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The evolution of international logistics in the era of globalisation: opportunities and challenges for business operations

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Abstract: The state of international logistics is closely related to political, economic, and technological changes that take place in the context of dynamic technological development, military threats, and, at the same time, integration of countries in search of partners. The article aims to highlight the main aspects and features of the international logistic development in the globalization context. The methodology included general scientific methods of studying the chosen research object (analysis, synthesis, grouping). The logistics productivity index is considered the leading indicator of the global logistics sector developmet in 2018-2023. The study's results demonstrate the dependence of logistics development on several factors. In the leading countries, according to the Logistics Performance Index, the drivers of change are investments in infrastructure, transport networks, IT communications, technology, digital networks, logistics centres and hubs; logistics education and competence; government support and incentives for the sector; and a stable political and economic environment that fosters investment and innovation. The article highlights the main aspects and features of the international logistics development in globalization condition. The practical value ofthe study lies in highlighting the challenges faced by the logistics sector on a global scale in the context of technological shifts and military threats (the need for investment in maintaining logistics sustainability, changing supply chains, and rising delivery costs).

1 Introduction

International logistics, as a component of global supply chain management, is becoming increasingly important in the economic development of countries in the context of globalisation. Logistics ensures the efficient movement of goods, services and information between countries, regions and companies. Growing demand for efficient supply chains, changing requirements for the speed of transportation of products, rising transportation costs, and the need to consider environmental aspects – all these factors significantly impact the dynamics of international logistics.

On the one hand, the sector has undergone significant changes due to developed countries' governments' trade, investment, innovation international policies. The increased openness of the economies of developed and developing countries has led to an increase in international trade, which has had an impact on international logistics. The sector has significantly strengthened its position, which was also facilitated by technological factors, the development of railway, maritime infrastructure, and highways. On the other hand, political and economic vulnerability and military threats significantly hinder the development of the industry. The rise in energy prices as a result of the war in Ukraine, geopolitical risks and threats affect various sectors of the economy on a global scale, including the need to change supply chains, find new ways to manage logistics. In this context, the state and commercial enterprises face new prospects and challenges related to the factors affecting their dynamics. Despite these threats, logistics companies are evolving and developing thanks to technology, scaling up their operations.

The article aims to highlight the main aspects and peculiarities of the development of international logistics in the context of globalisation.

The study's objectives are the state of international logistics development and the level of its efficiency in different countries of the world, factors and drivers of international logistics development, and opportunitiesa and challenges for the development of international logistics in the context of globalisation.

2 Literature review

In the literature, logistics is defined as a component of Supply Chain Management (SCM) that ensures the planning, implementation, and effective control of the flow of goods and services and allows for the communication of information about these flows between companies, partners, and customers to meet customer requirements [1].

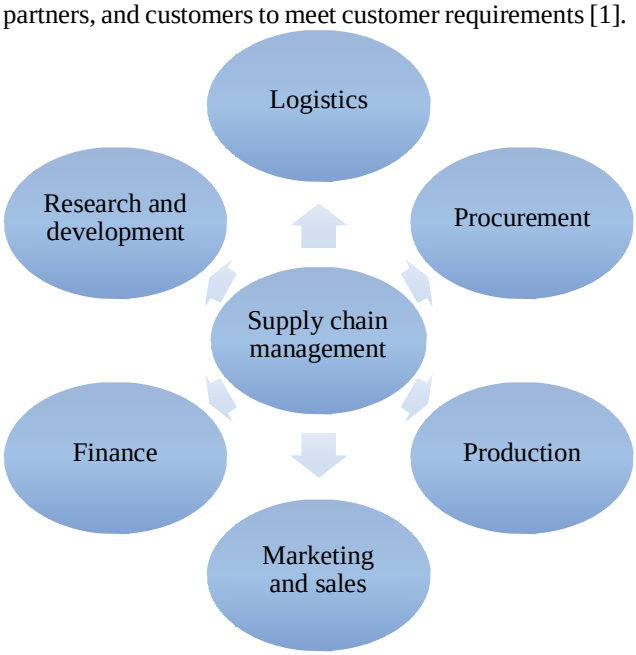

Figure 1 Logistics as a component of supply chain management
Source: Kozma et al. [1]

The critical dimensions of logistics are the system of management, financial flows, material flowas, and informantion flows. Thus, the management system is the basis of logistics, which in today's highly competitive environment is focused on the customer and his needs. Therefore, the management of materials, resources, and informantion flows is aimed at 1) understanding the range of goods and services required by customers; 2) obtaining information and data about customers, their needs and behaviour; 3) understanding the income and potential expenditures of customers for goods and services.

