Tourism Management 67 (2018) 98–110

Contents lists available at ScienceDirect

Tourism Management

journal homepage: www.elsevier.com/locate/tourman

# Decomposing the price of the cruise product into tourism and transport attributes: Evidence from the Mediterranean market

Spyros Niavis, Dimitrios Tsiotas*

*Department of Planning and Regional Development, University of Thessaly, Pedion Areos, Volos, 38 334, Greece*

## HIGHLIGHTS

- The cruise product price is mostly affected by the tourism attributes.
- The most important tourism attribute is the amount of onboard amenities.
- The most important transport attribute is the closeness of ports of each itinerary.
- Cruise networks of companies are being set towards cost-minimization.
- Differences in the cruise pricing still exist among companies of the same class.

## ARTICLE INFO

*Article history:*
Received 13 March 2017
Received in revised form
19 October 2017
Accepted 5 January 2018

*Keywords:*
Hedonic price modeling
Cruise network
Pricing strategy
Cruise companies

## ABSTRACT

The price composition of the cruise product is described by a high level of complexity, since it incorporates both tourist and transport dimensions. Despite that research on cruise sector is advancing, the international literature still lacks of studies focusing explicitly on the composition of cruise product's price. Within this concept, this paper decomposes the price of cruise packages into tourism- and transport-driven characteristics and it builds on the established method of hedonic price modeling (HPM), which is applied on data drafted from the scheduled trips of two contemporary cruise lines for the Mediterranean, to measure their contribution in the final formation of the offered price. The overall analysis validates that the contribution of tourism attributes outweighs this of transport attributes, whereas a high proportion of price variability is also attributed to the different marketing targets adopted by companies, even for those belonging to the same class.



## 1. Introduction

Cruise vacations can be considered as a composite product incorporating characteristics that emanate from both the tourism and transport disciplines. The transportation component of the cruise product regards the transferring of passengers to the ports that are included in each scheduled cruise trip. On the other hand, the tourism component refers to the leisure services that are offered to passengers. Such services are available both onboard (e.g. pools, theatres, restaurants, etc.) and onsite (e.g. dining, shore excursions, sightseeing, etc.) at the ports-of-call (POCs) (Sun, Jiao, & Tian, 2011). In order to be competitive against alternatives offered within the cruise market, the cruise package should satisfy the passengers' needs and fulfill their expectations at the highest possible level (Qu & Ping, 1999; Teye & Leclerc, 1998). That is, the tourism and transportation dimensions should be combined in a way that boosts cruise product's attractiveness to customers. In this sense, alternative packages composed by different kind of ships, various itineraries, and trips' duration, are used as means of product differentiation so as the different market segments to be covered (Sun et al., 2011). The aforementioned trends have resulted in the development of a plethora of alternative cruise packages at a global scale, which is depicted in the fact that, during the year 2015, 63 different cruise liners deployed 448 ships that carried about 23.2 million passengers through their scheduled itineraries (CLIA, 2016).

Many scholars have focused on the issue of cruise product attractiveness and, in particular, on how different combinations of its tourism and transport characteristics affect the customers' market choices while constituting the base on which the itineraries planning of cruise liners is developed and implemented. As far as the customers are concerned, it is well recognized in academia that

* Corresponding author.
*E-mail addresses:* spniavis@uth.gr (S. Niavis), tsiotas@uth.gr (D. Tsiotas).

https://doi.org/10.1016/j.tourman.2018.01.004
0261-5177/

the decision of buying a cruise trip is subjected to motivational and emotional factors, such as relaxation, socialization, and exploration (Hung & Petrick, 2011). In addition to these factors, the quality of product attributes and the satisfaction obtained by the offered services seem to be decisive parameters for the customers' decisions, regarding the selection of a product among the total offered cruise packages (Chua, Lee, Goh, & Han, 2015; Petrick, 2004; Xie, Kerstetter, & Mattila, 2012). As far as the cruise companies are concerned, their strategies about enhancing product attractiveness are based on the two pillars of passengers' satisfaction and cost minimization/profits maximization. Thus, cruise-liners are heavily taking into account the customers' preferences regarding the various attributes of the cruise product, in order to develop competitive products, while adjusting the tourism and transport characteristics of the product in a context that enhances their profitability (Sun et al., 2011). The pursuit of product differentiation, as a prerequisite for the coverage of the different market segments, has resulted in the emergence of four basic classes of cruise liners. The lowest class is the contemporary cruises, in which basic services are offered in a rather low price and could be regarded as the most popular type of cruises. The second class is regarded as premium, in a sense that more sophisticated services are offered to customers. The third class is the so-called luxury cruises, in which personalized services of the highest quality are combined with highly attractive itineraries, aiming to offer a luxurious cruise experience to passengers. Finally, the fourth class is formed by those cruise liners that target at niche markets by offering specialized cruise packages, such as cruises at remote itineraries or thematic cruises (Pallis, 2015).

Regardless the class, the achievement of a balance between customers' satisfaction and profit maximization requires a careful strategy of the cruise liners concerning the schedule of the itineraries, the allocation of ships, and the respective pricing policy (Sun et al., 2011). The oligopolistic nature of cruise tourism, in which major liners operate either directly or through subsidiaries at a global scale, renders this scheduling as an extremely complicated task, since an enormous fleet of cruise ships and potential itineraries should be combined and priced accordingly for every season and for each particular geographical area (Pallis, 2015; Rodrigue & Notteboom, 2013). Having the itineraries and respective ships scheduled for a season and geographical area, cruise liners should develop a pricing policy that will enhance the attractiveness of their offered product and thus cover as many of their available berths. As Sun et al. (2011) state, in order for the different market segments to be covered, the pricing strategy of cruise companies should be adjusted according to the "Willingness to Pay" (WTP) of their potential customers. To this end, it is critical for the cruise companies to understand the value that customers place on the different attributes of the cruise product, so as their pricing policy to be competitive and, at the same time, to be able to reflect the differentiation among the offered products. This is because, both for the cruise product and as for other tourism products, an attribute that is positively evaluated by customers will tend to shift its price up, whereas a negative evaluation for an attribute will shift the price to the opposite direction (Thrane, 2005).

Within this context, the attributes of the cruise product play a key role in the setting of supply and demand balance, implying that the final price of a cruise product is shaped by the number and type of its attributes. Thus, by modeling the relationship among products' price in respect to its demand-driven tourism and cost-driven transport attributes, the contribution of each attribute on the price could be estimated, which is a critical issue for the cruise industry since it affects all of its actors. More precisely, by understanding the significance of attributes on the price of the cruise product, the cruise companies could draw more effective price policies by adjusting their ship deployments and itineraries schedules in a profitable context. Moreover, by recognizing the elements that push the demand (and thus the margins of their profitability) upwards, the cruise firms are capable to design their ship orders and refurbishments more efficiently. In addition, the customers become aware of the price variations caused by changes in the different product attributes and thus they gain the critical information that could support their decisions towards the selection of the best cruise package, in terms of value for money and personal standards fulfillment. Finally, the port and local authorities are able to evaluate their competitive position, by understanding the effect that the inclusion of their port into a cruise itinerary will have on the customers' WTP together with the costs for the cruise companies.

Although it is a critical issue for the cruise industry, the price decomposition of the cruise product has not been studied in a comprehensive context in the relevant literature, since most of the papers approach the attractiveness of the product in terms of preferential characteristics, such as the passengers' satisfaction (Qu & Ping, 1999; Xie et al., 2012), the willingness to pay (Lee & Yoo, 2015; Chen, Zhang, & Nijkamp, 2016), and the willingness to repeat a cruise (De La Viña & Ford, 2001), whereas the quantitative figures, such as the ships' occupancy or the cruise price, seem to be absent or latent from this consideration. By doing so, the current research appears to emphasize on the "behavioral" determinants of the cruise product (e.g. on the stated preferences of customers, on the aims and strategies of the cruise actors, etc.), leaving rather unexplored how such aspects affect or interact with the real cruise market conditions. Thus, despite that we are equipped to model and interpret the preferences of the customers in the cruise industry, we are still incapable to realize whether and how such preferences determine the product price and in what amount these are taken into account by the cruise companies. In addition, quantitative measures of the cruise attractiveness can be found in the cruise-port literature (Castillo-Manzano, Fageda, & Gonzalez-Laxe, 2014; Niavis & Vaggelas, 2016), where passenger flows per port are used as proxies of the port attractiveness. Nevertheless, although these studies suffice to model how the infrastructures or the tourism assets of a port-of-call (POC) affect its attractiveness, they are deficient to capture the way that the overall attractiveness of a destination is reflected on the attractiveness of the cruise product. Using the price as a proxy for the overall attractiveness of the cruise product helps to overcome this deficiency and to broaden the scale of reference in the study on port attractiveness, from the level of ports to this of the itinerary framework, setting new dynamics in the relevant research.

This debate highlights the need to test and evaluate the current research findings based on such preferential or behavioral approaches under the empirical perspective and to broaden the scale of reference of the quantitative approaches regarding the cruise port attractiveness in order to measure variations of itineraries attractiveness. Towards these challenges, this paper approaches the cruise product's attractiveness from the aspect of its price and attempts to interpret how the various cruise product attributes are translated on real market price variations. In order to acquire a more structural picture of the attributes affecting the cruise price, we distinguish them into a tourism and transport category. The authors believe that this decomposition introduces an approach that will motivate future researches towards a structural consideration of the cruise price modeling, which will facilitate comparisons between research of different time and geographical contexts, even when different variables are used as components of the tourism and transport attributes of the cruise. In order to capture the size and direction of the relationship between the cruise product's price and its tourism and transport attributes, this paper applies a Hedonic Price Modeling (HPM) analysis and it develops and evaluates an empirical model on the scheduled Mediterranean cruises of two major companies.

