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Review on the Role of Ports in the Development of a Nation

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Abstract

The transportation sector is a strong factor in terms of economic and regional balanced development, as well as also having a great influence on national integration to the world economic market. India has a rich history of trade across seas. Ports constitute an important economic activity in coastal areas. The higher the throughput of goods and passengers year-on-year, the more infrastructure, provisions and associated services are required. These will bring varying degrees of benefits to the economy and to the country. Ports are also important for the support of economic activities in the hinterland since they act as a crucial connection between sea and land transport. As a supplier of jobs, ports do not only serve an economic but also a social function. In terms of load carried, seaway transportation is the cheapest and most effective transportation system compared to other systems. Industries require a safe and cheap means of exporting finished goods and importing raw materials. Hence the majority of industries in the world are located in the coastal belts, in the vicinity of major ports. These industries in turn, influence the lives of the employees and indirect benefactors. This report seeks to study the role played by ports in the development of a nation.

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1. Introduction

Oceans have always been an alien realm for humans. Ancient humans dared not sail too far into the ocean for fear of falling off the edge of the world. As science progressed, humans began to understand more about this unknown world. Ancient civilizations had trade relations between the coastal cities. The age old belief was broken when the planet was proven not to have edges according to Castro et al. (1970).

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Nomenclature

TEU	Twenty Foot Equivalent Units
MTEU	Million Twenty Foot Equivalent Units
GDP	Gross Domestic Product

The extensive trade networks of the Ancient Maya contributed largely to the success of their civilization spanning three millennia. Moderately long distance trade of foreign commodities from the Caribbean and Gulf Coasts provided the larger inland Maya cities with the resources they needed to sustain settled population levels in the several thousands as per Foster (2002). Due to the action of wind and waves, the sea surface is never still. The phenomenon of tides also adds to this. The wobbling of boats due to these reasons makes loading and unloading of cargo and passengers challenging. Hence naturally sheltered areas were used for docking the boats and ships. As per Lorenzi (2013), the oldest harbour to have been discovered is 4500 years old. This port was discovered at Wadi al-jarf in Egypt. A harbour is a place where ships can seek shelter. In the concept of "shelter" must be included anchorages, landing places on beaches and ports with structures like, access channels, breakwaters, jetties, landing stages, quays, warehouses for storage of commodities and equipment, ship sheds and slipways for ships. Ports played an immense role in trade, commerce and politics even during the dark ages. Empires became richer by trade and stronger by conquest. Rome and its 4 ports (Portus Tiberinus, Portus Claudius, Portus Trajanus and Ostia). Athens and its 4 ports at the Piraeus (Kantharos, Munychia, Zea) and Phaleron. Alexandria and its 2 maritime ports (Portus Magnus, & Eunostos) as per De Graauw (2014).

This paper is intended to provide an overview of the role played by ports in the development of a nation by reviewing studies conducted on the significance of ports and economic reports from several ports across the globe. The following sections consist of the literature review section, followed by regionalized reviews of the impacts of various ports and finally the conclusions.

2. Ports

A port is a location on a coast or shore containing one or more harbors where ships can dock and transfer people or cargo to or from land. Port locations are selected to optimize access to land and navigable water, for commercial demand, and for shelter from wind and waves. Harbors can be natural or artificial. An artificial harbor has deliberately constructed breakwaters, sea walls, or jetties, or otherwise, they could have been constructed by dredging, and these require maintenance by further periodic dredging. In contrast, a natural harbor is surrounded on several sides by prominences of land. Before the discovery of the monsoon winds by Hippalus in AD 45–47, the mariners of the east coast of India were aware of the monsoon wind and currents and used them for maritime trade. The maritime trade from India to Southeast Asia was a seasonal phenomenon according to Tripati (2011). Indian maritime history begins during the 3rd millennium BCE when inhabitants of the Indus Valley initiated maritime trading contact with Mesopotamia as per Chaudhuri (1985). By the time of Augustus up to 120 ships were setting sail every year from Myos Hormos to India. As trade between India and the Greco-Roman world increased spices became the main import from India to the Western world according to Ball (2000). The dock at Lothal established the seafaring capabilities of the Harappans as per Rao (1992) and (1965) although this is not widely acclaimed as it does not meet all the requirements of a dock as per Leshnik (1968).

