International Trade and the Maritime Shipping Revolution

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Just as rivers and oceans have unquestionably shaped societies throughout the centuries, so too has trade by waterways been pivotal in how economies have developed. Panayotis Gounaris explores innovations in the shipping industry and the effect they have had on international trade throughout the ages. He provides a clear and detailed analysis of the increased efficiencies that came along with the maritime shipping revolution and their implications for trade today.

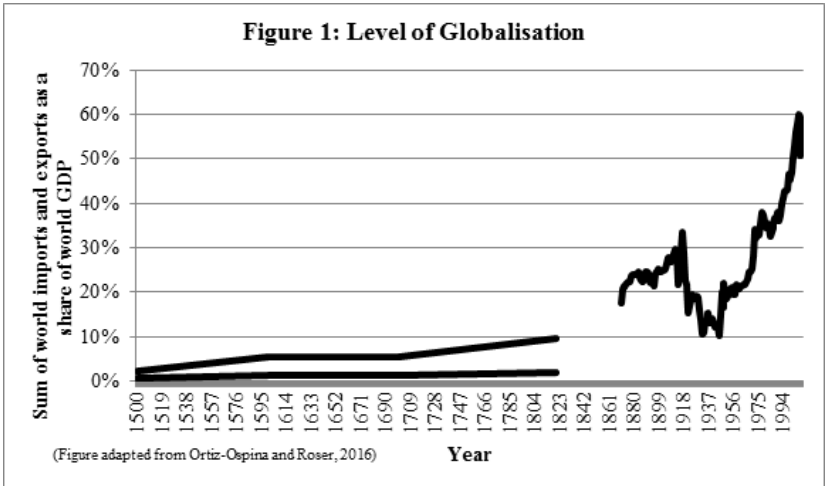
Introduction

Maritime shipping has always been important, even in the early stages of economic development. Adam Smith highlighted the important role that shipping plays in enabling trade in his book, 'The Wealth of Nations', published in the 18th century, before any meaningful revolution in the industry had occurred:

"*As by means of water-carriage a more extensive market is opened to every sort of industry than what land-carriage alone can afford it, so it is upon the sea-coast, and along the banks of navigable rivers, that industry of every kind naturally begins to subdivide and improve itself [...]*" (Smith, 1982).

Over millennia, the maritime industry has changed in many dimensions; there have been technological changes and innovation, changes in the structure of the industry and changes related to the geography of where the service is provided.

In the last couple of centuries international trade has grown significantly and changed the way our world operates. In the last few decades, trade has increased at a faster rate. At the end of the 19th century, the sum of world imports and exports was lower than 10% of world production, but in more recent periods, the global balance of trade increased to more than 50% of world production (Ortiz-Ospina and Rosa, 2016). This astonishing increase in international trade merits further examination. As is shown in Figure 1 below, the rate of trade growth increased quite significantly in the late 1800s and then again after the war in the mid-1900s. Significant technological change took place in the transport industry during these periods. This essay will examine the effect of technological advances in the maritime industry on international trade flows.



The Steamship

The first notable innovation in the industry was the steamship. Before its arrival, trade routes depended strongly on wind directions, so the possibilities for trade were limited. Because the trade of goods between two countries often involved carriage by sea, the introduction of the steamship, which was used regularly by 1807, drastically increased the possibilities for international trade by improving cross-country integration. It was possible for countries, which were separated by water to engage in trade more easily and efficiently regardless of wind directions (Levinson, 2008)

Research has shown that the advent of the steamship boosted trade significantly. Between 1870 and 1913 the world export to GDP ratio increased from 5% to 9% (Pascali, 2016). The increase in exports can be attributed to the fact that firms who were productive and cost-efficient could export more of their goods due to decreasing shipping costs. Firms who previously could not join the industry due to higher transport costs could now enter, which increased output and trade.

As well as increasing trade through lower shipping costs, the steamship increased international trade by reducing effective trading distance; trade could be conducted quicker and became more reliable – these were improvements in the quality of the service. Shipping firms could carry out a regular shipping service. Vessels were not confined to specific potential trade routes and could quickly reach their destination. It has been shown that the reduction in shipping times induced by the Steam Engine was responsible for around half of the increase in international trade during the late 19th Century (Pascali, 2016).

