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CARGO DIVERSIFICATION OPPORTUNITIES AND METHODS IN PORTS UNDER THE INFLUENCE OF ECONOMIC CHANGE

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Abstract

Current study provides evaluation of the processes for assessing the efficiency in the transport cargo structure process based on real-time research using the same technologies and methods as well as offering new methods for assessing cargo diversification. The aim of this study was to confirm the importance of timely estimation of possibilities to diversify the cargo structure in order to take respective measures before the specified risks occur in the multimodal transport system by developing a methodological proposal for monitoring and assessment of the efficiency of the cargo structure as well as for measures and comparative assessments. Methods and materials: The principal materials used for the studies are as follows: various sources of literature, e.g. scholars' articles, research papers and the reports of institutions. The following suitable qualitative research methods have been used: monographic; analysis and synthesis; grouping, logical and abstractive constructional etc.

Keywords: ports economic; cargo diversification; port efficiency; blue economy; diversification methodology

1. Introduction

This study investigates the impact of diversification-driven industrial transformation, adopted by port enterprises to combat slowing economic growth and domestic competition, on their operational performance. The study focuses on publicly listed port-related enterprises in corresponding port cities, considering their interaction. The study analyzes the impact of the industrial transformation and urban economic development level of port cities on three aspects of companies' operating performance: profitability, operating capacity, and development capability. Findings indicate that the relationship between the industrial transformation and operating capacity is nonlinear and inversely shaped, suggesting an increasing negative impact on profitability and development capability. The level of urban economic development within port cities enhances profitability and development capability of port enterprises, has minimal effect on their operating capacity, but positively regulates the relationship between the diversification-driven industrial transformation and operating performance. The port is one of the most important segments in the transport chain and one of the most important facilitators and providers of the economic development of countries. Each port is unique in terms of its geographical location, infrastructure and offered range of services, which are aimed at servicing the maximum number of ships and processing the maximum amount of cargo, as well as being competitive in the global market of logistical services.

In order to make an overall evaluation of a port, systems of port operation efficiency must be developed, because, if the efficiency of port operation is known, more efficient use of the resources at the disposal of the port can be promoted, thus raising the competitiveness of the port. The directions of cargo transit flow often change radically under the influence of contemporary economic processes as well as political conditions, therefore ports must be capable of diversifying their structure, by sustaining minimum financial loss.

Ports play an important role in the global supply chain through efficient logistics operations, and each port enterprise aims to increase economic value added through its unique competitive advantage [21]. Especially under the pressure of global competition, port authorities are looking for ways to improve their operational performance, which is an important indicator of the effectiveness of the activities the enterprises perform [20]. Scholars have conducted extensive research on the impact of diversification-driven industrial transformation strategies on business performance, but have arrived at dissimilar conclusions. This indicates that there is a complex relationship between a port's diversification-driven industrial transformation and its operating performance. Studies on port–port city relationships have proven that coordination between the two entities is conducive to achieving positive outcomes for both. However, to date, few scholars have analyzed the impact of port enterprises' diversification-driven industrial transformation on their operating performance from the perspective of port–port city relationships. As an important external environmental factor, the urban economic development level of port cities can provide essential synergy for port enterprises that implement diversification-driven industrial transformation strategies to improve performance. [19]

2. Materials and methods

The present study provides the evaluation of the processes that are used to evaluate the efficiency in the transport cargo structure process, based on the research studies performed in real time by using the same technologies and methods, as well as by offering new cargo diversification assessment methods. The objective of the study was to confirm how important prompt performance of potential calculations are, regarding the possibilities of diversifying the cargo structure, in order to ensure prompt implementation of appropriate measures, before the determined risks occur in a multimodal transport system, by determining the methodical proposal for the monitoring and assessment of the efficiency of cargo structure, as well as for the development of measures and comparative assessments.

