
Market of Logistics Services During the Covid-19 Pandemic

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Abstract:

Purpose: The purpose of the paper is to check, verify, and evaluate the impact of the Covid-19 pandemic on the logistics services market in Poland in March–June 2020.

Design/Methodology/Approach: The paper was prepared using a diagnostic interview survey (secondary research), statistical data analysis method, critical analysis of the research literature. The general research problem is defined as an attempt to explain the state of lack of knowledge regarding the following question: How did the epidemic affect the logistics services market?

Findings: The research results are characterized by the topicality and novelty of the issues and the fact that they have been conducted from this perspective to a limited extent so far. This is particularly important from the point of view of national security, as the logistics services market directly impacts the economic security of the state, and its functioning in pandemic conditions also affects citizens' security. Due to the very dynamic market situation, the research contains the most important changes from the normal state. It uses a measurement tool that shows the scale and trend of changes in the logistics services market.

Practical Implications: The article makes it possible to assess the pandemic's real impact on the development of the logistics services market and to take measures to stimulate the development of individual sectors of the Polish economy in the pandemic. It may also provide a basis for planning and making appropriate interventions in the state's sectoral policies.

Originality/Value: The situation of logistics companies, due to the degree of dependence of the market on the orders from specific industries during the pandemic, has clearly been varied. Companies specializing in the supply of food products and consumer chemistry, as well as e-commerce support, have benefited from increased purchases by retail customers, which has given them a particular advantage over logistics companies serving industries where the sale of goods has practically ceased, such as cars and automotive accessories (a significant decrease in purchasing activity was recorded by as much as 72% of logistics companies in this respect).

Keywords: Pandemic, logistics services, supply chain, purchasing activity, economic crisis.

JEL code: R41.

Paper Type: Review research article.

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1. Introduction

In Poland, the logistics services market is one of the most important sectors of the national economy (Biesok, 2013; Kłosiński and Masłowski, 2005; Knauf and Tłuczak, 2018). Its dynamic development began at Poland's accession to the European Union and still maintains a fast growth rate (Ciesielski, 2005; Czubała *et al.*, 2012; Przybylska, 2017). Poland is one of the powerhouses in the European transport market (Rydzkowski, 2011), in which Polish companies have a 20% share (Gołbska *et al.*, 2017; Rosa *et al.*, 2017). According to the Statistics Poland, since Poland acceded to the European Union, the direct share of the TFL sector (transport, forwarding, and logistics) has increased by more than one fifth, and its level increased from 5.4% of GDP in 2004 to 6.5% in 2019. A significant share of the logistics services sector is represented by international transport (Coyle *et al.*, 2010; Płaczek, 2018), which in the initial period of the restrictions, due to limitations related to the closure of borders and reduction of consumption, were exposed to the risk of loss of business continuity and liquidity.

In the initial period of the pandemic's spread, the global supply chains from China were first disrupted. A shift of the coronavirus epicenter to Europe resulted in restrictions on the movement of resources, people, and materials within the European Union. The emergence of increased border controls, reduced entry into certain countries, and queues at the borders caused significant delays but did not completely disrupt international transport. During that period, the logistics industry tried its best to overcome the existing constraints to maintain liquidity and supply internal markets. Regardless of nationality, all drivers transporting goods were exempt from the mandatory 14-day quarantine upon entering Poland. The rest of the European Union introduced similar exceptions. All this was to minimize disruption to supply chains.

In Poland, the first changes in the functioning of the social and economic life of the country due to the SARS-CoV-2 virus infection were introduced on 11 March 2020, when the World Health Organization (WHO) declared a state of the pandemic as a result of which Poland was one of the first countries in Europe to introduce, on 13 March, by way of a regulation (Regulation, 2020), a state of epidemic emergency on the territory of the Republic of Poland effective from 14 March until further notice. On the basis thereof introduced were, among others, restrictions in citizens' movement and the functioning of institutions and workplaces. The measures taken were under the current Act on Preventing and Combating Infections and Infectious Diseases in Humans (Act, 2008).

Poland gradually lifted the restrictions in four stages in the months that followed, starting from 20 April 2020. For example, Poland restored full border traffic within the European Union (www.gov.pl) starting from 13 June 2020, which is of paramount importance for the logistics sector. According to experts, the pandemic

restrictions will cause significant losses to logistics companies in 2020, and its consequences may be felt in the Polish economy even until 2022.