The Intermodal Container

Nonetheless, despite the improvements in efficiency during the 19th Century, the industry was still cost inefficient and trade costs were high in the early 1900s. Before the use of intermodal containers, freight costs were worth a considerable 12% of US exports and worth 10% of US imports. Since the average import tariff, another trade cost, was only 7%, freight costs represented a significant share of total trade costs. As the freight costs were so high – even higher than import tariffs- one questioned whether it made economic sense to trade using ships. Freight could represent up to 25% of the cost of a product in 1959 (Levinson, 2008).

The costliest part of the operation was the process of moving cargo. Goods had to be collected by truck, each good loaded separately from a warehouse and then brought to the port where they were unloaded separately and dragged to the pier. Every single piece of freight had to be stacked on top of another in the cramped and odd dimensions of breakbulk vessels. Goods were lost, stolen or just abandoned on the docks. Loading and unloading was complicated and took time. Two thirds of a ship's productive time was spent at a port which resulted in low levels of ship-utilization (Bernhofen et al, 2016). The fact that the process was so inefficient, unreliable and slow meant that shipping costs were excessively high.

The industry was as labour intensive as it was capital intensive and there were millions of workers[1] who provided services in and around the port. The Longshoremen were arranged in gangs and had strong labour union support (Levinson, 2008). With strikes often taking place, even higher shipping costs were incurred and the ability of the industry to provide a reliable service was often called into question.

It was in the 1950s that entrepreneur Malcom McLean thought about the concept of the intermodal container[2]. McLean, preoccupied with cutting costs, noticed that highway congestion was increasing and that transportation of goods by water could be quicker. As his ideas were developed and implemented over a large time period, huge cost reductions and quality improvements in the industry were seen. The advantages of the container were not felt immediately – the adoption was a slow process and innumerable changes to the industry were made.

The Container's Success in Reducing Transport Costs

The Ideal-X, which set sail in 1956, was the first successful container ship. The ship was loaded in eight hours carrying a modest fifty-eight containers and left the port on the same day. Loading cargo on a breakbulk vessel cost 5.83 dollars per tonne and took many days. With Ideal-X the cost was 15.8 cents per tonne (Levinson, 2008). The cost reductions associated with the container attracted new firms to enter the market, which led not only to greater competition, but to greater international trade flows (Levinson, 2008).

Shipping firms and ports required less labour as a result; a containership could be loaded in about one sixth of the time required for a conventional breakbulk vessel and only used around one third of the labour (Levinson, 2008). The world's first container crane was forty times more productive than the average productivity of an entire longshore gang (Bernhofen et al, 2016). Containerisation, a system of intermodal freight transport using intermodal containers, eventually displaced many thousands of workers who were involved in unloading, loading and sorting cargo in the Breakbulk era. This reduced the overall costs in the industry as less labour was required. The development and utilisation of advanced and highly specialised capital machinery reduced the costs even further.

International standardisation of containers occurred in 1965. The worldwide adoption of containers facilitated huge reductions in maritime shipping costs – in Britain, a study conducted by McKinsey & Company found that containerisation could involve a few large ports and would halve the freight bill of the UK (Levinson, 2008).

With the advent of containerisation, port side operations have become much more cost efficient and quicker; massive terminals accommodate massive containerships, each ship capable of carrying thousands of containers. Container handling is partly computerised. Cranes pick up and move containers using spreaders. These changes drastically reduce the average time a containership spends in a port (the more time a container spends in the port, the costlier it is for the ocean shipping firm). The UNCTAD claimed in 1970 that the costs of moving freight that ship lines faced on the new vessels were less than half of those on breakbulk vessels. Strong evidence suggests that the cost of shipping a tonne of international freight declined as containerisation became widely adopted in the late 1960s (Levinson, 2008).

