

POST-COVID-19 SUPPLY CHAINS: CHALLENGES AND PROSPECTS

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Abstract: The article examines the impact of COVID-19 on supply chains – the problems caused by the pandemic and the prospects that it opened up for further business development. The emergence and spread of COVID-19, as well as the quarantine measures became a significant challenge for the global economy. Despite the negative impact of the pandemic, it also opened up a number of opportunities for the development of companies and improvement of the existing drawbacks in their logistics activities. The aim of the study is to analyze supply chain disruptions, identify the main reasons for and consequences of these changes as well as propose directions for the future development of supply chains in the post-COVID-19 period. Overcoming the current crisis is an unprecedented challenge for the management team of all logistics players. The COVID-19 pandemic could be the starting point for global changes in the construction of supply chain systems, taking into account current trends such as digitalization, flexibility, localization, new types of delivery, etc.


Keywords: COVID-19, disruptions, digitalization, supply chains, transportation

JEL classification: L91, O18, R40, R41

Introduction

Globalization has been one of the main drivers of supply chain development. The COVID-19 pandemic has affected global supply chains at an unprecedented speed and on an unparalleled scale (Raj, 2022). The emergence and spread of COVID-19,

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as well as the introduction of quarantine measures to limit its spread have been a significant challenge for the global economy. After all, with the limited mobility of people, problems with the transportation of goods by all modes of transport, the significant growth of e-commerce, etc., existing supply systems can no longer fully ensure rapid change in the global environment.

From an economic and industry point of view, the pandemic has brought uncertainties and disruptions to international businesses and supply chains (Sharma et al., 2020; Ivanov & Dolgui, 2020). Hence, supply chain managers must carefully align their strategies to the present situation (Mashud et al., 2021). Therefore, it is important for business leaders to make quick decisions and immediately implement measures to maintain business continuity to meet the needs of their consumers, customers and communities, and also to protect and support their employees. Despite the negative impact of the pandemic, it also opened up a number of opportunities for the development of companies and improvement of the existing drawbacks in their logistics activities.

In 2020, shortages in the supply of many goods were among the most prominent topics in the media, policy discussions and everyday conversation (Ozdemir et al., 2022). Taking into account the fact that the problem of disruptions in supply chains in the post-COVID period is global in nature, it is studied by many scientists and researchers around the world. Thus, Friesen (2021), Harapko (2021), Pape (2020), Wilding (2021), Kireeva et al. (2020) and others have devoted their research to the study of general changes in supply chains with the onset of the coronavirus disease pandemic. In identifying the pandemic as a global driver of risks, the key measures to manage them have been studied, in particular, by Hodge (2020), Kilpatrick and Barter (2020). As for the consequences of changes in supply chains, some of them are quite obvious, such as increasing digitalization, and some have become a real challenge for many actors in supply chains. This applies to the reduction in the number of truck drivers, IRU (2021), which has an indirect link to the pandemic, but directly affects the operation of supply chains in the post-COVID period.

The main aim of the research is to analyze supply chain disruptions, identify the main reasons for and consequences of these changes as well as propose the directions of future development of supply chains in the post-COVID period.

Methodology

The research in this paper was preceded by a review of the current literature on the subject related to the impact of the COVID-19 pandemic on the global supply chain.

During the research general and special scientific methods were used. Employing the methods of analysis and synthesis provided an opportunity to explore the peculiarities of the functioning of post-COVID supply chains. Systematization and grouping were used in the process of identifying the key problems and consequences of disruptions in post-COVID supply chains. The method of comparison made it possible to determine changes in the volume of e-commerce before and after the onset of the coronavirus disease, which became the basis for predicting the development of supply chains in the post-COVID period.

The research is based on secondary data obtained from recognized statistical databases, i.e. Statista Business Data Platform.

Results

Companies all over the world have been celebrating the final return of more normal business activity, more stable supply chains and a boost from recovered consumer confidence. Nevertheless, COVID-19 has had a significant impact on the modernization of supply chains, and if a business's supply chains were not adapted to the new working conditions, it could become an enormous challenge for the company to stay competitive on the market.

