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Hinterland transport services of the Ports of Szczecin and Świnoujście – a comparative analysis

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Abstract

Seaports are important points in international supply chains. As hubs for several transport sectors, seaports are an essential element of transport corridors. Over the years, the types of cargo moving through the ports in Szczecin and Świnoujście have changed significantly. In the last two decades, the largest transhipments were typically coal, grain and other bulk cargoes; this is reflected in the share of total hinterland shipments transported by different transport methods. In 2005, more than 2/3 of the cargoes delivered to and from the ports of Szczecin and **Świnoujście** were transported by rail.

Rail transport continued to account for the leading share of hinterland transport until 2011, when road transport started to dominate (46.3% of cargo carried by rail and 47.50% by trucks). This is indicative of a correlation between the type of cargo and its mode of hinterland transport. With an increase in general cargo transhipments, the share of shipments travelling to and from the ports by road transport has increased. In turn, the fall in coal shipments is reflected in rail transport's share decreasing. In 2005, 3.8% of coal was transported by roads and 80% by rail. In the following years, despite the decrease in the share of global transhipments accounted for by coal, road transport's use for coal transport increased. This indicates that the type of cargo is not the only factor influencing the relative contributions of different modes of transport to hinterland travel.

Introduction

Seaports are important points in international supply chains. As hubs connecting several branches of transport, seaports are a key component of sea-land transport corridors (Kotowska, Mańkowska & Pluciński, 2016). The transport accessibility of the seaport and its technical equipment (transhipment potential) determine the nature of the port's specialization with regard to cargo types handled. Over the years, the type of cargo shipped via ports in Szczecin and Świnoujście has changed significantly. Volumes of bulk cargo, coal and grain are currently losing their market share in ports, while the quantity of general cargo handled in seaports is increasing. Changes in the type of cargo handled in ports are reflected in changes in the share of total shipments, to and from seaports, accounted for by different transport modes (Pietrzak, 2010). Nevertheless, the nature of the cargo is not the only reason for the decreasing share of rail transport in hinterland transport from the ports of Szczecin and Świnoujście.

The aim of this article is to analyse and evaluate the hinterland transport of the ports of Szczecin and Świnoujście. For analysis, data from the ports, concerning their transport handling between 2005 and 2015, was used.

Characteristics of cargo handled by ports in Szczecin and Świnoujście

Transport is an instrumental need arising from the implementation of specific tasks *reported by the economy and the public, due to the need to move people, loads and messages at a certain time to a specific location* (Wojewódzka-Król & Załoga, 2016).

In the case of seaports, transport needs are defined by the port environment, in particular by freight forwarders, consignors and receivers.

According to the Act of Seaports from Dec 1996, there are four ports in Poland, considered to be ports of fundamental importance to the national economy. These ports are in Szczecin, Świnoujście, Gdańsk and Gdynia (Ustawa, 1996). Due to their geographical location, ports in Szczecin and Świnoujście provide the shortest route connecting the Scandinavian countries with the countries of Central and Southern Europe (Szczecin and Świnoujście Seaports, 2016). Ports in Szczecin and Świnoujście are considered universal ports, which allow for the transhipment and storage of bulk, liquid and general cargo (including containerized units) as well as dangerous and oversized cargoes.

During the last ten years (2005–2015), most shipments in the ports of Szczecin and Świnoujście were made up of general cargo, coal and other bulk goods. According to Table 1, the largest transhipments during the analysed period were general cargo shipments, characterized by an increase of approximately 3.7 million tonnes. The second largest cargo group in terms of turnover is coal. This group, despite a significant contribution to global port turnovers, has been experiencing a steady decline in shipments. The third largest group of cargo shipments is other bulk goods. Significant fluctuations were observed in shipments of grain and ore.

As shown in Table 1, in the analysed period there was a noticeable change in the turnover share of particular cargo types. Coal and grain saw a significant reduction in shipments, while the number of handled general cargoes, especially containerized cargoes, increased.

Reasons for the above may be the availability of particular transport branches which are characteristic of particular cargo groups.

Share of transport branches serving the ports of Szczecin and Świnoujście

Seaports constitute multi-modal transport points of a nodal nature and fulfil important tasks for the efficient and effective functioning of transport chains. The hinterland of a port is defined as a dedicated land area, located around the port and associated with the transport infrastructure network, characterized by a certain degree of economic development and business relationships (Grzelakowski & Matczak, 2012). Some researchers see the hinterland of ports as a commodity, encompassing a certain land area and the ports themselves (Grzelakowski & Matczak, 2012). Free access to ports from inland and from the sea is considered as an important element of the competitiveness of ports, supporting the development of connections with business entities (Pluciński, 2013). The analysis carried out in the first part of this article pointed to a steady increase in the volume of shipments in ports in Szczecin and Świnoujście, despite changes in the share of total port turnover of particular cargo groups.

