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HOW DOES THE COVID-19 PANDEMIC IMPACT THE PERFORMANCE OF CHOSEN LOGISTICS PARAMETERS?

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Abstract: The ongoing Covid-19 pandemic affects all segments of economic activity globally, including the logistics industries worldwide. The subject of this research is the analysis of the pandemic impact strength on this sector of the economy at the global level through the analysis of parameters that determine the logistics prosperity of countries. The aim of the research is to point out the negative impact of the pandemic onto logistics parameters, such as slowing down customs formalities, less investment in improving the quality of infrastructure and reducing international transport and delivery delays, which has been recorded in almost all supply chain performance. Logistics companies that provide storage facilities and transport organization services are directly affected by the Covid-19 pandemic. The results of the research show that the fastest recovery in this domain has been recorded in Asian countries, where the pandemic was brought under control at the end of 2020, while the slowest recovery has been recorded within the domain of the USA logistics industry. Results also show that the Balkan countries are, in cooperation with European countries, working intensively to introduce and improve the “green corridors” to stimulate the smooth flow of international trade and thus reduce the negative impact of the pandemic within the logistics industries.

Keywords: Covid-19 pandemic, logistics industry, logistics performance, logistics parameters, green corridors.

1. INTRODUCTION

The Covid-19 pandemic had a negative impact on economic growth and the volume of foreign trade of all countries in the world. Given that the development of the logistics industry took place in parallel with the economic growth of countries, the decline in economic activity at the global level, caused by the pandemic, led to a decline in foreign trade and a decline in global freight transport, and thus the engagement of logistics providers (Choi, 2020; Singh et al., 2021; Chowdhury et al., 2021; Illahi & Mir, 2021; Nikolopoulos et al., 2021). Countries

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have faced a major economic crisis, and the largest percentage of investments is aimed at improving the health system, in order to more effectively protect the population. The decline in international deliveries, the drastic reduction in investment in transport infrastructure and the improvement of logistics competence, border delays that negatively affect the timeliness of deliveries and the slower implementation of customs procedures have contributed to the deteriorating logistics prosperity of countries around the world (Barua, 2020; Carreno et al., 2020; Vidua & Prabheesh, 2020; Goel et al., 2021). The World Bank has pointed to the deterioration of all parameters of the Logistics Prosperity Index (LPI) for all countries of the world for 2020, but positive results for some predictors at the start of 2021, especially for Asia, give promising forecasts in terms of speed and efficiency of global recovery of logistics industry after the end of the crisis caused by the Covid-19 pandemic.

2. THE IMPACT OF THE COVID-19 PANDEMIC ON THE VOLUME OF INTERNATIONAL TRADE

The Covid-19 pandemic caused a major disruption in world trade, which had a direct impact on global production and consumption. At the start of the pandemic, UNCTAD (2020) predicted a significant decline in global trade, to a level lower than the volume of global trade during the great economic crisis of 2007-2010. years (Figure 1). The projections came true. International trade was significantly affected, especially in the second quarter of 2020, when there was a decline of about 14.3% compared to the same period in 2019 (WTO, 2020). There was an improvement in the situation during the summer of 2020, with the easing of the virus, which resulted in a final decline in international trade by 9.2% compared to 2019, and it is predicted that recovery from the effects of the Covid-19 pandemic will take several more years (Barlow et al., 2021).

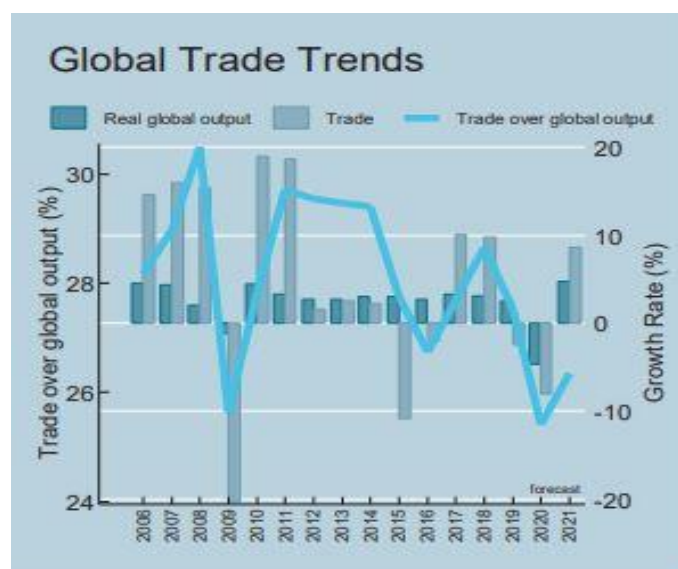


Figure 1. Forecasting the volume of international trade affected by the Covid-19 pandemic (UNCTAD, 2020)

There was a decline in the volume of foreign trade in all parts of the world, first in China, as the cradle of the spread of the pandemic, after which the crisis spread rapidly at the global level. In 2020, Asian countries were the most successful in bringing the Covid-19 pandemic under control, which had a positive effect on GDP, trade volume and the gradual

recovery of industries from the effects of the pandemic. The end of 2020 was marked by the leading position of Asian countries in the field of trade recovery (UNCTAD, 2021), while other parts of the world are facing great losses because they fail to control the spread of the virus (Figure 2).

