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PORTS IN THE NEW MANUFACTURING LANDSCAPE

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The association between ports and manufacturing has constantly evolved through technological and economic changes. Prior to containerization, there were strong linkages between ports and heavy industrial activities, and indirectly with lighter forms of manufacturing. Many ports were a combination of commercial and warehousing activities requiring a large amount of labour, while other ports focused on transshipping bulk commodities with the related heavy industrial activities.

Manufacturing activities are influenced in their locational choices by three main categories of factors with each activity having different considerations for ports (Figure 1).

- The first are the material inputs of manufacturing such as energy, raw materials and land, which is associated with industrial ports
- The second concerns the non-material inputs of manufacturing such as labour and regulations, which is associated

with manufacturing cluster ports

- The third involves the outputs of manufacturing such as its markets and customers, which is associated with gateway or transshipment ports

THE DIVERGENCE OF MANUFACTURING

Containerization and globalization shifted the manufacturing landscape by enabling a minimization of input costs, particularly those costs related to labour. This in turn led to a paradoxical outcome as lower cost labour in developing economies became a suitable alternative to the ongoing mechanization of existing manufacturing clusters in the developed world. Instead of labour being gradually substituted for machinery and equipment, higher cost labour was substituted by lower cost labour, creating a divergence in manufacturing and a growth in shipping activity. At the same time that manufacturing activities tried to minimize input costs through outsourcing

and offshoring, more efficient transportation supported the growing flows of parts and finished goods across long distances.

This process was very disruptive to the global manufacturing landscape, particularly because of the rapid closure of manufacturing facilities in advanced economies. Developing economies, particularly in East Asia, started to quickly develop their manufacturing sector. This led to a dislocation of the relationship between ports and manufacturing. The ports of many developing economies became the head of export-oriented manufacturing clusters while the ports of advanced economies became commercial gateways focusing on distribution of imported goods within a hollowed manufacturing landscape.

THE FOURTH INDUSTRIAL REVOLUTION

At the beginning of the 21st century, as containerization and globalization reached a phase of maturity, a "fourth industrial

