
Costs and Benefits of the Disruptions Caused by the Pandemic Crisis and the Container Shipping Market's Turbulences and their Allocation within the Global Supply Chains: An Analytical Approach

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Abstract:

Purpose: The main aim of the research is to determine the economic and financial effects of adopting aggressive pro fiscal pricing strategies by leading container shipping carriers, operating on a highly concentrated oligopolistic market hit by serious disturbances generated by global pandemic crisis, to indicate main directions and forms of the allocation of extra benefits and costs, induced by the disrupted container shipping markets, among the key logistics links of the global supply chains, and to assessing of the potential aftermath of such effects transfer within the logistics supply chain.

Design/Methodology/Approach: At conducting this research, the following methods were applied: factor analysis (FA), costs/benefits and market analysis (CBMA) based on the evaluation of the container market freight indices, as well as in-depth analysis of many reports, experts' opinions and statistical data.

Findings: The obtained research results indicate that the extremely strong market position of sea container carriers, achieved as a result of their widely advanced consolidation enables them to implement an aggressive pro-fiscal pricing strategy towards shippers, even in times of global crisis, allows them not only to realize extraordinary financial and economic benefits achieved in a significant part at the expense of shippers and forwarders, and to take action for the further capital integration of the global supply chain.

Practical Implications: The results of the study clearly indicate that nowadays existing highly consolidated supply side of the global maritime container market, being a result of adopted by international regulatory authorities friendly for shipping operators regulatory mechanism should be changed. It is necessary to modify it, adopting a new regulatory model aimed at limiting the real market power of container consortia as well as their already strong impact on other links of the global supply chains.

Originality/Value: It has been made an attempt to present how a dual, internally inconsistent, system of regulation of a highly integrated transport market of the oligopolistic type can at the time of a deep crisis and accompanying disruptions of the global supply chains, affect their economic and logistic environment, i.e., deepening the scale of deformation of such global logistics structures, as well as damaging the established level of credibility among their between its participants. This kind of research that may be treated as a case study, can contribute to enriching the existing theory of the functioning of transport markets, in particular the global market for container transport.

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JEL classification: *D42, K21, L13, L22.*

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1. Introduction

The main research problem is focused on identifying and analysing the key economic and financial effects resulting from numerous disruptions caused at first by Covid-19 pandemic crisis and then, a little later, from the unprecedented turbulences which affected the global maritime container market (Grima *et al.*, 2020; Khan *et al.*, 2020). The last ones, which can be defined as the second wave of the global supply chains' disruptions, were gradually increasing from August 2020 and lasting until the mid of April, 2022.

They were successively transferred from the already seriously hit by the first wave of pandemic crisis global maritime container market to other links of the global supply chain, causing a great number of perturbations mostly in the global trade as well as on the markets of maritime transport and logistics.

Numerous distortions arising in the aftermath of the first wave of supply chains' disorder, i.e., pandemic crisis, being the result of the unexpected surge in demand for container shipping services, which occurred in a period of still deep crisis of the global economy and accompanying disruptions of the global container market, generated in the period from September 2020 to April 2022 a hitherto unknown and unexpected new wave of turbulences on this particularly vulnerable global maritime freight market. They were in fact dual in nature and manifested themselves on two levels.

The first of them resulted from the disruption of the previously existing relatively efficient model of the container shipping market organization. In fact, this was due to the very limited access of carriers and shippers to empty containers stored on container terminals or on board mooring at terminals' wharfs not discharged vessels.

Such kind of organizational disruptions created an artificial lack of containers and impacted on smooth turnover of containers between the main global container terminals, and as a consequence, disorganized the existing reliable system of vessels' port container calls schedules. Created in such a way organizational chaos on the global container markets was deepened due to the shortage of container ships' capacity, for many ships were immobilized, queuing in the ports due to the imposed lockdowns.

As a result, by the created in such an specific way lack of operational container ships' capacity, i.e., limited access to the existed potentially supply of sea transport services on the one hand and, on the other hand, by the noticeably rapid increase in demand for container transport by sea, which was unexpectedly revealed at the same time, the leading global container shipping carriers, operating within three powerful shipping consortia on the already highly concentrated oligopolistic container shipping market, launched an aggressive, pro-fiscal pricing strategy.

They were fully aware that this typical fiscal mechanism, driving a spiral of increase in both spot and contract freight rates, would cause serious economic consequences within the supply chain and would not lead to a return to a relative equilibrium of the maritime container market.

