invasion on global business activities, global food prices and inflation. The need arises from the multiplicity of economic sanctions imposed on Russia, making the Russia-Ukraine war quite different from past wars such as World War I, World War II and the Iraq war.

The study begins by providing a background on the events leading to the Russian invasion of Ukraine or the Russia-Ukraine war. Since the 2000s, Ukraine has been wavering between the West and Russia. This means that Ukraine has not been able to fully join a Western alliance and has not accepted to be fully under Russian influence. In 2008, Ukraine planned to formally join the North Atlantic Treaty Organization (NATO), a move supported by the United States but opposed by France and Germany after Russia announced its opposition to Ukraine's membership of NATO. Subsequently, the plan to join Ukraine was postponed to a later time. In February 2010, a new Ukrainian president was elected who promised that Ukraine will be a 'neutral state' which will cooperate with Russia and Western alliances like the European Union (EU) and NATO. Soon after, Crimea was annexed by Russia in 2014. The annexation led to violence in Donbas and led to intense fighting and violence along the border regions that separated Russia and Ukraine to the east of Europe. Since then, Ukrainian public sentiment has been towards the West with calls for Ukraine to join NATO and the EU to reduce the influence of Russia on Ukraine. But Russia's opposition of Ukraine's membership of NATO since 2010 has caused escalation between the two countries. Russia invaded Ukraine on the 24th of February 2022.

Before the 2022 invasion, the world witnessed the COVID-19 pandemic which began in 2020. The COVID-19 pandemic disrupted economic activities globally (Ozili and Arun, 2020; Ozili, 2021, 2022). Many countries began to recover from the negative effects of the COVID-19 pandemic in 2022. The significant decline in the number of reported COVID infections and death cases in many countries led to the removal of COVID-19-era restrictions in many countries. At the start of 2022, there was great optimism about post-COVID-19 economic growth. Many countries intensified efforts to spur economic growth and to control the COVID-induced inflation. This led to a positive

outlook for global GDP growth which was predicted to increase to 4.4 percent or 4.9 percent in 2022, according to the IMF World Economic Outlook. During the same period, Russia unexpectedly invaded Ukraine on 24 February 2022 (IMF, 2022). The invasion led to geopolitical tensions between the West and Russia, and it diminished global growth forecast due to uncertainty about the effect of the invasion on global supply chain.

The study focuses on the first four months after the invasion and investigate the immediate global economic consequence of the Russia-Ukraine war. Data were obtained from multiple source such as central banks, world bank and trading economics. Graphical analysis, correlations and two-stage least square regression methods were used to analyse the data. The findings reveal that stock prices plunged on the invasion date. The Russian invasion of Ukraine and the COVID-19 pandemic jointly led to a significant increase in the world price of food and crude oil. The rise in the world food price index after the invasion was driven by a significant increase in the price of dairy and oils. The rise in inflation in Russia and Ukraine after the invasion was followed by a rise in inflation in countries that imposed severe sanctions on Russia, and in countries that were not involved in the conflict in any way.

The study contributes to the literature in several ways. First, this study presents the first evidence of the immediate impact of the Russia-Ukraine War on the global economy. Second, it contributes to the literature by analysing how the violent actions of combatant countries affect shared prosperity, especially the prosperity of non-combatant countries. The findings showed that the actions of combatants, e.g., Russia, exacerbated inflationary pressure in many European countries, and led to a rise in the world price of food and oil, which negatively affected countries that were not involved in the conflict. Third, the study contributes to the literature that examines the economic consequence of past wars such as World War I, World War II, Korea wars and the Iraq war (e.g. Kang and Meernik, 2005; Heydemann, 2018; Chassang and Miquel, 2009; Koubi, 2005; Collier, 1999; Nordhaus, 2002; Glick and Taylor, 2010; Bluszcz and Valente, 2019; Ganegodage and Rambaldi, 2014; and Kesternich et al, 2014). However, these studies did not examine the economic consequence of war in a modern European society, and the spillover effect to other countries.

The rest of the paper is structured as follows. Section 2 presents the literature review. Section 3 presents a discussion of Russian invasion of Ukraine. It discusses the cause of Russian invasion of Ukraine in February 2022, the international response to Russian invasion during the war, the multilateral support for Ukraine, and Russia's response to international sanctions. Section 4 presents the research methodology. Sections 5 and 6 presents the empirical results. Section 7 concludes.

2. Literature review

2.1. Studies on the general economic effects of war

Existing studies on the economic effects of war show that wars have economic consequences. For instance, Kang and Meernik (2005) showed that there are two schools of thought on the effects of war. The first school of thought is the 'war renewal' school of thought while the second school of thought is the 'war ruin' school of thought. The 'war renewal' school of thought argued that wars can produce beneficial effects as they improve efficiency in the economy by reducing the power of special interests, bringing technological innovation, and increasing human capital while the 'war ruin' school of thought view wars as destructive events with no benefit on the economy (Kang and Meernik, 2005). Heydemann (2018) argued that civil wars, such as the civil wars in the Middle East, did not create conditions conducive to re-conceptualizing sovereignty or decoupling sovereignty and governance; rather, parties involved in the conflict compete to capture and monopolize the benefits that flow from international recognition. Under these conditions, civil wars in the Middle East will not yield easily to negotiated solutions. Chassang and Miquel (2009) stated that poor countries have a higher propensity to suffer from civil war especially when poor countries suffer from negative income shocks.

Several studies empirically estimated the economic effects of wars. Koubi (2005) studied the consequences of interstate wars for economic growth in a large cross-section of countries from 1960 to 1989. The study found that cross-country differences in economic growth is systematically related to the occurrence and the characteristics of war. The study observed that

post-war economic performance is positively related to the severity and the duration of war. But the growth-enhancing effects vary negatively with a country's level of economic development. Kang and Meernik (2005) examined the effects of civil wars on many countries from 1960 to 2002. They found that wars have a negative effect on economic fundamentals, and that the response by the international community to civil wars exerts powerful effects on economic growth. Collier (1999) developed a model to evaluate the economic effects of all civil wars since 1960. Collier (1999) observed that after long civil wars, the economy recovers rapidly, whereas after short wars the economy continues to decline. Nordhaus (2002) showed that wars are very costly, and the estimated cost of the Iraq war to the United States over the decade ranged from \$100 billion to \$1.9 trillion. Glick and Taylor (2010) studied the effects of war on bilateral trade with available data extending back to 1870. They used the gravity model to estimate the effects of wars on international trade while controlling for other determinants of trade as well as the possible effects of reverse causality. They found a large and persistent impact of wars on trade, national income and global economic welfare.

Bluszcz and Valente (2019) quantified the short-term causal effects of the Donbass War on Ukraine's GDP from 1995 to 2017. They found that Ukraine's per capita GDP declined by 15.1% because of the war from 2013 to 2017. Ganegodage and Rambaldi (2014) found that the war in Sri Lanka had a significant negative effect on GDP. They also showed that high returns from investment in physical capital did not translate into sizable positive externalities. Kesternich et al (2014) investigated the long-run effects of World War II on the socioeconomic status and health of older individuals in Europe. They analysed data from SHARELIFE, a retrospective survey conducted as part of SHARE in Europe in 2009. SHARELIFE provides detailed data on events in childhood during and after the war for over 20,000 individuals in thirteen European countries. They constructed several measures of war exposure: experience of dispossession, persecution, combat in local areas, and hunger periods. They found that exposure to war and to individual-level shocks caused by the war significantly predict economic and health outcomes at older ages.

2.2. Studies on the Ukraine and Russian conflict

Existing studies analysed the effect of the 2014 Ukraine-Russia crisis. Shelest (2015) explained that the protests in Ukraine in the winter of 2014 resulted in the annexation of Crimea by Russia. Ukraine considered the conflict to be a Russia–Ukrainian conflict. Meanwhile, Russia considered the crisis to be a Russia–West confrontation, claiming that the crisis was provoked by NATO's desire to enlarge into the region where Russia has strong interests. Samokhvalov (2015) argued that the conflict in the EU-Ukraine-Russia triangle was affected by the combination of choices made by the Ukrainian political class, business elites and broader society in three major dimensions: internal political practices, economic international politics, and ideological dimension. Hoffmann and Neuenkirch (2017) analysed the impact of the pro-Russian conflict on stock returns in Russia and Ukraine from November 21, 2013, to September 29, 2014. They found that the conflict reduced Russian and Ukrainian stock returns. Wang (2015) showed that the 2014 Ukraine crisis and Russia's Crimea annexation pushed Russian-Western relations to near the freezing point, and despite the international sanctions imposed on Russia led by the US and the European Union, Russia remained politically stable, diplomatically stable, and its population is united. Liefert et al. (2019) examined how Russia's economic crisis and ban on agricultural imports from the United States and other Western countries that began in 2014 affected its agricultural and food sector. They documented that the import ban affected Russian consumers by reducing Russia's import of agricultural and food products, substantially raising food prices, and lowering consumption. But the import ban did not affect Russia's basic food availability. Rather, the import ban stimulated agricultural production within Russia thereby ensuring food sufficiency during the ban. Dreger et al (2016) showed that, during the aftermath of the 2014 conflict between Russia and Ukraine, the Russian Ruble lost 50% of its value against the US dollar. Havlik (2014) showed that the cost of the conflict for Russia was estimated to be in the tune of 1% of Russia's GDP from 2014 to 2016 because of increased investment risks.

Recent studies also examined the effect of the 2022 Russia-Ukraine war. Abakah et al. (2022) examined the effect of the Russia-Ukraine war on the global financial technology industry and blockchain markets. They developed a Russia-Ukraine War Economic Sanctions News Sentiment Index (RUWESsent) that reflects the public sentiment and reaction to economic sanction news

using media coverage, panic, sentiment and media hype based on Twitter sentiments, Google Trend, Wikipedia Trend, and News Sentiments. They found that the negative sentiments about the war negatively impacted FinTech and blockchain market stocks. Alam, Chowdhury, Abdullah and Masih (2023) investigated the return and volatility spillovers among financial assets from January 2019 to November 2022 using connectedness approaches. They found that the total return and volatility connectedness increased during the COVID-19 and the Russia–Ukraine war. Qureshi, Rizwan, Ahmad and Ashraf (2022) investigated the systemic risk implications of the conflict in Russia, Ukraine, France, Germany, Italy, the UK, the USA, and China. They showed that the systemic instability costs of the conflict go beyond Russia and Ukraine. Chortane and Pandey (2022) examined the impact of the Russia-Ukraine war on the value of global currencies against the US dollar (USD). They showed that the Russia-Ukraine conflict had a negative impact on the value of the global currencies; meanwhile, a region-by-region analysis showed that while European currencies (particularly the Russian rouble, Czech koruna, and Polish zloty) depreciated against the USD, Pacific currencies appreciated significantly, and the currencies of the Middle East and Africa (ME&A) are insignificant. Bounou and Yatié (2022) investigated the impact of the Ukraine–Russia war on the world stock market returns of 94 countries from 22 January to 24 March 2022. They found a negative relationship between the Ukraine–Russia war and world stock market returns. Lo, Marcelin, Bassène and Sène (2022) investigated the influence of the Russia-Ukraine war on financial markets in 73 countries. They found that financial markets reacted to the war-induced shock significantly, with a weaker effect on asset prices than volatility, and the markets perceived the dependence on Russian commodities as a significant risk factor.