Ports are one of the primary components of the general transportation sector and are nowadays linked to the expanding world economy. Ports are basically a means of integration into the global economic system. The maritime sector encompasses a wide range of services, the transportation of goods and passengers being the primary one. Other related services included in this sector are various port services (such as pilotage, towing and tug assistance, emergency repairs, anchorage berth and berthing services, etc.) and auxiliary or supporting services (such as storage and warehousing, maritime cargo handling services, customs clearance services, etc.). While many countries have opened up some auxiliary services, such as storage and warehousing services to foreign service providers, custom

clearance services are mostly regulated by government policies. Within the port area, a great diversity of activities are performed: infrastructure services, generally provided by port authorities, cargo handling services, in most ports provided by private firms, and other services such as mooring, towage, etc. Each of these activities shows well-differentiated features and their own technology.

As per Mukherjee (2001), India has the largest merchant shipping fleet among the developing countries and ranks seventeenth in the world in terms of gross registered tonnage (grt) and fifteenth in terms of deadweight tonnes (dwt). It has been estimated that around 90 per cent of the world's merchandize and commodity trade is transported by ships. 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 the disintegration of production and the integration of world trade according to Feenstra (1998). As per Berköz, (1999), ports have 2 main advantages. First of all they perform roles as important links of hinterlands to points overseas. On the other hand, countries also require inner linkages, such as links to other ports, airport and railway connections if they are to perform their role efficiently. Secondly, sea conveyance is the cheapest way of transportation when considered in terms of fuel consumption and investment. When compared to other transportation systems, railway transportation requires twice as much energy consumption, while road transportation requires ten times as much as sea conveyance. During the past few decades the world has become increasingly environmentally conscious and, with its lower energy consumption, marine transportation is obviously more environmentally friendly than other means.

Greater transport costs lead to lower levels of foreign investment, a lower savings ratio, reduced exports of services, reduced access to technology and knowledge, and a decline in employment. It is estimated that a doubling of transport costs leads to a drop in the rate of economic growth of more than half a percentage point. This impact may appear low, but it should be noted that lower growth over the long term results in sizeable variation in per capita income. From the study conducted by Sánchez et al. (2002), it was found that more efficient seaports are clearly associated lower freight costs after controlling for distance, type of product, liner services availability, and insurance costs, among others. Port efficiency factors, as explanatory variables, reflect a set of components easily observable in any port terminal. Variables considered include the container hourly loading rate, the annual average of containers loaded per vessel, waiting times, and several others. According to Sánchez et al. (2002), a 25% improvement of one efficiency factor implies a reduction of approximately 2% in total maritime transport cost. As per Ferrari (2011), there is a positive influence of port throughput on local development That influence is weak (elasticity is less than 0.05) and weaker than that of other transport infrastructures (i.e. airports). The employment impact is positive and higher on tertiary activities than industrial ones. The study conducted by Kowalczyk (2012) agrees that the recent world tendencies in cargo transport are heading towards deployment of large and fast container ships and reducing the number of ports of call. As a result of reduced number of calls, the total costs of cargo handling in the sea ports can be substantially decreased and the total time required for port operations can be shortened.

As international barriers to trade have effectively been lifted by the 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 as per Massey, (1984).

Ports are a key component of the logistics chain and, therefore, their operation has a direct effect on relevant economic variables such as export competitiveness and final import prices, thus affecting economic development according to Tovar et al. (CCRP Working Paper No.7)

A dry port provides services for the handling and temporary storage of containers, general and/or bulk cargoes that enters or leaves the dry port by any mode of transport such as road, railways, inland waterways or airports A dry port of international importance shall refer to a secure inland location for handling temporary storage, inspection and customs clearance of freight moving in international trade. As per the roles of dry ports in economic corridors issued by the transport division, UNESCAP, they have many purposes like:

- Help bring economic development from coastal area to hinterland (particularly for LLCDs)

- Dry ports can grow to SEZs

The problem of biological invasions is known as one of the major threats to aquatic environments in the world, and the involvement of shipping as a vector for alien species and pathogenic agents has been internationally suggested at various conferences and recognized by the provisions of treaties.

