Global economic consequence of Russian invasion of Ukraine

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Abstract

This paper explores the global economic consequence of the Russian-Ukraine war in the month of invasion. Russia invaded Ukraine on the 24th of February 2022. As a result of the Russia-Ukraine war, multiple international sanctions were imposed on Russia to compel Russia to de-escalate the crisis. The sanctions imposed on Russia, although intended to hurt Russia, had spillover effects to the global economy mainly through global supply chain disruption. Using global data and data from the Euro Area, Ukraine and Russia, the findings show that there was an increase in the global PMI and an increase in the world price of food and food ingredients. The index of global stock markets plunged on the day of invasion. The Euro Area manufacturing purchasing managers' index (PMI) declined in the month of the invasion. Also, the transportation component of the consumer price index rose in the month of the invasion due to shortage of energy and fuel supplies which led to a rise in the price of gasoline for transportation in the Euro Area. Ukraine experienced a more devastating effect from the invasion than Russia and the entire Euro Area. Core consumer prices in Ukraine and the Euro Area were highly correlated during the invasion. Food inflation was highly correlated in the Euro Area and in Russia. Also, there is a positive and high correlation between world food price index, world oils price index, world diary price index and world cereals price index during the month of the invasion. The conflict led to a global rise in prices leading to a rise in global inflation. Although conflict resolution between Russia and Ukraine was brokered by Israel, the economic effect of the crisis still lingered on in many parts of Europe and beyond Europe.

Keyword: War, Ukraine, Russia, Conflict, sanction, SWIFT, invasion, economic consequence, NATO.

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1. Introduction

The world witnessed a significant disruption in economic activities due to the lockdown restrictions during the COVID pandemic (Ozili and Arun, 2020). Global recovery from the COVID pandemic began in early 2022. Many countries announced plans to remove COVID-era restrictions due to a significant decline in the number of reported COVID infection and death cases in many countries. At the start of 2022, there was great optimism about post-COVID economic growth as many countries intensified efforts to control rising inflation and to spur growth. This led to a positive outlook for global growth which was predicted to increase to 4.4 or 4.9 percent in 2022 according to the IMF World Economic Outlook (WEO). During the same period, Russia invaded Ukraine in February of 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 conflict on global supply chain.

This paper explores the global economic consequence of the Russian-Ukraine war in the month of invasion. It is important to understand and identify how the invasion affected global business activities and prices and the implication for the future. I begin by providing some answers to the question: why do countries fight and go to war in the modern era? The simple answer is that countries to go war, or engage in conflict, to protect national resources, to maintain one's regional influence, to gain more or equal control over shared resources, or to preserve colonial rights, heritage or values (Averre, 2016; Malyarenko and Wolff, 2018). In the case of Russia, the reason for going into conflict with Ukraine is to protect its border and to maintain its regional influence in the east of Europe (Mankoff, 2014).

But how did the Ukraine-Russian crisis start? 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 that was supported by the United States but was 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 EU and NATO. Soon after Crimea was annexed by Russia in 2014. The annexation led to violence in Donbas and

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led to intense fighting and violence along the border regions that separated Russian 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 its dependence on Russia. But Russia's opposition of Ukraine's membership of NATO since 2010 has caused escalation between the two countries.

While the full economic consequences of Russian invasion of Ukraine may not be fully known until the crisis ends, early economic data shows some significant movement in global economic data as a result of Russian invasion of Ukraine. The data show evidence of an increase in the global PMI and an increase in the world price of food and food ingredients. The index of global stock markets plunged on the day of invasion. The Euro Area manufacturing purchasing managers' index (PMI) declined in the month of the invasion. Also, the transportation component of the consumer price index rose in the month of the invasion due to shortage of energy and fuel supplies which led to a rise in the price of gasoline for transportation in the Euro Area. Ukraine experienced a more devastating effect from the invasion than Russia and the entire Euro Area. Core consumer prices in Ukraine and the Euro Area were highly correlated during the invasion. Food inflation was highly correlated in the Euro Area and in Russia. Also, there is a positive and high correlation between world food price index, world oils price index, world diary price index and world cereals price index during the month of the invasion.

This paper contributes to the economic literature that examine the economic consequence of war. Some studies in this literature include Kang and Meernik (2005), Mazower (1991), 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). There is extensive research on the economic effect of past wars such as the effect of World War I, World War II and the effect of the Iraq war on the economy. But there is little research about the economic consequence of war in a modern European society and the likely spillover effect to other countries. This paper fills this gap in the literature.

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 Russia's invasion during the war, the multilateral support for Ukraine, and Russia's response to international sanctions. Section 4

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highlight the potential impact on the global economy. Section 5 presents the methodology. Section 6 presents the empirical analysis. Section 7 concludes.

2. Literature review

2.1. Studies on the 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 argue 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). In the context of the great depression, Mazower (1991) states that there is the belief that the great depression led directly to the collapse of parliamentary democracy in many countries. Heydemann (2018) argues that the civil wars in the Middle East have not created conditions conducive to re-conceptualizing sovereignty or decoupling sovereignty and governance. Rather, parties to 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) state that poor countries have a higher propensity to suffer from civil war especially when poor countries suffer from negative income shocks.

