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Research Article

Are cruise cost factors affected by the place and the size of the cruise company?

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Article information	Abstract
	The aim of this study is to investigate the factors that affect and influence the cost of a cruise company, within the frame of different cruise ship sizes and operations in dissimilar geographic areas. For the purposes of this research, a small (deluxe) cruise company (SCC), offering specialized programs, and a larger (mass) cruise company (LCC), headquartered in Greece and operating in the East Mediterranean, are compared; two similar types of companies, headquartered in Italy, and operating in the Central Mediterranean, were selected for a comparison study. The methodology applied is the Analytic Hierarchy Process (AHP). Our study argues for the significance of cruise ship size and the cruise operation area to the general cost of a cruise ship, as well as to differentiations on specific cruise factors. Financial cost is the major driver for the total cost for SCCs, as well as for LCCs, in both countries. For instance, a shipping company could decide whether to operate in a specific market, based on destination selection with the specific cost factors, and which size of cruise ship could minimize certain cost components for the vessel and, eventually, for the cruise itinerary and the company. The results have significant implications for cruise ship management and operations, but also contribute to the limited existing literature.

1. Introduction

In the discussion regarding whether the cruise industry is more of a shipping activity or a tourist one, the undisputable interpretation accepted by all disputed parties, like "Solomon's solution", is that a cruise product comprises a floating all-inclusive hotel which travels to several destinations for the leisure purposes of their passengers. The cruise product is not limited only to providing transportation and accommodation, but also offers a wide variety of leisure and entertainment happenings to its consumers, both aboard and ashore. As a sector with the aspiration to produce and offer high-quality products, it should embrace, as the primary objective, the delivery of memorable experiences to its clientele and the generation of loyal customers (Lekakou et al., 2014). It is considered by many researchers and sector experts that, even if destinations are considered core components of the cruise experience, eventually, the cruise ship has gradually become the "destination" itself (KeyNote, 2018).

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The cruise industry, as displayed in **Figure 1**, is one of the most dynamic sectors of the globalized economy, with a steady growth rate. Even though the industry has shown its resilience to adversity and global crises, such as SARS, the war in Iraq (Stefanidaki & Lekakou, 2012), and the financial crisis of 2008, which did not leave negative effects on cruise companies or the industry in general (Rodrigue & Notteboom, 2012), the global pandemic COVID-19 outbreak in March of 2020 has shown severe negative impact on the sector (Syriopoulos et al., 2020).

The restrictions on international travel, after bans on non-essential travel introduced and imposed by the World Health Organization (WHO) in most countries around the world to contain the virus spread, have affected severely tourism and travel. Specifically, the latest World Tourism Organization (WTO) estimates and current forecasts, considering the impact of the COVID-19 outbreak, assume a decrease of 35 % to the total tourism industry revenues for 2020 compared to 2019, i.e., from $685 billion in 2019 to $447 billion in 2020. This translates to a triple loss compared to the 2008 global financial crisis, leading to a reduction of 300 million tourists and $320 billion losses in worldwide tourism revenue (UNWTO, 2020; Richter, 2020).

The global cruise sector not only has had persistent recovery after the 2008 financial crisis, but also presented significant growth rates, compared to other shipping industries.

The cruise industry turnout was $46.6 billion in total revenue in 2018, exhibiting almost a double increase in revenue from the previous $25 billion, reached during the recession spread of 2008 and after (CLIA, 2020). The global cruise industry produced a total output of $150 billion in 2018, increasing by 20 % from the $126 billion in 2016.

