**Literature Review**

1. Yuri M. Zhukov, ”Near-Real Time Analysis of War and Economic Activity during Russia’s Invasion of Ukraine”, Department of Political Science University of Michigan, 2023. https://sites.lsa.umich.edu/zhukov/wp-content/uploads/sites/140/2023/02/viina\_v02.pdf

* This paper introduces new near-real time data on Russia’s full-scale invasion of Ukraine, and uses these data to investigate the short-term impact of occupation and violence on local economic activity.
* Using remote sensing data on nighttime luminosity and remote sensing data on vegetation, a significant decline was found in economic activity in locations most exposed to combat.
* It is estimated that urban areas that spent a month under contestation but neither combatant had full control, saw a 50% point drop in nighttime luminosity the following month.
* Also, a decline was found in vegetation on agricultural land in actively contested areas. However, in areas fully under Russian occupation, an increase was found in both luminosity and vegetation.

1. K. Deininger, D. Ayalew Ali, N. Kussul, A. Shelestov, G. Lemoine, H. Yailimova,”Quantifying war-induced crop losses in Ukraine in near real time to strengthen local and global food security”

* A 4-year panel (2019–2022) of 10,125 village councils in Ukraine is used in this study to estimate effects of the war started by Russia on area and expected yield of winter crops aggregated up from the field level.
* Satellite imagery is used to provide information on direct damage to agricultural fields.
* Although data is currently only available for winter crops, results point towards a reduction of up to 4.84 million tons of wheat.
* Taking area and yield reduction together suggests a war-induced loss of winter wheat output of up to 17% assuming the 2022 winter wheat crop was fully harvested.

1. N. Kussul, H. Yailymova and S. Drozd, “Detection of War-Damaged Agricultural Fields of Ukraine Based on Vegetation Indices Using Sentinel-2 Data”

* In this work, the search for war-damaged agricultural fields is based on data from the Sentinel-2 satellite. Cloud-free composites of Normalized Difference Vegetation Index (NDVI) are compared for the immediate period before and after active hostilities in a specific area (dates and locations obtained from ACLED source).
* According to the results of research, such damage to agricultural fields as funnels from explosions and shelling, traces of machinery, burnt fields, etc., were found. Detected damaged areas were verified using ACLED data. It was established that more than 50% of the total number of identified damaged areas are located within a radius of up to 5 km from the combat zone (up to 75.4% for the 9th period of the war, 20 Jun – 3 July).
* This data will provide an opportunity for the government of Ukraine and world representatives to correctly distribute financial resources among the affected landowners for the successful and effective restoration of the agricultural and industrial complex of Ukraine.

1. Association for the Study of Medical Education and John Wiley & Sons Ltd, “Fate and future of the medical students in Ukraine: A silently bubbling educational crisis”

* This study discusses the nature and extent of the impact of war on the disruption of medical education in the conflict zone affected by the Russo-Ukrainian war.
* Ukraine has over the years become a popular student-friendly destination for medical education. Whilst there were many students who proactively returned to their home countries, other students had to rush out to safe locations, underground bunkers, and subway stations in Ukraine. And some went to other EU countries through border. But the future of these students has been uncertain since they are having problems regarding the opportunity of education in foreign countries or in their own countries.
* In EU countries, especially Ukrainian citizens are being prioritized while international students have been asked to register for the waiting lists.
* Some Ukrainian universities resumed online education, yet there remain concerns regarding the gaps in the education and the deterioration in the quality of education. Attacks and bombing on schools and universities have caused infrastructural damage in the schools.
* In wartimes, doctors and medical staff have been subject to irregular and targeted violence and kidnapping, which forces a mass departure of medical staff. This forced displaced leads to a drain in the medical personnel supply and the local education system that will train the future healthcare providers.