Several studies empirically estimate 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 economies from 1960 to 2002. They find that wars have a negative effect on economic fundamentals, and that the response by the international

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community to civil wars exert powerful effects on economic growth. Collier (1999) developed a model to test for 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 find 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 find that Ukraine's per capita GDP declined by 15.1% as a result of the war from 2013 to 2017. Ganegodage and Rambaldi (2014) find that the war in Sri Lanka had a negative and significant effect on GDP. They also show that high returns from investment in physical capital did not translate into sizable positive externalities. Kesternich et al (2014) investigate the long-run effects of World War II on the socioeconomic status and health of older individuals in Europe. They analyze 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 construct several measures of war exposure: experience of dispossession, persecution, combat in local areas, and hunger periods. They find that exposure to war and to individual-level shocks caused by the war significantly predicts economic and health outcomes at older ages.

2.2. Studies on the Ukraine and Russian conflict

Existing studies analyse the effect of the 2014 Ukraine-Russia crisis. Shelest (2015) explained that the protests in Ukraine in winter 2014 resulted in the annexation of Crimea by Russia. Ukraine considered the conflict to be a Russian–Ukrainian conflict. Meanwhile, Russia considered the crisis to be a Russian–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 is affected by the combination of choices made by the Ukrainian political class, business elites and broader society in four major dimensions: internal political practices, economic international politics, and ideological dimension. Hoffmann and

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Neuenkirch (2017) analyzed the impact of the pro-Russian conflict on stock returns in Russia and Ukraine from November 21, 2013 to September 29, 2014. They find that the conflict reduced Russian and Ukrainian stock returns. Stukalo and Simakhova (2018) argued that Ukraine needs an integrated approach in order to solve all economic and social problems in the country. Wang (2015) showed that the 2014 Ukraine crisis and Russia's Crimea annexation have pushed Russian-Western relations to near the freezing point, and despite the international sanctions imposed on Russia led by the US and Europe, 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 document that the import ban affected Russian consumers by reducing Russia's imports 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 were estimated to be in the tune of 1% of Russia's GDP from 2014 to 2016 as a result of increased investment risks.

3. Understanding the Russian invasion of Ukraine

3.1. The cause of Russia's invasion of Ukraine in 2022

There are different accounts of what caused the Russian 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 that Ukraine was using its military to oppress citizens in separatist regions who are loyal to Russian government and is committing genocide against its own people[1]. The Russian government also claimed that Ukraine's ambition to join a military alliance with NATO poses an existential threat to Russia's national security, and such ambition will expand NATO eastward and bring NATO closer to Russia's border thereby posing an

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

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existential threat to Russia. It will allow the West to infiltrate Russia and undermine Russia's national security. Russia claims that these two issues 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, the Russian government said that it chose the least dangerous option which was to invade Ukraine in order 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 the NATO and the European Union.

The pro-West or Western account of what caused the invasion, as reported by multiple Western media[2], 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 opposes 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 believes that this is the reason why Russia launched a 'special military operation' in Ukraine so that it can remove the Ukrainian president and the incumbent government in Kyiv and install a new pro-Russian government in Ukraine.

3.2. Sanctions: International response to Russia's invasion during the war

Many countries in the West opposed Russian invasion of Ukraine. Many countries reacted by openly condemning Russia for invading Ukraine. Other countries reacted by imposing sanctions on Russia such as the United States, United Kingdom, European Union, France Japan, Australia, Canada, New Zealand and Taiwan. Some of the sanctions imposed on Russia during the 2022 invasion include:

- Blocking some Russian banks from using the SWIFT global payments system. SWIFT is a high security network that facilitates payments among 11,000 financial institutions in 200 countries.

[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/

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- Germany halted the certification of Russia's Nord Stream 2 gas pipeline project intended to distribute energy to Europe.
- New Zealand prohibited the export of goods to Russian military and security forces in response to the invasion of Ukraine.
- The United states banned the export of war technology to Russia to severely limit Russia's ability to advance 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 cannot make transactions in American dollars. The US 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. It banned Russian deposits above €100,000 in EU banks, on Russian accounts held by EU central securities depositories and on selling euro-denominated securities to Russian clients. The EU banned the listing of the shares of Russian state-owned entities on EU trading venues. The EU banned the sale, supply, transfer or export of technologies in oil refining to Russia. The EU imposed an export ban on all aircraft, spare parts and equipment to Russian airlines, as well as to the Russian space industry. The EU halted visa agreements with notable Russian persons. This means that diplomats, Russian officials and businesspeople will no longer be able to benefit from visa facilitation provisions which allow privileged access to the EU[3]. The EU removed Russia from all cultural events and sporting events such as the Eurovision and the UEFA champions league.
- 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.

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

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- 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 2009, including for diplomats. It also imposed travel bans for five unnamed oligarchs close to Putin who have ties with Switzerland.
- The United Kingdom 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.
- Finland, Belgium, Latvia, Ireland, Estonia, Lithuania, Poland, Bulgaria, Moldova, Romania, Slovenia and Czech Republic also banned Russian planes from flying into their airspace.

3.3. Support to Ukraine

The US offered over $1billion aid in security assistance to Ukraine to enable Ukraine resist Russia. The aid was used to purchase stinger anti-aircraft systems, military javelin, light anti-armor weapons, anti-armor systems; tactical unmanned aerial systems, grenade launchers, rifles, pistols, machine guns, shotguns; grenade launcher, body armor, and helmets. Other countries offered military assistance to Ukraine such as Australia, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland Germany, Italy, etc. Some countries such as Argentina, Hungary, India, Pakistan and Thailand offered humanitarian aid such as food, clothing and emergency medical supplies.

