Ukraine Food Crisis

Global Energy Crisis and the Influence from the Russian Invasion of Ukraine

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

The Russian invasion of Ukraine has heightened the worldwide energy crisis. The European Union has decided to sever relations with Russia and wean off of their reliance on Russian energy supply (Tavernise, 2022). In addition to the EU placing sanctions on Russian energy supply, Russia has cut off energy sources in order to weaponize prices in protest of the EU's support of Ukraine (Tavernise, 2022). The decline in Russian energy supply poses a major threat to global energy supply since in 2021 Russia was the world's largest oil and natural gas exporter (Birol, 2022). Natural gas is the most common source of ammonia production, and ammonia is the starting point for all mineral nitrogen fertilizers (Levi, 2022). Increasing agriculture input costs like fertilizer due to low supply, causes strain in the food supply chain and therefore, the increase in natural gas prices directly affects global food prices. Ukraine and Russia are both such a vital global food exporter, accounting for 30% of total global wheat exports (Levi, 2022), and thus, the decrease in food production has caused dire food supply consequences in regions around the world.

The very interconnected world we live in in the modern day is great in the sense that resources that only come from certain areas are able to be exported around the globe. However, when countries that are net importers become reliant on the resources that are not native that to that region and there is a disruption in the supply chain, the consequences can be detrimental. Russian aggression in Ukraine has led to a blockade of the Black Sea ports, disrupting food and other exports from Ukraine (Levi, 2022). Countries in the Middle East and North Africa who rely heavily on wheat exports from Ukraine, due to their inability to grow crops in their own

country, feel the effects of the food crisis the worst. For example, over two-thirds of wheat imports in Egypt, Libya, and Lebanon come from Ukraine and Russia (Ritchie, 2022).

Similar insecurities have occurred in the energy supply after Russia cut off natural gas sources, decreasing the EU imports of Russian natural gas from 40% to 7% (Tavernise, 2022). Global energy supply has already been under extreme scrutiny due to Net Zero Emission goals that are aimed to be achieved by 2050 (Birol, 2022). The supply disruption that has caused oil prices to shoot up is pushing countries to explore alternatives. The challenge in finding new sources of energy also comes with the challenge of working with climate change goals. Countries are attempting to ensure that the alternate energy sources to Russian oil and natural gas are adding as little of a burden as possible to the climate crisis.

The research topic of my Capstone technical project is on the topic of the Ukraine Food Crisis. This food crisis is a very broad topic that both influences and affects a wide variety of industries and stakeholders all around the world. Thus, my group have split up the topic into five research topics in order to best understand the reach of influence of our project topic. I have been tasked with researching the ongoing energy crisis, which I have chosen to use as the focus of my thesis. The technical portion of the project will analyze effects of the Russian invasion of Ukraine on the global food supply using trade and food supply data. The later portion of this paper will focus on the effects of the Russian invasion of Ukraine on the global energy crisis. Since the global food and energy crisis are very interconnected, both portions of the project will address the other and analyze how energy and food supply impact one another.

Technical Topic

In late February of 2022, Russian troops invaded Ukraine, causing a disruption in the global food supply chain. The global food crisis is not a new issue that was sparked by the start of the Russian-Ukraine conflict, but instead, an ongoing problem that was exasperated by the effects of the invasion. The global food supply chain is an already very fragile system with Russia and Ukraine as two of the most important players. Ukraine and Russia export about one-quarter of global wheat and over two-thirds of global sunflower oil (See Figure 1, Ritchie). The majority of these exports are shipped out of Ukraine from the Black Sea but after Russia blockaded access to these ports, the entire supply chain has been disrupted (Lampietti, 2022). Countries in Northern Africa and the Middle East who are net importers and receive large portions of their essential food imports from Russia and Ukraine, such as Syria, Lebanon, and Yemen, are suffering from extreme food insecurity. Lebanon, specifically receives 90% of their grain from Russia and Ukraine (Lampietti, 2022). In addition to the supply issue that has been causing the increase in food insecurity, food prices are at an all-time high. The price increase of exports like wheat are felt most severely in the countries closest to the conflict zone such as Croatia, Estonia, and Latvia. In these countries the price of bread is up by 30% (Alderman, 2022).