The remainder of the paper is organized as follows; Section 2 reviews the studies and methods examining the effect of the cruise product attributes to its attractiveness and price. Section 3 describes the adjustment of a HPM on the cruise industry and presents the variables participating in the model and Section 4 discusses the main results. Finally, Section 5 addresses the main conclusions and recommendations for further research.

## 2. Literature review

Focusing on customers' satisfaction and intention to order a cruise trip, several past research papers have employed a range of different methodological frameworks, in order to reveal the most significant characteristics of the cruise product on the basis of their influence on the customers' decisions. Specifically, Qu and Ping (1999) targeted their research on the tourism characteristics of the cruise product, using the customer's satisfaction level regarding the on-board services as predictors of their likelihood to re-purchase a cruise trip. Using a logistic model, predictors were separated to five main services categories, namely accommodation, food and beverage, entertainment, staff, and other facilities. Based on the statistical significance of the estimations, the authors concluded that the satisfaction obtained by the offered services (lying on the categories of accommodation, food and beverage, and entertainment) could be considered as the most important factors affecting the decisions of customers to re-purchase a cruise trip. Moreover, Xie et al. (2012) employed independent-samples *t*-tests to obtain the different weights assigned by cruisers and potential cruisers on several on-board tourism attributes of the cruise product, which were extracted by a preceding exploratory factor analysis. Seven main categories of facilities, namely Entertainment, Recreation and Sport, Supplementary, Core, Fitness and Health, and Children and Crew, were identified as determinants of the customers' perceived importance of the cruise product.

In addition, De La Viña and Ford (2001) considered both tourism and transport attributes of the product, in order to measure the importance of these attributes on the attractiveness of the cruise product. More precisely, De La Viña and Ford (2001), based on a binary logistic model, estimated the likelihood of purchasing a cruise trip in a period of two years over a set of variables concerning both the importance assigned by the respondents on various cruise attributes and their demographic profile. As far as the results of the cruise attributes are concerned, the model's results indicated that the cost of the cruise, the number of days, and the inclusion of new destinations were found to have a positive effect on respondents willingness to purchase a cruise trip while the on-board amenities, such as gambling and the type of itinerary, were found as insignificant in affecting customers choices. Finally, Li and Kwortnik (2016) focused on Passenger Perceived Experience, in order to categorize the cruise lines according to customers' satisfaction. A total of 11 elements were identified to have the greater influence on the customers' selection of a cruise line. Among the available alternatives, tourism attributes, such as the entertainment on board, the itineraries, and some transport attributes (i.e. the trip length) were also identified to affect the customers' choices.

On the cruise product supply side, although the issue of cruise product pricing is critical for the companies' success and thus for the cruise industry in general, this is not yet reflected on the volume of relevant empirical researches that are available in the international literature and are paying attention on the cost implications of different combinations of tourism and transport attributes. Among the few relevant studies, Hersh and Ladany (1989) identify the transport cost elements of a cruise schedule and adopt a goal programming method to maximize the profits of a cruise company for the schedule of a hypothetical cruise itinerary during the Christmas season. Additionally, Bull (1996) provides a categorization of cruise costs into capital costs, fixed running costs, and voyage costs. The author concludes that the first two cost categories, namely vessel acquisition and respective depreciation costs and administrative costs and wages of the permanent staff, account for the highest proportion of total cruise costs.

On the other hand, studies incorporating the WTP context provide hints for the value that customers place on the attributes of a cruise product. To this end, Lee and Yoo (2015) used a choice experiment method to reveal the cruise product's most significant characteristics as these were evaluated by potential cruisers. Authors developed a hypothetical set of 16 different cruise products and employed a random utility model with predictors corresponding to cruise product attributes of duration, type of cabin, on-board activities and services, number of foreign POCs, tour guide services, domestic crew services, and the total cruise cost, in order to extract a WTP estimation for each of the cruise products. Based on the statistical significance of estimations, authors concluded that, although all attributes affect the customers' utility extracted from the cruise product, not all of them have the same effect on their WTP. It is noteworthy that cruisers in Korean market seem to assign a larger weight on on-board facilities than on the foreign destinations included in the cruise trip. Finally, Chen et al. (2016), based on a censored regression model, estimated the WTP of cruise tourists by taking into account socio-demographic, regional and personal perceptual, motivational, and preferential variables. Significant differences for the WTP extracted as results of the model estimation among the passengers of different Asian regions, whereas the Japanese are presenting a higher WTP for a cruise trip. Moreover, demographic variables, such as the income and education level of respondents, seem to be positively connected to the WTP, whereas respondents with little aged children are found to present lower levels of WTP. Finally, higher values of the variables such as the duration of trip, the cruise experience and the presence of basic ship amenities seem to push the WTP of respondents up.

Despite that the aforementioned studies promote the understanding of the multivariate nature of the cruise product's pricing and attractiveness, their contribution to this subject is not yet complete. This is because the paper of Bull (1996) provides only a simply categorization of the attributes affecting the cost of a cruise, without accounting for the significance of each attribute on the final formation of the price, and the paper of Hersh and Ladany (1989) concentrate only on the transport characteristics of the itinerary, providing no insights about the potential effect that tourism attributes, such as the ships' amenities and the attractiveness of POCs would have on the price of the cruise. Finally, the papers that employ the WTP (Lee & Yoo, 2015; Chen et al., 2016) concentrate only on the demand side of the cruise product still paying less attention to the companies' pricing strategies, since in both of the papers the offered choices on which the customers' WTP was modeled consisted of hypothetical rather than real marketed products.

In order to draw safer conclusions on the effect of cruise product attributes on its price, the actual prices offered by the companies should be taken into consideration. On this, the HPM could be effective in understanding how different characteristics of the offered cruises affect the actual prices variability, as the method is based on real market prices. As Rosen (1974) noted, HPM does not only reflect customers' willingness to pay for an additional unit of a product's attribute, but also incorporates the value that suppliers place on the additional unit of the particular characteristic, which in turn is reflecting the supplier's costs. According to the best of the authors' knowledge, up to date there is only one paper (Savioli and

Zirulia, 2016) employing the HPM in cruise related literature. More specifically, Savioli and Zirulia (2016) focus their research on the add-on pricing in the cruise industry and by implementing a HPM over the data of 2072 different cruises, capture the effect of add-on services on the price of cruises. Authors divided the add-on services to these on which cruise companies pose a large market power, mainly on board services being offered with extra charge such as, casino and spa treatments and on these for which the market power of companies is lower, namely shore excursions. The results of the regression model signified that the first category of add-on services tend to reduce the price whereas the opposite stands for the services of the second category.

Based on the above findings, this paper seeks to enhance the rather limited research regarding the effect of the various attributes on the price of cruise product and to enrich the relevant literature with an empirical model that will incorporate the actual pricing strategies of cruise companies. Extending the work of Savioli and Zirulia (2016), the paper applies a HPM analysis shifting the attention from the add-on services to a novel division of attributes in tourism and transport categories. Consequently, the contribution of the paper in the literature of cruise industry is threefold; firstly it helps disentangle the significance of the two main categories of attributes that shape this particular hybrid form of cruise. Secondly, it provides the actors of the cruise industry with a novel method for measuring the tourism and transport attributes of their products and thus for adopting a more effective pricing policy. Finally, it provides an empirical evaluation for whether the previous findings, regarding the importance of various cruise product attributes on both customers' and cruise companies decision making processes, are reflected on the actual pricing policy of cruise operators. The scheduled itineraries and the respective prices per type of cabin for the year 2013 of two major contemporary cruise lines operating at the Mediterranean are used as the primary data sources on which the proposed model will be applied. In the next section the adjustment of the HPM on the cruise industry according to the particular context of the present research is described.

## 3. Materials and methods

The rationale behind the HPM is to describe every product as a composition of its attributes and to express its price as an additive function of these components (Thrane, 2005), where a regression of the attributes on the actual product's price provides an estimation of each component's contribution to product price formation (Alegre, Cladera, & Sard, 2013). This rationale is of a great importance for the managerial decision-making process, because the HPM is proven useful for assigning values to non-marketed and non-observable attributes of products (Papatheodorou, Lei, & Apostolakis, 2012). Moreover, the great strength of the HPM concerns that, for a given set of a product's attributes, it provides a flexible pricing method for managers, which also takes into account the actual pricing strategy of their competitors (Papatheodorou et al., 2012). This is because the development of a HPM model is based on the actual publicly available prices of the competitive products and thus, through the estimations, valuable information about the market pricing tactics can be revealed without the need of time and cost demanding customers' surveys (Rigall-I-Torrent & Fluvià, 2011). In addition, the HPM is considered as to reflect more precisely the actual market conditions than other valuation methods, such as the WTP, since the method is implemented on real products, taking into account both supplier costs and customer preferences, and not on prices that customers are willing to pay on hypothetical sets of product attributes (Papatheodorou et al., 2012; Rosen, 1974).

Despite its aforementioned strengths, the HPM also comes up with some limitations. The method is very sensitive to the functional form of the selected regression model and thus different approaches may lead to remarkable different results (Xiao, 2017). International literature is rich in models incorporating different functional forms, which suggest a useful pool for adjusting HPM on the specific conditions of each study, such as are the most widely used forms are these of linear, log-linear, and log-log functions (Triplett, 2004). Moreover, provided that the HPM is based on regression analysis, any multicollinearity effects among the attributes may lead to biased results (Cropper at al,. 1988). On this, a general a priori correlation analysis among the explanatory variables and the collinearity diagnostics of Condition Index and Variance Inflation Factors (VIF) have been suggested by scholars as means for adjusting the regression model to overcome multicollinearity issues (Gujarati, 2009; Kramer-Schadt et al., 2013). Finally, an additional limitation of the HPM regards its stationary nature, as generally it only provides a snapshot of the market and thus it is inflexible for building future scenarios and adjusting managerial practices according to future projections (Papatheodorou et al., 2012).

