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Impact of Flight Departure Delay on Airline Choice Behavior*

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ABSTRACT

The Korean aviation industry (KAI) has been expanded significantly, because the Incheon International Airport opened in 2001 and low cost carriers (LCC) entered the KAI market. But following the KAI's growth, flight departure delays (FDDs) have increased six-fold during the past decade. In terms of these situations, this study firstly adds the FDD variable to an airline choice behavior (ACB) model and secondly analyses how FDD impact the ACB. As a result, FDD is relatively less influential on ACB than other attributes. Both the flight service and available schedule are positively related to the choice of full service carriers (FSC). The analysis shows that FSCs' allotment rate (AR) is 85.3%, while LCCs' one is 14.7%.

1. Introduction

Because of the 1978 Airline Deregulation Act and the 2001 open skies policy, the global airline industry has gradually grown. In 1978, the United States (US) negated federal government control over such things as fares, routes, and new airlines' entry into the market. The government introduced the 1978 Airline Deregulation Act to make the commercial airline industry a free market, which led to a great increase in the number of flights, decreased fares, and the growth of passenger numbers. "Open skies" is an international policy concept that calls for the liberalization of the rules and regulations of the international aviation industry, especially commercial aviation, to create a free market environment for the industry.

Triggered by these two policies, the airline industry has experienced growth all over the world. According to the International Air Transport Association (IATA), the industry's revenue doubled over recent years from US$ 369 billion in 2004 to US$ 746 billion in 2014. This revenue growth was triggered by the entry of low-cost carriers (LCCs) into the international aviation market, sharing a quarter of air passengers worldwide.

The Korean aviation industry (KAI) has been developed in numerous ways, because of the 1988 Seoul Olympics and the overseas tourism freedom since 1989. Before and just after the 1997 International Monetary

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Fund (IMF) financial crisis, the KAI shrunk somewhat, but since then, it has grown a great deal, because of the Incheon International Airport (IIA) opening in 2001 and the entry of LCCs into the KAI market. The allotment rate (AR) of LCCs was 46% in 2012 and penetrated up to 50% in 2014.

Following the KAI's considerable growth, flight departure delays (FDDs) have increased six-fold during the past decade. According to a report published by the National Assembly of the Republic of Korea (http://korea.assembly.go.kr/), there were 26,136 delayed flights, with 3,948,000 passengers boarding the flights, producing a time loss of 5,452,297 hours in Korean airports, including IIA, over 16 months. If we consider the minimum wage in Korea, the social cost of FDDs was about 826 million won or US$ 709,621.

Some aviation experts have pointed out some limitations to LCCs, such as a lack of aviation mechanics. The case of People Express, a US LCC, vividly shows the limitations of LCCs, leading to frequent FDDs. People Express had gained a great deal of revenue in its growth stage, but it did not invest. The company expanded its flight schedule and service routes, creating flight clerk fatigue and causing technical problems with the flights. In the end, the company went bankrupt.

In spite of the significance of LCC's FDD, several researches dealing with aviation and airports primarily analyse efficiency in terms of operational performance (Oum and Yu, 2004; Yoshida and Fujimoto, 2004; Lam et al., 2009; Yang, 2010; Choi, 2017; Mallikarjun, 2015; Ha et al., 2013; Pires and Fernandes, 2012; Tsui et al., 2014) and ACB (Hess et al., 2007; Jung and Yoo, 2016; Drabas and Wu, 2013). Recent studies have attempted to analyse specific elements of efficiency and productivity, such as energy (Xu and Cui, 2017; Cui and Li, 2016; Cui et al., 2016) and noise (Voltes-Dorta and Martín, 2016), while both Lozano and Gutiérrez (2011) and Fan et al. (2014) only highlighted the importance of delay times for airlines. There is only rare attention paid to FDD problems among airline and airport disciplines.

To fill this research gap, this paper uses stated preference (SP) to analyse how much FDD affects the airline choice behavior (ACB). This study firstly considers FDD in an ACB model, secondly determines how FDD affects ACB.