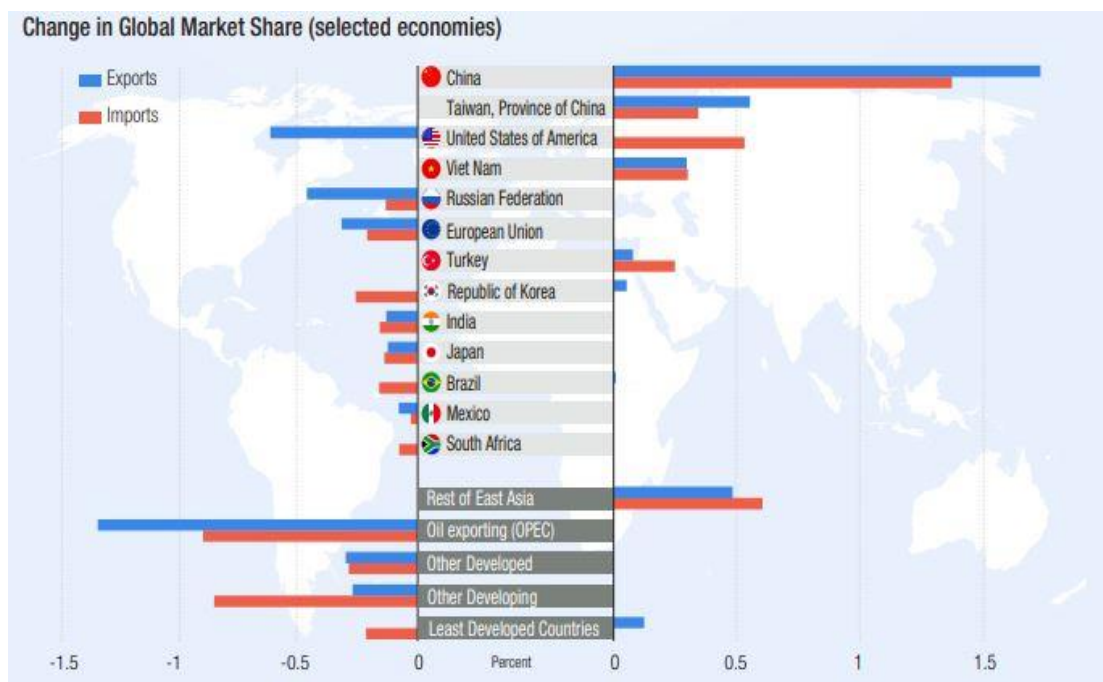


Figure 2. Imports and exports globally during the Covid-19 pandemic - period 2019-2021. (UNCTAD, 2021)

Import and export activities of all parts of the world directly affect the development of the logistics industry on a global level, and current trends, caused by the pandemic, have left consequences in the management of logistics and supply chains of all internationally oriented companies. There has been a slowdown in economic growth in all countries of the world (Barua, 2020; Carreno et al., 2020), which has had a direct impact on the slowdown in the growth and development of the global logistics industry (IFC, 2020; Gonzalez, 2020; Goel et al., 2021; Sing et al., 2021).

3. SLOWING OUT OF GLOBAL LOGISTICS PROSPERITY AS A RESULT OF THE COVID-19 PANDEMIC

The International Transport Forum (2020), researching the volume of freight transport at the global level during the period 2010-2019, noted the existence of a correlation between global economic growth and the growth of all types of freight transport. Road freight transport recorded the highest growth in the observed period, especially in Russia (+ 32%) and Europe (+ 20%), followed by an increase in the volume of maritime container transport (the highest growth was recorded by OECD countries + 50%). The growth trend was halted in early 2020 when the Covid-19 virus began to spread rapidly from China to all parts of the world, affecting all spheres of life, including economic growth and development of all countries, and thus the logistics industry and all predictors of its development (ESCAP, 2020; Rivera, 2020).

The first quarter of 2020 was marked by a slowdown in China's economic growth, which spread to other Asian countries. During the period January-February 2020, the volume of China's freight transport decreased by 19.8% compared to the same period in 2019, which is partly due to the large impact of the Covid-19 pandemic on reducing the business activity of small and medium enterprises by as much as 46 % compared to the same period last year (Liu et al., 2020). The volume of foreign trade of Asian countries with the rest of the world has drastically decreased, and with the spread of the pandemic, the volume of trade among all countries in the world has gradually decreased (Liu et al., 2020; Rivera, 2020; Larsen, 2021). Time and resources are focused on the health care of the population, with measures to help the population and the economy to survive in times of crisis. All spheres of the economy have been affected by the Covid-19 pandemic, which has directly affected the logistics industry, which has the status of an important support to every sector of the economy (ESCAP, 2020; Loske, 2020; Liu et al., 2020; Rivera, 2020; Nikolopoulos, 2020; Goel et al., 2021; Notteboom, 2021; Oyenuga, 2021):

- reduction of the volume of all types of freight transport (road, water, train and air),
- negative impact on the timeliness of deliveries due to border delays and driver testing procedures,
- slowing down the implementation of the customs clearance procedure,
- supply chain disruptions and blockages affect the liquidity of logistics companies.
- reduction of supply chain management outsourcing due to savings in crisis conditions reduces the engagement of logistics providers,
- investments in the improvement of transport infrastructure are no longer a priority, which creates additional problems for the logistics industry.

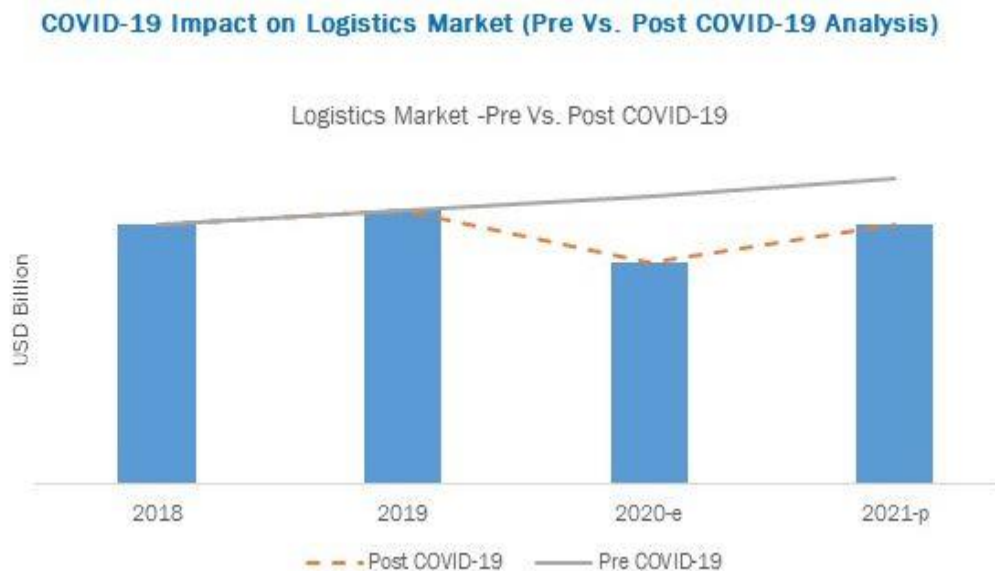


Figure 3. The impact of the Covid-19 pandemic on the value of the global logistics market (Markets & Markets, 2021)

The Covid-19 pandemic affected all predictors of the development of the global logistics industry, resulting in a decline in the value of the global logistics market (Figure 3). A slight recovery is projected for the period mid-to-late 2021, and the basis for a positive prognosis is the fact that Asian countries have already brought the virus under control by the end of 2020,

while positive effects of vaccination are expected for the rest of the world. The forecast of growth in the value of the global logistics market for the period 2020-2021. is influenced by the dynamic development of e-commerce (OECD, 2020; Ding & Chao, 2021) whose most important support comes from the domain of the logistics industry, as well as the currently important role of this industrial sector for the distribution of vaccines around the world (Shretta et al., 2021; WHO, 2021), also has an impact. The global logistics industry suffered losses in 2020, but they are much smaller than the losses suffered by other sectors: tourism, catering, all modes of passenger transport ... Optimistic forecasts for the period ahead are the best proof of the role and importance of the logistics industry globally. It has the status of an important support and backbone of all other economic sectors, which implies that the full recovery from the consequences of the pandemic, in addition to the economic policy measures of the countries, will be conditioned by the dynamics of recovery of other economic sectors.

