Short communication

Methodological framework for the investigation on the rapidly growing air travel market – An application of multivariate statistical analysis

Jovana Kuljanin*, Mira Paskota, Milica Kalić

Faculty of Transport and Traffic Engineering, University of Belgrade, Serbia

A B S T R A C T

The paper develops an integrated multivariate statistical model which can be used as a methodological framework for investigation the factors affecting the airline choice in rapidly growing air travel markets such as those in the Central (CE) and South-East Europe (SEE) countries. The methodological framework consisting of three multivariate statistical techniques (Principal Component Analysis, Canonical Correlation Analysis and Discriminant Analysis) are applied to data (766 passengers) collected at Belgrade Airport on the routes where there is competition between a full-service and a low-cost carrier to investigate the determinants affecting airline choice. The results reveal that passenger perceptions are significantly different across airline type and usage frequencies. Although a number of managerial implications stem from the applications of the methods, the results reveal the major finding that western concept of value added and purchasing decision making concept tend to be a "complete mystery" for CE and SEE passengers due to its historical legacy.

1. Introduction

The expansion of the EU to the countries of the Central (CE) and South-East Europe (SEE), and liberalization of their air space has spurred the opportunities for low-cost carriers (LCC) to offer their service. As newcomers, the LCC broke the monopoly that was previously established by national full-service carriers (FSCs), thereby intensifying the competition on specific routes. Understanding the particular marketing variables that influence passenger's choice between FSCs and LCCs has been extensively investigated across different regions and countries (Mason, 2000; Evangelho et al., 2005; Fourie and Lubbe, 2006). While there is substantial evidence that LCCs provided new dimension to air travel experience in the markets of CE and SEE countries expressed through new west-east routes that catalyze post-migration flows, new tourist practices and new types of business (Dobruszkes, 2009; Jankiewicz and Huderek-Glapska, 2015), very little empirical researches (Kuljanin and Kalić, 2015) have been done into these markets' distinctive characteristics.

Although the rapid development of air travel market in CE and SEE countries copied the development model of deregulated Western markets (Graham, 1998), it was largely influenced by the political and social legacy of its former communist past and centrally planned economy, particularly in terms of consumer behavior. The products were designed to the principle of "one product fits all" that did not allow customers to differentiate between quality and price of products.

Unfortunately, the transition to market based economy was accompanied by either political or economic unrest in many CE and SEE countries (severe hyperinflation, high ratio of unemployment, etc.) which contributed to money becoming the critical bottleneck in buying behavior of customers. Thus, the price became the decisive factor in buyer behavior in the environment featured by reduced consumption leaving all other "product value" aside. For example, Marinov et al. (2002) indicates that western concept of value added and purchasing decision making concept tend to be a "complete mystery" for SEE and CE buyers. In other words, the fundamental factors normally considered when modeling decision making process could create great confusion in the psychological evaluation and perception of the "value" of airline service by majority of passengers originating from these countries.

Bearing in mind that identifying passengers' expectations become a core of airline marketing strategies in any market, there is a need for identifying the reliable factors that influence passenger's choice between FSCs and LCCs in the developing markets such as those in CEE and SEE countries. Accordingly, this paper proposes the methodological framework consists of three statistical methods (Principal Component Analysis - PCA, Canonical Correlation Analysis - CCA and Discriminant Analysis - DA) applied on the sample of 766 respondents on the routes where there is competition between a FSC and LCC. The proposed framework aims: first, to identify those factors that are properly understood and perceived by passengers using LCCs and FSCs on competing routes in growing air travel markets based on those factors that

* Corresponding author.
  E-mail addresses: j.kuljanin@sf.bg.ac.rs (J. Kuljanin), m.paskota@sf.bg.ac.rs (M. Paskota), m.kalic@sf.bg.ac.rs (M. Kalić).

are generally employed in developed markets including service expectation, service perception, service value, passenger satisfaction and airline image (Park et al., 2004). Second, to classify the passengers on those who fly FSCs and LCCs based on their ratings of the factors employed. Third, to establish the relation between certain set of variables that will help airline and airport managers to design its product in more subtle and efficient way.

2. Methodology and data

In addition to descriptive analysis as the initial phase in any research, multivariate analysis is seen as a powerful statistical tool which can help researchers perform the analysis across multiple dimensions, while taking into account the effects of all variables on the responses of interest at the same time. The output of PCA is given in the form of several principal components that represent linear combinations of the original variables and describe the certain portion of the total variability. The DA determines whether the initial set of factors is adequate to successfully classify passengers in terms of airline type (FSC vs LCC). The output of this technique can be presented as a portion of accurately classified customers based on their ratings of factors. In addition to its predictive characteristic, this could be an indication that there might be some unidentified factors which could efficiently discriminate the passengers on predefined groups (FSC or LCC). Finally, CCA captures the relation between two set of factors influencing passengers' airline choice and mostly serves as predictive tool.

