

MIT Center for Transportation & Logistics | Webinar Summary

Supply Chain Lessons From the War in Ukraine

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Russia's brutal invasion of Ukraine started a conflict that has disrupted supply chains at the global, regional, and local levels. It compounded the operational problems caused by the Covid-19 pandemic and other large-scale challenges.

The conflict can teach us much about the impact of war on supply chains that are globally interconnected and already under pressure from disruptions on various fronts.

At a webinar organized by the MIT Global SCALE Network, faculty from three member centers, the MIT Center for Transportation & Logistics (CTL), the Luxembourg Center for Logistics and Supply Chain Management (LCL), and the Ningbo China Institute for Supply Chain Innovation (NISCI) discussed some of the supply chain lessons learned from the early stages of the conflict.

Food for thought

Chris Mejía, Founder and Director of the MIT Food and Retail Operations Lab at CTL, described how the Russian incursion has devastated food supply chains, particularly in impoverished communities worldwide.

In developed economies, food accounts for two to seven percent of consumer spending, but in low-income countries, the figure is 20% to 50%, said Mejía.

Russia and Ukraine combined provide 33%, 25%, and 75% of the world's wheat, barley, and sunflower oil production, respectively. The UN World Food Programme (WFP) buys about half of this wheat output for malnourished populations in places like Africa.

The war and related economic sanctions have disrupted these supplies. In addition, supply interruptions hinder programs to tackle poverty and malnourishment in low-income countries. Another unwanted byproduct of the conflict is fertilizer shortages, making it more difficult for other growing countries, such as India, to maintain crop production levels.

The WFP identifies the Russia/Ukraine conflict as one of the four causes of an unprecedented world food crisis in 2022 (the other causes are climate shocks, the Covid-19 pandemic, and soaring food costs). The number of people facing acute food insecurity has increased from 135 million to 345 million estimates the WFP, and 49 million people in 49 countries are teetering on the edge of famine.

Compromised food supply chains also impact the world economy. The global food system produces and delivers about 11 billion tons of food annually, said Mejía. Moreover, shortages tend to reduce productivity levels in affected areas.

Mejía listed some critical takeaways from the crisis. For example, the world needs to find alternative sources of fertilizer. Countries such as Morocco could help to compensate for the shortfalls caused by the war in Ukraine. Also, public/private partnerships can ease the crisis by empowering smallholder farmers to build shorter, more efficient supply chains and increasing the capacity of logistics systems. These partnerships can also support more research on food security issues, such as reducing waste in supply chains.

Sourcing new solutions

Webinar presenter Joachim Arts, Associate Professor, LCL, focused on sourcing issues raised by the conflict. While these issues pose new challenges for companies, they also create opportunities.

The war prevented many companies from sourcing products or materials in Russia or Ukraine. Supporting joint ventures in these countries became difficult if not impossible. Various industries, including the automotive, oil & gas, and food sectors, have been hard-hit by these limitations, said Arts. For example, the auto industry sourced car wiring components from plants in Ukraine. The hostilities disrupted production at these facilities, causing supply problems that rippled through auto supply chains. Imports into the combatant countries declined since war broke out. For example, before it attacked its neighbor Russia was a major market for fresh produce grown in Europe.

However, these challenges come with opportunities, suggested Arts. Entrepreneurs outside the two countries can step in to fill the gap in supply capacity left by the conflict, assuming such investments make sense.

In addition to rethinking their sourcing strategies in the region, affected companies have also had to review how they transport the goods they source.

Over the last decade rail transportation has become more important as a mode for moving European freight, primarily owing to the development of more rail links with China. But rail connections that transit Russia were compromised by the invasion, making the mode less attractive. Similarly, it became more expensive to transport cargo by aircraft through Russian airspace.

The shifts in sourcing patterns and modes caused by the war lengthened shipment lead times in the region, said Arts. Moreover, such delays can potentially cause supply chain shortages that give rise to the bullwhip effect (where overordering to compensate for uncertainty becomes amplified along the supply chain).

Demand uncertainties exacerbated these problems. Arts pointed to the dramatic increase in defense spending in Europe in response to the conflict, especially in Germany. The bulk of this spending was on equipment, not personnel, creating surges in demand for components such as semiconductors.

Again, challenges like these created benefits too. To deal with the fallout from the war, companies learned how to better coordinate shipments, allocate scarce resources, and improve the way they evaluate risk and collaborate with trading partners.

Making the connection with rail

The war's impact on rail transportation in Europe, described briefly by Arts, was analyzed in more detail by Pascal Wolff, Assistant Professor at NISCI, at the webinar.

In the 2020/2021 period, China managed to maintain its manufacturing capacity, said Pascal, but suffered transportation failures and related equipment shortages due to the Covid-19 pandemic.

Port congestion was a significant problem. Air transportation also felt the brunt of the pandemic's disruptive forces as flights were canceled. Consequently, many shippers turned to rail for moving goods between China and Europe, and demand for the mode surged during this time.

In 2021 some 15,000 trains carried about 1.5 million TEUs of freight between the two trading superpowers, Pascal said. In terms of freight transportation across the region this is a relatively modest amount of cargo. However, in some sectors, notably automotive and electronics, rail became a critically important mode. Rail offered comparatively competitive lead times of around 18 days for some shipments from China to Europe.

When Russia attacked Ukraine in 2022, rail transportation between China and Europe came to a virtual standstill, mainly owing to the imposition of sanctions on Russia. Companies scrambled to cope with this abrupt change.

Pascal said that Lenovo and Hewlett Packard, as well as various enterprises in the auto industry, used rail regularly for up to 40% of their freight volumes from China. HP's main facility in China was especially hard-hit. The facility is located in the country's hinterland, requiring the company to ship product thousands of miles to the port of Shanghai. One reason it chose that location was the availability of efficient, low-cost rail connections.

Some auto companies in China that used rail to export cars to Europe had geared their sales processes to the mode. As Pascal explained, shipping cars by sea required 40 to 50-day lead times, a delay that European consumers would not tolerate. Hence, auto companies based their sales cycle on the faster transit times provided by rail transportation, which was suddenly unavailable when Russia invaded Ukraine.

In some cases, enterprises reconfigured rail routings to use links that were less disrupted by the conflict. As a result, the so-called middle corridor of rail routes, where shipments departing from China reach European markets via Kazakhstan, the Caspian Sea, the Black Sea, and Turkey, experienced an uptick in volumes.

Manufacturing facilities in Europe also had to adapt quickly to rail's unexpected decline. For example, German auto companies that shipped product by rail to China had to redesign their manufacturing networks, especially concerning the allocation of products. For example, relatively high labor costs in Germany prompted some companies to shift the export of cars to China to other European countries such as Hungary.

Pascal noted that changes like these are not easy to implement and prove troublesome for the companies involved.

In contrast, Chinese freight forwarders and carriers continued to promote rail transportation because they were largely unaffected by the sanctions on Russia. For these players, the conflict represented an opportunity to build freight capacity.

But not all interests in China reaped such benefits. Pascal pointed out that the national government has invested hugely in rail connections to Europe and needs the network to flourish if their expansion plans are to be realized. Also, conflict-related rail network problems proved to be a nightmare for local governments in China. They have sought to attract multinationals by touting the advantages of efficient rail links to and from their regions, and the conflict has undermined these efforts.

Looking ahead

No one knows how or when the war in Ukraine will end, so forecasting the conflict's future impact on supply chains is fraught with uncertainty.

However, the lessons learned from dealing with the fallout can help companies guard against future conflicts and better understand the implications of building resilient supply chains.

