

# THE IMPACT OF PORT LOGISTICS SYSTEMS ON A COUNTRY'S COMPETITIVENESS (CASE OF SMALL COUNTRIES)

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## Abstract

*Globalization processes determine the necessity to ascertain and use effectively the competitive advantages of port logistics systems on national and international levels.*

*The purpose of the research is to analyse the impact of port logistics systems using the concept of port-centric logistics systems in small countries with the aim to increase their competitiveness.*

*The use of the term "a logistics system" has been determined; therefore, it is expedient to describe the comprehensive application of the term "a logistics system", which by implication must cover all elements of 8R principle. The authors ascertained competitiveness forms of port-centric logistics systems, dictated by the levels of the competition between ports: between whole ranges of ports or coastlines, ports in different countries, individual ports in the same country, operators or providers of facilities within the same port and between different modes of transport. The activities of port logistics systems must be investigated in a complex manner taking into account the factors and levels of a country's competitiveness. Considering the particularity of port logistics systems, its functionality and effectiveness, a country's economic growth and competitiveness are based on logistic flexibility. However, the particularity of a country's economy determines the forms and nature of interconnections and processes in the structure of port logistics systems. Therefore, the competitive advantage of a small country could be generated through the improvement of effectiveness rates and indexes of the activities of port logistics systems.*

**Type of the article:** Theoretical article.

**Keywords:** economy of small countries, competitiveness, logistics systems, seaports.

**JEL Classification:** A10, L91, R41.

## 1. Introduction

**Problem.** Gaining and maintaining the competitive advantages of small countries in the context of globalization processes in economics is an increasingly more important goal, whereas discovering the methods and ways to achieve this goal is a relevant problem. The logistics systems of these countries determine the functionality and ensure the effectiveness of their economic systems. Usually, general methods and measures of effective evaluation and increase of the effectiveness of logistics systems have been used to distinguish the particularities of logistics systems of small countries as one of the main factors increasing competitiveness on national and international levels. However, by the employment of general conceptual methods of logistics it becomes more and more difficult to uphold competitive advantages in the long-term perspective, especially for small countries. Therefore, the necessity to discover new conceptual trends in the science of logistics appears in order to form and maintain the competitive advantages of small countries taking into account the particularities of their logistics systems, i.e. ports as the main part (element) in the activities of logistics systems.

**Relevance.** Globalization processes determine the necessity to ascertain and use effectively the competitive advantages of seaport logistics systems on national and international levels. They ensure stable and long-term growth of a country's economy and competitiveness. The formation of logistics systems is based on the concept of complexity. This process includes the research in different areas,

i.e. transport and other related logistics services and activities performed by different entities as well as the interests of the producers and consumers on the national level. Port logistics systems and their interaction with other systems, which ensure the activity of the country's economic system, become the main object of the research in case of the application of the concept of port-centric logistics. It becomes very important for small countries because of the huge impact on their competitiveness.

**Object of the research:** the impact of port logistics systems in the view of the increase of small countries' competitiveness.

**Purpose of the research:** to analyse the impact of port logistics systems using the concept of port-centric logistics systems in small countries with the aim to increase their competitiveness.

**Tasks of the research:**

1. To distinguish the particularities of the functionality of seaport logistics systems on national and international levels;
2. To determine the peculiarities of the concept of port-centric logistics systems and the significance thereof to the economic systems of small countries;
3. To analyse the forms of competitiveness of port-centric logistics systems and to evaluate their input in the formation and the increase of small countries' competitiveness.

## Theoretical background

### *Particularities of the functionality of port logistics systems*

Scientists distinguish logistics as an integrated science with the aim to solve the problems of optimal management of flows (informational, financial and material) by invoking a systematic approach (Johnson *et al.*, 1999; Gourdin, 2001; Harrison, Hoek, 2005; Urbonas, 2005; Meidute, 2012). Whereas the purpose of logistics systems is to serve the flows of tangible and intangible assets, which have been formed and which are moving in different production and consumption spheres, in different coverage and development levels (Николашин *et al.*, 2003; Palsaitis, 2010; Paulauskas *et al.*, 2011). Thus, in the view of port logistics systems, these flows are distributed on two levels: within port logistics systems, i.e. on the national level, and on the international level during the process of interconnection with the logistics systems in other countries. Other operations take place in this process at the same time, including the creation of added value. Thus, it can be concluded that seaport logistics systems ensure that the problems related to transportation, warehousing and provision of port logistics services are solved conveniently as well as ensure timely control of prices, the increase of ports' competitiveness and the demand for their logistics services.

