The Role of Port Infrastructure and Logistics in Global Networks

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Introduction

It has been estimated that around 90 per cent of the world’s merchandize and commodity trade is transported by ship. This percentage has remained fairly constant over the last century, yet the volumes have increased enormously in the last two decades. This rise in global shipping volumes resulted from what Feenstra (1998) aptly described as the ‘disintegration of production and the integration of world trade’. As international barriers to trade have effectively been lifted by the GATT/WTO-agreements since the 1980s, global manufacturers have vertically disintegrated their Fordist production systems into geographically dispersed and flexibly organized supply chain systems. The international trade regime allowed manufacturers to re-locate their production and assembly plants to more cost-efficient locations in developing economies, in turn generating a new spatial division of labour (Massey, 1984). Vertical disintegration allowed manufacturers to specialize and optimize by taking full advantage of ICT in the coordination of the disintegrated production chain, thus creating economies of scope through the reduction of inventory costs and by means of outsourcing those parts of the chain with the lowest profit margins. The geographical extension and dispersion of manufacturing have been conceptualized by development economists as the rise of Global Value Chains (Kaplinksy, 2004; Gereffi & Korzeniewicz, 1994), by economic geographers as Global Production Networks (Dicken et al, 2001) and what transport economists would call Global Supply Chains (Robinson, 2002). Regardless of the conceptualization, it can be stated that this generic process of economic globalization has increased the demand for global transport services enormously.

While some have argued that ICT has been the major technological facilitator of economic globalization, creating a ‘death of distance’ (Cairncross, 1997) or a ‘flat world’ (Friedman, 2005), this perspective fails to fully appreciate the role of innovation in transportation, most notably containerization (Levinson, 2006). It is through the standardization (in the 1970s) and mass-application (since the late 1980s) of the shipping container that global transportation services could be offered more cheaply and more reliably, while increasing the flexibility of distribution and delivery of (semi-) finished goods. It is exactly the combination of both containerization and ICT that allowed the reduction of shipping costs and the rise in importance of logistics and supply chain management in the evolving global economy as described above. Despite this, the costs of transportation are still considered marginal factors of declining importance, by many economists and geographers, in explaining regional economic development outcomes. I would argue the opposite; it is specifically differences in access to appropriate shipping infrastructure (such as seaports), logistics expertise and appropriate government regulations that explains differences in regional development processes within the global economy. What will become clear is that there is a paradox in global shipping: economies of scale prevail in transport infrastructure, while economies of scope prevail in logistics. Yet it is the combination of both that creates competitiveness.
The Paradox of Global Shipping

A profound paradox has emerged in global shipping between the physical activity of transportation and the logistics planning of increasingly geographically dispersed supply chains. The paradox can be explained as follows. The principles of logistics and supply chain management are built around just-in-time delivery, the reduction of inventory costs and an optimal coordination between the different suppliers of components in the final assembly and distribution to consumer markets. Flexibility and reliability are crucial. Logistics heavily relies upon ICT, but ultimately also upon actual physical transportation. An integral element of these supply chain systems is thus the actual physical or material transportation of goods carried out by ocean carriers and by land-based haulage of road, rail and barge. While economies of scope are the state-of-play in global logistics and supply chain management, global transportation and port infrastructure is far-more driven by economies of scale.

In order to remain cost effective, ocean carriers have increased the size of their vessels. Current sizes are well beyond Panamax (the maximum size of a ship to pass through the Panama Canal). The largest vessels are over 45 meters long and 18 meters deep with the capacity to carry over 10,000 TEUs (twenty-foot equivalent unit, the standard size of a container). The introduction of these giants has consequences for shipping routes, especially the ones dependent on the Panama Canal. Rather than using the Panama Canal, ships carrying goods from Asia to the East Coast of the United States increasingly call at the West Coast ports of Los Angeles and Long Beach after which the goods are transported by double-stacked trains to Chicago from where they are finally moved to the East Coast. In order to regain their function as global hub, the Panamanian government decided to upgrade the Canal in 2007 (expected completion in 2014).

The introduction of these giant vessels has consequences for seaport infrastructure. Not every port has the capacity to handle these giant ships in terms of navigable port channels and quay wall sizes. Port infrastructure is characterized by huge investments and large sunk costs, often reflecting investment decisions in the past and leading to sub-optimal locations in the present. Many ports are thus spatially and environmentally constrained to accommodate infrastructure upgrading and expansion as they are often located near dense urban areas. While major port expansions have been spatially planned away from urban cores (e.g. Rotterdam’s Second Maasvlakte), much of the offloaded goods still need to be funneled through already congested metropolitan infrastructure.
corridors towards distribution centers and final markets in the hinterland. For this reason logistics activity and distribution are increasingly being developed further inland and away from the congested ports, in turn making their intermodal connectivity with the ports and the coordination between various transport intermediaries of upmost importance (Notteboom & Rodrigue, 2005; Van der Horst & De Langen, 2008).

