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Passengers' airport choice within multi-airport regions (MARs): some insights from a stated preference survey at Hong Kong International Airport

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Abstract

Passengers' airport choice in multi-airport regions (MARs) is of great interests to transport researchers, local governments, airport authorities and airline companies. This paper analyzes the airport choice of passengers departing from Hong Kong International Airport (HKIA) to 15 destinations in different parts of the world. The results, based on stated preference (SP) data, show that air fare, access time, flight frequency and the number of airlines were the most important airport level-of-service (LOS) attributes. In contrast, the number of airport access modes, access cost, airport shopping area and queue time at check-in counters were not statistically significant. The segmentation analyses reveal important subtle variations in airport preferences among different market segments. The findings provide valuable insights on a less well-researched MAR – the Hong Kong-Pearl River Delta (HK-PRD) MAR.

Keywords: Muti-airport region; Airport level-of-service attributes; Stated preference survey; Multinomial logit model; Hong Kong-Pearl River Delta; Market segmentation

1. Introduction

Passengers' airport choice in multi-airport regions (MARs) is an important research topic in transport geography. In the first place, MARs are major air traffic generating regions, which have at least 10 million originating air passengers per annum (de Neufville, 1995). Given the substantial air traffic volume, there is a strong incentive to understand how MARs function. Secondly, the emergence of MARs challenges the traditional concept of a clear-cut and immutable airport catchment area (Ashford and Bencheman, 1987; Cohas et al., 1995; Loo et al., 2005). Geographically, a country or region is first divided into mutually exclusive and exhaustive air traffic zones (or other administrative units). Then, all air passengers within the same air traffic zone (or the administrative unit) are assigned to the nearest airport based on the winner-take-all principle (Augustinus and Demakopoulos, 1978). Within MARs, air passengers, however, can and do choose among different airports not only based on vicinity but also a series of other airport level-of-service (LOS) attributes. Generally, the air ticket price is the most important factor and is called the primary airport LOS attribute. Other factors, broadly referred to as secondary airport LOS attributes, may be categorized into two types. The first type is related to flight characteristics, including flight frequency, in-flight travel time, number of stops, transfer arrangements, congestion or punctuality of flights, airlines serving the route and aircraft type. The second type is closely associated with airport characteristics, including airport access time, access cost, access mode, parking facilities, check-in facilities, lounge, restaurant and shopping facilities, transfer facilities, baggage, customs and immigration facilities, and airport tax or passenger charge (Bradley, 1998; Pels et al., 2000).

Among the numerous MARs in different parts of the world, the San Francisco Bay Area MAR in the United

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States of America (USA) has been the most widely studied for airport choice. This is partly attributable to the highly accessible and systematic air passenger survey data collected by the Metropolitan Transport Commission in the San Francisco Bay area (Basar and Bhat, 2004; Cohas et al., 1995; Harvey, 1987; Hess and Polak, 2005; Pels et al., 2001, 2003). Moreover, passengers' airport choice within the New York/New Jersey MAR (Cohas et al., 1995) and the Washington/Baltimore MAR (Cohas et al., 1995; Skinner, 1976; Windle and Dresner, 2002) have also been closely examined. Since airlines are free to enter and exit any particular route in the USA, these studies primarily focused on the supply decisions (particularly pricing and flight frequency) of the airlines. Ground access mode choice, however, was seldom included because most air travellers would drive (rather than take public transport) to the airports.

In the UK, the studies of Ashford and Bencheman (1987), Brooke et al. (1994) and Thompson and Caves (1993) also found flight frequency to be of critical importance in affecting the (potential) competitiveness of an airport. In contrast, Ndoh et al. (1990) found access time to be the most significant airport LOS attribute. More recently, Mason (2000) found air ticket price, in-flight comfort and frequency to be the top three factors (in that order) in the airport selection of business travellers in the London MAR. At the larger spatial scale of the European Union, Bradley (1998) found the air ticket price and the ground access time to be the major factors affecting airport choice. In Japan, Furuichi and Koppelman (1994) found flight departure frequency to be the most significant. In the Hong Kong-Pearl River Delta (HK-PRD) MAR, Loo et al. (2005) found that air fare (including airport tax), together with the ground transport cost, could capture people's airport choice very well for international flights. The explanatory power of these two factors was lower for domestic flights.