During the analysis of scientific literature (Николашин *et al.*, 2003; Baublys, 2003; Palsaitis, Bazaras, 2004; Leenders, Fearon, 2006; Rimiene, Grundey, 2007; Bowersox, Closs, 2008; Meidute, 2005; Meidute, 2012; Wang, 2011; Sheffi, 2013), a variety of logistics systems terms was discovered. Some scientists identify the logistics system as logistic parks or centers. Thus they highlight the importance of logistic nodes (centers, parks, etc.) as the object of attraction and creation of added value. Other scientists describe logistics systems as clusters, integrated infrastructure (usually, transport) or supply systems. In this case, it is possible to distinguish the complex of interconnections and interaction of detached elements of logistics systems, which demonstrates the principles of the activities of logistics systems on the regional level or on the level of separate industrial sectors or groups of companies only, i.e. as a prototype of a local logistics system or as a part of the measures and connections ensuring the activities of the logistics system. However, the authors describe abovementioned terms as constricted as they render separate elements of logistics systems or its models on the regional level only.

With the aim to demonstrate the importance of the purpose of logistics systems and the coverage of their activities, scientists (Mangan, Lalwani, Butcher, 2008) distinguished 8R principle for the description of the activities of logistics systems: getting, in the right way, the right product, in the right quantity and right quality, in the right place at right time, for the right customer at the right cost. The authors mention that this principle is applicable to the formation and development of port-centric logistics systems in small countries on the national and international levels. In this

instance, the highest standards (requirements) for the capability, capacity and flexibility may be applied to and the attention may be focused on the port as the basic element of a port-centric logistics system. At the same time, the principles of compatibility and interconnection of all elements of logistics systems remain one of the significant concepts, which are the basis of and which ensure the activities of the logistics systems and the synergetic effect of its elements.

In order to meet the demand, it is necessary to deliver products from the locations of supply to the locations of demand by using logistical operations and functions in the seaports. Thus ports become the main centers of planning, implementation, management and control of the process ensuring the activities of the logistics systems in small countries. Logistical functions and operations in seaports are reflected in the process of tangible flow movement. That is, the application of concepts and principles of logistics determines the flow movement through the seaport, i.e. the delivery of production in accordance with the consumers' needs and expectations, at minimal costs, on time and in a convenient place.

It should be noted that, in case of increasing consumption, the demand for different resources of the port activities is growing according to the functionality in production and services sectors, and these resources are transforming into the source of creation of added value. The compatibility of the aims of seaport logistics systems and the aims of production and consumption sectors will be validated here, i.e. the necessity of resources changes with regard to time, place, quality and quantity, ensuring the development of production and trade sectors, sustainable development and growth of ports and their logistics systems supported by the conceptual measures of logistics during the process of satisfying the consumers' needs.

The role and importance of effective usage of the competitive advantages of port logistics systems is increasing on national and international levels in respect of global economy, whereas it is impossible for business sector to survive in the conditions of protectionism and high standards for the consumers' needs.

The balance of the business environment is achieved and supported by the feedback between the producer and consumer through port logistics systems and the decision-making processes which take part in them; this balance is defined by appropriate distribution of the economic values which are moving in the country's economic system, effective usage and mobility of these values based on the peculiarities of port logistics systems as well as by the possibilities to differentiate the functions, operations and processes of the system.

The fact of differentiation and consistency of the connections between the elements of port logistics systems positively influence the effectiveness indicators of the usage of resources and other values in port logistics systems expressed by technical, financial and other indicators. In the view of geographic, demographic and other economic factors, port logistics systems can change the concentration of the flows of tangible and intangible assets, their deployment locations (statics) and the routes and directions (dynamics) of their movement on national and international levels, within the port logistics systems just as in the country's economic system.