COVID-19 definitely could be described as the black swan event that finally forced many companies, and entire industries, to reevaluate and reconstruct their global supply chain model (Kilpatrick & Barter, 2020).

However, the pandemic should not be considered as the main cause of all problems. An unforeseen event such as COVID-19 only exposed vulnerabilities in the supply chain. To categorize and visualize the potential causes of a problem and its consequences, the authors used the bow-tie analysis diagram (Figure 1).

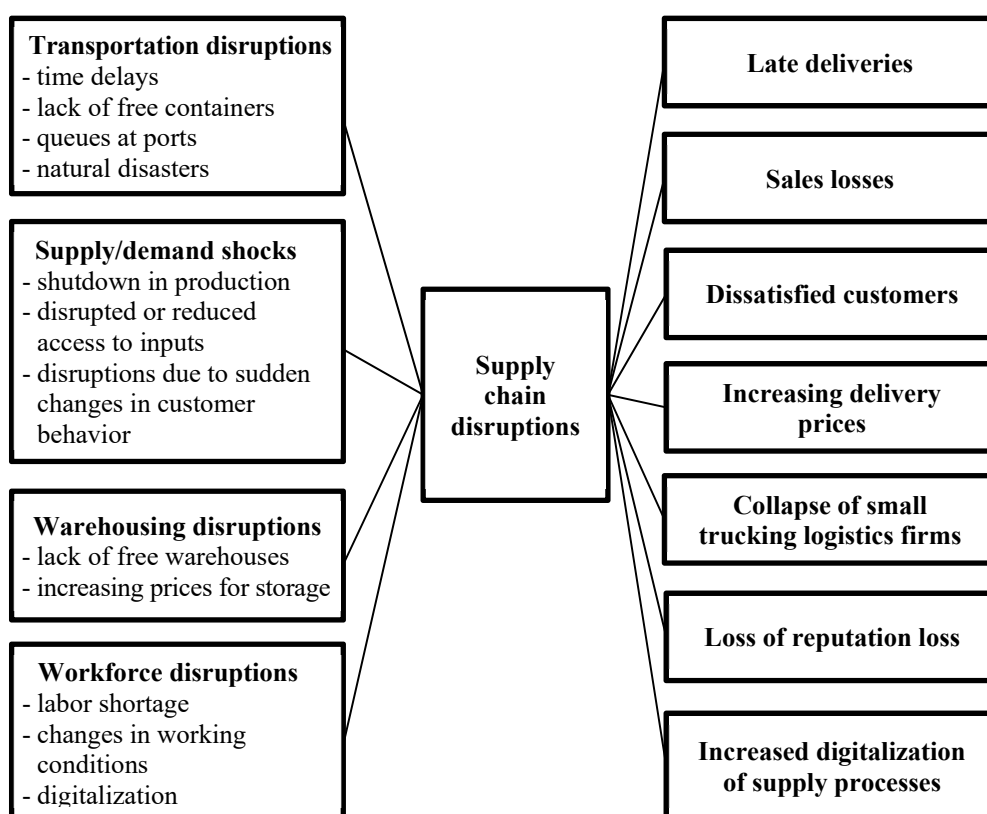


Figure 1. Bow-tie analysis of supply chain disruptions

Source: Authors' own compilation

The left side of the proposed bow-tie analysis (Figure 1) includes the main problems and challenges that cause supply chain disruptions, and the right side shows the consequences and prospects of these changes.

Transportation disruptions such as time delays, lack of free containers, queues at ports, and natural disasters influence supply chains immensely. According to the International Transport Forum, there was an overall decline in global transport measured in ton-kilometers of 36% in 2020 compared to pre-crisis levels. The Forum experts note significant regional differences; if in the ASEAN countries, Central Asia, Russia and India, transport traffic was reduced by more than half, then in the case of China, the drop did not exceed 25%, while in Europe and the United States it was at the level of 40% (International Transport Forum, 2020).