The multi-attribute nature of the tourism product (Cracolici & Nijkamp, 2009) has rendered a HPM into a popular method in tourism research (Papatheodorou et al., 2012). A basic segmentation of the relevant literature concerns the type of the particular tourism product that the hedonic price model is applied. Within this concept, the most of the attention has been given on hotel rates and tourism packages. Towards the first direction, Espinet, Saez, Coenders, and Fluvià (2003) applied the HPM in order to extract the price differences of hotels in Catalonia, Rigall-I-Torrent and Fluvià (2011) focused on Catalonia to test the effect of private and public attributes on the price of hotels, Hamilton (2007) examined the effect of landscape attributes on the average price of accommodation in the coastal districts of Schleswig-Holstein, and Chen and Rothschild (2010) applied a HPM to capture the effect of both quantitative and qualitative attributes on the hotel room rates in Taipei. Towards the direction of tourism packages prices, Clewer, Pack, and Sinclair (1992), based on the data of various travel agents, analyzed the price competitiveness of the inclusive packages in Paris and London, whereas Haroutunian and Pashardes, 2005, using the available tourism packages from a single agent, analyzed the price differences stemming from their different characteristics, such as the different Mediterranean destinations and the different types of included amenities. Moreover, Alegre et al. (2013) considered hotel-related and resort-related locational characteristics in order to capture their effect on the prices of tourism packages in the Balearic Islands and Papatheodorou (2002), based on the offered packages of eight British travel operators for Mediterranean destinations, regressed the prices of the tourism packages on factors concerning packages amenities and operator and destination particular characteristics.

Regardless the focus of each research, it is widely accepted that the price of a tourism product is affected by both internal and external factors. To illustrate, the price of a hotel room can be affected by the hotel star category, suggesting an internal factor, but also by its surroundings that are considered as an externality. That is, not only the characteristics of a hotel define hotel rates but also the characteristics of the destination on which the hotel is situated. Consequently, the HPM is effective for the description of the attributes composing the price of a tourism product, when it includes a destination perspective in its explanatory structure (Alegre et al., 2013; Rigall-I-Torrent & Fluvià, 2011). This consideration renders the application of a HPM on the cruise industry into a rather complex process, because the concept of destination in the cruise industry portrays different characteristics than these of the products considered in the aforementioned studies.

More precisely, the destination in the cruise framework can be considered as a multidimensional and dynamic concept. As far as its multiple dimensions are concerned, it is widely accepted that both ships and POC could be considered as destinations. This is because the wide range of onboard amenities has rendered the cruise ships not only as floating hotels but also as on-sea destinations. Wood (2004) states that nowadays cruise ships tend to become "*mobile versions of their land-based competitors*", whereas Weaver (2005) calls this development as the "destinization" of cruise ships. Moreover, the fact that every cruise trip is adjusted to an itinerary and not to a single destination portrays the dynamic nature of the destination concept in the cruise market. Thus, buyers select itineraries and not just single destinations during their decision-making process of a cruise product purchase (Rodrigue & Notteboom, 2013). This signifies that, not only the places visited, but also the sailing time and the length of stay at ports play a key role in the formation of the cruise product. For the cruise companies' perspective, each port, in addition to its tourism attractiveness, portrays also a significant role as a transport node for the formation of their itineraries. Port characteristics, such as their distance (from other ports in a region), accessibility, tariff policy, and any possible preferential policies against specific cruise companies affect the cost of each trip (Castillo-Manzano et al., 2014; Pallis, 2015). Such attributes can be regarded as the transport dimensions of the cruise product, as they directly influence the choices of companies regarding the frequency of calls at each port, the allocation of ports into itineraries (whose distances could be covered in a cost reasonable context), and the deployment of ships on each itinerary according to their speed and techncial capabilities.

Within this framework, for the application of the HPM in the cruise industry to be effective, this should reflect the unique composition of the destination concept, as this is evolved in the cruise market. To this end, the present paper by utilizing the existing literature provides a novel classification of cruise attributes which in turn may prove to be efficient in capturing all the different sources that affect the cruise product attractiveness. Setting the price as the proxy of product attractiveness, the categorization of attributes help disentangle the pure destination dimension of cruises, mostly affecting the demand side such as ship characteristics and POCs (tourism attributes), from the dynamic elements of the cruise such as distances and time which are mostly associated with the navigation and operation of cruise ships (transport attributes). The proposed classification of the attributes of cruise product into tourism and transport categories is presented in Table 1.

Based on the previously mentioned fundamentals of HPM, the model constructed to capture the contribution of tourism and transport attributes on the price of cruise product is described as follows:

$$P(CP_i) = P(TA_{ik}, TRA_{im}) = P(TA_{ik}) + P(TRA_{im}) \quad (1)$$

where $P$ is the price of a cruise product $CP_i$ $(i = 1, \ldots, N)$, expressed as a linear function of the Tourism Attribute $TA_{ik}$ $(k = 1, \ldots, K)$ and Transport Attribute $TRA_{im}$ $(m = 1, \ldots, M)$ prices.

In order to adjust the model to cruise market, the information sources about prices and attributes should be defined. For this purpose, this paper uses data from the online published catalogues of two major cruise lines, the Costa Cruises (Costa Cruises, 2013) and Mediterranean Shipping Company - MSC (MSC Cruises, 2013), presenting the offered itineraries and respective prices for the Mediterranean schedules at the 2013 season. This particular selection is followed for two main reasons; the first is that both companies are considered as lying in the general category of contemporary cruise lines and targeting at the same market segments (Pallis, 2015). Thus, the difference of their prices is expected to vary mostly due to the different attributes of their offered products and, in a lesser extent, to other factors such as the brand prestige and market orientation, which in fact segment the companies into the different classes. The second regards that the two cruise companies share a dominant role in the Mediterranean market, as their itineraries account for about the 36% of the total offered in Mediterranean (2010 data) (Marusic et al., 2012). Therefore, the available sample can be satisfactorily considered as representative of the general structure of the Mediterranean cruise market. At next, the variables employed for the application of the HPM are described in brief.

### 3.1. Dependent variable: price of cruise product (PCP)

The price of the offered cruises, expressed in euros (€) for the year 2013 are used as the dependent variable of the regression model. For each type of cabin, a price is offered at the brochures of the two cruise companies. Due to compatibility, the prices of MSC, which are expressed in dollars, are converted to euro according to the average exchange rate for 2013 (€/$ = 1.3281) (Oanda.com, 2014). Although it is acknowledged that several factors (such as the booking method, the time of purchase, the period of cruise, and the discount policies of companies) may result to a different price than this presented in the brochures (Papatheodorou, 2006; Xie et al., 2012), the initial prices of the brochures could be a consistent approximation of the cruise product price. This is testified by several past researches on other tourism products, for which discounts and differentiation of prices according to the booking method also exist and still brochure prices were used as the primary information source for the configuration of the HPM models (Papatheodorou, 2002; Alegre et al., 2013). In order to attach a single price in each of the offered products, all the available types of cabins and their exact number for each ship are recorded. Further, the total revenue per cruise is extracted by assuming full occupancy per adult for the single cabins and per adult couple for all the others. Finally, the average price per night and passenger is calculated by dividing the total revenue of each offered cruise to the number of nights and passengers. This metric is considered by the authors as essential for comparisons among cruises of different duration. Finally, the prices considered in the analysis do not include port tariffs, taking into account the existence of high correlations between port tariffs and other port destination attributes, such as the Itinerary Attractiveness and Closeness, which were captured in relevant studies (Castillo-Manzano et al., 2014).

### 3.2. Tourism attributes

#### 3.2.1. On-board amenities and leisure activities (OA)

As it was previously shown, the amenities of the ships strongly affect the attractiveness of the cruise products and thus are accordingly expected to affect their price (Papatheodorou, 2006; Xie et al., 2012). For the purpose of this analysis, the variable measuring the availability of ships amenities is computed by the sum of restaurants, bars, pools and Jacuzzis of each ship, on data drafted from the companies' websites.

#### 3.2.2. Service quality – crew per cabin (SQ)

Despite the existence of a variety of factors defining the service quality of a cruise product, a reliable indicator of the expected service quality, before booking a cruise, is the so-called crew capacity (Teye & Leclerc, 1998). For the purposes of this paper, the variable of service quality is estimated as the ratio of crew per number of cabins for each trip, computed on data drafted from the

**Table 1**
The main tourism and transport Attributes of the Cruise Product.

| Tourism Attributes | Transport Attributes |
|---|---|
| On-Board Amenities and Leisure Activities.<br>(i.e. pools, casinos, restaurants, shops) (Papatheodorou, 2006; Xie et al., 2012) | Total Sailing Distance and Time (Rodrigue & Notteboom, 2013) |
| Cabins Class.<br>(i.e. indoor, balcony, suites)<br>(Lee & Yoo, 2015; Li & Kwortnik, 2016; Xie et al., 2012) | Total Length of Stay at Ports (Gabe, Lynch, & McConnon, 2006; Hersh & Ladany, 1989; Rodrigue & Notteboom, 2013) |
| On Board Service.<br>(i.e. Number of crew, Room Service, Restaurant Service, Desk Service, Embarkation Easiness).<br>(Teye & Leclerc, 1998; Xie et al., 2012; Li & Kwortnik, 2016) | Homeport Accessibility.<br>(i.e. air, land and sea connections, distance to the target market).<br>(Niavis & Vaggelas, 2016; Rodrigue & Notteboom, 2013) |
| Ports-of-call (POCs).<br>(i.e. type of destinations, attractiveness of destinations).<br>(Niavis & Vaggelas, 2016; Papatheodorou, 2006; Teye & Leclerc, 1998) | |
| POCs Leisure Activities, POCs Leisure Activities.<br>(i.e. On shore excursions, dining and shopping options).<br>(Castillo-Manzano et al., 2014; Niavis & Vaggelas, 2016; Teye & Leclerc, 1998) | |
| Season (i, Season (i.e. Low or high season, Christmas, Summer) (Papatheodorou, 2006) | |
| Booking Easiness (i.e. online platforms, direct sales, travel agency) (Papatheodorou, 2006) | |

(Source: Own Elaboration).

websites of these companies.