2.3. Studies on the consequence of war in combatant countries

Several studies showed that war affects combatant countries i.e., countries directly involved in the war. Leigh et al (2003) showed that the US-Iraq war raised oil prices in the US by around \$10 per barrel, and the war lowered the value of U.S. equities by around 15 percent. However, the war boosted the gold and energy sectors in the U.S. The findings of Leigh et al (2003) suggest that countries that are net oil importers are most likely to experience adverse effects from war. Simeunovic (2016) analysed the effect of the Iraq war on stock returns in U.S. financial markets.

They focused on the quarterly prices of the Dow Jones Industrial Average index from October 1960 to September 2015, and found that the war had a positive effect on the quarterly returns from the Dow Jones Industrial Average index. In a related study, Cortes et al. (2022) analysed the effect of the US war on stock volatility after U.S. invasion of Afghanistan in 2001 and the Iraq war in 2003. They found that defence spending reduced stock volatility for firms that produce military goods. An explanation for Cortes et al (2022)'s findings is that the profit of defence firms becomes easier to forecast during wartime due to massive government military spending. Furthermore, Fan et al (2022) investigated whether US trade war against China in 2018 to 2019 enhanced or diminished the US soft power in China during the period of the Trump tariffs. In the study, US soft power in China was measured by the viewership of US movies in China. They found a significant reduction in US movie revenue in regions more exposed to the Trump tariffs, but there was no corresponding reduction in non-US movie revenue. They also observed that online search for US movies, US tourist destinations, and US branded sports shoes declined during the period of the Trump tariffs. The findings of Fan et al (2022) suggest that one of the consequences of the US-China trade war was a decline in US soft power in China during the Trump tariff era.

2.4. Studies on the effect of war on non-combatant countries

Other studies showed that a war can have external unintended positive and negative consequences on the economy of non-combatant countries, i.e., countries who are not involved in the war in any way. A non-combatant country may be a neighbouring country or a distant country. Regarding the positive effect of war on non-combatants, Sanyal (2021) examined the impact of the US-China trade war on India. They noted that India had significant trade ties with both the US and China. They found that the high import tariffs which the US and China imposed on each other led to significant trade diversion to India from China. The trade diversion had significant benefits for the Indian economy. Regarding the negative effect of war on non-combatants, Jordi van (2022) showed that the Ukraine war had negative consequences for the economic growth of neighbouring countries. Federle et al (2022) argued that major geopolitical events have global repercussions. They analysed stock market reactions to the Ukraine war. Federle et al (2022) found a large "proximity penalty" effect, which means that neighbouring countries close to Ukraine witnessed an abnormal decline in equity indices of 23.1% within four

weeks from the start of the Ukraine war. The implication is that countries who are neighbours to a combatant country often face some sort of economic repercussion when their neighbours go to war. Bounou and Yatié (2022) investigated the effect of the Ukraine–Russia war on world stock market returns. They analysed 94 countries from 22 January to 24 March 2022 and found that the war had a negative impact on the world’s stock indices, and the effect was more significant after the invasion of Ukraine by Russia. Also, neighbouring countries including Ukraine and Russia who were not involved in the war were the most affected. Carvalho et al. (2019) investigated the effects of the US–China trade war on both countries and some emerging economies. They used the global trade analysis project (GTAP) computable general equilibrium model and showed that the US-China trade war would benefit emerging countries by shifting demand to sectors where they have a comparative advantage.

3. Understanding why Russia invaded Ukraine

3.1. The cause of Russia’s invasion of Ukraine in February 2022

Many agreements have been reached to resolve the conflict between Russia and Ukraine (Matveeva, 2022; Bharti, 2022; Hebert and Krasnozhan, 2023). The earliest agreement is the Budapest memorandum in 1994 which prohibited Russia, the United Kingdom and the United States from threatening or using military force or economic coercion against Ukraine, Belarus, and Kazakhstan except in self-defence or otherwise in accordance with the Charter of the United Nations. There is also the Minsk agreement. The Minsk I and II agreements were international agreements which sought to end the war in the Donbas region of Ukraine. The first Minsk agreement was reached in 2014. The parties to the agreement were Ukraine, Russia and the Organization for Security and Co-operation in Europe. The mediators were the leaders of France and Germany. The Minsk 1 agreement failed to stop the fighting and was consequently revised to become the Minsk II agreement which was signed in February 2015. The Minsk II agreement consisted of a ceasefire, withdrawal of heavy weapons from the front line, release of prisoners of war, constitutional reform in Ukraine, and restoring control of the state border to the Ukrainian government. Although the fighting diminished in effect after the Minsk II agreement

was reached, it did not end the fighting completely. In 2022, Russia officially recognized the Luhansk and Donetsk People's Republics and declared that the Minsk agreements no longer existed. This move by Russia further escalated the tensions between Ukraine and Russia. After the Minsk agreements failed to end the war in the Donbas region of Ukraine in 2015, there have been heightened tensions between Ukraine and Russia. Ukraine's desire to join NATO as well as Russia's opposition to NATO coming close to its borders escalated the conflict between the two countries. Consequently, Russia invaded Ukraine on the 24 February 2022.

There are different accounts of what caused the 2022 Russia's invasion of Ukraine. There is the pro-Russian account of what caused the invasion. There is also the pro-West or Western account of what caused the invasion. The pro-Russian reason for invading Ukraine is that Ukraine is being controlled by Western powers, and Ukraine was using its military to oppress citizens in the separatist regions who are loyal to the Russian government and is committing genocide against its own people¹. The Russian government also claimed that Ukraine's ambition to join a military alliance with NATO posed a threat to Russia's national security, and such ambition would expand NATO eastward and bring NATO closer to Russia's border thereby posing an existential threat to Russia. It will allow the West to infiltrate Russia and undermine Russia's national security. Russia further claimed that Ukraine refused to comply with the Minsk Agreements that offered a peaceful solution to the conflict and accused the Ukrainian government of turning Ukraine into an anti-Russian parade ground. Russia stated that these concerns gave it a motivation to act militarily against Ukraine. Russia also claimed that it considered many options to resolve the issue including negotiation or invasion. But with Ukraine refusing to negotiate before the invasion occurred, the Russian government claimed that it chose the least dangerous option which was to invade Ukraine to remove the pro-West government in Kyiv, install a new government, and sign a peace deal with the newly installed government. The peace deal will include a ban from joining NATO and the European Union.

¹ Many western commentators say that this claim by the Russia government is false and baseless.

The pro-West or Western account of what caused the invasion, as reported by multiple Western media², is that Russia feels threatened that Ukraine wants to be a democratic nation, free from Russian influence, and seek collaboration with the West in politics, security and trade which includes the possibility of joining NATO and the European Union. The pro-West media reports that Russia opposed Ukraine's decision to adopt Western democracy and alliance because Ukraine's western alliance with the European Union and NATO could threaten the national security of Russia. Western media also believes that the Russian 'special military operation' in Ukraine was aimed at removing the Ukrainian president and the incumbent government in Kyiv and installing a new pro-Russian government in Ukraine.

3.2. International sanctions imposed on Russia for invading Ukraine.

Many countries in the West imposed sanctions on Russia for invading Ukraine, according to S&P Global's timeline of sanctions against Russia³. These countries include the United States, United Kingdom, the European Union, France, Japan, Australia, Canada, New Zealand, Taiwan and others. The purpose of the international sanctions was to launch an economic warfare against Russia, inflict economic pain on the Russian economy, and significantly reduce Russia's ability to fund its military operations in Ukraine, in order to force Russia to end its military invasion of Ukraine. Some of the sanctions imposed on Russia during the February 2022 invasion are listed below.

Western countries blocked some Russian banks from using the SWIFT⁴ global payment system. SWIFT is a high-security network that facilitates payments among 11,000 financial institutions in 200 countries. Germany halted the certification of Russia's Nord Stream 2 gas pipeline project intended to distribute energy to European countries. New Zealand prohibited the export of goods to Russian military and security forces in response to Russia's invasion of Ukraine. The United States banned the export of war technology to Russia to severely limit Russia's ability to advance

² Al Jazeera - <https://www.aljazeera.com/news/2022/2/24/explainer-russias-invasion-of-ukraine-what-we-know-so-far>

Reuters - <https://www.reuters.com/world/europe/events-leading-up-russias-invasion-ukraine-2022-02-28/>

³ <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/sanctions-against-russia-8211-a-timeline-69602559>

⁴ SWIFT means 'Society for Worldwide Interbank Financial Telecommunication'

its military and aerospace sector. The ban will limit US export of semiconductors, telecommunication, encryption security, lasers, sensors, navigation, avionics and maritime technologies to Russia. The United States also barred Russian financial institutions and the Russian Central Bank from accessing their dollar external reserves held in the United States. This means that Russian financial institutions and the Russian Central Bank could not make transactions in American dollars. The United States also banned all Russian oil and gas imports.