From the above literature review, two important observations can be made. Firstly, while *air fare*, *access time* and *frequency of service* were found to be important airport LOS factors, their relative importance varied substantially under different geographical circumstances. Secondly, there is a need to strengthen the understanding of passengers' airport choice in an Asian context. So far, it is not clear whether passengers' airport choice within Asian MARs is shaped by the same set of airport LOS attributes as in the West. In this study, the focus is put on the HK-PRD MAR, which encompasses the Hong Kong (Chek Lap Kok) International Airport (HKIA), Guangzhou (Huadu) International Airport, Shenzhen (Baoan) International Airport, Zhuhai (Sanzao) International Airport and Macau International Airport, or the A5. Up to date, it is the largest MAR in China in terms of total air passenger enplanement (Loo et al., 2005). Fig. 1 shows the locations of these airports and the administrative boundaries of the PRD region. The summary information about A5 is shown in Table 1.

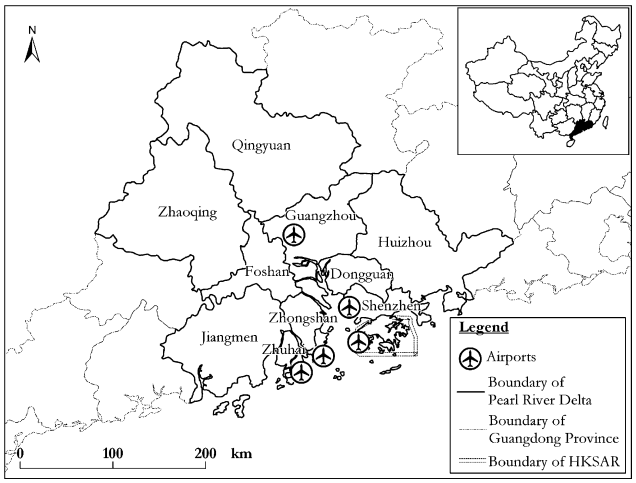

Fig. 1. The Hong Kong-Pearl River Delta multi-airport region.

In 2005, the HK-PRD MAR handled over 84.5 million air passengers. Currently, HKIA is the fifth busiest international passenger airport in the world (Airport Authority Hong Kong, 2007). Moreover, the Airport Authority Hong Kong also adopts active growth strategies to reach out to its "redefined and enlarged home market which comprises Hong Kong and the 50 million people in PRD" (Airport Authority Hong Kong, 2007). Over the past few years, numerous initiatives have been made to create a multimodal transport network to facilitate passengers in the wider HK-PRD MAR to use HKIA. Examples included the introduction of cross-boundary ferry services (at the newly built SkyPier) and cross-boundary limousine services (called SkyLimo). In mainland China, the air transport market has also been changing dramatically under the reforms of the Civil Aviation Administration of China (CAAC) since 1979. As a result of the moves to "separate government from enterprise management", there have been sweeping changes in China's airline industry (Zhang, 1998; Zhang and Chen, 2003). In particular, the China Southern Airlines (based at the Guangzhou International Airport) has recently announced the launching of 10 new international air routes to eight Asian nations in 2007 (M2 Presswire, 2007). All these new air routes are expected to greatly enhance the role of Guangzhou International Airport as an important airport hub in China. Within the HK-PRD MAR, airlines and airports operate in a highly competitive business environment. Hence, local governments, airlines and airport authorities have a strong interest in understanding passengers' airport preferences.

