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A Model Based Study: War's Consequences on Global Supply Chain Manipulating Developing Nations' Trading Pattern

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Abstract

This paper uses a 3-sector theoretical model extending Jones 1971 model for a developing nation assuming that it is a small open economy which is not a part of war but a major trading partner of both the countries in conflict. However, geopolitical alliances generating from common interests, creates pressure on countries to be involved in the war in some way or the other. Usually, developing nations bear the brunt of war whether they are involved in it or not. War has caused and is causing both social and economic disturbance since the evolution of human kind. It affects the modern economy differently than it had affected the primitive economy when mankind was not fully evolved. Every war in history has affected the global economy either partially or completely. War is a shock that creates disruptions in worldwide trade pattern. This model reflects the effect of changes in the supply chain caused by war which is a shock component in the model. Changes in supply chain are accompanied by changes in price and output level. The manufacturing sector, in the model, imports intermediate inputs from the nations at war. Due to the existing scenario of the war there is an alteration in the price of the intermediate inputs, which changes the price of the finished product produced in the manufacturing sector. These finished products are exportable from the point of view of the developing nation producing it. These price changes lead to a total change in trade volume. This model shows the change in price of intermediate inputs during war situation which can be extended for war that has taken place in the real world. Data showing change in trade volume for different intermediate importable goods during the war period are used to describe the conclusion driven from the study. In order to attain social and economic stability it is essential to restore peace. Historically, it has been proven that war is inevitable. Developing nations bear the burden while the global superpowers reap benefits from the situation specifically in terms of trade, slowing down the growth and development of the developing countries.

Keywords: War, Disruption, Supply chain, Developing countries, Imports

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Introduction

War brings immeasurable suffering to mankind. Aside from the psychological and physical damage caused by war, it impacts the economics of an economy. Evidence from the war periods implies that even with external precautions war cannot be circumvented. It has a major repercussions effect on the world economy. War is surely an economic bad that has evidently been able to startled economy in terms of growth, development, trade and environment. Using a 3-sector model for a small open economy which is a developing nation an impact on this economy is determined. This model is an extension of Jones 1971 model. The economy on which the sectorial model is based is not participating in the war; rather it is a major trading partner with the countries at war. The economy experiences a spillover effect of the war. The results derived from working of the theoretical model under a war situation can be extended for actual scenarios that can be observed as an aftermath of a war.

On-going Russo-Ukraine war that has started from 2014 has peaked in 24th February, 2022 after Russian army attacked Kyiv, capital of Ukraine causing massive destruction and killing massive number of people and leaving many injured and without roof. Many domesticated animals and innocent civilians are victim of this war. As of 15th February 2024, 10,582 Ukrainian civilians have died (source: statista). According to a report by Atlantic Council 315,000 Russian troops has been wounded or killed in the war. Lives are lost on both sides. Before war Russia and Ukraine was major trade partner, but due to war this situation has changed and had not been beneficial for either. India being a major trading partner with both the nation at war has faced alteration in its trading pattern. In 1992 Treaty on Friendship and Co-operation was signed between India and Ukraine that benefitted India's trade. On May 6, 2022 India gave 7725 KGs of medical and essential supplies for people of Ukraine (source-Embassy of India, Kyiv, Ukraine). India has imported products from both Russia and Ukraine.

India has not supported any of the two countries directly in the war. US President Biden has directly taken side of Ukraine in his speeches. Countries like United Kingdom, Italy, Germany, Denmark, and EU, US, NATO are in support of Ukraine. Russia is backed by Mali, South Africa, China, Iran, Belarus, and North Korea. Every country supporting Russia believes that the invasion was justified on the ground of western provocation. Alliances in the world economy influences trade. These alliances can prove to be beneficial in time of economic shocks.

Changes in import and export of India due to this war on few intermediate products are explained in this paper using descriptive statistics. The war has impacted the developing economy of India; there has been a jump in India's retail inflation of 7.79% as of April 2022. There was a hefty impact on the share market. In 2021 GDP growth (annual %) for the world was 6.2%, which fell to 3.1% on 2022 that is during the period of conflict (source: The World Bank). During the period of 2021 when the Russo-Ukraine war did not escalate annual per cent of GDP growth was better in the world as a whole. A situation of peace smoothens the path of growth and development. Peace brings in macroeconomic stability and is essential for chaos free operation of an economy.

Three sector extended Jones 1971 model
Assumptions

- Here we consider a small open economy which implies that the economy is price taker in the international market.
- There are three sectors. The sectors are agricultural (A), manufacturing (M) and service (Z).
- All the sectors are exporting sectors. Manufacturing sector imports intermediate inputs (I) from the countries indulged in war.
- There are two primary factors of production - labour and capital. All the sectors use these two primary factors in different forms to produce its product.
- Agriculture uses unskilled labour (L) and domestic capital (KD). Manufacturing sector uses skilled labour (S) and domestic capital (KD). Service sector uses skilled labour (L) and foreign capital (KF).
- Production function in each sector exhibits constant returns to scale (CRS) with diminishing marginal productivity to the variable factor.
- Skilled labour is mobile between manufacturing and service sector. And domestic capital is mobile between agricultural and manufacturing sector. Unskilled labour is specific to agricultural sector and foreign capital is specific to service sector.
- Here we assume β is the shock parameter and implied as war in the model.