The average passengers' growth rate was estimated at 7.2 % from 1990 - 2020 (Cruise Market Watch, 2020), despite the rapid decrease of −74.22 % from 2019 to 2020, because of COVID-19. The 28.5 million cruise passengers created 1,177,000 jobs (full-time equivalent employees), 6.2 % more than the jobs of 2017. The gross compensation in wages and salaries reached $50.2 billion (CLIA, 2018; CLIA, 2019). The exponential growth in cruise passengers is presented in the following **Figure 1**. The worldwide cruise passengers in the figure reflect the dynamics of the cruise sector, with an increase from 1990 to 2000 of 93 %. The cruising growth rate in cruise passengers was similar in the following years, until the outbreak of the pandemic in 2020. In particular, cruise passengers increased by 54 % in 2005 from 2000, by 66 % in 2010 compared to 2005, and by 400 % since 1990 (**Figure 2**).
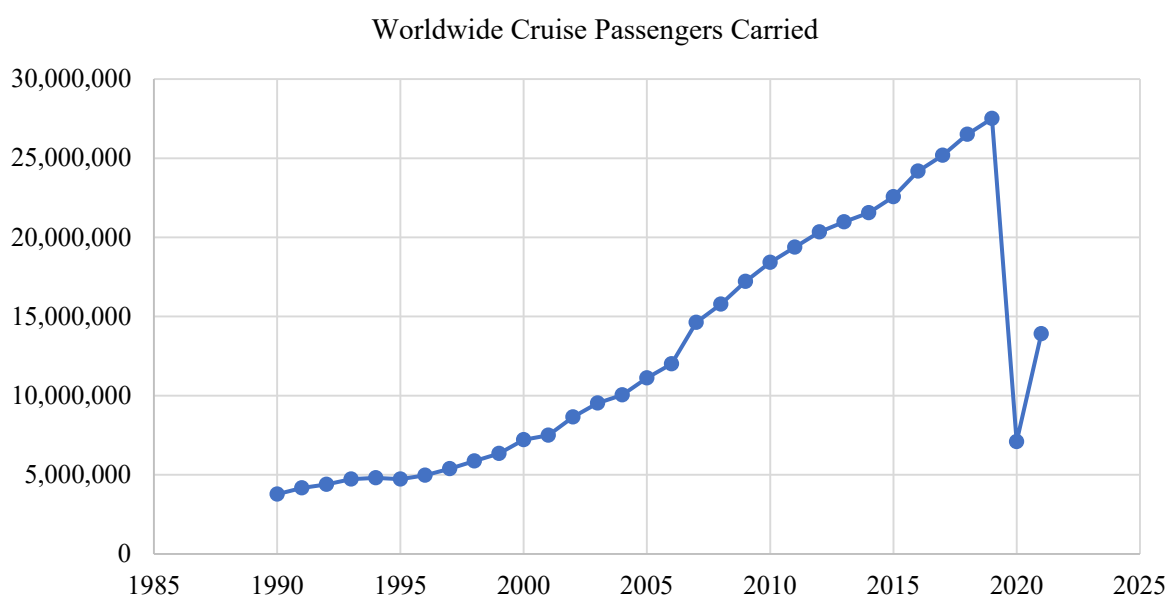

Figure 1 Cruise passengers worldwide (Cruise Market Watch, 2020).

A similar increase, by 50 % was recorded from 2010 to 2019, with an overall increase from 1990, 640 %. The impact of the pandemic in 2020 reduced the number of passengers to 2000 levels, while in 2021, the industry recovered to around 2007 levels.

The high complexity and sophistication of the cruise product (Diakomihalis et al., 2009; Diakomihalis et al., 2016; Diakomihalis, 2007), affects, in a similar manner, the cost components composition of the cruise business.

During the last decades, one can observe the progressive increase of cruise ship size, which is a choice based on economic criteria. Economies of scales are referred to in corporate reports as being a component of the industry's success. Obviously, ship size cannot be the only factor affecting the generation of the cost of a cruise itinerary. Other decisions, regarding geographic areas of deployment, destination selection, financial policy, suppliers, food and beverage, etc., are some constituents influencing and shaping the economic performance of cruise ships and, consequently, the wealth of a company (Diakomihalis & Stefanidaki, 2011). Cruise ship cost factors participation to cost criteria, and cost criteria to total cruise company cost, is a subject without the expected and required attention in the literature (Papathanassis & Beckmann, 2011).

The total cost of cruise ship operation, as well as cruise cost components, have been investigated in general (Vogel et al., 2012; Papathanassis & Beckmann, 2011), without any approach towards identifying certain cost factors' participation in total cruise cost, neither to the cost differentiation because of the size of the cruise ship, nor to the specific geographical area of cruise itineraries.

The issues of economies of scale are expected to occur on a larger cruise ship, and specific issues related to the cruise ship's area of activity (ports of approach, travel time between ports, ports of supply, etc.), are both the motivations that have led us to specific research to determine whether there are, indeed, differences in the cost sizes of specific categories, and what these differences are.