In the first weeks since the Covid-19 pandemic broke out, logistics companies faced major challenges to ensure continuity of operations and uninterrupted supply chains. Therefore, the paper presents an attempt to check, verify, and evaluate actions taken by the logistics industry to limit the pandemic's effects and the restrictions introduced on the basis thereof. The research made use of the results of a survey conducted by "DGC spółka z o.o.", which covered a group of Polish logistics and transport companies of different sizes and revenue scale. The survey aimed to document "live" the logistics services market's state in the first weeks after the pandemic outbreak. The research attempted to capture the most important changes in the "normal" state, showing the scale and trend of changes occurring due to the introduced restrictions. For the purposes of the paper, the author focused on three research problems:

1. On the verification and assessment of the impact of pandemic-induced restrictions that negatively affected the activities of logistics companies during the period of social and economic restrictions imposed by the state.
2. On the evaluation of actions taken by logistics companies to ensure continuity of operations in the pandemic.
3. On checking the activity of individual branches of the national economy in the purchase of logistics services during the time of restrictions.
4. On the assessment of State aid to logistics companies affected by the pandemic during the period of the restrictions.

2. The Effects of the Introduced Restrictions on the Logistics Sector in the Pandemic

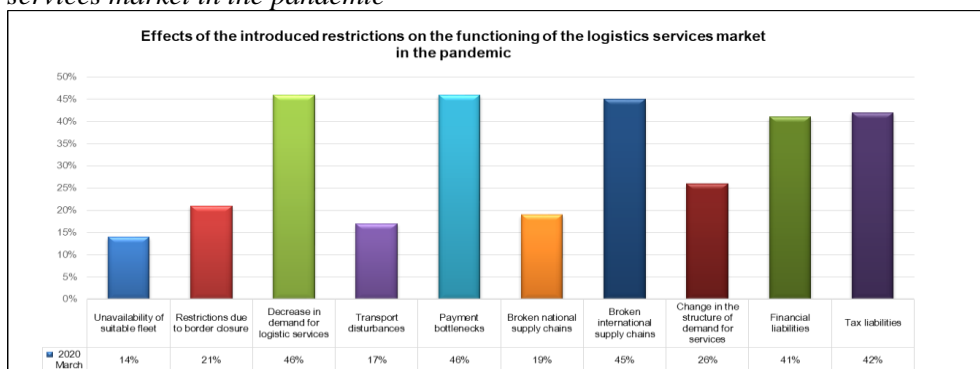
Figure 1 shows the effects of the restrictions introduced, which negatively affected the logistics sector during the pandemic.

In Poland, in the initial period of introducing the pandemic-induced restrictions (March-April), several phenomena negatively affecting the logistics sector's activity, which only deepened in the following weeks, occurred. This was the case, among others, for such areas of operation of logistic service providers as the decline in demand for services, growing financial difficulties, or broken supply chains.

The study shows that in the first weeks of restrictions, the most negative effects on the logistics industry's functioning included a decrease in demand for services (46%), payment bottlenecks (46%), and broken international supply chains. Almost similar values were recorded for tax liabilities (42%) and financial liabilities (41%). According to the respondents, the least threatening to the functioning of logistics companies were such phenomena as fleet unavailability (14%),

disruptions in transport (17%), and closure of borders (21%). An additional challenge for logistics service companies was also the change in the structure of demand for services, which was indicated by more than ¼ of logistics companies (26%).

Figure 1. Effects of the introduced restrictions on the functioning of the logistics services market in the pandemic



Source: Own study based on DGC survey.

It is characteristic that at this stage of economic and social restrictions, more than 4/5 of companies (83%) recording a decrease in demand for logistics services stated that the reason for this was excessive financial and tax liabilities, which clearly indicates the poor condition of nearly half of the surveyed companies. The effects of restrictions that have had the greatest impact on the activity of the logistics services sector are presented in the following figures, and according to the author, one of the utmost importance is a decrease in demand for logistics services (Figure 2).

Figure 2. Decrease in demand for logistics services in the pandemic

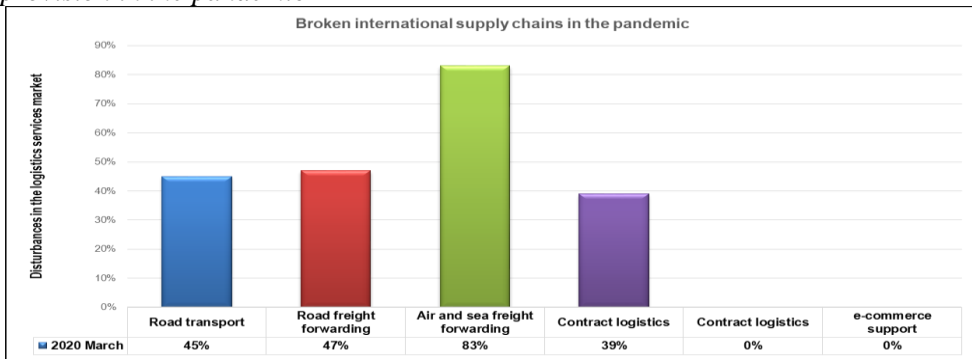


Source: Own study based on DGC survey.