How do air passengers choose their (departure) airports within the HK-PRD MAR? How do their airport preferences compare with the overseas findings in the West? To what extent are air passengers willing to trade-off different airport LOS attributes? For instance, are they willing to travel longer (ground) distances for additional flights to their destinations? If so, what is the trade-off relationship? Furthermore, would the preferences of different market

Table 1
Summary information of airports in the HK-PRD MAR

	Passenger enplanement in 2005 (passengers)	Market share within the HK-PRD MAR (%)	Area (km^2)	Number of runway	Runway length (m)
Hong Kong International Airport	39,799,602	47.1	12.5	2	North: 3800 South: 3800
Guangzhou International Airport	23,558,274	27.9	15.4	2	East: 3830 West: 3600
Shenzhen International Airport	16,283,071	19.3	10.8	1	3400
Zhuhai International Airport	657,117	0.8	25	1	4000
Macau International Airport	4,250,742	5.0	1.9	2	No. 34: 3360 No. 16: 3285
Total	84,548,806	100.0	65.6	8	–

Source of data: http://www.Chinainfobank.com; http://www.szairport.com; http://www.macau-airport.com; http://www.cad.gov.hk; and http://www.caac.gov.cn.

segments, such as business and non-business or short- and long-haul air travellers, be different? All these research questions are highly important because China is the biggest emerging air transport market in the world and the HK-PRD MAR is the largest MAR in the country. From 1980 to 1994, the average annual growth rate of civil aviation in China was as high as 20.7% (Zhang, 1998). In 1980, China only ranked 33rd in the world in terms of total air revenue passenger-kilometres performed; in 1998, it had risen to rank number six (Zhang and Chen, 2003). According to the latest statistics in 2005, China already ranked second (after the USA) (ICAO, 2006).

The above research questions, however, cannot be answered satisfactorily by analyzing the existing aggregate revealed preference (RP) data, such as existing airport choice, alone. In the current research context, RP data suffer from three limitations. First, it is often difficult to distinguish the effects of different attributes leading to a particular choice (Bates and Terzis, 1992). For instance, one can observe an international air traveller choosing HKIA in the HK-PRD MAR but cannot tell whether he/she was choosing HKIA because of the cheaper air ticket price or higher flight frequency or other factors like better airport access. Hence, the measurement error for RP data tends to be greater than stated preference (SP) data (Bradley and Kroes, 1992). Secondly, it is the multi-colinearity problem if all relevant attributes are included to model the airport choice (for details, see Yoo and Ashford, 1998). Lastly, behavioural models based on RP data cannot handle new alternatives which are currently unavailable in the market. For instance, the notable increase in international flights at Guangzhou International Airport could hardly be reflected in the past behaviour of the air passengers. Under the dynamic institutional and regulatory settings, as well as the highly competitive market environment in the HK-PRD MAR, air passengers' past behaviour (RP data) may not be a very good indicator of their future behaviour.

SP data refer to the stated responses of the respondents about hypothetical choices, which are designed by the researchers to reflect conditions that are not currently observable. The biggest strength of the SP methodology is its flexibility, which can reflect a wide range of airport LOS attributes for strategic planning purposes. Properly designed SP games also avoid the multi-collinearity problem and allow researchers to examine effects of changes in closely related attributes (Bradley and Kroes, 1992). The preferences of the respondents are often solicited as ratings, rankings or a discrete choice among all available hypothetical alternatives in an SP game. This paper, like most other SP surveys, adopts the discrete choice option. Hence, the term "choice" has been used throughout this paper. It is recognized that air passengers may value certain airport characteristics but, in reality, have little choice of the airport because of other constraints like limited knowledge. (This factor, termed the consideration effect, has been studied by Basar and Bhat (2004).) Thus, airport competition is often about finding a niche rather than competing directly with each other.

SP data, however, are also prone to errors. In particular, since the respondents were only required to indicate their preference without actually taking the choice (and incurring the costs involved), SP data are known to have larger perception and reporting errors (Bradley and Kroes, 1992). Another source of error for an SP analysis is not associated with the SP data *per se* but the statistical model used to analyze the data. Very often, the standard multinominal logit model (MNL) is used for analyzing SP data under the random utility maximization theory (Loo, 2002). However, the MNL model (whether used in analyzing RP or SP data) has two rather restrictive assumptions in relation to the distribution of the error term (independently

and identically distributed in accordance with the Gumbel distribution, IID) and the choice basket (independence from irrelevant alternatives, IIA) (Loo, 2002).[1] Hence, the researchers must be very careful, should the MNL coefficients be used for prediction purposes. Since the primary aim of this paper is not to make predictions but to examine the relative trade-offs[2] among different LOS attributes, the MNL model is chosen. In fact, many key factors, such as the population spatial distribution, income level and people's air travel propensity, should be considered if one wants to predict the distribution of air passenger traffic among airports in a MAR (Graham, 1998; Loo et al., 2005). In a nutshell, the preferences of air passengers for airports in an MAR are of interests to the governments, airlines and airport authorities. However, major decisions about airport planning and airline services are clearly shaped by a series of other complicated factors, including political, economic and strategic reasons, which are beyond the scope of this research paper. The aim of this research is to provide a first glimpse of the airport preferences of passengers in the booming HK-PRD MAR.