4. THE IMPACT OF THE COVID-19 PANDEMIC ON THE PREDICTORS OF THE WORLD BANK LPI INDEX

Every other year, the World Bank publishes a ranking list of countries with the most developed logistics industries. For this purpose, the Logistics Prosperity Index (LPI) was developed, which is determined by the following predictors of the level of development of the logistics industry: customs, logistics infrastructure, logistics competence, international shipments, efficiency of shipment tracking/tracing and timeliness of deliveries. The World Bank published the last ranking list in 2018, after which, in the period 2019-2021, all countries on the list underwent serious changes in the domain of each of the predictors of the LPI index, under the influence of the Covid-19 pandemic. In the continuation of the work, the focus will be on the impact of the Covid-19 pandemic on each of the predictors of the LPI index for the parts of the world with the most developed logistics industry: Europe, the USA and Asia.

4.1. THE IMPACT OF THE COVID-19 PANDEMIC ON THE PARAMETERS OF LOGISTIC PROSPERITY OF EUROPEAN COUNTRIES

European countries have faced the consequences of the Covid-19 pandemic in the domain of all economic sectors, which has directly affected the logistics industry in support of them. The European Commission, in cooperation with all EU member states, has taken measures to mitigate the impact of the pandemic on the transport sector in order to ensure the rapid and continuous flow of goods (EC, 2020). Similar variants of support, depending on the budget, were provided by a large number of non-EU countries in Europe (such as Serbia). The focus was on providing unhindered transport and logistical support to the import/export of basic goods such as food and medical supplies. The expansion of e-commerce, especially during lockouts across Europe, has contributed to the survival of many logistics providers and is the main reason for the smaller volume of crises in Europe's logistics sector compared to the one facing other sectors of the economy.

Germany, the Netherlands, Sweden, Belgium, the United Kingdom and Austria, the best ranked countries in terms of the value of the LPI index for 2018 (WB, 2018), during the period 2020-2021. changed the list of priorities to economic and financial policies, reoriented themselves to the protection of the population and basic activities, which directly reflected on the stagnation of the improvement of any predictor of the LPI index. Stagnation in the field of

improving the predictor of logistical prosperity was recorded in all European countries, which, with the drastic influence of external factors over which countries have no influence (especially the Covid-19 pandemic), affected the lack of ranking of countries in this domain in 2020.

Period 2020-2021. marked the following trends in the domain of the impact of the Covid-19 pandemic on the predictors of logistical prosperity of European countries:

Customs: All European countries have defined customs regulations and procedures in the context of the Covid-19 pandemic. These regulations and procedures were encouraged by the slowdown in customs clearance procedures that were expressed during the period February-April 2020, at the very start of the pandemic (Deloitte, 2020). The European Commission has adopted a list of measures to, given the circumstances, maximize the stalemate in the customs clearance procedure, especially in the area of compliance with epidemiological measures (EC, 2020). The period December 2019-April 2020 was marked by a slow procedure of import customs clearance of shipments from Asian countries, especially shipments from Asian e-traders, in order to get acquainted with the way the virus spreads and define steps to combat it (OECD, 2020; Ding & Chao, 2021). During this period, due to the fear of spreading the virus, the companies Lufthansa, British Airways, Air France, American Airlines and Turkish Airlines stopped transporting shipments from China (BBC, 2020). In Serbia, during the period March-April 2020, there was a lot of truck pressure on large border crossings because it was only through them that it was possible to enter the country. This has resulted in a slowdown in import and export customs procedures, and has also contributed to the tightening of legislation in the field of exports of medicines and food. Getting used to the pandemic and defining regulations and procedures in the field of improving goods transit and customs clearance in the conditions of a pandemic have contributed to accelerating these flows. Detentions throughout Europe were caused by the fact that drivers had to undergo the necessary sanitary examinations to prevent further spread of the virus. The crisis caused by the pandemic slowed down the economic growth of European countries, had an impact on the reduction of imports and exports during period January-May 2020, which directly reflected on the reduction of import /export customs clearance of goods (Figure 4).

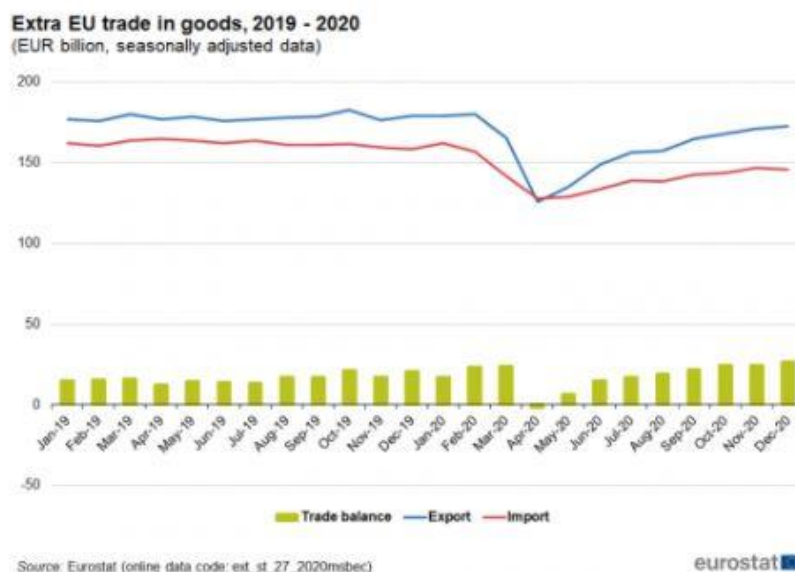


Figure 4. Trends in the volume of international trade in Europe during the Covid-19 pandemic (EUROSTAT, 2020)

- **Logistics infrastructure:** During the period 2019-2021. the volume of investments in the improvement of the logistics infrastructure of European countries has been significantly reduced, because the focus has shifted to preventing the disruption of the stability of the health sector, including all activities that support it. In the second quarter of 2020, the largest part of GDP in European countries was spent on investments in health care and the improvement of the transport of medical equipment (Figure 5). The period end of 2020-2021 was marked by an increase in investment in the field of improving logistical support in the field of vaccine distribution at the global level. The European Bank (2021) published data that around 1.5 billion euros were invested in the strengthening of the economy and health in the European Union during 2020.