Scientists often compare the definition of port logistics with a refined concept of transport and described it as "the optimization process of distribution, movement and storage of resources and other tangibles, including their source of origin, participation in various economic activities and final consumption" (Alderton, 1995). However, taking into account the development of the concept of logistics systems from the period "before logistics" until the period of classic logistics and neo-logistics (Garalis, 2003), it is necessary to evaluate port logistics systems not only from the point of view of technology (transport capacity); modern logistics systems must be evaluated from the point of view of economic processes as well as socially, ecologically and politically. It shows the complexity and variety of logistics systems and logistic processes within these systems. The authors of the article consider that it is necessary to fully integrate all internal processes into port logistics systems or into the model of the flows of economic activities. In this instance, it is possible to achieve the aim of total optimization of the logistic process in the view of port activities. The role of seaports in the formation of economic systems and their development strategies in small countries is highlighted in this way.

The aim to create favorable conditions for port activities substantiates the necessity to

improve the logistics infrastructure in port logistics systems. In the opinion of scientists, this infrastructure must be understood as a “material-technical system designed to provide for the production and citizens’ social life” (Hocob, 2007), also highlighting the importance of the concept of “joint responsibility” (Garalis, 2003) for the activities of port logistics systems. In this instance, the logistics system is a subject providing the necessary infrastructure to the production and consumption sectors and organizing the movement and distribution of various flows (material, financial, information, etc.) through port logistics systems.

Having analyzed the scientific literature describing the particularity of port activities (Comprehensive Manual on Port Reception Facilities, 1995; Muller, 1999; Waters, 2003; Urbonas, 2005; Paulauskas, 2005; Palsaitis, 2011) the authors note that the infrastructure consists of the network of various types of transport and its nodes, informational channels and systems, means of communication and locomotion, storage facilities, external provision of energy resources, financial supply systems for logistic processes, service companies for citizens, etc. Thus, the scientists emphasize the multiplicity and multimodality of port logistics systems. Furthermore, sustainable development of infrastructure ensures favorable conditions for business expansion social welfare and quality of life in the country (Navickas, Sujeta, 2011).

The impact of infrastructure is perceived through the services provided by using the infrastructure physically. It proves once more that the infrastructure is directly dependent on capital and human resources and cannot be separated from it (Snieska, Simkunaite, 2009). Scientists also emphasize that competitiveness of the country is formed on the basis of competitiveness of production sectors, development of infrastructure and the country’s economic and political position (Cibinskiene, 2009; Reiljan *et al.*, 2000). Thus, competitiveness of a small country may be expressed as high production level, stability of economic and political situation and effective use of the opportunities to develop infrastructure, i.e. the factors of the impact of infrastructure, macro environment and innovations are highlighted. However, the authors emphasize the growing dependence on and the increasing impact of these factors in the economic systems of small countries as well as in port logistics systems. As reasons of this dependence and impact are limitation of countries’ budgets, high sensitivity to economic and political changes and increasing dependence on the economic impact groups (especially in energy, land and capital management areas).

In order to analyze the peculiarities of seaport logistics system on national and international levels it is expedient to invoke the principles of regional logistics and competitiveness of the country’s regions. The scientists emphasize that regional logistics must be oriented at the development of regional economy through the development of logistic infrastructure and services (Held *et al.*, 2000; Hocob, 2007). Scientists Snieska and Bruneckiene (2009) offer a view on competitiveness as a cyclic process in which the result becomes the contribution which causes the result later. Thus, in case of the aim of sustainable and equivalent development of regions, successful economic development of the country will be achieved by the synergy effect of development of all regions of the country which needs the contribution of each region in respect of the activities of logistics systems. In accordance with the principles of regional logistics and competitiveness of regions, it is necessary to improve and harmonize the infrastructure for sustainable development of regions by creating the conditions for effective capital expenditures. Furthermore, destabilization of the processes of infrastructure in these regions determines the increase of the costs of production and services and the decline in the quality of the citizens’ life in these regions. It has a negative impact on the competitiveness level of regions in this case, as well as the competitiveness of port region and country in general and, as a result, negatively affects the intensity of consumption in the regions and in the whole country.