In fact, it turned out that the applied in September 2020 pricing strategy, which was continued until April 2022, was mainly aimed at achieving financial results for container sea carriers, thus becoming the second causative factor disrupting the functioning of the container transport market and, consequently, seriously deepening of the already existed global intermodal supply chains' disruptions in both operational and economic dimensions.

Each of the above-mentioned factors, manifesting itself on the operational and economic level, had a significant impact on the emerging and gradually increasing turbulence on the sea container transport market and, consequently, the degree of severity of arising disturbances of the global supply chains, causing unprecedented chaos in both these areas.

However, the latter causative factor is the main focus of the conducted research, because it was the main contributor to the sharp increase in direct and partially indirect costs, generated in the aftermath of the applied aggressive pricing strategy.

These effects of skyrocketing freight rates, both spot and contract, reflected in all major freight indices such as SCFI, CCFI, Drewry World Index, Freightos etc., affected primarily container shipping carriers, shippers, forwarders and other companies operating at the interface with the maritime link of the global intermodal supply chain. Each of the beneficiaries and losers, however, felt the effects of this type to a different extent and in a different form. For some, these were financial and economic benefits, and for others, only costs and losses.

However, they have changed the current, relatively balanced model of costs and benefits' distribution within the global logistics value chains. This is a very important issue, both from the theoretical and practical point of view, on which the author's attention is focused.

Taking this into account, in this study an attempt was made to determine the allocation scheme of direct and indirect costs as well as benefits arising from

unprecedented disturbances caused by both the first and the second wave of turbulences that affected the global maritime container market and other key links of the global supply chains.

The implementation of the research objective set in this way, required the collection of many dispersed sources and data and their appropriate development in accordance with the adopted research methodology. Mainly reliable sources were used, i.e., reports of international organizations, such as UNCTAD, OECD or World Bank that tried to evaluate the effects of disruptions in the global supply chains in the years 2020-2022, as well as the expertise of specialized institutes and agencies as well as numerous statistical sources, such as e.g., Statista.

To meet the main research purpose, the following methods were applied, factor analysis (FA), costs/benefits and market analysis (CBMA) based on the evaluation of the container market freight indices.

2. Literature Review

To study the emerging and growing disruptions on the global maritime container transport market, caused by the Covid-19 crisis and the carriers' behaviour taken as a result of the first wave of disruptions which affected seriously all carriers, as well as taken into account its multidimensional effects of such last longing disruptions, an in-depth analysis of selective sources was applied. Mainly reliable, current and available sources were used, such as reports of many international organizations, i.e., UNCTAD, WTO, World Shipping Council, BIMCO and many others, shipping companies accounts and expert opinions concerning the global container shipping sector, i.e., reports as well as many other sources indicated in the references (Arvanitis *et al.*, 2012).

The source literature related to this study is in fact, quite extensive. However, its specific feature involves the fact that there are only few compact books regarding this topic, and also current ones concerning at least indirectly the reserch subject. Therefore, attention should be paid, first of all, to the interesting study by Karakitsos and Varnavides (2014), where the authors presented the functioning of freight markets and the principles of assessing their effectiveness in the micro and macroeconomic aspect, taking into account business cycles affecting shipping operators and freight markets (Karakitsos and Varnavides, 2014). The methods of analysing freight markets and freight rate quoting processes presented provide grounds for assessments on shipowners' decisions made during the crisis and other phases of market development (Thalassinos *et al.*, 2009; 2013).

The functioning of maritime freight markets and the strength of their impact on container shipowners' medium and long-term behaviour is also presented by Stopford in the new edition of his earlier publication on the shipping economics (Stopford, 2022). However, interesting approach, concerning mainly business

grounds for making decisions by global container operators in the field of cooperation within the shipping alliances and implementing pricing strategies under the turbulent market, is also presented by Breskin in a paper published by CMP (Breskin, 2018).

Whereas the literature, although mainly of a contributory nature, concerning the forms and methods of transferring the costs and benefits and their allocation among the participants of the maritime container market, observed within the last few years, is relatively extensive. The literature on the impact of these processes on the sector's financial condition and the other links of the global supply chains is of a similar nature.

However, these are mainly online sources, valuable for their topicality, synthetic way of presenting the problem and the ability to assess the impact and draw conclusions, close to the current reality. This category also includes reports of international organizations and expert opinions of specialized research institutes and consulting offices analysing this segment of the container market (Drewry, GlobalInsight, Alphaliner, CEVA and many more).

In this group of available studies, there are, first of all, the characteristics and assessment of revenues and losses of the container shipping operators within the various phases of the ongoing crisis and their investment activity presented by Agarwald on the well-known SIBM'19 portal (Agarwald, 2021). Similar characteristics of these processes are presented on the Cogoport portal (Cogoport, 2020) and Global Trade (Global Trade, 2021).