Notation with explanation

Pj* = international price
Pj = domestic price of the product produced in sectors (j = A, M, Z) Xj = output of the j^{th} sector
S = skilled labour
L = unskilled labour KD = domestic capital KF = foreign capital
w = fixed wage rate
r = fixed rate of return
wS = wage rate of the skilled labour rF = rate of return on foreign capital
aij = requirement of i^{th} factor for producing one unit output in the j^{th} sector
β = shock parameter [β ≥ 1]

Equational structure

Sector-wise competitive equilibrium condition

$$a_{LA} . \underline{w} + a_{KM} . r = P_A \tag{1}$$

$$a_{SM} . w_S + a_{KM.} r + \beta P_I^* . a_{IM} = P_M \tag{2}$$

$$a_{SZ} . w_S + a_{KZ} . r_F = P_Z \tag{3}$$

Mobile factors allocation condition

$$a_{SM} . X_M + a_{SZ} . X_Z = S \tag{4}$$

$$a_{KA} . X_A + a_{KM} . X_M = K_D \tag{5}$$

Immobile factors allocation conditions

$$a_{IM} . X_M = X_I^* \tag{6}$$

$$a_{KZ} . X_Z = K_F \tag{7}$$

$$a_{LA} . X_A = L_e \tag{8}$$

$$L - L_e = L_u \tag{9}$$

Working of the model

The working of the model is simple. There are 9 equations and 9 unknowns: w_S, r, r_F, X_A, X_M, X_Z, X_I*, L_e, L_u in the model. From equation (1) r can be derived as $\underline{w}$ is fixed and PA is also known because this is a small open economy price level in every sector is same as the price in the world market. Plugging in the derived value of 'r' in equation (2) we can get the value of w_S, as w_S is determined r_F can be derived from equation (3). Now the factor prices and factor endowments are known and the output X_Z can be determined from equation (7). X_M can be derived from (6) as import of intermediate good is known. X_A is obtained from (5) plugging in XM. Subsequently, L_e is derived from (8) and L_u from (9).

Impact on the developing nation not at war

This model examines the impact of war on three sectors of the economy. We have 9 equations and 9 unknowns in the model: L_e, L_u, w_S, r, r_F , X_I*, X_M, X_A , X_Z . Agricultural and Manufacturing sectors are producing exportable, while Service sector is producing import competing services. The β parameter in this model captures the impact of shock and it lies between 1 and greater than 1. β tends to 1 in absence of a shock in the economy, in this model the it is the situation of peace. β

tends to a value greater than 1 in presence of a shock or in a situation of war in this model. This shock is a spill-over effect of a war that is going on or has happened between other countries. As a result of the exogenous shock i.e. war factor price changes leading to alteration in factor requirements and output. Intermediate goods used in the production process by the manufacturing sector are imported from the countries participating in the war. The economy importing intermediate product is a developing nation. Due to the war situation β tends to be greater than 1, as a whole βP_I^* increases.

From equation (i), value of 'r' can be derived as $\underline{w}$ is constant and P_A is given because it is a small open economy which accepts the price prevailing in the world market. Hence to maintain PM, ws in the manufacturing sector will fall. Skilled labour is mobile between manufacturing and service sector. So, ws in service sector will also fall. Therefore, to maintain Pz return to foreign capital (r_F) will increase. As a result, the output in service sector increases. Given the endowment of skilled labour in the economy and the existing ws demand for skilled labour expands in the service sector. This further leads to a reduction in XM. Increased price of intermediate goods provides a route to reduction in X_I* (quantity of imported intermediate good). Lesser import of intermediate goods reduces X_M. As X_M is reducing with given domestic capital endowment X_A needs to rise, in order to maintain the full employment situation. There is a contraction in the output of the manufacturing sector and expansion in the output of agricultural and service sector. Fall in ws inferred the reduction in wage between skilled and unskilled labour. Wage being fixed in agricultural sector can lead to a situation of unemployment. Labors may not be willing to work at the existing level of wage in the agricultural sector. Given the unskilled labour endowment, and the level of wage in the agricultural sector a situation of involuntary unemployment can arise if the wage is fixed at a much higher rate than the equilibrium because the employer will employ lesser amount of labour in order to retain profit. Unemployed unskilled labour cannot get employment in either manufacturing or service sector. As X_A rises labour employment (Le) increases and Lu falls. Increase in employment in (A) can create the problem of disguised unemployment in that case marginal productivity of labour will decrease due to exportable. Reduction in X_M is not desirable in the economy, but if increase in X_A is greater or equal to than the reduction trade volume would not reduce. Expansion in X_Z shall prove to be beneficial as it is import competing sector and can improve net export in the developing economy. The wage inequality between the two groups of labour decreases but the fall in output of the manufacturing sector hinders the growth in the developing nation.

Russia-Ukraine conflict

Ukraine and Russia at present share boundaries and had historically shared ancestry over a millennium. Ukraine was a part of the USSR. With the collapse of the Soviet Union in 1991, Ukraine became an independent state. Ukraine had a willingness to join the European Union, and in 2013 they finalized an agreement with EU. Russia was against this agreement as Ukraine would become a part of the western Europe which would strengthen the relationship among the countries in western Europe.