The European Union imposed financial sanctions on Russia, targeting 70% of the Russian banking market and key state-owned companies. The EU banned Russian deposits above €100,000 in EU banks on Russian accounts held by EU central securities depositories. The EU banned the selling of euro-denominated securities to Russian clients. The EU banned the listing of the shares of Russian state-owned entities on EU trading venues. The European Union banned the sale, supply, transfer or export of technologies in oil refining to Russia. The EU banned Russia's biggest banks from SWIFT. The European Union imposed an export ban on all aircraft, spare parts and equipment to Russian airlines, as well as to the Russian space industry. The European Union halted visa agreements with notable Russian persons. This means that Russian diplomats, officials and businesspeople were no longer able to benefit from visa facilitation provisions which allow privileged access to EU countries.⁵ The European Union removed Russia from all cultural events and sporting events such as the Eurovision and the UEFA champions league. Russia was also suspended from many sporting events such as the Wimbledon Tennis Championship, World Rugby and the Olympics. Canada cancelled all valid export permits associated with Russia. Switzerland and Japan freeze the assets of certain Russian individuals held in Swiss and Japanese banks. Australia imposed travel bans and financial sanctions on eight members of the Security Council of the Russian Federation. Japan suspended visas for individuals from the "Donetsk People's Republic" and the "Luhansk People's Republic". Japan also prohibited the issuance and transaction of new Russian sovereign debt in the primary and secondary market. Switzerland partially suspended a visa agreement that made it easier for Russians to enter Switzerland since

⁵ According to a report by the Financial Times <https://www.ft.com/content/6f3ce193-ab7d-4449-ac1b-751d49b1aaf8>

2009, including for diplomats. It also imposed travel bans on five unnamed oligarchs close to Vladimir Putin who have ties with Switzerland.

The United Kingdom (UK) imposed financial sanctions on Russian banks by freezing the assets of Russian oligarchs held in UK banks. The UK also barred Russia's largest bank 'Sberbank' from clearing payments in Pound Sterling. The UK announced that it will phase out Russian oil by the end of 2022. The UK banned Russian airline 'Aeroflot' from operating in the UK airspace. South Korea banned exports of strategic items to Russia and joined other countries in blocking some Russian banks from accessing the SWIFT international payments system. The ban exports include electronics, semiconductors, computers, information and communications, sensors and lasers, navigation and avionics, and marine and aerospace equipment. South Korea also halted transactions with the Russian Central Bank, the Bank Rossiya, and Sovereign Wealth Funds associated with Russia. Finland, Belgium, Latvia, Ireland, Estonia, Lithuania, Poland, Bulgaria, Moldova, Romania, Slovenia and Czech Republic also banned Russian planes from flying into their airspace. European countries expelled at least 43 Russian diplomats and at least 45 Russian citizens. The number of expelled diplomats was 17 in Netherland, 1 diplomat in Czech, 21 diplomats in Belgium, and 10 diplomats in Latvia, Estonia and Lithuania. The United States and EU countries imposed sanctions on Putin's family members, including Putin's daughters, on suspicion that his family members or his daughter were hiding his wealth. The EU further imposed (i) an import ban on all forms of Russian coal, (ii) a full ban on Russian and Belarusian freight road operators working in the EU, (iii) a full prohibition on the participation of Russian nationals and entities in procurement contracts in the EU. The United Nations expelled Russia from the United Nations Human Rights Council for its alleged human rights violations in Ukraine. The expulsion took place in a United Nations general assembly in which 93 members voted in favour of expelling Russia while 24 members voted against expelling Russia and 58 members abstained from voting. These international sanctions imposed on Russia were severe and affected the Russian economy in many ways. But there were concerns that Russia would retaliate and the effect could be devastating for the global economy.⁶

⁶ Moscow Times Media - <https://www.themoscowtimes.com/2022/02/23/russia-promises-strong-response-to-us-sanctions-over-ukraine-a76539>

3.3. Support for Ukraine

Ukraine received overwhelming support during the invasion according to the Kiel Institute's Ukraine Support Tracker⁷. The United States offered over \$1billion aid in security assistance to Ukraine to enable Ukraine to defend itself against Russia. The aid was used to purchase stinger anti-aircraft systems, military javelins, light anti-armour weapons, anti-armour systems; tactical unmanned aerial systems, grenade launchers, rifles, pistols, machine guns, shotguns; grenade launcher, body armour, and helmets. Other countries offered military assistance to Ukraine such as the United Kingdom, Australia, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland Germany and Italy. Some countries offered only humanitarian aid to Ukraine in the form of food, clothing and emergency medical supplies. These countries include Argentina, Hungary, India, Pakistan and Thailand.

Multilateral organizations also supported Ukraine by offering financial assistance to Ukraine. The European Bank for Reconstruction and Development (EBRD) approved a "War on Ukraine – EBRD Resilience Package" valued at EUR 2 billion. The fund will be used to meet the immediate needs of the people affected by the war and to support the substantial reconstruction of Ukraine. The European Investment Bank (EIB) offered an emergency solidarity package for Ukraine of EUR 2 billion, including the provision of EUR 668 million in immediate liquidity assistance to the Ukrainian government. The International Monetary Fund (IMF) disbursed emergency assistance of US\$1.4 billion to Ukraine in March 2022 under the Rapid Financing Instrument (RFI) to help meet the urgent financing needs of Ukraine including to mitigate the economic impact of the war. The World Bank offered more than US\$925 million for Ukraine.

⁷ <https://www.ifw-kiel.de/topics/war-against-ukraine/ukraine-support-tracker/>

3.4. Russia's response to the international sanctions

Many economists anticipated Russia's reaction to the international sanctions and warned that retaliatory sanctions could start a global economic war. Russia reacted to the international sanctions by taking some calculated measures according to Reuters⁸.

For instance, Russia forced countries that rely on Russia's energy import to pay for Russia's energy export in Ruble rather than the US dollar. This measure helped the Ruble to appreciate in value to pre-invasion levels after previous weeks of multiple depreciation of the Ruble. Russia pegged the Russian Ruble to gold. This action by Russia was remarkable because it was a bold step to weaken the dominance of the US dollar as the ultimate reserve currency. Pegging the Russian Ruble to gold helped to insulate Russia's economy from the negative economic effects of the dollar-based multilateral financial sanctions. Russia banned Russian export of more than 200 products until the end of 2022. The banned exports include telecoms, medical, vehicle, agricultural, electrical equipment and timber. Russia increased the key interest rate to stop the decline of the value of the Ruble which is the Russian currency. Russia barred the payment of interest to foreign investors who held Russian government bonds. Russia banned Russian firms from paying dividends in US dollars to overseas shareholders. The purpose of this ban was to reduce Russia's demand for US dollars, and to mitigate the effect of the dollar-based financial sanctions imposed on Russia by the United States. Russia banned foreign investors who held billions of dollars' worth of Russian stocks and bonds from selling them. The purpose of this ban was to reduce Russia's demand for US dollars, and to mitigate the effect of the dollar-based financial sanctions imposed by the United States on Russia. Russia retaliated by expelling foreign diplomats from Russia. Russia offered to buy back its \$2billion Eurobonds in Ruble rather than US dollars when it matured in April 2022. This was to reduce the overall amount of foreign currency the Russian government had to pay out. Russia nationalised foreign companies in Russia that closed their operations to show their opposition to Russia's invasion of Ukraine. Russia cut off food and fertilizer exports to "hostile" countries. This led to food and fertilizer shortage, thereby leading to food price inflation in hostile countries.

⁸ <https://www.reuters.com/world/russias-response-western-sanctions-2022-05-13/>

4. Research Methodology

Data were collected from multiple sources, as shown in Table 1. Global data, Euro Area data and country-specific data for Ukraine and Russia were collected. The data were collected for a four-month period beginning from December 2021 to March 2022. February 2022 was the month of Russia's invasion of Ukraine. Trend analysis was used to analyse the impact of the invasion on relevant macroeconomic variables. The Pearson correlation method was used to assess the correlation between relevant macroeconomic variables during the period. The two-stage least square regression was used to analyse the effect of the invasion on selected global economic indicators including the rate of inflation.

Table 1. Variables and data source

<i>Symbol</i>	<i>Variables</i>	<i>Source</i>
PMI	Global Composite PMI	JP Morgan Markit Economics
	Global Manufacturing PMI	JP Morgan Markit Economics
FOOD	World Food Price Index	Food and Agriculture Organization database
WCP	World Cereals Price Index	Food and Agriculture Organization database
WOP	World Oils Price Index	Food and Agriculture Organization database
WDP	World Dairy Price Index	Food and Agriculture Organization database
BRENT	Brent crude oil price	IEA
MPMI _E	Manufacturing PMI for the Euro Area	The S&P Global Eurozone PMI
MPMI _E	Service PMI for the Euro Area	The S&P Global Eurozone PMI
PMI _E	Composite PMI for the Euro Area	The S&P Global Eurozone PMI
CPI	Transportation CPI for the Euro Area	Eurostat
INF _M	Inflation rate (MoM) for Russia and Ukraine	Trading economics
INF _Y	Inflation rate (YoY) for Russia and Ukraine	Trading economics
COVID	Number of world coronavirus cases	World health organization
WAR	Binary variable representing the months of Russian invasion of Ukraine	Author's construction

CPI=Consumer price index. PMI = Purchasing Managers' Index (PMI). YoY=Year-on-year. MoM = Month-on-month. S&P = Standards and Poor

Source: Multiple databases

5. Results

5.1. Potential impact on the global economy

5.1.1. Global supply chain disruption

Military operations during Russia's invasion of Ukraine affected operations in multiple sectors through global supply chain disruption. The ban on Russian exports and a retaliatory ban on imports by Russia, including Russia's refusal to allow foreign cargoes to pass through its waterways and airspace during the early phase of the invasion, disrupted the global supply chain. It created scarcity and led to an increase in the price of imported goods. Companies anticipated that the disruption caused by cross-border blockades and cross-trade bans would lead to hoarding of supplies thereby leading to high prices. Furthermore, restrictions to commercial flights around the Ukraine-Russia border and the increased security checks at refugee camps in neighbouring countries led to further disruption in cargo flow as many cross-border goods and supplies were halted or delayed due to border officials processing refugees before attending to cross-border goods. It worsened the disruption in global supply chain and increased the price of imports.

5.1.2. Rising oil and gas prices

Prior to the invasion, energy prices were rising⁹ due to multiple factors such as the COVID pandemic, limited energy supplies and growing tensions between Russia and Ukraine. During this time, oil prices were stable within the price band of US\$80 to US\$95 before the invasion, as shown in figure 1. After the Russian invasion of Ukraine, oil prices exceeded USD\$100 a barrel. The invasion made it difficult for European oil marketers and oil companies to receive energy supplies from Russia, as Russia is the world's second-largest oil producer and sells most of its crude to European refineries. The oil import ban placed on Russia during the invasion led to energy shortage in Europe and a sustained rise in energy prices. Gas prices for household use also increased due to fears of a disruption to global energy supplies as shown in figure 2. There were concerns that a retaliatory export ban on energy supplies to Europe and the rest of the

⁹ According to <https://www.iea.org/data-and-statistics>

world by Russia would plunge the world into a lasting energy crisis and could make oil price exceed \$150 a barrel. This expectation reduced global economic growth forecast.