3.4. Russia’s response to the international sanctions

Many economists anticipated Russia’s reaction to the international sanctions and warned that it could start a global economic war. Russia reacted to the international sanctions by taking some countermeasures which includes:

- banning exports of more than 200 products until the end of 2022. The banned exports include telecoms, medical, vehicle, agricultural, electrical equipment and timber.

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- increasing key interest rate to stop the decline of the value of the rouble which is the Russian currency.
- barred the payment of interest to foreign investors who hold Russian government bonds
- banned Russian firms from paying overseas shareholders.
- banned foreign investors who hold billions of dollars worth of Russian stocks and bonds from selling them.
- These sanctions imposed on Russia are severe and could affect Russia's economy in many ways even though Russia vowed to impose retaliatory sanctions on all countries that sanctioned Russia[4]

4. Potential impact on the global economy

- **Global supply chain disruption**

Military operations during Russian invasion of Ukraine will affect operations in multiple sectors through global supply chain disruption. The ban on Russian exports and a retaliatory ban on foreign imports by Russia, including Russia's refusal to allow foreign cargoes to pass through its waterways and airspace during the conflict, can disrupt global supply chain. It can create scarcity, and lead to an increase in the price of imported goods. Companies have anticipated that the disruption caused by cross-border blockades and cross-trade bans will lead to the hoarding of supplies thereby leading to high prices. Furthermore, restrictions to commercial flights around the Ukraine-Russian border as well as increased security checks at refugee camps in neighbouring countries means that there will be a disruption in cargo flow and border operations as cross-border goods and supplies may be halted or delayed due to border officials processing refugees before attending to cross-border goods. This will further worsen the disruption in global supply chain and increase the price of imports.

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

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- **Rising oil and gas prices**

Prior to Russian invasion of Ukraine, energy prices have been rising 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. After the invasion, oil prices exceeded USD$100 a barrel. A potential consequence of the invasion is that European oil marketers and oil companies will experience difficulty in receiving energy supplies from Russia, as Russia is the world's second-largest oil producer and sells most of its crude to European refineries. Russia is also the largest supplier of natural gas to Europe, providing about two-fifths of its supply. Due to Russia's large share of oil export, the Russian invasion of Ukraine is likely to lead to energy supply shocks and a sustained rise in energy prices. This effect may worsen if Russia places a retaliatory export ban on energy supplies to Europe and the rest of the world. A retaliatory energy export ban by Russia will lead to a major disruption in global energy supply, thereby increasing energy prices. The Russia-Ukraine war could make oil price exceed $140 a barrel and can significantly reduce global economic growth forecast, and plunge some European and non-European countries into a recession. Gas prices for household use may also increase due to fears of a disruption to global energy supplies. Although the United States can release its energy reserves to meet energy shortages in World energy markets, it will take a long time to meet growing energy demand due to energy trade negotiations as global energy prices continue to rise.

- **Effect on the global banking system**

The direct effect of Russian invasion of Ukraine on the global banking system is minimal. The most notable effect is the international financial sanctions imposed on Russian banks. The sanctions, including the ban of selected Russian banks from SWIFT, is unlikely to have a significant effect on global banking system. The only banking segments that have been severely affected by the sanctions are foreign banks with large operations in Russia. These foreign banks were affected after several countries imposed financial sanctions on Russian banks and Russian wealthy individuals. The most affected banks were Austria's Raiffeisenbank, Italy's Unicredit and France's Société Générale. However, the global banking system may suffer from the indirect consequence of the war if pro-Russian groups retaliate against Western financial sanctions by launching a significant cyber-attack on the global payment system. The potential global loss that

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could arise from an attack on the global payment system could amount to a daily loss of US$50m daily.

- **Decline in economic output and growth**

Western interference into Russia's struggle for regional control could pressure Russia to place a ban on oil export as a retaliatory measure to the sanctions imposed on Russia by the West. This could lead to higher oil prices and could affect economic growth. This is because businesses will have to spend more to import raw materials and also spend more to produce goods and services. This will lead to higher input and output prices, and people may not be able to pay for goods and services at a high price. This will lead to fewer purchases by consumers, and could lead to a reduction in the supply of goods and services, thereby leading to a fall in economic output. Consumption expenditure will also be affected as households will spend more on oil and gas for cooking and to heat up their homes. This will lead to a fall in household's disposable income after tax, thereby dampening consumer spending. This will affect the consumption expenditure component of GDP.

- **Rising global inflation and cost of living**

If the invasion persists, most European countries including, Germany and the United Kingdom, will face rising cost of living. In the UK, for instance, inflation is already high at 5.5%.[5] This means that consumers are already spending more money on fewer goods. The conflict will lead to a further hike in the price of oil, gas, food and food ingredients. This will increase the cost of living as the cost of mortgage deductibles, cars and lighting may increase significantly. There will be spillover effects to developing countries that rely on energy import. Developing countries will pay a higher price for energy imports which could translate 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. This will lead to an increase inflation and a rise in the cost of living in developing countries. The combined effect for developed countries and developing countries is that it can lead to a rise in global inflation and high cost of living.

[5] According to the UK Office for National Statistics

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5. Methodology

To assess the global economic effects of the invasion, global data, Euro Area data and country-specific data were collected from the Food and Agriculture Organization, Markit Economics and other sources (see table 1). The data was collected for a three-month period which covers December 2021, January 2022 and February 2022. February 2022 was the month of Russian invasion of Ukraine. The methodology used to analyse the correlation between the relevant macroeconomic variables during the period is the Pearson correlation method. The correlation result is reported in section 6. I also compare the pre-invasion data and the data for the month of invasion in section 6. Stock market data was also analyzed in section 6.

