



Exploring preference heterogeneity of air freight forwarders in the choices of carriers and routes



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ABSTRACT

This paper investigates important factors affecting the decisions of air freight forwarders in choosing air carriers and shipping routes. To examine the preferences and choice behavior across firms of various sizes, a total of 285 air freight forwarding firms offering air freight services from Taiwan to Asia or global were categorized into small, medium, and large by the average tons of cargo handled annually. The latent class model that identifies the heterogeneous preferences among different categories of air freight forwarders was found to perform well in estimating influential factors. The findings indicate that large-sized and medium-sized firms have different concerns about the choice of air carriers from small-sized firms, e.g., (1) offering shipping discounts for high-volume customers, (2) ensuring a low rate of lost, damaged or destroyed cargo, and (3) performing freight forwarding service consistent with the shipping agreements. The findings also identify heterogeneity in preferences for shipping routes between large-sized and small-sized firms, e.g., (1) destination airports providing efficient cargo handling services, and (2) destination airports offering fast and effective customs clearance services.

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1. Introduction

In Taiwan, the volume of air cargo increased by approximately 30% from 2000 to 2011. The only exception was 2008–2009 when there was a significant decrease of 8% as compared to 2007 due to the global financial crisis. The number of air freight forwarding companies in Taiwan also grew by approximately 105% from 623 in 2000 to 1277 in 2011 which reflects the importance of international freight forwarding services. Since Taiwan's accession to the World Trade Organization (WTO) in 2002, the number of foreign freight forwarding companies in Taiwan has grown significantly and this has increased the competition in the air freight forwarding market. To survive and succeed in this highly competitive industry, air freight forwarders must enhance their operations and performance of international forwarding services for shipping and delivery of merchandise.

A freight forwarder is the intermediary between shippers and carriers for dispatching cargo. Generally, freight forwarders consolidate merchandise of individual shippers into large quantities of freight and then book cargo space with the carriers for a more efficient and economical shipment. In addition to providing

freight transportation and logistics, freight forwarders also offer multiple services such as documents for customs clearance for import and export, cargo insurance, packaging, warehousing, and intermodal transportation to meet the various requirements of clients and businesses. International freight forwarders can also offer global services and arrange seamless door-to-door services from the shipper to the consignee by air, sea, and land (e.g., airplane, ship, truck, and railroad).

Freight forwarders usually arrange shipment with carriers to provide a cost efficient, timely, and reliable service for the shippers in the supply chain management. To efficiently provide global freight forwarding and logistics services, an international air freight forwarder would choose the most appropriate air carriers and economical shipping routes to deliver the merchandise to its overseas destination. Also, air freight forwarders are third-party brokers/operators who coordinate and manage cargo shipments for airlines (Clancy and Hoppin, 2001). Due to the increase in the supply chain management and e-business practices, forwarders must handle tight schedules with frequent unplanned changes, non-fixed origins and destinations, along with special requests from shippers and consignees (Wong et al., 2009).

In terms of the choice of freight forwarding services by shippers, Matear and Gray (1993) indicated that carrier timing and price characteristics are important factors for shippers in the choice of freight services. As the service choice decision of freight suppliers,

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performance and schedule are important in selecting sea transport services, while a combination of schedule and space is important when purchasing air services. [Murphy and Daley \(1997\)](#) indicated that important factors to be considered by shippers in selecting international freight forwarders include: forwarder's expertise, reliability of service, ability to provide relevant information, company reputation, forwarder's financial condition, etc. [Voss et al. \(2006\)](#) indicated that security, resiliency, and cost reduction are the most important criteria for shippers to consider in selecting the carrier to transport goods.

In terms of the choice of airports or routes by air cargo carriers, [Ohashi et al. \(2005\)](#) used a multinomial logit model to identify factors that have a significant effect on choosing the route used for transshipping air cargo. The findings showed that the choice of the air cargo transshipment location is more sensitive to the connecting time at an airport than airport charges e.g., landing fees and line-haul price. [Gardiner et al. \(2005\)](#) used an international survey to identify factors influencing the choice of an airport by freighter-operating airlines. Night curfews, freight forwarders, and airport charges were found to be influential factors in the choice of an airport by cargo airlines. [Gardiner and Ison \(2008\)](#) used a staged survey and interviews to explore the effect of important factors on the choice of an airport of non-integrated cargo airlines within regions. It was found that factors that attract the airline to the airport include: origin–destination demand, presence of freight forwarders, presence of passenger airline operations, presence of partner airlines, flying time and cost, location of competitors, airport user charges, financial incentives, airport reputation, and airport advertising. [Scholz and Cossel von, 2011](#) assessed the importance of hub airports for cargo carriers from a network perspective. The results suggested that hub airports continue to be successful in maintaining their airlines while secondary airports have to set incentives such as fees, operating hours, and night flights for a long-term commitment by the operating cargo airline.

