CHALMERS
UNIVERSITY OF TECHNOLOGY

AN EXPLORATORY ANLYSIS ON EMPTY CONTAINERS POSITIONING TO IMPROVE TRANSPORT EFFICIENTY OF DRY PORT OPERATIONS

Background:

Since the invention in the second half of the 20th century, there is a growing trend in the use containers in the international goods transport. Today, 60% of the world's goods transported by sea are packed in containers. This fact has made international trade highly dependent on container availability, which has lately experienced shortages due to fluctuations in global supply chains. Before being in the spotlight of the current crisis, the success of containers had brought some concerns about the need of optimizing their flows, especially when they are empty. The use of containers means that an empty container (EC) needs to be moved from the place where it was emptied to the place where goods can be loaded, so-called empty positioning.

In Sweden, around 32% of the total container kilometres travelled are empty. Although some of the EC movements are necessary due to imbalances in outgoing and incoming freight flows in different geographical areas, practitioners and researchers believe that there is great scope to make the container transport efficient by reducing the empty container trips and increase in the use of more energy-efficient modes.

Based on this need, the Swedish Energy Agency (Enerimyndigheten) funded the project TOMPOS – "Increased transport efficiency through reduced empty positioning of containers", carried out by SSPA, Chalmers and VTI. The project aims to contribute to increased transport efficiency by understanding how empty positioning of containers in the Sweden's transport system can be reduced and made more efficient, in the form of increased knowledge of the current situation, the potential for efficiency and developing concrete plans for improvements.

The past research found that the dry ports as a possible solution to mitigate containers imbalances, minimizing EC movements and thus reducing the impacts on cost, energy consumption and emissions. Nonetheless, quantitative analyses need to be done to estimate how significant the effects are, taking a real operation as a case study. The master thesis will be connected to this goal, contributing to a case study of a dry port complemented with real-life data analytics and scenario modelling.

Master thesis objective and research questions:

The objective of this master thesis is to evaluate the potential impacts of a dry port on EC movements and associated externalities, i.e., cost, emissions, and energy consumption, using quantitative techniques.

Possible research questions for this thesis include (i) What are the potential impacts of a dry port on EC movements and the associated externalities, i.e., cost, emissions, and energy consumption? (ii) How does the design of operational strategies at a dry port impact EC movements and externalities? (iii) What are the possible strategies to improve the container movements in the dry port? Evaluate different strategies quantitatively for the benefits, and savings. iii) How do dry port-led collaboration strategies among private companies impact EC movements and externalities?

Prerequisites: Exposure in econometric modeling, optimization, and data analysis is preferred. Experience in any programming has further advantage.

Software and Tools: The thesis work requires the students to work on **some (not all)** of the following platforms: STATA, JMP, R, PYTHON, and LINDO. However, **no prior experience** on these tools is required.

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