They pressured Ukraine to withdraw their partnership, and if they went along with the agreement Russia threatened to not acknowledge Ukraine's borders. In November of 2013 Viktor Yanukovych, then Ukrainian president withdrew the agreement in order to strengthen their ties with Russia. This led to a massive mass riot by the Ukrainian citizen known as Euromaidan, further processing to the

Revolution of Dignity in February 2014. The Ukrainian president was removed from power and had to flee to Russia. Russia was infuriated and chose violence. They attacked the peninsular region of Crimea and annexed it, in February and March of 2014. Russian forces openly attacked Donbas in April, 2014. The armed Russian forces along with the separatists from Donetsk People's Republic and Luhansk People's Republic seized Ukrainian government buildings and proclaimed independent DPR and LPR. Ukraine in order to retain the Eastern part implemented an Anti-Terrorist Operation (ATO) in Sloviansk. They were heavily armed which was not anticipated by the separatists. Quickly, Ukraine was able to regain control over some parts which were invaded by Russian with the help of Separatists. They realized the need to cut off the supply line from Russia that benefitted the rebellions. Malaysian Airlines Flight 17 departed from Amsterdam was heading towards Kuala Lumpur was destroyed killing 298 passengers while flying over Eastern Ukraine by a missile belonging to the 53rd anti air brigade of the Russian Federation. Russia denied its involvement in the attack and vetoed international tribunal in the UN security council. It started to appear that Ukraine was gaining an upper hand in the war, Battle of Shakhtarsk Raion started from 16th July 2014 and went on for a month. DPR own the battle reclaiming the areas that were annexed by Ukrainian Army. Ukraine's situation in the battle started to deteriorate and they had to retreat from the situation. After this defeat Ukraine made progress in proclaiming areas captured by the Separatists, they even planned to take back some of the border checkpoints which were highly concentrated with the separatists. This move lead to further attacks and Ukrainian Army was defeated by the Separatists backed by Russian Army. Russia even with evidence denied their involvement in the violence. For peaceful negotiation Minsk Agreement was signed between Ukraine, Russia and both separatist republic. It was all in vain as Ukraine did not feel safe to demilitarize the 15 km wide region drawn to create a border. The republicans and Russian had their own demands. The negotiations were nugatory, the situation went back to square one only thousands of lives were lost by then. Donetsk Airport was attacked on September 2014, it was the only part of Donetsk under the control of Ukraine. This continued till February, 2015 and separatists were able to shatter the airport in an indistinguishable manner. Minsk 2 was drawn on February, 2015 which was of no use. On 29th December, 2014 Ukraine decided to actively seek membership in NATO. Disturbance has existed between Ukraine and Russia. Until, on 24th February 2022 Russia invaded the suburbs of Kyiv (Capital of Ukraine). This invasion marked the beginning of a never-ending violence putting social and economic strain across the world either actively or passively.

Very few countries backed Russia in the war situation. A good place to start looking is who voted against UN resolution which was adopted on Feb 23, 2023. Only Russia, Belarus, Syria, rogue state, North Korea, Mali, Nicaragua and Eritrea voted against it. Belarus was the most loyal ally of Russia. It allowed Russia to use both its air and land for the Ukrainian invasion. In June 2023, Belarus started hosting Russian tactical nuclear weapons on its own territory. Iran was also in favor of Russia. There was an extensive and developing relationship growing between these two countries involving supply of equipment such as helicopters, fighter jets and kamikaze drones. North Korea and Syria was also in favor of Russia. China was one of the closest global superpower of Russia. But China has never directly supported the Russian invasion of Ukraine. But undoubtedly china supported Russia by importing Russian oil and gas. And India did the same as China by importing Russian gas and oil.

Ukraine was not a part of NATO and also did not have military alliance with US or any NATO nations, but around 40 NATO member countries, including Sweden and Germany, provided financial, humanitarian and military aid to Ukraine. The US has provided most military assistance and aid to Ukraine. European Union (EU) has also provided military support as well as lethal arms to Ukraine.

An invasion by Russia would put pressure on India to choose between the Western alliance and Russia. As Russia is a big trading partner of India, it had to maintain a strong strategic partnership with Russia and as a result India cannot join any Western strategy aiming isolating Russia. India called for "a peaceful resolution of the situation through sustained diplomatic efforts for long-term peace and stability in the region and beyond" and largely rooted at neutrality. Russia was the 2nd largest oil, natural gas and wheat exporter all-over the world. Western sanctions were posed on Russia to weaken its power and finance. US, UK, EU imposed sanctions on Russia since February in response to the war on Ukraine. These sanctions affected the trading of Russian oil and natural gas. US and UK banned importing technology that could be used for weapons and EU has imposed price cap on oil. EU has also stopped importing gold and diamonds from Russia weakening its power. At this time, Russia lowered its price of oil and natural gas and wheat. India at that time imported a large amount of oil, gas and wheat indirectly benefitting Russia financially. China on the other hand, being the opposition party of the US, also supported Russia financially by importing Russian products. In 2022 china became Russia's leading trading partner.

