Itinerary planning: Modelling cruise lines' lengths of stay in ports

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ABSTRACT

Cruise tourism is a fast-growing segment of the tourism industry that generates substantial benefits to port cities. This study explores strategic aspects of cruise lines' itinerary planning, and models the determinants of their lengths of stay in ports, based on extensive observations of network data collected from emerging Japanese cruise ports. The duration model shows the robust result that a cruise line's duration of stay in a port is primarily influenced by the gross tonnage of the cruise ship, the number of passengers, the sailing distance from the previous port, the sailing distance to the next port, the nature of international cruise lines, the specific home ports of cruise ships (e.g. Yokohama), and the attractive ports of call (e.g. Kyoto).

1. Introduction

Cruises provide packages of ship-based onboard leisure activities and sightseeing attractions in port cities for tourists' recreational purposes (Gibson, 2008; Chen et al., 2016a); and in this respect, the cruise market has become increasingly competitive worldwide in recent years. Consequently, cruise lines often try to differentiate themselves in terms of product heterogeneity and price to quality ratio (Hung and Petrick, 2011; Chen et al., 2016b). Cruise itineraries appear to have a significant effect, up to 23%, on cruise occupancy rates (Lee and Ramdeen, 2013). Most cruise lines diversify their products by offering a deliberate selection of distinct ports, assigning vessels to different itineraries; the result is an increased demand for cruise ports with interesting onshore activities (Duman and Mattila, 2005; Petrick and Durko, 2015).

At the same time, port cities are interested in attracting and accommodating cruise ships, because they benefit from passengers' consumption while on land (Dwyer and Forsyth, 1998; Ellis and Kriwoken, 2006). Passengers consume port-based onshore excursions and purchase other goods and services while visiting port cities. According to the Florida Caribbean Cruise Association (FCCA, 2015), the share of passengers' expenditures for onshore excursions amounted to approximately 53% of their total expenditures during the 2014/2015 cruise year. Then, in the course of one cruise itinerary, the passenger expenditures fell in the range of $42.58–$191.26 per passenger. The average per passenger expenditure for onshore activities amounted to $103.83, while the value of crew expenditures was, on average, approximately $67.10. Consequently, expenditures in port cities are rather substantial (Dwyer and Forsyth, 1998; Brida and Zapata, 2010).

However, some researchers have argued that cruise tourists tend to have low average spending at destinations because of the time constraint on cruise lines docking in ports, but to cause relatively high environmental costs. This awareness has reduced the interests in cruise tourism of the stakeholders involved, in particular the port communities (Lester and Weeden, 2004; Klein, 2011; Dowling and Weeden, 2016).

Cruise passengers' experiences at port destinations are based on the duration of time that their ships spend docked in ports, so understanding how the length of stay is determined is useful for three main reasons. First, for cruise lines it is important to plan optimal space-time itineraries that maximize occupancy and expected revenue (Sun et al., 2011), taking into consideration the range of services to be produced (e.g. maximising the satisfaction of clients, minimising port duties and fees, and optimising the catering supply and other services). Second, from a cruise port's perspective, a cruise line's duration of time in the port is undoubtedly an important determinant of tourists' expenditures, and there is likely to be a positive correlation between local sales and tourists' lengths of stay (Thrane and Farstad, 2011). However, an uncoordinated length of stay may create capacity problems at destinations (Pullman and Rodgers, 2010); therefore, a logistically well-organized cruising process is essential (Chen et al., 2017), while there may also be related implications regarding the port policy making. Third, the needs of the tourists should be taken into consideration (Liu et al., 2017). The cruise itinerary planning and the length of stay at port destinations must meet customers' demands (Petrick et al., 2007). Neuts et al. (2016) have suggested that the expected actual duration of time in a port is a critical parameter for various stakeholders in the planning

process, particularly in terms of the tourists' perceived value of their travel.

This research focuses primarily on cruise lines' lengths of stay in ports, in order to clarify the main research question: What are the determinants of a cruise line's length of stay at a port destination? This study serves to fill a gap in the literature on cruise lines' duration in ports and cruise tourists' lengths of stay at port destinations. It aims to provide guidance related to ports' marketing policies and cruise lines' decision-making processes related to selecting ports and destinations in regional and international tourism markets. The present work is organised as follows. In the next section (Section 2), hypotheses are proposed based on a literature review related to lengths of stay. This is followed by an introduction to duration models and a description of the data (Section 3). Then the empirical approach is presented based on a Weibull duration model with robustness checks using ordinary least squares (OLS) and panel data models (Section 4). Finally, the results are discussed (Section 5) and some closing remarks are provided (Section 5).

2. Literature review

In applications in the general tourism field, it has been suggested that the tourists' lengths of stay at destinations should be regarded as an important variable for estimating their local consumption (Legoherel, 1998; Saarinen, 2006; Brida et al., 2013). Therefore, the determinants of the tourists' lengths of stay are critical factors in the development of marketing policies (Mok and Iverson, 2000; Barros and Machado, 2010; Alén et al., 2014), especially with regard to promoting greater tourist expenditures and higher occupancy rates (Alegre and Pou, 2006; Gokovali et al., 2007; Thrane, 2016).