### 3.2.3. Duration of trip (TD)

This variable is incorporated in the estimations to capture any possible effect of the duration of cruise trips on the price of the cruise. After conducting a pilot calculation, the average nights per trip concludes around the characteristic value of “7 Nights”, which is detected by Rodrigue and Notteboom (2013) as the most popular worldwide duration of tourism packages. Taking these findings into account, a variable of total nights per cruise is entered in the analysis, centered to the characteristic value 7 in order to interpret the fluctuations from the center ($TD_i - TD_o$, $TD_o = 7$) as deviations from regularity Available data for this variable is extracted from the published brochures of the two companies.

### 3.2.4. Season dummy (Ds)

As the analysis in Chapter 3 has revealed, the season in which a cruise trip is taken is a fundamental part of the cruise product. This is expected to be also reflected on the price of the each trip. In order to test for seasonal effects on the price of the cruise product, the present paper divides the year in four distinct seasons. The first season lasts from January to March, the second from April to June, the third from July to September and the fourth from October to December. Taking as a reference base the third season, as the most of cruises are executed during July to August, three Seasonal Dummies ($Ds_1$, $Ds_2$, $Ds_4$) are configured and entered to the model, in order to test the variations of the price regarding cruises of the peak season against the cruises of all other seasons.

### 3.2.5. Itinerary Attractiveness (IA)

Although quantifying the tourism attributes of a ship is a quite straightforward procedure, this is not the general case for the POC. This is because the attractiveness of an itinerary cannot be approached directly, but rather through a combined evaluation of its content destinations. In order to develop a combined measurement of the attractiveness of each itinerary, a quantitative universal index (that could be applied to all destinations) is constructed. Castillo-Manzano et al. (2014) and Niavis and Vaggelas (2016) approached the attractiveness of cruise destinations based on their capacity in tourist infrastructures. In addition, many scholars have managed to show that not only the capacity in tourism infrastructures but also the quality of services is a critical issue affecting the attractiveness of a destination (Cracolici & Nijkamp, 2009; Kozak & Rimmington, 2000). Consequently, an effective and precise metric of attractiveness should also measure aspects of the service quality. Based on these remarks, the POC Attractiveness index is defined by the following formula:

$$PCA_i = \frac{Number\ of\ Hotels\ in\ the\ i^{th}\ POC}{Total\ Population\ of\ the\ i^{th}\ POC} \cdot Average\ Hotels\ Ratinng\ in\ the\ i^{th}\ \ POC \cdot 100 \quad (2)$$

where $i$=1, ….N refers to the POC being under examination.

The PCA incorporates the notion of a tourist function index (TFI) that was initially developed by Defert (1966) and employed in many previous studies in order to measure the capacity of tourism infrastructures on various destinations (Coccossis & Parpairis, 1992; Saveriades, 2000). It also takes into account the variations of service quality at different destinations as these are expressed by the feedback of their customers. Its values are real positive numbers, ranging to the inteval $(0,+\infty)$, expressing the levels of accommodation capacity. Because it is critical to define a common spatial reference for the estimation of the index, the data used to quantify the number of hotels, their rating and the total population refers to the direct hinterland of the POCs (city level). In addition, provided the unavailability to obtain official data for the number and rating of hotels in the city level, such information is drafted from the website www.tripadvisor.com, in order to maintain a common reference. After the configuration of the PCA index, the aggregate Itinerary Attractiveness (IA) is defined by the following formula:

$$Itinerary\ Attractiveness\ (IA_p) = \sum_{i=1}^{N_p} PCA_i / N_p \quad (3)$$

where the index $i$=1, …$N_p$ refers to the number of POCs included in the $p$th itinerary.

### 3.3. Transport attributes

#### 3.3.1. Sailing speed – miles per day (MpD)

The first of the transport attributes quantifies the trip intensity in terms of approaching the total of POCs, according to the initial planning. It is expected that for equal-lasting cruises the itineraries composed by ports of rather higher distance will force the ships to attain higher speed levels and thus to increase their prices. The variable of sailing speed (MpD) is estimated as the ratio of total miles of each itinerary per sailing days, computed on data extracted from the brochures of the two companies. This variable was selected against two alternatives, namely total miles per hour (TMpH) and total hour at ports per total cruise time (THpTT), due to high paired correlations captured between them along with the better model estimations (in terms of confidence intervals and model fitting) produced for the MpD.

#### 3.3.2. Itinerary Closeness (IC)

Apart from the port attractiveness that is considered of great significance to the formation of the cruise product, ports are also serving as route-intermediates by encompassing transport characteristics, such as their proximity to other ports, their adequacy of infrastructures, and the easiness of approach. As it has been already shown at McCalla (1998) and Lekakou, Pallis, and Vaggelas (2009), ports being in close proximity to a large number of other POCs and those with adequate approach and mooring infrastructures are favored by the cruise companies, because they better serve their targets (i.e.keeping the fuel costs low by avoiding long distance itineraries and stay tight with their schedules by avoiding any delays emanating from the lack of proper service at the POCs). This is reflected on the fact that several ports are repeatedly included in multiple itineraries, while others are called in rarer basis. In order to examine the effect of ports in the formation of the cruise product price, considered as transport nodes, it is essential to adopt a holistic approach that can depict the significance of each POC against the whole set of itineraries of a cruise company, for a particular period and geographical market. To this end, network analysis is performed to construct a variable that measures the role of POCs as transport nodes within the schedule of itineraries of each company.

The variable entered in the model to capture network information is named “Itinerary Closeness” (IC), which is composite and customized to the special needs of the analysis. In particular, the IC variable is based on the formula of the well-established in Network Science measure of closeness centrality (CC), which is defined as the inverse sum of shortest path distances originating from a given node ($i$) with destinations all the accessible network nodes, according to the relation (Koschutzki, Lehmann, Peeters, & Richter, 2005; Tsiotas & Polyzos, 2015a):

$$CC(i) = \begin{cases} \left( \frac{1}{n-1} \cdot \sum_{j=1, i \neq j}^{n} d_{ij} \right)^{-1} = \left( \bar{d}_i \right)^{-1}, \text{ if } ij \in paths(G) \\ 0, \text{ if } ij \text{ are not connected} \Rightarrow ij \notin paths(G) \end{cases} \quad (4)$$

where G(V,E) is the graph model of the network, $n$ is the number of network nodes (POCs), $i,j$ are network nodes ($i,j \in V(G)$), and $paths$(G) is the set of all the available paths in the network.

Practically, higher values of CC express that nodes (POCs) are, on average, closer (in terms of proximity) to all the other destinations in the (cruise) network, where distances are computed on network paths and not as Euclidean distances (Tsiotas & Polyzos, 2015b). Based on CC, the IC variable is adjusted to refer to a cruise-route (p = 1, …,N) and is defined as the average of the closeness centrality values CC(i|p) for the route p, where i = 1, …,n (n = number of nodes in the network), subjected to the condition that the CCs of the nodes that are not included in the route p are considered zero, namely CC($i \notin p|p$) = 0. The mathematic formula of this composite measure is shown in the following relation:

$$IC(p) = \frac{1}{N} \sum_{i=1}^{n} CC(i|p) \Big| \text{ subjected to } CC(i \notin p|p) = 0 \quad (5)$$

By including the non-participating POCs (CC($i \notin p$) = 0) in the IC's formula, this variable additionally incorporates scale information (i.e. the size of each route). High values of IC express that a cruise route includes destinations that are closer, in terms of proximity, to the other ports in the network.

### 3.4. Model specification

Taking into account the previous description of the variables, the HPM is specified as follows:

$$PCP_i = c + \beta_{OA} \cdot OA_i + \beta_{SC} \cdot SC_i + \beta_{TD} \cdot TD_i + \beta_{IA} \cdot IA_i + \beta_{MpD} \cdot MpD_i + \beta_{IC} \cdot IC_i + \\ + \beta_{DS1} \cdot Ds_1 + \beta_{DS2} \cdot Ds_2 + \beta_{DS4} \cdot Ds_4 \quad (6)$$

where $i$ = 1,2, …,$p$, $c$ = constant, and $p$ is the number of available itineraries.

Model (6) assumes that there is no heterogeneity between the two cruise companies', provided that both constitute contemporary cruise lines. However, since differences in the pricing strategies may also exist among companies of the same category, a second model incorporating a company dummy $D_{COM}$ is also estimated to overcome any possible bias emerging from such heterogeneity. Finally, the linear functional form of the HPM is selected, in order to obtain more easily interpretable results.

## 4. Results and discussion

### 4.1. Descriptives

In total, 524 available itineraries offered by the two companies for the year 2013 in Mediterranean are extracted. Fig. 1 presents the ports included in the networks of the cruise companies, whereas Table 2 provides a general overview of the itineraries' design and ship deployment strategy of the two companies for the reference year.