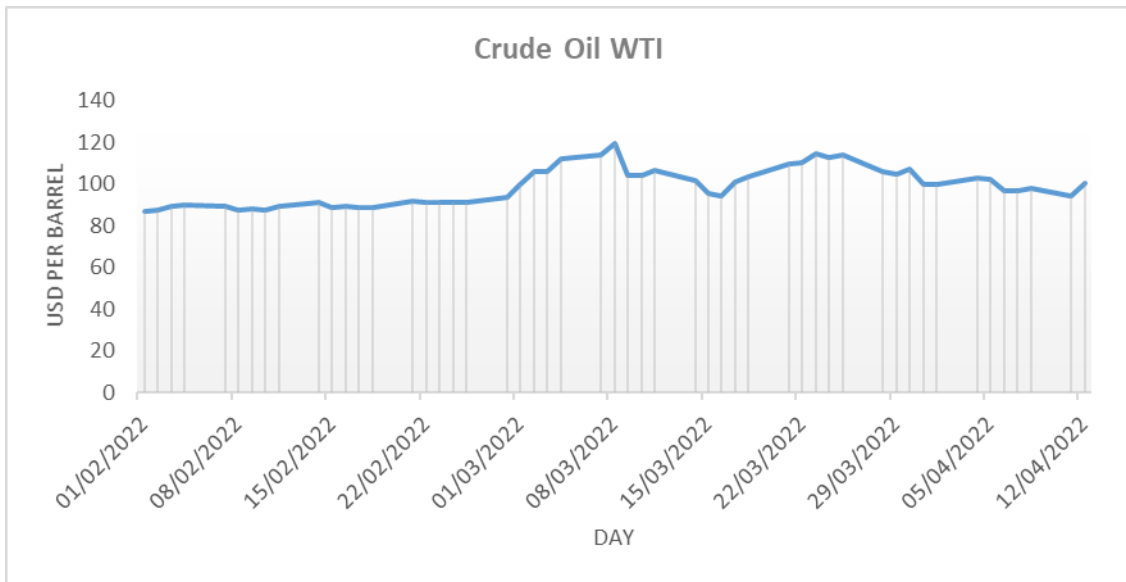


Figure 1: Trend in crude oil WTI (source: trading economics)

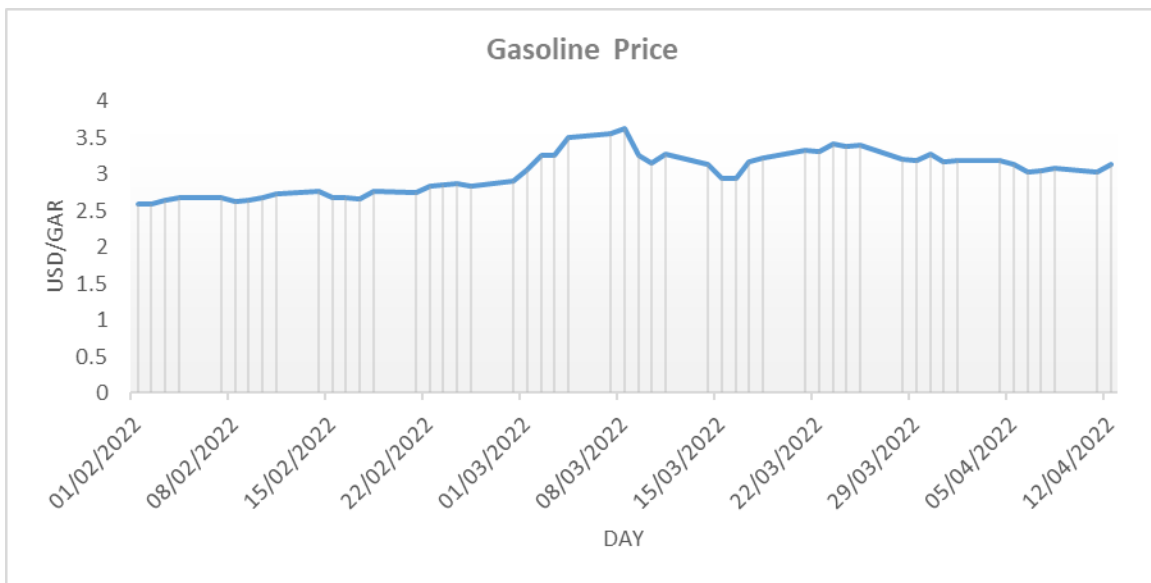


Figure 2: Trend in gasoline price (source: trading economics)

5.1.3. Effect on the global banking system

The effect of Russia's invasion of Ukraine on the global banking system was minimal because the international financial sanctions targeted mostly Russian banks. The sanctions, including the ban of selected Russian banks from SWIFT, did not affect the global banking system in a significant way. It only affected foreign banks with large operations in Russia. Many foreign banks recorded losses after several Western countries imposed financial sanctions on Russian banks, the Russian Central Bank and Russian wealthy individuals. The most affected banks were Austria's Raiffeisenbank, Italy's Unicredit and France's Société Générale. Many more foreign banks recorded huge losses when they discontinued their operations in Russia. The resulting losses were significant for small foreign banks and insignificant for large foreign banks. Also, banks with large operations in Russia recorded significant loss in investment profit from their discontinued Russian subsidiary.

5.1.4. Rising global inflation and cost of living

Monthly inflation rate increased in many countries due to the invasion (see figure 3). The rise in inflation increased the cost of living. In the UK, for instance, the inflation rate rose to 5.5%,¹⁰ implying that consumers spent more money on fewer goods. The invasion led to a further hike in the price of oil, gas, food and food ingredients. It increased the cost of living as the cost of mortgage deductibles, cars and lighting increased significantly. It generated spillover effects to developing countries that rely on energy import from European countries. Developing countries paid a higher price for energy imports which translated to a rise in the local pump price of fuel, a rise in food prices and a general rise in merchandise imports despite income levels remaining unchanged. The combined effect for developed countries and developing countries is that it led to a significant rise in global inflation and higher cost of living.

¹⁰ According to the UK Office for National Statistics

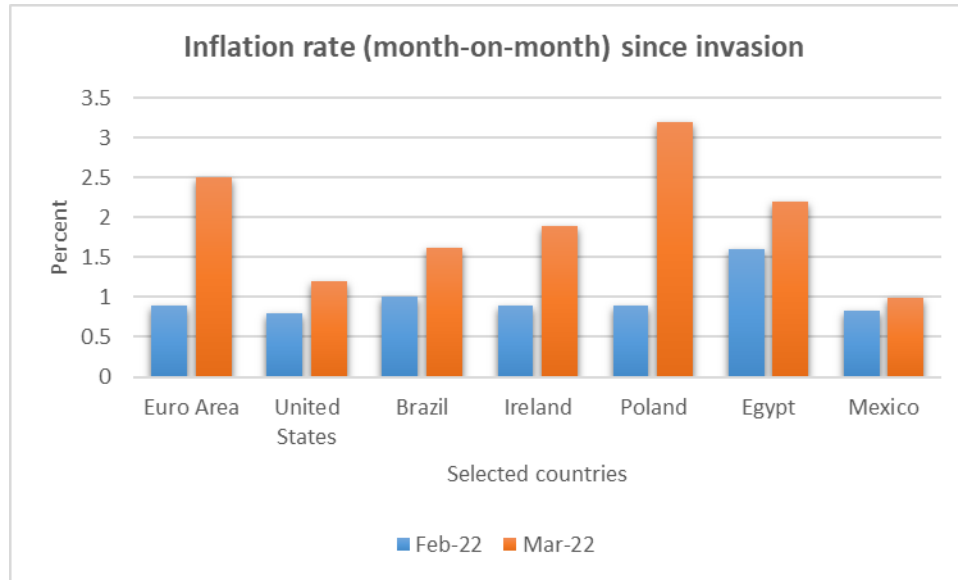


Figure 3: Month-on-month inflation rate since Russian invasion (source: trading economics)

6. Further results: Regression analysis of the global economic effect of the invasion

6.1. Two-stage least square (2SLS) regression analysis

6.1.1. Unilateral effect of Russian invasion of Ukraine on some global economic indicators

Table 2 reports the 2SLS regression result for the unilateral effect of Russian invasion of Ukraine on some global economic indicators. Table 2 shows that the WAR coefficient is statistically significant and positively related to the world food price index and the price of Brent crude oil. The result indicates that world food price and the price of Brent crude oil increased significantly during the period of Russian invasion of Ukraine. Meanwhile, the WAR coefficient is not significantly related to global PMI in column 3.

**Table 2. Unilateral effect of Russian invasion on global economic indicators
Analysis based on Two-Stage Least Square Regression (2SLS)**

	(1)	(2)	(3)
	Dependent variable: Brent crude oil (BRENT)	Dependent variable: Food price index (FOOD)	Dependent variable: Global PMI (PMI)
	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	80.350** (11.67)	134.650*** (22.31)	52.800** (49.00)
WAR	25.97* (2.92)	18.450* (2.36)	-0.433 (-0.31)
R-square	74.01	65.14	3.13
Adjusted R-square	65.35	53.53	-2.91
F-statistic	8.546	5.61	0.097
Prob (F-statistic)	0.06	0.09	0.77

***, **, * denote statistical significance at the 1%, 5% and 10% level. The 2SLS instruments are the WAR and COVID variables. WAR variable = a binary variable representing the months of Russian invasion of Ukraine. COVID variable = the logarithm of the total of number of world coronavirus cases

Source: Author's computation

6.1.2. The separate effect of Russia's invasion and the COVID pandemic on global economic indicators

Table 3 reports the 2SLS regression result for the separate effect of Russian invasion of Ukraine and the COVID pandemic on some global economic indicators. Table 3 shows that the WAR coefficient is statistically significant and positively related to the global PMI in column 3. This indicates that sentiments about global business activities increased during the Russian invasion of Ukraine. In contrast, the COVID coefficient is statistically significant and negatively related to the global PMI in column 3. This indicates that the number of COVID cases increased during the Russian invasion of Ukraine. The WAR coefficient is not significantly related to the BRENT and the FOOD variables in columns 1 and 2 of table 3. Similarly, the COVID coefficient is not significantly related to the BRENT and the FOOD variables in columns 1 and 2 in table 3.