Logistics is also defined as the organization, planning, and coordination of the materials, resources, information, energy, and values within an enterprize logistic system to meet satisfy customer needs in a timely and cost-effective manner [2]. This definition considers the critical goal of logistics - customer satisfaction, which aligns with the modern concept of customer-centric marketing. At the same time, the objects of logistics are the movement of material, resource, information, financial, and technological flows. The subject of logistics is the purposeful management of material, financial, information and technological flows from suppliers to end users.

The primary tasks of logistics include optimisation of the processes of documenting logistics operations (contract logistics) since this process has a regulatory impact on the information flow, and contract agreements are the information base for a logistics operation, i.e. they determine the conditions for the movement of material flow and the volume of financial flow [3].

Logistics as a system can be divided into interconnected subsystems, namely procurement logistics, production logistics, warehousing and distribution logistics, and after-sales (service) logistics.

International logistics goes beyond the internal borders of a country, involving the crossing of flows of tangible and intangible assets across the borders of other countries. International logistics is a field of specialists 'theoretical and practical knowledge and skills focused on organising and implementing technologies and equipment to improve logistics processes, managing and controlling interconnected flows, and servicing the international exchange of material flows, innovations, and services in time and space.

In the literature, the main areas of research on the peculiarities of international logistics development are as follows:

1) the relationship between the logistic sector development and macroeconomic growth (macro level) [3-8];

2) the role of logistics in the activities of enterprises;

3) "sustainability" and logistics, its impact on the environment [9-14].

Hayaloğlu [4], based on a panel analysis of data and indicators of international logistics development in OECD countries for 1994-2011, concludes that it has an impact on international trade and, consequently, on economic growth. Similar conclusions are drawn in Wiederer [7] and Gani [6], which find a significant link between logistics productivity and trade. Chua et al. [8] find a relationship between the state of transport and logistics infrastructure and international trade between China and its main trading partners in the textile sector. Saidi et al. [15] found significant causal relationships between transport, logistics, foreign direct investment, and economic growth in developing countries in 2000–2016. Transport and logistics infrastructure is a factor in the inflow of foreign investment. At the same time, Blyde and Molina [5] found that a developed logistics infrastructure facilitates investment in logistics service-dependent industries.

3 Research methodology

The article uses the analysis and synthesis metods to characterise the peculiarities of international logistics development in the context of globalisation. The World Bank data are used to assess the development and state of international logistics of countries, namely the Logistic Performance Index and indicators of the level of globalisation (share of trade in GDP). Table 1 shows the six components of the Logistic Performance Index and their brief description.

Table 1 Logistic Performance Index components

Component	World Bank explanation
Customs	The efficiency of border and customs management clearance.
Transport infrastructure	The quality of transport and trade infrastructure in country.
Services quality	The quality and competence of logistics services.
Timeliness	The frequency with which shipments reach consignees within the expected delivery times.
Tracing and tracking.	The ability to trace and track consignments.
International shipments	The ease of arranging competitively priced shipments.

Source: based on [16,17]

The LPI is an interactive tool for conducting a comparative analysis of countries' existing problems, challenges and opportunities for developing the international logistics sector. The Index also provides a more detailed and comprehensive picture of supply chain performance and constraints in more than 100 countries across the globe based on the following parameters: time, distance, reliability, quality of domestic infrastructure, services, customs and related services. Experts are surveyed in eight countries to calculate the Index and assign scores to the above components from 1 to 5 (1 – low productivity, 5 – high logistics productivity). The survey is conducted among respondents who are experts in international transport and logistics.

We used information from UN Trade and Development [18], European Security and Defence [19], European Parliament [20], and International Transport Forum [21] to highlight the challenges of international logistics development.

4 Results

The development of logistics is closely interconnected with various factors that stimulate the development of infrastructure (ports, roads, railways) and support its continuous operation. The most developed European countries generally have a high degree of efficiency in logistics activities, which is associated with economic stability, government programmes supporting the sector, and investment and innovation policy.

In 2018, the countries with the highest logistics efficiency were Germany, Sweden, Belgium, Austria, Japan, and the Netherlands (Table 2). By comparison, in 2023, the leaders are Singapore, Finland, Denmark, Germany, the Netherlands, and Switzerland, which achieved greater efficiency by improving infrastructure, logistics competences and quality of logistics, tracking of material flows, timeliness of logistics, and customs. At the same time, GDP growth rates in these countries were below average in 2018-2019 (less than 2%), and in 2020 they declined (the average for countries was 3.59%) [22]. In 2021-2022, the average GDP growth rate was 4.06% [22], but the economies of the leading countries in the Logistics Productivity Index demonstrated the ability to recover from the crisis.

