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The airport choice of exporters for fruit from Brazil

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ABSTRACT

Decisions related to transportation should be optimized using criteria and indicators. Although the literature shows relevant criteria and indicators in competitiveness between airports, this study intends to contribute to the airport choice theory presenting perceptible indicators to air cargo service users. In this sense, this study aims to analyze the airport choice factors for the export of perishables from Brazil. Based on criteria found within the literature, a sensitivity analysis was performed under simulation for airport choice. Specifically, using the Analytic Hierarchy Process (AHP) method, indicators related to time and cost criteria were compared based on interviews performed with Brazilian mango exporters. It was simulated the choice between of Brazil's main airports used for fruit export in recent years on the basis of the selection criterion pointed out by these exporters. The results show that the prioritization or choice based on time, commonly used as a reference, can result in loss of road freight, increasing costs for access to the airport by 23%. Hence, future studies can be conducted with the purpose of verifying the relation between cost and time in the decisions for choosing specific cargo airports for exporting nonperishable products.

1. Introduction

The decision about which airport to use is presented as a topic of interest in air cargo transportation research (Kupfer et al., 2011, 2016) and according to Ohashi et al. (2005), this choice results from competition between airports. The literature presents several variables for measuring the performance and competitiveness of airports (Sarkis, 2000; Gillen and Lall, 2001; Pels et al., 2001; Fernandes and Pacheco, 2002; Martín-Cejas, 2002; Pels et al., 2003; Oum and Yu, 2004; Yoshida, 2004; Barros, 2008; Assaf, 2009; Chung and Han, 2013; Chung et al., 2015), such as the number of international air cargo transit lanes and gates, cargo terminal areas and aircraft flights, and cargo destination traffic. However, a lack of studies addressing indicators perceptible to users was noticed. This paper contributes to research on the relationship between air cargo exporters and airport choice in relation to perishable goods.

Decisions involving product transportation encompasses two criteria, time and cost (Murakami and Matsuse, 2014). Studies show time (Zhang and Zhang, 2002; Adenigbo, 2016) and access cost (Hess and Polak, 2005; Jung and Yoo, 2016) as relevant for choosing an airport. Although the cost of access to the airport is a relevant criterion in the choice for an airport (Hess and Polak, 2005), it is noted that users of air transportation services are willing to incur additional costs if this results in less time (Loo, 2008; Jung and Yoo, 2016).

Thus, the purpose of this study is to analyze the process of airport choice for the export of perishable products, specifically the export of Brazilian mango by air, identifying the criteria followed by exporters as well as the relationships the exporters hold with airports. In this sense, a survey with producers and exporters of mangoes from the São Francisco Valley, the region responsible for 85% of mangoes exported by Brazil, was performed. Through Multiple-Criteria Decision-Making (MCDM) analysis and using the Analytic Hierarchy Process (AHP) method, exporters evaluated time and cost indicators related to airport performance and access to terminals and pointed out their relevance in the choice for a cargo airport for the export of mangoes. A simulation of the choice process was performed using the International Airport Governor André Franco Montoro/Guarulhos (GRU) in São Paulo, International Airport Luís Eduardo Magalhães/Salvador (SSA) in Bahia, and International Airport Gilberto Freyre/Guararapes (REC) in Pernambuco.

Section 2 provides the conceptual framework considered by air cargo agents for airport choice focusing on the criteria of time and cost. Section 3 demonstrates the method used in this research and the characterization of the object of study. Section 4 presents the decision

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weights from the analyzed variables. Section 5 show simulate the choice of airport from the evaluated criteria. And section 6 presents the final considerations of the research.

2. Conceptual framework

Air cargo transportation is an area that has attracted the attention of academics. Though, as shown in Merkert et al. (2017), publications on airfreight are quite limited because traditional literature has focused on passenger transport. However there are several study gaps, such as the choice of airports.

The airport choice is commonly approached in literature on passenger transport (Zhang and Zhang, 2002; Pels et al., 2003; Hess and Polak, 2005; Loo, 2008; Hess, 2010; Postorino and Praticò, 2012; Jung and Yoo, 2016). Although the focus of this study is on the movement of cargo, it is possible to identify decision criteria presented in studies with passengers that fit the airport choice process for cargo transportation. The study by Hess and Polak (2005) analyzed the criteria that influence the choice of passengers in region of San Francisco and identifies the consistent relationship between airport choice, airfare, access time and flight frequency. Loo (2008) also identifies this relationship, but in a multi-airport region of China. With a focus to examine the relative advantages and disadvantages between factors, the author used Multinomial Logit (MNL) from stated preference data and found that there is a statistically significant relationship between airport choice and airfare, access time to the airport, and frequency of flights. The author also demonstrate that passengers are able to pay more if this results in a reduction of the time spend in the airport.

