Journal of Air Transport Management 44-45 (2015) 25–33

Contents lists available at ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

Dynamic effect of inter-firm rivalry on airfares: Case of Japan's full-service and new air carriers

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ARTICLE INFO

Article history:
Received 19 August 2013
Received in revised form
23 January 2015
Accepted 10 February 2015
Available online 18 February 2015

Keywords:
Japanese airlines
Entry
Dynamic competition
Consumers' surplus

ABSTRACT

This paper analyzes the dynamic changes in carriers' airfares and outputs and computes the change in the consumers' surplus year by year after new Japanese carriers entered thriving routes and started to compete with Japanese full-service airlines. Using unbalanced panel data from 222 routes and carrier specific sample observations, it finds that new carriers discounted airfares significantly as soon as they entered new markets, but two early carriers, Skymark Airlines and AIRDO, which had entered with very low airfares, raised their prices year by year. On the other hand, both All Nippon Airways and Japan Airlines responded to the new entrants and lowered their airfares to a much lesser extent than the new entrants did, and their airfare levels remained almost unchanged for at least four years after the first entry. The consumers' surplus increased significantly in the first year of each new entry but gradually decreased as the new entrants raised their airfares.

1. Introduction

The Ministry of Transport of Japan authorized Skymark Airlines (SKY) and Hokkaido International Airlines (ADO, renamed as AIRDO in 2012) to commence operations in 1996. These new entries were followed by Skynet Asia Airways (SNA) and Star Flyer Airlines (SFJ), which were founded in 2000 when the Japanese Ministry of Land, Infrastructure, Transport and Tourism deregulated carriers' entry, exit and airfares. Such new carriers in Japan used to be referred to as low-cost carriers (LCCs). However, although new Japanese carriers have some features in common with the LCCs of other countries in terms of route by route service and low airfares, the services and cost structures of Japan's new entrants are different from those of foreign LCCs.

The main difference between foreign LCCs and the new Japanese carriers is that, unlike in the US, Japan's metropolitan areas do not have secondary commercial airports available for LCCs, and the cost structures of the new carriers are almost the same as those of full-service airlines (FSAs), except for their low labor costs. The maintenance costs of the new carriers can be higher than those of FSAs, as the new carriers do not have their own maintenance subsidiary companies or divisions, and thus they have to outsource their maintenance to FSAs. Also, their leasing fees for aircraft are higher than those of FSAs due to the lack of credibility of the new firms. Since FSAs charge new entrants high maintenance fees to weaken the new carriers' cost competitiveness, the new carriers have to lower their input costs such as labor, in-flight services and maintenance costs. In addition, new Japanese airlines sometimes offer Frequent Flyer Programs (FFP) without simplifying their in-flight service, and costs such as landing fees, fuel prices and taxes are uniform among Japanese airlines, so there is not much difference in these costs between new airlines and FSAs. Moreover, because the Japanese government assesses taxes for fixed assets on each aircraft, the cost to new Japanese carriers is higher than that of overseas LCCs that are free from these taxes.

Fig. 1 depicts the fluctuations in the average costs of each carrier. We calculated the average costs by dividing the aggregate operating costs by the available ton-kilometers. The average costs of Japan Airlines (JAL) and All Nippon Airways (ANA) are fully allocated by domestic and international average ton-kilometers. Since 10 yen is approximately 10 US cents according to the exchange rate in 2014, the values on the vertical axis are almost equivalent to US cents.

The average costs of new carriers do not greatly differ from those of FSAs. In fact, those of ADO, SNA, and SFJ are even higher than those of FSAs. The reasons for this include the following:

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http://dx.doi.org/10.1016/j.jairtraman.2015.02.002
0969-6997/

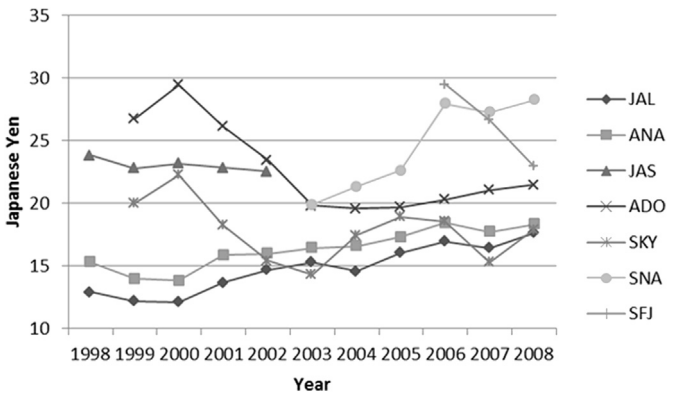

Fig. 1. Changes in carriers' average costs from 1998 to 2008.
Sources: Civil Aviation Databook and Financial Statement of Each Airline, *Japan Aeronautic Association (JAA)*, 1998–2008.

reasonable prices and reliable management (ADO calls this the 3R model) under a code-share scheme with ANA, and SNA became similar to ADO. Currently the president and board members of ADO and SNA are mainly from banks, from ANA, and from the national government. ADO and SNA are no longer LCCs but regional carriers that offer in-flight services such as beverages and shopping. SFJ is also a regional carrier that sells medium-priced tickets and offers more comfortable services such as larger pitches than other regional carriers or LCCs. In addition, among new entrants, AIRDO, SKY, SNA and SFJ now code-share with ANA, and only SKY is independent of ANA and JAL.