Unlike other studies from this field that combine socio-demographic attributes and trip characteristics (Gilbert and Wong, 2003; Milioti et al., 2015) to derive specific passenger segments, this paper focuses solely on the relevance and understanding of factors that generally belong to "western concept" of value added and purchasing decision-making in developing air travel markets. The main objective here is to extend the findings obtained in Kuljanin and Kalić (2015) that use the cluster analysis to investigate market characteristics at Belgrade airport[1] that saw tremendous growth after the liberalization of the market. The authors used descriptive statistics in addition to two-step cluster analysis, as a technique of multivariate statistical analysis (Fig. 1), to derive market segments. Therefore, the application of proposed methodology enables to assemble "a piece of missing puzzle" in order to obtain a comprehensive outlook of a rapidly growing market.

We move to evaluation of factors that determine airline choice by following Park (2007) and also adding new variables that seem to be relevant for growing markets. The final set of 13 variables (Table 1) was chosen to capture several aspects of airline service. "Average number of bags per pax" is the variable that has been derived as it has been proven as significant in describing the total variance of the dataset. The factors were measured on a 5-point scale ranging from 1 (no influence) to 5 (extremely high influence).

The survey was conducted through face-to-face interviews at the Belgrade Airport in year 2013 over the period of one month. The sample consisted of passengers[2] who traveled on seven routes[3] where two or more airlines compete and one of them was a LCC (as classified in Dobruszkes (2009)), which includes all the routes where FSC and LCC compete against each other (Table 2).

These seven routes accounted for 10.3% of the total weekly capacity, including the flights from Belgrade to Brussels, Copenhagen, Gothenburg, Istanbul, London, Munich and Stuttgart. Each of these routes is characterized by the existence of competition between a FSC and a LCC and thus, passengers from both types of airlines were
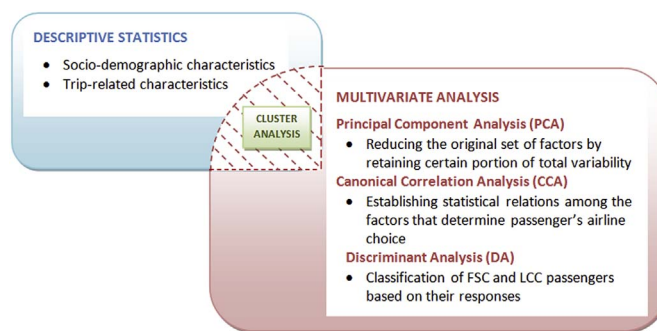

Fig. 1. Methodological framework for investigation of air travel market.

Table 1
Measurement items.

Measures	Variables
In-flight service	1. Seating comfort and legroom
	2. Service onboard
	3. Aircraft type
Reliability	4. On-time performance
Flight availability	5. Convenient take-off and landing time
Ticket-related	6. Ticket price
	7. Tariff flexibility
	8. Frequent Flyer programme
Proximity of airport to city center	9. Location of the airport at destination
Reservation-related service	10. On-line check in
	11. Seat selection
Overall airline image	12. Previous experience with an airline
Travel-related (derived)	13. Average number of bags per passenger

interviewed. Table 2 provides additional information on these seven routes which highlights some important aspects of the competition. As it can be observed from Table 2, among these seven routes, FSCs and LCCs serve the same airport only in Copenhagen and Stuttgart, while on five other routes the LCCs use secondary airports.

In order to ensure that the structure of the sample reflected the structure of the population the passengers were interviewed randomly, including all passenger nationalities. The target was to achieve at least 100 responses per observed route. The total number of interviewed passengers for both FSCs and LCCs flights was 766.

Table 3 gives the summarized statistics. The proportion of the passengers in terms of gender is almost equal between FSCs and LCCs and is balanced within the carrier type (with slightly more males in both groups). These two groups do not differ in terms of age. As observed, the passengers who fly with FSCs tend to be slightly higher educated than those traveling with LCC. Among these 346 passengers who travel by FSCs, nearly 43.4% of them have business as the trip purpose, while other 56.6% are split on those who travel on private purposes (33.2%), tourist (18.5%) and other (4.9%). Among passengers who use LCCs, the leisure segment encompasses large portion of 85.8%, while only 14.2% of passengers fly on business purposes. Concerning the place of residence, it is evident that the emigrants are dominant segment of the passengers who use LCCs (36%), whereas only 14% of emigrants use traditional airlines. This is ample evidence that LCCs succeeded to attract the large number of Serbian people living abroad to use air service through their affordable prices.

3. Results

3.1. Principal component analysis

The PCA is based on eleven variables (Table 4) describing passengers' attitude toward different factors that may have important influence on the decision about the chosen airline. Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Chi-square statistics of the

---

[1] The detailed traffic characteristics on Belgrade Airport can be found in Kuljanin and Kalić (2015).

[2] All the passengers interviewed are O&D passengers. Connecting passengers who use Belgrade as a middle point airport or who use destination airport as a middle airport point were not interviewed.

[3] All seven routes are direct routes connecting Belgrade with these seven destinations.