The World Container Index (WCI), which reflects the average cost of freight (Figure 2), gradually declined from mid-December in 2019 due to seasonal factors. Nonetheless, prices plummeted by 15% February-March 2020.

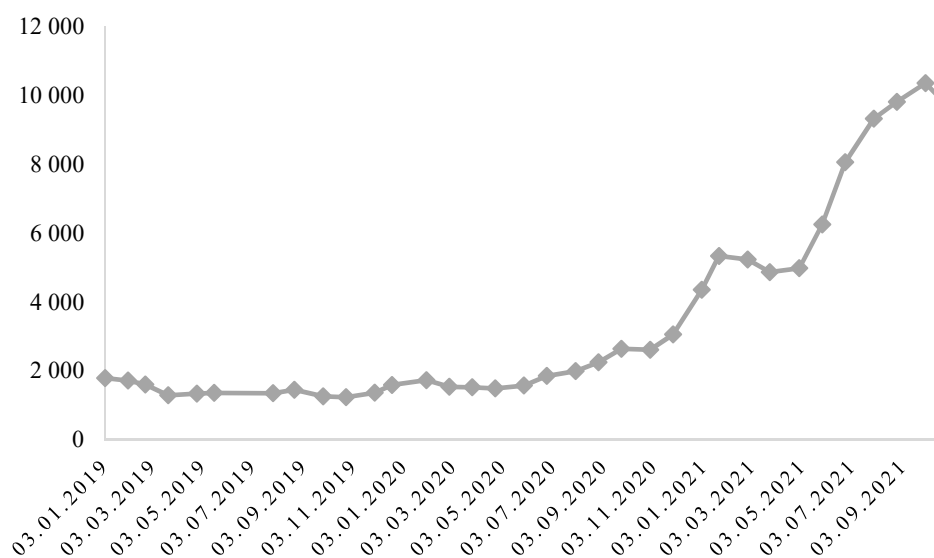


Figure 2. World Container Index (\$ for 40-ft container)

Source: (Drewry, 2021; Infogram, 2021)

During the same period, the median waiting time for ships to be unloaded at the six largest ports in the world was 32% below average, indicating a drop in traffic flow and poor loading of port services. However, at the end of April, WCI was 20% above the average, reflecting the resumption of transport activity. At that time, analysts from the International Transport Forum anticipated its gradual recovery and it was not mistaken. On the 28th of October 2021, the composite index was 276% higher than on the same day of the previous year and was equal to \$9669 per 40-foot container (Drewry, 2021; Infogram, 2021).

Against the background of a decrease in the volume of sea cargo transportation, 11 of the 12 largest sea lines were forced to return rented vessels to their owners.

The main reductions fell on the Danish company Maersk and the international company MSC (headquartered in Switzerland). They resigned from ships with a total cargo capacity of 236 000 TEU. At the same time, the carrier HMM (South Korea), for similar reasons faced an increase in the number of vacant ships, having to give back previously leased boats.

According to the European Commission, the number of containers leaving Chinese ports has almost halved. Ports are filled with unclaimed containers from other countries, which leads to additional downtime penalties. On the other hand, there is a shortage of containers for shipping between Europe and other regions of the world (Pape, 2020).

Nevertheless, there are still few alternatives to sea transportation, while other transport industries are also affected by the same impacts of the pandemic.

The transportation of commercial goods by air has traditionally been less common due to its high costs. At the same time, for example, air freight rates across the Pacific Ocean increased on average threefold by the end of March, and in some periods up to fivefold (Figure 3). Such changes are caused by the cancellation of most flights because for the transportation of commercial goods, the cargo bays of conventional passenger aircraft are used in 45-50% of cases.