**Table 3. Effect of Russia-Ukraine War and COVID on global economic indicators
Analysis based on Two-Stage Least Square Regression (2SLS)**

	(1)	(2)	(3)
	Dependent variable: Brent crude oil (BRENT)	Dependent variable: Food price index (FOOD)	Dependent variable: Global PMI (PMI)
	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	-937.665 (-3.41)	-598.452 (-0.95)	275.004** (9.71)
WAR	6.659 (5.90)	4.539 (0.42)	3.783** (8.76)
COVID	119.542 (3.71)	86.085 (1.16)	-26.092** (-7.84)
R-square	86.15	76.13	91.08
Adjusted R-square	72.31	52.25	82.17
F-statistic	6.223	3.189	10.220
Prob (F-statistic)	0.138	0.239	0.089

***, ** denote statistical significance at the 1% and 5% level. The 2SLS instruments are the WAR and COVID variables. WAR variable = a binary variable representing the months of Russian invasion of Ukraine. COVID variable = the logarithm of the total of number of world coronavirus cases

Source: Author's computation

6.1.3. The combined effect of Russian invasion and COVID pandemic

Table 4 reports the 2SLS regression result for the combined effect of Russian invasion of Ukraine and the COVID pandemic on some global economic indicators. Table 4 shows that the WAR*COVID coefficient is statistically significant and positively related to the price of Brent crude oil in column 1 of table 4. Also, the WAR*COVID coefficient is statistically significant and positively related to the world food price index in column 2 of table 4. The two results indicate that the combined effect of Russian invasion of Ukraine and the COVID pandemic led to a rise in world food price and a rise in global oil price. The COVID*WAR coefficient is not significantly related to the PMI variable in column 3 of table 4.

**Table 4. Combined effect of Russian invasion and the COVID pandemic on global economic indicators
Analysis based on Two-Stage Least Square Regression (2SLS)**

	(1)	(2)	(3)
	Dependent variable: Brent crude oil (BRENT)	Dependent variable: Food price index (FOOD)	Dependent variable: Global PMI (PMI)
	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	80.327*** (11.71)	134.611*** (22.46)	52.805** (49.03)
COVID*WAR	2.997* (2.94)	2.134* (2.39)	-0.051 (-0.32)
R-square	74.23	65.61	3.24
Adj. R-square	65.64	54.15	-2.90
F-statistic	8.64	5.72	0.101
Prob (F-statistic)	0.06	0.09	0.77

***, **, * denote statistical significance at the 1%, 5% and 10% level. The 2SLS instrument is the COVID*WAR variable. The COVID*WAR variable = a binary variable that represents the combined effect of Russian invasion of Ukraine and the COVID pandemic. COVID variable = the logarithm of the total of number of world coronavirus cases

Source: Author's computation

6.1.4. The combined effect of Russian invasion and COVID pandemic on the components of the world food price index

The world food price index is made up of five components, namely, the cereal price index, meat price index, oils price index, dairy price index and sugar price index. Table 5 estimates the combined effect of Russian invasion and COVID pandemic on the five components of the world food price index. Table 5 shows that the WAR*COVID coefficient is statistically significant and positively related to WDP and WOD in columns 3 and 5. This suggests that the increase in the world food price index was driven by the rise in oils and dairy prices.

Table 5. Combined effect of Russian invasion and the COVID pandemic on the components of the world food price index

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Food price index (FOOD)	Dependent variable: cereal price index (WCP)	Dependent variable: dairy price index (WDP)	Dependent variable: meat price index (WMP)	Dependent variable: oils price index (WOP)	Dependent variable: sugar price index (WSP)
	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
c	134.611*** (22.46)	140.496*** (17.29)	130.788*** (66.81)	111.532*** (44.84)	182.134*** (12.17)	114.526*** (12.17)
COVID*WAR	2.134* (2.39)	2.440 (2.02)	1.616** (5.55)	0.774 (2.09)	5.564* (2.49)	0.256 (0.49)
R-square	65.61	57.62	91.12	59.29	67.55	7.56
Adjusted R-square	54.15	43.49	88.16	45.73	56.75	-0.23
F-statistic	5.72	4.08	30.77	4.37	6.24	0.24
Prob (F-statistic)	0.09	0.14	0.01	0.13	0.08	0.65

***, **, * denote statistical significance at the 1%, 5% and 10% level. The 2SLS instrument is the COVID*WAR variable. The COVID*WAR variable = a binary variable that represents the combined effect of Russian invasion of Ukraine and the COVID pandemic. COVID variable = the logarithm of the total of number of world coronavirus cases

Source: Author's computation

6.1.5. Correlation analysis for the global economic indicators

The variable of interest in the correlation analysis is the correlation of the WAR variable with the global economic variables in table 6. The correlation result is reported in table 6 below. There is a significant and positive correlation between the WAR variable and the BRENT variable. The correlation is high at 86 percent. This suggests that oil prices were high during the invasion. Similarly, there is a significant and positive correlation between the WAR variable and the FOOD variable. The correlation is high at 80.7 percent. This suggests that food prices were high during the invasion. Meanwhile, there is a negative correlation between the WAR variable and the PMI variable, but the correlation coefficient is not significant. The correlation result implies that the world food price index and oil price were significantly higher during Russian invasion of Ukraine.

Table 6. Correlation between the global economic variables

Variables	WAR	BRENT	FOOD	PMI	COVID
WAR	1.000 ----- -----				
BRENT	0.860* (2.92) ((0.06))	1.000 ----- -----			
FOOD	0.807* (2.36) ((0.09))	0.918** (4.01) ((0.03))	1.000 ----- -----		
PMI	-0.177 (-0.31) ((0.77))	-0.385 (-0.72) ((0.52))	-0.444 (-0.85) ((0.45))	1.000 ----- -----	
COVID	0.878** (3.18) ((0.05))	0.922** (4.12) ((0.03))	0.867* (3.01) (0.06)	-0.603 (-1.31) ((0.28))	1.000 ----- -----

***, **, * represent statistical significance at the 1%, 5% and 10% level. T-statistic is reported in single parenthesis. P-value is reported in double parenthesis.

Source: Author's computation

6.1.6. Pre-invasion vs post-invasion trend analysis of the global economic variables

Global economic data show that Russian invasion of Ukraine had far reaching effect on the global economy. Data collected from FOA¹¹ shows that world food prices were affected during the invasion. Figure 4 shows that the world price of food, cereals, oils, meat and dairy products increased significantly in February and March 2022 compared to December 2021 and January 2022. The increase in global food prices in February and March 2022 was caused by the Russia-Ukraine war, the sanctions imposed on Russian import (including food ingredients) by Western countries, and the retaliatory food export ban imposed by Russia. In the global business sector, the JP Morgan global composite purchasing managers' index (PMI) decreased from 52.7 points in March to 51 points in April 2022. This indicates that sentiments about global business

¹¹ FAO means the Food and Agriculture Organization of the United Nations

performance worsened during the invasion. The decline in the global composite PMI index was due to disruption in global supply chain as a result of the sanctions imposed on Russia. The sanctions disrupted the movement of goods and commodities that usually pass through Ukraine and Russia before reaching other European and non-European countries.

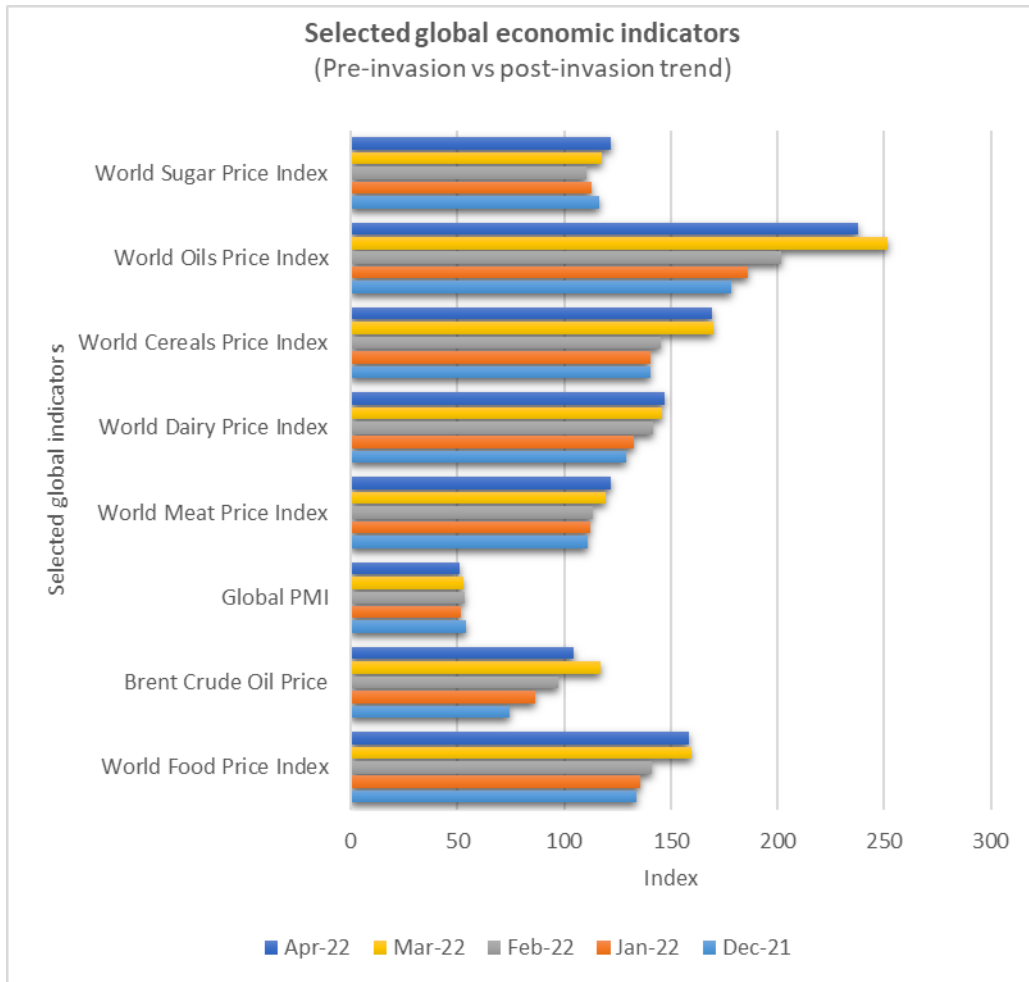


Figure 4. Selected global economic indicators: pre- vs post- invasion (source: trading economics)

6.1.7. Effect on global stock markets

Data collected from major stock markets showed that share prices plunged in value across global stock markets after Russian invasion of Ukraine. Investors fled for safety after the announcement of Russian invasion of Ukraine. Table 7 shows the lowest price at which stock was traded in major stock exchanges during the invasion period. It shows that the lowest drop in share price within a 5-day period (from February 18 to February 25) was on the day of the invasion on 24th February 2022. The Dow-Jones industrial average fell by more than 100 points. The S&P500 index fell by more than 250 points. The EuropeNext 100 index fell by more than 400 points. The Shanghai composite index fell by more than 150 points. However, stocks rebounded the day after the invasion following the announcement of severe international sanctions imposed on Russia by multiple countries.