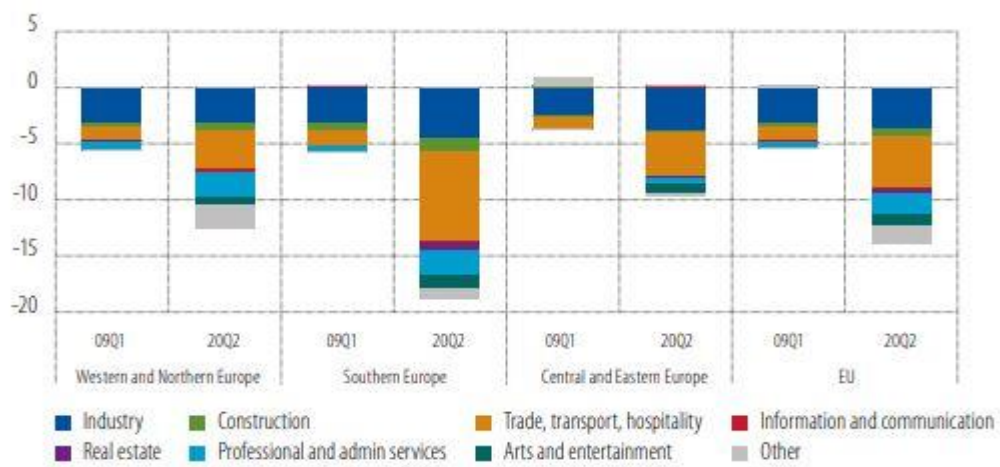


Figure 5. Investment in Europe - % of GDP Q2 2020 vs. the same period of 2019 (Eurostat, 2020)

- **International shipments:** Figure 4 shows a decrease in the volume of international shipments because they are determined by the volume of imports and exports. The decline was pronounced during the period January-April 2020, after which there was a gradual increase. Frequent lockouts in Europe have not slowed down international shipments significantly, and the expansion of e-commerce has further stimulated them. Over the years, European countries have been known for a large number of average online purchases per year, and the same number increased even more during the pandemic (Figure 6).

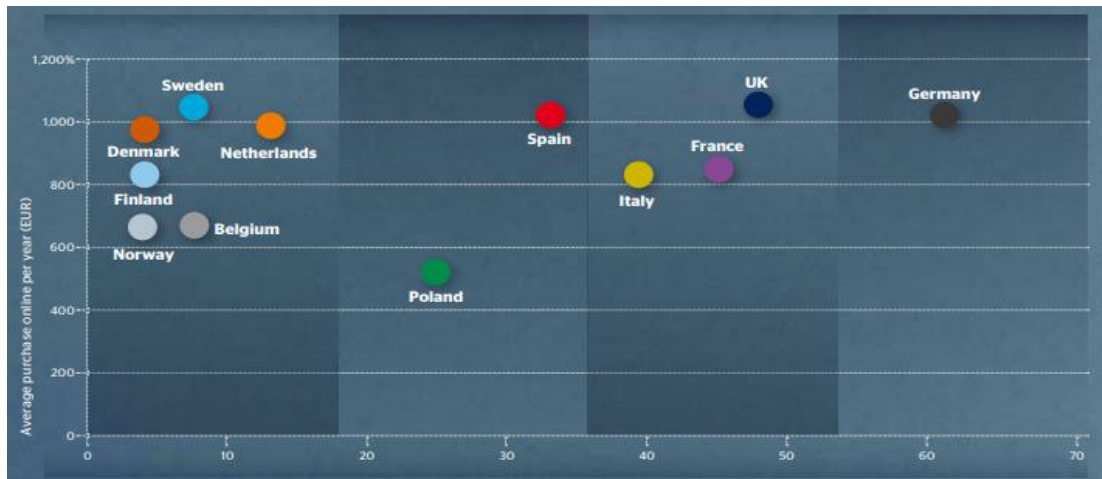


Figure 6. Number of e-commerce consumers and average online spend per year – Europe (Postnord, 2020)

- **Logistics competence:** During 2020, logistics providers invested in the improvement of logistics competencies, but to a much lesser extent than in previous years. In times of economic crisis, caused by a pandemic, the focus is on the struggle for survival and elimination of all unnecessary costs, and investing in logistics competencies can be considered as such a category of costs in a global crisis. During 2020, logistics providers invested in the improvement of logistics competencies, but to a much lesser extent than in previous years. In times of economic crisis, caused by a pandemic, the focus is on the struggle for survival and elimination of all unnecessary costs, and investing in logistics competencies can be considered as such a category of costs in a global crisis. At the same time, it is important to note that the existing logistics competencies of all logistics providers significantly crystallized during the Covid-19 pandemic, especially in the area of deciding how to quickly and efficiently, with minimal costs, implement any supply chain operation (Cantoni et al., 2021).
- **Efficiency of shipment tracking/tracing:** The efficiency of shipment monitoring, from the technical-technological aspect, has not been impaired. The volume of investments in innovations in this domain has been reduced, but by 2019, innovations have generated numerous benefits. Monitoring efficiency has not been impaired, but compliance with normal delivery deadlines has been compromised.
- **Timeliness of deliveries:** The timeliness of deliveries globally is jeopardized by border congestion, sanitary procedures for drivers, delays and customs clearance procedures. European countries have become accustomed to this domain, delays are much smaller in the period from 2020 to 2021, but they are still not negligible. The timeliness of deliveries globally is jeopardized by border congestion, sanitary procedures for drivers, delays and customs clearance procedures. European countries have become accustomed to this domain, delays are much smaller in the period from 2020 to 2021, but they are still not negligible. The countries of the European Union, together with the countries of the Balkans, including Serbia, are working on establishing and defining regulations for the functioning of the so-called "green corridors" whose goal is to reduce shipment delays (EC, 2020), while at the same time solving a number of other problems in the implementation of customs procedures and the efficiency of shipment monitoring.