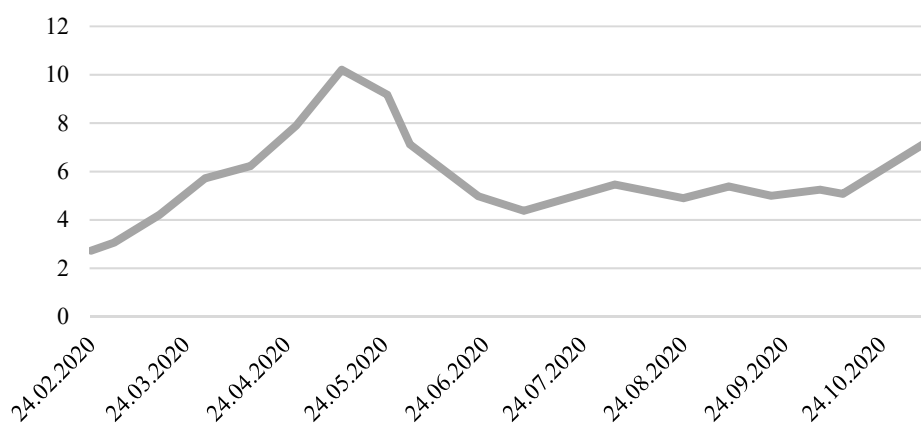


Figure 3. Air freight rates for transportation from China to US in 2020 (\$ per kilogram)

Source: (Leonard, 2020)

If the average costs of air freight usually fluctuate in the range of 3-4 USD per kilogram, then against the background of the rush demand for personal protective equipment, which became the main type of airlifted goods in the early months of the pandemic, the cost of air transportation from Asia to the United States reached almost \$11 per kilogram. In the face of a decrease in the number of flights and passengers, airlines resorted to converting their passenger aircraft in order to accommodate commercial cargo in the cabin and not just in the hold.

The pandemic has caused changes in consumer behavior and contributed to the significant development of e-commerce. With stores closing and people staying indoors, consumers embraced online shopping on a massive scale in almost every

region, further reinforcing and entrenching the Internet's role as the indispensable infrastructure of modern economies (World Trade Report, 2021).

Thus, Figure 4 shows that the growth of global e-commerce retail sales in 2020 increased by almost 28% compared to the previous year.

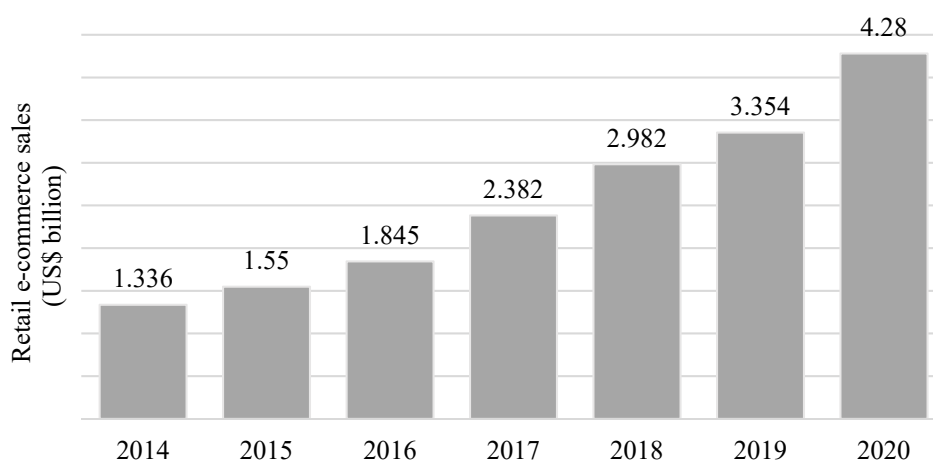


Figure 4. Growth of global e-commerce retail sales accelerated during COVID-19 pandemic

Source: (Statista Business Data Platform)

Significant growth in consumer activity in 2021 caused an imbalance in the supply and demand of goods and gave rise to additional disruptions in supply chains.