The above summary shows that road transport (62%) and road freight forwarding (47%) were the most affected by the negative impact of restrictions on the logistics services market during the pandemic. It is characteristic that the logistics support services for e-commerce have not been affected. The research shows that the main

reason for this situation is a change in customers' purchasing trends. This is confirmed by global research results, which show that many retailers leverage the change in customers' buying preferences to implement multi-channel strategies to capture online sales (Gorczyca, 2020). An important component of the collapse in demand for logistics services during the pandemic was international supply chains (Figure 3).

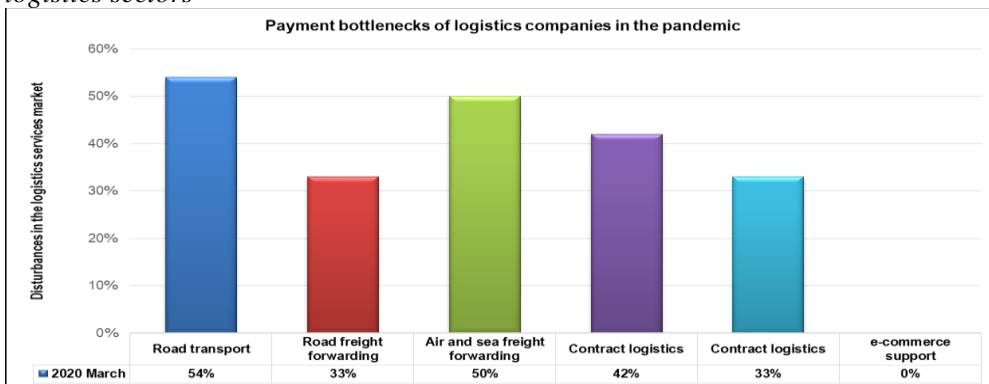
Figure 3. Effects of break-up of international supply chains on logistics service provision in the pandemic



Source: Own elaboration based on DGC survey of companies.

Figure 3 shows that in the TFL sector, air and sea freight forwarding (83%), which recorded the biggest losses in revenues, was most affected by the broken international supply chains. The turnover of road transport (45%), road freight forwarding (47%), and contract logistics (39%) decreased by almost half. Courier and e-commerce support services did not record any losses. Another negative phenomenon resulting from the introduced restrictions are payment bottlenecks (Figure 4).

Figure 4. Pandemic payment bottlenecks in the logistics industry, broken down by logistics sectors



Source: Own study based on DGC survey.

The research shows that car transport (54%) and air and sea freight forwarding (50%) were the most affected by payment bottlenecks among logistics companies during the pandemic. The research results clearly indicate that the direct cause of this was the decrease in demand for such industries' services. The decrease in demand for services, with the companies being obliged to pay credit installments at the same time, had a double impact on the above-mentioned industries. Other logistics industry sectors did not record such a decrease in demand, nor are they burdened with maintaining such costly resources.

Moreover, nearly two thirds (62%) of transport companies were strongly affected by the decline in demand, unlike companies specializing in contract logistics or express and courier services. E-commerce companies achieved the best results. Their results stem from excessive stockpiling by customers and the need to avoid physical contact in retail stores. At the same time, the results of the survey indicate a decrease in customers' interest in buying clothes and cars.

Figure 5 shows payment bottlenecks in the logistics sector broken down by revenues.

Figure 5. Payment bottlenecks in the logistics sector in the pandemic broken down by revenues



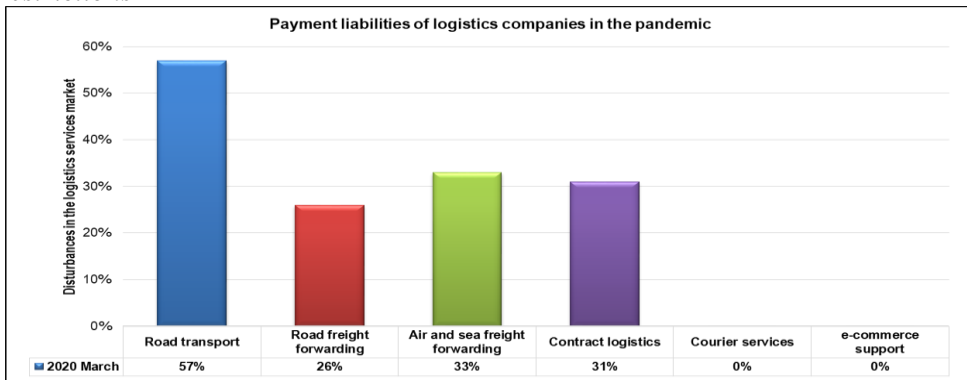
Source: Own study based on DGC survey.