Table 2 Grouping of countries by Logistics Productivity Index in 2018, 2023

LPI score	Countries 2018	Countries 2023
More than 4	Germany, Sweden, Belgium, Austria, Japan, Netherlands	Singapore, Finland, Denmark, Germany, Netherlands, Switzerland
3 - 4	Singapore, Denmark, United Kingdom, Finland, United Arab Emirates, Hong Kong SAR, China, Switzerland, United States, New Zealand, France, Spain, Australia, Italy, Canada, Norway, Czech Republic, Portugal, Luxembourg, Korea, Rep, China, Taiwan, China, Poland, Ireland, Qatar, Hungary, Thailand, South Africa, Chile, Slovenia, Estonia, Israel, Panama, Vietnam, Iceland, Malaysia, Greece, Oman, India, Cyprus, Indonesia, Turkey, Romania, Croatia, Côte d'Ivoire, Mexico, Bulgaria, Slovak Republic, Lithuania, Saudi Arabia	Austria, Belgium, Canada, Hong Kong SAR, China, France, Japan, Spain, Taiwan, China, Korea, Rep, United States, Australia, China, Greece, Italy, Norway, South Africa, United Kingdom, Estonia, Iceland, Ireland, Israel, Luxembourg, Malaysia, New Zealand, Poland, Bahrain, Latvia, Qatar, Thailand, India, Lithuania, Portugal, Saudi Arabia, Turkey, Croatia, Czech Republic, Malta, Oman, Philippines, Slovak Republic, Slovenia, Vietnam, Brazil, Bulgaria, Cyprus, Hungary, Kuwait, Romania, Botswana, Egypt, Arab Rep, North Macedonia, Panama, Bosnia and Herzegovina, Chile, Indonesia, Peru, Sweden, Uruguay, United Arab Emirates

Source: compiled by the author according to Logistic Performance Index [17]

Germany is a leader in Europe, ahead of France, the UK and the Netherlands, in terms of international logistics development. Several factors contributed to this: innovation, technology and quality logistics services; development of a logistics hub and a comprehensive, extensive infrastructure that combines transport networks

with IT communications; leadership in the quality of logistics education; stimulation of the sector's development at the state level by the Federal Ministry of Digitalisation and Transport, development of industry incentive and support programmes; politically and economically stable investment environment that promotes logistics sustainability and competitiveness [23]. The volume of investments in transport infrastructure and its support in Germany amounted to EUR 271.6 billion in 2018-2022 (land transport, rail, roads, water transport, maritime transport, aviation) [24].

The factors behind the high level of logistics productivity in the Netherlands include high-quality air transport, efficient seaports, the high availability of logistics infrastructure within Europe, and new technologies, digital networks, and solutions. The country's average GDP growth rate for 2018-2023 was 1.85% [22]. The volume of investments in transport infrastructure and its support in the Netherlands amounted to 92.7 billion euros in 2018-2022 [24]. More than 10% of the country's specialists are employed in the logistics sector, which helps to develop its innovative component [25]. Therefore, the country has significant opportunities for distributing material flows and a reliable supply chain. Following the UK's exit from the EU, the level of investment in Dutch logistics is growing, particularly in distribution networks and logistics centres, which greatly simplify trade operations in global markets. The growing interest of foreign freight carriers in Dutch logistics has also stimulated the industry development. More than 1000 American and Asian companies have centralised their distribution activities in the country by investing in logistics projects [25].

In Finland, logistics development is driven by economic growth, which has allowed the government to invest in road infrastructure and a favourable geographical location [26]. According to the World Bank, the average annual GDP growth rate was 0.524% in 2018-2023 [22]. The volume of investments in transport infrastructure and its maintenance in Finland amounted to €24.4 billion in 2018-2022 [24]. Accordingly, these factors also led to an increase in private investment in the logistics sector. In addition, due to the high share of small and medium-sized businesses, the country's economy remains stable, which positively impacts logistics. In addition, the country is also developing green logistics, with the logistics infrastructure transitioning to a more environmentally friendly one. For example, the country has zero-carbon airports and electrified ports and is transitioning to electric transport [27].

Favourable geographical location, developed infrastructure, including port infrastructure, and economic growth have contributed to the development of the Danish logistics sector. From 2018 to 2023, the country's average GDP growth rate is estimated to be 2.08%. The volume of investments in transport infrastructure and its support in Denmark amounted to EUR 5.4 billion in 2018-2022 [24]. The Port of Aarhus handles 70% of the country's total container sales. The electricity grid's reliability is also one of the country's strategic advantages [26].