Taking into consideration the main challenges and opportunities in the sector, the aim of this analysis is to investigate the factors that affect and influence the cost of a cruise company, as well as its conformation within the frame of different cruise ship sizes and operations in dissimilar geographic areas. For the purposes of this research, a small deluxe cruise company, which offers specialized programs, and a larger mass cruise company, operating in the countries of Greece and Italy, and the wider areas of Central and East Mediterranean, respectively, were selected for a comparison study. The methodology applied is the Analytic Hierarchy Process (AHP), which is a flexible multi-criteria method for decision making and priority ranking. The research was concluded by the end of 2019. Therefore, any impacts of the COVID-19 outbreak in March of 2020 are out of the scope of the research. Besides, the period under COVID-19 pandemic cannot be representative of a normal cruise period, and any report including the impact of COVID-19 before the end of the pandemic would be neither accurate nor reliable regarding the impacts to cruise cost evaluation.

The existing literature and cruise experts' opinion insistence for the need for low operating costs, while at the same time, for preserving high levels of quality, is very challenging for the competition of a cruise company. This study aims to identify the major cost differences arising, firstly, from differences in cruise ship size and, secondly, from different operating areas, in order to contribute to the total cost restriction, and help cruise companies to put a lid on pointless spending.

The aim of this study focuses on filling this research gap by identifying the factors which compose the cost of a cruise company so much by analytical categorization and by evaluation of contribution to the total cost. In this context, we make distinct comparisons among the cost criteria of larger cruise companies (LCCs) and small cruise companies (SCCs), respectively, and also in two different areas of home porting and activity within the same wider geographical area, one in the East and the other in Central Mediterranean.

The results arising from the research may lead to useful conclusions regarding the selection of the size of cruise ships, as well of as the areas of activity, with the intention to minimize cost and maximize profits.

The paper is structured as per the following. Following the introduction, Section 2 analyzes and presents a literature review. Section 3 describes the methodology applied, including a short discuss on the Analytical Hierarchical Process (AHP) and the way data are analyzed. The results are presented in Section 4, with the conclusion of the paper stated in the last Section 5, followed by references.

2. Literature review

Financial efficiency is crucial for the survival of any business and, therefore, it is also of high significance for a shipping company. The cruise product is unquestionably distinguished by its complexity, since the cruise ship creates various cost categories, which are included in the costs of the shipping company, related to the operation and management of the ship and the costs of hotel operations related to the provision of high-level hotel and leisure services.

The financial performance of a cruise company will, therefore, be affected by the way cost and revenues are managed. Management outcome depends on day-to-day costs, whilst efficiency outcomes depend on how much revenue can be generated (Stopford, 2013).

2.1 Cost components of cruise ships

Cruise revenues derive from two main sources: ticket and onboard services and activities. Revenues also come from the sale of land-based tours, air charter business to third parties, etc. Based on Cruise Market Watch, the average revenue per cruise passenger, forecasted for 2021, for all cruise lines is estimated at $214,25 per day, with a $152.12 per person per day ticket price and $62.13 per person per day on board spending (average cruise duration 8.0 days, median duration 7.0 days).

In average, the total cost of an 8-day cruise is calculated at $1.714, from which 71 % corresponds to ticket price, and the remainder, 29 %, represents on board spending, which counts for $497. Based on the same source, casinos and bars generate 55 % of the onboard revenues.

The factor of ship size and its effect on total cost might be perceivable by looking to other shipping markets where relevant studies have been carried out. In the container shipping market, it has been noted that, whilst the cost per at sea per ton, or TEU, is decreased as ship size is increased, the efficiency of the ship depends on the time needed to complete a voyage, with the time spend in the port being a critical factor (Gullinane & Khanna, 2000). A core question arising from the dominant trend of ship gigantism is whether this is also the case for cruise ships, meaning what is more beneficial for ships; to keep its valuable cargo (passengers) on board, or to extend their time in each port. There are two alternative options: the first one suggests that cruise companies decrease their stay time at ports, so as to increase their revenues on board, and the other option suggests that calls are designed in such a way that companies benefit from the number of excursions sold at port.

In any case, the size of cruise ship as the selection of any alternative, regarding the itinerary design and its components, to the total cost of the cruise company will be affected in various ways.