The following conclusions can be drawn from the above list. Each of the logistics companies in the initial period of the pandemic faced payment bottlenecks. Another regularity, however, could also be observed. The larger the company, the less it experienced a decrease in revenue and the less it suffered from payment bottlenecks. Also, there is another apparent regularity: smaller companies are twice as likely to experience the threat of liquidity loss due to payment bottlenecks compared to others. This affected 68% of companies with up to 10 million and 58% of companies with revenues of between 10 million and 25 million. Moreover, most small companies (72%) with revenues of up to 10 million declare that they will not settle their tax liabilities in the future. Logistics companies treat the liabilities to the state as more dangerous than the liabilities to financial institutions.

63% of companies with revenues of up to 10 million declare that they may be unable to pay these liabilities.

Another negative impact of the pandemic concerns the accumulation of financial and tax liabilities and the inability to settle them. How big a problem this poses for the logistics sector is illustrated in Figures 6 and 7.

Figure 6. *Financial liabilities of the logistics sector resulting from pandemic restrictions*

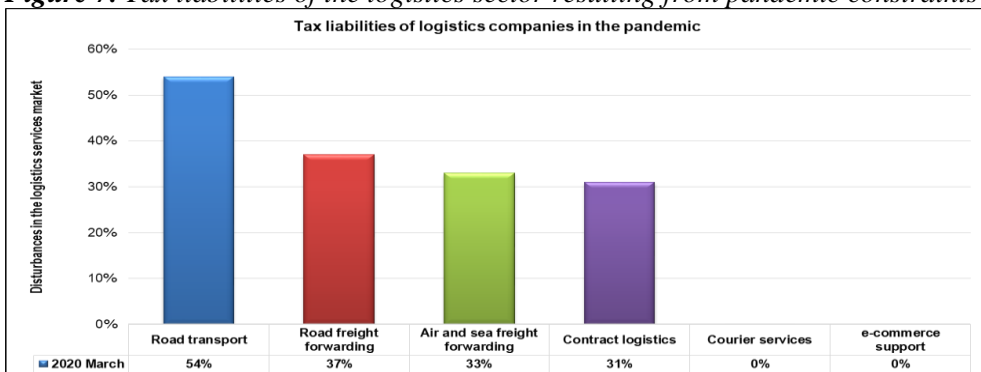


Source: Own study based on DGC survey.

The financial liquidity assessment of the TFL companies shows that in the first stage of the restrictions, road transport had the most difficulties with handling financial liabilities, with almost 3/5 of the companies losing the ability to meet their liabilities. On the other hand, courier and e-commerce companies did the best, as they did not have any delays meeting their financial liabilities.

If, on the other hand, we analyze the logistics sector's tax liabilities by branch, its results are presented in Figure 7.

Figure 7. *Tax liabilities of the logistics sector resulting from pandemic constraints*



Source: Own study based on DGC survey.

The above summary provides similar conclusions to those regarding the meeting of financial liabilities. The worst situation is among companies providing forwarding and car transport services. At the same time, air and sea forwarding and contract logistics report great difficulties in meeting tax liabilities. However, the companies' declarations show that those from the courier and e-commerce sector were paying their tax liabilities on an ongoing basis.

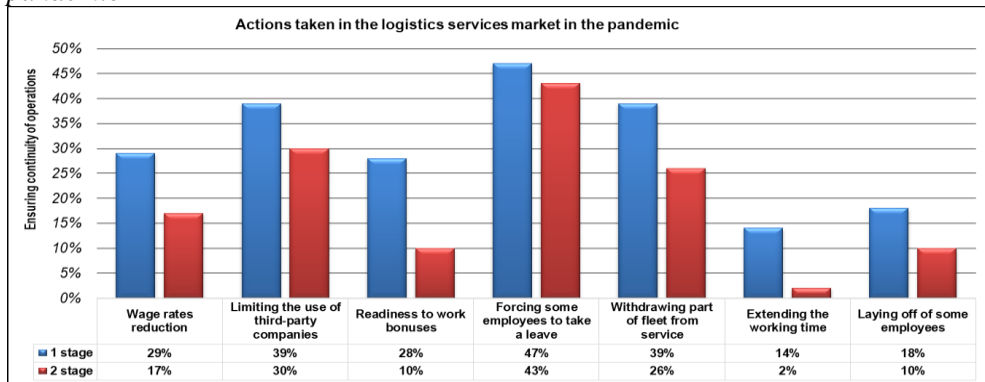
The issue of cash flow during the pandemic is an important part of companies operating in highly volatile conditions, as they are exposed to an increased risk of losing financial liquidity, which in turn may lead to the insolvency bankruptcy of the company.