Austria, Belgium, Canada, Hong Kong SAR, China, Sweden, the United Arab Emirates, France, Japan, and Spain recorded a relatively high level of logistics efficiency in 2023. However, globally, most countries are either in the middle of the logistics productivity spectrum (3–4 points) or in the lower middle (2–3 points).

As shown in Figure 2, there is a direct, low correlation between the Logistics Productivity Index and the level of economic openness, expressed as the share of trade in GDP. It should be noted that a predominantly open economy characterises countries with a logistics productivity score of 2-3, expressed as a share of trade in GDP, of 50% to 100%. At the same time, countries with logistics productivity scores of 3-4 and above are generally characterised by a tendency to have a higher share of trade in GDP.

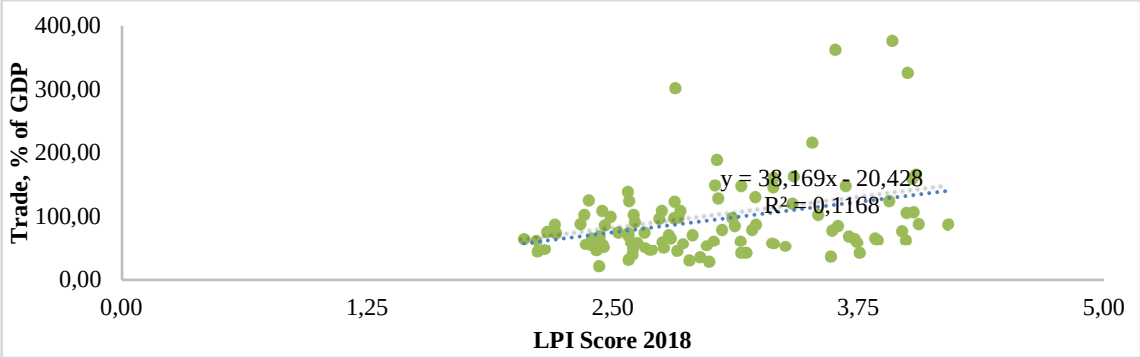

Figure 2 Correlation between the Index and the share of trade in GDP in different countries in 2018
Source: compiled by the author based on [17,22]

In 2023, this correlation is still relatively low despite a slight increase in the correlation between the Logistics Productivity Index and the share of trade in GDP in different countries. This is due to significant variation between countries, both in the trade development, and growth with other countries and in the presence of other export and import growth drivers.

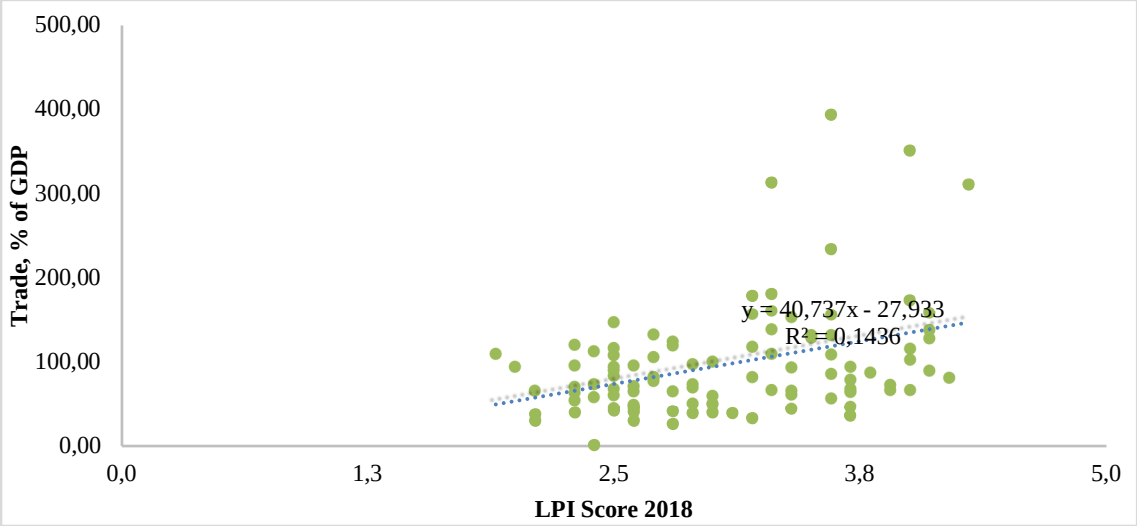

Figure 3 The relationship between the Logistics Productivity Index and the share of trade in GDP in different countries in 2023
Source: compiled by the author based on [17,22]