Cargoes are transported to and from the ports of Szczecin and Świnoujście from sea and from inland using roads, rail and inland waterways. Below, only inland transport will be analysed, as a part of the hinterland transport of ports.

In the analysed time period, the share of total shipments accounted for by particular branches of hinterland transport has changed, especially for road and rail transport. Figure 1 shows that in 2005, more than 2/3 of the freights were transported by rail. Rail was the dominant method of transport until 2011, when road transport took the lead (46.3% by rail and 47.5% by roads). In 2013, rail transport once again had a slight majority.

In 2015, over 61% of cargo in the ports Szczecin and Świnoujście was transported by road, while

Table 1. Dynamics of transshipments in ports in Szczecin and Świnoujście between 2006 and 2015 (thousand tonnes) (own elaboration on the basis of materials provided by the Port of Szczecin and Świnoujście Port Authority)

Cargo group	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Coal	5087.6	4322.4	5463.7	4219.7	7294.9	5422.1	4257.4	4529.4	4601.8	3119.8
Ore	1349.0	1086.1	1456.6	610.8	471.5	464.9	720.8	2654.7	1880.4	1851.9
Other bulk	2676.4	2898.8	2506.4	1994.7	2213.8	3670.0	4040.4	2887.6	3250.0	3451.0
Grain	1812.6	1516.4	1129.1	1615.5	1342.9	1081.8	1394.4	1648.5	1644.3	1743.9
Wood	42.1	65.2	45.2	12.1	12.4	23.1	25.2	16.8	17.4	14.30
General cargo	7541.2	7818.2	7859.4	7096.1	8467.1	9290.7	9425.5	9392.2	10337.2	11254.6
Oil and preserves	697.9	1017.5	755.5	948.8	1040.2	1401.5	1403.0	1620.8	1670.3	1738.9
Total	19206.8	18724.6	19215.9	16497.7	20842.8	21354.1	21266.7	22750.0	23401.4	23174.4

rail's share decreased to 34.1%, this trend continues until today. A minor share is accounted for by inland waterway transport. In 2005, around 10% of freight was transported by river fleet; in the following years, the share of inland waterway transport decreased, reaching 4.5% in 2015.

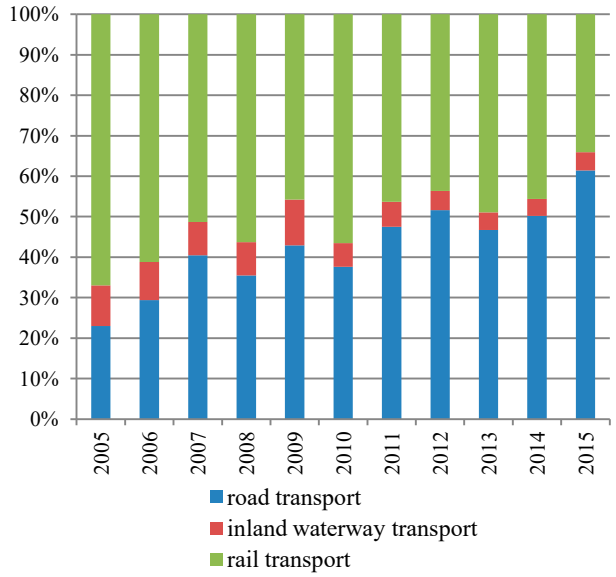

Figure 1. The share of each transport branch in port backend support in Szczecin and Świnoujście (own elaboration on the basis of materials provided by the Port of Szczecin and Świnoujście Port Authority)

Continuation of these trends may cause further reduction of the share of total hinterland shipments accounted for by rail and inland waterway transport. Figure 2 shows linear trends for the above data, forecasting how these shares could change in the next 5 years.

The above analysis was performed while keeping all external factors constant (ceteris paribus). It shows growth of the share of road transport and decreasing shares of rail and inland waterway transport.

Comparing the changes to the structure of shipments with the changes in the shares of total shipments accounted for by the different transport branches, it is easy to see a correlation between cargo type and transport method. With an increase the in handling of general cargo, the share of road transport has also increased. In turn, a decreasing volume of bulk goods shipments is reflected in a decreasing share of rail transport.

The question arises, whether only the changes in the structure of shipments have an impact on the share of the hinterland transport methods. As shown in Table 2, the change in the volume of shipments is not the only factor influencing the share of the various transport sectors. In 2005, 3.8% of coal was transported by road transport, while rail transport accounted for over 80%. In the following years, despite a decrease in coal's share of total global shipments, road transport's share of coal transport increased (to 5.3% in 2010 and 8.2% in 2015).