3. Ensuring the Continuity of the Logistics Industry under the Constraints of a Pandemic

During the pandemic, the logistics industry companies, as well as all other sectors of the national economy and public institutions, have been subject to extraordinary measures limiting direct contact between the provider and recipient of logistics services. To ensure, among others, the continuity of logistics companies' operations, limitations regarding direct contact of own employees and employees of other cooperating companies, couriers, or mail carriers were introduced. Separate zones for own and third-party employees were separated in storage and distribution facilities. At the same time, settlements in the form of paper documentation were abolished or reduced. Also, remote working, dividing workers into a part on duty at the workplace, and working from home was the real panacea for the epidemic risk. It turned out to be difficult for companies to implement.

Figure 8 shows the logistics industry's practical actions to counteract the restrictions introduced during the pandemic.

Figure 8. Actions taken by logistics companies to ensure business continuity in the pandemic



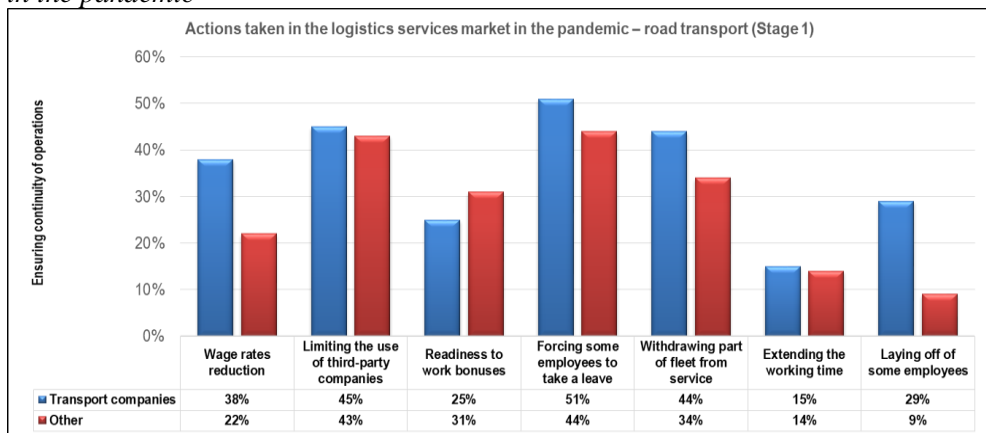
Source: Own study.

The research results presented in Figure 8 show that in the first stage of restrictions (March-April), employers providing logistics services most often decided to ask employees to take a leave (47%). However, at the next stage, after some of the restrictions were relaxed (May-June), this form of maintaining companies' operations continued to take first place, but a slight downward trend could be observed (43%).

In order to maintain liquidity and continuity of operations, in addition to forcing employees to take a leave, other ways of solving problems resulting from the introduced restrictions included: limiting the use of third-party companies (39%) and withdrawing part of the own fleet from service (also 39%). In the second stage (lifting the restrictions), these solutions did not find an equally high acceptance (decrease by 10%). The next recipe for improving the situation was to lower the employee's wage rates (29%) and to reward readiness to work (28%). The decision to lay off some of the employees was made only as a last resort.

It is characteristic that in small companies, the order was statistically different. The first method (leave) was omitted, and the wage rates were immediately reduced. During the pandemic month, this solution was introduced by almost half of small companies, twice as often as by medium and large companies. The final solution was a decision to lay off employees. This form of maintaining a logistics company on the market was used by every third small company and only 14% of medium and large companies. The actions are taken to ensure operational continuity in logistics companies vary. It is worth noting that the transport companies' market situation is much worse than that of forwarding and courier companies or those dealing with e-commerce or contract logistics. A much more frequent solution among companies providing transport services is to ask employees to leave, reduce wages, and lay off unnecessary staff. This is illustrated in Figure 9.

Figure 9. Actions taken by the car transport industry to ensure business continuity in the pandemic



Source: *Ibidem*.