Aside from these spatial and physical issues, ports are faced with organizational changes in the transport and logistics industry. Over the last decade the industry underwent a process of horizontal and vertical integration in order to reduce costs, optimize services and, above all, capture more value. Ocean carriers have been engaged in both takeovers and formalized cooperation in the form of alliances. In addition, some carriers have been setting up their own terminal divisions (such as Maersk Line’s sister company APM Terminals) or arranged dedicated terminal agreements (often in joint venture) with terminal operators. Likewise, the terminal operating industry underwent a process of integration and globalization. Since the late 1990s, local stevedoring (loading and unloading) services in major ports across the world have rapidly been taken over by a small group of multinationals, the so-called global terminal operators (GTO). These GTOs not only have ‘deep pockets’ to acquire the lease concessions to operate terminals and to make the necessary investments in cranes and straddle carriers, they also have the knowledge to manage large volumes of cargo and the latest technologies. As such they are able to increase the productivity of ports and the efficiency of the flows that move through them. The largest terminal operating companies are now Hutchison Port Holdings based in Hong Kong, PSA Corporation based in Singapore and DP World from Dubai. Together with APM Terminals these four companies now handle the majority of containers shipped across the globe. In contrast, the majority of land-based logistics service providers (road, rail and barge transporters) remain local or national in their operations and remain fairly small and medium in size (Ayoama et al 2006).

**Logistics Performance and Economic Development**

In the light of these structural changes, the importance of logistics and trade infrastructure should not be underestimated. Countries that have invested heavily in trade infrastructure, that have reformed port management and that have opened up the logistics services market to foreign investors have been able to capture the benefits of global trade. China is the most obvious example of how manufacturing growth and foreign direct investment went hand in hand with large scale transport infrastructure investments, and in doing so it followed the successful strategy of Singapore, Korea, Japan and Taiwan. More recently, major infrastructure investments are taking place, often in combination with liberalization and governance reforms, in countries such as Vietnam, Turkey, Indonesia and Brazil in order to facilitate their export-orientated growth.

Yet the upgrading of the logistics performance of a country should not be reduced to mere investment in physical infrastructure and application of ICT, but also to regulatory and procedural issues regarding global shipping and international trade and to the management of ports and related infrastructure. Since 2007 the World Bank has produced an annual Logistics Performance Index, an international benchmark which includes variables such as the average time of a shipping container to be cleared by customs, the number of inspections and the quality of local logistics services such as brokerage. Not surprisingly, the countries that rank highest in this index are advanced economies, e.g. Germany, Netherlands, Sweden, Singapore and Japan. The countries that score lowest are mostly conflict affected (and often landlocked) countries in under-developed economies. However, the World Bank does observe differences between logistics under-performers and over-performers when compared with the average income level of a country (World Bank, 2010). Better logistics performance can create benefits in terms of trade expansion, economic diversification and the attraction of foreign direct investment. According to the World Bank (2010) those countries with the best logistics performance experience 1 per cent growth in GDP and 2 per cent in trade as a result. Low income countries are of course disadvantaged due to the lack of financial means to invest in
infrastructure and the lack of competence in regulatory procedures. However, less capital intensive policies (e.g. liberalized logistics services and port/terminal management; improved customs procedures) can make the difference.

Much depends however on the commodities shipped. Large bulk volumes such as ore and crude oil are being shipped on a point-to-point basis and are much more dependent on global shifts in demand and price fluctuations, whereas the shipping of containerized merchandize (e.g. electronics components) is far more complex and sensitive to reliability in delivery. Hence, in some cases it might be more economic to maintain relatively high inventory costs than to incur the costs of rapid and reliable transportation. For example, (using the case of Malawi - World Bank, 2010, p21) since sugar is inexpensive and time-insensitive, exporters prefer the use of unreliable rail services to ‘the rather unproductive’ port of Nacala in Mozambique. Garment producers for the US market are, however, prepared to pay the cost of trucking directly to the efficient container port of Durban in South Africa for direct shipping to the US for up to 10,000 US$.

Conclusion

In this article I have outlined some structural developments within the port and transport industry and the importance of infrastructure upgrading and logistics for economic growth. For development economists and for geographers alike, the role that these factors play within global value chains remain fairly understudied, as mentioned by Coe et al (2008: 6): ‘In fact, with the vastly increased complexity and geographical extensiveness of production networks (...) the logistics problem is absolutely central. We need to understand it’. Further analysis therefore needs to focus on particular commodity chains that move from developing countries to the global market and the role that logistics and transport plays within these chains. Of particular importance is the governance of the chain including the logistics part, the locations of value creation and how these commodities are routed and the bottlenecks they encounter. Such understanding can also provide better insights for policymakers engaged with promoting economic development. Within the GOLLS (‘governance of labour and logistics for sustainability’) project, such research is presently underway by focusing on particular commodity chains between Brazil and Holland.

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References