In 2021, Leonard and International Cargo Express presented detailed analysis on the issues examined, focusing mainly on specifying the conditions and factors affecting the choice of progressive pricing strategy of container operators as well as analysis of its effects for the world trade and for selected groups of exporters and importers, as well as international forwarders (Leonard, 2021; ICE, 2021).

In addition, by examining the effects of the first and the second wave of disruptions that occurred in 2020-2022 in the maritime container transport market and within the global supply chains as well as assessing their distribution path and economic impact on other entities directly connected with container shipping carriers, it is necessary to indicate two more interesting publications referring indirectly to this issues (Lotus Containers, 2021; Khandelwal, 2020).

These studies highlight two distinguishable stages of the decision making processes of container shipping carriers operating on the oligopolistic type of freight market, i.e., the end of the 1990s and the period since 2017. Both indicate the financial effects as well as their impact on shippers and forwarders (Ghorbani *et al.*, 2022). They make it possible to better understand and assess the processes being under the examination, and to determine the future trends as regards the research issue.

3. Research Methodology

In order to identifying and analyse both the direct and indirect economic and financial effects, caused by the first and the second wave of disruptions, and assess the strength of their impact on the shippers, forwarders as well as other entities of the global supply chains, it was necessary to apply market analysis (MA) methods at first.

They covered not only the freight and charter indices' analysis, but also took into account other market analytical techniques. The basic one used in this research included PEST analysis which refers to the assessment of the impact of other types of markets, mainly commodity and partially capital markets on both, supply and demand side of the maritime container carriage markets (Kotler, 2000; Baker, 2003).

In addition, the method of factor analysis was applied which is regarded as the best efficient tool when used to simplify complex data sets with many variables. Factor analysis is the practice of condensing many variables into just a few, so that the research data is easier to work with any kind of process that simplifies complexity, that is typical for the chosen research subject.

There is a trade-off in this case between the accuracy of the data and how easy it is to work with. With factor analysis, the best solution is the one that yields a simplification that represents the true nature of the data, with minimum loss of precision. In analysing of the maritime container transport market disruptive processes as well as their effects, the Shresth's inspiring suggestions were applied, as regards the usefulness of the factor analysis method in this type of study (Shrestha, 2021).

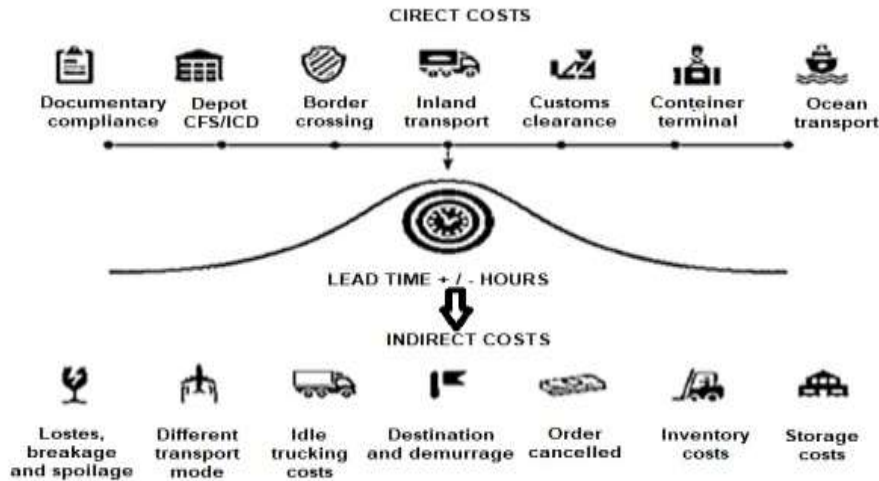
In order to identify and examine the economic and financial effects of the disruptions and turbulences existing in the years 2020-2022, caused by the pandemic crisis as well as chaotic and volatile global container transport market, the method developed by the World Economic Forum (WEF, 2016) for classifying transport and logistics costs in terms of direct and indirect costs was used. In a synthetic form, its general assumptions can be presented graphically as in Figure 1.

However, in the case of the examined problem, this general concept of WEF had to be slightly modified because not all costs' elements listed in the costs statement need to be included. For the purposes of this study, only those costs should be taken into account that directly relate to the effects of turbulences and disturbances that occurred in this period.