**Fig. 1.** The ports of Costa and MSC Mediterranean Cruise Network (2013).
(Source: Costa Cruises, 2013; MSC Cruises, 2013; Own Elaboration).

**Table 2**
MSCand costa cruise schedules and ship deployment in the mediterranean (2013).

| | Itineraries | Total Cruises | Total Ports | Ships | Average No of Cabins (st.dv) | Average Cabin Options (st.dv) | Average Nights (st.dv) |
|---|---|---|---|---|---|---|---|
| MSC | 15 | 246 | 43 | 12 | 1344 (405.4) | 6 (2.82) | 7.46 (1.23) |
| Costa | 24 | 278 | 50 | 12 | 1239 (306.5) | 11 (3.4) | 7.3 (1.91) |

(Source: Costa Cruises, 2013; MSC Cruises, 2013; Own elaboration).

According to Table 2, the MSC offered 15 different cruise itineraries with calls at 43 ports, resulting to 246 available cruises through the repeated round schedules. The Costa Cruises offered more itinerary options, as for the year 2013 its brochure included 24 itineraries, 50 ports, and 278 available cruises. Both companies deployed 12 different ships to cover their itineraries. Based on the average number of cabins, the MSC seems to have deployed a larger fleet, as the average number of available cabins per trip reached 1344, whereas Costa's average did not exceed the 1240 cabins per trip. Nevertheless, despite the larger ship deployment of MSC, Costa seems to have provided a larger variety of cabin options, as on average cruisers could select among 11 available cabin types in Costa's cruises and among just 6 available cabins in MSC's cruises. Finally, despite the fact that 7-nights cruises seem to be favored by both companies, the MSC average duration of cruise surpasses this of Costa.

Table 3 presents the relative frequencies of the nominal and the basic descriptives of the continuous (scale) variables of the HPM model, where the average price of the cruise product is estimated at €223.60 per night and per person. The lowest price lies at €90, whereas the highest exceeds €376. The onboard amenities (including restaurants, bars, and pools) range between 8 and 53. The average offered amenities per ship is estimated at about 31. Regarding the service quality, the average ratio of crew to cabins per trip is 0.82, where the highest ratio approaches 1 (0.98) and the lowest is 0.68. The relatively low sd of the estimation signifies that the ratio of 0.82 could be regarded as the common practice of the contemporary cruise lines for their schedules in Mediterranean.

Moreover, the descriptive statistics of the variable TD signify that, on average, the cruise duration slightly exceeds the characteristic value of 7 nights (+0.38). The shortest duration is 3 nights (−4 from the center = 7), whereas the longest consists of 13-night cruises (+6). The observed values of IA range between 1.19 and 18.12, with an average of 2.95. Additionally, the deployed ships sail with a speed of about 310MpD on each trip, with the lowest value at 176MpD and the highest at about 473MpD. The highest cases refer mainly to cruises with one or more days without a stop at a POC included in the itinerary. Finally, the mean value of the

**Table 3**
a. Relative frequencies of the nominal model variables. b. Descriptive statistics of the continuous (scale) model variables.

| | Variable | | | | |
|---|---|---|---|---|---|
| | | Dcom | $Ds_1$ | $Ds_2$ | $Ds_3$ |
| Freq. | $n$ | | | 524 | |
| | $n(0)$ | 53,2% | 94,5% | 64,1% | 79,8% |
| | $n(1)$ | 46,8% | 5,5% | 35,9% | 20,2% |

| Type of Attribute | Variable | Min. | Max. | Mean | Std. Dev. |
|---|---|---|---|---|---|
| Tourism | Price of Cruise Product (PCP) | 90.00 | 376.00 | 223.60 | 66.43 |
| | On-Board Amenities and Leisure Activities (OA) | 8.00 | 53.00 | 30.75 | 13.22 |
| | Service Quality – Crew per Cabin (SC) | 0.68 | 0.97 | 0.82 | 0.08 |
| Transport | Duration of Trip (TD) | −4.00 | 6.00 | 0.38 | 1.63 |
| | Itinerary Attractiveness (IA) | 1.19 | 18.12 | 4.81 | 2.95 |
| | Sailing Speed – Miles per Day (MpD) | 176.00 | 472.57 | 310.15 | 78.81 |
| | Itinerary Closeness (IC) | 2.45 | 3.75 | 2.84 | 0.27 |

(Sources: Costa Cruises, 2013; MSC Cruises, 2013; TripAdvisor, 2014, 2017; Own elaboration).

**Table 4**
Pearson's pairwise correlation coefficients for the explanatory variables.

| | OA | SC | TD | IA | MpD | IC |
|---|---|---|---|---|---|---|
| OA | 1 | −0.27** | −0.15** | −0.19** | 0.23** | −0.51** |
| SC | | 1 | 0.24** | 0.09* | −0.17** | 0.45** |
| TD | | | 1 | −0.01 | 0.40** | −0.02 |
| IA | | | | 1 | 0.11* | 0.26** |
| MpD | | | | | 1 | −0.22** |
| IC | | | | | | 1 |

N = 524.
(**) Statistically significant at 0.01 level and (*) at 0.05 level.
Source: Own Elaboration.

variable IC is 2.84, with lowest at 2.45 and higher at 3.75. Lower values denote that itineraries include ports that have not been assigned with a central role regarding the network of cruise companies, whereas higher values correspond to itineraries that are conducted on ports that are repeatedly included in the company itineraries, thus attaining a key role on their network.

### 4.2. HPM analysis

In addition to the aforementioned descriptives, a (Pearson's) correlation matrix is presented in Table 4. This kind of analysis is essential for the HPM because it provides insights about the existence of any multicollinearity effects in the model. According to these results, the highest coefficient is observed for the pair of variables (OA, IC), whereas all the other estimations do not exceed 0.5. These results signify that no serious correlation among the variables exists, as this would typically arise in cases where the correlation coefficient for two variables exceeds the value of 0.8 (Tabachnick & Fidell, 2013).

The results of the HPM analysis are shown in Table 5, where the adjusted $R^2$ values describe the determination ability of each model, whereas the VIFs measure the collinearity effects among the estimated coefficients. As it can be observed, the two models are similar in terms of their coefficient signs, implying that each predictor variable contributes accordingly (either positively or negatively) to both models. The VIFs lie far below the critical value of 10, which for many researchers suggests a threshold for the existence of multi-collinearity (Dormann et al., 2013; Mason & Perreault, 1991). Nevertheless, these models are different in detailed results, such as in terms of the adjusted $R^2$ values and the coefficient estimations. More precisely, the model B including the company dummy (DCOM) has notably higher determination ability (adjusted $R^2$) and more statistically significant parameter estimations than the basic model.

For the Model A the adjusted $R^2$ can be considered as quite satisfactory, implying that over the 74% of the response variables' (price) variation is explained by the selected predictors. The estimations for all the coefficients are significant either at the 0.01 and or in the 0.05 level (except this for the constant coefficient), rendering the interpretation of the HPM results rather robust.

The coefficient for the variable OA is positive (as expected), implying that additional amenities push the price of a cruise product upwards. This result is reflecting the higher preference of customers for ships that can provide them with a large range of leisure activities and also the higher capital costs associated with the building of larger vessels and more leisure infrastructures. The result validates the previous findings of many scholars (Lee & Yoo, 2015; Li & Kwortnik, 2016; Qu & Ping, 1999) who also found that food and beverages and entertainment amenities affect the attractiveness of cruises. A positive contribution to the model also describes the SQ variable, denoting that the cruse price grows proportionally to the number of the service crew, which in turn implies a better service quality. This finding portrays the higher WTP of passenger for premium services, which also push the price up, due to higher operational costs for the companies. This finding seems to validate the previous findings of Xie et al. (2012) who found Crew capacity as one of the most affecting factors of cruise attractiveness whilst comes in contrast with the findings of Qu and Ping (1999) who found that the staff capacity was amongst the least important factors affecting the decisions of customers to repurchase a cruise trip.

The estimation for the coefficient of TD variable is also found statistically significant, validating the previous findings of De La Viña and Ford (2001), Li and Kwortnik (2016), Chen et al. (2016) and Savioli and Zirulia (2016), regarding the significance of trip duration for the attractiveness of cruises. Nevertheless, in contrast to the previous observations, the estimation presents negative contribution to the model, expressing that as the cruise duration grows the price per night declines. This result is in line with the relevant finding of Savioli and Zirulia (2016), who have also observed a negative relationship between the trip duration and the price of the cruise. This result seems reasonable, as the companies are able to share their fixed costs on more days and to achieve higher earnings from on-board add-on services, whilst the majority of passengers seem to prefer cruises whose durations hover around seven nights showing lesser interesting for cruises of higher duration.