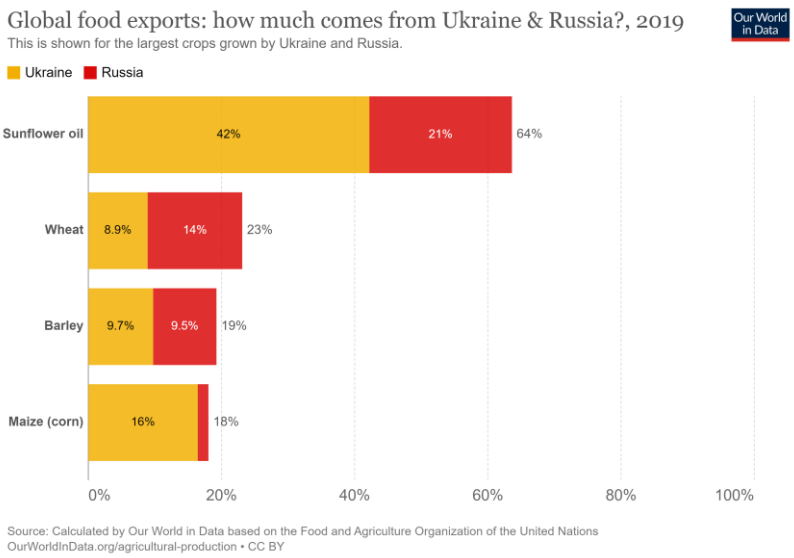

Figure 1. Chart shows the share of major food exports that come from Ukraine and Russia in the year 2019.

While the Russian invasion has contributed a great deal to the food crisis, there are additional factors that have been compounding the crisis for many years that the invasion just exposed to a greater extent. Increasing inflation has contributed a great deal to the increasing global food prices. In addition, the Covid-19 pandemic disrupted global food supplies and distribution that have had a lasting ripple effect even 2 years later. A third factor is the climate change crisis that has led to droughts, flooding, heat waves and wildfires, which have all have negatively affected agricultural production, shooting up food prices (Stanley, 2022). One of the most vital factors effecting the food crisis is the increasingly severe energy crisis. Decreased use of Russian oil supplies after the invasion has led to skyrocketing energy prices all across Europe. This includes fertilizer, an agricultural input cost, thus driving up the cost of production and therefore the cost of the crops.

This prospectus is a proposal for the research project that is focused on understanding how the wide spectrum of compounding factors of the Russian and Ukraine War has contributed

to the global food crisis. As some are mentioned above, the factors include climate change, the global energy crisis, the conflict itself, and the internal politics and economies of affected countries. Through data analysis, using data from sources such as the Food and Agricultural Organization (FOA) and The World Bank, a greater understanding of the extent of influence the war has had on global food networks will be achieved. Our group plans to compare the food production from rates of Ukraine and Russia before the Russian invasion to production rates after the invasion. We will also compare food insecurity levels in countries that relied heavily on Russian and Ukraine food imports from before and after the invasion. This data analysis coupled with current news information will be used to understand the extent that the global food crisis is caused by the Russian invasion, predict how future conflicts may disrupt the global food supply chain, and determine if any measures could be taken to soften the effects.

STS Topic

The actual infrastructure of energy sources and international trade relationships are part of a human organization which is just as complicated and problematic as any other organization. This framework suggests that infrastructure has various properties, three of which are embeddedness, reach or scope, and becomes invisible upon breakdown (Star, 1999). These three properties of infrastructure are important for understanding how dependent the entire world is on Ukraine and Russian energy sources, and to what extent the Russian invasion of Ukraine has disrupted the global energy trade.

The ongoing energy crisis cannot be traced back to one single event as the sole cause. Instead, multiple global events such as the Russian invasion of Ukraine, the Covid-19 pandemic, as well as the ongoing climate change crisis all contribute to the current energy crisis. Due to this wide scope of contributors, the energy crisis expands beyond just the energy distribution to the direct recipients of imports from Ukraine. Since our economy is so globalized and interconnected, often when one part of the supply chain is damaged, there is a ripple effect worldwide. The steep increase in fertilizer costs due to natural gas price increases in Europe, is harmful to other countries such as the United States and Brazil that import the majority of the fertilizer, they use for food production (Lampietti, 2022). Not all countries may be affected to same severity, so recognizing the countries that are suffering the most and being able to determine how and from where they will be able get assistance is just as important as the actual energy source solution.

