One Way Logistics in Freight Transport - The Rise of the Container in Europe and Overseas Trade

(Press photo Hupac)

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Prof. Dr. Richard Vahrenkamp

Logistics Consulting Berlin

Tel. 0177-628 3325

Mail: vahrenkamp2016@gmx.de

Content

1 In search of a container standard

The competition that developed in the 1920s for small-scale truck traffic between many source and destination areas gave the railroads in Europe and the USA the idea of replicating small-scale truck traffic with small containers. Four to five small containers were to utilize one large freight car to capacity and additionally streamline general cargo handling.[1] The European railroad companies founded the International Container Bureau in Paris in 1933 to promote this idea.[2] However, the attempt to implement a Europe-wide standardization of small containers failed. In the end, these approaches remained at the experimental stage, since container transport did not lead to convincing cost savings and the average transport distances in numerous countries were merely small, so that container transport was not really worthwhile.[3] In Germany in 1928, the average shipping distance for rail freight was a mere 153 km.[4] Only the Swiss company Hupac successfully developed container transport with transalpine freight transport by rail between Germany and Italy.[5]

Instead of being used for domestic traffic with small containers, the container as a 20-foot or 40-foot large container has prevailed in overseas traffic since 1970, after Europe and the USA had agreed on a common ISO standard so that empty containers could be exchanged between the various shipping companies in the global supply chains.[6] Since European countries could not agree among themselves on one of their own standards for a large container, the U.S. standard of an ISO container based on the foot system of measurement, of all things, was made the

[1] Der Kleinbehälterverkehr, in: Zeitung des Vereins Deutscher Eisenbahnverwaltungen, 1930, p. 1117.
[2] Alexander Klose, Das Container Prinzip, Hamburg 2009 , p. 45.
[3] Keith Harcourt: Railway Containers in the United Kingdom and Europe during the 1920s and 1930s, in: Ralf Roth/Colin Divall (eds.): From Rail to Road and Back Again?, Farnham 2015, pp. 109-132; Albert Churella: Containerization in the United States During the Interwar Period, in: Ralf Roth/Colin Divall (eds.): From Rail to Road and Back Again?, Farnham 2015, pp. 195-216.
[4] Statistisches Jahrbuch des Deutsches Reiches, 1931, p. 158.
[5] Richard Vahrenkamp: Warenströme in Mitteleuropa - Die Integrationsleistungen der Logistik im 20. Jahrhundert, in Günther Schulz and Mark Spoerer (eds.): Integration und Desintegration Europas: Wirtschafts- und sozialhistorische Beiträge (Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte. Beihefte), Stuttgart 2019, pp. 185-214.
[6] Marc Levinson: The Box, Princeton 2006, chapter 7.

standard in Europe as well, but it is not compatible with the metric system of pallets.[7] They represent an example of how transport capacity cannot be fully utilized in the transport chain due to a lack of compatibility. A 20-foot ISO container can fit 9 industrial pallets 1000mm by 1200mm with a space utilization of 80.1% or 11 Euro pallets 800mm by 1200mm with a space utilization of 77.3%. The figure illustrates these statements. The poor space utilization of ISO containers by industrial and Euro pallets not only means an increase in transport costs, but also makes it necessary to additionally secure cargo with fillers. This is particularly necessary in overseas transport to compensate for ship inclinations.

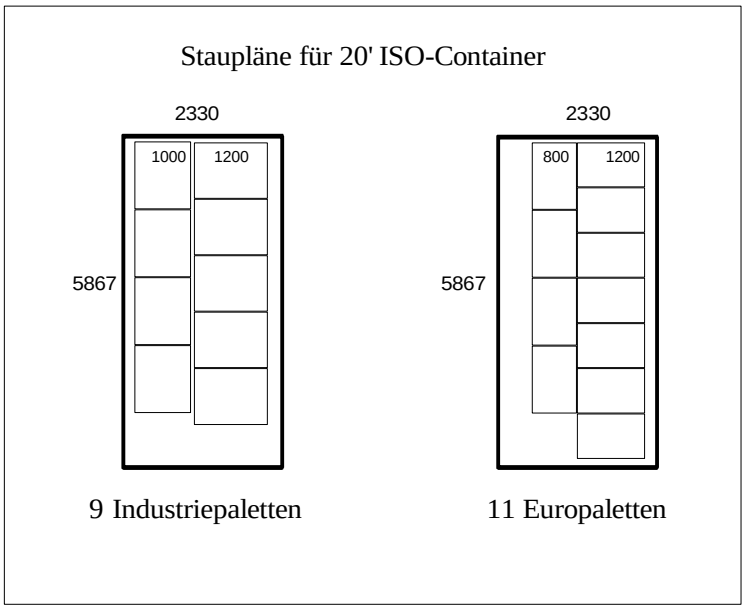

Figure 1: Stowage plans for pallets in a 20-foot ISO container (internal dimensions in mm)[8]