The positive sign of the IA's coefficient provides an important insight, expressing that the tourist attractiveness of the POCs included in each itinerary drives the price of the cruise product

**Table 5**
HPM model estimation results.

| Type of attributes | Coefficient | Model A | | Model B | |
|---|---|---|---|---|---|
| | | Adj. $R^2 = 0.743$ | | Adj. $R^2 = 0.899$ | |
| | | Estimations | VIF | Estimations | VIF |
| | *Constant* | −37.843 (25.693) | | 113.917*** (17.026) | |
| Tourism | $\beta_{OA}$ | 3.685*** (.137) | 1.518 | 2.088*** (.103) | 2.179 |
| | $\beta_{SQ}$ | 275.841*** (23.585) | 1.488 | 37.302** (17.083) | 1.977 |
| | $\beta_{TD}$ | −6.194*** (1.118) | 1.532 | −6.824*** (.703) | 1.534 |
| | $\beta_{IA}$ | 1.664*** (.538) | 1.164 | 1.376*** (.338) | 1.165 |
| | $Ds_1$ | −60.834*** (6.891) | 1.147 | −55.524*** (4.335) | 1.150 |
| | $Ds_2$ | −32.439*** (3.496) | 1.300 | −31.403*** (2.197) | 1.300 |
| | $Ds_3$ | −54.083*** (4.087) | 1.246 | −48.634*** (2.576) | 1.253 |
| Transport | $\beta_{MpD}$ | .067*** (.023) | 1.565 | .077*** (.015) | 1.566 |
| | $\beta_{IC}$ | −28.117*** (7.111) | 1712 | −8.026** (4.525) | 1.756 |
| Company | $D_{COM}$ | | | 72.306*** (2.575) | 1.932 |

Statistical significance: (***) at 0.01 level (**) at 0.05 level (*) at 0.10 level.
(values of standard errors are shown inside parentheses).
Source: Own Elaboration.

upwards. The finding is in agreement with the previous findings of other papers (Castillo-Manzano et al., 2014; Niavis & Vaggelas, 2016; Savioli and Zirulia, 2016) which empirically testified the existence of a positive relationship between the attractiveness of the cruise product and ports. Next, the sign of the MpD's coefficient is also positive, implying that for itineraries composed by rather distant ports, the passengers should expect to pay higher prices, since longer sailing hours are associated with higher fuel costs for the ships. The negative sign of the $\beta_{IC}$ illustrates that cruises conducted on repeatedly called ports are shown cheaper than those including ports called on an occasional basis. These two observations validate the findings of Lekakou et al. (2009), McCalla (1998), and Niavis and Vaggelas (2016), who found that cruise companies tend to favor ports in proximity to other POC as these are tending to lower their operational costs. Finally, the negative signs of the three seasonal dummies coefficients ($Ds_1$, $Ds_2$, and $Ds_4$) illustrate that cruises conducted during July to September are more expensive than those held in the other months of the year. This result validates in an empirical context the previous findings of Papatheodorou (2006) and Li and Kwortnik (2016) regarding the actual effects that sail dates have on the price and attractiveness of the cruise product.

Next, the participation of the company-dummy variable in the Model B seems to improve the overall HRM determination ability, as it is reflected on the adjusted $R^2$ result that approaches the value 0.84. Despite that this model also preserves the coefficient signs and the low VIF levels of the previous case (Model A), the positive and statistically significant coefficient of the $D_{COM}$ variable signifies that a quite large part of the price variance could be attributed to the different price strategies of the cruise companies. That is, cruise companies of the same class may still follow different marketing strategies and target at different market segments.

### 4.3. Further analysis

Provided that the HPM B is of better discriminatory power than A, a further analysis is performed on the estimated coefficients of this model (where $D_{COM} = 1$), in order to examine some partial effects that tourism and transport attributes cause to the price of the cruise product. This approach consists (a) of the correlations shown in the diagrams of Fig. 2(a-c), where values in the vertical axis (prices/night • passengers) are computed using the model B and the values of the predictors are shown in horizontal axes, assuming that all the other attributes are expressed by their mean values, and (b) of an $R^2$ decomposition meta-analysis shown in Fig. 3.

At first, Fig. 2(a) shows the range of the estimated average prices per night and passenger, referring to ships of different number of on-board amenities. According to this figure, the average cost per night in a small ship (with the least number of available on-board amenities) is estimated to €239. For the largest number of on-board amenities the average cost per night soars at €332, implying that, for a 7-night cruise package during the same period, a customer can pay up to €658 higher for embarking on a ship with plenty of amenities rather on a ship of limited leisure and entertainment choices.

Next, Fig. 2(b) presents the difference in the price between two 7-nights cruises executed on itineraries of dissimilar distance. The results portray that passengers can pay a particular lower price for cruises whose itineraries consist of rather close situated ports. Moving (ceteris paribus) from a 7-nights cruise in south Aegean (176 miles/night) to a 7-nights cruise from Venice to Istanbul (472 miles/night) can result to increase of about €23 per night for each passenger. For a 7-night cruise, this is translated to a higher average total cruise product price of €161.

Next, Fig. 2(c) presents the estimated price for cruises of different duration. According to this diagram, the average cost per night for a passenger can be reduced by almost €68, between a 3-nights cruise and 13-nights cruise. As it was stated before, this finding portrays that cruise companies apply a decreasing price policy regarding the duration of the different offered cruises. This is a rational choice since the lower returns of the basic fares per night may be balanced by the higher onboard passengers' spending on cruises of larger duration.

In addition, Fig. 2(d) depicts the estimation of the mean price per night per passenger across the four seasonal periods ($Ds_1 - Ds_4$). As it can be observed, on average, the price of a cruise in the period between July and September approaches 250€ per night, whereas this is reduced to about 180€ for the cruises conducted in the first three months of the year. A rather low average price is also observed during the period October-December (195€), whereas the average price of cruises between April and June hovers around 225€. The aforementioned findings illustrate the high seasonal character of the cruise industry.

Finally, Fig. 2(e) targets to enlighten the ship deployment policy of companies against the ports' closeness of each itinerary. More precisely, the deployment of three types of ships, the first with up to 1000 cabins (Class 1), the second of 1000–1500 cabins (Class 2), and the third above 1500 cabins (Class 3), is graphically compared on the values of the IC of the itineraries they serve. As it can be observed, ships of rather limited passenger capacity are allocated on itineraries consisted of ports whose (cruise) network closeness centrality is rather high. Since closeness is a measure of the companies' network, the distribution shown in this figure implies that companies select a number of ports to form the core basis of their itineraries planning, either because of their privileged geographical position or because of the existence of a favorable business relation between port authorities and companies (such as companies involvement in terminal management, port discount policies according to the frequency of cruise calls, low port tariffs, etc.) these ports are acting as cost minimizers for the cruise companies. Thus, it is on the great benefit of companies to direct their calls at these ports and especially the ships of limited capacity and thus of limited capabilities for on-board revenue generation.

The above findings portray that both tourism and transport attributes affect the price of the cruise product, which complies with the relative literature, but they also highlight that the price is affected by the different pricing strategies of the cruise companies. In order to rank the different attributes according to their contribution to the formation of the final cruise product price, the Shapley-Owen R-square Decomposition method is applied, in order to extract the contribution of variables to the variability explained by the model (Abrate & Viglia, 2016; Huettner & Sunder, 2012). In particular, for a response variable $y$, for a given set of $p$ in number predictor variables $V = \{x_1, x_2, \ldots, x_{p \in \mathcal{N}}\}$, and for a possible regression model $y = f(x_1, x_2, \ldots, x_p)$, the Shapley-Owen $R$-square Decomposition method measures the contribution of the $x_{i\in\{1,2,\ldots,p\}}$-th predictor variable to the formation of the model's $y = f(x_1, x_2, \ldots, x_p)$ coefficient of determination ($R^2$). The contribution of the $x_i$ predictor is computed on every possible subset $T \subseteq V - \{x_i\}$ that can be produced from the set $V$, according to the formula:

$$R_i^2 = \sum_{\substack{T \subseteq V-\{x_i\} \\ i=1,\ldots,p \in \mathcal{N}}} \frac{R^2(T \cup \{x_i\}) - R^2(T \cup \{x_i\})}{p \cdot C(p-1, |T|)} \tag{7}$$

where $C(p-1, |T|)$ is the number of the combinations produced for the $|T|$ in number predictor variables drafted from the set $V-\{x_i\}$ and $p-1$ is the number of the predictor variables included in the set $V-\{x_i\}$. The Shapley-Owen $R$-square Decomposition value satisfies a