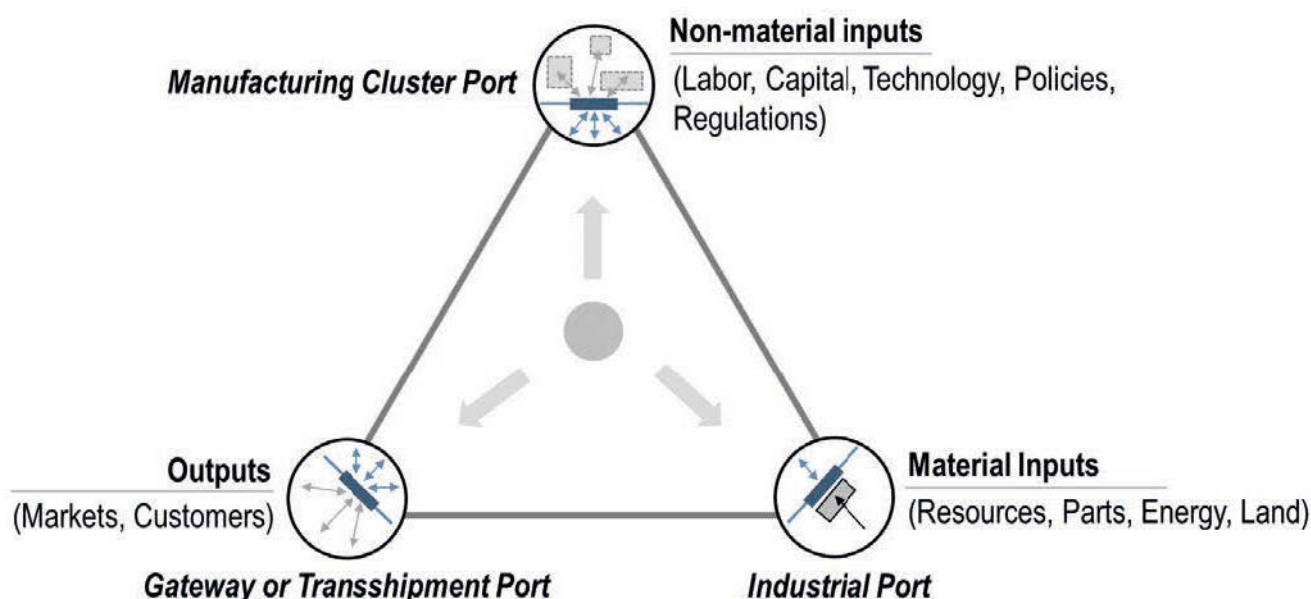


Figure 1: Ports and economic location factors

revolution” has been unfolding. It is mostly based around the trends of automation and robotization forming cyber-physical manufacturing systems with information technologies becoming increasingly imbedded with manufactured goods and processes. Robotization enables machines to perform increasingly complex tasks while being able to adapt to a constant redefinition (reprogramming) of these tasks. The performance of machines is getting so advanced it is becoming tantamount to the flexibility of human labour in many manufacturing sectors.

The probability of an occupation to be automated can be inferred from its level of dependency on three factors of human expertise: perception and manipulation; creative intelligence; and social intelligence. These tasks are usually very complex and difficult to automate, so occupations that have a high reliance level of any of them are less likely to be automated. Manufacturing, transportation and logistics employment are among the occupational groups that have the highest probability for automation since many of the tasks are repetitive. Various surveys and estimates underline that 80% of all the tasks related to manufacturing and logistics could be automated in the coming decades, which has created and will create a lot of uncertainty about how the future of manufacturing may unfold.

MANUFACTURING UPSIDE DOWN

Considering the expected disruptions, the importance of input costs is rebalanced since labour can be considered close to ubiquitous in the emerging manufacturing landscape of the Fourth Industrial Revolution. Thus, many manufacturing

activities are less incited by lower labour costs and must consider a different logic. This confers a higher level of flexibility in terms of the locations, the manufacturing processes, the scale and the scope of the outputs, as well as the customization of the products.

The focus therefore shifts to global value chains, which gather resources, transform them in parts and products, distribute finished goods to markets, and finally make these resources available again through various recycling and reuse strategies. Therefore, manufacturing and supply chain management become closely embedded to the point that it is almost impossible to tell them apart; manufacturing is upside down.

FUTURE PORTS

With several aspects of manufacturing becoming less dependent on basic inputs costs, the value of manufacturing is more related to how a location can provide access to a wide pool of suppliers and customers. Areas having access to global and regional distribution systems thus convey an important advantage. Manufacturing in the Fourth Industrial Revolution becomes more dependent on logistical capabilities and the flexibility they confer.

Since logistics is a highly transport intensive activity, areas nearby terminal facilities such as ports, airports and intermodal rail yards are offering an attractive proposition. The port, through its connectivity to global markets, raw materials and parts, can be maximizing opportunities for manufacturing and appears to be the most stable location in a context where inputs cost and sourcing strategies could fluctuate. The higher the connectivity a port can offer, the better

its value in the emerging manufacturing landscape. The port of the future will be more than a national infrastructure resource, it will be tool to multiply the opportunities of manufacturing and logistics.

ABOUT THE AUTHOR

Dr Jean-Paul Rodrigue is a Professor at Hofstra University, New York. His research interests mainly cover the fields of transportation and economics as they relate to logistics and global freight distribution. Specific topics over which he has published extensively cover maritime transport systems and logistics, global supply chains, gateways and transport corridors.

ABOUT THE ORGANIZATION

PortEconomics is a web-based initiative aiming at generating and disseminating knowledge about seaports. It is developed and empowered by the members of the PortEconomics group, who are actively involved in academic and contract research in port economics, management, and policy. Since October 2012, Port Technology International and PortEconomics have been engaged in a partnership. www.porteconomics.eu.

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