Nevertheless, it is a fact that several factors can affect the returns of a cruise company and, therefore, affect its performance and profitability. Adverse conditions, i.e., bad weather, or the first come-first serve system applied, may result in not calling to a destination, leading, probably, to re-routing of the itinerary, consequently affecting, among others, port charges and fuel consumption. Such unpredictable circumstances and peculiar conditions, along with the legislative framework and extra regulations that exist in each destination, make the operation of a cruise ship an even more complicated procedure. In this situation, the handling of the various cost categories is a crucial factor of business success (Diakomihalis et al., 2016).

In the history of adverse international circumstances, epidemic or pandemic outbreaks are considered among the most severe and indistinct consequences. According to UNWTO estimates, the effects of COVID-19, which resulted in partial or total lockdown worldwide, have slowed economic growth, with many negative consequences in many sectors of the economy, including the

travel and tourism industries and, therefore, on cruises themselves (UNWTO, 2020; Richter, 2020). The financial impact on cruise ship companies is mainly on their revenue and profits, while at the same time burdening them with an increase of certain expenses, such as the cost of cancellations, the cost of mooring ships in quarantined ports, and the cost of maintaining ships, even when they remain inactive (Syriopoulos et al., 2020). Additionally, the decline in liquidity will lead cruise companies to increase debt and, thus, further worsen their financing costs, amid a pessimistic climate in international stock markets (McKinsey, 2020; Syriopoulos & Bakos, 2019). In these adverse conditions, large cruise companies have seen their investment-grade statuses downgraded because of the "high level of uncertainty" (Nagarajan, 2020), which is the consequence of revenue and profits restriction, along with the increase of operational and financial costs (Syriopoulos et al., 2020).

In the recent study conducted by Diakomihalis et al. (2016), searching for the effect of different size of cruise ships offering different programs, operating mainly in Greece and the East or even wider area of the Mediterranean, on the cost components, revealed some interesting differences in the significance of the criteria, as well as in the sub-criteria between the two types of cruise companies.

The financial breakdown of total passenger revenues to the main cost categories of cruise company or a cruise operator is estimated at $1.564. The greatest cost category is of agents' commission, representing 13 % of the total cost, followed by corporate operating costs and payroll (11.6 %) and ship fuels costs (10.8 %).

Table 1 Financial breakdown of typical cruiser | Cruise Market Watch (2020).

Cost category	%
Agent commission	13 %
Ship fuels costs	10.8 %
Corporate operating costs	11.6 %
Payroll	11 %
Depreciation/Amortization	9.6 %
Victualing	6 %
Onboard and other	4.4 %
Other and transportation	3.3 %
Interest expense	3.1 %
Other operating costs	14.5 %
Profit before taxes	12.7 %

Source: Royal Caribbean Cruises. Carnival Corporation and PLC (2018). NCL Corporation. Cruise Lines. International Association (CLIA). The Florida-Caribbean Cruise Association (FCCA) and DVB Bank. https://cruisemarketwatch.com/financial-breakdown-of-typical-cruiser (accessed November 2020).

As described analytically in the methodology (Section 3), a set of key factors was identified based on the literature review and from discussion with experts. Based on this, a questionnaire was developed and addressed to two cruise companies operating in each country, Greece and Italy.

The responses were analyzed using specialized software and using the Analytic Hierarchy Process (AHP) to determine the key decision factors regarding cost analysis. The AHP method,

which is analyzed in Section 3, is a very widely used multi-criteria decision-making (MCDM) method, applied in personnel selection, staff appraisal, and senior promotion issues, as well as in the selection of students admitted to various educational institutions, in many military matters, and in various government programs. Of particular interest is the widespread use of the method in China, where it is quite often used for various decisions in the construction industry.

3. Methodology and data

The Analytic Hierarchy Process (AHP) method was developed by Thomas Saaty (1970) and is based on addressing a complex decision-making problem with benchmarks, in its components that are organized into a hierarchical structure. Hierarchical Decision Analysis in AHP primarily aims to build realistic models for decision making. For a model to be realistic, it is necessary to consider all the factors- criteria involved in decision making, whether they are material or intangible. Measurements in an AHP model can be quantitative or qualitative. This is the "revolution" in Saaty's method; he created a scale, beyond the fundamental scale, which makes everything measurable, so that factors can be consistently prioritized and, ultimately, determine the best alternative decision.

