An Index to Evaluate Carrier Competence in Container Inventory Management

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1. Introduction

Container inventory management (CIM) is an important activity in liner shipping business. The container inventory imbalances (CIIs) can primarily be attributed to global trade imbalances. Well planned, accurately forecasted, realistically allocated, and effectively managed container flows ensure that material and goods are globally supplied on time, in a cost-efficient way. The CIM decisions are usually influenced by many factors (Edirisinghe, Zhihong, & Wijeratne, Container Inventory Management: Factors influencing Container Interchange, 2016). However, there is no standard fool-proof CIM system in place that could effectively and efficiently control these factors (Edirisinghe & Zhihong, Virtual Container Pool: Solution to Container Inventory Imbalance, 2016).

It is identified that managing containers comprises of various parameters such as high detention cost, rising inventories, vessel misses, rejection of cargo by buyers and load times: each of which have a significant impact on economic profit as freight containers are usually exchanged in intermodal stations or terminals. The total sum spent on repositioning an empty container (MTY) is a complex calculation because the cost parameters are varied and numerous (Edirisinghe, Zhihong, & Wijeratne, Evaluation Of Expected Payoff Through Container interchange between shipping lines: a solution to container inventory imbalance in Sri Lanka, 2015).

The increasing complexity of transportation and manufacturing networks poses huge challenges for container in the process. Thus, new business corporation models are an essential factor. There is a great lack of transparency about container movements and inventory in the network which cause substantial inefficiencies in the entire supply chain. This invariably leads to prohibitive costs in transportation, sourcing, material planning and administering containers as well as to an inadequate availability of containers and therefore to low service quality. Striking an optimum

balance between customer demand for the carriage and supply of containers is the key to optimising the utility of containers.

If carriers can provide the right size, quantity and quality of containers at the right location/port at the right time when it is demanded by exporters, optimum utilisation will be achieved. It is not easy to know the exact amounts of empty containers required in the future port area.

There are 6 CIM strategies, namely: Freight Drop for Import; Freight Drop for Export; Service Agreements; Budget Synchronise; Agile Inventory; and Priority Export (Edirisinghe, Zhihong, & Wijeratne, The Global Impact of Container Inventory Imbalance and the Factors that Influence Container Inventory Management Strategies, 2016). The objective of this paper is to develop an index to evaluate carrier' competence in CIM. This index has two facets, namely, the CIM competence of an individual carrier and the country index of CIM that represents the CIM competence of all carriers which operate container services in a country. The country index is termed as the multidimensional CIM index[5] (MCI)® while the individual carrier's index is labelled as carriers' CIM competence (CCI)®.

2. Methodology

The questionnaire survey data of the research conducted in 2016 by authors (Edirisinghe, Zhihong, & Wijeratne, The Global Impact of Container Inventory Imbalance and the Factors that Influence Container Inventory Management Strategies, 2016) were used in computing the multidimensional CIM index (MCI) for Sri Lanka. The concept and methodology of MCI is borrowed from the Multidimensional Poverty Index (MPI) introduced by Alkire & Santos, (Alkire & Santos, 2011)and customised to the shipping industry. MPI measures acute poverty: the proportion of people who experience multiple deprivations and the intensity of such deprivations. The purpose of MCI is to measure acute paucity of CIM: the proportion of carriers who experience multiple deficiencies and the intensity of such deficiencies with respect to managing their container inventories. It is expected that carriers may assess their individual competence (CCI) while the country's CIM index (MCI) provides the overall competence level of the shipping industry with respect to CIM in each country. The paper explains the formation of CCI and MCI and how to derive MCI through CCI in six stages: namely, (1) choosing the unit of analysis: (2) choosing the dimensions and strategies: (3) choosing the strategies' deprivation cut-offs: (4) choosing the strategies' weights: (5) choosing the scarcity of strategies' cut-off; and (6) computing the country's multidimensional CIM index. The paper

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[5] MCI and CCI are notations newly introduced by the authors and all rights are reserved with respect to these abbreviations.

proposes that the country's multidimensional CIM index (MCI) = S × A where, S is the carrier-count ratio and A is the intensity of scarcity of effective and efficient CIM strategies in the country.

The paper reveals that 56.81% of domestic exports in Sri Lanka are empty containers: this speaks for the seriousness of the problem. It was calculated that the carrier-count ratio and the intensity of scarcity of effective and efficient CIM strategies in Sri Lanka as 0.875 and 0.670 respectively. Accordingly, the multidimensional CIM index of Sri Lanka is calculated at 0.586.

3. Conclusion/Recommendation

Although the cost of empty container reposition will be met by the individual carrier, as far as the operation procedures are concerned it is imperative that costs are transferred to importers and exporters as freight adjustments. This additional transportation cost in turn leads to higher prices of consumer goods: thus, finally it poses a recurrent financial burden to the public. Therefore, competence in CIM is not only a concern for carriers or their customers: its indirect impact has a bearing to the economy. Therefore, these findings have strategic and specific economic relevance to the region. China, for example, suffers regular container deficit while import-dependent countries like Sri Lanka usually experience excess inventories of empty containers.

4. References

[1] L. Edirisinghe, J. Zhihong and A. Wijeratne, "Container Inventory Management: Factors influencing Container Interchange," in *13th International Conference on Business Management*, Sri Jayawardanepura, 2016.

[2] L. Edirisinghe and J. Zhihong, "Virtual Container Pool: Solution to Container Inventory Imbalance," *Logistics Conference 2016 Journal,* pp. 179-204, 2016.

[3] L. Edirisinghe, J. Zhihong and A. Wijeratne, "Evaluation Of Expected Payoff Through Container interchange between shipping lines: a solution to container inventory imbalance in Sri Lanka," *Int. J. Logistics Systems and Management,* vol. 21, no. 4, pp. 503-533, 2015.

[4] L. Edirisinghe, J. Zhihong and A. Wijeratne, "The Global Impact of Container Inventory Imbalance and the Factors that Influence Container Inventory Management Strategies," in *13th International Conference on Business Management*, Sri Jayawardanepura, 2016.

[5] S. Alkire and M. E. Santos, "The Multidimensional Poverty Index (MPI)," 10 2011. [Online]. Available: http://www.ophi.org.uk/wp-

content/uploads/MPI_TrainingMaterial_23Nov2011.pdf. [Accessed 18 07 2015].

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