The development of international logistics depends on political, economic, geographical and technological factors. The sector dynamics have been particularly affected by technological changes, such as the Fourth Industrial Revolution, which has contributed to the automation of logistics operations and processes. Industry 5.0 focuses on automation of logistics businesses: large organizations automate processes to increase flexibility and respond quickly to customer demands. However, the desire to meet market needs will become a challenge for international logistics [28]. Digitalisation has created challenges and needs to restructure logistics operations, processes and functions. This will require significant investment from both national governments and leading service providers. Additionally, the industry needs to ensure resilience during the war in Ukraine and the disruption of logistics links. The ports and transport links in the Black Sea region have been particularly affected by the invasion, which has led to increased demands on maritime and land transport infrastructure and services. Global demand for ships and shipping costs have increased significantly. The main challenges in developing international logistics in the context of globalisation are shown in Figure 4.

Figure 4 Key challenges in the development of international logistics in the context of globalisation
Source: compiled by the author [18,20,21]

The war in Ukraine has led to difficulties with the availability of technology and equipment, both in the security and defence sectors and the energy, transport, and warehousing sectors. The destruction of seaports has hurt

food security globally, as 90% of agricultural exports were exported through the Black Sea before the war. As a result, European supply chains were disrupted [21].

5 Discussion

In general, the study's findings demonstrate the emergence of new challenges in the logistics sector, which correlates with the conclusions presented by scholars who have studied this issue. The digitalisation of the logistics sector in the context of globalisation is changing supply chains. In addition, such changes are influenced by customer requirements, product characteristics, and a new philosophy of production and service [29]. Traditional mass production is being replaced by serial, unique, personalised production [4,30]. Technological development and individual use of information and communication technologies have created new challenges and opportunities for logistics on a global scale [31,32].

At the same time, the research results indicate specific differences compared to the works of scholars in this area. The study results indicate a direct low correlation between logistics and trade efficiency in different countries. Gani [6] shows a positive, statistically significant impact on overall logistics productivity with exports and imports (mainly exports), and continuous investment in logistics infrastructure positively impacts international trade. Bensassi et al. [33] also conclude that logistics significantly impacts a country's exports (based on the case of Spain). In particular, this impact is due to geographical location, transport infrastructure and accessibility. Munim and Schramm [34] prove the importance of continuously improving the quality of port infrastructure through investment to ensure the growth of logistics productivity, which increases international trade and economic growth. Bugarčić et al. [35] show a positive statistically significant relationship and impact of international logistics, measured by the Logistics Productivity Index for 2007 and 2018 in Central and Eastern Europe, on trade between countries. Thus, in general, our results align with the findings of studies on the importance of investment and development of transport infrastructure for improving logistics productivity.

6 Conclusion

International logistics is developing in a challenging political and economic environment. The experience of the leading countries in the Logistics Productivity Index shows that positive changes in the efficiency of the logistics sector are driven by economic sustainability, investment in infrastructure and transport networks, expanding the availability of infrastructure, research and development, and the development of education and competences. The experience of logistics development in developed European countries demonstrates the importance of combining several factors to ensure positive changes in the industry. The experience of Germany, the Netherlands, Finland, and Denmark shows that governments have chosen different strategies and policies for logistics development. Germany has achieved a high level of productivity in the sector due to government programs, the development of high-quality logistics services, innovation, technology, investment, and the development of an extensive infrastructure network. In the Netherlands, the volume of public investment in transport infrastructure is somewhat lower, and the industry is driven by the quality of transport, the efficiency of port infrastructure, technology, and digital networks. Finland and Denmark also have lower levels of investment in transport infrastructure, and in these countries, the government focuses on sustainable economic development and environmental friendliness. Thus, government incentives and infrastructure development programs are creating new opportunities for logistics development, which vary significantly from country to country. The openness of the economy and the level of globalization are interconnected with the state of logistics productivity. In general, the productivity of this sector has a positive impact on a country's export opportunities. In the context of growing military risks and threats, there is a need to move to sustainable logistics. This practice is most typical in Denmark. In most countries, logistics development is average or below average. There is a low degree of direct correlation between logistics efficiency and trade. A higher level of trade integration characterises countries with average logistics efficiency. In contrast, a lower share of trade in GDP characterises countries with below-average logistics productivity. In the context of globalisation, the development of the international logistics sector is characterised by its dependence on political, economic, and technological factors, challenges, and the level of political and economic integration of countries. Further research should focus on identifying the relationship between these factors and the state of the international logistics sector.

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