2. The survey

In order to examine the above research questions, an SP survey was conducted in the restricted area of HKIA for flights departing from Hong Kong to 15 destinations in different parts of the world. These destinations included mainland China, India, Indonesia, Japan, Malaysia, Singapore and Thailand in Asia, Brazil, Canada and the USA in America, France, Italy and the UK in Europe, and Australia and New Zealand in Oceania. A total of 25 flights were randomly selected among the 1129 flights departing from Hong Kong during the two-week survey period of 1st March to 14th March 2003. The selected flights were operated by a total of 10 airlines. They were British Airways, Cathay Pacific Airways, China Airlines, China Eastern, China Southern, Dragonair, Japan Airlines, Singapore Airlines, Qantas Airways and United Airlines. Among the 10 selected destinations, four could be considered as short-haul flights (Beijing, Shanghai, Xiamen and Xian). Three were medium-haul flights (Singapore, Sydney and Tokyo) and the other three were long-haul flights (London, New York and San Francisco). In view of the diverse nationalities of the air passengers, the questionnaire was prepared in four different languages (Cantonese, English, Japanese and Mandarin). During the main survey period, face-to-face interviews were conducted by trained interviewers with multilingual abilities.

Ideally, the survey should be conducted in the restricted areas of the other airports of the HK-PRD MAR during the same survey period. After all, the questionnaire and the survey methodology have been developed. However, this was not feasible because of the more complicated administrative structure of the airport authorities in mainland China. For instance, the more commercially oriented Guangdong Airport Management Limited was not yet set up in 2003 and that there was (still is) a Group Communist Party of China (CPC) Committee overseeing the Shenzhen International Airport. Nonetheless, airport reforms are under way in mainland China. It might be possible to conduct similar surveys in the future. Despite this limitation, the survey team still considered it worthwhile, as a first step, to carry out the SP survey at HKIA, where nearly half of the air passenger enplanement in the HK-PRD MAR took place (see Table 1). Conducting research on airport selection is not easy because it is time-consuming and costly to conduct specifically organized surveys, as opposed to general surveys conducted regularly by the airport or transport authorities. In fact, the process of obtaining approval from the Airport Authority Hong Kong was not without difficulties and conditions.[3]

During the survey period of 1st March to 14th March 2003, a total of 308 completed questionnaires were collected. In terms of ethnicity, the results show that the majority of the respondents were Chinese (58.6%). The other major groups were Caucasian (23.8%) and Japanese (7.8%). In terms of the normal place of residence for the last 12 months, 28.6% were residing in Hong Kong. These people included non-Hong Kong citizens of a surprising wide range of nationalities like Australians, British, Chinese (mainland Chinese and Taiwanese), Filipinos, Indians and Americans. These findings reflect HKIA as a major airport hub in the HK-PRD MAR and Hong Kong as an international city. Moreover, 24% of the respondents were having their normal place of residence in the other parts of China, that is, mainland China and Taiwan. Though this SP survey could not claim to be representative of all air passengers in the HK-PRD MAR, it did include a rich variety of air passengers, including mainland Chinese living beyond the Hong Kong Special Administrative Region (SAR) boundary.

Since each respondent was asked to engage in two SP games, there are a maximum of 618 observations for the SP analysis. After data editing and correction, there were 587 SP observations. Eight factors of attributes were included in the SP game based on the literature review and the local context. They were the number of public transport modes to the airport (AMODE), airport access time from downtown (ATIME), airport access cost from downtown (ACOST), number of airlines (AIRLINES), flight frequency (FREQ), air fare (AFARE), airport shopping area (ASHOP) and queue time at check-in counters

[1] Methodologically, these MNL assumptions can be relaxed by building more complex nested MNL models or multi-nominal probit models.