Table 7. Global stock markets (the lowest price at which stocks were traded during the time period)							
	United States	United States	Australia	Europe	United Kingdom	South Africa	China
	Dow Jones Industrial Average	S&P 500 Index	S&P/ASX 200 Index	Europe Next 100 Index	FTSE 100 Index	JSE	SSE Composite Index
	Lowest price	Lowest price	Lowest price	Lowest price	Lowest price	Lowest price	Lowest price
Year	% change	% change	% change	% change	% change	% change	% change
2022	(Basis points)	(Basis points)	(Basis points)	(Basis points)	(Basis points)	(Basis points)	(Basis points)
Feb 25	3.11 (311)	4.18 (418)	2.242 (224.2)	1.12 (112)	1.12 (112)	1.27 (127)	1.20 (120)
<i>Feb 24</i>	-1.08 (108)	-2.53 (-253)	-2.604 (-260.4)	-4.27 (-427)	-4.45 (-445)	-1.69 (-169)	-1.68 (-168)
Feb 23	-0.84 (-84)	-1.07 (-107)	0.515 (51.5)	1.93 (193)	2.42 (242)	1.74 (174)	0.597 (59.7)
Feb 22	-1.80 (-180)	-1.38 (-138)	-0.664 (-66.4)	-1.55 (-155)	-1.73 (-173)	-0.403 (-40.3)	-0.979 (-97.9)
Feb 21	-	-	-0.633 (-63.3)	-2.19 (-219)	-2.15 (-215)	-1.63 (-163)	0.715 (71.5)
Feb 18	-0.79 (-79)	-1.07 (-107)	-1.104 (-110.4)	-0.63 (63)	-1.70 (-170)	0.817 (81.7)	-0.209 (-20.9)

Source: Bloomberg & Author's computation

6.2. Effect of the invasion on combatant countries

This section analyses the effect of the invasion on the inflation rate in combatant countries. The combatant countries are Ukraine, Russia, the Euro Area countries and other non-European countries particularly the United States, United Kingdom, Canada and Japan which imposed huge sanctions on Russia. Euro Area countries and some non-European countries were included in this category because they imposed significant sanctions on Russia which made them indirectly involved in the conflict during the invasion.

6.2.1. Trend analysis: impact on the Euro Area

Figure 5 shows that the S&P Global Euro Area Manufacturing PMI decreased to 56.5 points in March from 58.2 points in February 2022. The decline in manufacturing performance indicates that the invasion affected manufacturing activities in the Euro Area. This was due to supply chain disruption which led to the shortage of input inventory during the invasion. Also, the Euro Area composite PMI decreased to 54.9 points in March from 55.5 points in February 2022. This indicates that sentiment about business performance in the Euro Area worsened during the invasion. Also, the transportation component of the consumer price index increased significantly in February and March 2022 compared to the pre-invasion month of January 2022 and December 2021. This was due to shortage of energy and fuel supplies due to the energy import ban imposed on Russia which led to a rise in the price of gasoline for transportation in the Euro Area.

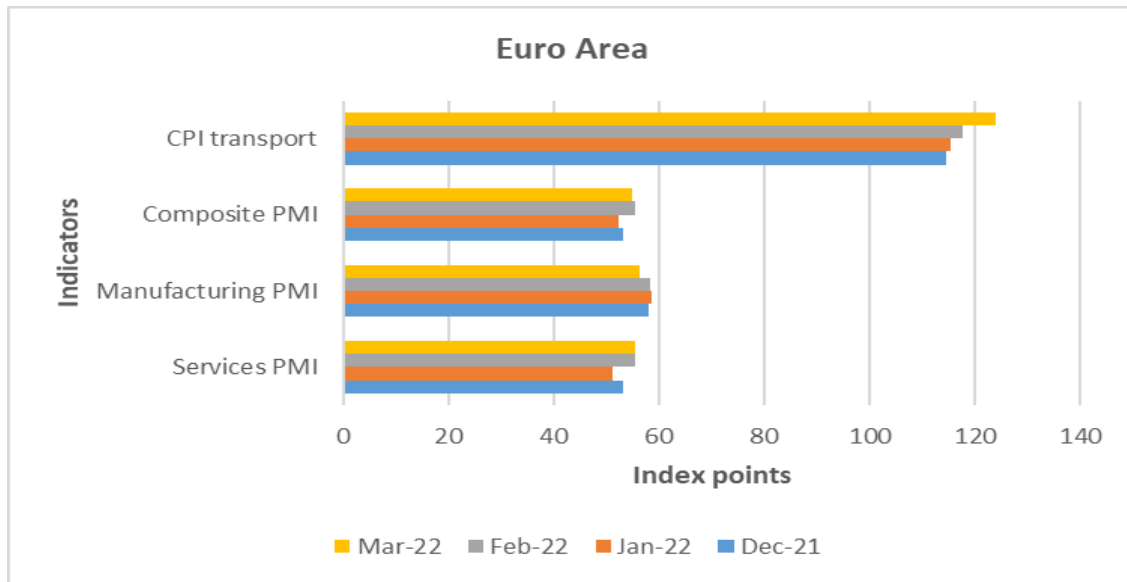


Figure 5. The Euro Area countries (source: trading economics)

6.2.2. Trend analysis: Inflation rate in the combatant countries

Figure 6 shows the annual inflation rate in the combatant countries. The data shows that the annual inflation rate in some combatant countries increased in February and increased in March 2022. The countries that imposed heavy sanctions on Russia e.g., the United States, Canada, United Kingdom, and Japan, witnessed a rise in rate of inflation in February and March. Also, figure 6 shows that Russia witnessed the highest rate of inflation compared to Ukraine and the Euro Area countries. Annual inflation rate in March was relatively higher in Russia at 16.7% than in Ukraine (13.7%) and the Euro Area (7.5%) during the invasion. The rise in Russia’s annual inflation in March indicates that the international sanctions imposed on Russia affected the Russian economy through a rise in the general price level in Russia, although Russia’s inflation rate was much lower at 9.17% and lower than the annual inflation rate in Ukraine at 10.7% in the month of invasion in February. The inflation effect is amplified when the month-on-month (MoM) inflation rate is analysed in figure 7. Figure 7 shows that MoM inflation rate is larger in Russia, followed by Ukraine and the Euro Area countries. Meanwhile, the countries that imposed sanctions on Russia (e.g., US, UK, Canada, and Japan) also witnessed a rise in MoM inflation rate but at a lesser rate compared to Ukraine and Russia.

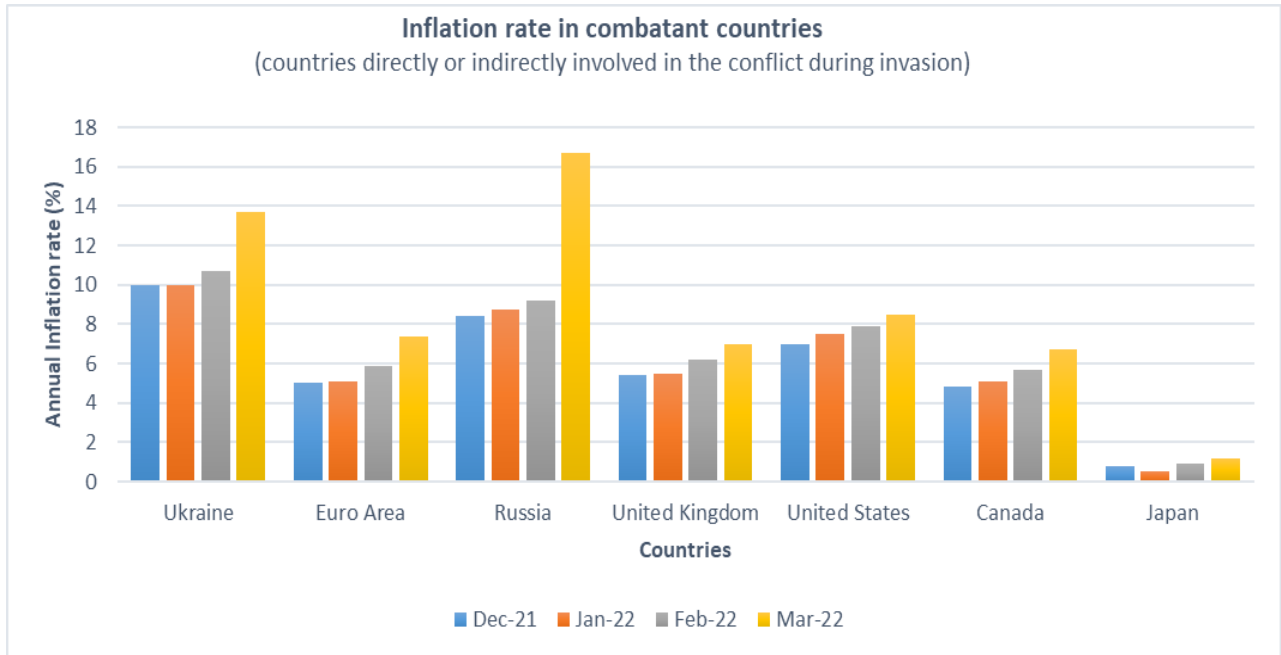


Figure 6. Annual inflation rate in combatant countries (source: trading economics)