4.2. US LOGISTIC PROSPERITY INDEX DURING THE COVID-19 PANDEMIC

For years, the USA has been highly ranked by the World Bank in the field of logistical prosperity and all the predictors that determine it. In the period 2012-2018. The USA, according to the value of aggregate LPI, ranked high 10th globally, and the following predictors of logistical prosperity were rated best: timeliness of deliveries, efficiency of tracking shipments, quality of infrastructure and logistical competence (WB, 2018).

In addition to the Covid-19 pandemic, the United States also faced political turmoil, which affected the country's economic growth. The largest decline in the volume of US foreign trade activity was recorded in the first five months of 2020, especially trade between China and the USA (Figure 7). The decline in the volume of foreign trade activity directly reflected on the stagnation of the logistics industry, and the trends in the field of logistics prosperity and its determinants are identical to the trends that prevailed in Europe:

- complicated sanitary procedures have led to congestion at borders and the disruption of customs clearance procedures,
- reduced volume of investments in improving the quality of logistics infrastructure,
- reduced volume of international shipments, especially sea container shipments (Figure 8), but the expansion of online trade has led to large losses in the field of the logistics industrial sector (Figure 9),
- high rank in the field of consignment tracking efficiency (especially technical-technological innovations in this domain) and logistical competence has stagnated, ie. remained at the level of previous years,
- the timeliness of deliveries, a predictor of logistical prosperity by which the USA was recognizable, was disrupted as a result of the Covid-19 pandemic. Stagnation at the borders and the slowdown in the customs clearance procedure, along with political protests before and after the elections, have led to delays in deliveries, but since the start of 2021, this issue has been significantly resolved.

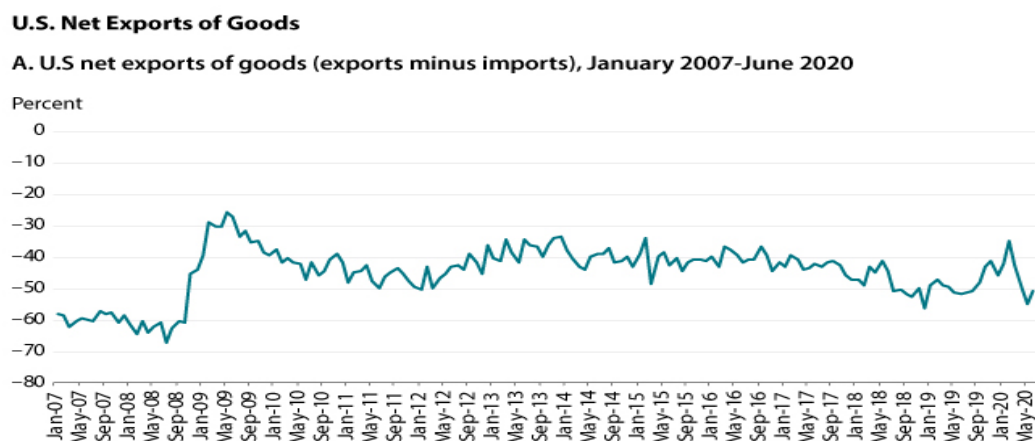


Figure 7. Decline in the volume of USA exports during period January-May 2020. (Leibovici & Santacreu, 2020)

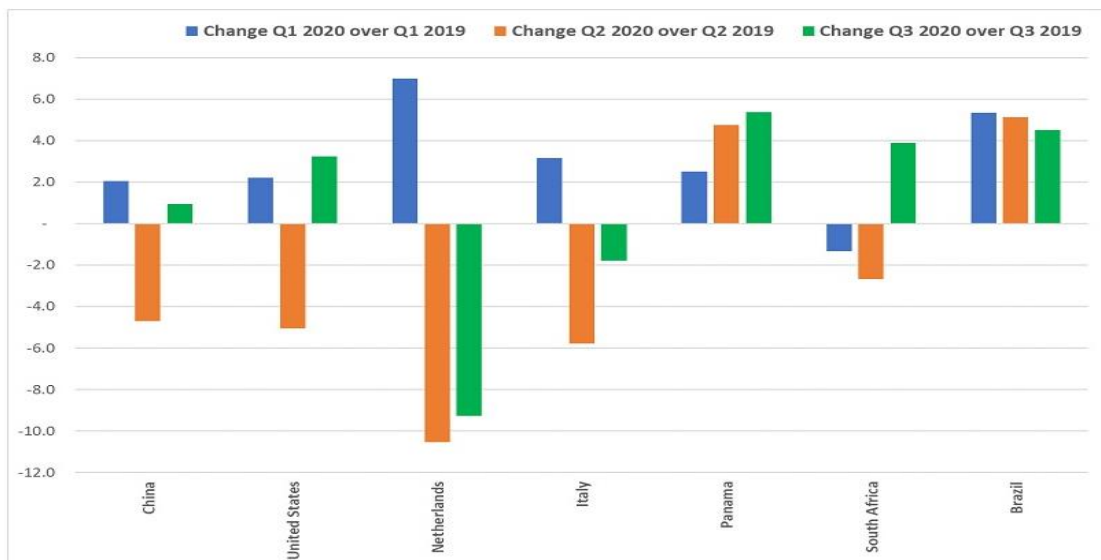


Figure 8. Sea container transport globally experienced the largest decline in Q2 2020 (UNCTAD, 2020)