Table 1. Variables and data source

Variables	Source
Global Composite PMI	Markit Economics
Global Manufacturing PMI	Markit Economics
World Food Price Index	Food and Agriculture Organization database
World Cereals Price Index	Food and Agriculture Organization database
World Oils Price Index	Food and Agriculture Organization database
World Dairy Price Index	Food and Agriculture Organization database
Services PMI for the Euro Area	Markit Economics
Manufacturing PMI for the Euro Area	Markit Economics
Composite PMI for the Euro Area	Markit Economics
Transportation CPI for the Euro Area	Europena central Bank
Inflation rate (MoM) for Russia and Ukraine	Trading economics
Inflation rate (YoY) for Russia and Ukraine	Trading economics
Core consumer prices for Russia and Ukraine	Trading economics
Food inflation rate for Russia and Ukraine	Trading economics
CPI=Consumer price index. PMI = Purchasing Managers' Index (PMI). YoY=Year-on-year. MoM = Month-on-month	

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6. Empirical Results

This section reports the empirical results based on the business performance and price data collected in section 5.

6.1. Correlation analysis

6.1.1. Global prices and business performance analysis

The correlation of the global prices and business performance indicators is reported in table 2 below. Table 2 shows that the global manufacturing PMI and the global composite PMI are positively correlated and have a high correlation at 93.6%. This suggests that the global manufacturing PMI contributed positively to the global composite PMI during the period. Also, there is a high positive correlation between world food price index, world oils price index, world diary price index and world cereals price index during the period. This suggests that Russian invasion of Ukraine led to an increase in the world price of food, dairy products, cereal and oils. More importantly, the correlation between world food price index and diary price index is statistically significant. Also, the correlation between world oils price index and diary price index is statistically significant.

Table 2. Pearson correlation: Global prices and business performance analysis

Variables	Composite PMI	Manufacturing PMI	World Food Price index	World Cereal Price Index	World Oil Price Index	World Dairy Price Index
Composite PMI	1.000					

Manufacturing PMI	0.936	1.000				
	(0.22)	-----				
World Food Price index	0.008	-0.342	1.000			
	(0.99)	(0.77)	-----			
World Cereal Price Index	0.220	-0.134	0.977	1.000		
	(0.85)	(0.91)	(0.13)	-----		
World Oil Price Index	-0.075	-0.420	0.996	0.955	1.000	
	(0.95)	(0.72)	(0.05)	(0.19)	-----	
World Dairy Price Index	-0.051	-0.397	0.998**	0.962	0.999**	1.000
	(0.96)	(0.73)	(0.03)	(0.17)	(0.02)	-----

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** denote statistical significance at the 5% level. P-values are reported in parenthesis

6.1.2. Euro area analysis

The Euro Area correlation result in reported in table 3. The correlation result shows that the Euro Area services PMI is positive and highly correlated with the Euro Area composite PMI and transportation prices (CPI transportation). The services PMI has a negative correlation with the manufacturing PMI during the period. There is also a negative correlation between the Euro Area manufacturing PMI and the Euro Area composite PMI during the period. This suggests that increases in the composite PMI of the Euro Area was not driven by increase in the Euro Area manufacturing PMI during the period.

Table 3. Pearson correlation: Euro Area business performance

Variables	Services PMI	Manufacturing PMI	Composite PMI	CPI Transportation
Services PMI	1.000			

Manufacturing PMI	-0.654	1.000		
	(0.54)	-----		
Composite PMI	0.987	-0.525	1.000	
	(0.10)	(0.64)	-----	
CPI Transportation	0.735	0.031	0.834	1.000
	(0.47)	(0.98)	(0.37)	-----

P-values are reported in parenthesis

6.1.3. Core consumer prices correlation

The correlation result in table 4 shows that core consumer prices in Russia and the Euro-Area are negative and weakly correlated at -40.8%. Also, core consumer prices in Russia and Ukraine are positive and averagely correlated at 50%. Meanwhile, Ukraine and the Euro Area have the highest core consumer price correlation at 58.6%. This average correlation is attributed to each country shielding their economies from the effect of inflation as a result of Russian invasion of Ukraine.

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Table 4. Pearson correlation: Core consumer prices

Variables	Euro Area	Russia	Ukraine
Euro Area	1.000		

Russia	-0.408	1.000	
	(0.73)	-----	
Ukraine	0.586	0.500	1.000
	(0.60)	(0.67)	-----

P-values are reported in parenthesis

6.1.4. Inflation rate (MoM) correlation

The correlation result in table 5 shows that the month-on-month inflation rate in Russia and the Euro-Area is positive and highly correlated at 79.6%. The correlation is higher than the month-on-month inflation rate correlation between Ukraine and the Euro-Area at 61.6%. Meanwhile, Ukraine and Russia have the highest month-on-month inflation rate correlation at 96.7%. The high correlation is attributed to the war which disrupted global supply chains and led a rise in the general price level during Russian invasion of Ukraine.

Table 5. Pearson correlation: Inflation rate (m-o-m)

Country	Russia	Ukraine	Euro Area
Russia	1.000		

Ukraine	0.967	1.000	
	(0.16)	-----	
Euro Area	0.796	0.616	1.000
	(0.41)	(0.57)	-----

P-values are reported in parenthesis

6.1.5. Food inflation correlation

The correlation result in table 6 shows that the food inflation rate in Russia and Ukraine is positive and highly correlated at 96.2%. The correlation is higher than the food inflation rate correlation between Ukraine and the Euro-Area at 85.9%. Meanwhile, the Euro Area and Russia have the

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highest food inflation rate correlation at 96.7%. The high correlation is due to the war which disrupted food supply chains in Russia and Europe, thereby increasing the price of food during Russian invasion of Ukraine.