Not only in the after-war situation but also in the pre-war period, the economy of Ukraine was not so strong. GDP was falling in the pre-war period of Ukraine and there was rising poverty and unemployment. The Russian invasion of Ukraine affected the already crumbling Ukrainian economy. Russia and Ukraine both the countries were major exporters of different commodities. And Russia was the largest trading partner of Ukraine. In the after-war period the trading between Russia and Ukraine took a huge turn and it decreased. On the other hand, China was one of the largest food trading partners of Ukraine. Being in the war Ukraine kept a diplomatic engagement with China while preventing China from providing meaningful support to Russia’s war. But both import and export between Ukraine and China decreased. India is Ukraine’s largest export destination in the Asia Pacific and fifty largest overall destination. Indian export to Ukraine fallen from 2021 to 2022 in the war situation but import has risen. The United States and Ukraine have a bilateral investment treaty. The war in Ukraine, has slowed bilateral trade between the US and Ukraine by 31% since July 2018. The US has also provided Ukraine with approximately $44.2 billion in military assistance since Russia’s invasion in 2022. The US has also provided Ukraine with humanitarian and financial support.

Supply chain disruption due to Russia-Ukraine war (an Indian perspective)

Import side

After the outbreak of the devastating war between Russia and Ukraine, a significant change in the trade volume has been observed. In this paper, we look into the trade volume between Russia and India specifically for the exchange of intermediate goods that are primarily used in the manufacturing sector in India. These goods include fertilizers, iron and steel, crude oil etc. A drastic fall in the export volume of Russia can be seen and deliveries to Europe decreased by 68 percent (source: Ukrainska Pravda).

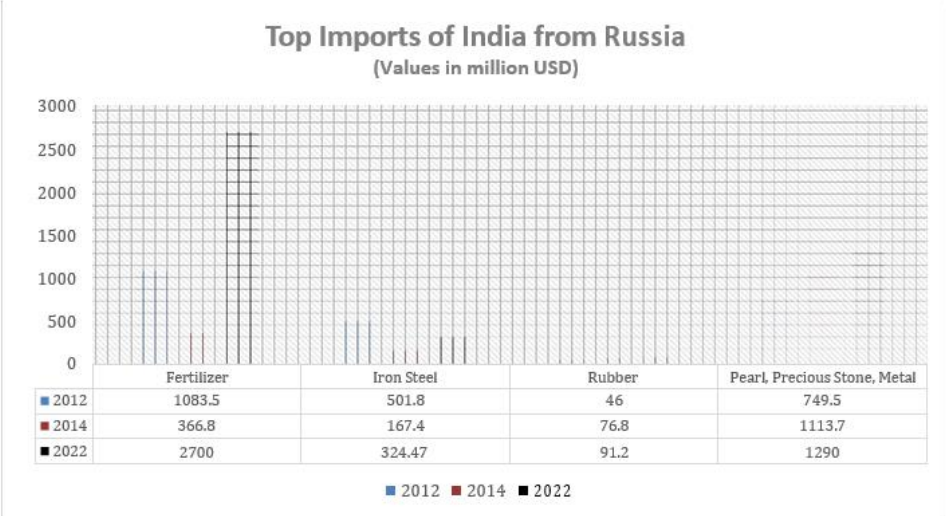
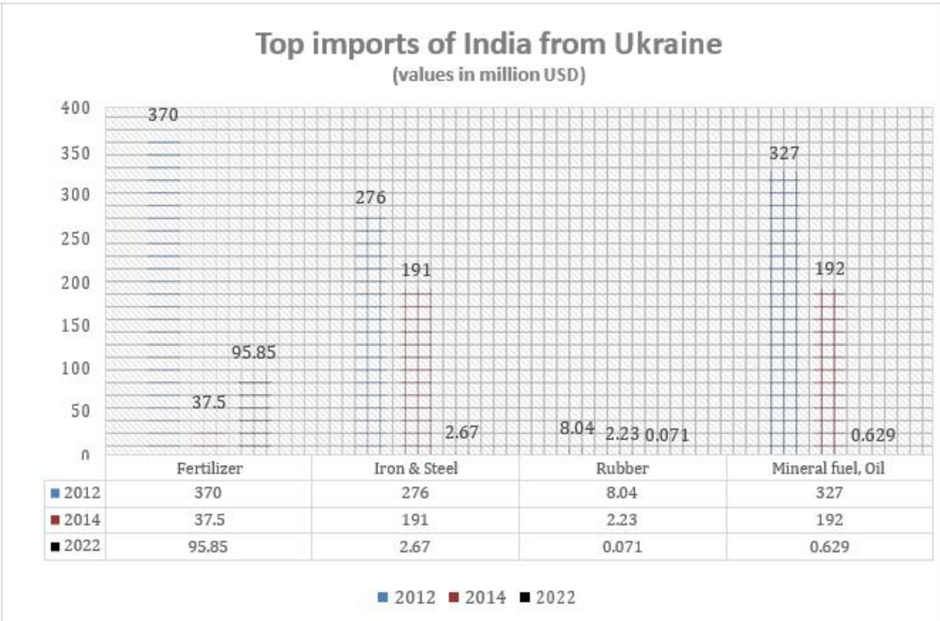


Figure 1 (data source: https://tradingeconomics.com/)

From this diagram, it is seen the imports of intermediate goods from Russia to India in the various time period: 2012 as the pre-war situation, 2014 as the active war situation and 2022 when the full-scale invasion happened.