[2] Under such circumstances, the scaling factor would cancel out. See Loo (2002).

[3] For instance, it was part of the agreement that the interviewers should not interview air passengers who had been interviewed previously on the same day unless they agreed to do so. During the survey period, there were two concurrent surveys conducted by IATA and the Airport Authority Hong Kong.

(check-in delays) (QUEUE). Each factor of attribute has four levels, with two levels better than and two levels worse than the current situation of HKIA. Using the technique of orthogonal design (based on experimental statistics), a total of 32 profiles were generated using SAS® Conjoint Analysis. As a choice basket of 32 different airports with eight different LOS attributes is too complicated and is likely to give rise to unreliable SP data (Loo, 2002), the 32 profiles were further divided into four sub-sets. In each stated preference game, the respondent was shown one of the four sub-sets and was asked to choose the most preferred option among the eight airports presented. Moreover, each sub-set has an equal chance of being presented to the respondents. The stated preference data were analyzed by the MNL model.

3. Discussion of results

3.1. The full model

Table 2 summarizes the results of the MNL analysis. *Four* out of the eight factors of attributes were statistically significant at the 0.05 level. They were airport access time, number of airlines, frequency of flights and air fare. In contrast, the number of airport access modes, access cost, airport shopping area and queue time at check-in counters were not statistically significant. Overall, all signs of the statistically significant MNL coefficients were correct. These findings, based on the first large-scale SP survey conducted in a Chinese MAR, are of theoretical and empirical significance. The discussion below will focus on the statistically significant airport LOS attributes. Where appropriate, these findings will be compared with the research findings of airport choice studies conducted in the other MARs worldwide.

Noticeably, *air fare* (AFARE) (coeff. = −0.0003) was having a negative relationship with people's airport utility. The *t*-ratio was high, indicating that this variable was having high statistical significance and was rightly considered as the primary LOS attribute for airport choice. In fact, air ticket price has been included in most other airport choice studies (Ashford and Bencheman, 1987; Bradley, 1998; Brooke et al., 1994; Cohas et al., 1995; Furuichi and Koppelman, 1994; Hess and Polak, 2005; Loo et al., 2005; Pels et al., 2000, 2003; Thompson and Caves, 1993). Some notable exceptions include Basar and Bhat (2004), Harvey (1987), Ndoh et al. (1990), Pels et al. (2001), Skinner (1976) and Windle and Dresner (2002). Since air fare is a primary concern of air passengers, Table 2 also shows the trade-off relationships of air fare with the other three statistically significant airport LOS attributes – ATIME, AIRLINES and FREQ. The values can be interpreted as the additional amounts that air passengers were willing to bear (as air fare) in order to have one unit of improvement in the other airport LOS attributes.

From the literature review, airport access is an important factor affecting air passengers' choice. Nonetheless, airport access may be defined in different dimensions. This study carefully differentiates among the airport access modes, cost and time. Among the three airport access variables, *airport access time* (ATIME) (coeff. = −0.0177) was found to be the *only* statistically significant variable in the full model. Moreover, it was having the highest statistical significance with the largest *t*-ratio. While airport access time was described as given and fixed in other MARs (Pels et al., 2000), it has been a key strategic variable for airports competing in the HK-PRD MAR. The SP analysis, designed under a controlled experiment, allows researchers to probe into the real concerns of the air passengers about ground access. In this SP study, the respondents were primarily concerned about the ground access time rather than the number of ground access modes or ground access cost. Hence, the airport authorities in the HK-PRD MAR should put more emphasis on reducing the access time (and perhaps also increasing time reliability) rather than cutting the access cost or increasing the modal choice. Nonetheless, it is recognized that these airport ground access attributes can be interrelated. For instance, a better integration of railways and air transport can significantly reduce airport access time and provide more modal choice at the same time. Moreover, based on the MNL coefficients estimated, air passengers were generally willing to pay an additional HKD59 (USD7.61; EUR6.27) in air ticket price for shortening the ground access time by 1 min.