2 The container in overseas trade as a success story

Container handling in Northern European ports developed into a classic success story, reflecting the decline of consumer goods industries in Europe. Articles of consumer electronics and textiles were produced in Asia and brought to Europe by

[7] Alexander Klose, Das Container Prinzip, Hamburg 2009, p. 58.
[8] Source: Richard Vahrenkamp: Logistik - Management und Strategien, 6th edition, Munich 2007, p. 341.

container ships. The loading capacity of container ships grew considerably over the past 40 years: 1980: 3000 TEU, 1988: 5000 TEU, 2009: 13000 TEU, 2015: 18000 TEU, were the temporary maximum sizes. Globalization required special import logistics for container transshipment in the ports of Northern Europe, and distribution logistics linked to this, with hinterland transport by railroads, but also by trucks. In 2014, the handling company Eurogate in the Port of Hamburg unloaded the container ship CSCL Le Havre with 11,500 containers over cranes known as "container gantry cranes" in a model test within 52 hours in day and night operation and had to provide a corresponding storage area on the quay for this, as the containers could not flow off directly into the hinterland.[9]

The "northern ports" of Rotterdam and Hamburg rose to become the most important import ports for containers in Europe, overtaking the ports on the Mediterranean and gaining the position of container hubs supplying neighboring countries with feeder ships, such as the countries on the Baltic Sea. At the Port of Hamburg, throughput (import and export containers combined) grew steadily from 2 million TEU in 1990 at an average rate of 10% p.a. to nearly 10 million TEU in 2008. The global economic crisis in 2008 brought a slump to 7 million TEU in 2009, followed by a renewed increase to just under 10 million TEU in 2014. [10]

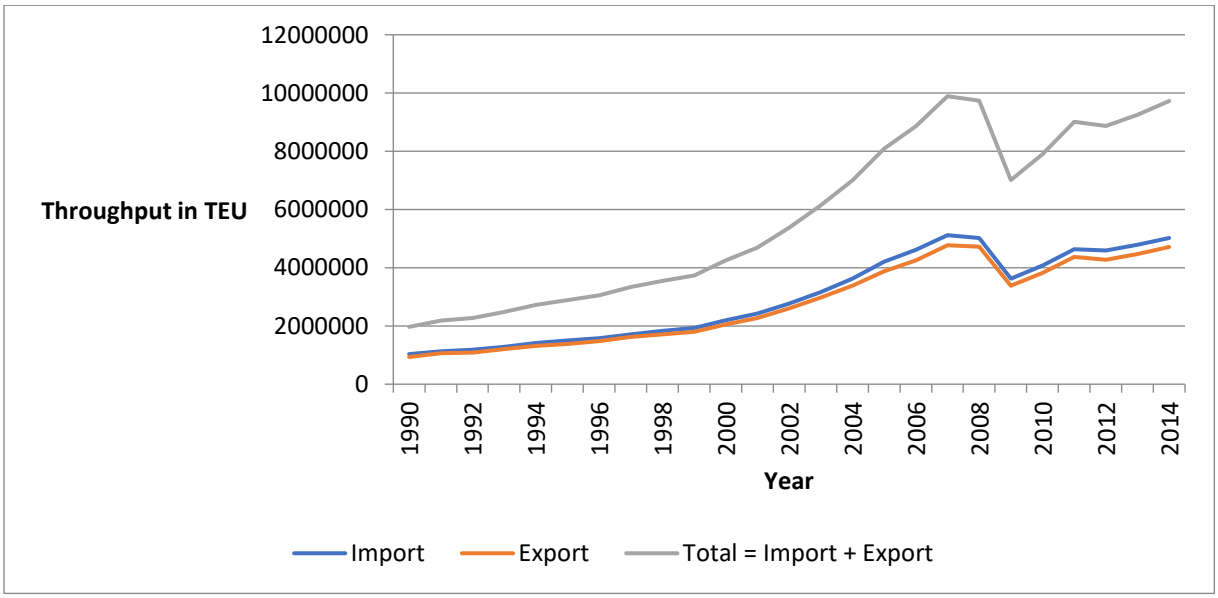

Figure 2: Container throughput in Hamburg in the years 1990 to 2014 (Hamburg Port Authority)