The dissemination of AHP is due to its simplicity and clarity, to its ease of implementation, and to the results of its various applications. AHP is based on the very well-defined mathematical structure of consistent matrices and the ability of their eigenvectors to produce true or well-approximated relative weights. AHP is one of the multi-tiered problem-solving decision methods known as Multi-Attribute Decision Methods (M.A.D.Ms).

AHP is perhaps the most widely used of the M.A.D.M. methods because, as a method, it has a number of desirable properties:

• AHP is a structured decision-making method that can be documented and reproduced.

• AHP, in addition to its application to multi-criteria decision problems, is also applicable in cases of decisions where subjective judgment is involved.

• It uses both qualitative and quantitative data to calculate the data of the hierarchy. Ways are provided to measure the consequence of judgements by the process itself.

• There is a wealth of data on AHP applications in the academic literature, which makes it very accessible to the user.

• AHP Expert Choice's commercial software is available with technical and training support, and it is easy to apply.

The operation of AHP is based on the following axioms:

• Reciprocal Comparison: The decision maker must make comparisons between the elements of the hierarchy, and these comparisons must meet the inversion rule, i.e., if A is more important than B, by x, then B is more important than A, by 1 / x.

• Homogeneity: Preferences are reflected in a common, delimited scale (1 - 9), used to quantify quality judgments.

• Independence: When the criteria are given weight, they are considered independent of the characteristics of the decision alternatives.

The hierarchy construction phase includes three processes which interact with each other until the final elements of the problem are selected. These procedures are:

• The recognition of levels and elements of the hierarchy.

• The definition of the elements of the problem.

• The design of the relevant questions to be answered by the respective decision maker.

This process ends with the comparisons of all the alternative actions of the last level of the hierarchy, in relation to the elements of the immediately preceding level. Two such tables related to the hierarchical structure of the previous figure are illustrated below.

In **Table 2a**, the criteria (C) of decision C1, C2, C3, and C4 (second level of hierarchy) are compared in pairs in terms of their degree of participation in the fulfilment of the goal (Goal). In

Table 2b, the alternatives sub-criteria (SC); SC1, SC2, SC3, and SC4 are compared in pairs in terms of fulfilment of the criterion to which they belong.

Table 2 Pairs of comparison of criteria and sub-criteria.

GOAL	C1	C2	C3	C4
C1				
C2				
C3				
C4				

(a) By pairs of comparison of criteria

C1	SC1	SC2	SC3	SC4
SC1				
SC2				
SC3				
SC4				

(b) By pairs of comparison of sub-criteria

According to Saaty (1994), this scale, whether qualitative or quantitative, must be able to clearly reflect ideas, thoughts, and feelings. Saaty proposes a scale of reasons that clearly captures both quantitative and qualitative information. Thus, he considers that our ability to express quality preference is satisfactorily reflected by five levels, with intermediate evaluations also existing and being used (2, 4, 6, 8):

1. Equivalent.
3. Moderate.
5. Strong.
7. Very Strong.
9. Absolute.

In a pairwise comparison table, the decision maker declares his / her preferences for each comparable decision pair, X and Y, based on the following rating:

I	X is equivalent to Y (X I Y)	1
WP	the preference of X over Y is weak (Week Pref. – X WP Y)	3
SP	the preference of X over Y is strong (Strong Pref. – X SP Y)	5
DP	the preference of X over Y is very strong (Very Strong Pref.-X DP Y)	7
AP	the preference of X over Y is absolute (Absolute Pref. – X AP Y)	9

P={I, WP, SP, DP, AP}

They correspond to the numerical scale 1, 3, 5, 7, and 9, which expresses the equivalence of preferences, weak preference, strong preference, and intermediate states, as presented in the table below. On this scale, it is possible to use the intermediate values 2, 4, 6, and 8 that express intermediate preferences. Therefore, the total possible Saaty preferences ratings are:

P={1, 2, 3, 4, 5, 6, 7, 8, 9, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7, 1/8, 1/9}

The inversions of values 2, 3, 4, 5, 6, 7, 8, and 9 correspond to inverse preferences of the decision maker (Saaty, 1999).

This scaling process can then be translated into priority weights- scores, according to the gravity selection in between the pair of criteria or sub-criteria, as shown below.