The quality of the shipping service improved; the journey between Europe and Australia was cut from seventy to just thirty-four days (Bernhofen et al, 2016). Major users of international shipping abandoned breakbulk and switched to the more modern way of shipping; shippers had a choice in shipping their goods and chose to ship with containers. The revealed preference of shippers is strong evidence that the container was more beneficial and attractive in terms of cost. Shipping was clearly cheaper with the container.

During the same time period, the volume of sea trade increased drastically. In the port of Hamburg, eleven million tonnes of cargo were handled in 1960. In 1996, more than forty million tonnes were handled. In 2014, Hamburg cargo trade was 100,000 million tonnes (Levinson, 2008). Figure 1 shows that after the mid-1950s trade grew faster than ever before. To what extent the huge increase in sea and international trade was due to the cost reductions and efficiency increases of the container merits further discussion.

Nowadays freight costs do not really affect a shipper's decision whether to ship or not. One paper mentions that it is better to assume that moving goods is essentially

costless than to assume that moving goods is an important component of the production process' (Glaeser et al, 2003). In 2004, the value of the world import trade was 9.2 trillion dollars whereas the cost of freight was 270 Billion dollars; the cost representing only 3.6% of the total value of world trade (Stopford, 2008). This measure also overestimates the shipping freight cost since it includes inland transport and distribution. It can be inferred that shipping costs have decreased significantly.

The above does not mean that transport costs are unimportant. If transport costs were higher in a certain country, a shipper in that country would add more weight to transport costs as a share of the total trade costs and the levels of trade could potentially be affected. Maritime transport costs have been shown to significantly impede the levels of international trade in developing countries, where they are high due to restrictive trade policies and private anti-competitive practises. This suggests that transport costs matter – they are important in determining the amount of international trade (Fink et al, 2002).

Increasing International Trade

In Paul Krugman's paper published in 1995, 'Growing World Trade', he acknowledged that the reasons for increased trade volumes remained an open, important and disputed issue. In 1960 America's trade as a percentage of GDP was 4.7%. In 1994 it increased to 11.4%. Journalists emphasised the importance of technological advances, whereas economists spoke about the role of multi-lateral and bilateral trade agreements and the removal of protectionist measures after World War II, and their role in boosting international trade.

A considerable number of empirical studies have examined the role of maritime shipping in boosting trade. Results have differed. Some have claimed that the maritime industry did not help at all in boosting trade. Other research has shown that maritime trade did not help to the same extent that other factors did, claiming, for example, that income growth and tariff reductions were more important factors (Baier and Bergstrand, 2001). A recent paper has claimed that intermodal containerisation played a key role in increasing trade and causing globalisation, downplaying the results of research undertaken earlier (Bernhofen, 2016). Another finding of this study was that containerisation boosted trade not only in "containerisable" products, but also boosted trade of goods that were not shipped with containers. The researchers claim that the presence of positive externalities shows just how important the innovation was.

Conclusion

Maritime transport has clearly played and continues to play a vital role in boosting international trade flows through cost reductions and quality improvements. During the two time periods of technological advancement discussed, the volume of international trade increased significantly. Although studies have conflicted one another, it is clear that there is some kind of link between technological improvements in maritime shipping and international trade.

Of course, there are other costs that affect international trade levels. Tariff costs, information costs, enforcement costs and distribution costs must also be considered (Anderson and Wincoop, 2004). When trade costs are so broadly defined; all the costs involved in getting a good from the producer to the consumer, then these costs appear to be quite large. It is important for policy makers to attempt to minimise all of these trade costs in order to increase international trade levels even further.

And even after considering all of these trade costs, there are still other factors that are connected with and affect international trade both directly and indirectly. As such, it is difficult to determine the direct effects that technological improvements in the maritime shipping industry had on international trade. As Paul Krugman put it: '*International Trade is, after all, the prime example [...] in which everything affects everything else in at least two ways*.' (Krugman, 1995: 328). While determining specific causal relationships may be difficult, the influence of shipping on societies and economies throughout the ages cannot be denied and makes this topic a fascinating one for all those interested in the development of international trade.

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Notes

1. Workers who are involved with operations in the port are called longshoremen.
2. An intermodal container is a container which can used on multiple modes of transportation; Vessels, Trucks and Railways.