Warehouse capacity is a frequently overlooked component in the supply chain. Many containers are unloaded at distribution centers, and if there is no available space, it adds to the container circulation problem. The growing e-commerce demand, especially post-COVID, created a shortage of warehouse space, leading to higher warehouse rental rates, which in turn, is beginning to pass through into consumer prices (Friesen, 2021).

Another problem was the significant reduction in the number of employees in the supply chain, in particular the largest reduction was observed among truck drivers. A survey by the International Road Transport Union (IRU) of 800 road transport companies across 20 countries found that Eurasia is most affected by driver shortages. According to the data, 20% of driver positions were not filled in Eurasia in 2020. The percentage of truck drivers under 25 fell nearly everywhere in 2020, from already low levels down to 5% in Europe and Russia, 6% in Mexico and 7% in Turkey. With the average age of professional truck drivers globally now close to 50, and steadily growing older each year, this demographic time bomb will only get worse without action to reduce the minimum driver age (IRU, 2021).

The IRU survey also investigated the reasons for driver shortage:

- lack of trained drivers (38% of respondents)
- challenging working conditions, further exacerbated by the pandemic
- difficulties attracting women and young people to the profession (IRU, 2021).

The pandemic has uncovered a handful of uncomfortable truths regarding the overall readiness for global contingent events with high risks. At the same time, it has laid a new path for improvements and a whole other way of development for many companies.

Innovation entrepreneurs can use these challenges and convert them into new opportunities. Additionally, the trends of developing such startup clusters as “On-line Supply Chains”, “Supply Chains for Industry 4.0”, “Digital warehousing”, “Robotics/autonomous vehicles” are growing in post-COVID supply chains (Boiarynova & Kopishynska, 2021). Taking into account all the above-mentioned challenges, there is a need to focus on the main changes that will be seen in post-COVID supply chains.

Growth of service costs

One year after the first waves of turmoil, global supply chains were moving by leaps and bounds. They were working but in an unstable way, subject to local uncertainties and a background for substantial accumulation of disruptions.

In the short and medium term, the impact of the COVID-19 pandemic will not disappear, which means a slight change in picture of lockdowns and restrictions in different parts of the world. In general, this has already led to a sharp increment in the cost of shipping and air travel. Overall, there is a need to extend lead times in supply chains (Wilding, 2021).

As a result, there is a necessity for more containers, more non-moving containers and full capacity utilization. Consequently, containers end up in the wrong places in the global supply chain. It is like shopping carts; if the procedure of getting the carts back to the front of the store do not work, they end up scattered around the edges of the parking lot (Wilding, 2021).

Warehouse management improvements

Many people underestimate the importance of modern warehouse management. In an emergency situation, it is crucial to obtain up-to-date information on available stocks from suppliers in order to be able to meet consumer demands.

Modern VMI solutions (vendor-managed inventory) and advanced warehouse automation systems make it easy to solve these problems. Nonetheless, before the outbreak of the pandemic, many companies had not even considered the implement of solutions like that (Generix Group, 2020).

Adopting such system is mutually beneficial as retail stores get an increase in sales due to the fact that the buyer finds the product he needs in stock on the shelf; meanwhile, the suppliers experience growth in product turnover.

Shorter and more localized supply chains

Companies saw the need to reduce and localize supply chains. Some of the raw materials in demand, such as cobalt and lithium, may only come from certain regions – this cannot be changed by anything – but there may be more near-shoring and on-shoring. The future focus of many companies will be on the need for multi-shoring rather than basic multi-sourcing, which caught out some operations during lockdowns that had arranged multiple supply sources in the same region, all affected by COVID-19 (Wilding, 2021; Kireeva et al., 2020).

The crisis has demonstrated the need for transparency; continuous monitoring and analytics, real-time information through networks to anticipate and understand the impact of variability and better cope with the complexities associated with it. Events such as the blockade of the Suez Canal earlier this year had an increased impact as it was a case of disruption.

Flexibility

In the medium term, adaptability will be a priority for any business. Companies that understand their capabilities and can be flexible will do it in the most efficient way.

