Ports, Maritime Transportation and the Global Economy

The enduring tenet of maritime transportation is its ability at moving large quantities of cargo over long distances. This activity is shaped by the maritime geography of the world, mainly the configuration of oceans, coasts, seas, lakes, and rivers. Where possible, the construction of canals, channels, locks and dredging have been attempted to facilitate maritime circulation. This reduced the discontinuity imposed by geography on global trade.

A Fundamental Physical Support to Global Trade

Maritime transportation is as old as global trade and historically the scope and extent of long distance trade came on par with developments in maritime transportation technology. Between the 16th and 19th centuries the galleon was the linchpin of long distance colonial trade and the refinement of sailing technology let to fast clipper ships in the mid 19th century, which essentially reflected the optimal in wind propelled maritime technology. Clipper ships were however short lived and were supplanted by steamships, which lead to a remarkable specialization of ship function with liners, battleships, cargo ships, tankers and containerships, just to name a few. Yet, the role of maritime transportation in the movement of passengers is marginal; it is almost exclusively the domain of freight. International trade and seaborne trade are thus interrelated. As of 2006 seaborne trade accounted for about 90% of global trade in terms of volume and 70% in terms of value.

The notion of maritime transportation rests on the existence of regular itineraries, better known as maritime routes. They draw arcs on the earth water surface as intercontinental maritime transportation tries to follow the great circle distance. Maritime transportation operates on its own space, which is at the same time geographical by its physical attributes, strategic by its control and commercial by its usage. While geographical considerations tend to be constant in time, strategic and especially commercial considerations are much more dynamic. For instance, strong industrial growth in Pacific Asia has been accompanied with a surge in port activities along the Chinese coast as well as a growth along transpacific and trans-Indian shipping routes.

Shipping has traditionally faced two drawbacks. It is slow, with speeds at sea averaging 15 knots (26 km/hr). Secondly, delays are encountered in ports where loading and unloading takes place. The latter may involve several days of handling when break-bulk cargo was concerned. These drawbacks are particularly constraining where goods have to be moved over short distances or where shippers require rapid service deliveries. However, technical improvements tend to blur the distinction between bulk and break-bulk cargo, as both can be unitized on pallets and increasingly in containers. For instance, it is
possible, and increasingly common, to ship grain and oil, both bulk cargoes, in a container. Maritime shipping is dominated by bulk cargo, such as petroleum, minerals and grains, which roughly accounted for 70% of all the ton-miles shipped. These flows supply the world’s energy generation, manufacturing and food transformation systems. The share of break-bulk cargo is increasing steadily, mainly because of containerization. Consequently, the amount of containerized freight has grown substantially and the majority of the global trade of manufactured goods is now carried in containers, the twenty-foot equivalent unit, or TEU, is a common measure of volume.

**Ports: Valuable Resources**

Even if the physical geography of the world conveys a staggering amount of coastline, only a limited amount is effectively suitable for port operations. Port terminals handle more freight than any other types of terminals combined. To perform their role, port infrastructures jointly have to accommodate transshipment activities both on ships and inland. They are points of convergence between land transport and maritime systems. Considering the operational characteristics of maritime transportation, the location of ports is constrained to a limited array of sites, mostly defined by geography. Most ports, especially those that are ancient, owe their initial emergence to their site as the great majority of harbors are taking advantage of a natural coastline or a natural site along a river. The suitability of port sites is even changing with technical changes in maritime shipping and coastal urbanization. They have become valuable and rare resources.

**A Matter of Scale**

The principle of economies of scale is fundamental to the economics of maritime transportation as the larger the ship, the lower the cost per unit transported. This trend has particularly been apparent in bulk and containerized shipping. For instance, the evolution of containerization, as indicated by the size of the largest available containership, has been a stepwise process (Figure 1). Changes are rather sudden and often correspond to the introduction of a new class of containership. Since the 1990s, two substantial steps took place. The first step involved a jump from 4,000 to 8,000 TEUs, effectively moving beyond the “panamax” threshold. This threshold is particularly important as it indicates the physical capacity of the Panama Canal and thus has for long been an important operational limitation in maritime shipping. The second step took place in the 2000s to reach the 13,000-14,000 TEU level. This is essentially a suezmax level, or a “new panamax” class when the extended Panama Canal is expected to come online in 2014. From a maritime shipper's perspective, using larger containerships is a straightforward process as it conveys economies of scale and thus lowers costs per TEU carried. From a port terminal perspective, this places intense pressures in terms of infrastructure investments, namely portainers. Thus, the matter of scale is bringing forward a paradox as the more economies of scale are applied to maritime shipping, the lower the number of ports able to handle such ships.
Maritime Gateways and Hubs

The current geography of ports and maritime trade has been the most transformed by containerization since it permitted an entirely new class of ships, new companies (or the transformation of existing companies), new port locations, new networks and new flows.