Now, in case of imports from Ukraine, a drop in the level of imports can be seen across various intermediate inputs, some of this drop is balanced with the increase in imports of those goods from Russia. The volume of India-Ukraine trade dropped from $3.38 billion in 2021 to $2.58 billion in 2022. India's exports to Ukraine dropped by 22.8% to $85.49 million, while Ukraine's exports to India fell by 17.3% to $1.69 billion (source: The Deccan Herald). The main reason for this can be explained as Russia was exporting commodities to India at a discounted price and the Rupee-Rouble trade policy was another main reason for that leap in the imports from Russia as the sanctions by US, European Union and other major countries took place against Russia.



	Fertilizer	Iron & Steel	Rubber	Mineral fuel, Oil
2012	370	276	8.04	327
2014	37.5	191	2.23	192
2022	95.85	2.67	0.071	0.629

Figure 2(data source: https://tradingeconomics.com/)

Russia being the world's second largest crude oil exporter had to sell crude oil at a steep discount as several countries, imposed sanctions on Russia. The West expected India to turn its back on Russia, but a look at the numbers shows that expectation was never realistic. India took advantage of the situation and imported large volume of crude oil from Russia. Price cap for crude oil was set at an initial 60 dollar per barrel on Russian seaborne oil with an adjustment mechanism to keep the price cap at 5% below the market price. Due to this restriction Russia was supposed to pace a fragile trade situation. Setting the price cap for Russian crude oil implies a passive move adopted by the European Union and backed by US and other G7 countries and Australia as an attempt to weaken Russia's economy. Prior to its invasion of Ukraine, Russia was a relatively small trader with India, not figuring among India's top 20 partners. In the 2021-22 FY (1 April to 31 March), trade between India and Russia accounted for a meager 1.3 percent ($13 billion) of India's total trade. In the 2022-23 FY, India's imports of crude oil from Russia increased nearly 13-fold, from less than $2.5 billion in 2021-22 to over $31 billion in 2022-23. Russia became India's second largest source of crude oil imports with a share of 19.1 percent. Imports of other major commodities of India's interest, namely fertilizers and coal, also increased four-fold and three- fold, respectively. Consequently, Russia emerged as India's fourth largest import source in 2022-23 with imports totaling $46.2 billion, 6.2 percent of overall imports (source: The Diplomat). The discounted price of crude oil and other commodities exported from Russia and the Rupee-Rouble trade with India facilitated the jump in the trade volume with Russia. As derived from the model manufacturing sector is supposed to contract due to war. In reality India imported crude oil which is an intermediate good to produce more of refined products, thus increasing India's export of refined products in FY 23-24. Global crude oil prices would have surged and created "havoc" in the international oil market had India not ramped up oil imports from Russia in the aftermath of Moscow's February 2022 invasion of Ukraine, the petroleum and natural gas ministry told the department-related parliamentary standing committee.

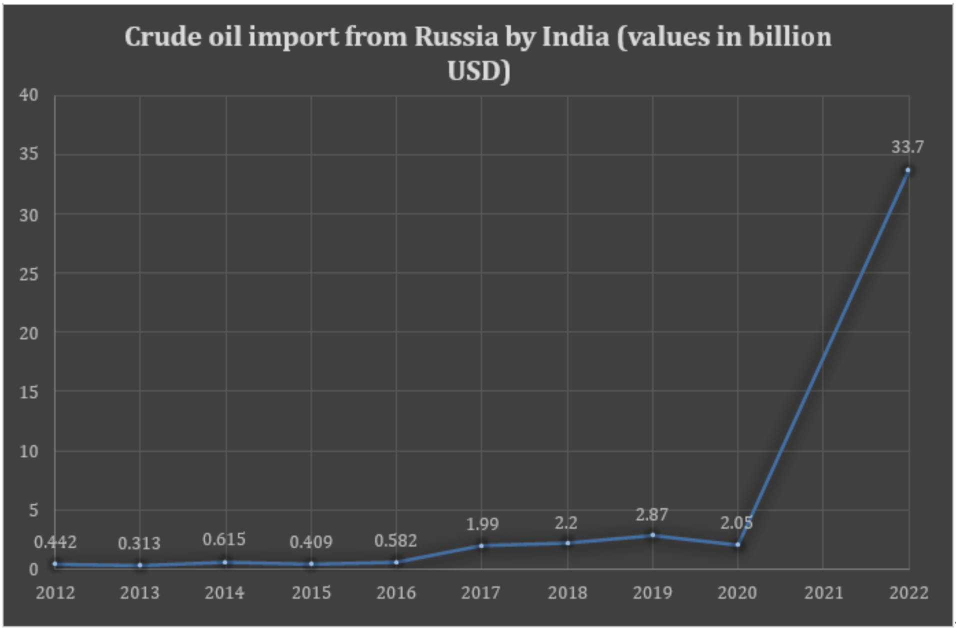


Figure 3 (data source: https://www.statista.com/)

Export side

"In the 13 months since the oil price cap took effect (in December 2022), over one third of India's exports of oil products to sanctioning countries was derived from Russian crude (EUR 6.16 billion or USD 6.65 billion)," the Finland-based Centre for Research on Energy and clean Air (CREA) said in a report. India, maintaining its diplomatic balance, continued to purchase Russian crude oil amid the Ukrain-

Russia conflict while strengthening its defense and trade relationship with the west. Data from Kpler, analyzed by the Independent, shows that India became the top importer of Russian crude oil in 2023, with an average of 1.75 million barrels per day, marking a 140% increase from 2022.