3. Results and discussion

Ports are one of the most significant segments in the logistical chain of cargo and passenger transportation, which occupy an important role at economical, political and national level in a country. Each port is unique in terms of its geographical location, infrastructure and the range of services offered. The efficiency parameters of port operation will depend on the efficiency and scope of the use of port resources. Therefore, organisation of the economic activity of the port in the manner that balances the capacity of the port, with the existing and prospective flow of overland cargo and the development of infrastructure, considering the alternative directions of cargo transportation through other ports, is important to ensure the efficient operation of a port. Ports have a significant role in the transport industry and promotion of competitiveness and their potential in creation of workplaces and attracting investment, is huge. [9]

The port industry has a significant influence on the economy, which is expressed both as the promotion of employment and activity in the industry of ports (direct effect), the influence on the supply chain (indirect effect), as well as a wider influence on the economy (induced effect). Ports are business locations of companies providing a wide range of services – for instance, coal, container and other cargo reloading services. Costs and quality of services provided by ports are an important element of the business environment. Port costs can constitute a significant part of the total costs of logistical services. Ports considerably differ in terms of their productive capacity. Currently, the cargo structure significantly differs at different ports. Differences in capacity cause a significant drop in efficiency – routes become longer as a result of significant deviations in them, the transportation requires more time, the distances covered by sea and road last longer and, consequently, more transport emissions and transport overload occur, which harms residents and the economy.
Considering only tentative economic growth forecasts, the cargo volume at ports is expected to grow by 50% until 2030 and the rapidly growing sector of container traffic is expected to grow even faster. In order to operate under the conditions of forecasted growth, the decisions must be taken as early as today, while the effect of such decisions will be experienced after 5 to 10 years. If ports fail to act now, the economic growth will be endangered by the risk of overload and high external costs − especially in port cities and regions and port connections with larger mainland areas between them. [7]
The efficiency of ports differs considerably: not all ports are equally successful in their operations and the differences between ports that have adapted to the new logistical and economic conditions, and the ports that have failed to adapt have only increased over the last years. As a result of differences in productive capacity, traffic flows are being diverted considerably, which adversely affects the business opportunities at the ports that are operating well. This endangers the efficiency and sustainability of the transport network and the overall competitiveness of the economy.

Ports must modernise the provision of their services, improve connections between ports and ensure that all ports are capable of offering as high quality of services, as possible. This means that ports that are falling behind must gain on the ports that are developing faster. Transit cargoes dominate the cargo structure of several ports, which, in turn depend on the economic, as well as political development of other countries. Therefore, there is a risk that, as a result of economic or political decisions, these transit cargoes will be diverted to other ports with more favourable business conditions.

Previous research studies regarding terminal operators' strategies focused predominantly on the activities and strategies of container terminals that operate in large seaports, i.e., specialisation strategies. There are few studies addressing diversification strategies in business models followed by operators of multipurpose terminals, operating in multipurpose, small and medium ports or secondary ports [5] [17]. Secondary ports function in a highly competitive environment of large hub ports, also providing complementary functions for them [11]. This has a significant effect on the directions of strategic development of terminal operators in secondary ports. Compared to hub ports, secondary ports to a larger extent experience the effects of structural changes taking place in the world economy, maritime trade and transport, which are also stimulated by the increasingly strict climate policy [12] [13] [14]. The impact of those changes on the operations of seaports is manifested by the gradual decrease in trading of traditional bulk cargo groups (coal, ores) or general cargo. The competitiveness of this category of ports is also limited by their technical parameters, which prevent the ports from handling increasingly large vessels that are put in operation. Consequently, secondary ports are under strong pressure as they need to attract new cargo groups to replace those on the decline. This justifies implementation of diversification measures by terminal operators, focusing on the search for new cargo groups, new cargo flow directions and expanding the range of offered services. [16]

For this reason, ports must promptly evaluate the sustainability of their cargo structure and assess the possibilities of diversifying the cargo and service structure of the port. To perform a study of the influence of contamination processes of heat exchange equipment on reducing the quality of regulation, it is necessary to assess the quality of closed loop single-circuit regulation of the heat exchanger, taking into account the technological wear of the equipment and to simulate the change in its characteristics over time. [15]

Diversification is a business development strategy allowing a company to enter additional lines of business that are different from the current products, services and markets. In the current conditions of dynamic markets and strong competition, a successful instrument of risk management is to avoid focusing on a single product, service and/or their distribution to a single limited market. When implemented wisely it contributes to keeping the company stable even in hard times since the economic downturn usually occurs simultaneously in all sectors and all markets. Diversification of business activities brings competitive advantages allowing companies to reduce business risks. That is why it is a great tool for business development. However, its successful implementation requires profound knowledge and thorough preliminary assessment of the company and its environment. And, although sometimes diversification is difficult for the small companies, it can prove to be inevitable when their original markets become unviable.