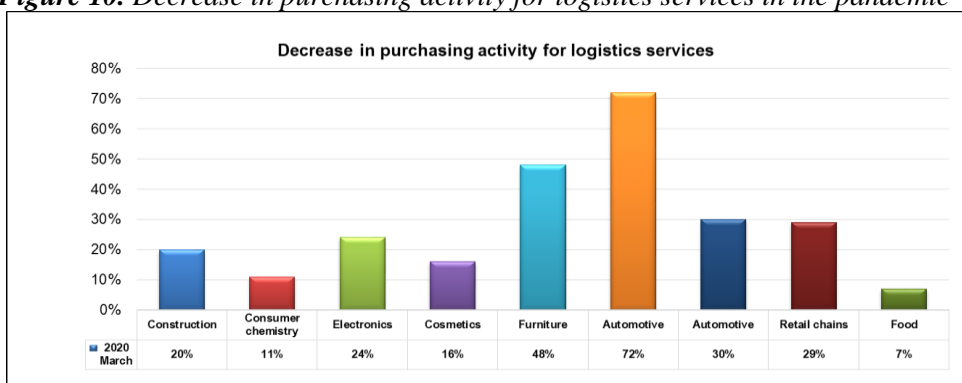
The group of companies included in the research under the "other" heading consists of forwarding and courier companies and companies providing e-commerce and contract logistics support services. The comparison shows that companies from other logistics industry sectors decided first to reduce the use of third-party carriers (%), then to lower wage rates (47%) and finally to lay off employees (33%).

4. Purchasing Activity of Companies on the Logistics Services Market in the First Stage of the Pandemic (March-April 2020)

In Poland, starting from 15 March 2020, the situation of logistics companies in the first weeks after the introduction of restrictions varied, depending on the degree of dependence on orders from specific sectors and branches of the national economy. The demand for logistic services in the first stage of the restrictions (March-April 2020), following the international market's closure and the reduction of the domestic market, fell dramatically for some logistics industry sectors.

On the other hand, for companies specializing in the supply of food and consumer chemistry and e-commerce support services, it was a period when they could benefit from increased purchases by retail customers. As a result, they gained a special advantage in logistics companies serving industries where the sale of goods was practically nonexistent. This is particularly true of the automotive industry, which recorded a sharp decrease of 72% in the purchase of logistics services in this period. Detailed results of the purchasing activity of individual branches of the national economy are presented in Figure 10.

Figure 10. *Decrease in purchasing activity for logistics services in the pandemic*



Source: Ibidem.

The research shows that the first group of companies (food, consumer chemistry, electronic, and cosmetics industry) did not tend to force employees to leave but tried to reward their work readiness. There were also no reasons to reduce the rates of wages, let alone to lay off employees. Although this industry branch was also affected by economic constraints, most companies' liquidity was not at risk.

On the other hand, among the second group of companies, especially from the automotive and furniture industry, a drastic decline in interest in purchasing logistics services can be observed. Comparing the situation of companies specializing in contract logistics with that of companies specializing in road transport and forwarding, one should note a better position in almost all sectors of the first group of companies compared to the second. This is because, in sectors with declining turnover, orders were proportionately smaller, while larger in those with increasing turnover. While in the electronics industry, transport companies recorded only a moderate decline in the number of orders, contract logistics was able to keep order volumes at the pre-pandemic level.

Another trend observed during the introduced restrictions is a change in consumers' shopping preferences and a large transfer of sales to the online channel, which contributed to increased turnover in the e-commerce industry. In this period, an increase of up to 70% was recorded in the e-commerce of food, the zoological industry, the purchase of supplements, OTC drugs, and the electronic industry. However, electronic shops selling clothes and jewelry suffered a drop of about 15%. The biggest winners in the times of the pandemic were the sales platforms, e.g., "Allegro," "eBay," and "Amazon."

However, Globally, there was a declining purchasing trend during this period, as although consumers were buying more than before, these were not expensive and luxurious goods, which reduced the average value of the shopping cart. Such a situation did not pose a threat to supermarkets, but small order values slowed down the development of e-business in the case of small and medium-sized online shops. Another negative trend was an increase in the number of returns.

Therefore, it is currently difficult to predict how the logistics services market's situation will change in the long term once the pandemic has been completely eradicated and economic "normality" has returned. Also, it is still unclear whether the various forms of online shopping activity from the first stage will remain at the same high level in subsequent periods of recovery from the pandemic. It can only be assumed that the development of e-commerce will probably slow down a bit, but the shopping trends launched at this stage will no longer be completely halted.