Prior to the current energy crisis became the everyday conversation on global news networks, the interworking's of the international trade relations were not known by the average

person. The strains to the system by the Russian and Ukraine war has shed light on the infrastructure behind the global energy distribution (Star, 1999). One example of such strain is the halting of the supply of natural gas through the Nord Stream 1 Pipeline. This pipeline is the single biggest pipeline for gas from Russia to Europe, and out of protest to the EU's support of Ukraine, Russia has been limiting the supply (Lawson, 2022). Prior to the disruption of supply, it was not as apparent how much Europe relied on Russian energy sources, and it has sent European countries scrambling to store supplies and find alternative sources. The dependence net import countries have on net export countries became apparent as suddenly net export countries like Russia were no longer a reliable source of energy. Without obvious energy shortages and skyrocketing prices, there is not really a need to question let alone even know where your energy comes from. The breakdown of this energy supply chain has allowed a greater portion of population to become aware of how their energy is delivered to their convenience.

The complexities of today's global economy make it difficult to pin point a single solution to fix the supply chain issues. While there are some countries that dominant large portions of the share of exports, such as Ukraine and Russia, there is not one source of influence that is causing supply issues that can solely find a solution. The Russian invasion of Ukraine is a very large contributor to the scarce source of energy as well as increased prices due to sanctions that have been put in place, however, this conflict only heightened issues that already existed. If Russia were to leave Ukraine tomorrow, the lasting effects after the Covid-19 pandemic that lowered productivity and crop yields that felt the negative effects of global warming, would still contribute to the supply chain issues. These various systems that all contribute to the supply chain issues make reliving the current supply chain strain a very long and complicated process,

involving a wide variety of stakeholder including political leaders, environmental scientists, and world health agencies.

For my thesis, I will be exploring the extent of influence that the introduction of new low emission energy sources will have on relieving energy supply strain. While researching new technologies may not address the wholistic issue to the energy crisis, it is addressing one of the contributors to the energy crisis, climate change and proposing a potential solution.

Research question and methods

The research question I have set out to answer is, will the implementation of alternate energy sources be effective in relieving pressure in the global energy crisis while also keep the Net Zero Emission goals on track? Since the energy crisis is a very current event, I plan on using various media accounts, such as news articles and podcasts in order to stay up to date on new developments. The sources I have been using include, the New York Times podcast, The Daily, as well as online new sources such as The Economist, The Guardian and The New York Times. The data that I will use in my data analysis will come from the energy agencies, Environmental Protection Agency (EPA) and the International Energy Agency (IEA). These sites can provide me information on the current energy production capacities of different countries from renewable energy sources, which will allow me to determine if the energy production is comparable to the current gap in energy supply.

I will compare the energy production capabilities of countries from different regions such as the capabilities of European countries to non-European countries such as the United States, as well as the comparing capabilities before and after the Russian invasion. Comparing the energy capacities of various countries will be important to understanding where energy should then be exported to fill the need. Thus, in addition to energy data, I will also use import and export data from The World Bank in order to analyze historical energy trade data and determine if trade exchanges for new energy sources should be differ from the past. Through this data comparison I will be able to understand the reach that the Russian invasion has impacted the global energy supply whose infrastructure became apparent after many country's energy sources were disrupted and how embedded other global issues are in the energy crisis.

Conclusion

This prospectus is a proposal for both the technical deliverable and STS deliverable that address the global supply chain effects caused by the Russian invasion of Ukraine. The technical deliverable will focus on the global food network and involve data analysis and creation of data visualizations in order to understand the extent that the war has influenced the food crisis. The data models will be utilized to predict how future global conflicts may fracture the global food supply chain. The STS deliverable will be focused on the related global energy crisis that has been heightened by the Russian invasion. Research on alternative energy sources to the traditional fossil fuels that are currently in short supply and high priced will be conducted. I will be exploring if more environmentally friendly energy sources such as low emission energy sources could relieve some of the energy supply strain by diversifying energy sources away from the dominant suppliers, while also keeping CO2 emission goals on track.

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