Table 6. Pearson Correlation: Food inflation

Country	Russia	Ukraine	Euro Area
Russia	1.000		

Ukraine	0.961	1.000	
	(0.17)	-----	
Euro Area	0.966	0.859	1.000
	(0.16)	(0.34)	-----

P-values are reported in parenthesis

6.1.6. Inflation rate (YoY) correlation

The correlation result in table 7 shows that the year-on-year inflation rate in Russia and the Euro-Area is positive and strongly correlated at 96.6%. The correlation is higher than the year-on-year inflation rate correlation between Ukraine and Russia at 90%. Meanwhile, Ukraine and the Euro Area have the highest year-on-year inflation rate correlation at 98%. The high correlation is due to the war which disrupted global supply chains and led a rise in the general price level during Russian invasion of Ukraine during Russian invasion of Ukraine.

Table 7. Pearson correlation: Inflation rate(YoY) correlation

Country	Russia	Ukraine	Euro
Russia	1.000		

Ukraine	0.901	1.000	
	(0.28)	-----	
Euro	0.966	0.982	1.000
	(0.16)	(0.12)	-----

P-values are reported in parenthesis

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6.2. Comparing the invasion period with the pre-invasion period

Finally, in this section, I compare the changes in economic data in the invasion month (February 2022) and in the month before the invasion (January 2022). Figure 1 shows that the world price of food, cereals, oils and dairy products increased in the month of the invasion compared to the pre-invasion months. This suggests that the Russian-Ukraine war contributed to the increase in the world price of food and food ingredients. Meanwhile, the global composite purchasing managers' index (PMI) increased in February compared to January. This indicates that there was a positive business performance in the global economy in the month of the invasion.

Figure 1.

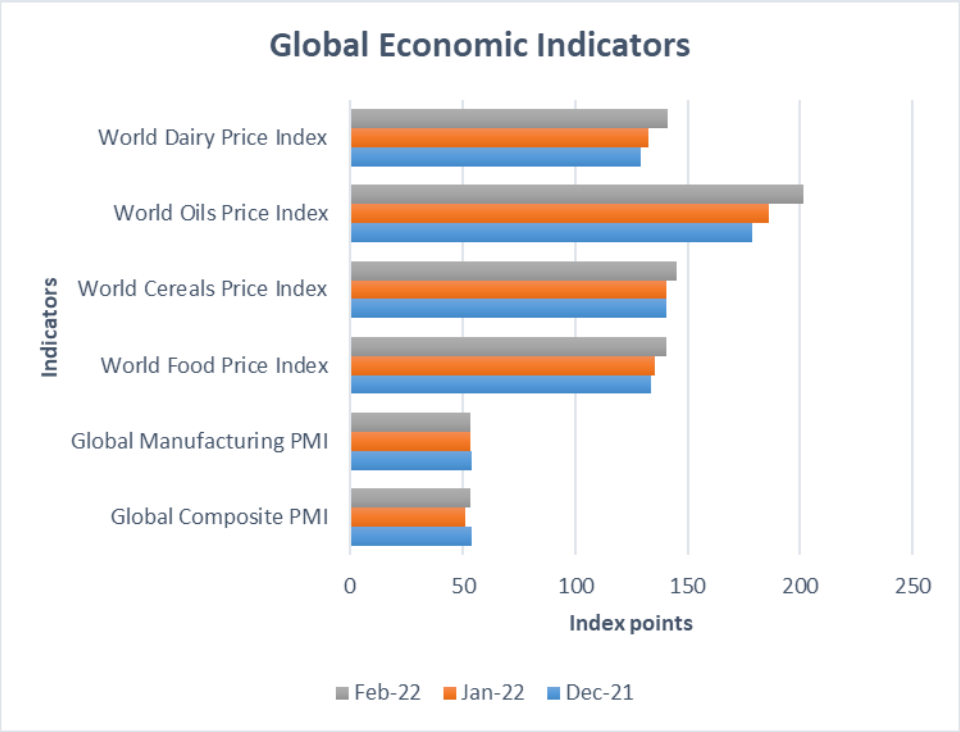

Figure 2 shows that the Euro Area composite purchasing managers' index (PMI) and the Euro Area services purchasing managers' index (PMI) increased in February compared to January 2022. This indicates that the services sector in Europe witnessed a positive performance in the month of the invasion. Meanwhile, the Euro Area manufacturing purchasing managers' index (PMI) declined in the month of the invasion. This was due to the shortage of input inventory and supply chain disruption during the 2022 Russian-Ukraine war. Also, the transportation component of the consumer price index rose in February compared to January. This was due to shortage of energy and fuel supplies which led to a rise in the price of gasoline for transportation in the Euro Area.