### ***Particularities of the concept of port-centric logistics systems and their role in the processes forming and increasing a small country’s competitiveness***

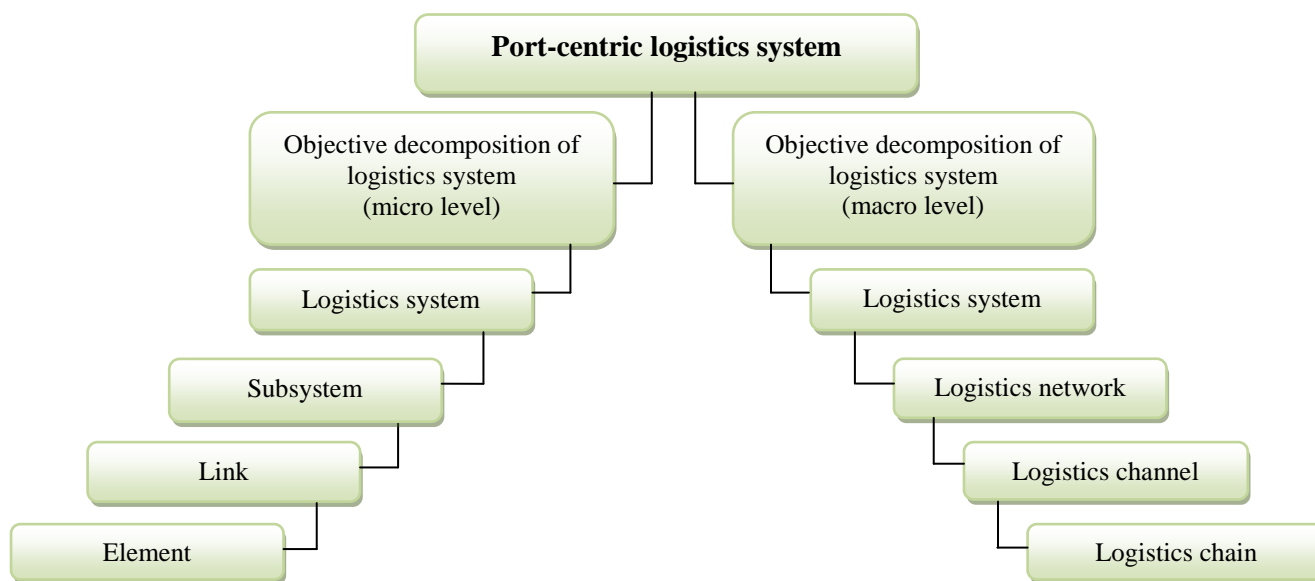
Logistics systems of small countries are based on functionality and ensure the effectiveness of their economic systems. It becomes more and more difficult for small countries to maintain

competitive advantages in the long-term perspective by applying the general conceptual methods of logistics. Thus, it becomes necessary to discover new conceptual trends in the science of logistics for the formation and retention of competitive advantages of small countries taking into account the particularities of their logistics systems.

Having analyzed the scientific literature (Baublys, 2003; Huang *et al.*, 2003; Tongzon, Heng, 2005; Port Reform Toolkit, 2007; Mangan *et al.*, 2008; McKinnon, 2009; Wang, 2011), the authors note that seaports are becoming an increasingly more important node in transport system and the whole economic system of the country. According to the research and the Port Reform Toolkit determined by the experts of the World Bank, it is expedient to distinguish five significant factors affecting port activities in the context of global economy: intensification of global competition, new technologies, environmental, security and safety requirements and standards, changing distribution patterns, shifting bargaining power due to realignments / consolidations.

The scientists in their works (Navickas, Malakauskaite, 2009), the World Economic Forum (2010; 2012) in its reports, the experts of the World Bank (Arvis *et al.*, 2012) distinguish the following groups of the factors of economic growth and competitiveness: general factors (business environment), specific factors of different areas or sectors of activities as well as innovation and sophistication factors. These factors are reflected in the structures of Logistic Performance Index (LPI), Global Competitiveness Index (GCI) and Global Enabling Trade Index (GETI). The authors determined that the factors which affect the activities and development of port-centric logistics systems (institutions and their regulation as the indicator of the system's flexibility, infrastructure as the indicator ensuring the technological functionality of the system, macro environment as a complex of economic, political, ecological, etc. elements, the quantity of resources, their distribution and mobility, the complexity of business and the level of innovation, opportunities for extension of labor force, financial and commodity markets) are evaluated and counted in these indexes as the main factors determining the level of countries' competitiveness. Therefore, it is necessary to evaluate the activities of port-centric logistics systems, their formation and development processes in the context of competitiveness of the country in the conditions of global economy.