[9] Eurogate, press release, May 21, 2014. The term hinterland has been adopted into English.
[10] Data according to the Hamburg Port Authority.

The shipping companies discriminated against the European ports on the Mediterranean because of poor services for unloading containers. They cited the risk of strikes, theft, limited opening hours and poor hinterland connections. In France, for example, container throughput plunged 1.6% in 2005 because of strikes in Le Havre and Marseille, while it rose 15% in Hamburg.[11] Due to poor service, containers destined for Austria, for example, were not unloaded in nearby Trieste or Koper; instead, when ships arrived from the Suez Canal, shipowners accepted the high capital cost of a ship for several additional days of travel to round the Iberian Peninsula and unload containers in Rotterdam or Hamburg. The shuttle trains set up especially for this relation from 1995 onwards then brought the containers from Hamburg to Vienna with a considerable ecological footprint for a 1000 km journey. [12]

[11] Transport Review 14.3.2006.
[12] Forty Years of Kombiverkehr, published by the Kombiverkehr Company, Frankfurt 2008.

3 The mismatch in freight transport - One Way Logistics

In order to analyze container handling in the Port of Hamburg in more detail, the problem of the unpairability of freight traffic will be addressed here. If we look at the pairing, differences between passenger traffic and freight traffic become apparent. In passenger traffic, people normally start the return journey to the point of departure after the outward journey. Thus, passenger transports are paired. In 1925, Dr. Spiess, the director of the Reichsbahn, estimated that within 45 days 99% of the people who start an outward journey by rail also make the return journey.[13] This pairing of traffic is not found in freight transport. In the history of the Roman Empire, deliveries of olive oil from Spain to Rome in clay amphorae are well known. Once there, the oil was consumed, and the emptied amphorae were destroyed on the spot, with no return transport of empty amphorae from Rome to Spain.[14] Another example of unpaired transports are the deliveries from the coal mining area of St. Étienne via the river Loire to the big cities on the lower river, such as Tours, Angers or Nantes in the 19th century. The barges, built of wood in St. Étienne, had only one trip ahead of them. They were loaded with coal, sailed down the Loire, and were unloaded at their destination, disassembled into wooden parts, and sold as wooden parts, without the barges returning empty or full to their starting point in St. Étienne.[15] Bulk railroad traffic was also unpaired. For example, the Reichsbahn delivered coal from the coalfields to large industrial users in special trains that ran back to the loading point empty without picking up return loads from other shippers. Since freight cars were in short supply, backloading at other shippers would have caused delays.[16] Of the 1584 million axle kilometers covered by the Reichsbahn in monthly average freight traffic in 1928, 1152 million axle kilometers had been run with loaded freight cars.[17] Thus,

[13] Spiess (no first name): Die Bedeutung der Rückfracht für einzelne Verkehrsmittel, in: Der Güterumschlag, Tagung und Ausstellung des VDI in Düsseldorf und Köln 1925, Sonderausgabe der Zeitschrift des VDI, Berlin 1926, pp. 246-248.

[14] Klose: Das Containerprinzip, Hamburg 2009, p. 137.

[15] H. von Dechen: Über die Steinkohlen-Reviere in den Departments der Loire und der Saone, in: Archiv für Mineralogie, Geognosie, Bergbau und Hüttenkunde, vol. 17, 1843, p. 155 (accessed via Google Books); further examples of unique boat trips downriver in Fernand Braudel, France. Die Dinge und die Menschen, Stuttgart 1990 , p. 269.

[16] Spiess, Rückfracht, (see note 12), 1926, p. 247.

[17] Statistisches Jahrbuch des Deutsches Reiches, 1931, p. 158.