Concurrently, the European Union's import of refined products from India surged by 115%, from 111,000 barrels per day in 2022 to 231,800 barrels per day in 2023. This figure represents the highest in the past seven years and possibly the highest ever. Matt Smith, Kpler's lead analyst, explained, "It has worked two-fold India has been able to buy cheap oil for its refineries, then it has been able to refine that oil and sell the refined products at full price, and into a market (Europe) that is willing to pay up for them because it desperately needs to replace the loss of Russian material that it has applied sanctions on." For instance, the Jamnagar Refinery in India's Gulf of Kutch, a primary destination for Russian crude, accounted for 34% of India's Russian crude imports, receiving 400,000 barrels per day from Russia and 770,000 barrels per day from other sources. Approximately 30% of the refinery's exports in 2023 were directed to Europe.

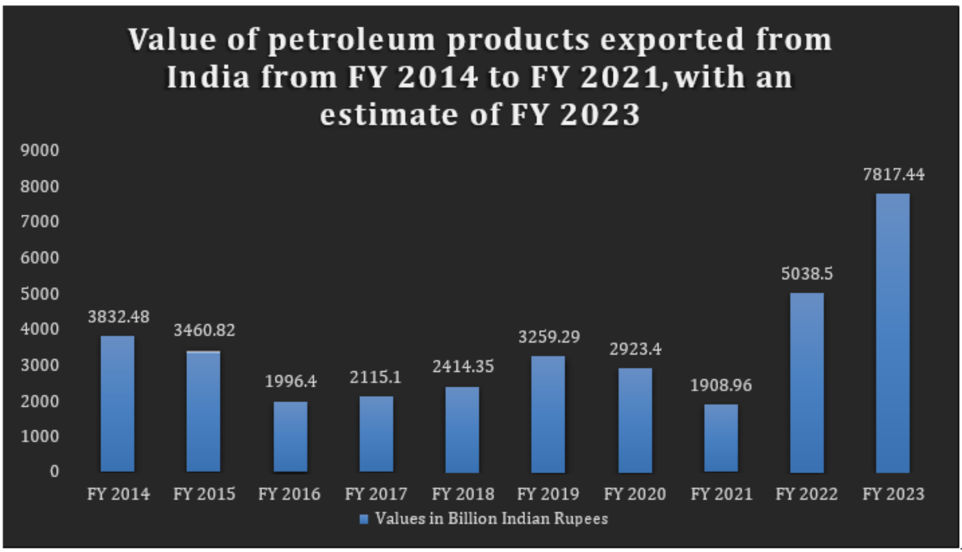
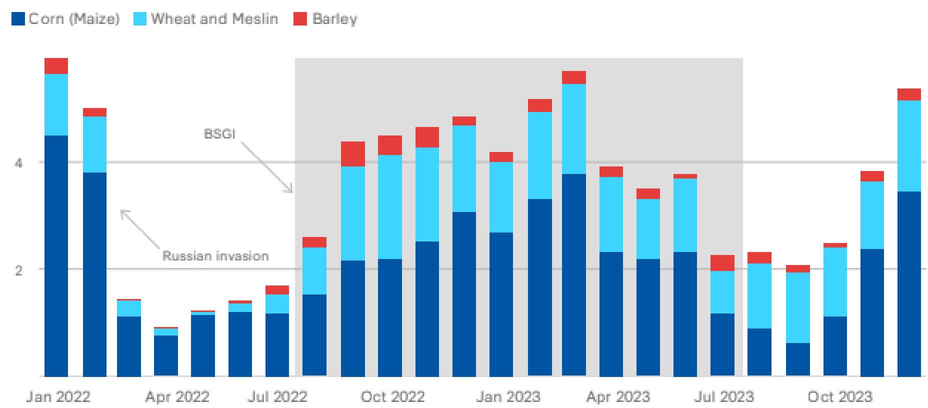


Figure 4 (data source: https://www.statista.com/)

Is food-grain a silent weapon for Russia?

Ukraine's GDP contracted by more than 29% in 2022 compared to 2021 and the value of agriculture as a proportion of Ukraine's GDP was 39% lower in 2022 than 2021.The global disruption in the agricultural market due to lower production in Ukraine was huge. World food prices reached all-time nominal highs in March 2022. The rising food insecurity generated from Russia's war has also been beneficial for them. Ukraine's lower production and export made way for Russia to capture the market. Russia using agricultural export as a soft power. In early 2022 Dmitry Medvedev, deputy chairman of Russia's Security Council, declared food to be Russia's "silent weapon". And by August 2023 President Putin declared Moscow's intention to "replace Ukrainian grain" with Russian grain particularly to "needy countries".



Note: This data was downloaded from the TDM database using the following tariff lines: HS 1001 (wheat), HS 1003 (barley) and HS 1005 (corn).
Source: "Trade Data Monitor: Homepage," tradedatamonitor.com.