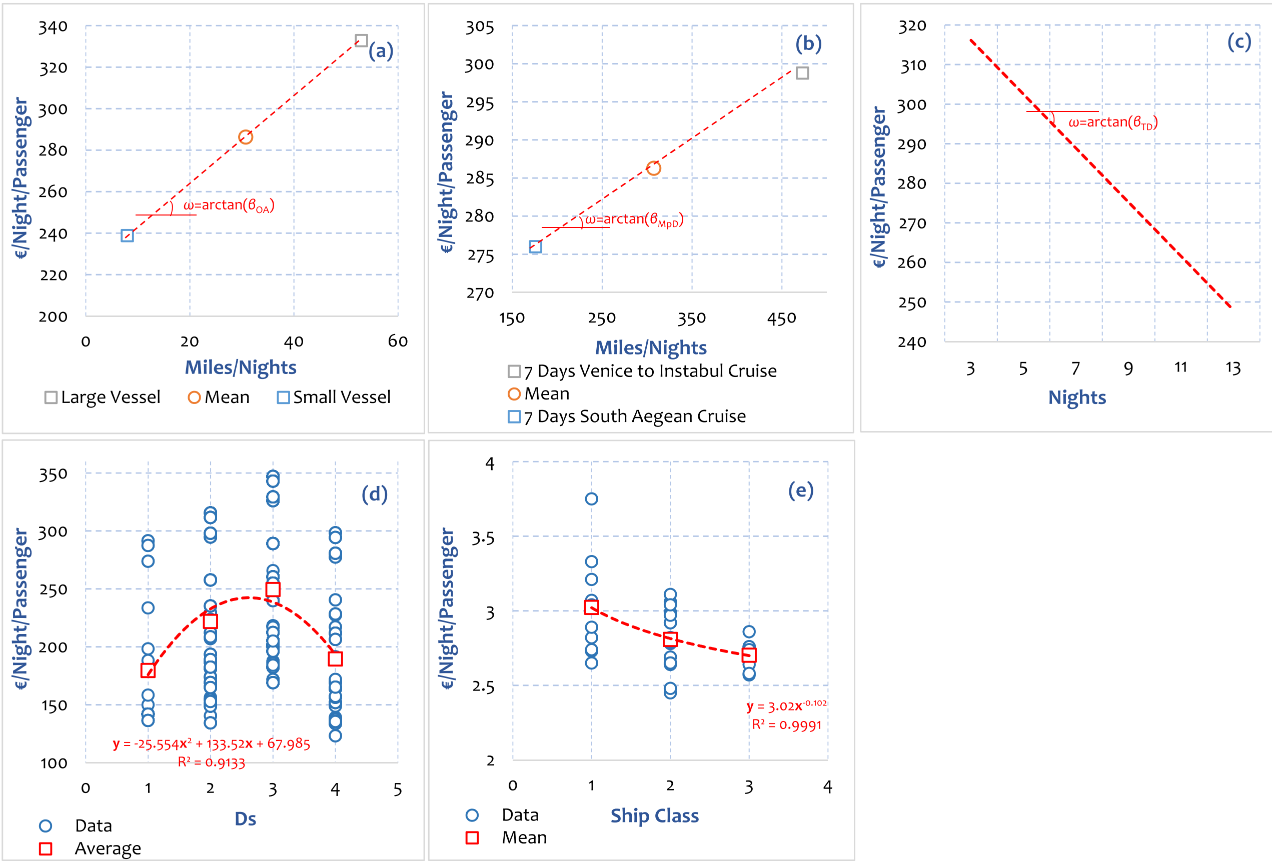


**Fig. 2.** Diagrams showing the partial effects that tourism and transport attributes cause to the price of the cruise product.

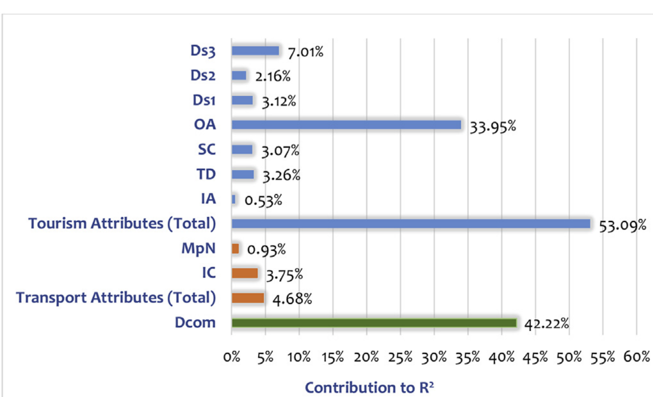


**Fig. 3.** Results of the Shapley's–Owen's $R^2$ Decomposition analysis.

set of good properties, such as efficiency, monotonicity and equal treatment for predictors and groups (see Huettner & Sunder, 2012), which makes it an effective measure for the goodness-of-fit (GOF) decomposition of a model.

The results of this procedure are shown in Fig. 3, where the difference in price strategies of the cruise companies (variable $D_{COM}$) account for about the 42.2% of the total price cruise product's formation.

In addition, tourism attributes seem to account for about the 53% of the price variability, whereas the most important tourism attribute is this of the onboard amenities, whose contribution to the $R^2$ price approaches the 34%. A remarkable finding regarding tourism attributes is the higher estimation extracted for the SQ variable comparatively to this of the IA variable. This finding portrays that for the current sample of cruises, service quality seems to surpass the attractiveness of the itineraries in capturing the prices' variability. This result may be due to the rather efficient itinerary planning of the companies, which are successful in combining the attractive POCs with less attractive stations and thus in keeping the variability of itineraries attractiveness at rather low levels. Finally, prices seem to be affected by the Transport Attributes at a lesser extent, since the couple of attributes included in this category and are participating in the model contribute by only 4.68% to the total formation of the $R^2$. These results illustrate that tourism attributes of the cruise product surpass the transport attributes, in terms of contribution to the formation of the cruise product's price.

## 5. Conclusions

This paper utilized the Hedonic Pricing Model (HPM) to examine the effect of several tourism and transport characteristics on the price of the cruise product. Tourism attributes, namely on board amenities, service quality, trip duration, and the itineraries attractiveness, which are widely accepted as affecting the cruise product price, were inserted on the model in order to capture the importance of the cruises' tourism dimension on the product price formation. Moreover, the sailing speed and a composite network variable referring to the itineraries closeness were used as representatives of the transport dimension. The performed analysis aspired to fill the gap in the relevant literature of cruise tourism that has been focusing merely on the customers' perceptions, leaving the pricing strategies of cruise operators rather understudied.

The quite satisfactory fitting of the models on the data derived from the schedules of two contemporary cruise companies in the Mediterranean market, along with the statistical significance of the estimations, allowed robust conclusions to be extracted. In general, tourism attributes appear to have a larger effect on the price formation of the cruise product, when compared to this of transport attributes. Regarding the tourism attributes, on board amenities are found to be the most significant price shapers, whereas for the transport dimension, the attribute of Itinerary Closeness accounts for the larger price's variability. In addition, apart from the effect caused by the tourism and transport attributes, the price of cruise product was also found to be affected from the individual pricing strategies of cruise companies, as these are trying to cover the highest possible part of market segments.

The aforementioned results signify that similarly to other tourism products, the tangible and unveiled attributes of the cruise product can be also priced. This pricing method suggests a driver for cruise lines in order to employ more effective pricing strategies, as they will be able to measure the value of their product attributes, by comparing its valuation against their competitors. Moreover, any further investigation and research on this issue may appear of great importance for the potential cruisers, as an a priori knowledge about how the cruise attributes affect the cruise prices would drive them to a better understanding of the best value for money products in a more straightforward context. To exemplify, for a customer that is interested to the on board amenities, the decomposition of cost could support finding the cruise for which the on board amenities are charged in the most reasonable price, after controlling the effect of all other attributes. That is, customers can simplify their decision making process, by basing it on an attribute oriented approach rather than on final offered packages selection.

Finally, port and local authorities can more easily understand the role of their destinations in shaping the cruise product attractiveness and further on its price. As for the Mediterranean market, the rather low variability of the price that is explained by the Itineraries Attractiveness variable portrays that cruise companies manage to tap the potential of each destination towards the formation of strongly competitive itineraries. The plethora of attractive destinations, being situated in quite short sailing distances, add an extra difficulty for port and local authorities on establishing and maintain a competitive advantage. The estimation of the value of each destination, as this is expressed by its contribution to the final cruise price, can support both the port and the local authorities in adjusting their development strategies and can provide them with valid and justified data to be used when it comes on the negotiations with the cruise companies.

Despite the rather useful insights appeared in the analysis, there is still a long road ahead in order to fully understand the shaping mechanism of the cruise product pricing. At first, the increase of the companies sample size would provide a better resolution to this phenomenon. Towards this direction, the analysis should also target to other company classes than merely to the contemporary, and either to other geographical markets, besides the Mediterranean. In addition, the analysis can be extended from the average price per cruise to a more detailed range of prices, in order to capture the effect of cabins class on the price of cruises. Furthermore, additional attributes such as discount strategies, booking methods, booking time, and homeport connectivity, which are not included in this consideration, they are expected to shed more light on the issue of cruise pricing. Finally, although it is time demanding, the record of longitudinal data and the employment of panel data analysis could lead to the extraction of more accurate results. The decomposition approach followed in this paper for the pricing of the cruise product is submitted as an initialization of the academic dialogue towards this direction, aspiring to motivate successive research that will contribute to a more in-depth knowledge about the pricing mechanism in the cruise industry.

## Acknowledgment

The authors would like to thank the three anonymous reviewers for their valuable comments that improved the quality of the article.