27% of the axle kilometers had been driven empty. Unpairedness is also perceived as a major problem in air freight traffic.[18]

In world trade, container traffic is also unpaired: the number of loaded containers leaving Asia for Europe is about twice the number of export containers in the opposite direction.[19] If we understand the pairing index as the percentage of imports over the sum of imports and exports, this index is equal to 100% for the Rome and Tours cases described above. There, there were only imports, but no exports. For the port of Hamburg, we have the time series of container imports and exports since 1990 shown in Figure 2.[20] If one calculates the pairwise index for this time series, one finds, astonishingly, that the pairwise index is close to 50% and fluctuates only slightly around the long-term mean value of 51.72%, as shown in the following graph.

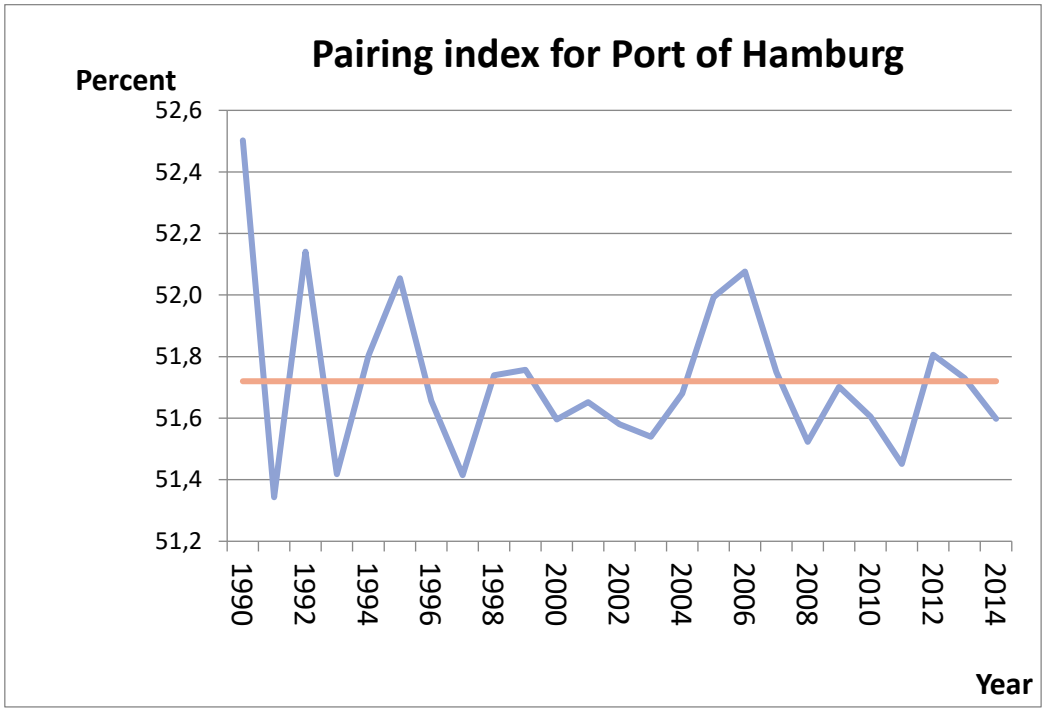

Figure 3: The Port of Hamburg's pairwise index for containers from 1990 to 2014 jitters only slightly around the long-term average of 51.72 percent.

In the 25 years documented, the index has never fallen below 51%. As the chart shows, the fluctuations around the mean value are only minimal, in the range of half

[18] Richard Vahrenkamp: Global Air Cargo Networks, Hamburg 2014.
[19] Martin Stopford: Maritime Economics, London 2009, p. 525.
[20] Data according to the Hamburg Port Authority.

a percent. The reason for this constancy, even over the turbulence in 2009, remains to be seen. What needs to be examined is how the relationship between imported and exported containers is to be understood in economic terms. This opens up a whole new field of research as to how the index behaves in the other Northern European ports and whether there are differences with the Southern European ports. Although imports seem to be nearly balanced with exports, thus disproving the theorem of unpaired traffic, there has been a surplus of containers every year since 1990 over the subsequent 24 years, amounting to as many as 311 thousand in 2014, adding up to nearly 5 million empty containers worth $1000 each since 1990 that have not been repatriated. Instead, some of them are now stored as large container graveyards around the Port of Hamburg. The Hamburg Port Authority is required to set up working groups to manage the empty containers.