Ballast water has been identified as the main vector for the introduction of alien and harmful organisms into coastal zone waters, from which can originate ecological, social and economic impacts. Oliveira (2008) puts forth that the governments are forced to spend large amounts to mitigate the harmful effects caused by the alien species brought into the marine environments through the ballast water. This is a degenerative aspect of ports on the development of a nation.

For container ports and their terminals to remain competitive and to handle the anticipated growth there are huge challenges to increase their productivity, to reduce the spatial pressure and congestion and to improve their hinterland accessibility. New port concepts in which the 'port entry' is shifted to an inland location, accompanied by a movement of all kinds of operations, as buffering, stripping and stuffing and warehousing, contribute to solving the port problems, such as congestion and lack of space.

3. Economic Impacts

Common ways of measuring economic impacts are the quantity of jobs, sales, and tax receipts associated with an activity. These metrics are often reported as evidence that the welfare of a community will be (or is being) enhanced by a policy decision. Common measures of economic impacts are employment, wages, output or revenue, and tax revenues. While the methodologies that are used to estimate these impacts vary widely in sophistication and detail, the metrics that are reported tend to be consistent. This is because economic impact studies in the maritime realm often employ input-output (I/O) models derived from I/O economics. These models are most commonly suited to providing users with a local and regional analysis of port impacts.

Up to 600,000 tons of goods (imports & exports) flow yearly through Port of Beirut (POB). Hence, an incident at the port (Natural or manmade) that results in its congestion or blockage will have distressing consequences not only to the Lebanese community, but also to the regional trade and economy.

Utilizing regression analysis, the role of ports on a nation's development as a part of transportation services is examined in Berköz (1999). In the regression analysis, Gross National Income is taken as the dependent variable and port length, total traffic figures, imports and exports, ship visits, number of workers and storage/warehousing are considered to be the independent variables. Trade being carried out at ports and by means of seaway transportation is one of the fundamental elements have a direct effect on the macro-economy of any country and is one of the factors affecting that country's economic development. Within the regression analysis, it was determined that total burden exports and imports and ship visits are highly correlated with the gross national incomes of the cities. On the other hand, the assumption that port size, number of workers and stock capacity are related with gross national income has failed.

In the 2005-06 fiscal year (April to March), Chennai PT handled 0.73 Million Twenty Foot Equivalent Units (Mteu) of container volume. It is expected that the port shall handle anywhere between 0.85 Mteu to 1.0 Mteu in the year 2006-07. Presently, the maximum numbers of ships visiting Chennai PT have parcel size between 700 to 1500 teu. From April 2006 to December 2006, Chennai PT handled approximately 39.00 Million Tonnes (MT) of inbound and outbound cargo. Of this traffic, containerized cargo amounted to around 10.35 Mt i.e. 0.65 Mteu at an average of 16 tonnes per teu as per the Business plan for chennai port trust: final report (2006).

In 2010 the Port of Hamburg supported 133,000 jobs in the Free and Hanseatic City of Hamburg and 155,000 jobs in the entire metropolitan region. This is equivalent to 11.8% of the labour force. Approximately every 8th job in Hamburg is generated by economic activities that are in some way related to the Port of Hamburg. Jobs supported by the Port of Hamburg employ about 261,000 people in all of Germany. In 2010 the port generated, directly and indirectly, a gross domestic product of € 12.6 billion which roughly equals 14% of overall gross value creation in Hamburg as per the port development plan to 2025 by the Hamburg port authority.

As per the University of Texas (2008), the local and regional economic impacts of several Texas seaports are estimated through surveys, interviews and the use of a modeling tool called IMPLAN, which is widely used to estimate regional and local economic impacts.

Port of Beaumont	
Economic Value (in millions of US $):	122.2
Port of Brownsville	
Economic Value (in millions of US $):	2,779.5
Port of Corpus Christi	
Economic Value (in millions of US $):	2,762.7
Port of Houston (Port of Houston Authority)	
Economic Value (in millions of US $):	117,589.5

Further detailed account of local and national economic impacts of these ports can be obtained from the accounts of University of Texas (2008).