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Figure 2

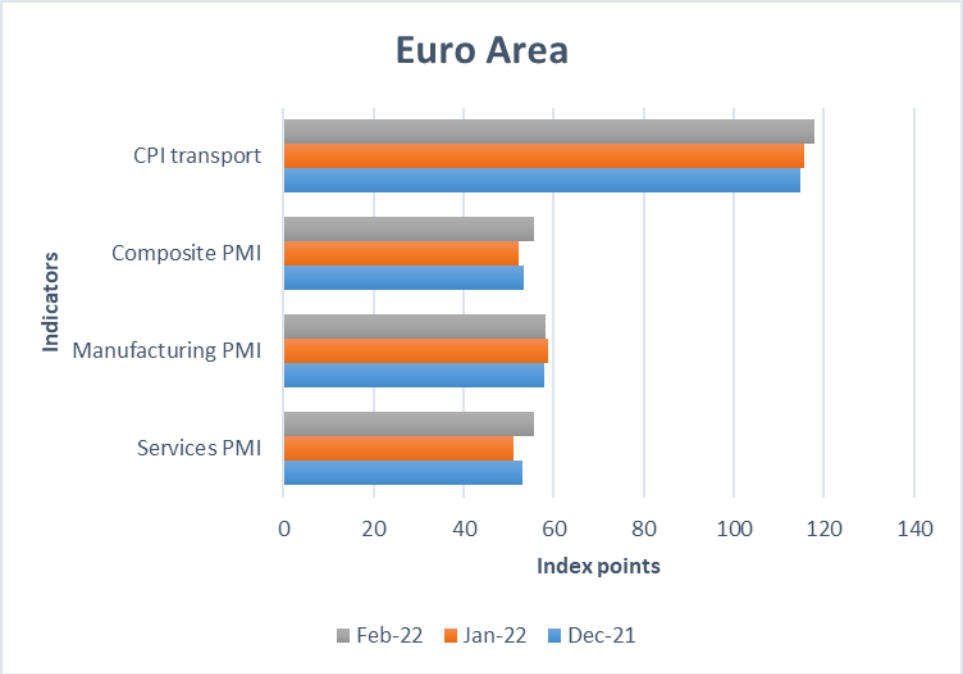

Figure 3 shows that core consumer prices were relatively higher in Ukraine and in the Euro Area during in the month of the invasion. Consumer prices were relatively lower in Russia. Figure 4 shows that the annual inflation rate was relatively higher in Ukraine than in Russia and the Euro Area in the month of the invasion. Figure 5 shows that the month-on-month inflation rate was relatively higher in Ukraine than in Russia and the Euro Area in the month of the invasion. Figure 6 shows that the food inflation rate was relatively higher in Ukraine than in Russia and the Euro Area in the month of the invasion. These data show that Ukraine's economy experienced a more devastating effect from the invasion than Russia and the entire Euro Area.

