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Strategic airline alliances and endogenous Stackelberg equilibria

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Abstract

This paper analyzes the economic effects of the code-sharing alliances between an international and a domestic airline. If these two allied airlines and a separate unallied international airline *endogenously* choose the role of fare-leader or fare-follower, two types of Stackelberg equilibria exist. This finding suggests that the Stackelberg solution seems reasonable, and provides a guideline for the airlines' role-choosing. Furthermore, although this complementary alliance improves the social welfare, it decreases the consumer surplus of the direct international passengers and may decrease that of the direct domestic passengers. The negative effects should also be considered when governments evaluate a complementary alliance.

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Keywords: Airline alliances; Hub-spoke network; Stackelberg leader-follower

1. Introduction

In recent years, various types of alliances have been concluded and some are even now being negotiated in the airline industry. ¹ Brueckner (2001) indicates that code-sharing agreements have become a mainstream practice of the alliances in the international airline network. ² Pat Hanlon

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¹ The various types of cooperative alliances include code-sharing agreements, block-spacing agreements, Computer Reservation System (CRS), Frequent Flyer Program (FFP), and so on. Among others, for an excellent overview of developments in the industry, See Borenstein (1992), Morrison and Winston (1995) and the special report 255 of the Transportation Research Board (1999).

² A code-sharing agreement is a strategic cooperation between two airlines whereby each airline's designated code is shown on his partner's flights. The code-sharing flights are ticketed and provided as if they occurred on one partner airline. For details relative to code-sharing agreements, see Barron (1997).

(1996) points out that one of the reasons for the explosive numbers of code-sharing agreements is that the airlines' network can be extended by the agreement. For example, when a foreign airline cannot operate a domestic flight due to the Cabotage constraint, or when the home country's international airline is not interested in operating the domestic flight, while the domestic airline has a lack of authority to operate an international flight which connects to its own domestic flight under existing bilateral agreements, the international airline and the domestic airline can extend their network by concluding a code-sharing agreement.

Let us consider a simple hub-spoke network where United Airlines and Air Canada operate direct international flights between Denver (International) and Winnipeg, under the bilateral agreements between the US and Canada. On the other hand, Great Lakes Aviation (a regional carrier) operates the direct domestic flight between Denver and Amarillo monopolistically. The passengers traveling between Amarillo and Winnipeg have to interline at Denver since there is no direct flight between these two cities. If one of these two international carriers (e.g., United Airlines) concluded a code-sharing agreement with the domestic carrier (Great Lakes Aviation) for the purpose of extending their network, how will the competition among the airlines change? ³ Does the code-sharing agreement really benefit the allied airlines? Moreover, will the passengers in these markets be better off (or worse off) than before? Should the policy authorities promote the code-sharing agreement between the airlines? The code-sharing alliance issue seems to raise many economical concerns in the industry.

This paper analyzes the effects of a code-sharing alliance between the international and the domestic carriers on fares, traffic levels, and welfare. The focus is on the change in the relationship between the airlines caused by the code-sharing alliance. Essentially, we try to construct a model where the airlines can choose the roles of fare-leader or fare-follower in the allied markets. Although similar modeling has been done in many oligopoistic studies during the 80 s and 90 s (e.g., Ono, 1982; Dowrick, 1986; Furth and Kovenock, 1993; Normann, 1997 among others), previous studies on airline competition or airline alliances failed to focus on this feature. However, in an oligopoly market like the airline industry, it is noticeable that the relationship among the airlines will be affected by the code-sharing alliance. It is therefore important to take into account this changed relationship when discussing the airline alliance issue.

In previous literature on airline alliances including Park (1997), Park and Zhang (1998), Brucekner and Whalen (2000), each paper assumes *exogenously* that the airlines who act in the Nash fashion in the pre-alliance market, still act in the Nash fashion in the post-alliance market. On the other hand, the empirical study presented by Oum et al. (1996) shows how a code-sharing alliance between two small carriers (market follower) on an international city-pair market affects the market leader, under the assumption that the leader-follower relationship of the carriers is *exogenously* given.

³ According to my knowledge, Great Lakes Aviation is the code share partner of United Airlines. Another plausible example that can be suggested is the hub spoke network that links China and Japan. Both China Eastern Airways and All Nippon Airways operate direct flights between Osaka (Kansai International) and Shanghai (Pu Dong). And Shanghai Airlines operates the direct domestic flight between Shanghai and Xiangfan (an inland city in China) monopolistically. On May 7, 2003, All Nippon Airways announced that they allied with Shanghai Airline on their complementary flights between Osaka-Shanghai and Shanghai-Xiangfan.

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