Wisconsin's port facilities serve as hubs of diverse economic activity linking waterborne commercial vessels with an extensive network of highways, railroads and airports as per Wisconsin Department of Transportation Bureau of Planning and Economic Development, (2014) . Each year, over 30 million tons of goods worth over $2.4 billion pass through Wisconsin's commercial ports, including essential products such as coal for power plants, iron ore for industry and salt for the safety of roads. Total gross economic impact of commercial ports in Wisconsin (not including U.S. Coast Guard expenditures): 9,550 jobs, $1,625,085,310 in output and $461,987,535 in personal income from wages and salaries.

In the Pearl River Delta (PRD) region of Guangdong Province in China, port systems have been heavily intensified in the recent decades. As per Guoqiang et al. (2005), GDP of Guangdong province increased from 573.4 billion Yuan in the initial reform year 1979 to 1362.6 billion Yuan in 2003; and in the same period annual growth rate of GDP per capita reached 11.4%.Container logistics systems in these areas have been amazingly changed in recent decade as per Wang, (1998).

The Latvian ports handle on average 60 million tons per year. The transportation and storage account for approximately 13% of the Latvian GDP, and the total revenues from transit cargoes account for approximately 4.4% of the GDP and are equal to 27.7% of the total volume of the export of services according by Rijkure and Sare (2013).

In 2011, the ports sector directly employed 117,200 people. This was 0.4% of total employment in the UK, or 1 in every 270 jobs. Of these, the majority (44%) were employed in either transport or transport-related activities. As per Maritime UK (2013), the ports sector made a value-added contribution to UK GDP of £7.9 billion, equivalent to 0.5% of UK economic output. This was a larger contribution than made by the aerospace and hotel accommodation sectors.

4. Discussion and Conclusions

Results of the various reports from ports around the world clearly put forth the idea that ports are a vital part of a country's economy. The growth of ports will unerringly boost the country's economy. The growth and development of ports leads to greater trade activity, increased supply, greater foreign reserves and reduced prices for commodities as a whole. Improvement in the port infrastructure has shown very good reflections in the GDP in the cases discussed.

In our globalized world, companies look to expand their businesses overseas through export tactics. As a result, a country's GDP is significantly affected by the ability of companies to export their goods and services globally. Convenient, effective transportation ports have the potential to significantly increase economic growth and success of nations as per Sleeper (2012). As a result of intense competition in the port industry, the container shipping industry has changed significantly. Major shipping conglomerates have attempted to globalize their services through joint ventures, mergers, etc., facing slimmer profit margins. Concurrent with this movement has been an increase in deployment of larger vessels in order to enhance cost efficiencies through economies of scale. Ports continue to play an important role in the economic status of a country, and their effectiveness can lead to significant economic benefits or failures. Additionally, any country that wishes to increase its global economic footprint faces the challenge of constructing large, efficient ports for export purposes.

Also the competitive battle among ports will increasingly fought ashore. Rising concerns about capacity issues have led market players to secure terminal and corridor capacity. Ports have become more dependant on the

intermodal carriers. Thus Notteboom, (2008) presses the argument that the port authorities co-ordinate with logistics networks to promote an efficient intermodal system to secure cargo under conditions of high competition.

Exports have a profound effect on a country's GDP. According to Sleeper (2012), when comparing the change in percentage of China and Brazil's GDP and exports, there is a consistent trend that suggests a link between the two sets of data. Port efficiency, which ultimately affects total exports, is important when attempting to increase GDP. Countries with more efficient and/or numerous ports also tend to have higher overall GDP. China has 12 ports listed in the "Top 50 World Container Ports" ranking by the World Shipping Council in 2010, where as Brazil only has one. Interestingly, China's GDP (5.926 trillion USD) was more than twice that of Brazil (2.087 trillion USD) in 2010. By examination of the scatter-plots, Sleeper (2012) determined that there is a positive trend in this relationship. That is, the greater number of highly recognized ports in a country, the higher the GDP.

If port systems are not continuously updated, they face the threat of becoming obsolete and eventually too inefficient to run. As a result, port owners need to constantly reserve funds for upgrades and maintenance costs. Due to the exorbitant nature of these projects, public-private partnerships are often pursued. Unfortunately, large infrastructure projects often face delays and unexpected cost increases, resulting in the inability to deliver completion by the original deadline or within budget constraints as per Vining and Boardman (2008). Increased research into best practices in these endeavors would benefit the partnership greatly, and is a wise investment for contractors and governments alike.

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