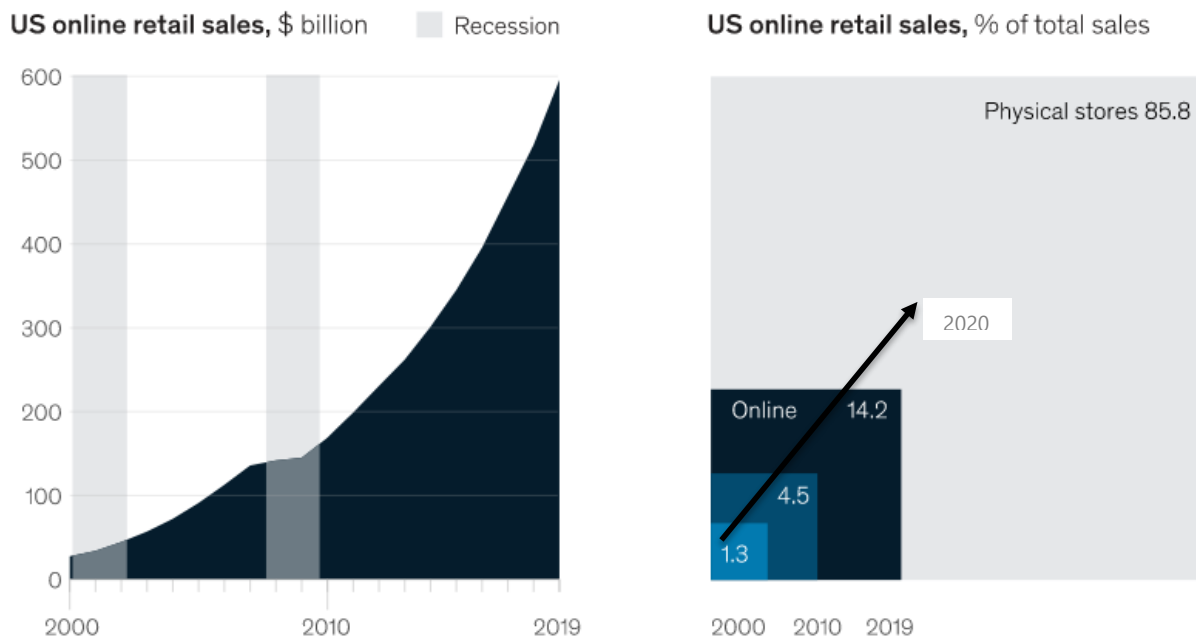


Figure 9. Expansion of online retail in USA during period 2000-2020 – 32,4% of total sales (McKinsey, 2020)

With the consequences of the Covid-19 pandemic in the field of logistics industry, the US was hit hardest in the first two quarters of 2020. At the end of 2020, a set of measures for the recovery of the entire economy from the consequences of the pandemic was adopted, which will directly lead to the economic growth of the country and the development of the logistics industry. The US logistics industry is an important support to the global distribution of medical equipment and vaccines.

4.3. LOGISTIC PROSPERITY OF ASIAN COUNTRIES DURING THE COVID-19 PANDEMIC

The Chinese economy was the first to be hit by the consequences of the Covid-19 pandemic. The period January-March marked a drastic decline in the volume of imports and exports of China (Figure 10) which directly affected all industrial sectors, and thus the logistics industry of the best ranked Asian countries in the field of logistics prosperity: Singapore, China and India. The main problems faced by Asian logistics providers are: delivery delays, delays in procurement, expected transit stops and labor shortages. Each of the aforementioned problems created problems in the supply chains of multinational companies, which directly affected their business results (Kumar, 2020).

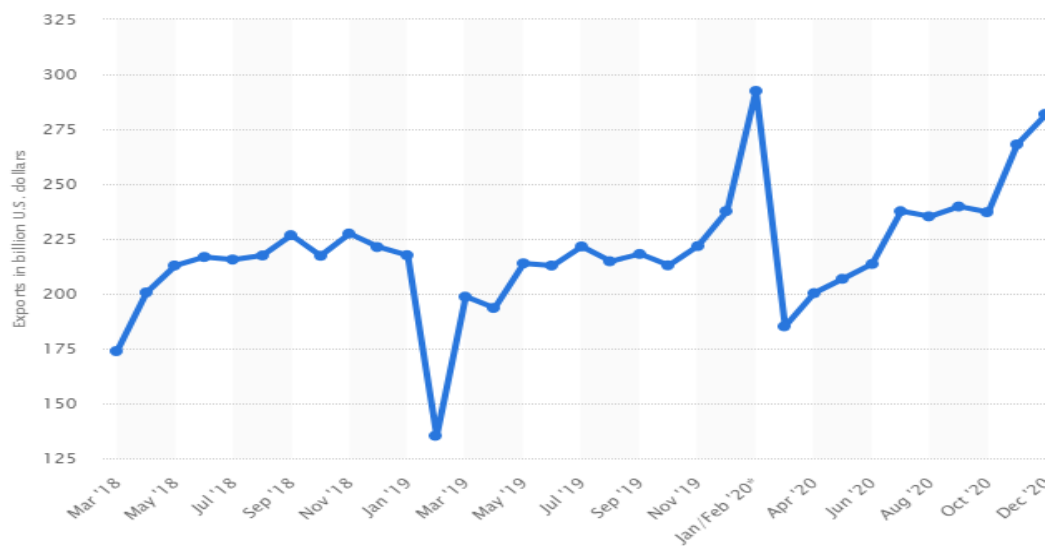


Figure 10. Monthly value of exports from China (Statista, 2021)

China brought the virus under control by strict epidemiological measures as early as mid-2020, which had a direct impact on economic recovery and export growth (Figure 10). Singapore has also seen a solid recovery from the effects of the crisis, while India is facing a major problem of putting the virus under control, resulting in a drop in foreign trade of \$ 15.24 billion. The stable recovery of the logistics industry of China and Singapore was already recorded in Q3 & Q4 of 2020 thanks to e-commerce and related 3PL providers (Figure 11). In March 2021, Chinese exports amounted to around 241.13 billion USD (Statista, 2021). This indicated an over 30 percent increase in exports compared to the same period of the previous year. A more drastic crisis in the domain of India's logistics industry has been avoided due to the increase in demand for warehouses, as a result of the growth in demand for food and other products that meet the daily needs of the population. Thus, Asian countries, thanks to the rapid

bringing of the virus under control, suffered the impact of the Covid-19 pandemic on the predictors of logistical prosperity, but already in Q3 2020, stability was achieved in each of the predictors. Rapid recovery with the consequences of a pandemic will be one of the key sources of competitive advantage of these countries in the global logistics market in the years to come (Figure 12).