The characteristics of these newcomers are summarized in Table 1.

We analyzed the dynamic price competition between FSAs and the new Japanese carriers. This competition is waged among carriers of different scales and having different characteristics. The analysis includes not only duopoly markets, but markets in which several new carriers have entered. Having observed these regulatory reforms and the founding of new carriers, we have sought to

Table 1
Brief description of Japanese new air carriers.

	Air do	Skymark	Skynet Asia	STARFLYER
Frequent flyer program	Yes (My AIRDO)	No (Code-shared with Delta)	Yes (Solaseed Smile Club)	Yes (STAR LINK)
Reservation by tel.	O.K.	O.K.	O.K.	O.K.
Seat Reservation	O.K.	O.K.	O.K.	O.K.
Baggage Charge	free under20 kg	free under 15 kg	free under20 kg	free under 20 kg
Inflight Beverage	Soft drinks	Not available	Soft drinks	Soft drinks
Inflight Amenities	Audio	Not available	Not available	Video, Audio
Inflight Shopping	Original Goods	Not available	Original Goods	Original Goods
Magazine	Available	Available	Available	Available (2 kinds)
Routes	11: From Tokyo to 6 local cities in Hokkaido and from Sapporo to 5 cities in Honshu	27: Bases at Tokyo and Kobe	From Tokyo to 5 cities in Kyushu, and Kagoshima-Naha, Kobe-Naha	Tokyo-Fukuoka Tokyo-Kansai Tokyo-Kitakyushu Fukuoka-Nagoya

(1) Economies of traffic density exist, as previous studies of airline costs such as Caves et al. (1984), and Fischer and Kamerschen (2003) have shown.
(2) The cost of leasing an aircraft differs between Japanese FSAs and new carriers. This cost is higher for new airlines than for FSAs due to their lack of financial credibility. New carriers have not joined business consortiums such as Mitsubishi, and they do not code-share with FSAs, so leasing companies charge high insurance fees to new carriers in case of bankruptcy.
(3) New carriers have to pay FSAs for the maintenance of their aircraft, for ground operation activities at airports, and for the training of pilots. FSAs charged new entrants high fees for these activities.

Although new carriers face these difficulties, ADO entered the Tokyo-Sapporo market in 1998 as a budget carrier fully independent of FSAs, but after it went bankrupt in 2002 and was then revived under a code-share agreement with ANA, ADO stopped offering aggressive discounts and raised its airfares. SKY has been independent of FSAs from its founding in 1996 (its first entry was in 1998) up to the present, but its upward-price-adjusting behavior is quite similar to ADO's. During the period we analyzed, SKY seems to have faced the same situation as ADO, but unlike ADO, SKY was saved by a large investment from an individual entrepreneur who managed an internet service provider.[1] SNA received financial support from the Industrial Revitalizing Corporation in 2004.

After bankruptcy, ADO was revived as a regional carrier with

analyze the market performance of the routes that the new carriers have entered and how this performance has changed over time. To measure the market performance, we estimated the structural demand and quasi-supply functions, in which we introduced entry-year dummy variables for new entrants and for FSAs to investigate the dynamic changes in airfares and passenger volume after the new carriers entered.

In the next section we review the literature on the economic analysis of the competition between FSAs and carriers that provide heterogeneous services such as LCCs. In Section 3 we first model the entry-effect of a firm on the market price and output in the case of a one-shot game, assuming that two firms produce heterogeneous products. We then associate this result with the dynamic competition issue, and describe the econometric model. In Section 4 we give our dataset, and in Section 5 we show and discuss the empirical results and consumers' surplus. In section 6 we state our concluding remarks.

2. Literature review

Although new Japanese carriers cannot be classified in the LCC category, it is useful to review the literature on LCCs. There have been many studies on the economic impact of the entry of the U.S. LCCs into the air transportation market. Morrison and Winston (1996) empirically showed that Southwest Airlines forces its competitors to reduce their fares.[2] Dresner et al. (1996) and Morrison (2001) have measured the airfare-reduction effect of LCC entry in

[1] The Nikkei, September 24th, 2003.

[2] Morrison and Winston (1996), pp. 132–156.