Table 2
Summary results of the multinomial logit model

	Unit	Coeff.	Standard error	*t*-Ratio	*p*-Value	Trade-off relationship with AFARE[a]
AMODE	Number	0.0379	0.0309	1.2279	0.2195	n.a.
ATIME	Minutes	−0.0177**	0.0015	−11.8284	0.0000	59.0
ACOST	HKD	0.0007	0.0013	0.5419	0.5879	n.a.
AIRLINES	Number	0.0965**	0.0488	1.9763	0.0481	−321.7
FREQ	Weekly frequency	0.0153**	0.0019	8.2196	0.0000	−51.0
AFARE	HKD	−0.0003**	0.0000	−10.5911	0.0000	2.0
ASHOP	Square metres	0.0000	0.0000	0.6367	0.5243	n.a.
QUEUE	Minutes	−0.0224	0.0127	−1.7664	0.0773	n.a.

n.a., not applicable.
[a] For variables significant at the 0.05 level only.
** Significant at the 0.05 level.

Based on the level of statistical significance, the *frequency of flights* (FREQ) (coeff. = 0.0153) was the next most important. This result echoes the research findings of Furuichi and Koppelman (1994) in Japan, Harvey (1987) in the UK and Pels et al. (2001) in the USA. While the local contexts of different MARs are different, there are certain common factors affecting the airport choice of air passengers within MARs. Specifically, airport access time and flight frequency were found to be highly important regardless of the distinctive local circumstances in different continents. Based on the results of this SP survey, air passengers were willing to pay HKD51 (USD6.58; EUR5.42) more in air fare for an additional flight per week.

How about air passengers' preferences for airlines? The overall MNL model suggests that there was a statistically significant positive relationship between air passengers' utility and the *number of airlines* (AIRLINES) (coeff. = 0.0965). In fact, its MNL coefficient was the highest. So far, *no* airport choice studies reviewed in this paper have included the number of airlines in their airport choice model formulation. Hence, it is uncertain whether this airport LOS attribute is also important in other MARs under different geographical circumstances. Nonetheless, the current study suggests that the exclusion of this airport LOS attribute may not be justified. Practically, the result suggests that the airport authorities within the HK-PRD MAR should try their best not only to increase the flight frequency at their airports but also to solicit more airlines to operate in the airports. The full MNL model suggests that air passengers were willing to trade HKD322 (USD41.53; EUR34.23) more in air fare for having one more airline to choose from at a particular airport.

3.2. The segmentation analysis

Trip purpose may affect air passengers' airport choice. When the segmentation was based on business and non-business trips, the results, shown in Table 3, imply that there were no substantial differences in the preferences of these two groups of air passengers. This finding was consistent with the studies of Skinner (1976) and Pels et al. (2001). For both groups of air passengers, airport access time, flight frequency and air fare were statistically significant. Moreover, the MNL coefficients were comparable. Nonetheless, there was also some evidence that business passengers (coeff. = −0.0189) valued access travel time more highly than non-business passengers (coeff. = −0.0183). This result was also reported in the studies of Harvey (1987) and Windle and Dresner (2002). In addition, similar to the findings of Thompson and Caves (1993), this study suggested that business travellers (coeff. = 0.0161) were more concerned than non-business travellers (coeff. = 0.0157) about flight frequency. Last but not least, non-business passengers (coeff. = −0.0004) were more sensitive than business passengers (coeff. = −0.0002) to air ticket price. The findings echoed those of Ashford and Bencheman (1987) and Bradley (1998).

Table 3
Summary results of the segmentation analysis by trip purpose

	Business trips ($n = 242$)		Non-business trips ($n = 337$)	
	Coeff.	*p*-Value	Coeff.	*p*-Value
AMODE	0.0626	0.1964	0.0164	0.6914
ATIME	−0.0189**	0.0000	−0.0183**	0.0000
ACOST	0.0004	0.8448	0.0008	0.6205
AIRLINES	0.1114	0.1837	0.0906	0.1461
FREQ	0.0161**	0.0000	0.0157**	0.0000
AFARE	−0.0002**	0.0000	−0.0004**	0.0000
ASHOP	0.0000	0.3564	0.0000	0.1351
QUEUE	−0.0340	0.0857	−0.0160	0.3436

