DEVELOPMENT OF COMPETITIVE PRICING GAME FOR LOGISTICS SERVICE

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Degree of Master of Philosophy (MPhil)

July 2009
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Submitted to
Department of Manufacturing Engineering and Engineering Management
in Partial Fulfillment of the Requirements for the Degree of Master of Philosophy

by

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July 2009
ABSTRACT

In this thesis, we study the optimization solutions under competitive and cooperative framework in the logistics service. By assuming oligopolistic market conditions, game theoretical concepts are used to examine the behavior of oligopolies in a two-echelon model. This model is an extension from the previous work. In our two-echelon model, a Stackelberg structure is considered among the competitive logistics service providers (LSPs), which include duopolistic shippers and oligopolistic forwarders. The shippers perform as a leader and ship cargoes to points around the world at the lowest cost, also they provide shipping lines to both forwarders and consignees (consumers). The forwarders including shipping agents perform as follower and assist consignees to arrange export shipment from port to port. In addition, we analyze the optimal solutions by investigation three rival game behaviors simultaneously, namely Cournot, Collusion, and Stackelberg. Thus, we propose the two-echelon model that attempts to study the action of cooperative and non-cooperative decision, and maximizes total profits of the logistics service competition among the logistics service providers. To prove this theory, numerical examples are illustrated. The goal of this thesis is to find out the optimal solutions among shipping freight, shipping quantity, and additional charges in the three behaviors. Therefore strategic decision can be developed to make individual logistics service providers successful in competition.

There are a large significant number of literatures that deal with competition in supply chain management. However, there are relatively few current studies that focused on competitive behavior of the logistics service providers under the Stackelberg structure. The main contribution of this thesis is advancement of game theory as a tool for understanding the logistics service. Determine the optimal competitive behaviors by
evaluating the rational decision of the shippers and the forwarders in shipping market, and illustrating the benefits of incorporating some specific shipping data into the freight structure. In this context, we assume the shippers attempt to optimize a more general logistics service which contains some technical parameters, such as terminal handling charges, container handling charges, and documentation fee. These aligned with the factors in a real situation that consists of the freight and the quantity. Those factors are directly and coincidently affect the optimal solutions. Taking into account of such parameters and the developed algorithms, we establish the problems by considering the optimal solutions in the Collusion, Cournot, and Stackelberg competition among the logistics emulous parties.

As a result, the optimal solutions can benefit from quantitative techniques which are relatively simple to understand and apply. This can support the logistics service providers in pricing decision under imperfect information and unstable demand as well. With the simulations of the three different game behaviors, they have a new methodology to evaluate possible freight changes in the various contexts of the shipping market situations. New perspectives are obtained from this research and presented through simulations for decision-maker to achieve their optimal benefits under their competitive situation.

The paper will be concluded by explaining how these three kinds of competitive game models give a rational approach for investigating whether cooperative or non-cooperative is a suitable freight strategy for the shippers and the forwarders. We discover that for the forwarders, Stackelberg behavior can carry out the maximization profit under certain situations. This result is in contrast with the cooperative behavior in Collusion game which can achieve the maximization profit of the shippers. Furthermore, the decision on the technical parameters of the additional charges can provide the
shippers with a powerful indicator of the direction in which the charges increase as the result of change in profit. We found out that the performance under optimization in the two-echelon logistics model is similar to which achieved in previous work.

Keywords: Oligopoly, Shippers, Forwarders, Logistics service providers, Collusion, Cournot, and Stackelberg
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