Similar trends can be observed in the handling of grain (69.3%, 86.7% and 95.6%, respectively in 2005, 2010, and 2015), and general cargo. The share of road transport in the handling of general cargo increased by over 40% over 10 years, while the share of rail transport decreased by over 42%. Despite the decreasing share of railways in port shipment handling during this period, this transport sector remained the most important for ore transport

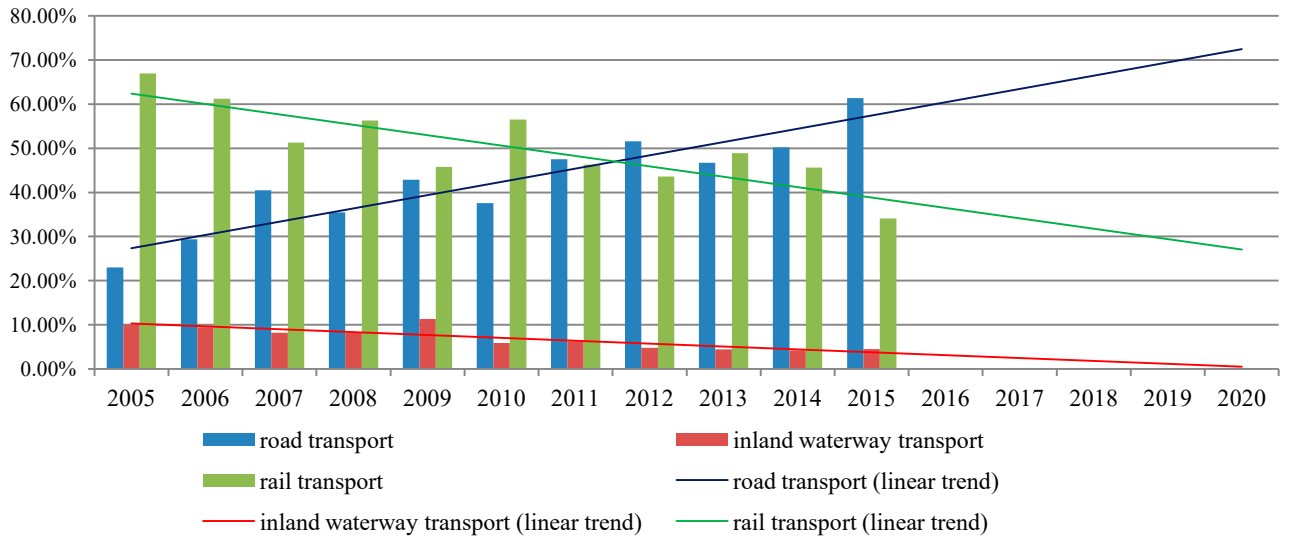

Figure 2. Trends of the share of each transport branch in port backend support in Szczecin and Świnoujście until 2020 (own elaboration on the basis of materials provided by Port of Szczecin and Świnoujście Port Authority)

Table 2. Contribution of hinterland transport services to Szczecin and Świnoujście ports in 2005, 2010, 2015 (%) (own elaboration on the basis of materials provided by Port of Szczecin and Świnoujście Port Authority)

	Road transport	Inland waterway transport	Rail transport
		2005	
Coal	3.80	15.30	80.80
Ore	0.80	0.60	98.60
Other bulk	21.40	24.80	53.80
Grain	69.30	12.20	18.40
Wood	53.40	0.00	46.60
General cargo	41.30	2.40	56.30
Oil and preserves	0.00	0.00	0.00
		2010	
Coal	5.30	8.20	86.50
Ore	10.90	30.00	88.80
Other bulk	40.30	9.50	50.20
Grain	86.70	4.40	9.00
Wood	15.00	0.00	85.00
General cargo	70.40	2.90	26.70
Oil and preserves	0.00	0.00	0.00
		2015	
Coal	8.20	19.70	72.10
Ore	3.10	0.40	96.50
Other bulk	40.10	10.30	49.50
Grain	95.60	0.60	3.90
Wood	100.00	0.00	0.00
General cargo	85.00	0.60	14.40
Oil and preserves	100.00	0.00	0.00

(98.6%, 88.8% and 72.10%) and other bulk cargo (53.80%, 50.20 % and 49.50%). It can therefore be stated that the type of cargo doesn't have total influence over the transport branches used in the hinterland transport of ports in Szczecin and Świnoujście.

Factors influencing the choice of transportation method

In the observed time period, a link between the changes in the types of cargo handled and the share of total shipments accounted for by different transport sectors was observed; however, as shown by the analysis of the data in Table 2, changes in the volume of cargo did not have a lasting impact on the various transport methods' shares. Further analysis must be carried out, exploring other factors.