Figure 5: Ukraine Grain Exports, January 2022–November 2023

Russia is the world's largest exporter of wheat and accounts for a large share of global exports of fertilizer components such as potash, urea, di-ammonium phosphate (DAP), and anhydrous ammonia. Market prices for these commodities increased rapidly after the invasion in February 2022, because of the fear that Russian exports, as well as Ukraine's, would be adversely affected due to the invasion and supply chain disruption caused by it. The sanctions imposed by the European Union, United States, Canada, and other countries on Russia and Belarus following Russia's 2022 invasion included restrictions on banking, trade, technology transfers, and specific individuals. But these sanctions exempted the agricultural sector, including inputs such as fertilizers, to avoid side effects on global food security.

Russian wheat production over the past two marketing seasons has been at a record high due to record plantings and yields. The USDA estimates that Russian wheat exports will likely be a record-high 51 mmt for the 2023–2024 marketing year.

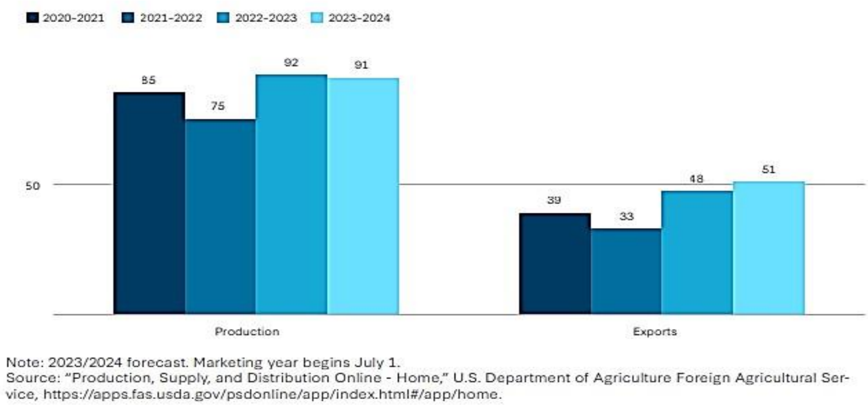


Figure 6: Russian Wheat Production and Exports

Peace - choosing harmony over conflict

Trade offers an advantage to all its participants. Every country involved in trade agreements benefits as they can focus on producing goods and services where they have a comparative advantage, leading to increased efficiency and productivity. However, in the circumstances of war, the bilateral agreements between the countries compel them to take opposing stands leading to a disruption in trade agreements.

We should strive to prevent war at all costs. The adverse consequences of war are mostly borne by the developing nations, and in the absence of war, a country's journey towards development will be smoother. Even during circumstances of war, the ultimate objective should always be to attain peace and stability. Trade also flourishes in times of peace, benefiting all parties involved. Developing countries rely on intermediate goods for the manufacturing sector but war disrupts the supply pattern.

The disruption of supply chains has significantly contributed to inflation and war has further aggravated the situation, mainly due to disruptions in the supply of commodities such as wheat and fossil fuels from Russia and Ukraine.

Why war should be avoided

Macro-economic problem— Inflation, GDP and other macro-economic disturbance are the major problems that a war brings in. That not only affect those countries who are participating in that war but also disturb the economy of others. One of the major economic disturbance in the world economy started with the active war situation between Russia and Ukraine. It is estimated that in 2022, Russia's gross domestic product (GDP) dropped by 2.1% Russia's economy may continue to shrink in 2023. Its GDP is forecasted to decline by 2.5% in the worst-case scenario (OECD) or by 0.2% according to the World Bank. The IMF expects growth in 2023 (0.7%).

Inflation in Russia was afflicted humongously. Russia's state statistics agency Rosstat said that price inflation for February rose 7.7% year-on-year, accelerating from 7.4% in the previous month. Russian inflation has spiked due to the continued effects of international sanctions on everyday prices in the country. The Russian invasion of Ukraine has led to a substantial increase in the prices of energy and food since the start of this war. Consumer price inflation in Ukraine averaged 14.1% in the ten years to 2022, significantly above the Eastern Europe regional average of 7.7%. The 2022 average figure was 20.1% (source: FOCUSECONOMICS).

As a developing nation and also a significant trading partner of both the countries, India has also suffered the problem of increase in inflation rate and decrease in YoY GDP growth. In FY 2021 India had a significant rise of 9.1% which faced a sudden fall in FY 2022 (GDP growth rate 7.2%).

In April 2022, 2 months after Russia's invasion of Ukraine, India's retail inflation jumped to 8-year high of 7.79% and remained above the Reserve Bank of India's (RBI) tolerance band 2-6% (source: Times of India). This was mainly fuelled by massive surge in global crude oil prices due to supply chain disruption and multiple sanctions on Russia.