5. Demand for Purchase of Logistics Services during Market Thawing (May-June 2020)

In the second stage of the pandemic, the factor differentiating logistics companies' situation was still the degree of dependence on orders from specific industries. Companies specializing in the supply of pharmaceuticals, food, and consumer chemicals and e-commerce support can continue to benefit from the increased purchases of retail customers and thus gain an advantage over other logistics companies.

The research results show that the increased demand is of an insular nature, while in most other industries, demand is still low. Besides, demand for certain groups of goods has been met or is very unstable, as was the case with food products, when customers made increased purchases of stocks at the time of the restrictions. In the economy and social life thawing (May-June), the food industry's situation was still conditioned by the maintenance of the blockade of catering outlets within mass catering. A decrease in the activity of purchasing logistics services by retail chains is still visible. On the other hand, the only industry that has seen a month-to-month increase in shopping activity is online shops. The increase in demand for electronic services, built on the need to avoid physical contact between customers in retail stores, leads to significant changes in the organization of trade. This benefits logistics operators operating in e-commerce. The scale of interest in such services is evidenced by the fact that one in three operators managed to attract new customers in e-commerce support during the pandemic.

These were equally new customers of these logistics companies and old customers not using such support services before. It should be predicted that the business relations established nowadays will certainly pay off in the future after the pandemic expires. The thesis that having the ability to manage the supply chain, as is the case in contract logistics, gives a good chance to survive in the market under threat is also confirmed. A further conclusion, resulting from the assessment of market behavior in the second stage of the restrictions, is that trends similar to those from the first stage can be observed. Comparing the situation of companies specializing in contract logistics with companies specializing in road transport and forwarding, the research confirms the better condition of contract logistics companies, which means recession and growing losses in the transport and forwarding industry.

Observing the purchasing activity of logistics services in some industries, such as automotive, in which the sale of cars and automotive accessories was virtually nonexistent in the first stage (a sharp drop in purchasing activity is currently recorded by as much as 82% of logistics companies), one might get the impression that the downturn is deepening. Fortunately, however, this is a mistaken observation, as most industries' situation – although difficult – improved slightly immediately after the opening of stores (4 May 2020).

6. Conclusions

When it comes to the Polish market of logistics services, the economic and social restrictions and limitations introduced in the first week of the pandemic, primarily those resulting from the closure of borders, caused organizational chaos in the country's economy. Initially, it was unknown whether and how one could pass through Poland, which is, after all, a transit country. This led to the disruption of international supply chains, which disrupted road transport, as vehicles were

queuing at border crossings. On top of that, it was not clear whether drivers returning from abroad would have to undergo quarantine.

Given the above, the resulting distortions, particularly the decrease in demand for logistics services, harmed the whole TFL sector's functioning in the last four months. The research shows that during this period, logistics companies serving the food industry and e-commerce did best. The other sectors of the logistics sector experienced a major setback, which experts believe will be difficult to compensate for in the short term. It is predicted that in the long term, the TFL sector will suffer from the negative effects of the restrictions resulting from the pandemic even until 2022.

Another conclusion from the functioning of logistics companies in the first period of the pandemic is that the epidemic was a test of the resilience and professionalism of the TFL sector to the threats posed during the pandemic. In the first week after introducing the restrictions, the companies took steps to minimize the impact of the epidemic on their operations. Moreover, there were other threats than the decline in demand for logistics services. There was a risk that the logistics companies would have to suspend their operations should any employee be confirmed infected. Fortunately, effective measures were taken to reduce this risk. The companies introduced a ban on workers' movement between branches, the obligation to wear masks and gloves. Some of the administrative staff moved to remote working. Separate zones and places to communicate with drivers were introduced, and hygiene and health safety procedures were implemented. Digitization processes were accelerated to minimize the circulation of paper documents in favor of electronic ones, thus minimizing direct contact with customers.

Regarding difficulties in meeting financial and tax liabilities and payment bottlenecks in logistics service providers, the study shows that most of the TFL sector branches have been affected. Only the companies providing courier and e-commerce support services were paying their liabilities on an ongoing basis. However, it can be observed that after gradual thawing of the world's economies, the demand for logistics services has not returned to the pre-Coronavirus level. The question is how long this situation will last. It can also be seen that some of the companies purchasing services on the TFL market decided to support their suppliers financially in this difficult time by making prepayments for services provided in the future.

The research also shows that TFL experts are keen to express their opinions on the logistics services market's future in the post-pandemic period, but they change their opinions often and quite smoothly. Their voices are also polarly divided. It can be assumed that the scope of changes in the functioning of the logistics services market is so wide that no one can reliably determine what the recovery will look like and what its specific effects will be. The risk of uncertainty is particularly

difficult for small and medium-sized logistics companies to accept. Some entrepreneurs assume a permanent decline in demand and reduce resources; others hope that the downturn will be contemporary and short-term, trying to survive unchanged and remaining operational readiness to start up the business. Others believe that changes in the market will affect not only demand but also consumer behavior. Moreover, TFL sector entrepreneurs assume the risk of similar attitudes among their own employees and business partners.