These additional, so-called extra costs, must also be related to both direct and indirect cost categories. It should be remembered that the latter category is a derivative of the total time of the transport and logistics operations accomplishing,

and in fact, in this case, the result of extended time of their performing in the period of lasting disturbances, i.e., during the first and the second wave of disruptions.

Figure 1. Total transport and logistics costs broken down into direct and indirect costs; scope for export leg



Source: WEF, 2016

Consequently, from the point of view of the requirements of this study, in relation to the cost structure specified in Figure 1, the group of direct costs should include only two categories, i.e., additional costs of container terminals and carriage of containers by sea (ocean transport). In turn, the category of indirect costs should include such components from this group of costs as detention and demurrage, all penalties and orders cancelled, as well as extra inventory and storage costs, incurred by shippers and later on by other entities involved in global supply chains, including consumers of products moved in containers by sea.

Both of these categories of costs, similarly to the benefits resulted, for example, from the implementation of aggressive pro-fiscal pricing strategies by sea carriers, were then transferred to other entities in the global supply chains. Their allocation within the global supply chains' entities is the main research objective set in this study.

4. Research Results and Discussion

In order to identify and assess the economic and financial effects of disruptions that occurred during the first and second phase of the turbulences that strongly affected the sea container transport markets, at first, the level of disruptions in the global supply chains existing during this period should be indicated. The level of their

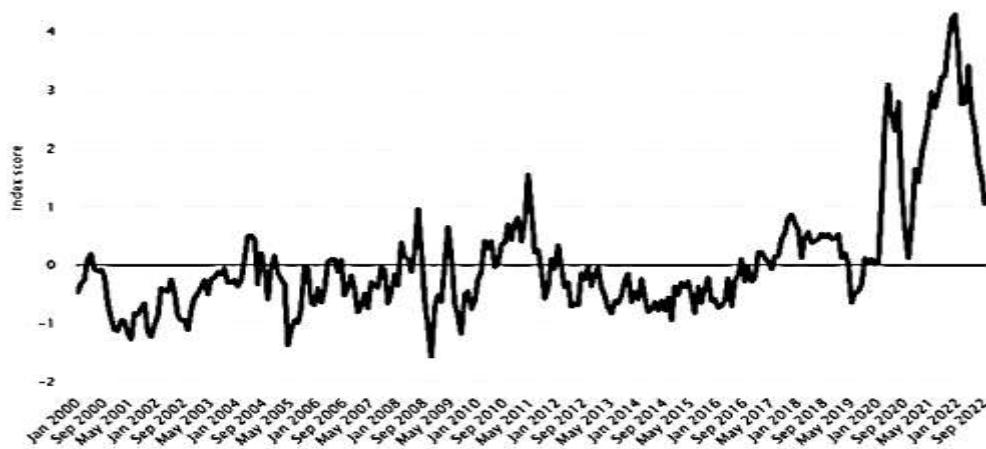
interference is best reflected by the New York Global Supply Chain Pressure Index (GSCPI) that assesses the intensity of their disturbances. It is a parsimonious measure of global supply chain pressures that could be used to gauge the importance of many supply constraints with respect to economic and financial outcomes (GSCPI, 2023). Therefore, it is the best measure that can be used in this study.

The GSCPI integrates a number of commonly used metrics with the aim of providing a comprehensive summary of potential supply chain disruptions. Global transportation and logistics costs are measured by employing data from the commonly used maritime freight indices such as the Baltic Dry Index (BDI), the Harpex index, as well as many others well known container freight and charter indexes, e.g., SCFI, CCFI, Drewry World Container Index and Freightos (Thalassinos *et al.*, 2009; 2013).

There are also taken into account the airfreight cost indices as well as several supply chain-related components from Purchasing Managers' Index (PMI) surveys. Thanks to this aggregated index composed in this way, it is possible to better understand and assess in economic and financial terms, albeit only indirectly, the impact of the several disruptions on the supply chains, and therefore also on the global sea container transport market as its integral component, as well as on individual participants of the transport and logistics processes carried out there. It is also easier to recognise the mechanism of allocation of these disruptions' among the entities operating within the global intermodal maritime supply chains.

Figure 2 presents the level of disruption of the global supply chains over the period January 2000 August 2022, providing a basis for comparing the crisis of 2008-2009 with the pandemic crisis of the twenties.