** Significant at the 0.05 level.

A more detailed segmentation analysis by the six trip purposes of "company business", "attending trade show/exhibition", "holiday", "social", "education" and "return trip" was also conducted. Some of the results are also worth reporting. Firstly, the airport shopping area was significant at the 0.05 level for holiday trips only. Secondly, though airport access time, flight frequency and air fare were significant for all trip purposes, the ratios between the MNL coefficients were very different. Company business passengers (1:3.1) and air passengers returning home (1:3.0) both valued airport access time about three times higher than air passengers making social trips. For flight frequency, company business passengers valued this airport LOS attribute about three times (1:3.0) higher than holiday makers. Besides, air passengers making return trips also valued flight frequency about twice (1:2.0) that of holiday makers.

Next, the segmentation analysis by haul reveals further insights about air passengers' choice in the context of an MAR. The summary results are shown in Table 4. Overall, air fare, airport access time and flight frequency were the three common statistically significant airport LOS attributes for air passengers taking flights of different hauls. Beyond these similarities, there were some notable differences. For long-haul air passengers, five out of the eight airport LOS attributes were statistically significant. Most notably, long-haul passengers valued *airline choice* (coeff. = 0.2720) very highly. Furthermore, the frequency of flights (coeff. = 0.0379), airport access time (coeff. = −0.0326) and airport access cost (coeff. = 0.0052) were important. For medium-haul passengers, airport access time (coeff. = −0.0177), flight frequency (coeff. = 0.0188), air fare (coeff. = −0.0006) and airport retail shopping space (coeff. = −0.0000) were significant. In other words, medium-haul passengers placed more weight on *airport shopping facilities*. The number of airlines was not a significant factor. Similarly, this airport LOS attribute was not a significant factor for short-haul air passengers. Instead, short-haul air passengers placed substantially higher importance on ground travel to the airport. *All three airport ground access attributes*, that is, the number of transport modes available (coeff. = 0.1239), airport access

Table 4
Summary results of the segmentation analysis by length of haul

	Long-haul ($n = 188$)		Medium-haul ($n = 225$)		Short-haul ($n = 174$)	
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value
AMODE	−0.0689	0.2566	0.0435	0.4133	0.1239**	0.0443
ATIME	−0.0326**	0.0000	−0.0177**	0.0000	−0.0153**	0.0000
ACOST	0.0052**	0.0417	0.0030	0.1903	−0.0084**	0.0010
AIRLINES	0.2720**	0.0249	0.0879	0.2144	0.1400	0.3355
FREQ	0.0379**	0.0000	0.0188**	0.0000	0.0096**	0.0027
AFARE	−0.0002**	0.0000	−0.0006**	0.0000	−0.0007**	0.0000
ASHOP	0.0000	0.4048	0.0000**	0.0437	0.0000	0.7592
QUEUE	−0.0161	0.3644	−0.0122	0.6131	−0.0344	0.4453

** Significant at the 0.05 level.

time (coeff. = −0.0153) and airport access cost (coeff. = −0.0084), were statistically significant at the 0.05 level.

Next, the segmentation analysis by gender suggests that males and female air passengers did not have substantially different airport preferences, except that male passengers placed higher negative valuation on queue time at the check-in counters (coeff. = −0312). This factor was not significant for female air passengers. Moreover, the airport shopping area was not significant for both male and female passengers. Lastly, a segmentation analysis by class shows that *none* of the eight airport LOS attributes were significant in accounting for the airport choice of business class air passengers. The summary results are displayed in Table 5. Airport/airline lounge, in-flight comfort and other ancillary services are likely to be important for business class passengers. Nonetheless, the number of respondents in the business class was very small (12 only) in this survey. When the economy class passengers were considered, the airport access time (coeff. = −0.0179), number of airlines (coeff. = 0.1053), flight frequency (coeff. = 0.0152) and air fare (coeff. = −0.0003) were again significant.