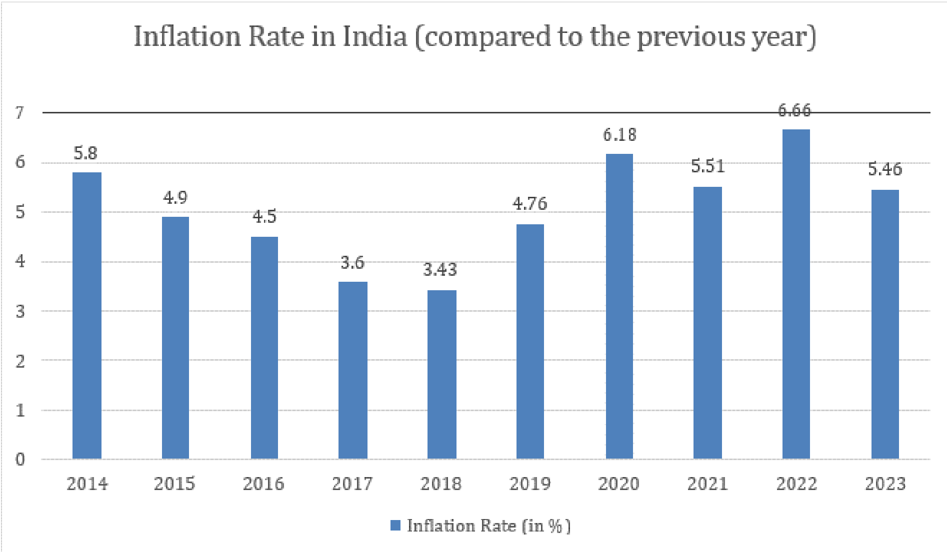


Figure 7 (data source: https://www.statista.com/)

Rising Rates: Central banks face the challenge of determining how much they need to raise interest rates and for how long to counteract inflation. The risks associated with prolonged high inflation are significant as it could potentially undermine the credibility of central banks, and even lead to a recession, particularly given the current high levels of public and private debt.

De-globalization risk: There is an increased risk of de-globalization since the invasion of Ukraine. Although efforts have been made to make supply chains more resilient and reduce dependence on imports, potential disruptions in trade between advanced economies and China may pose threats to global economic stability. The negative effects of de-globalization on the world economy in the near term could be substantial. Trade de-globalization leads to higher mark ups by local monopoly suppliers which can significantly increase costs. The effects of de-globalization are likely to hit some sectors much harder than others, which can, in turn, amplify the aggregate effects.

The intersection of peace and supply chain dynamics in developing nations highlights the critical role of stability and cooperation in promoting economic growth and sustainable development. The presence of peace not only mitigates the risks and disruptions to supply chains but also creates an environment conducive to investment trade and innovation. By addressing the root causes of conflict and fostering reconciliation, developing nations can benefit significantly from peace-building and conflict resolution initiatives and can lay the foundation for robust supply chain networks that drive economic prosperity and social progress.

Conclusion

Any form of economic shocks is not desirable. In this paper the model which has been established as an extension of Jones 1971 model, acknowledges the changes in factor prices and output. Agriculture is usually a native sector which doesn't rely on foreign factors of production and can expand its production during a war period. The service sector can also expand as the concept of work from home has been established in the modern economy. But the manufacturing sector might experience a reduction in output as the economy is developing it is dependent on foreign countries for factors of production. Due to war trade routes are distributed and trade alliances also alter. The manufacturing sector imports intermediate goods and industrial machinery from foreign. Importing from countries during war can be costly as transportation charges increase, the destination from which the product is imported influences the price of the import and other factors can also lead to an increase in price of import. These results are derived from the model, which explains the alteration in output in the three sectors of a developing nation. The Russia-Ukraine conflict spawns' catastrophe in the globalized economy and concocts incertitude in international trade. Dogfight of kinship between the countries carries bird's eye reverberation on world geostrategic, and indeed, the world marketplace. The two countries illustriously supply and export diverse products like wheat, crude oil, fertilizer, and precious stones etc. to the orb. But the discord disdainfully disturbs the supplies of the commodities. Russia and Ukraine jointly meet around 25% of the world exports. So, the conflict between them hauls blowback on any developing economy deeply with world economy and there is a hike in prices of cooking oil, gas, crude oil etc. In light of the supply disruption causing up surging prices across the world, the civil society should come out and decipher the ongoing crisis through abrupt disposition and free the global economy particularly the developing economy like India. India, a developing nation was able to balance out the negative impact of the Russo- Ukraine war. They imported intermediate products from both Russia and Ukraine. As a developing nation India withstood the blow of war pretty well. It provided humanitarian aid to Ukraine, after Russia's invasion.

The economies which have a peaceful environment accumulate more physical and human capital accumulation and enhance economic growth rapidly. Absolutely, peace is the cornerstone of progress and prosperity for societies. It allows people to live without fear and uncertainty, fostering an environment where everyone can thrive and realize their full potential. It's not just the absence of conflict, but also the presence of justice, equality, and respect for human rights that truly defines peace.

Collaborative initiatives that prioritize conflict prevention, peacekeeping and post-conflict reconstruction can contribute to the creation of more resilient and inclusive supply chain ecosystems. By investing in peace and stability, we not only safeguard the integrity of supply chains but also promote the well-being and prosperity of communities in developing nations, ultimately advancing the collective goal of a more peaceful and prosperous world.

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Declarations:

Authors' Contribution:

- All Authors **Conceptualization, and intellectual revisions, Data collection, interpretation, and drafting of manuscript**
- The authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed
- **JEL classification: F11, F19, J64**
- **Objective:** This paper constructs a model of a developing country not being indulged in a war but affected by the countries at war. And also studies the changes of the trade pattern of those countries affected by the war situation. As war is inevitable and creates disruption in different aspects, the motto should be avoidance of war and conflicts and to maintain stability.
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