



# Implications of Russian Invasion on the Logistical Competition for Corn Shipments from the United States and Ukraine (Summary)

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## WHAT IS THE ISSUE?

Logistics is a critical component determining competitiveness in international commodity markets. In the global corn market, the United States is a leading exporter but faces strong competition from Ukraine and Brazil. The Russian invasion of Ukraine on February 24, 2022, disrupted Black Sea and worldwide grain flows, especially for corn. The war’s influence on logistical costs, shipping routes, and export-handling capacities at ports on the Black Sea have changed the relative competitiveness and market shares of major corn exporters in the global market.

This study analyzes the logistical costs, competitiveness, and trade flows of corn exports from the United States, Ukraine, and their competitors to determine global market shares in the periods before and after the Russian invasion.

## HOW WAS THE STUDY CONDUCTED?

The study uses an optimized Monte Carlo simulation model to derive optimal trade flows among origins and destinations under two alternative scenarios: 1) the pre-invasion period (2017 to 2021 calendar years), and 2) the post-invasion period (2022 calendar year). The study focuses on the minimization of logistical costs through the network for corn flows from the United States and Ukraine to the major importing countries and regions for a representative year from each scenario based upon Monte Carlo generated data. For the United States, the export routes are through the U.S. Gulf and Pacific Northwest (PNW). For Ukraine, the predominant export route in the pre-invasion period is through the Port of Odesa. In the

post-invasion period, the export routes are the Ports of Odesa, Chornomorsk, and Yuzhny/Pivdennyi (by provisions of the Black Sea Grain Initiative); shipments routed through Constanta, Romania; and rail shipments through Ukraine's western border. The model's results show short-run trade flows resulting from a minimum cost specification, which were used to derive market shares and represent the logistical competitive advantage between specific origin-destination pairs.

## **WHAT DID THE STUDY FIND?**

The study's findings indicate the international corn trade is extremely competitive, whereby one country's loss is another country's gain. As a result of the Russian invasion, Ukraine lost corn market share to most countries, which was gained by rival exporters. The U.S. Gulf would be the primary beneficiary of Ukraine's lost market share to China and the European Union. The U.S. PNW would also gain export volume in China, although port capacity constraints and congestion prevented the PNW from gaining a higher share of the Chinese market. However, soon after the invasion, China relaxed its phytosanitary restrictions (SPS) on corn imports from Brazil. The effect of this change is important and shifts Chinese imports from the U.S. Gulf and PNW to Brazil.

During the pre-invasion period, the United States had a logistical cost advantage over Ukraine to serve China (from both the U.S. Gulf and PNW), South Korea (from the U.S. Gulf) and Japan (from the PNW). Ukraine had logistical advantages for shipments to the European Union and was highly competitive in Indonesia and China.

During the post-invasion period, Ukraine's shipping costs sharply increased while its export capacity declined. Ukraine's total logistic costs from farm to port via Odesa increased from \$31/metric ton (mt) in the pre-invasion period to \$97/mt in the post-invasion period. Shipments to Constanta were \$115/mt and were \$130/mt to the western border. For comparison, competing U.S. origins during the same period were about \$57/mt to the PNW and \$47/mt to the U.S. Gulf. Monthly export capacity via Odesa decreased from 7 million metric tons (mmt) to 3 mmt. While alternative routes allowed for additional export capacity of 3 mmt via Constanta and 1.5 mmt via the western border by rail, these alternative routes were at a higher cost than Odesa. As a result, Ukraine lost market share in every importing region due to the combined impacts of reduced exportable commodities, supply chain capacity constraints, and higher domestic and international logistical costs. However, the loss of market share did not accrue to the United States, despite the U.S. Gulf and PNW having a cost advantage for corn shipments to China. The observed shipments indicated Ukraine was the dominant supplier to China over the majority of years in the base period up until 2020 when the United States became more dominant.

Several uncertainties emerge from the Russian invasion that could have long-lasting effects on the global corn trade. These are 1) whether Ukraine's Port of Odesa re-opens, 2) whether the Port of Odesa reverts to its previous capacity and costs, 3) changes in the relative cost of alternative routes for Ukrainian grain, 4) if shipping rates through alternative routes remain elevated (which has the impact of weakening the basis in Ukraine and impacting production decisions)<sup>1</sup>, and 5) changes in capacity limits for shipments through these routes and ports. In the short run, these uncertainties were mitigated by the Black Sea Grain Initiative, which helped facilitate world trade and stabilize price volatility.

Finally, because global market shares are sensitive to changes in logistics and transportation costs, exporting countries will continue to make investments to lower their supply chain costs. In regions where exports are increasing, there is a greater frequency for the supply-capacity to be restricted. As a result, there is significant pressure on countries and firms to expand export capacity. Indeed, expansion initiatives are underway in the U.S. Gulf, Ukraine, and Brazil. However, long-run competitiveness and market shares depend not only on lowering supply chain costs within a country, but on those costs relative to other exporting countries. While this study has contributed to understanding shifts in logistics costs, global competitiveness, and market shares as a result of the Russian invasion, these can only be interpreted as short-run findings. Over the long-run, the effects of the invasion are subject to uncertainties, yet to be determined.

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<sup>1</sup> Logistic cost increases reduced the price paid to Ukrainian farmers by \$127/mt, resulting in net prices being marginally less than production costs.

## **PREFERRED CITATION**

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