One of the key components of international supply chains is the availability of infrastructure. The ports of Szczecin and Świnoujście have three inland connections with the hinterland – motorways, railways and waterways. According to the Central Statistical Office of Poland, in the time period 2005–2015, the number of roads in use in Poland has grown by an average of 1.06% per year, while the number of railways has decreased by 0.58% per year (GUS, 2015). Similar trends are observed in the Western Pomeranian region. A result of the above is the increasing availability of road transport infrastructure which could influence the make-up of hinterland transport of ports in Szczecin and Świnoujście.

Other important factors that determine the choice of a transport service are the quality of service (availability and flexibility) and price. It is also beneficial, from the point of view of the buyer, if the transport service is able to track shipments on a regular basis and has well integrated transport and logistics systems. Evaluating these traits in road and rail transport, it can be seen that road transport has an advantage over rail transport in terms of availability and flexibility, especially in the context of door to door and just in time deliveries, as well as control of the transport process (contact with the carrier or driver). On the other hand, the advantage of rail transport over road is the relatively lower price of carriage of the consignment and the ability to carry a single large load (Rosa, 2006). Factors influencing the cost of transport include: distance of transport, size of cargo, type of cargo and mode of transport (direct or indirect transport) (Salomon, 2003). In addition, the price for the transport service is affected by: the number of market participants offering similar services, changes in energy prices, service life and costs of the enterprise (Rosa, 2013).

By analysing the above, it can be concluded that, in addition to affecting the share of individual cargo types in global shipments, the impact on hinterland transport methods is due to the flexibility and availability of different transport methods. Practical analysis carried out by the enterprise arranging the transport of goods from ports in Szczecin and Świnoujście showed that the organization of rail transport is often less flexible and less predictable in terms of delivery time (especially when dispatching a single wagon with 24–50 metric tonnes of cargo). Rail transport deliveries are made using existing infrastructure, while constraints (congestion, repairs, random events, etc.) cause delays to delivery without the possibility of using an alternative route, as is the case in road transport. In addition, the availability of rail infrastructure at the place of delivery (lack of railway sidings and adapted shipment facilities) is also a factor which can determine the transport method.

To increase possibilities of hinterland transport by rail, investment in the development and expansion of

existing infrastructure is necessary. Equalization of access to individual transport sectors is the subject of European Commission (EC) activities. According to the EU Transport White Book 2011, EU Members will move around 50% of cargo loads transported by road over a distance of more than 300 km to other transport sectors including rail. Efforts to achieve the intended effects can be supported, for example by investment in maintenance of the existing high-speed rail network and the creation of a multimodal TEN-T network based on rail transport (Wojewódzka-Król & Załoga, 2016). According to the decision of the European Parliament and the Council, the ports in Szczecin and Świnoujście have been included in the base and complex networks of the planned TEN-T, which assumes implementation of infrastructure investments by 2030 and 2050 respectively (Regulation, 2013).

It is also worth mentioning the development plans for inland waterway transport. According to the Plan of development of inland waterways in Poland in the years 2016 - 2030, improvements are to be made to the connectivity of river roads. The main priorities of the plan are: to achieve an international class of navigability on the Odra waterway (E-30), improved navigational conditions on the Wisła waterway, and the extension of the E-70 and E-40 waterways (Ministerstwo Gospodarki Morskiej i Żeglugi Śródlądowej, 2017).

The prospects for the development of the transport network could significantly improve the condition of the road infrastructure in Poland. Increasing transport capacity is also crucial for the ports of Szczecin and Świnoujście, both in the context of free movement of cargo, the flow of new cargo to ports, and investment attractiveness and increased competitiveness of the ports in the global market.

Conclusions

The analysis presented in the first part of this article showed that the changes in the shares total shipments accounted for by individual transport sectors in the ports in Szczecin and Świnoujście did not result directly from changes in the handling of different types of cargo. In 2005, about 2/3 of the cargo was transported by rail, while in the following years this trend changed in favour of road transport. The impact of this new situation was reduced volume of bulk cargoes being handled, including coal, which are significant cargoes in the context of rail transport, and an increase in the transport by road of other cargo types historically transported by rail.

Despite the relatively lower transport costs, rail transport decreased its share of total shipments transported to and from the ports of Szczecin and Świnoujście to the fortune of road transport, which has higher availability, flexibility and reliability. In addition, the availability of linear infrastructure is undoubtedly important. This factor is the subject of action by the European Commission to increase investment railway infrastructure and transfer some of the load to wagons.

The development of road networks, regardless of the transport sector, is important in the context of the development of the ports in Szczecin and Świnoujście. The ports are investing in a reloading base, increasing their capabilities. It is therefore necessary to ensure that all branches of transport are accessible to enable further development of the ports.

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