Figure 2. Global Supply Chain Pressure Index (GSCPI) in the period January 2000 to August 2022

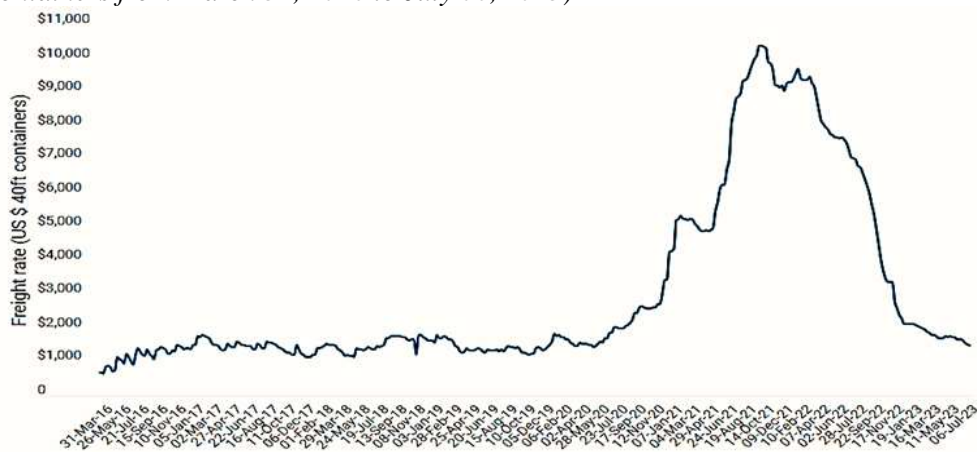


Source: GSCPI, 2023.

The level of disruptions to global intermodal supply chains during the recent crisis presented in Figure 2 shows a high degree of convergence with the dynamic of increase in spot freight rates measured by the consolidated global Drewry's freight index. The last one is presented in Figure 3. The correlation coefficient is at the level of 0,73. It clearly indicates that one of the main reasons for the ongoing disruptions in the second phase were, above all, skyrocketing increases in both spot and contract freight rates, observed since September 2020.

The scale of this growth, fuelled by pro-fiscal aggressive pricing strategies of leading global container carriers operating on highly integrated type of the oligopolistic market, led to serious deformations in the global supply chains operations. It happened at the time of the increasing recovery of global economies, threatening seriously the evident processes of economic recovery and further growth (WEF, 2021; Baraniuk, 2022).

Figure 3. *Drewry's world container composite index (freight rate in US \$/40 ft containers from March 31, 2016 to July 06, 2023)*



Source: Drewry, 2023.

The detailed data from container shipping markets which reflects charter and freight indices shows that since October 2020 the container shipping industry has been booming under the strain of high demand. The carriage of 40-feet container from Asia to Europe costs 17.500 USD, more than ten times the price of the previous year (Logan, 2021; S&P Global Platts, 2021).

Additionally, some shipping companies are charging premium rates to guarantee delivery within a few weeks. Many importers are also attempting to outbid one another, offering extra cash to snap up containers over their rivals (Source Today, 2021b). Consequently, global container operators were the short-term financial beneficiaries of the ongoing shipping boom at that time by obtaining unprecedented revenues.

The drastic increase in spot freight rates and then of contract ones as well as in the amount of freight surcharges imposed from September 2020 to February March 2022 has generated unprecedentedly high profits for container shipping companies, calculated on the base of EBIDTA or EBIDT (direct benefits). In the first quarter of 2020, operating profits of container shipping companies measured as EBIDT already amounted to \$ 1.6 bl but in the end of that year the container shipping companies made a total operating profit of \$ 25.4 bl. Only in the fourth quarter of 2020, 11 of the leading carriers generated the total net profit amounting to 5.8 bl. USD.

Assuming that those who failed to disclose their data (EBITDA), such as e.g., MSC, generated similar profit, it can be estimated that their accumulated net profit for that period totalled as much as 9 billion USD. It means that they generated 2 billion USD higher profits than the profit generated within the last five years, which amounted to 7 billion USD.

Only a few container operators recorded losses in the analysed period. They did not include the three largest Taiwan operators, i.e., Evergreen, Yang Ming and Wan Hai, who generated significant operating profit during the dynamic increase in rates and the related shortage of containers (Alphaliner, 2022). Evergreen recorded net profit in amount of 853 mil. USD per 2020, whereas Yang Ming and Wan Hai recorded profits in amount of 420 million and 396 mil., respectively.

However, due to the constantly progressing dynamic increase in freight rates, only in the first quarter of 2021 the gross operating profit of that sector accounted for \$ 27.1 bl and at the end of the year 2021, an astronomical level of \$ 150 bl was achieved (Drewry, 2022). The data by Statista show that the operating profit achieved by the global maritime container sector in the year 2021 was almost three (2.93) times bigger than that generated by the sector over the past 11 years (Statista, 2021; Source Today, 2021).