Diversification, being a strategic approach, is the subject of extensive research aiming to examine its relation to the financial results of the market. In the majority of studies a comparison is done between results of related and unrelated diversification, although the distinctive line between them is still not clear. [18]

Depending on the direction of company diversification, the different types are:

- *Horizontal Diversification* - acquiring or developing new products or offering new services that could appeal to the company´s current customer groups. In this case the company relies on sales and technological relations to the existing product lines.
- *Vertical Diversification* - occurs when the company goes back to previous stages of its production cycle or moves forward to subsequent stages of the same cycle - production of raw materials or distribution of the final product.
- *Concentric Diversification* - enlarging the production portfolio by adding new products with the aim of fully utilising the potential of the existing technologies and marketing system. The concentric diversification can be a lot more financially efficient as a strategy, since the business may benefit from some synergies in this diversification model. It may enforce some investments related to modernizing or upgrading the existing processes or systems. This type of diversification is often used by small producers of consumer goods.
- *Heterogeneous (conglomerate) diversification* - is moving to new products or services that have no technological or commercial relation with current products, equipment, distribution channels, but which may appeal to new groups of customers. The major motive behind this kind of diversification is the high return on investments in the new industry. Furthermore, the decision to go for this kind of diversification can lead to additional opportunities indirectly related to further developing the main company business - access to new technologies, opportunities for strategic partnerships, etc.
- *Corporate Diversification* - involves production of unrelated but definitely profitable goods. It is often tied to large investments where there may also be high returns. [18]

Diversification of risks is required, since the expansion of the market, as well as customer range, makes the company or a market segment independent of the economic situation in the local market.

a – growing trend of cargo volume;
x – critical point of cargo volume growth;
S – the required mechanism of compensation for the fall in cargo volume;
Sd – cargo diversification.

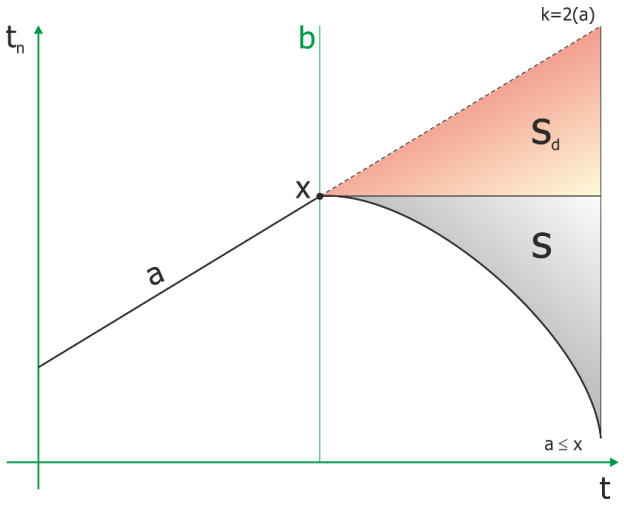

Fig. 1. Cargo diversification methodology

This figure illustrates critical point of cargo volume growth (x), when it is necessary to diversify the cargo structure in order not to reduce the amount of cargo. It is important to appreciate the right moment when the process of cargo diversification has to start, because it takes some time and the result is not immediate. Several risks that need assessment exist, when the diversification process is initiated:

- Political, economic and social conditions
- Technological solutions
- Legislation and taxation policy
- Infrastructure and logistics

- *Political support* is the decisive factor for cargo diversification, although minor, political risks exist, becoming especially topical during economic crisis conditions, which can affect the fluctuations of currency exchange rate, as well as international trade policy.
- *The economic situation* in the country determines the availability of financial resources and purchasing power, inflation, as well as currency exchange rates. All these are factors that significantly affect the proportion of international trade.
- *Social conditions* or the lifestyle of the residents. Under the conditions of diversification this factor is most directly affected by the advertising policy and public relations.
- *Technological solutions* or innovations considerably reduce the life cycle of products, which causes the necessity for investment, research and development.
- *Legislation and taxation policy*, it is important to assess, whether the created conditions are favourable for the initiation of a diversification process, whether the existing legislation creates obstacles for the launching of new products and services on the market.