Overall, the results of this SP airport choice study not only lend strong support to the worldwide significance of air fare, flight frequency and access time in passengers' airport choice but also highlight the special nature of the air market in the HK-PRD MAR. In particular, the HK-PRD MAR nowadays is still characterized by a lot of long-haul air traffic and no significant penetration by low-cost carriers. The first low-cost carrier offering services in the HK-PRD MAR was Oasis, which started its first flight in October 2006. So far, Oasis is only flying between London (Gatwick) and HKIA. Moreover, there are no international low-cost carriers operating in the PRD region. Hence, the impact of low-cost carriers is yet to be realized in the HK-PRD MAR. Based on the experience of North America and Europe, such impact, however, is perceived to be profound. Specifically, Barrett (2004) has remarked that secondary airports were "a natural part" of the business strategies of the low-cost carriers. In the HK-PRD MAR, these secondary airports are the Macau, Shenzhen and Zhuhai International Airports (see Table 1). To the management authorities of these airports, the large volume of air passengers brought by the low-cost carriers is highly attractive. Hence, they are often willing to enter into preferential contracts with low-cost carriers by reducing their aeronautical charges, including landing fees and charges per passengers (Francis et al., 2004). To the low-cost carriers, they could overcome the high costs and the difficulties of getting landing slots at the busiest airport(s) in the MAR. To the air passengers, they enjoy the lower air fare and avoid the congestion associated with transfer passengers at the busiest airport(s). As a result, a new airport–airline relationship is likely to emerge upon the airline liberalization and the entry of the low-cost carriers in an MAR (Barrett, 2004; Francis et al., 2004; Vowles, 2001). Once again, the final market shares of individual airports within the MAR would be affected by a series of complicated factors (such as the business strategies of the airports and the full-service carriers), which are beyond the scope of this paper. Nonetheless, the airport preferences of passengers would certainly be one of the factors which should be taken into account in airport and airline planning.

Table 5
Summary results of the segmentation analysis by class of travel

	Business class ($n = 12$)		Economy class ($n = 571$)	
	Coeff.	p-Value	Coeff.	p-Value
AMODE	−0.4556	0.4665	0.0319	0.3081
ATIME	0.0058	0.7735	−0.0179**	0.0000
ACOST	0.0305	0.3215	0.0010	0.4398
AIRLINES	0.5596	0.4163	0.1053**	0.0351
FREQ	−0.0138	0.6024	0.0152**	0.0000
AFARE	−0.0030	0.1514	−0.0003**	0.0000
ASHOP	0.0005	0.1664	0.0000	0.6805
QUEUE	−0.1393	0.4278	−0.0193	0.1321

** Significant at the 0.05 level.

4. Conclusion

In summary, the results of this paper show a first glimpse of the airport choice behaviour of air passengers in China. These findings about the Chinese air transport market are in the main consistent with the previous research findings in different parts of the world. In particular, airport access time, flight frequency and air fare are the

most important airport LOS attributes in affecting passengers' airport choice. Nonetheless, there are also many interesting differences. Most notably, passengers were found to be placing high value on the number of airlines in their airport selection.

Furthermore, substantial insights about passengers' airport preferences have been gained through the segmentation analyses. In particular, there was some evidence to suggest that business air passengers placed higher importance on airport access time and flight frequency while non-business air passengers had higher negative valuation on air fare. Secondly, air passengers taking flights of different hauls also have different preferences over various airport LOS attributes. Generally, long-haul air passengers placed relatively more emphasis on the number of airlines available at an airport. Medium-haul air passengers placed higher importance on airport retail shopping space. Short-haul air passengers were the most concerned about different aspects of airport ground access. Air fare, airport access time and flight frequency were the three common airport LOS attributes for all groups of air passengers taking different hauls of flights. Thirdly, male passengers put more emphasis on check-in time; and business class air passengers might have a different set of airport choice criteria.

As pointed out by Graham (1998), the geography of air transport needs to be understood against the local context. Currently, the HK-PRD MAR is characterized by many special geographical circumstances, such as the existence of the Hong Kong SAR boundary, the high reliance on public transport and the lack of low-cost carriers (Loo et al., 2005). The results of this study on airport choice are expected to be of useful reference to the local governments, airport authorities and airlines in formulating a long-term strategy to thrive in the highly competitive environment of MARs.

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