Considering the general classification of logistics systems determined by scientists (Канке, Кошечая, 2010; Meidute, 2012), it is expedient to divide port-centric logistics systems in accordance with the coverage of their activities (on national and international levels) into two groups: micro logistics and macro logistics systems (see Figure 1).



**Figure 1.** Classification of logistics systems in accordance with the coverage of activities (decomposition)

Source: adapted by the authors with reference to Meidute (2012)

As the application of the concept of logistics systems defines the nature of flows and the processes of their movement, it is possible to distinguish specific characteristics of the movement of these flows: orientation on the basis of linear principle, aggregation and junction into a logistics chain the elements of which are being analyzed, optimized and synchronized continually. These characteristics are very important for the evaluation of port-centric logistics systems as well as their activities and effectiveness on national and international levels. All links of the logistics chain have their own purposes in the pursuance of general aim – the increase of the effectiveness of port-centric logistics systems.

Mangan, Lalwani, Butcher (2008) distinguished 5 forms of competitiveness: competition between groups of ports or coastlines, competition between ports in different countries, competition between individual ports in the same country, competition between the operators or providers of facilities within the same port, competition between different modes of transport.

The authors determined that applying these forms of competition is expedient when assessing and evaluating port-centric logistics systems in small countries by distinguishing national and international levels (micro and macro levels) (see Table 1).

**Table 1.** Forms of competitiveness of port-centric logistics systems

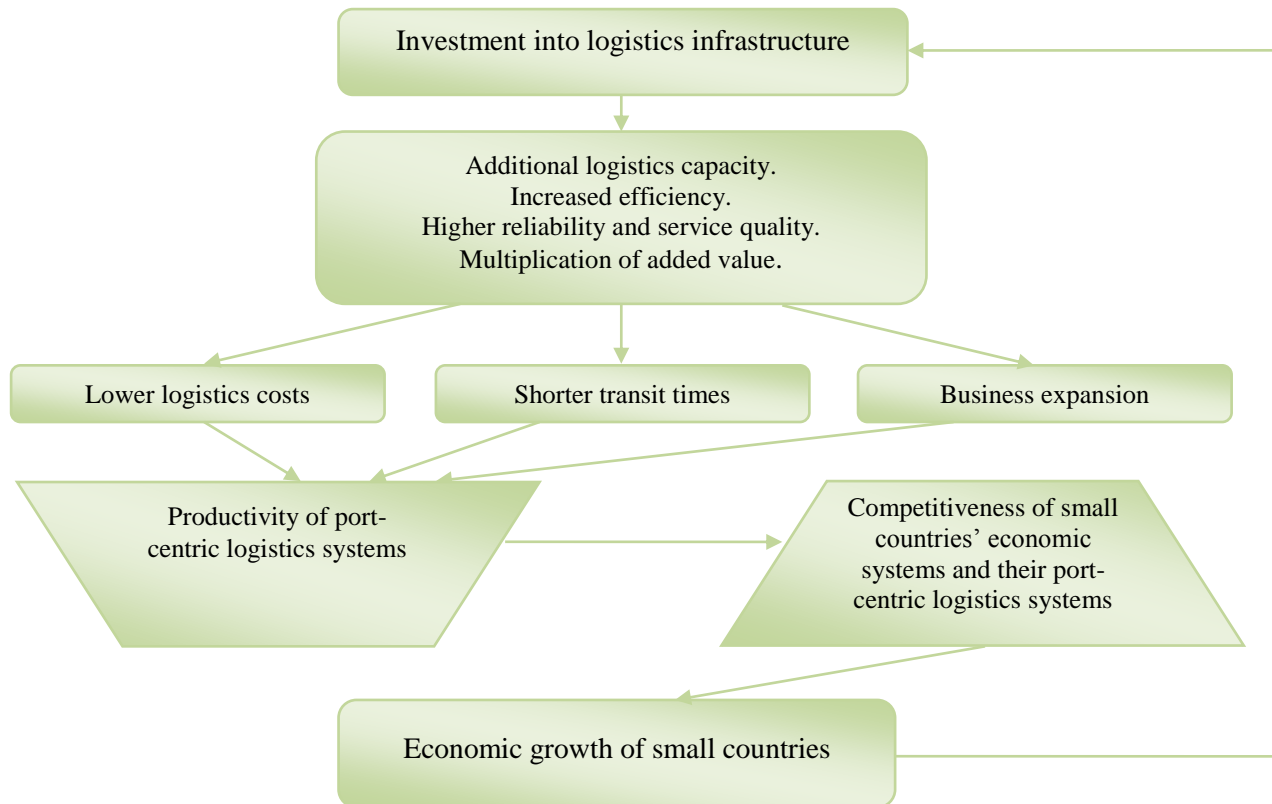
Forms of competitiveness of port logistics systems according to the object	National level (in respect of small countries)	International level (in respect of small countries)
Logistics system oriented at groups of ports or coastlines	Generally, it is not applicable to small countries (it is more applicable to big countries taking into account the particularity of natural (geographic) environment in case competitive groups of ports or coastlines exist in these countries).	It is applicable to small countries when ports or coastlines of different countries are joined into groups with the aim of cooperation and increase of competitiveness.
Logistics system oriented at groups of ports in one country	Not applicable (by implication).	It is applicable to small countries where there are several seaports formed as a competitive group compared to a competitive group of seaports of another country (for example, seaports of Germany, Denmark and Latvia).
Logistics system oriented at one port in the country	It is applicable to small countries where there are several seaports.	Not applicable (by implication).
Logistics system oriented at a group of operators or companies providing logistics services within one port	It is applicable to small countries, irrespective of the number of seaports.	Not applicable (by implication).
Logistics system oriented at a port (ports) as one of transport modes	It is applicable to small countries (as an alternative in respect of time, distance, costs and other factors which affect the choice of the seaport for the logistics chain).	It is applicable to small countries (as an alternative in respect of time, distance, costs and other factors which affect the choice of the seaport for the logistics chain).