Only the largest in this period container operator Maersk Line estimated them at 16.2 bl. USD in 2021. What's more, the biggest container shipping carriers achieved on average, during that 19-month period of unprecedented prosperity, operating profit in the amount of 861 USD/TEU (Placek, 2022b).

Global leading container operators as the short-term financial beneficiaries of the ongoing shipping boom, started transferring their extraordinary direct financial benefits into capital markets to pay off old debts and repay the loans as well as in part to the shipbuilding industry sector to invest in the new tonnage and purchase the equipment, including the containers.

The data of the 12 leading global container shipping operators show that, from the end of December 2020 to the end of September 2021, their accumulated debt was reduced by \$ 3.5 bl (to the level of \$ 73.2 bl). The increasing financial flows of container shipping companies have strongly stimulated the growth of their shares'

value on stock exchanges, simultaneously ensuring that shareholders are paid high dividends and, as a result, make further investments in container tonnage (ICE 2021).

The ability to pay dividends measured with the use of the FCF (*Free Cash Flow*) index, amounted to \$ 14.5 bl at the end of 2021. It was calculated that, for the entire container shipping sector, the FCF for the year 2021 was more than \$ 100 bl., (ICE, 2022; Alphaliner, 2022).

As mentioned above, the high level of the net operating profits in 2021 created for container shipping operators an extra opportunity to increase the tonnage capacity. At the end of 2022, the portfolio of orders for container vessels in world shipyards was 1.7 times higher than at the end of 2018. Relatively low prices of new, bigger container vessels was another incentive for placing new orders and thereby boosting development of the shipbuilding industry sector that absorbed a significant part of the extra revenues obtained.

Positive thing was that the majority of shipowners ordered vessels with new power efficiency parameters, adjusted to the IMO and EU requirements with regard to the necessary reduction of greenhouse gas emission (GHG), in the 2030/35 and 2050 perspective (IEA, 2021; McKinsey&Company, 2022). Furthermore, the gradually growing portfolio of the shipyards since the first quarter of 2021 (in total, the shipyards received orders for vessels of carrying capacity above 1.39 million TEU) which was the best result in six years, indicates the struggle of ship owners, as participants in the global supply chains, to improve the efficiency of their operations in the logistics context, and increase in the effectiveness of container movement on a global scale.

Simultaneously during that period many of the large global container shipping operators undertook actions for the purpose of further capital integration within supply chains by way of mergers and takeovers, finding their place in the maritime sector of a very active global M&A market, whose operations in the year 2021 were estimated at the level of \$ 4 tr. (ISN 2022).

These kinds of vertical capital integration clearly indicate that global maritime container shipping operators, firmly rooted in strong shipping consortia, are moving in the direction of being transformed into global providers of comprehensive container shipping services in supply chains, ensuring end-to-end logistics solutions for their customers. This means a start of the ongoing change in the current business model of the global supply chain which can lead to a number of consequences for providers of logistics services as well as shippers and final consumers of goods transported in containers by sea.

This trend should be monitored by the antimonopoly authorities, as further continuation of these processes will mean another strong strengthening of the market

position of the leading container operators. This will be done at the expense of shippers – their decreasing role as representatives of the demand side, and above all, forwarding and logistics companies operating independently on the competitive global logistics market as well as final consumers of goods transported in containers by sea. For the latter ones, the unprecedented increase in freight rates during the period of 18 months (09.2020-03.2022), estimated at ca. 318% (UNCTAD 2022), generated on average the rise in the global prices of goods imported by sea by 15,7%. As a result of this, the inflation rates were significantly fueled and not only in LDC.

With all this in mind, however, it must not be forgotten that container operators in the first and second quarters of 2020 were also strongly affected by the effects of the pandemic crisis (Grzelakowski, 2021). The first wave of the pandemic crisis led to limiting the activities of numerous seaports and container hubs, because they were closed due to sanitary restrictions and excluding a considerable number of containers from operation, what resulted in an artificial shortage of available at that time containers.

In this situation, to reduce the operating costs the container operators slowed down the carriage by sea and at the same time withdrew many vessels from operation. In these conditions, hundreds of thousands of full containers were kept on ships that served at that time as warehouses, or on storage yards in port terminals. Whereas empty containers remained in those ports where their transfer cycle was suspended due to the pandemic.

The inability to continue onward carriage to the ports of the exporting countries, in particular to China, due to the collapse of the container ships schedule (numerous blank sailings), and the increasing port congestions, which prevented the unloading of full containers in terminals in various parts of the world, caused the collapse of the existing and efficiently operating container turnover system (CEVA Logistics, 2020).