New Locations

For a long period, the world’s most important ports were North American (e.g. New York) and Western European (e.g. Rotterdam). Containerization completely changed the world’s commercial geography with the emergence of an array of new port locations (Figure 2). This geography indicates a high level of traffic concentration around large port facilities, the top ones being Pacific Asian ports along to Tokyo – Singapore corridor. As export oriented economic development strategies took shape, containers handled in Pacific Asian ports, notably Chinese ports, surged. There is also an emerging geography of container ports where there is a specialization between container ports acting as gateways and container ports acting as hubs. Gateway ports command the access of large manufacturing or market regions. Hong Kong, Los Angeles and Rotterdam are notable examples. Hub ports (or offshore hubs) act as intermediary locations where containers are transshipped between different segments of the global maritime transport system. Singapore and Dubai are among the most prominent.
New Networks

The conventional bulk shipping network is point-to-point where two ports are directly serviced and with the ship coming empty for the backhaul. This typically reflects oil, mineral and grain shipping with origins corresponding to extraction regions and destinations being large urbanized regions. Containerized shipping permitted the emergence of new networks, namely pendulum services. They involve a set of sequential port calls along a maritime range, commonly including a transoceanic service from ports in another range and structured as a continuous loop. Their purpose is servicing a market by balancing the number of port calls and the frequency of services. For instance, pendulum services between Asia and Europe have on average 8 to 10 containerships assigned and involve 8 to 12 port calls. Most transatlantic pendulum services have 6 to 8 containerships and involve 6 to 8 port calls. A pendulum service is fairly flexible in terms of the selection of port calls, particularly on maritime ranges that have nearby and competing ports grouped as regional clusters (e.g. North American East coast, Western Europe). This implies that a maritime company may opt to bypass one port to the advantage of another if its efficiency is not satisfactory and if its hinterland access is problematic. The shipping network consequently adapts to reflect changes in market conditions.
**New Flows**

The global shift in the location of manufacturing activities as well as changes in supply chain management has led to new flows handled by maritime shipping. Flows of raw materials handled by maritime shipping have adapted and emerging manufacturing clusters have seen a growth. It is however over the issue of container shipping that the new flows are the most prevalent. As exemplified on Figure 2, the new geography of production entails a new geography of distribution and its related flows. Because of a global trade structure characterized by imbalances, this structure implies its own new sets of flows. Many containers are moved empty, which is not generating any income but convey a cost that must be assumed in one way or the other. Either full or empty, a container takes the same amount of space on the ship or in a storage yard and takes the same amount of time to be transshipped. For instance, there are 3 times as much containers moving from Asia to the United States than there are from the United States to Asia. By 2005, about 70% of the slots of containerships leaving the United States were empty with major container ports such as Los Angeles handling large amounts of empty containers. Other major maritime trade routes, such as the Asia-Europe segment, are facing a similar but less acute imbalance. Thus, production and trade imbalances in the global economy are clearly reflected in imbalances in physical flows and transport rates. For Transpacific trade, it costs more per TEU for eastbound flows than for westbound flows, making freight planning a complex task for container shipping companies. For Asia-Europe flows, westbound rates are higher than eastbound rates.

**Maritime Shipping Companies and Port Operators**

**A Private Domain**

The maritime transport industry is one of the most globalized industries in term of ownership. Maritime shipping companies and the majority of the largest port terminals are either privately owned or operated. Such large assets must be efficiently managed, which requires extensive capital requirements. The trend in recent years has been a convergence between the maritime segments of global trade with inland freight distribution. Global port operators, such as APM (Denmark), DPW (Dubai), HPH (Hong Kong) and PSA (Singapore) have been active at acquiring a portfolio of terminal assets in almost all the major ports of the world. Some, like APM, are a direct subsidiary of a maritime shipping company; Maersk, the world’s largest, in this case. Thus, a growing convergence between maritime shipping, ports and inland operations enables large private conglomerates to achieve a level of control over global supply chains. This is particularly important as global trade is more than a matter of capacity, it is also concerned about the timeliness and reliability of the distribution.

**Port Operators**

The emergence of global private operators marks a reversal in the trend of having ports considered as public entities since many became inefficient and unable to cope with market pressures. The top 5 terminal operators account for about half of the world’s port container throughput. In an era characterized by lower levels of direct public involvement in the management of transport terminals, specialized companies involved in the management of port terminals are finding opportunities at the global level. They thus tend to be horizontally integrated entities focusing on terminal operations in a variety of locations. The main tool for global port operators to achieve control of port terminals has been through
concession agreements. A concession agreement is a long-term lease involving the requirement that the concessionaire undertakes capital investments to build, expand, or maintain the cargo-handling facilities, equipment, and infrastructure. The range of port terminals controlled by port holdings covers several of the largest freight markets. As globalization permitted the emergence of large multinational corporations managing assets in a variety of locations, global port holdings are a similar trend concerning the management of port terminal assets. This has been a very profitable business with substantial positive impacts in the efficiency of ports and maritime trade.

References