Source: adapted by the authors with reference to Mangan, Lalwani, Butcher (2008) and Meidute (2012)

The purpose of development of port-centric logistics systems is to discover the unused opportunities and disproportions of economic growth and its employment for the foundation of the development strategy of the activities of port-centric logistics systems and their interactive transport types and modes. In this instance, one of the strategic goals is to achieve long-term competitiveness through the flexibility of port-centric logistics systems in the context of global economy by the strategic decision-making process. The success of this decision-making process depends on its flexibility in respect of the levels of port-centric logistics systems and of the level of small countries' economic systems, i.e. on national and international levels. It is evidenced in quick adaptation of port-centric logistics systems and continuity of the decision-making process. All strategic decisions regarding development and expansion of economic systems in small countries are made in accordance with strategic goals, tasks and political, legal, economic, technological and ecological measurements

of seaports and their activities. It is noteworthy that these goals and processes positively affect the state of environment, its stability reflected in the activities of port-centric logistics systems as well as have an impact on the state of the small country's economic system.

Investment into port and other related transport infrastructure and technological capacity as well as into the land for this infrastructure allows expanding the logistics capacity, increasing its effectiveness and reliability as well as improving the quality of logistics services and enlarging the level of creation of added value (see Figure 2).



**Figure 2.** The impact of investment into logistics infrastructure on competitiveness and economic growth of small countries

Source: adapted by the authors with reference to Masiulis *et al.* (2009)

It allows lower logistics costs, shorter transit times of flows in port-centric logistics systems and favorable business conditions. Thus, the investment process in the port and related infrastructure ensures the productivity of port-centric logistics systems and competitiveness of port-centric logistics systems and small countries' economic systems on different levels, and, as a result, economic growth of small countries and their competitive advantages with the feedback to the investment process.

## 2. Methods

Systemic, logical and comparative analysis as well as synthesis of scientific literature are used as the methods of this research.

