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The Growing Importance of E-Commerce as a New Trend Factor Shaping in Rail Transport between Asia and Europe

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Abstract:

Purpose: *The aim of this research is to assess and discuss the impact of the growing importance of e-commerce on increasing rail transport between Asia and Europe.*
Design/Methodology/Approach: *The starting point for the study is the importance of East Asian countries (especially China) as suppliers of goods in the global economy. The European Union is the second largest sales market in the world. Economic exchange between them increases as a result of the popularization of e-commerce and its constant growth. Quantitative data related to the share of e-commerce in total retail sales, transport data from the rail transport market, published by operators and transport companies, have been used. The analysis of trends in the volume of loads handled by rail carriers in selected trade cycles was also used.*
Findings: *The constant increase in the popularity of online shopping, determinates e-commerce impact on the transcontinental rail forwards. A remarkable increase of importance of container transport by rail is noticeable. Branch transport markets struggle with various problems of different scale and origin, which periodically weaken their position in supply chains. Rail transport between the Asian and European Union markets shows an upward trend even in periods when competing modes of transport (sea, air) show a decline. E-commerce affects the number of containers connections along the Eurasian corridors.*
Practical Implications: *Optimization of deliveries consider the factor of time and unit costs as one of the key factors in the efficiency of the supply chain. Consequently, improving service quality is a decisive factor in the competitive advantage of e-commerce enterprises. The identification of upward trends in Trans-Eurasian rail transport is desirable from the point of view of the organization of supply chains and is justified by pro-environmental premises. Data can be compared with other transport branch.*
Originality/Value: *The study deals with an important aspect of international exchange and the relationship between key markets. It is based on data that additionally includes trends in a specific period (the coronavirus epidemic caused changes on a global scale). The results may contribute to the reconfiguration of parts of the supply chains and their optimization.*

Keywords: *E-commerce, Trans-Eurasian transport, supply chain management, containerization of rail shipments.*

JEL codes: *L81, N70, O18, R41.*

Paper type: *Research article.*

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1. Introduction

E-commerce, understood as "doing business on the Internet", covers any transactions between the organizations and people, although as indicated by the literature analysis, B2B and B2C is most important in terms of market size. The rise of e-commerce and the digital marketing, has changed the composition of consumer buying behavior and expectations. Demanding delivery schedule challenges traditional logistics and supply chain models as companies are now forced to adjust their strategies to provide the low-cost and on-demand delivery service that consumers now demand.

Logistics service providers are trying to minimize logistics costs (related to transportation, stock, data processing etc.) while meeting the requirements from the shippers. The requirements have become sophisticated and costly, for instance temperature control, time-window delivery or tracking information services. Customers like to maximize consumer surplus by purchasing favorite goods conveniently at reasonable prices. The important aspect is that the price is one of the factors affecting consumer's satisfaction. They are willing to pay more money if quality goods are delivered just in time. At the same time, the consumers are the residents suffering from traffic congestion, traffic accidents, and environmental problems. Therefore, they expect that these problems be alleviated and a comfortable environment is maintained (Nemoto *et al.*, 2001). The dynamics of the supply chain are fundamentally shifting as companies are augmenting traditional long-haul delivery with *just-in-time* delivery and suppliers are transitioning from multiple storage facilities to single warehouse locations to meet local needs. E-commerce represents a growing share of the retail market. Reports indicate that e-commerce accounted for 14.3% of all retail sales in 2018, up to 15% year-over-year. In fact, it is estimated that e-commerce sales will reach 17.5% of retail sales worldwide by 2021. This exponential growth and demand will undoubtedly impact the logistics and transportation industry as they will need to be prepared to manage increased volume and delivery expectations (Sasso, 2019).

In long-distance forwards, it is increasingly important to effectively ensure constant, cyclical deliveries using a means of transport that guarantees mass and possibly reliable supply or distribution. The paper attempts to indicate the relationship in terms of the growing demand for goods and the observed increase in container transport in the Eurasian space.

2. E-Commerce and its Impact on Transport Review

Electronic commerce has evolved over the years to become a major channel through which businesses can exchange goods and services, coordinate production, and market to customers. By harnessing the power of the internet, electronic commerce has changed the way in which organizations conduct business. The ever-increasing sophistication of websites, intranets and extranets, has led to advanced web

applications being used to address the needs of customers (Ohene-Djan, 2008). E-commerce affects three main stakeholders, namely the economy, entrepreneurs, and customers. To understand e-commerce, it is important to identify all areas of the economy that are affected and not just to focus on the seller-customer relationship. These include the flow of information and products in the procurement, transport and distribution process, as well as reliability and safety issues, in addition to access costs, social divide and difficulties in controlling the Internet (Shahriari *et al.,* 2015).

Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle although it may also use other technologies such as e-mail (Clement, 2020). E-commerce allows customers to overcome geographical barriers and allows them to purchase products anytime and from anywhere. Consumers gain power through online shopping. They are able to research products and compare prices among retailers. E-commerce technologies cut transaction costs by allowing both manufactures and consumers to skip through the intermediaries. This is achieved through extending the search area best price deals and by group purchase. The success of e-commerce in urban, regional and global levels depend on how the local firms and consumers have adopted the e-commerce (Evans, 2002).

Transport related effects of e-commerce have been studied from various angles, ranging from private mobility to freight mobility, commodities purchased, spatial scale, and population involved. First, reaching a single conclusion regarding the impact of e-commerce on travel is complicated and far from trivial which mobility effect(s) dominate(s) heavily depends on the definitions, assumptions and research methodology. Most studies involving only respondents with affinity for internet use indicate that e-shopping is likely to lead to some shift from personal travel to freight forwarding (Rotem-Mindali *et al.,* 2013). Nevertheless, the comprehensive picture is much more intricate. B2C and C2C e-commerce leads to more freight trips and more freight transport kilometers. A first reason why more freight forwarding is expected is that e-shopping leads to substitution of personal travel with home delivery (Cohen, 2000; Dodgson *et al.,* 2000; Anderson *et al.,* 2003). In addition, more FT kilometers are assumed due to the fact that the internet provides consumers with the opportunity to contact and purchase from distant retailers and manufacturers that can be located anywhere on the globe (Nemoto *et al.,* 2001; Hesse, 2002; Visser and Lanzendorf, 2004).

More goods movement is also possible because B2C and C2C e-commerce increase the number of goods that are purchased, since consumers can purchase more goods with the same amount of money. It is often suggested, that e-retailers offers lower prices than bricks-and-mortar retailers due to lower search costs for buyers and lower operating costs for sellers. The internet also stimulates the sale of highly discounted perishable items, to the extent that consumers do purchase additional goods for a given amount of money, freight forwarding is likely to increase (Nemoto *et al.,* 2001; Mokhtarian, 2004).

In some studies, different approach can be met. As e-commerce grows every year at rates that vastly exceed brick-and-mortar store sales, it is leaving no mode or segment of the international logistics chain unaffected (Tirschwell, 2018). However, since the change in the method of managing supplies, optimizing the use of warehouses and the growing importance of just-in-time necessitate redefining logistics chains. Logistics, next to marketing, plays a key role in e-commerce. This is a complex dependency between the supply and distribution. The unifying factor is most frequently the program which e-shop is based on, as well as, those which serve as a CRM with additional warehouse management and forwarding functions. The change in client's preferences results in the need to optimize the use of means of transport and the method of transporting parcels which is particularly visible in the macroeconomic approach, relating to the exchange of goods on a transcontinental scale. With no sign whatsoever that e-commerce sales will slow the impact promises to be even greater in years to come. E-commerce is changing the basic economics of freight markets. Although the last-mile impact of e-commerce attracts the most headlines — whether it is options to order by computer and pick up from the store, stores fulfilling e-commerce orders, or futuristic ideas such as drone delivery — the impact is being felt.

From a cargo handling point of view in recent years, as full containerload rates weakened, LCL (less than a container load) fell out – it was cheaper to ship smaller volumes as the only shipment within a 40-foot container even if much of the container remained empty. With full containerload rates headed higher, albeit in fits and starts, LCL is drawing greater attention because it now makes more sense to ship smaller parcels — frequently driven by e-commerce — within a consolidated container including multiple shipments from several shippers. When goods arrive at ports, changes are visible as well. To speed their onward movement to distribution centers located near major consumer markets, the shippers prefer to take control of goods as soon as possible. An original viewpoint is to divide "Business" into "Shipper" (e.g. suppliers, manufacturers, wholesalers, and retailers) and "Logistics Service Providers" (e.g. freight carriers, warehouse firms, and third party logistics).

