Competitions of motorcycle courier networks in a metropolitan area

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In a metropolitan area where the conventional four-wheel vehicles may have difficulties in shipping small consignments efficiently due to the limited parking spaces and congested traffic, the motorcycles become perfect means for such a task. Two major network configurations are used in the industry of the metropolitan motorcycle courier services: the hub-and-spoke network (HB) and the point-to-point network (PP). Conventional motorcycle courier services usually employ PP as their network structure, yet the largest motorcycle courier service in Taipei metropolitan area uses HB to achieve higher quality of service and thus dominates the market of shipping small consignments. This paper, with both network strategies employed, analyzes the efficiency of service and trend of profits for both the monopoly and competition models, respectively. In the monopoly model, we derive the total amount, on-time amount, and delayed amount of consignments as the performance indices representing the service efficiency for each network strategy. Then, we try to exploit the theories of games and incorporate the penalty of delayed consignments into the profit function to analyze the profits for two motorcycle courier services in a Duopoly market.

By exploring the three different network strategy combinations (HS, HS), (PP, PP) and (PP, PP) in a simultaneous-move Cournot game where both players serve the same service zones, we observe the following three facts: First, the HS strategy will always have more profits when the economies of scale is sufficiently significant so that it can conduct more consignments with less cost (and thus is considered to have more service advantages); Second, the PP strategy may beat the HS strategy in the cases where the HS strategy does not have sufficient service advantages, and then the equilibrium would exist; Third, when both the HS and PP strategies have the same service efficiency, then the PP strategy becomes the only profitable choice. In the cases when both players are free to serve different amount of service zones and their network strategies as well, generally the PP strategy is competitive to, or even sometimes beats the HS strategy. Nevertheless, if the HS strategy has sufficient service advantages, it becomes the profitable choice for both players. Besides, we also propose a two-types-of-services model to obtain the optimal decision of allotting capability while the proportions of market demand of two type services are known.

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