The remainder of this paper is organized in four sections. Section 2 reviews previous studies related to the aviation industry, air transport, transportation modelling, and modal choice modelling. Section 3 comprises the research design, including data and methodology. Section 4 is the empirical research, while Section 5 discusses the analysis with brief results.

2. Literature review

As with the decision-making process for consumption goods, air passengers display identical consumption patterns when they purchase airline tickets. To define the ACB, it is first necessary to clarify what consumer behavior is. It is the process by which consumers explore, purchase, use, evaluate, and dispose of products to satisfy their needs and wants. To shed light on the mechanisms of consumer behavior, the Engel-Kollat-Blackwell (EKB) theory states that the mechanism by which a consumer decides upon a product from among several substitute goods heavily depends on the individual's internal or external features. Banfe (1992) explained EKB theory using five stages: 1) recognition of a problem, 2) exploration of information, 3) evaluation of alternatives, 4) purchase, and 5) evaluation after purchase. In line with EKB theory, Etherington and Var (1984), Toh and Hu (1990), Kaynak and Kucukemiroglu (1993), Fourie and Lubbe (2006), Hess et al. (2007), and Drabas and Wu (2013) explored and suggested various attributes of ACB, as summarized in Table 1. Most of the highlighted attributes of ACB have dealt with available schedules (AS), flight service (FS), and airfares. This confirms that many passengers consider these attributes important when they choose an airline.

Table 1
Attributes of airline choice behavior

Authors (Year)	Highlighted attributes of Airline Choice Behavior
Etherington and Var (1984)	Available schedule, airport service, flight service, airfare, attitude of flight crew
Toh and Hu (1990)	Available schedule, reliability (on-time service), airfare, overall service of flight crew, premium service, flight service, recommendation of tourism corporation
Kaynak and Kucukemiroglu (1993)	Counter service, exact aviation information, flight crew service, quick baggage handling, convenient flight connectivity, available schedule, reliability, airfare
Fourie and Lubbe (2006)	Comfortable seat, punctuality, airfare, advance service of choosing seat
Hess et al. (2007)	Access time to airport, airfare, total time of flight
Drabas and Wu (2013)	Type of flight, delayed time, punctuality, airfare, refund service, seat level

It is also necessary to review studies of FDD in the aviation and airport disciplines. Lozano and Gutiérrez (2011) analysed the efficiency of airports with respect to delay times, using a slacks-based measure data envelopment analysis model. They then considered delay times as undesirable output. Britto et al. (2012) analysed how FDD affects both passenger demand and airline fares; they determined that FDD decreases both passenger demand and social welfare. Keumi and Murakami (2012) empirically analysed modal choice behavior when passengers moved to an airport. Zou and Hansen (2014), Hao et al. (2014), and Fan et al. (2014) also studied FDD. Hao et al. (2014) measured the impact of FDDs at a New York airport, and Fan et al. (2014) used a distance function to analyse the operational efficiency of airports with respect to FDD.

There are also several previous studies related to research methodology and the logit model on the aviation and airport side. Park and Ha (2006) measured the AR between the Korea Train eXpress (KTX) and domestic flights through the Seoul–Daegu line using the SP method after the KTX entry into the market. Park and Ha (2006) showed that if the one-way airfare for KTX was about US$ 30, the AR was 86%; then the AR of domestic flights was 14%. Lee and Song (2014) analysed the AR between the Arctic sea and existing sea routes, using a binary logit model. Their results showed that if the total cost of a voyage using the Arctic sea was 70% of the total cost of an existing sea route voyage, and the total period of a voyage using the Arctic sea was 20 days, all demands from the existing sea route would be transferred to the Arctic sea route. Ng (2006) used a multi-logit model to analyse port competitiveness in the European region, especially in the northern part, in Antwerp, Bremen, Felixstowe, Hamburg, Le Havre, and Rotterdam. Lee et al. (2016) analysed the consumer behavior of passengers for transportation modes between domestic and high-speed rail, using a mixed logit model. Jung and Yoo (2016) studied passengers' airport choices in Korea using a hybrid choice