All these disturbances caused significant chaos in the operating activities of sea container carriers, what as a consequence resulted in a strong increase in their operating costs and a serious decrease in current revenues. These were significant costs and losses incurred at that time by global container operators, generally considered to be the beneficiaries of the second phase of the crisis (Grzelakowski, 2022).

In May 2020 the index of reliability with regard to keeping the planned timetables for container vessels amounted to 75% on the global scale. Then began a long-lasting wave of its decline. In May 2021 it was only at the level of 39%. At that time container vessels were delayed, on average by 6 days, and three months before by as much as 7 days. The disturbances of such kind continued even in the first half of the year 2022 (Metroshipping, 2022).

However, over the period from January to May 2022, the average ships' delays in container terminals with respect to the set sailing schedule was decreasing, from 9.95 to 6.17 days respectively (Statista, 2022; Placek, 2022a; ISN, 2022a).

The existing disturbances in the system of servicing the major container terminals resulted in significant lengthening of the time servicing ships in container ports and containers *dwell time* as well as serious congestions, thus making the flow of empty containers within the subsequent links of the supply chain impossible (lack of empty containers). It considerably increased the expenses connected with container shipping.

Shippers were forced to pay an additional charge, the so-called *premium rate*, for making earlier return of containers possible, irrespective of the expenses borne by them with regard to the introduced additional congestion charges, as well as the established *demurrage and detention fees* (d&df) (Houssaye and Torrent, 2022). The latter were particularly high. As shown by analyzes performed in 20 largest container ports in the world, (by a digital platform,) the d&df increased more than twice over the years 2020-2021, reaching the level of \$666/container (ContainerxChange, 2022; Baraniuk, 2022; Source Today, 2021) .

This unprecedented, not known earlier phenomenon of such intensity, resulting from the superimposition of the first and second waves of disturbances, has significantly deepened the already existing chaos in the global container transport sector, leading to an (artificially) created shortage of containers and serious disruptions to the most important maritime links of the global supply chains (DHL, 2021).

Therefore, after a year and a half since the outbreak of the Covid-19 pandemic, the capacity of many seaports and container terminals has significantly decreased, which led to the accumulation on a relatively large scale of previously observed backlog and delays of supplies and, consequently, the unprecedented collapse in the supply chains system on the global scale. This situation had affected to a larger and larger extent all entities in the supply chain.

For this reason, it was difficult to restore later smooth supply operations quickly in this area because never before has there been such a paradoxical situation where the fully operational ports block the supply chains and these in turn block the ports. This deadlock significantly delayed the possibilities to restore balance in the manufacturing and logistics container turnover sectors of the global supply chains (Sea-Intelligence, 2022). All these disruptions generated huge additional direct and indirect costs for all the participants within the supply chain (Habert and Braun, 2022).

However, it is practically impossible with the current data base to assess directly and precisely the scale of these additional costs and losses. Therefore, only examples known from surveys of the international organizations and well known professionals

experts institutions can be used.

Anyway, based on the survey research conducted at the end of 2020, it can be concluded that 56% of SCM professionals experienced moderate disruptions, 32% little disruptions and only 12% heavy disruptions (Finances Online 2021; Retail Next, 2021).

In turn, Interos' Annual Global Supply Chain Report based on the survey conducted among 900 senior SCM decision makers interviewed in May 2021 reveals that the global supply chain disruptions are costing large organizations about 184 ml. USD in lost revenue annually (Interos, 2021).

It has been discovered that 83% of those companies suffered at least some reputational damage because of the supply chain issues and 66 per cent were at that time not assessing their global supply chain on a continuous basis. Finally, 74% of these companies relied solely on manual methods of assessing their supply chains and the related risks (Interos, 2021).

Moreover, it should be emphasized that the financial impact of supply chain disruptions varied depending on the region of the world, with the average cost being 228 ml. USD in the U.S., compared to 145 ml. USD in DACH. The U.S. companies give higher priority to the supply chain risk management given the potential negative financial burden (Retail Next, 2021).

However, the damage to organizations due to the supply chain disruption goes beyond the purely financial aspects. It can also lead to "reputational damage". In the report conducted by Interos it was pointed out that four-fifths of companies suffered some damage to their reputation directly due to the supply chain related issues.

For this can lead to a greater financial cost to organizations through the loss of confidence and trust from existing customers, lack of new business opportunities and other aspects, This, combined with the existing financial burden of supply chain disruption, further emphasizes the pressure exerted on organizations to effectively monitor and ensure the robustness of their supply chains (Baker and McKenzie, 2021).