The key issue regarding lengths of stay is related to the tourists' socio-demographics (Barros et al., 2010; Ferrer-Rosell et al., 2014); it is also likely that the length of stay of tourists at a given destination is planned well before their departure (Choi and Chu, 2001; Decrop and Snelders, 2004). There have been a number of studies on tourists' consumer behavior at cruise destinations (Andriotis and Agiomirgianakis, 2010; Brida et al., 2012). Larsen et al. (2013) discussed the amount of money cruise tourists spend during a day at a port destination, and how these funds are spent (e.g. on food, beverage, shopping, and sightseeing). It seems, however, that there is a lack of sufficient knowledge on how the cruise tourists' length of stay at a port destination is decided, and more research in this area is required. Based on these observations, cruise ship attributes (gross tonnage and the number of passengers) will be used instead of cruise tourists' profiles, and the following hypotheses are now formulated:

H1a. The cruise ship tonnage has a positive effect on its length of stay in a given port.

H1b. The number of passengers has a positive effect on its length of stay in a given port.

Mass tourism research has found that the distance between home country and destination is an important factor in explaining the tourists' length of stay in cross-country vacations (Uysal et al., 1988; Thrane and Farstad, 2012). In a cruise tourism context, related crucial factors have also been highlighted, such as port locations (Lekakou et al., 2009) and port networks (Gui and Russo, 2011). The cruising process is affected by the sailing time between ports of call (cruise ships can sail up to 200 nautical miles per night) and the duration of time spent in a port. The variable of interest in this study is the cruise lines' length of stay in a port, which is related to the cruise lines' sailing time from the previous port and to the next port. In general, however, cruise port networks continue to be under-researched. Given the above-mentioned background, a second set of hypotheses is formulated as follows:

H2a. The cruise sailing distance from the previous port has a positive effect on its length of stay in a given port.

H2b. The cruise sailing distance to the next port has a positive effect on its length of stay in a given port.

In a given space-economy (that of cruise lines in the present research), an increase in a cruise line's length of stay allows tourists to engage in a larger number of port-based activities, which is likely to affect their overall spending at port destinations (Petrick, 2004; Chen et al., 2016b), as well as their onboard cruising experiences (Petrick et al., 2006; Satta et al., 2015). It has been suggested that destination characteristics are highly correlated with tourists' lengths of stay (Barros et al., 2008). It seems that cruising, in itself, has predominantly been regarded as a form of tourism destination (Hung and Petrick, 2011; Satta et al., 2015), and hence, the cruise lines' features are critical factors of cruise tourists' decision-making (Chen et al., 2016a; Lee and Lee, 2017). In the light of the previous research, a third set of hypotheses regarding cruise lines' features were formulated as follows:

H3a. The regional cruise line has a positive effect on its length of stay in a given port.

H3b. The international cruise line has a positive effect on its length of stay in a given port.

In the field of cruise tourism, cruise lines' occupancy rates are significantly influenced by each port's geography and the destination selection of the cruise lines which are allowed to dock (Marti, 1990; Toh et al., 2005). Chen et al. (2017) found that cruise lines' lengths of stay in given ports may vary according to the local attractions the ports offered. It was also suggested that the determining factors of port selection and price for cruise lines are affected by the capacity of a cruise port and the number of shore excursions, especially for first-time cruise tourists and price-sensitive passengers (Petrick, 2005; Bresson and Logossah, 2011). When considering the benefits that cruise tourism brings to port cities, it is important to understand the requirements and overall process a cruise company undertakes when deciding to select a port (Brida and Zapata, 2010; Wang et al., 2014). In general, there are two requirements: the sea, land, and air connections at a home port (Starr, 1994; Yeo et al., 2008), and the attributes of the port services and city attractions at a port of call (Robert, 1998; Petrick, 2003). Accordingly, the final set of hypotheses about port typologies is proposed as:

H4a. Home ports have a positive effect on cruise lines' lengths of stay.

H4b. Attractive ports of call have a positive effect on cruise lines' lengths of stay.

Obviously, in a cruise context, the cruise lines' pre-planned duration in a port determines the tourists' length of stay (Chen et al., 2017). The literature on cruise lines is rather scarce, and analyses of planning processes for cruise line itineraries are even more rare (Papathanassis and Beckmann, 2011). Hence, there is a need for a rigorous conceptual and theoretical framework focusing on cruise lines' itinerary planning and lengths of stay in ports. Accordingly, this research proposes four sets of hypotheses including eight sub-hypotheses (see Fig. 1).

3. Method and data

3.1. Method

Different approaches have been used to analyse the tourists' length of stay at leisure destinations. Discrete data are usually measured and handled by logit models (Alegre and Pou, 2006; Ferrer-Rosell et al., 2014). Continuous data have also widely been used, employing ordinary least squares (OLS) and duration models (Thrane and Farstad, 2012; de Oliveira Santos et al., 2015).

Compared with logit and OLS models, duration models are better able to reduce the influence of a non-normal distribution, heteroskedasticity, and outliers; thus they offer more flexibility when