Criterion	Gravity of relative significance	Criterion
A	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	B

For these values, the properties apply (Saaty 1994).
1. $\alpha ij = 1$, since they refer to comparisons of the elements with themselves.
2. $\alpha ij > 1$, when element i is preferred over j.
3. $\alpha ij < 1$, when the element j is preferred over i.
4. $\alpha ij = 1 / \alpha ij$ for each i, j.

Each of these values can be considered to express practically how many times one element is more important than another. It is, therefore, obvious that the data of pairwise comparisons are collected only for half of the data in the table, excluding, of course, the data of the diagonal. Thus, for a table of dimensions $n \times n$, the number of comparisons to be made by the decision maker is *n (n-1) / 2*; that is, the number of comparisons required by the decision maker is only for half of the elements in the table, excluding the elements of the main diagonal. The rest are calculated based on the properties mentioned above.

AHP has been used in the shipping industry, mostly to assess port selection criteria (Lirn et al., 2004; Guy & Urli, 2006; Ugboma et al., 2006), carrier selection criteria (Wong et al., 2008), and benefits distribution from port services (Vaggelas & Pallis, 2010). It is, therefore, undoubtable in its effectiveness to assess cost variations in the cruise shipping industry.
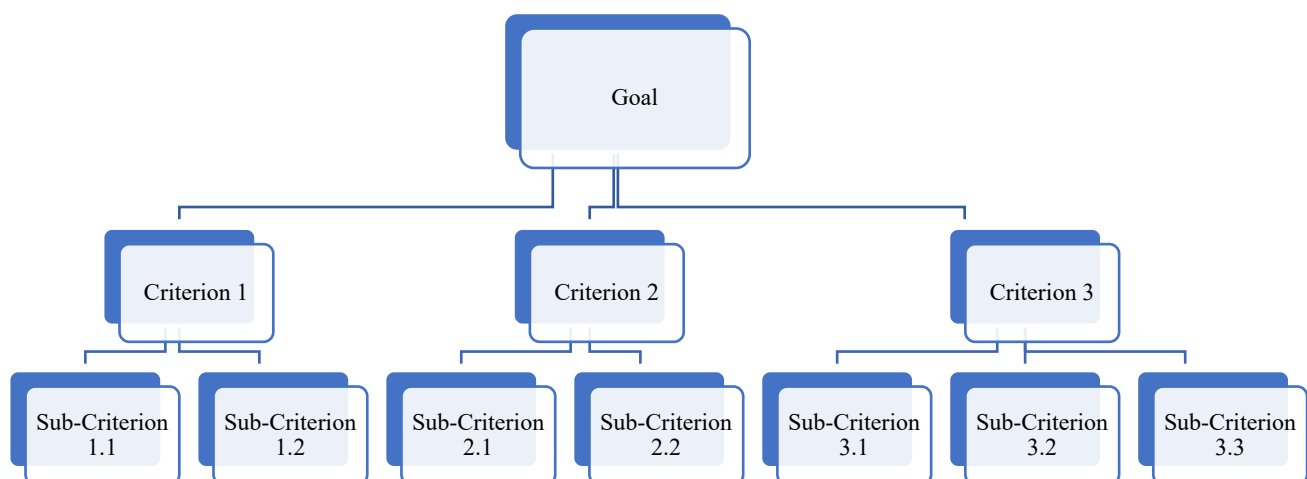

Figure 2 Hierarchical structure of decision-making process via AHP.

3.1 Identification of criteria and sub-criteria for questionnaire development
Through the required brainstorming among cruise sector experts, the cost categories that compose the total cost of cruise companies have been identified as the criteria that form the ultimate goal of the research. At a second row of discussion, every criterion was further analyzed for the

individual factors that compose its total value, in the form of sub-criteria. The major stakeholders of the Greek and Italian cruise industry, such as cruise companies and maritime agents, had to confirm whether the proposed cost factors resulting from the brainstorming process are all and equally significant for the final determination of the cruise companies' total costs. All possible factors, by level of criteria and sub-criteria, have been finally narrowed to the list of six major cost categories, each of which has been further broken down into its sub-criteria, as presented below:

3.2 Voyage cost

This is shaped by all the characteristics of the itinerary which cause cost to the ship and the company that appears and arises and occurs with the voyage. Such factors are the home port, geographic area of activity, port of call / regularity of call, time of eve in each port, crew cost, and ballast cost.