Optimisation *of infrastructure and logistics* is the principal pre-requisite for the attraction of new groups of cargoes to your market segment. Serious market research or regular monitoring of the target market must be performed in order to initiate the diversification process, which is best implemented by participation in trade missions [10], industrial trade fairs or conferences, and supplementing the aforementioned data by publicly accessible information and statistical analysis. In order to initiate a diversification process, a diversification strategy [8] must be developed, which must be performed at the highest level of policy planning in the context of the state. This strategy must comply with three main criteria:

1. Technical resources;
2. Financial resources;
3. Sales volumes.

Only if these macro-economic processes are considered, the re-distribution of market segments can be planned. [3] The following external factors must be considered to successfully start the development of the strategy, which can affect the diversification result:

1. Global economy trends - cargo volumes and market prices, topical transport corridors, etc.
2. International and political environment – important international trade trends and relations with target market countries;
3. Government support – a decisive factor to initiate the process of cargo diversification.

The author offers the following formula, which has been opportunted to evaluate the quantity of cargo diversification characteristics, based on Figure 1:

$$S_d = k \times a - S_{a\geq 1}^{t} \quad (1)$$

where
S_d- cargo diversification
k – cargo increase coefficient
t – time period, within which cargo increase is planned to occur
a – growing trend of cargo volume

In this formula is important to choose the optimal cargo increase coefficient (k), based on the time period (t) required for cargo diversification. This is a function that needs to be fulfilled in order to assess the potential for diversion of cargo:

$$S_d = \sum_{a\geq 1}^{t} (I + E + T) \quad (2)$$

where
S_d- cargo diversification
I – investment for the development of infrastructure
E – entry into new markets
T – optimisation of legal status

These are the conditions that must be met in order to make it possible and successful to cargo diversification. It is necessary to make the investment for the development of infrastructure, to look for new markets for goods and services and there is a need to optimisation of legal status. Moreover, the studies completed so far have shown that even though specialisation has a positive effect on the results of seaport activity [1], excessive specialisation, understood as strong dependence on several kinds of cargoes, may be detrimental not only to the ports, but also to the local economy dependent on the port [6]. In turn, diversity of port activity unambiguously stimulates the port's growth and development [4]. On the other hand, according to some studies [6], the global shipping network is strongly dependent on the more diversified transport nodes which in turn take over the greatest traffic and show higher connectivity.

Diversification can be considered a useful business development tool for companies in any sector and location of the economy. However, you have to keep in mind that there is no recipe for successful diversification. It depends on multiple internal and external factors for each company, which should be carefully studied and taken into consideration when developing a diversification strategy. It is also very important to implement and update this strategy according to the dynamically changing conditions and strong competition under which business usually operates.

4. Conclusion

1. The problem is the lack of methods for assessing the impact of industrial transformation and the level of urban-economic development of port cities. It can be attributed to three performance indicators of companies: profitability, operational capacity and development capacity. The creation of cargo diversification methodology addresses the possibility of timely assessment of ways to identify cargo diversification deadlines.
2. Ports considerably differ in terms of their productive capacity. Currently, the cargo structure significantly differs at different ports. Differences in capacity cause a significant drop in efficiency – routes become longer as a result of significant deviations in them, the transportation requires more time, the distances covered by sea and road last longer and, consequently, more transport emissions and transport overload occur, which harms residents and the economy.
3. Diversification of cargo is the last alternative to implement, where the existing market distribution does not ensure sufficient generation of profit.
4. The decisions regarding cargo structure diversification must be made promptly, as soon as the first signs bear evidence that the critical point of cargo volume growth has been reached, without waiting for the moment when cargo volumes start to fall. Therefore, ports must promptly assess the sustainability of their cargo structure and possibilities of diversification of the cargo structure and services provided.
5. Diversification of risks is required, since the expansion of the market, as well as customer range, makes the company or a market segment independent of the economic situation in the local market. In order to initiate a diversification process, a diversification strategy must be developed, which must be performed at the highest level of policy planning in the context of the state. This strategy must conform to three main criteria: technical resources, financial resources, sales volumes.
6. Certainly, for future research, other diversification methods idenfication properties of these materials should be analysed to better understand the behaviour of the diversification methods using different models with the aim of their application for other economics applications.

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