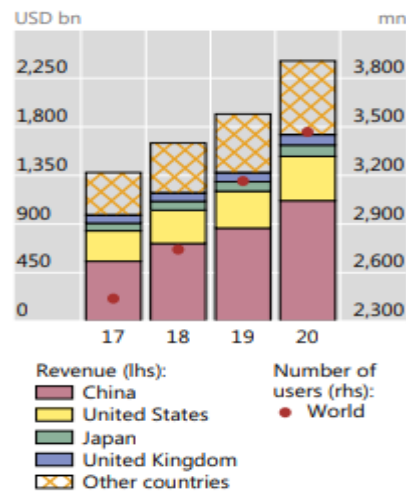


Figure 11. Online orders in retail industry in selected countries (Alfonso et al., 2021)

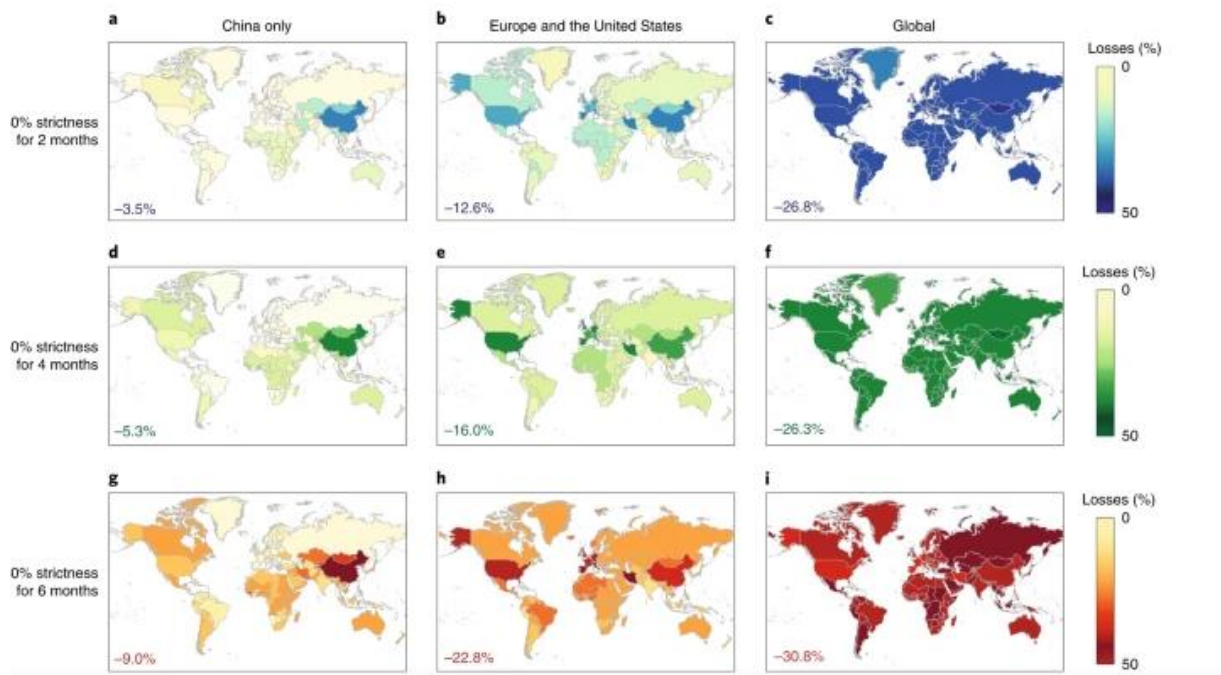


Figure 12. Economic impact of Covid-19 on China, Europe and USA (Guan et al., 2020)

The consulting company Mordor Intelligence (2021) is working on projections for the recovery of certain industrial sectors after the Covid-19 pandemic. Positive results of the logistics industry in Asia in the period end 2020-2021. are the basis for positive forecasts for the period 2021-2026. years. The consultants predict that the values of the logistics market of

the Asia-Pacific region will increase by 6.1% in that period, which is the best presenter of the successful fight of this sector of the economy with the consequences of the pandemic. The losses suffered by this industry are much smaller than other sectors of the economy, primarily thanks to B2C and C2C e-commerce models.

5. GLOBAL LOGISTICS INDUSTRY RECOVERY STRATEGY

The analysis of the impact of the Covid-19 pandemic on the global logistics industry presents the strength of this industrial sector, which is reflected in the speed and efficiency of dealing with the consequences of the pandemic and functioning in its conditions. The global logistics industrial sector suffered the greatest losses during the period January-May 2020, after which, with related economic and financial policies of countries around the world in this domain, it quickly "rose" in support of other sectors of the economy. Leading countries in the field of logistics prosperity worked on defining a strategy for rapid and efficient recovery from the consequences of the pandemic, in order to return the value of the global logistics market and the engagement of logistics providers to the 2018 level. It is a great challenge to solve the following issues in the coming period (IFC, 2020):

- financial support to the authorities in the field of recovery from the consequences of the pandemic, as well as in the field of stimulating the inflow of investments in the improvement of logistics infrastructure,
- improving the speed and efficiency of cargo inspection and cross-border controls in order to fully resolve the crisis of the temporary trade embargo and export restrictions on sensitive cargo such as medical and pharmaceutical materials,
- technical-technological innovations in order to improve coordination in relation to compliance with epidemiological measures - speed and efficiency of logistics activities,
- stimulating the development of e-commerce because the same year ago, even in the conditions of a pandemic, it crystallized as the leading driver of survival and development of the global logistics industry,
- reconfiguration of global value chains, ie. shortening supply chains during the crisis period (especially in the field of supply of strategic raw materials) in order to prevent any delays in the realization of supply chain management objectives.

6. CONCLUSION

The Covid-19 pandemic affected the economic growth of all countries, which directly affected all economic activities, including the logistics industry. The logistics industry did not suffer severe consequences such as tourism and hospitality, on the contrary, it quickly withstood the "blow" of the crisis, primarily thanks to the expansion of e-commerce and support for the distribution of medical equipment and vaccines. The prosperity of the logistics industry globally stagnated during the period 2019-2021. which can be considered a great success given the large losses suffered by other sectors of the economy. Forecasts for the coming years are promising. Measures of state financial support, "green corridors", improving the speed and efficiency of transit inspections and technical-technological innovations in the field of improving the efficiency of shipment tracking are the key predictors to effective recovery from the Covid 19 pandemic and improving logistics prosperity in Europe, USA and Asia.