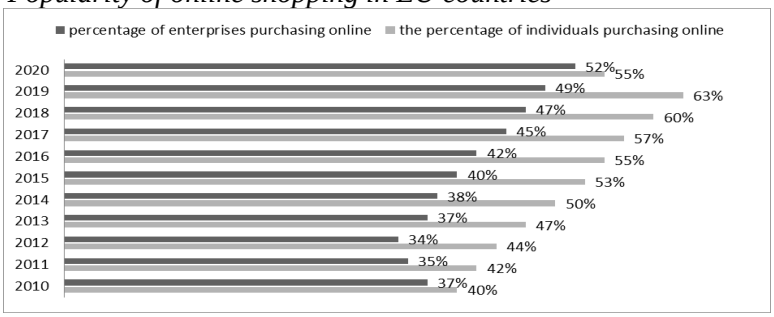
B2B usually means the transactions between shippers (S2S). It seems effective for us to distinguish the transactions in the market of logistics services, between Shipper and Logistics service provider (S2L) and between Logistics service providers (L2L). E-commerce affects the goods flows in tons in the following way. For B2B, the Internet has made possible that letters, reports, memos and other business correspondence can be formatted and sent in a digital way. Although the mail is collected anyway and the product replaced may have a low weight, the dematerialization of correspondence can diminish the goods flows in tons (Nemoto *et al.,* 2001). In e-commerce-related logistics, data infrastructure and information management are crucial to optimize routes, speed up deliveries, improve energy efficiency, and increase the operational capacity of distribution and reverse logistics, as well as to make the entire system more environmentally friendly (Fikar, 2018).

3. Global Trends in E-Commerce

Cross-border e-commerce is the sale or purchase of products through online stores from other countries. The buyer and seller are located in two different places in the world, may use different currencies and languages, and have different rights to which they are subjected. E-commerce markets are growing at noticeable rates. The online market is expected to grow by 56% in 2015-2020. In 2017, retail e-commerce sales worldwide amounted to 2,3 trillion USD and e-retail revenues are projected to grow to 4,88 trillion USD in 2021 (Clement, 2020). Thus, global e-commerce sales are projected to show 20% growth, which is a huge number for business and certainly a steady trend with no signs of decline. Same steady growth goes to the share of e-commerce when it comes to its global share of retail from 10,1% in 2017 and 11,6% in 2018 (Dobreva, 2018). In 2019, e-retail sales accounted for 14,1% of all retail sales worldwide. This figure is expected to reach over 16% in 2020 and 22% in 2023 (Clement, 2020).

Recent research clearly indicates that electronic commerce presently shapes the manner in which people shop for products. This is confirmed by the data relating to the growing importance of the online sales retail. Today, China is the world's biggest e-commerce market (E-commerce share of total retail sales is 15.9%), with an annual growth rate of 35%. China is also one of the fastest-growing e-commerce markets. Overtaking the US (7.5% of e-commerce share of total retail sales), UK (14,5%), Japan, (5,4%) Germany (8,5%) and France (5,1%). South Korea, Russia, Canada and Brazil occupy the remaining places in the ten largest E-commerce markets in the world by Nielsen's Global Connected Commerce report. Activist investors are trying hard to consolidate and slash their overall cost and the governments in western countries continue to impose more regulation on CPG manufacturers. Figure 1 shows the increase in the share of e-sales in the EU countries (data for 2020 are a forecast).

Figure 1. *Popularity of online shopping in EU countries*



Source: *Eurostat database.*

According to Eurostat data, the popularity of e-shopping in EU countries has increased over the last 10 years by over 20% among individual customers and by

15% among enterprises. Technology is no longer an option, it is essential in virtually all aspects of our lives. The biggest changes were introduced in the way of communicating and buying.

4. General Trends in Transport between Asia and Europe

Global economy by and large depends on the ability to deliver high-quality products at competitive prices to consumers worldwide. According to UN data, in 2018 64% of containers handled by sea transport were loaded or unloaded in ports in Asia, another 16% in European ports. At the same time, containerized trade, which is essential for e-commerce, on major East–West trade routes between Europe and Asia reached a value of 24,4%. The share of containers in sea transport in this relation has been growing consistently since 2015. The phenomena observed on the maritime container transport market over the last 5 years, especially the increase of the fleet of large container ships and, consequently, the decrease in transport rates may seem favorable from the customer's point of view. However, this does not matter for optimizing the delivery time, which is particularly important in e-commerce.

In April 2017, as a result of changes in the maritime operators' market, three alliances (2M, Ocean Three Alliance, G6 Alliance and CKYHE Alliance) remained active instead of the four. They account for a total of 98,8% of the fleet operating between Europe and Asia. In maritime transport, the division of ships into alliances helps carriers increase the frequency of services without introducing new units. At the same time, it is estimated that there is a controlled harmonization in alliances, although it is not allowed by law.

Air transport is predestined to handle a fairly narrow group of goods, primarily of high value, therefore it remains important for a relatively small part of e-commerce deliveries. Regarding to the *International Air Transport Association* (IATA) data, in recent years, air cargo transports over 6,8 trillion USD worth of goods, accounts for approximately 35% of world trade by value (less than 1% of world trade by volume) and transports commodities that are vital to the growth of new economies and the continuing prosperity of established ones. Air cargo becomes the new booming sector in, strengthening economies and e-commerce.