The idea that is gaining momentum in logistics is bimodal supply chains: “first mode” (traditional) – lean efficiency, low risks, high predictability and “second mode” – the need for agility, speed and exploration of new possibilities. Soon, most companies will have to become bimodal, and the second mode will be their priority – quick recognition of opportunities, adaptability, and readiness to solve unexpected problems (Hodge, 2020).

Supply chain digitalization

Flexibility in supply chains is a prerequisite for working with steadily growing volumes for e-commerce in the conditions of a pandemic. One of the solutions is the implementation of an OMS (order management system). This is a convenient service that shows the availability of the selected product in the warehouses and automates the selection of the nearest one, tracks the movement of each order, reduces the number of returns due to the ability of making adjustments to the order, therefore reducing logistics costs.

The digitalization of processes in modern supply chain management constitutes inevitable changes in business processes associated with the COVID-19 crisis.

Development of drone delivery

This trend came from Asia as a continuation of the idea of contactless delivery. During the pandemic in China, most parcels were delivered “to your home” in this way. Many companies around the world are investing in the purchase of drones and are actively testing this way of delivery. It is predicted that within the following year we will be able to experience all the benefits of this means of delivery (Harapko, 2021).

Thus, the losses of supply chains and the world economy during the COVID-19 illustrate the urgent need to modernize the infrastructure of international trade, develop flexible systems that can quickly adapt to new conditions, and digitalize all possible processes.

Conclusions

The pandemic caused by the COVID-19 pandemic continues to disrupt the global supply chain system, bringing new risks and challenges (Fu et al., 2022). The economic shocks that resulted from the pandemic have exposed many vulnerable spots in supply chains and increased apprehensions considering globalization. Large

companies around the globe must benefit from this crisis by rethinking their supply networks, undertaking some measures to understand their vulnerabilities, and then build up their resilience. They should not completely resign from globalization as it will result in a void that others (companies that do not resign from globalization) will eagerly and quickly fill. They are supposed to find ways to improve their business and gain an edge. Overcoming the current crisis is an unprecedented challenge for the management team of all logistics players. It is necessary to promptly take stock of all available state support measures and develop a further action plan.

The COVID-19 pandemic could be the starting point for global changes in the construction of supply chain systems, taking into account current trends such as digitalization, flexibility, localization, new types of delivery etc.

The presented research is not free of limitations. The main limitation is the reliance on secondary sources from a selected database and the inability to check the comparability of data. Future research could extend the present research with data obtained as a result of the authors' own empirical research.

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POSTCOVIDOWE ŁAŃCUCHY DOSTAW: WYZWANIA I PERSPEKTYWY

Streszczenie: W artykule dokonano analizy wpływu COVID-19 na łańcuchy dostaw – problemów wywołanych pandemią oraz perspektyw, jakie otworzyła ona dla dalszego rozwoju biznesu. Pojawienie się i rozprzestrzenianie COVID-19, a także środki kwarantanny stały się głównym wyzwaniem dla światowej gospodarki. Mimo negatywnych skutków pandemii otworzyła ona również szereg możliwości rozwoju firm i wyeliminowania istniejących niedociągnięć w ich działalności logistycznej. Celem opracowania jest analiza zakłóceń w łańcuchach dostaw, identyfikacja głównych przyczyn i konsekwencji tych zmian oraz zaproponowanie kierunków dalszego rozwoju łańcuchów dostaw w okresie po pandemii. Głównym zadaniem dla kadr zarządzających logistyką jest pokonanie obecnego finansowego kryzysu w kraju. Pandemia COVID-19 może być punktem wyjścia dla globalnych zmian w systemach łańcucha dostaw, biorąc pod uwagę obecne trendy, takie jak cyfryzacja, elastyczność, lokalizacja, nowe dostawy i inne.

Słowa kluczowe: COVID-19, zakłócenia, cyfryzacja, łańcuchy dostaw, transport

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