## References

Abrate, G., & Viglia, G. (2016). Strategic and tactical price decisions in hotel revenue management. *Tourism Management, 55*, 123–132.
Alegre, J., Cladera, M., & Sard, M. (2013). Tourist areas: Examining the effects of location attributes on tour-operator package holiday prices. *Tourism Management, 38*, 131–141.
Bull, A. (1996). The economics of cruising: An application to the short ocean cruise market. *Journal of Tourism Studies, 7*(2), 28.
Castillo-Manzano, J. I., Fageda, X., & Gonzalez-Laxe, F. (2014). An analysis of the determinants of cruise traffic: An empirical application to the Spanish port system. *Transportation Research Part E: Logistics and Transportation Review, 66*, 115–125.
Chen, C. F., & Rothschild, R. (2010). An application of hedonic pricing analysis to the case of hotel rooms in Taipei. *Tourism Economics, 16*(3), 685–694.
Chen, J. M., Zhang, J., & Nijkamp, P. (2016). A regional analysis of willingness-to-pay in Asian cruise markets. *Tourism Economics, 22*(4), 809–824.
Chua, B. L., Lee, S., Goh, B., & Han, H. (2015). Impacts of cruise service quality and price on vacationers' cruise experience: Moderating role of price sensitivity. *International Journal of Hospitality Management, 44*, 131–145.
Clewer, A., Pack, A., & Sinclair, M. T. (1992). Price competitiveness and inclusive tour holidays in European cities. In P. Johnson, & B. Thomas (Eds.), *Choice and demand in tourism* (pp. 123–143). Mansell, London.
CLIA. (2016). *2017 cruise industry outlook*. Cruise Lines International Association. Available at: https://www.cruising.org/docs/default-source/research/clia-2017-state-of-the-industry.pdf?sfvrsn=0. (Accessed 10 March 2017).
Coccossis, H., & Parpairis, A. (1992). Tourism and the environment—some observations on the concept of carrying capacity. In *Tourism and the environment* (pp. 23–33). Netherlands: Springer.
Costa Cruises. (2013). *Cruises 2013, july 2012*. online. Costa Cruises. Available at: http://www.costacruises.eu. (Accessed 1 March 2013).
Cracolici, M. F., & Nijkamp, P. (2009). The attractiveness and competitiveness of tourist destinations: A study of southern Italian regions. *Tourism Management, 30*(3), 336–344.
Cropper, M. L., Deck, L. B., & McConnell, K. E. (1988). On the choice of funtional form for hedonic price functions. *The Review of Economics and Statistics*, 668–675.
De La Viña, L., & Ford, J. (2001). Logistic regression analysis of cruise vacation market potential: Demographic and trip attribute perception factors. *Journal of Travel Research, 39*(4), 406–410.
Defert, P. (1966). *La localisation touristique. Problèmes théoriques et pratiques. Berne: Edit. Gurten*.
Dormann, C. F., Elith, J., Bacher, S., Buchmann, C., Carl, G., Carré, G., et al. (2013). Collinearity: A review of methods to deal with it and a simulation study evaluating their performance. *Ecography, 36*(1), 27–46.
Espinet, J. M., Saez, M., Coenders, G., & Fluvià, M. (2003). Effect on prices of the attributes of holiday hotels: A hedonic prices approach. *Tourism Economics, 9*(2), 165–177.
Gabe, T. M., Lynch, C. P., & McConnon, J. C., Jr. (2006). Likelihood of cruise ship passenger return to a visited port: The case of Bar Harbor, Maine. *Journal of Travel Research, 44*(3), 281–287.
Gujarati, D. N. (2009). *Basic econometrics*. New York: Tata McGraw-Hill Education.
Hamilton, J. M. (2007). Coastal landscape and the hedonic price of accommodation. *Ecological Economics, 62*(3), 594–602.
Haroutunian, S., & Pashardes, P. (2005). Using brochure information for the hedonic analysis of holiday packages. *Tourism Economics, 11*(1), 69–84.
Hersh, M., & Ladany, S. P. (1989). Optimal scheduling of ocean cruises. *INFOR: Information Systems and Operational Research, 27*(1), 48–57.
Huettner, F., & Sunder, M. (2012). Axiomatic arguments for decomposing goodness of fit according to Shapley and Owen values. *Electronic Journal of Sociology, 6*, 1239–1250.
Hung, K., & Petrick, J. F. (2011). Why do you cruise? Exploring the motivations for taking cruise holidays, and the construction of a cruising motivation scale. *Tourism Management, 32*(2), 386–393.
Koschutzki, D., Lehmann, K., Peeters, L., & Richter, S. (2005). Centrality indices. In U. Brandes, & T. Erlebach (Eds.), *Network analysis* (pp. 16–61). Berlin: Springer.
Kozak, M., & Rimmington, M. (2000). Tourist satisfaction with Mallorca, Spain, as an off-season holiday destination. *Journal of Travel Research, 38*(3), 260–269.
Kramer-Schadt, S., Niedballa, J., Pilgrim, J. D., Schröder, B., Lindenborn, J., Reinfelder, V., et al. (2013). The importance of correcting for sampling bias in MaxEnt species distribution models. *Diversity and Distributions, 19*(11), 1366–1379.
Lee, M. K., & Yoo, S. H. (2015). Using a choice experiment (CE) to value the attributes

of cruise tourism. *Journal of Travel & Tourism Marketing, 32*(4), 416–427.
Lekakou, M. B., Pallis, A. A., & Vaggelas, G. K. (2009). Which homeport in Europe: The cruise industry's selection criteria. *Tourismos: An international multidisciplinary journal of tourism, 4*(4), 215–240.
Li, Y., & Kwortnik, R. (2016). Categorizing cruise lines by passenger perceived experience. *Journal of Travel Research*, 0047287516674602.
Marusic, Z., Sever, I., & Ivandic, N. (2012). Mediterranean cruise itineraries and the position of Dubrovnik. In *Cruise tourism and society* (pp. 3–16). Berlin Heidelberg: Springer.
Mason, C. H., & Perreault, W. D., Jr. (1991). Collinearity, power, and interpretation of multiple regression analysis. *Journal of Marketing Research*, 268–280.
McCalla, R. J. (1998). An investigation into site and situation: Cruise ship ports. *Tijdschrift voor Economische en Sociale Geografie, 89*(1), 44–55.
MSC Cruises. (2013). *The mediterranean and northern Europe, March 2013-november 2013*. online. USA: MSC Cruises. Available at: http://www.msccruisesusa.com. (Accessed 1 March 2013).
Niavis, S., & Vaggelas, G. (2016). An empirical model for assessing the effect of ports' and hinterlands' characteristics on homeports' potential: The case of Mediterranean ports. *Maritime Business Review, 1*(3), 186–207.
Oandacom. (2014). *Average exchange rates*. online. OANDA. Available at: https://www.oanda.com/currency/average. (Accessed 1 August 2014).
Pallis, T. (2015). Cruise shipping and urban development: State of the art of the industry and cruise ports. online. In *OECDiLibrary, international transport forum discussion paper*. Available at: http://www.oecd-ilibrary.org/transport/cruise-shipping-and-urban-development_5jrvzrlw74nv-en. (Accessed 12 December 2015).
Papatheodorou, A. (2002). Exploring competitiveness in Mediterranean resorts. *Tourism Economics, 8*(2), 133–150.
Papatheodorou, A. (2006). The cruise industry: An industrial organization perspective. In R. K. Dowling (Ed.), *Cruise ship tourism* (pp. 31–40). Wallingford: CABI.
Papatheodorou, A., Lei, Z., & Apostolakis, A. (2012). Hedonic price analysis. In L. Dwyer, A. Gill, & N. Seetaram (Eds.), *Research methods in tourism: Quantitative and qualitative approaches* (pp. 170–182). Cheltenham: Edward Elgar Publishing.
Petrick, J. F. (2004). The roles of quality, value, and satisfaction in predicting cruise passengers' behavioral intentions. *Journal of Travel Research, 42*(4), 397–407.
Qu, H., & Ping, E. W. Y. (1999). A service performance model of Hong Kong cruise travelers' motivation factors and satisfaction. *Tourism Management, 20*(2), 237–244.
Rigall-I-Torrent, R., & Fluvià, M. (2011). Managing tourism products and destinations embedding public good components: A hedonic approach. *Tourism Management, 32*(2), 244–255.
Rodrigue, J. P., & Notteboom, T. (2013). The geography of cruises: Itineraries, not destinations. *Applied Geography, 38*, 31–42.
Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy, 82*(1), 34–55.
Saveriades, A. (2000). Establishing the social tourism carrying capacity for the tourist resorts of the east coast of the Republic of Cyprus. *Tourism Management, 21*(2), 147–156.
Savioli, M., & Zirulia, L. (2016). Add-on pricing: Theory and evidence from the cruise industry. online. In *Rimini centre for economic analysis, working paper* (pp. 15–26). Available at: http://www.rcfea.org/RePEc/pdf/wp15-26.pdf.
Sun, X., Jiao, Y., & Tian, P. (2011). Marketing research and revenue optimization for the cruise industry: A concise review. *International Journal of Hospitality Management, 30*(3), 746–755.
Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Allyn & Bacon.
Teye, V. B., & Leclerc, D. (1998). Product and service delivery satisfaction among North American cruise passengers. *Tourism Management, 19*(2), 153–160.
Thrane, C. (2005). Hedonic price models and sun-and-beach package tours: The Norwegian case. *Journal of Travel Research, 43*(3), 302–308.
TripAdvisor. (2014). *Hotels*. online. TripAdvisor LLC. Available at: https://www.tripadvisor.com.gr/Hotels. (Accessed 20 February 2014).
TripAdvisor. (2017). *Hotels*. online. TripAdvisor LLC. Available at: https://www.tripadvisor.com.gr/Hotels. (Accessed 5 July 2017).
Triplett, J. (2004). *Handbook on hedonic indexes and quality adjustments in price indexes*. Paris: OECD.
Tsiotas, D., & Polyzos, S. (2015a). Decomposing multilayer transportation networks using complex network analysis: A case study for the Greek aviation network. *Journal of Comparative Neurology, 3*(4), 642–670.
Tsiotas, D., & Polyzos, S. (2015b). Analyzing the maritime transportation system in Greece: A complex network approach. *Networks and Spatial Economics, 15*(4), 981–1010.
Weaver, A. (2005). Spaces of containment and revenue capture:'super-sized'cruise ships as mobile tourism enclaves. *Tourism Geographies, 7*(2), 165–184.
Wood, R. (2004). Cruise Ships: Deterritorialized destinations. In L. Lumdon, & S. J. Page (Eds.), *Tourism and Transport: Issues and agenda for the new millenium* (pp. 133–145). Amsterdam: Elsevier.
Xiao, Y. (2017). Hedonic housing price theory review. In *Urban morphology and housing market* (pp. 11–40). Singapore: Springer, 11-40.
Xie, H. J., Kerstetter, D. L., & Mattila, A. S. (2012). The attributes of a cruise ship that influence the decision making of cruisers and potential cruisers. *International Journal of Hospitality Management, 31*(1), 152–159.

Spyros Niavis, PhD, is an economist. He earned his PhD from the Department of Planning and Regional Development, School of Engineering, University of Thessaly, Greece. His research interests are efficiency and productivity analysis, maritime economics, regional development and economic policy. His research mainly focuses on South-Eastern Europe and Mediterranean Sea.

Dimitrios Tsiotas, PhD, is an engineer and mathematician. He earned his PhD from the Department of Planning and Regional Development, School of Engineering, University of Thessaly, Greece. His research interests include transportation networks, complex network analysis, statistics, and quantitative methods in Regional Science.