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Figure 3

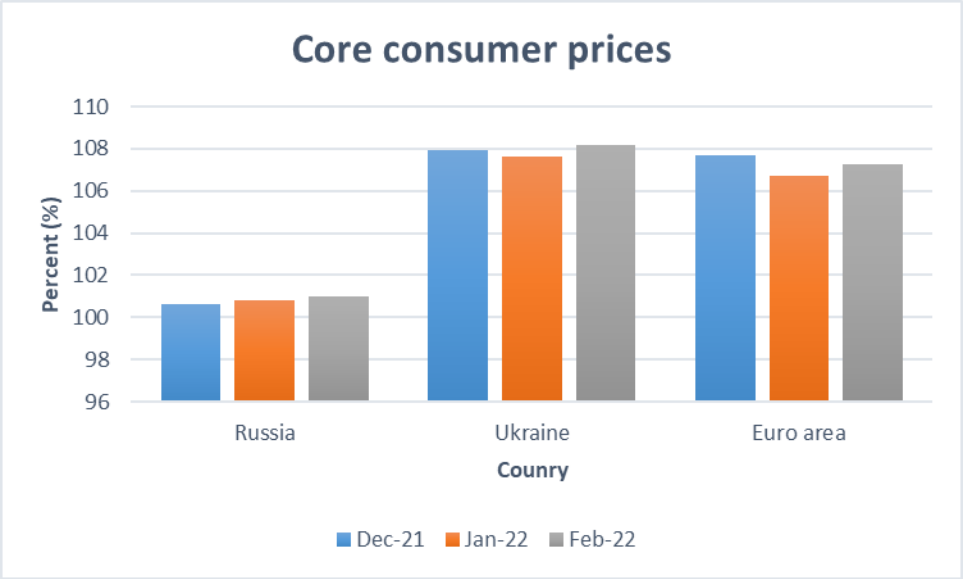

Figure 4

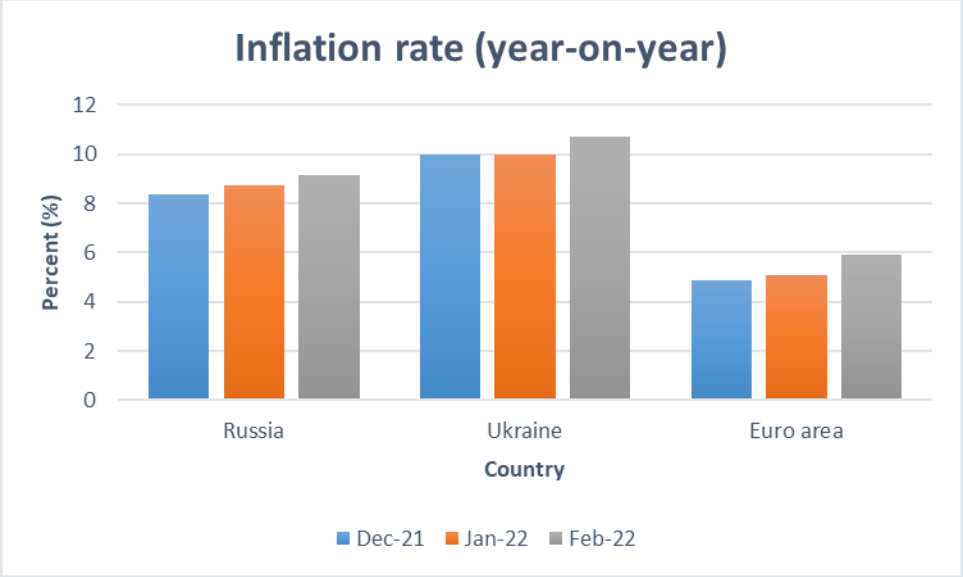

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Figure 5

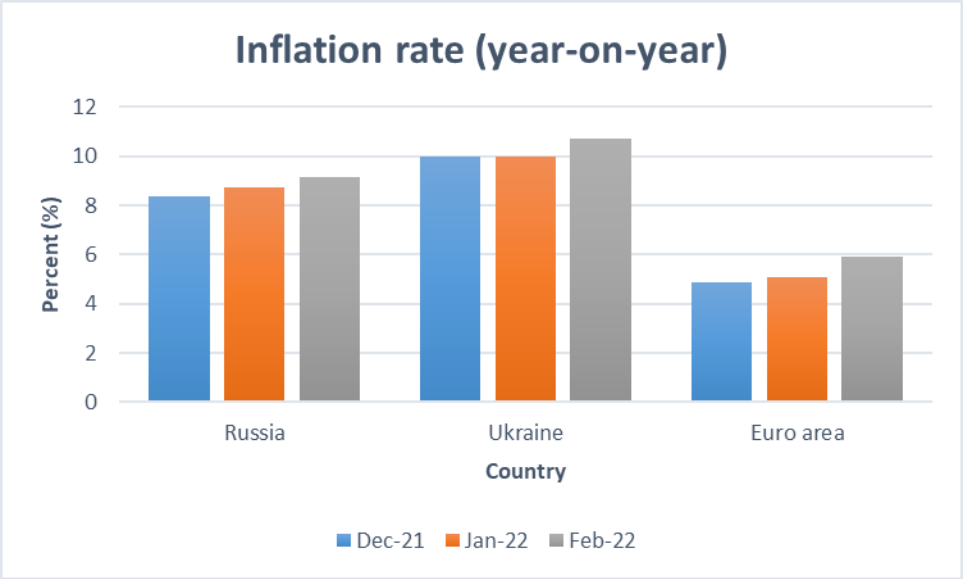
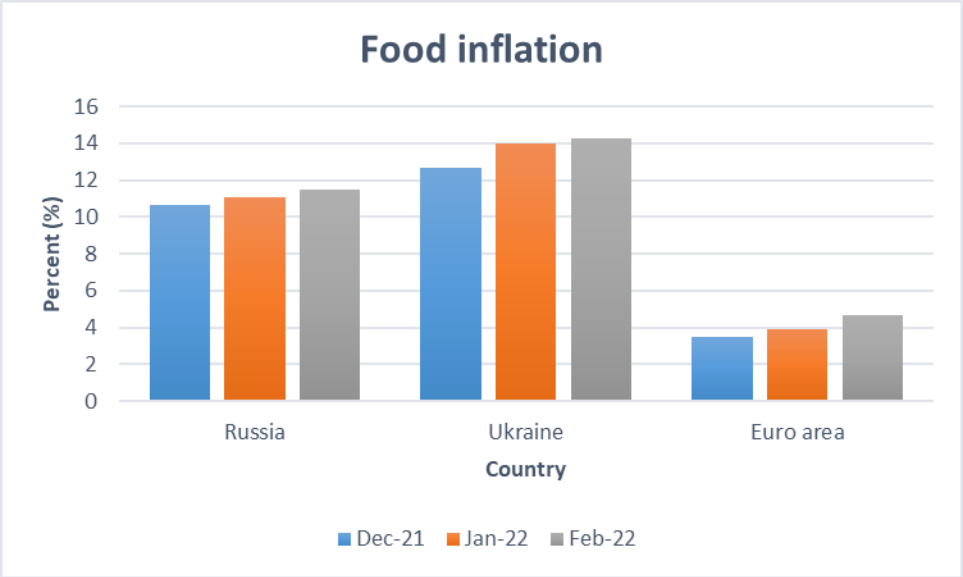


Figure 6



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6.3. Effect on global stock markets

Share prices plunged in value across global stock markets after Russian invasion of Ukraine. Investors fled for safety upon announcement of the invasion of Russia into Ukraine. Table 8 shows the lowest price at which stock were traded in major stock exchanges during the invasion window. It shows that the lowest drop in share prices within a 5-day period (from February 18 to Febraury 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 as shown table 8 below. However, stocks rebounded the day after the invasion following the announcement of severe sanctions on Russia by multiple countries.

Table 8. 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 2022	% change (Basis points)	% change (Basis points)	% change (Basis points)	% change (Basis points)	% change (Basis points)	% change (Basis points)	% change (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)
Feb 24	*-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)

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6.4. Other economic effects

Table 9 shows the changes in other economic indices in February which is the month of the invasion compared to the previous month of January including central bank actions in response to Russian invasion of Ukraine while table 10 shows the effect of invasion on global commodity prices.