In the same sense, Jung and Yoo (2016) demonstrate in their study the factors involved in the choice of passengers from Seoul, South Korea, regarding the three largest airports. Through the MNL and Nested Logit (NL) models, the authors present the behavior regarding choice of airport and airline simultaneously. Corroborating with the study of Loo (2008), Jung and Yoo (2016) also identify that passengers would be willing to pay more to reduce the time of access to the airport.

Pels et al. (2003) analyzed the airport choice regarding three airports in the San Francisco Bay Area, California, with reference to the relevance of the variable “access.” The authors divided survey participants into two groups, “business travelers” and “leisure travelers,” and identified through NL that there is a difference concerning the sensitivity for each group in relation to the evaluated criteria, especially when referring to time. For the authors, the time of access to the airport is of great relevance in the competition between airports of one specific region.

Postorino (2010) states that the location of the airport, as well as the distance between other terminals, are factors that influence competition between airports. The study of Postorino and Praticò (2012) uses MCDM to identify the classification of airports in a multi-airport region in northeastern Italy, considering criteria such as location, installations, financial revenue, efficiency, and operational effectiveness. According to the results, the choice criteria does not have any influence on the best-performing airport, however, it has greater influence on the other airports due to the dominant role of the main airport.

Although these studies assessed the airport choice criteria based on evaluation by passengers, it is assumable that these variables can be used to evaluate the choice of an airport in the context of cargo transportation. However, Kupfer et al. (2016) indicate that it is necessary to study passenger and freight transport separately as both have distinct rules. The study conducted by these authors approached the airport choice of airlines for regular operations with freighters in Europe. Based on data regarding the preference of 26 airlines, the authors used the Multinomial Logit (MNL) method and recognized that the presence of freight forwarders as well as nighttime operation of an airport are attractive factors. The results of this study are similar and reinforces the results of Gardiner et al. (2005) which also noted the presence of freight forwarders as a factor that influences the airport choice in cargo operations.

Table 1
Summary of reviewed literature.
Source: Author supplied.

Authors	Methods	Criteria
Pels et al. (2003)	Nested Logit (NL)	Access time to the terminal
Gardiner et al. (2005)	Arthritis Impact Measurement Scales (AIMS)	Presence of freight forwarders Location of the airport Opening hours Air rates
Hess and Polak (2005)	Mixed Multinomial Logit Model (MMNL)	Access cost to the terminal Access time to the terminal Air rates Frequency of flight
Ohashi et al. (2005)	Multinomial Logit (MNL)	Cost Air rates Location of the airport
Loo (2008)	Stated Preference (SP) Multinomial Logit (MNL)	Air rates Access time to the terminal Frequency of flight Airlines quantity acting
Hess (2010)	Stated Preference (SP)	Airport size Extent of service Location of the airport
Postorino and Praticò (2012)	Multi-Criteria Decision-Making (MCDM)	Air rates Airport efficiency level Service quality Parking Frequency of flight
Chung and Han (2013)	Conjoint Analysis	Air rates Frequency of flight Flight connectivity
Adenigbo (2016)	Factor Analysis (FA) Multiple Linear Regression (MLR)	Airport capacity Airport charges Customs efficiency
Jung and Yoo (2016)	Multinomial Logit (MNL) Nested Logit (NL)	Air rates Flight time Frequency of flight Access time to the terminal Access cost to the terminal
Kupfer et al. (2016)	Stated Preference (SP) Multinomial Logit (MNL)	Presence of freight forwarders Opening hours

According to the studies of Chung and Han (2013), most of the research on factors involved in airport choice analyzes the same types of attributes, such as airfare, frequency, and flight connectivity. For Boonekamp and Burghouwt (2017), the connectivity is a determinant in the choice of the airport. However, Zhang and Zhang (2002) affirm that customs operations in airports represents a relevant factor that influences the airport choice. Ohashi et al. (2005) argue that the choice emerges as result of competition in cargo transportation. The authors believe that this aspect makes freight forwarders prefer to perform their operations at an airport even when the airport's location is not in their favor. However, Gardiner et al. (2005) point out that location is a factor that increases the attractiveness of cargo terminals. Table 1 synthesizes the identified studies related to airport choice and presents the methods and criteria used by the authors.

According to Table 1, Adenigbo (2016) analyzes the factors that influence the choice of freight forwarders to operate at Abuja Airport in Nigeria. Through the combination of Factor Analysis (FA) and Multiple Linear Regression (MLR), the author identified that airport capacity, rates, and customs efficiency are the most significant factors in choosing a specific airport for cargo handling.