For the analysis of the functionality of seaport logistics systems and their particularity, logical and comparative analysis of scientific literature was performed in order to distinguish the purpose of port logistics systems. The levels of the movement of value flows were determined as well. Comprehensive application of the term "logistics systems", which covers all elements of 8 R principle, all logistics processes, functions and operations irrespective of the types of flows (material, financial and informational), was defined by the systemic view on port logistics systems, synthesis method and determined variety of the definitions of logistics systems. Logical analysis

helped determine the importance of port logistics systems in small countries' economic systems and their connections with production and consumption sectors with regard to the stages of development of the concepts of logistics and port-centric logistics systems. The abovementioned methods served to distinguish the significance of port-centric logistics systems for economic systems of small countries and for their competitiveness; the forms of competitiveness were determined according to the forms of ports' competitiveness and the factors of impact and interdependence between port-centric logistics systems and economic systems of small countries were determined in the context of competitiveness of small countries in the conditions of global economy.

### **3. Results**

The research demonstrated that the concept of logistics systems is often identified as the definition of a logistic park, center, cluster, industrial or other integrated systems created in order to sustain logistic activities with the aim to reinforce global and country's competitiveness, to stimulate cohesive development of regions and their economic growth. However, in accordance with the functional purpose, operational diversity and complexity of clusters (parks, centers, industrial systems), the presence of the elements necessary for the system, their interconnections and the synergy effect of their activities, these definitions could be integrated into a generalized concept of logistics systems where logistic clusters, parks or centers become the subjects of the logistics system or its regional-level models.

Having analyzed the particularity of port logistics systems, the authors of the paper determined that the activity of port logistics systems, the usage of their infrastructure with the aim of economic growth become a necessity in global economy; moreover, the aims, tasks and measurements of port logistics systems must be specific, stipulated by the economic and political aims of the country and oriented at long-term competitiveness.

During the research of the concept of a port-centric logistics system in the view of small countries' economic systems, the preconditions of its origin and development tendencies, the authors determined that seaports may be perceived as attraction centers for material, financial and information flows as well as gateways for the economic systems of small countries.

The research demonstrated that port-centric logistics systems enable reducing the costs of the movement of flows, improving the indicators of their circulation by reducing the turn-around time, increasing the effectiveness of consumption of resources and their mobility, minimizing the negative impact on natural environment and ensuring compliance with the security and safety requirements. The possibility to differentiate the processes and activities within logistics systems and the consistency of interconnection between the elements of the system allow ensuring sustainable development of the country's economy, proper allocation of synergy effect determined by the elements of the system and their activities. Thus, as material, financial and information flows move across port-centric logistics systems, their value is increased; this has a positive effect on macroeconomic rates and indexes of small countries as well as increases the competitiveness of their economic systems.

The authors determined the forms of competitiveness of port-centric logistics systems dictated by the levels competition and coverage of ports: between groups of ports or coastlines, ports in different countries, individual ports in the same country, operators or providers of facilities within the same port, different modes of transport on national and international levels (micro and macro levels). The activities of port logistics systems must be investigated using a complex approach and taking into account the factors and levels of the countries' competitiveness. Considering the particularity of port logistics systems, their functionality and effectiveness, economic growth and competitiveness of small countries are based on logistic flexibility; however, the particularity of the countries' economic systems determines the forms and nature of interconnections and processes in the structure of port-centric logistics systems. Therefore, the competitive advantage of a small country could be generated by improving the effectiveness rates and indexes of the activities of the port-centric logistics system as well as by the harmonization of strategic goals, tasks and



measurements of the small countries' economic systems and port-centric logistics systems in these countries.

#### 4. Discussion

It is necessary to distinguish the purpose of port logistics systems and the levels of movement of the flows of economic values when analyzing port logistics systems and particularities of their functionality. When determining the variety of the definitions of logistics systems, it is expedient to describe the comprehensive application of the concept of logistics systems which must cover all elements of 8R principle by implication, i.e. port logistics systems include all processes, functions and operations of logistics irrespective of the types of flows (material, financial and informational) and the logistics system coverage. It is also useful to determine the importance of port logistics systems and their relations and connections with production and consumption sectors according to the development phases of the concept of logistics systems. In this instance, the significance of port-centric logistics systems must be investigated in the context of competitiveness of small countries. It is also necessary to determine the forms of competitiveness of port-centric logistics systems, to substantiate the role of these systems in the formation of competitive advantages of small countries and the increase of competitiveness of their economic systems. It allows distinguishing the factors of impact and interdependence of port-centric logistics systems and small countries' economic systems in respect of their competitiveness and in the conditions of global economy.

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