An economic logistics model for the distribution of maritime containers through Campania ports and interports

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Abstract

In a container transportation and logistics network, we define an interport as a common user facility located in the hinterland of one or several seaports where different services are available to carriers and shippers such as: container rail-road trans-shipping, customs clearance and inspection, temporary storage, container tagging and sorting, container maintenance and repair, and even the opening, manipulation and processing of the contents of containers for later marketing efforts at distant ultimate destinations. The functions of these inland logistic centres thus range from simple cargo consolidation and intermodal switching to customs operations and advanced quasi-manufacturing and distribution logistic services (assembly, packaging, labelling, quality control, reverse logistics, city logistics, etc.). Interports represent an innovation posing challenges and opportunities for many operators involved in freight transport, logistics, manufacturing and trade.

Mathematically, we identify the "interport model" as an extension of the conventional hub-and-spoke model complemented with features indicating whether routing of traffic from/to any port via the interports may occur or not. The purpose of the model is to highlight the advantages that some shippers will enjoy in routing their maritime containers through the interports.

We discuss an empirical application portraying the intermodal and logistic "first-tier" network in the Campania region, Italy. In particular, Naples and Salerno are the major seaports of the region; the recently constructed terminal, warehousing and processing facilities at Nola and Marcianise are recognized as interports; Italian regions and cities are the final road and railway destinations (inward model).

The mathematical programming network model aims at minimizing the sum of all container-related logistic transportation costs throughout the entire network (including, as the case may be, customs inspection costs, handling charges and storage charges at ports and interports), and subject both to balancing conditions at all nodes and railway capacity constraints. Time dimension is included in demurrage charges computed through dwell times for empty containers, inspected full containers and non-inspected full containers at ports and interports. The numerical prototype application is solved by using GAMS computer program.