However, the year 2017 was a volatile year for the air cargo business due to consolidation in ocean freight, frequent strikes in Europe and airlines cutting down on scheduled freighters among other factors. This resulted in massive delays in airfreight. However, due to complications from the progressive spread of Covid-19 and the resulting restrictions, global air cargo capacity is down by 35% and only 20% of belly cargo is still flying by *the International Air Cargo Association* (TIACA) reports.

5. The Importance of Rail Transport in Europe-Asia Freight Connections

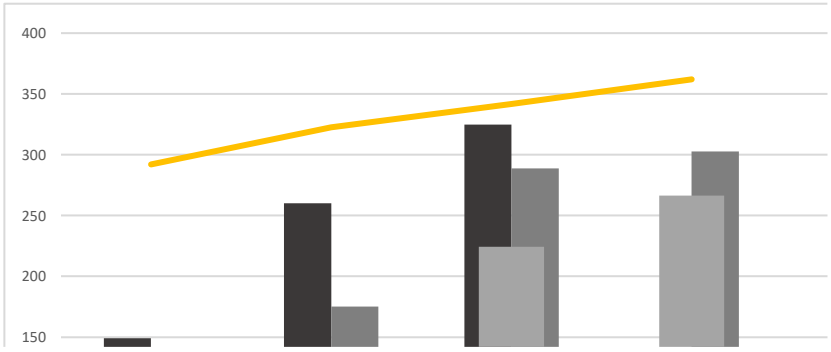
The question that needs to be answered at the stage of analyzing the importance of freight transport between Asia and Europe is why is the existence of land transport connections in this relation important for both parties? There are several reasons according to Kaplan (2016). Firstly, new transportation routes will enable to provide lower transport costs, faster freight times, more reliable transit links and new trade opportunities. Secondly, the trade volume between China and Europe will be expanding in the long run. If volumes grow and costs come down, it could become viable to transport substantial proportion of goods between the parties. Thirdly, China's middle-class spending power coupled with an outward-looking and adventurous attitude toward new brands, including those from overseas, is potentially a huge new opportunity for European companies. Fourthly, without fast rail solutions to Europe, Chinese companies may face heavier competition from such areas as Southeast Asian, Vietnam, Indonesia), which have lower labor costs and enjoy shorter transit times by the sea. E-shop operators, as the largest players on the e-commerce market, strive to optimize the use of shipment routes directed to customers. According to the results of research commissioned by UPS, published in the UNECE report, delivery of goods by road using the Chengdu (China), Lodz (Poland), Zhangzhou (China), and Hamburg (Germany) container train is twice as fast compared to sea transport and has 70% price advantage compared to air transport.

The volume of goods transported by rail between China and Europe is constantly growing. In the years 2013-2016 it increased fivefold. In the first six months of 2017, the volume of goods transported by rail increased by 44% compared to the same period in 2016 (Doński-Lesiuk, 2020). According to the China State Railway Group Company (CR), 815 container trains were launched in 2015 on the China-Europe-China route (550 from China, 265 from Europe). Deutsche Bahn (DB) informs that 400 direct container connections with China were launched in 2015 (30 thousand containers in total). In 2020, DB has planned to service 100 thousand containers from China. In 2017, 3.6 thousand trains were handled from China to the EU (and vice versa). In 2018, about 6.3 thousand trains. There is an upward trend in terms of transporting goods to China, in 2017 35% of them left the EU for China and in 2018 it was already to 43% (Szymczak, 2019). Regarding to the Organization for Cooperation of Railways (OSJD) data, the change of the number of launched container connections from 1 to 500 took 4 years, from 501 to 1.000 7 months, from 1.001 to 1.500 5 months, and from 1501 to 2000 only 3,5 months.

Unlike air transport and shipping, the current situation triggered by the Covid-19 pandemic has not changed the above-mentioned growth trends in rail forwards. CR data shows 2.920 trains on Asia-Europe routs between January and April 2020, carrying 262 thousand TEU (up 24% year-on-year). In August 2020 the number of monthly trains hit a record of 1.247 (up 62% compare to 2019). August was also the

sixth consecutive month that China–Europe freight train traffic registered double-digit percentage growth year-on-year. How much traffic increased (despite the initial drop at the peak of the pandemic in China) can be seen in the statistics for the CR terminals. While in 2019, maximum of 10 trains were cleared and accepted daily in Alashan (Xinjiang China - Kazakhstan border point), in February 2020 5 trains, in March 2020 11 trains, in April 2020 14 trains, in June 2020 19 trains a day. In the first half of 2020, the Changan terminal in Xian (Shaanxi, Central China) cleared 1.667 trains to Europe. This means almost a twofold increase in traffic year-on-year. The weight of the shipped cargo increased similarly, reaching 1,3 billion tons (Czubiński, 2020). Figure 2 shows the increase in the volume of rail container freight between China and the European Union (thousands of TEU) against the background of the dynamics of Chinese exports of goods to the EU market (EUR million). Data on the number of containers (vertical bars) differ due to a different scale of statistical data in individual sources (analysis of selected railways, selected corridors, etc.).