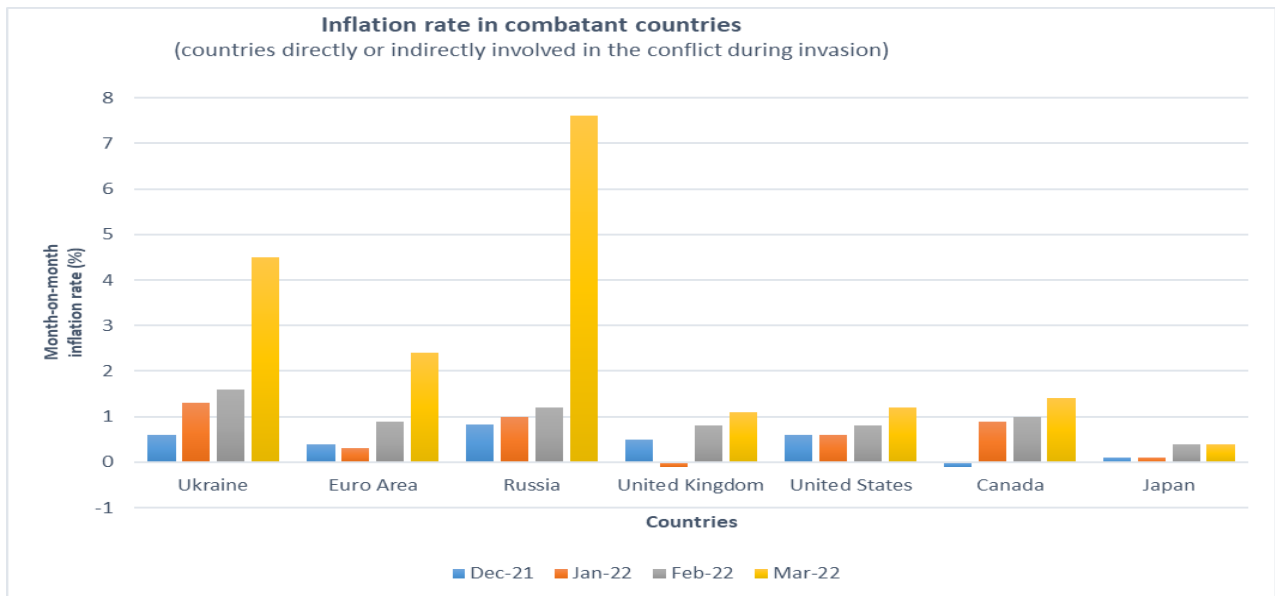


Figure 7. Monthly inflation rate in combatant countries (source: trading economics)

6.2.3. Correlation of inflation rate in combatant countries

Table 8 shows the correlation of MoM inflation rate in the combatant countries from December 2021 to March 2022. The reason for selecting the December 2021 to March 2022 sample period is to take into account the fact that inflation rate was already rising before the invasion. Table 8 shows that there is a high correlation between the MoM inflation rate in Russia and the MoM inflation rate in the combatant countries, and the correlation is above 60% in all cases. This suggests that the increase in monthly inflation in Russia was followed by increase in monthly inflation in Ukraine, the Euro Area countries and in countries that imposed the most sanctions on Russia. Similarly, there is a high correlation between the MoM inflation rate in Ukraine and the MoM inflation rate in the combatant countries and the correlation is above 65 percent in all cases. This suggests that the increase in monthly inflation in Ukraine was followed by increase in monthly inflation in Russia, the Euro Area countries and in countries that imposed the most sanctions on Russia. Also, the MoM inflation rate correlation coefficient is significant between: Russia and Ukraine; the Euro Area countries and Ukraine; the US and Ukraine; Russia and the US; and the US and Euro Area countries. Overall, the correlation result in table 8 confirms that the high inflation rate in Ukraine and Russia is correlated with a rise in inflation in countries that sanctioned Russia.

Table 8. Month-on-month inflation rate for combatant countries from Dec 2021 to March 2022

Countries	UKRAINE	Euro Area	RUSSIA	UK	US	CANADA	JAPAN
UKRAINE	1.000 -----						
Euro Area	0.974** (0.02)	1.000 -----					
RUSSIA	0.979** (0.02)	0.971** (0.02)	1.000 -----				
UK	0.681 (0.31)	0.825 (0.17)	0.694 (0.31)	1.000 -----			
US	0.973** (0.02)	0.996*** (0.00)	0.955* (0.04)	0.828 (0.17)	1.000 -----		
CANADA	0.793 (0.21)	0.695 (0.30)	0.659 (0.34)	0.367 (0.63)	0.739 (0.26)	1.000 -----	
JAPAN	0.705 (0.29)	0.774 (0.22)	0.610 (0.38)	0.845 (0.15)	0.816 (0.18)	0.724 (0.27)	1.000 -----

P-value is reported in parenthesis. **, **, * denote statistical significance at the 1%, 5% and 10% level.

Source: Author's computation

6.3. Effect of the invasion on inflation rate in non-combatant countries

This section analyses the effect of the invasion on the inflation rate of in non-combatant countries. Non-combatant countries refer to countries that do not want to impose sanctions on Russia because they do not want to be involved directly or indirectly in the conflict between Ukraine and Russia. The non-combatant countries in the sample are Indonesia, Vietnam, Brazil, Jamaica, Egypt, Kenya, Rwanda, South Africa, Nigeria and Mexico.

6.3.1. Trend analysis: inflation rate trend in non-combatant countries

Figure 8 shows the annual inflation rate in non-combatant countries. The inflation data in figure 8 shows that the annual inflation rate in some non-combatant countries increased in February and increased in March 2022. These countries did not impose sanctions on Russia, but they witnessed rising inflation. For instance, the annual inflation rate rose sharply in Rwanda, Egypt, Brazil and Jamaica. Also, the month-on-month inflation rate, in figure 9, increased significantly in non-combatant countries. Countries like Egypt, Brazil, Jamaica and South Africa witnessed a significant increase in MoM inflation rate during the invasion even though they were not involved in the conflict in any way. This shows that the invasion had spillover effects to other countries who were not involved in the war between Russia and Ukraine.

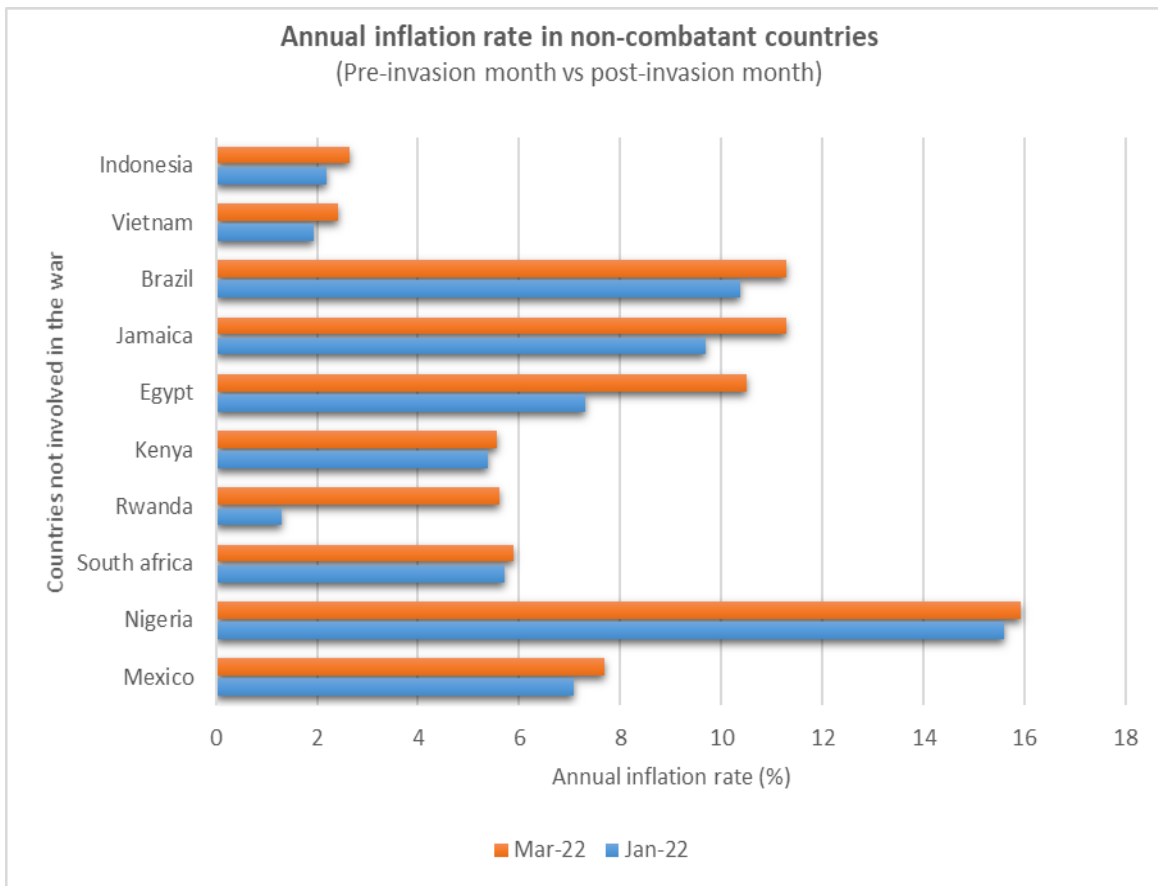


Figure 8. Annual inflation rate in non-combatant countries (source: trading economics)