In terms of the operation of air cargo carriers, [Wang \(2007\)](#) used quality function deployment (QFD) regarding outside consumer voices and the inside quality technology to examine the performance of the air cargo sector of China airlines. The results showed that important factors demanding improvement to satisfy the outside consumer voice are: prompt handling of import/export work, willingness to help solve customer problems, standard operating procedures, flight punctuality, and good transport considerations which also revealed that accuracy and efficiency of an air cargo forwarder are the key factors in service operations. [Zhang et al. \(2007\)](#) found that an improvement in multimodal integration by a forwarder–airline alliance would increase the alliance's output. Also, such an alliance generally leads to greater market shares for the firms involved than outsourcing would. [Park et al. \(2009\)](#) used AHP analysis to examine the competitiveness of air cargo express delivery services in Korea. The results showed that accuracy and promptness are the two most influential factors in competitiveness, followed by safety, convenience, economic efficiency, and dependability. In addition to factors of accuracy and promptness, price is the most important factor to service users.

Several studies have explored the choice of air freight forwarders from the shippers' perspective. Nevertheless, the investigations on the choice of air cargo carriers and shipping routes from the freight forwarders' perspective are relatively few in existing literature. Therefore, this study aims to examine factors that affect the choice behavior of air freight forwarders through their partnerships with cargo airlines and their selection of shipping routes.

The remainder of this paper is organized as follows: Section 2 describes the data collection and the design of survey questionnaire. Section 3 presents the methods of the latent class model and

the ordered probit model using the survey data to assess factors affecting the decision of air freight forwarding services. Section 4 discusses the results of choosing air carriers and shipping routes by air freight forwarders. Section 5 provides the major results and identifies the limitation of the research.

2. Data

This study conducted a nationwide survey of air freight forwarding companies in Taiwan that provide international air logistics services. The survey sample was collected by sending a total of 867 questionnaires and receiving 285 completed questionnaires (a response rate of 33%) from respondents who agreed to participate in the postal mail survey in October–December 2011. Air freight forwarding firms were classified into small, medium, and large according to the average annual tons of cargo they handled. These firms provide air cargo forwarding and shipping services from Taiwan to Asia or worldwide destinations (e.g., Europe, North and South America, Africa, Middle East, and Oceania). The major cargo airlines that coordinate with these air freight forwarders include: China Airlines, EVA Air, Hong Kong Dragon Airlines, Cathay Pacific, Japan Airlines, Singapore Airlines, Delta Air Lines, and FedEx. The major commodities which they ship include: dry products (54%), the 3C products of computers, communication and consumer electronics (21%), equipment and machinery (16%), frozen and refrigerated products (6%), and miscellaneous (4%).

2.1. Survey design

To obtain the information on important factors which influence the decision of choosing air cargo carriers and shipping routes from the perspective of air freight forwarders, a revealed preference survey was conducted to ask the respondents about their actual choices in terms of freight forwarding service. The survey questionnaire used a five-point Likert scale ranging from 1 to 5 (1 = not important, 2 = slightly important, 3 = moderately important, 4 = very important, 5 = extremely important).

The questionnaire consisted of three sections: (1) selecting preferred cargo airlines, (2) selecting appropriate shipping routes, and (3) understanding the connection between the characteristics of air freight forwarding firms and their choice of behaviors. The first section aimed to investigate factors that increase or decrease the choice of cargo airlines which include: pricing, operational efficiency, characteristics of air freight forwarding services, and characteristics of cargo airlines, as shown in [Table 1](#). The second section explored factors that increase or decrease the choice of shipping routes which include: characteristics of flight routes, characteristics of destination airports, socio-economic and political characteristics, as shown in [Table 2](#). The third section identified the characteristics of freight forwarders and carriers regarding the air freight forwarding services which include: (1) the classification of air freight forwarders by the average annual tons of cargo handled, (2) their long-term contracts with air carriers, (3) coordination with airlines (domestic only or both domestic and foreign-owned airlines), and (4) length of flights (short-haul to Asia, or long-haul to world-wide destinations, e.g., the Americas, Europe, Africa).

These characteristics are described as follows. The size of firms which is categorized by the average tons of cargo handled annually include: small-sized firms handling less than 500 tons (32%), medium-sized firms handling between 500 and 5000 tons (44%), and large-sized firms handling more than 5000 tons (24%). The selection of air cargo shipments by domestic airlines accounted for 39% (small: 12%, medium: 18%, large: 9%), while shipments by both domestic and foreign-owned airlines accounted for 55% (small: 16%, medium: 25, large: 14%) and the remaining 6% (small: 4%,

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