Therefore, the logistics services market should consider various scenarios of individual TFL sector branches functioning and be prepared for any developments. In any case, the research shows that the coronavirus crisis has revealed which companies operating in the logistics services sector are actually well organized, have adequate security procedures in place, and a portfolio of strong and loyal customers.

To sum up, in the era of threats and limitations related to the coronavirus pandemic, most companies in the TFL sector, despite the difficulties, turned out to be mature organizations, well prepared for completely unexpected challenges. As far as the challenges are concerned, despite a profound reorganization of the business, linked to the need to ensure security in all internal and external processes, the logistics services market was able to provide services in disrupted conditions, which is largely the result of initiatives taken, introduced several years earlier. As part of BCM (business continuity management) planning, some logistics service providers (e.g., Raben Group) systematically and consistently verify its resistance to various disruptions, subjecting all processes to periodic testing. As a result, despite the unpredictability of the pandemic's disruption, the TFL sector's response to these risks was largely standardized and controlled.

References:

- Biesok, G. 2013. *Logistyka usług*, Wyd. CeDeWu, Warszawa, 43, 10-16.
- Blaik, P. 2010. *Logistyka. Koncepcja zintegrowanego zarządzania*, Wyd. PWE. Warszawa, 164.
- Ciesielski, M. 2005. *Rynek usług logistycznych*, Wyd. Difin, Warszawa, 12, 57.
- Coyle, J.J., Bardi, E.J., Langley Jr., C.J. 2010. *Zarządzanie logistyczne*, Wyd. PWE, Warszawa, 693-698.
- Czubała, A., Jonas, A., Smoleń, T., Wiktor J.W. 2012. *Marketing usług*, Wyd. Wolters Kluwer, wydanie II zm. Warszawa, 18.
- Gołębska, E., Bentyń, Z., Gołębski, M. 2017. *Logistyka usług*. PWN, Warszawa, 30.
- Gorczyca, M. 2020. *Trendy zakupowe w czasie Covid-19*. Retrieved from: <https://europenews.xpo.com/pl/2439/ankiety-xpo-logistics-w-usa-i-wielkiej-brytanii-pokazuja-ze-konsumenci-zwracaja/>.
- Kłosiński, K.A., Masłowski, A. 2005. *Globalizacja sektora usług w Polsce*, Wyd. PWE, Warszawa, 127.
- Knauf S., Thuczak, A. 2018. *Logistyczna obsługa klienta*, Wyd. PWN, Warszawa, 9-10, 206-208.

- Murphy, J.P.R., Wood, D.F. 2011. Nowoczesna logistyka, Wyd. Helion, Gliwice, 124-125.
- Płaczek, E. 2017. Trendy rozwojowe usługodawców logistycznych w Polsce, Wyd. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach, Zeszyt, 322, 68-182.
- Przybylska, E. 2017. Potencjalne źródła innowacji w branży TSL, Wyd. Zeszyty Naukowe Politechniki Śląskiej, z., 101, 401-410.
- Raport DGC „Eurologistics”. 2020. Rynek logistyczny w dobie pandemii Covid-19, 2.
- Rosa, G., Jedliński, M., Chraćol-Barczyk, U. (red.). 2017. Marketing usług logistycznych, Wyd. C.H. BECK, Warszawa, 14-15.
- Rozporządzenie Ministra Zdrowia z dnia 13 marca 2020 r. w sprawie ogłoszenia na obszarze Rzeczypospolitej Polskiej stanu zagrożenia epidemicznego (Dz.U. 2020 poz. 433).
- Rydzkowski, W. 2011. Usługi Logistyczne, Wyd. Biblioteka Logistyka, Poznań, 8-9, 11,68.
- Serwis Rzeczypospolitej Polskiej. 2020. koronawirus aktualne zasady I. Retrieved from: <https://www.gov.pl/web/koronawirus/aktualne-zasady-i-ograniczenia>.
- Sondaż DGC „Eurologistics”. 2020. Rynek logistyczny w dobie pandemii Covid-19. Sondaż.
- Ustawa z dnia 5 grudnia 2008 r. o zapobieganiu oraz zwalczaniu zakażeń i chorób zakaźnych u ludzi (Dz.U. 2008 nr 234, poz. 1570).