REFERENCES

- Alfonso, V., Boar, C., Fost, J., Gambacrotta, L., & Liu J. (2021). E-commerce in the pandemic and beyond. *BIS Bulletin No. 36*.
- Barlow, P., Schalkwyk, M., McKee, M., Labonte, R., & Stuckler, D. (2021). COVID-19 and the collapse of global trade: building an effective public health response. *Open Access Journal*, 5(2), 102-107.
- Barua, S. (2020). COVID-19 Pandemic and World Trade: Some Analytical Notes. SSRN.
- Cantoni, F., Bisogni, P., & Brdulak, H. (2021). The role of European Logistics Association 2020 standards in facing modern industry expectations and logistics managers competences. *International Journal of Value Chain Management*, 12(2):1.
- Carreno, I., Dolle, T., Medina, L., & Brandenburger, M. (2020). The Implications of the COVID-19 Pandemic on Trade. *European Journal of Risk Regulation*, 11(2), 402-410.
- Choi, T. (2021). Risk analysis in logistics systems: A research agenda during and after the COVID-19 pandemic. *Transportation Review*, 145, 102190.
- Chowdhury, P., Paul, S., Kaisar, S., & Moktadir, A. (2021). COVID-19 pandemic related supply chain studies: A systematic review. *Transportation Research Part E: Logistics and Transportation Review*, 148, 102271.
- Deloitte (2020). EU overview on COVID-19 Customs and Trade measures. Deloitte Publications, <https://www2.deloitte.com/>
- Ding, Q., & Zhao, H. (2021). Study on e-commerce logistics cost control methods in the context of COVID-19 prevention and control. *Soft computing*, Springer.
- EC (2020). Guidance on Customs issues related to the COVID-19 emergency. European Commission Press. <https://ec.europa.eu/>
- EC (2020). Transportation during the pandemic. European Commission Press. <https://ec.europa.eu/>
- EIB (2021). EIB backs EUR 5.3 billion COVID-19 support, business, education, sustainable transport, and social housing investment, the day after meeting with civil society organisations. European Investment Bank Publications, <https://www.eib.org/>
- Goel, R., Saunoris, J., & Goel, S. (2021). Supply chain performance and economic growth: The impact of COVID-19 disruptions. *Journal of Policy Modeling*, 43(2), 298-316.
- Gonzalez, V. (2020). Impact of COVID-19 on transport and logistics connectivity in the Caribbean. *International trade and integration*. ECLAC Editorial.
- Guan, D., Wang, D., Helagatte, S., Davis, S., Huo, J., Yabgchun, B., & Xue, Q. (2020). Global supply-chain effects of COVID-19 control measures. *Nature Human Behaviour*, 4, 577-587.
- IFC (2020). The Impact of Covid-19 on Logistics. International Finance Corporation Press, World Bank Group.
- Illahi, U., & Mir, M. (2021). Maintaining efficient logistics and supply chain management operations during and after coronavirus (COVID-19) pandemic: learning from the past experiences. *Environment, Development and Sustainability*, January Nr., Springer.
- ITF (2020). Pre-Covid-19 sea and road freight volumes show continued growth. International transport forum press.
- Ivanov, D. (2021). Supply Chain Viability and the COVID-19 pandemic: a conceptual and formal generalisation of four major adaptation strategies. *International Journal of Production Research*, 1890852.
- Kumar, A. (2020). Covid 19: Effect of the Pandemic on Logistics and Supply Chain. *Entrepreneur*, April Nr.

- Larsen, S. (2021). How COVID-19 is affecting the shipping industry – and how to navigate through the storm. Greencarrier AB.
- Leibovici, F., & Sanacreu, A. (2020). The Dynamics of the U.S. Trade Deficit During COVID-19: The Role of Essential Medical Goods. Economic Research of Federal Reserve Bank of St. Louis, No. 41.
- Liu, W., Liang, Y., Bao, X., Qin, J., & Kim, M. (2020). China's logistics development trends in the post COVID-19 era. *International Journal of Logistics Research and Applications*, 1837760.
- Loske, D. (2020). The impact of COVID-19 on transport volume and freight capacity dynamics: An empirical analysis in German food retail logistics. *Transportation Research Interdisciplinary Perspectives*, 6, 100165.
- McKinsey (2020). US freight after COVID-19: What's next? McKinsey&Company Publication.
- Mordor Intelligence (2021). Asia-Pacific freight and logistics market – growth, trend, Covid-19 impact and forecasts. Mordor Intelligence Publishing, India.
- Nikolopoulos, K., Punia, S., Schafers, A., Tsinopoluos, C., & Vasilakis, C. (2021). Forecasting and planning during a pandemic: COVID-19 growth rates, supply chain disruptions, and governmental decisions. *European Journal of Operational Research*, 290, 99-115.
- Notteboom, T., Pallis, T., & Rodrigue, J. (2021). Disruptions and resilience in global container shipping and ports: the COVID-19 pandemic versus the 2008–2009 financial crisis. *Maritime Economics & Logistics*, Springer.
- OECD (2020). E-commerce in the time of COVID-19. OECD Report – Policy Responses.
- Oyenuga, A. (2021). Perspectives on the impact of the COVID-19 pandemic on the global and African maritime transport sectors, and the potential implications for Africa's maritime governance. *WMU Journal of Maritime Affairs*, Springer.
- Postnord (2020). E-commerce in Europe 2020. Report. Stockholm.
- Rivera, A. (2020). The impact of COVID-19 on transport and logistics connectivity in the landlocked countries of South America. United Nations Press.
- Shretta, R., Hupert, N., Osewe, P., & White, L. (2021). Vaccinating the world against COVID-19: getting the delivery right is the greatest challenge. *BMJ Global Health*, 6(3), 005273.
- Singh, S., Kumar, R., Panchal, R., & Tiwari, M. (2021). Impact of COVID-19 on logistics systems and disruptions in food supply chain. *International Journal of Production Research*, 59(7), 1993-2008.
- UNCTAD (2020). Key statistics and trends in international trade: Trade trends under the Covid-19 pandemic. United Nations Publications, www.unctad.org
- UNCTAD (2020). Navigating through the coronavirus crisis and uncertainty: How maritime transport data can help. United Nations Publications, www.unctad.org
- UNCTAD (2021). Global Trade Update: East Asia manufacturing leading the global trade recovery. United Nations Publications, www.unctad.org
- Vidya, C., & Prabheesh, K. (2020). Implications of COVID-19 Pandemic on the Global Trade Networks. *Emerging Markets Finance and Trade*, 56, 2408-2421.
- WHO (2021). COVID-19 vaccination: supply and logistics guidance. World Health Organization Publications –Overview.
- WTO (2020). Trade shows signs of rebound from COVID-19, recovery still uncertain. World Trade Organization Press release. www.wto.org