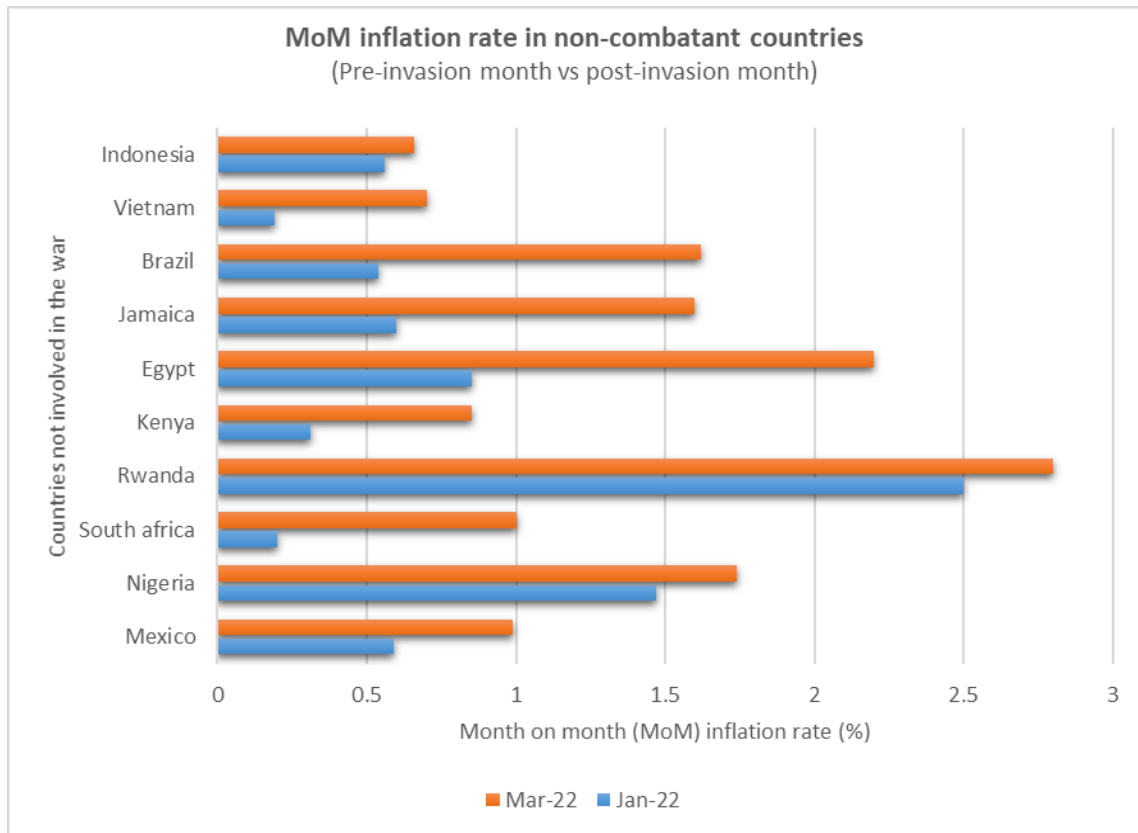


Figure 9. Monthly inflation rate in non-combatant countries (source: trading economics)

6.3.2. Correlation of inflation rate in non-combatant countries

Table 9 shows the correlation of MoM inflation rate in the non-combatant countries from December 2021 to March 2022. The reason for selecting the December 2021 to March 2022 sample period is to take into account the argument that inflation rate was already rising before the invasion. Table 9 shows that there is a high correlation between the MoM inflation rate in Russia and the MoM inflation rate in some non-combatant countries such as Mexico, South Africa, Egypt, Jamaica, and Brazil, and the correlation is above 70% in all cases. This suggests that the increase in monthly inflation in Russia was followed by increase in monthly inflation in countries that were not involved in the Ukraine-Russia conflict.

Similarly, there is a high correlation between the MoM inflation rate in Ukraine and the MoM inflation rate in some non-combatant countries such as Mexico, South Africa, Egypt, Jamaica, and Brazil, and the correlation is above 70% in all cases. This suggests that the increase in monthly

inflation in Ukraine was followed by increase in monthly inflation in countries that were not involved in the Ukraine-Russia conflict.

Table 9. Month-on-month inflation rate for non-combatant countries from Dec 2021 to March 2022

Countries	MEXICO	NIGERIA	SOUTH AFRICA	RWANDA	KENYA	EGYPT	JAMAICA	BRAZIL	VIETNAM	INDONESIA	UKRAINE	RUSSIA
MEXICO	1.00 ----											
NIGERIA	-0.11 (0.88)	1.00 ----										
SOUTH AFRICA	0.59 (0.41)	0.72 (0.27)	1.00 ----									
RWANDA	0.84 (0.15)	-0.58 (0.41)	0.08 (0.91)	1.00 ----								
KENYA	-0.10 (0.89)	0.93* (0.06)	0.71 (0.28)	-0.61 (0.38)	1.00 ----							
EGYPT	0.99*** (0.00)	-0.16 (0.83)	0.55 (0.44)	0.86 (0.13)	-0.13 (0.86)	1.00 ----						
JAMAICA	0.70 (0.29)	0.49 (0.51)	0.92* (0.08)	0.22 (0.77)	0.61 (0.39)	0.68 (0.31)	1.00 ----					
BRAZIL	0.83 (0.17)	0.43 (0.56)	0.93* (0.06)	0.40 (0.59)	0.47 (0.52)	0.80 (0.19)	0.96** (0.03)	1.00 ----				
VIETNAM	0.88 (0.11)	-0.19 (0.80)	0.39 (0.60)	0.89* (0.10)	-0.34 (0.65)	0.87 (0.12)	0.37 (0.62)	0.60 (0.39)	1.00 ----			
INDONESIA	-0.21 (0.79)	0.21 (0.79)	0.13 (0.86)	-0.45 (0.54)	0.53 (0.46)	-0.18 (0.81)	0.36 (0.63)	0.09 (0.91)	-0.63 (0.36)	1.00 ----		
UKRAINE	0.86 (0.13)	0.15 (0.84)	0.76 (0.23)	0.51 (0.48)	0.30 (0.69)	0.86 (0.13)	0.93* (0.06)	0.92* (0.07)	0.54 (0.45)	0.29 (0.70)	1.00 ----	
RUSSIA	0.75 (0.24)	0.31 (0.69)	0.81 (0.18)	0.33 (0.66)	0.47 (0.52)	0.74 (0.25)	0.97** (0.02)	0.92* (0.07)	0.38 (0.61)	0.42 (0.57)	0.97** (0.02)	1.000 ----

P-value is reported in parenthesis. **, *, * denote statistical significance at the 1%, 5% and 10% level.

Source: Author's computation

7. Conclusion

This paper explored the global economic consequence of the Russia-Ukraine war over a four-month period from December 2021 to March 2022. The global economic consequence of the invasion was a global supply chain disruption. This manifested through rising prices including rising energy prices and commodity prices and a rise in food prices, thereby leading to a rise in global inflation.

The empirical results in the paper showed that Russia's invasion of Ukraine and the COVID-19 pandemic jointly led to a significant increase in the world price of food and crude oil. The rise in the world food price index after the invasion was driven by a significant increase in the price of dairy and oils. Stock prices plunged on the invasion date. The rise in inflation in Russia and Ukraine after the invasion was followed by a rise in inflation in countries that imposed severe sanctions on Russia, and in countries that were not involved in the conflict in any way. Overall, the invasion had spillover effects on combatant and non-combatant countries.

The policy implication of the results is that policy makers should be careful when using economic sanctions during wars because geopolitical conflicts, such as the Russia-Ukraine war, can have wide-reaching economic effects to other countries. Imposing sanctions to force Russia to withdraw its military operations in Ukraine was a necessary action. But the sanctions did not have isolated economic effects on the sanctioned country. Rather, it affected other countries through economic spillovers, reflected in the price in world food price. The Russia-Ukraine invasion has shown that sanctions against a warring country is not an optimal solution because it produces spillover effects to other countries who are not part of the conflict, especially when the warring countries are trade partners of other countries who are not involved in the war.

It is recommended that political leaders should put in effort to discourage conflicts like the Ukraine-Russia conflict due to its spillover effects to other countries. They should use negotiation as an optimal conflict resolution option. National authorities should also put in place measures to mitigate inflationary pressures caused by global supply chain disruption especially when trade partners are at war. National authorities should use fiscal and monetary policy measures to shield their economies from the negative effects of war, particularly, rising inflation.

Future studies can examine the impact of Russia-Ukraine war sentiment on global economic indicators using data from the Russia-Ukraine War Economic Sanctions News Sentiment Index. Future studies can also assess whether conflict resolution through negotiations is very effective in pacifying countries that go to war to protect their own interests. Future studies can also examine whether the economic consequence of war during a pandemic year is more severe than the economic consequence of war in a non-pandemic year.

Future studies can revisit the topic of this paper and use the Autoregressive (VAR) framework, impulse response function, and causality analysis to examine the effect of the Russia-Ukraine war on the global economy.

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KEY TERMS & DEFINITIONS.

Brent crude oil: Brent crude oil is the most traded of all of the oil benchmarks. It is mostly drilled from the North Sea oilfields: Brent, Forties, Oseberg and Ekofisk (collectively known as BFOE). This oil type is widely used as it is both sweet and light, making it easy to refine into diesel fuel and gasoline.

Combatant countries: It refers to the countries who are actively involved in war.

COVID-19 pandemic: The COVID-19 pandemic is the global pandemic of coronavirus disease 2019 (COVID-19). It was caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

CPI = Composite price index is a statistical tool that aggregates different equities, securities, or indexes in order to create a representation of overall market or sector performance

Crude oil WTI: It is a grade or mix of crude oil.

Dow-Jones industrial average: The Dow Jones industrial average groups together the prices of 30 of the most traded stocks on the New York Stock Exchange (NYSE) and the Nasdaq.

Euro Area: The euro area consists of those Member States of the European Union that have adopted the euro as their currency.

Eurobond: A Eurobond is a bond issued offshore by governments or corporates denominated in a currency other than that of the issuer's country.

FAO: It is the Food and Agriculture Organization of the United Nations

GDP per capita: GDP per capita is economic output per person. GDP per capita is the sum of gross value added by all resident producers in the economy divided by the population of the country.

Inflation: Inflation is the persistent increase in the general price level.

MoM: MoM refers to month-on-month

Nominal GDP: GDP at current prices. Nominal GDP is not adjusted for inflation.

Nord Stream 2 gas pipeline project: Nord Stream 2 gas pipeline project is a natural gas pipeline from Russia to Germany running through the Baltic Sea and is financed by Gazprom and several European energy companies.

PMI: The Purchasing Managers Index (PMI) is a measure of the prevailing direction of economic trends in manufacturing.

Real GDP: Real GDP is GDP expressed in base-year prices. Real GDP is adjusted to account for inflation.

Ruble: The national currency of Russia

Sanction: a threatened punishment or penalty for disobeying a law or rule.

Shanghai composite index: Shanghai composite index is a stock market composite made up of all the A-shares and B-shares that trade on the Shanghai Stock Exchange.

S&P500 Index: The Standard and Poor's 500 is a stock market index in the United States that tracks 500 publicly traded domestic companies.

SWIFT: SWIFT means "Society for Worldwide Interbank Financial Telecommunications". It is a global member-owned cooperative that functions as a huge messaging system which members can use to send and receive money transfer instructions quickly, accurately, and securely.

The EuropeNext 100 index: The Euronext 100 Index is the blue-chip index of the pan-European exchange, Euronex NV.

Two-stage least squares method: Two-stage least square regression is a type of regression that uses instrumental variables that are uncorrelated with the error terms to compute estimated values of the problematic predictor(s) in the first stage, and then uses those computed values to estimate a linear regression model of the dependent variable in the second stage.

World Food price index: It is a measure of the monthly change in international prices of a basket of food commodities.

YoY: YoY refers to year-on-year.