Airport Competition and Congestion, and Their Effects on the Airlines’ Network Formation
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It is observed that some of the airport operators set discount airport charges to airlines in order to attract airlines to add their airports as one of final destinations. For example, Kansai International Airport (hereafter, KIX) has started the discount program for the airlines starting the new flights from KIX. As a result of this discount program, during the subsequent five years from 2009, KIX has experienced a significant increase in the numbers of flights, passengers, and cargo. Furthermore, in 2014, FedEx sets KIX as its hub for Northern Pacific region. Kuala Lumpur International Airport (hereafter, KUL) also offers several discount programs in order to attract airlines to serve to KUL. As a result of this campaign, some airlines such as Turkish Airlines start to provide the service from their hubs to KUL. These expansions in the network as KIX and KUL affect the economic welfare through several channels. Since users from these two airports or newly connected airports travel to each other via regional hubs before, this expansion improves their welfares through the reduction in scheduling cost. However, since these expansions augment the airport congestion, the discount programs to the airlines may harm the welfares of the incumbent airlines and the passengers from (to) the airports other than the newly connected. By taking into account this tradeoff, we address the following problem: i) whether the price competition between airports distorts the airline’s network choice; ii) whether the price competition worsens the airport congestion; iii) how the price competition affects the economic welfare.

Even though several literatures deal with the airline’s network formation, they pay less attention on the effect of the pricing policies of airports compared to on other topics such as the competition among airlines or alliances. Furthermore, the pricing policy at airports itself is another topic drawing an attention. The literatures dealing with the pricing policy mainly concern about the airport congestion, and its direct effect on the hinterland’s welfare. The pricing policy, however, may indirectly affect the welfare of its hinterland through the change in the airline’s network. For example, suppose that an airport raises its charge for airlines. Although this rise in the airport charge may have a positive impact on the hinterland’s economic welfare by the congestion relief, it may have a negative impact through the change in the airline’s choice on its network configuration. Namely, a rise in the airport charge may cause the change in the position of the airport in some airlines’ networks from the regional hub to the spoke. As a result, the hinterland users of this airport face the increase in their trip costs.

Teraji and Morimoto (2014) deals with the distortion of price competition on the carrier’s network choice. They show that the price competition may make the airline choose the airport in a relatively small city or country as its hub. Their model, however, have some shortcomings: i) the trip cost is just equal to the airfare;
ii) they focus on the specific type of the scale economy of forming the hub-spoke network. In order to overcome these shortcomings, Teraji (2015) extends the model of Teraji and Morimoto (2014) by adding the scheduling cost into the trip cost. By introducing the scheduling cost, which is dependent on the number of flights along the route, Teraji (2015) studies the effect of the price competition on the airline’s network in a more generalized situation. It has shown that the airport in the smaller city always becomes the airline’s hub when the price competition is present.

This result stems from the setups of the paper. Namely, under the inelastic demand assumption, it focuses on the trips from the two cities to an identical destination and the airport congestion is absent. These setups generate the following results. First, under the inelastic demand assumption, due to the absence of the airport congestion, the airline’s profit per passenger is identical between the two airports. Since the source of the revenue, the airline’s average profit, is identical between the two airports, the gain of becoming the hub is captured by the increase in the number of users. This implies that the smaller airports always receive the larger gain from becoming the airline’s hub; consequently, the smaller airport operators are more willing to discount their airport charges, and become the airline’s hub. However, once introducing the airport congestion, it reduces the airline’s profit at the larger airport more than the one at the smaller airport. As a result, it is ambiguous to tell which airport receives the larger gain from becoming the hub.

Second, since Teraji (2015) captures the difference in the airports by the number of users departing from their home cities, by forming the hub-spoke network, the airline solely receives the gain from the scale economy in shipping the passengers. However, when airlines determine their new routes, as well as the airport charge payments, they make consideration how many destinations can be added by serving a new route. This implies that the airline’s gain may differ between the two airports when the difference in the airports is represented by the number of connections, and airlines may choose the larger airport as their hubs even when the price competition is present.

By incorporating these two factors, we extend the model of Teraji (2015), by incorporating the network effect and the airport congestion. By using the setup of Teraji (2015), we develop a model consisted from three points. One of them is the foreign airline’s hub, and the others are located in the same region, for example East Asia, Europe or East Coast of North America. These two airports in the same region have services to other airports in the region, and the connections and the numbers may differ between two. The users in the foreign airline’s hub differ in their final destinations in the region where the two airports are located. The airline chooses whether to provide the service to two airports or to one of two airports. When choosing to provide the service to one of two airports, the carrier can save the operating cost to the other airport while it faces the smaller demand due to the loss of connections which is only available at the other airport.

Taking the airline’s choice into account, each airport operator determines the levels of the airport charges. In
order to deal with the price competition among airports, we consider two alternative scenarios: namely, i) the airline always has three alternative choices, providing the service to two airports or to one of two airports; ii) the carrier has two alternative choices, starting the service to one of two airports. In order to evaluate the distortion, we compare the equilibrium network choice with the optimum. By comparing with Teraji (2015), it is shown that it is difficult for airports with smaller connections to become the foreign airline’s hub even if it discounts its airport charge. This is because the airline’s gain of choosing such airport is less significant compared to Teraji (2015), in which the gain is identical between two airports.