Figure 2. *The volume of container transport by rail against the backdrop of an increase in China-Europe exports*



Source: *Own compilation based on the transport volume data of the Directorate General for Regional and Urban Policy (DG REGIO), Eurasian Rail Alliance Index (ERAI) and United Transport and Logistics Company (UTLC ERA) and EC Directorate-General for Trade data on trade exchange.*

The growing importance of container transport by rail in the Asia-Europe-Asia routs is also confirmed by the data of Russian Railways (RZD). During 2016–2019 steady growth has taken place in trend towards containerization of goods, which led to an increase in container cargo flows in export and transit directions. Thus, in 2018 Russian rail export shipments of containers amounted to 900 thousand TEU, transit container traffic, 377 thousand TEU. The container market in Russia grew by 9% at the end of 2019. High rates of market growth were supported by two segments transit (+22%) due to routes between China and Europe and exports (+14%). In 2020, RZD expects growth rate of 7%. On the one hand, forecasts of key macro parameters of the Russian economy in 2020 are more positive than in 2019, which implies an increase in entrepreneurial and consumer confidence and, as a consequence, an increase in the import direction. We also expect an increase in

freight traffic in transit from Japan and Korea to Europe. According to Russian analyzes of the logistics sector, the boom in transit through Russia on the China-Europe route took place in 2018-2019.

6. Conclusions

The existing infrastructure of Euro-Asian inland routes as well as ports facilities provide good potential opportunities for further development of inland transport of goods between Europe and Asia. However, competition of transport routes on the Euro-Asian continent was not about the simple choice between transport routes and/or transport modes. It is the competition of logistic decisions based on intermodal services and value-added services and focused on the needs of particular supply chains. Those require regular services, high punctuality, flexible costs, value added services availability, delivery speed appropriate for certain types of cargo. Any transport route within the Eurasian continent would be able to attract traffic if it was competitive in the context of supply chains.

The modernization of the Trans-Eurasian transport corridors, including the improvement of the condition of the railway infrastructure, construction and expansion of border terminals at the junction of railway lines with different track gauges, directly affects the competitiveness of supplies. This is happening not only due to the increase in capacity and transport capacity, but also the implementation of favorable legal solutions.

The carriage of freight between Europe and Asia is governed by two different legal regimes the CIM Uniform Rules and the SMGS Agreement. At the interface between these two legal regimes, shipments have to be reconsigned and a new consignment note has to be made out. The implementation of the common CIM/SMGS consignment note simplifies and accelerates rail cargo transport on the West-East and East-West axis. It is known as a bank and customs document. The advantages also include a shorter transit period by reducing the time spent with filling in the CIM/SMGS interfaces. Also, the governmental authorities acknowledge the bill for carried goods attached to the consignment note as customs paper, if a credit letter is also attached. A software product is available to complete and imprint the consignment note and to deliver the data it includes. This consignment note is an alternative to the classic transport system which implies the transcription of the SMGS consignment note to a CIM consignment note or the CIM consignment note to a SMGS consignment note to the re-dispatching place. Solutions unifying various spaces of cross-border exchange of goods favor shortening of the delivery time. Thus, the competitiveness of railways as an efficient and competitive mode of transport increases.

The development of e-commerce has triggered the emergence of logistics models based of outsourcing of services. The most complete form of this model is fulfilment

– transferring the service to companies specializing in such operations and not to the supplier, the importer, etc. Transfer of logistics into the hands of specialized companies allows for combining the interests of the customer and the supplier. Consumers have become accustomed to extremely quick delivery and, as more retailers offer fast, free shipping options, logistics companies need to adapt to the ever-increasing delivery pressures that align to evolving consumer expectations and preferences. As e-commerce continues to rise, it is likely that companies will need to continue to adjust business models to accommodate the fast, free and convenient delivery service that consumers demand. The optimization of technical, legal and organizational solutions in rail transport determines the natural direction for e-commerce operators in the use of container rail connections. This is confirmed by statistical data and sector-specific market trends.

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