The list of disruptions and turbulences as well as direct and indirect costs and losses identified and specified in the reports, concerning the area of supply chains, revealed during the crisis caused by the pandemic in 2020 and 2021 is in fact much longer. In most cases, these include periodic suspensions of production and limited possibilities to change the production potential, disruption in the maritime, air, rail and road transport operations, as well as the supply of logistics services, access to raw materials and other materials (trade restrictions, components, semiconductors, etc.) (Citi, 2021; Grzelakowski, 2023).

However, the most severe type of disruptions that caused huge economic and financial burdens, was the skyrocketing increase in freight rates in maritime container transport, which has compounded the already severe disruptions caused by the pandemic crisis.

5. Conclusions

Two waves of global supply chain disruptions that occurred between 2020 and 2022 (until the end of the first quarter) resulted in significant changes in the previously existing model of transferring economic and financial effects, including benefits and losses, in the system of global value chains. It is difficult to estimate them precisely due to the lack of complete data on the scale of direct and indirect benefits and losses. On the basis of data collected from many sources, only a general concept of their creation, as well as transfer and allocation in the various links of the global supply chain could be presented.

At first, based on the presented WEF's model of the division of benefits and costs into direct and indirect, the group of main beneficiaries in the financial dimension was indicated. These were mainly leading container shipping carriers operating on the oligopolistic, highly concentrated on the supply side transport market.

Using aggressive pricing strategies, expressed in the exorbitant increase in spot and contract freight rates, as well as applying of a number of additional charges and surcharges, not only those connected with the necessity of covering costs arising from the existing market perturbations (port congestion, lack of empty containers, etc.), but also the ones introduced with the aim of achieving extra profits (e.g., premium fee and others), resulted in the huge increase in their revenues and profits (EBIDTA/EBITD). Their financial results were unprecedented in the history of shipping.

However, container shipping carriers, being able to draw unimaginable benefits in the deep phase of crisis and lasting disruptions of global supply chains, achieved them at the expense of shippers, forwarders, manufacturers and final consumers of goods transported by sea. It was they, who bore the consequences of drastic increase in the cost of ocean container freight (direct expenses and costs), as well as the costs resulting from the unprecedented decrease in quality of services rendered to their customers (indirect costs).

A characteristic feature of that crisis period – and a certain market paradox – was the fact that the increase in freight rates occurred in the circumstances of gradually decreasing quality of shipping services, which generated a wave of increasing and accumulating indirect costs for other participants in the global supply chains.

This phenomenon resulted, *inter alia*, from periodic exclusion of certain relations (loops) from the service (blank-sailings), a high degree of unpunctuality, as well as

irregularity of service with respect to the determined shipping timetable. It meant that there had been a dramatic decrease in the reliability of the existing maritime container freight system and in the trust of freight forwarders and shippers to container operators.

Such significant turbulences that affected the ocean container shipping market, had the greatest impact on freight forwarders. Maritime carriers invaded, sometimes in a very aggressive manner, the existing area of the freight forwarders' competences and tasks. It was expressed in the form of refusing to accept the cargo (containers) for freight or demanding additional payments in the situation where freight forwarders did not require any other services from them.

Maritime carriers not only preferred such solutions, but they also imposed them on freight forwarders, thus forcing the latter to conclude linked transaction and use various forms of cross-selling. There were also situations where container operators used, for trading purposes, sensitive shipping data, covered by a confidentiality clause, in order to build direct relations with shippers and eliminate intermediaries (de la Houssaye and Torrent, 2022).

Those were activities aimed at strengthening or increasing market domination of container shipping companies in certain relations and excluding, wherever it was or could potentially be advantageous for shipowners, freight forwarders as providers of comprehensive services offered to shippers in the *door to door* formula.

Excluding freight forwarders, particularly those focused on servicing small and medium-sized enterprises involved in maritime export and import, or limiting the scope of services rendered by them, is a disadvantageous solution for shippers. It would mean being forced to purchase such services from carriers in a package, on conditions and principles defined solely by them.

Container shipping companies, receiving such disturbing signals from the global logistics market, as well as from shippers, who were worried about the tendency to exclude freight forwarders, visible more and more clearly from the end of the year 2020, modified their tactics, enriching them by new, still more aggressive actions.

In the situation of what may be called excess financial liquidity, they undertook rather intensive actions aimed at overtaking providers of freight forwarding and logistics services which lay in the area of their interests. The real, direct and indirect costs of such strategies will probably only become apparent in a few years.

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