Table 9. Country-specific economic consequences after the invasion in February

Selected countries	Some economic indicators	Direction
Netherlands	Business confidence fell to 8.5 points in February 2022 from 9.0 points on January 2022.	Negative
Turkey	Economic confidence index dropped to 98.2 points in February of 2022 from 100.8 points in January 2022. Also, manufacturing PMI fell to 50.4 points in February of 2022 from 50.5 points in January 2022	Negative
Denmark	Manufacturing confidence index fell to -2 point in February 2022 from -1 point in January 2022	Negative
France	Annual inflation rate expected to rise to 3.6% in February of 2022 from 2.9% in January of 2022.	Negative
Ukraine	The PFTS stock exchange remained closed due to the Ukraine-Russian conflict	Negative
Italy	Manufacturing confidence index dropped to 113.4 points in February of 2022 from 113.7 points in January.	Negative
European Union	Consumer confidence index in the EU decreased to -10.20 points in February from -10 points in January of 2022.	Negative
Slovakia	Consumer confidence index fell by 0.9 points to -22.3 in February of 2022 from 21.4 in January.	Negative
Iceland	The annual inflation rate in Iceland rose to 6.2 percent in February of 2022 from 5.7 percent in January.	Negative
Sweden	Business confidence index rose to 114.8 points in February of 2022 from 109.9 points in January	Negative
Russia	The IHS Markit Russia manufacturing PMI declined to 48.6 points in February of 2022 from 51.8 points in January	Negative
Kyrgyzstan	Central bank raises rate by 150 points to 10% on February 28th 2022 in response to ongoing COVID-19 infections, inflationary pressures, and rising geopolitical risk in eastern Europe.	Negative
Taiwan	Consumer confidence index in Taiwan dropped to 73.19 points in February 2022 from 73.67 points in January 2022	Negative
Myanmar	The IHS Markit Myanmar Manufacturing PMI fell to 47.3 points in February 2022 from 48.5 points in January	Negative
Ireland	The AIB Ireland Manufacturing PMI declined to 57.8 points in February 2022 from 59.4 points in January.	Negative
Indonesia	The IHS Markit Indonesia Manufacturing PMI fell to 51.2 points in February 2022 from 53.7 points in January.	Negative

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Japan	The au Jibun Bank Japan Manufacturing PMI fell to 52.7 points in February 2022 from 55.4 points in January	Negative
Belgium	Annual inflation rate climbed to 8% in February of 2022 from 7.6% in January	Negative
Sri Lanka	Annual inflation climbed to 15.1% in February of 2022 from 14.2% in January	Negative
Belarus	The Central bank raised refinancing rate by 275bps to 12% on February 28th 2022, to maintain financial stability and limit risks of rising inflation arising from the sanctions imposed against its neigbouring Russia.	Negative
Source: Trading economics		

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Table 10. Effect on global commodity	
Commodity	Economic effect
Natural gas	EU natural gas prices reached close to €100 per megawatt-hour.
Oil	Brent crude futures rose close to $100 a barrel on 28th February. Also, WTI crude oil rose to above $96 a barrel on 28th February after Western nations imposed fresh sanctions on Russia, raising fears of supply disruptions.
Gold	The price of gold almost reached $1,900 an ounce on 28th February
Palm oil	Palm oil increased to an all-time high of 6291 MYR/T
Uranium	Uranium futures traded at a high price above $46 per pound amid Russia's threat of using nuclear energy following the Western sanctions on Russia for invading Ukraine.
Mineral	Palladium futures rose to $1834 an ounce due to the ongoing conflict in Ukraine.
Silver	Silver futures traded above $24 per troy ounce on February 24th, due to rising demand for precious metals following the Ukraine conflict
Cocoa	Cocoa futures traded at around $2527 an ounce on 28th February due to lower global demand and supply constraints caused by Russia's invasion of Ukraine. Border closures placed curbs on travel which in turn prevent the sale of chocolate and coffee
Coal	Newcastle coal futures traded at a high price of $274.5 per tonne on February 28 due to soaring demand for electricity and power, particularly from European countries affected by the ongoing Russia-Ukraine war.
Source: Trading economics	

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7. Conclusion

This paper explored the global economic consequence of the Russian-Ukraine war in the month of invasion. The global economic consequence of the invasion was a global supply chain disruption. This manifested through rising consumer prices including rising energy prices and commodity prices and a rise in food prices, thereby leading to a rise in global inflation in many countries especially in Euro Area countries.

The empirical analysis in the paper showed that there was an increase in the global PMI and an increase in the world price of food and food ingredients. The index of global stock markets plunged on the day of invasion. The Euro Area manufacturing purchasing managers' index (PMI) declined in the month of the invasion. Also, the transportation component of the consumer price index rose in the month of the invasion due to shortage of energy and fuel supplies which led to a rise in the price of gasoline for transportation in the Euro Area. Ukraine experienced a more devastating effect from the invasion than Russia and the entire Euro Area. Core consumer prices in Ukraine and the Euro Area were highly correlated during the invasion. Food inflation was highly correlated in the Euro Area and in Russia. Also, there is a positive and high correlation between world food price index, world oils price index, world diary price index and world cereals price index during the month of the invasion.

The implication of the results is that geopolitical conflicts, such as the Russia-Ukraine conflict, 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 effects on the sanctioned country such as Russia. Rather, it affected other countries through economic spillovers. The Russian-Ukraine invasion has shown that sanctions against a warring country is not an optimal solution because it has 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. Political leaders should put in effort to discourage conflicts like the Ukraine-Russia conflict. They should use negotiation as a conflict resolution option.

Future studies can assess whether conflict resolution through negotiations are very effective in pacifying countries that go to war to protect their regional influence. Future studies can also

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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.

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