3.3 Cost of food and beverage provision

This incorporates all the factors affecting, to a greater or lesser degree, the total cost of alimentation required by the passengers. These factors are characteristics of the cruise program, such as luxury or thematic, the passengers' characteristics, like nationality, income, and nutritional habits, the quality of the provisions, the expertise, the transportation cost, taxes, and the clearance of alimentation supplies.

3.4 Cost of supplies

Similar to the cost of food and provisions, the cost of all other supplies needed by the cruise vessel are approached. Among these factors are the geographic position of the ship, the special supplies that might be required, like fueling and watering, and the national/local legislation influencing supplies' cost, such as sanitation regulations.

3.5 Administration cost

This includes the total cost of the shipping company management, which may refer either to the shipping owners' company or to the shipping operating of the specific cruise vessel. This cost is affected by the place of the company's headquarters and, also, by the size of the company, in terms of the number of vessels.

3.6 Financial cost

This is the combined cost of all factors which influence and determine the financial burden on the cruise company, which is shaped according to the agreements regarding both the way of debt payment and the way of claim collection, along with the company status of being either a parent or affiliated company.

3.7 Technical, upgrading and layup cost

The factors that synthesize this cost category refer to all kinds of required costs arising from technical and normal maintenance, from drydocking and all required minimum improvements, from the sanitation cost and the layup expenses at times of repairing damages.

Since the hierarchic structure of the levels of criteria and the number of criteria of all levels are of high significance for AHP, the structure of the present research is relatively simple, with data present of two levels (the 'criteria' and the 'sub-criteria'). The groups of criteria selected with the sub-criteria of each group of criteria per couple have the form of the final questionnaire, consisting of a total number of 57 questions (comparisons per couple).

The structure of the questionnaire was such that the respondents were asked to compare each sub-criterion included in the criterion with the remaining sub-criteria of the criterion. Therefore, there is no comparison of all the sub-criteria separately, with the remaining belonging to other

criteria. This was done for purposes of abridging the number of the questions. The Expert Choice™ software was used to calculate the gravity coefficients for every comparison per couple.

3.8 Field research and data analysis

The questionnaire was addressed to two cruise companies, with different market profiles, in each country. The first company was a small premium cruise company that offers specialized programs, and the other was a major cruise company that is very active in the cruise market, of Greece and Italy, respectively. Initially, the questionnaire was distributed to the heads of the departments related to the cost categories, such as the finance dept, management dept, marketing dept, accounts dept, purchasing dept, and operations dept. Instead of receiving separate responses from each executive, participant companies returned to us only two collective questionnaires, from each country. The final respondents were the heads of the general management depts of the selected companies in Greece and in Italy.

As explained earlier, the questionnaire answers were the input to the AHP method for the output of the analysis and were ranked by their gravity on all criteria and sub-criteria on a numerical scale. Thus, the impact of the different cost factors to every cost category, and the impact of each cost category to the ultimate goal, which is the total cost of the cruise company, will be determined.

Table 3 Tree view of criteria and sub-criteria of an SCC and of an LCC in Greece and Italy.

	SCC Greece		SCC Italy		LCC Greece		LCC Italy	
	Local	*Global*	*Local*	*Global*	*Local*	*Global*	*Local*	*Global*
1. Voyage cost	**0.181**	**0.181**	**0.149**	**0.149**	**0.275**	**0.275**	**0.239**	**0.239**
1. Home port	0.103	0.019	0.087	0.013	0.237	0.065	0.076	0.018
2. Geographic area of activity	0.186	0.034	0.149	0.022	0.127	0.035	0.096	0.023
3. Port of call / Regularity of call	0.224	0.041	0.152	0.023	0.068	0.019	0.132	0.032
4. Time of eve in each port	0.133	0.024	0.205	0.030	0.019	0.005	0.226	0.053
5. Crew cost	0.097	0.018	0.344	0.052	0.515	0.142	0.354	0.085
6. Ballast cost	0.257	0.047	0.063	0.009	0.034	0.009	0.116	0.028
2. Cost of food and beverage provision	**0.173**	**0.173**	**0.114**	**0.114**	**0.225**	**0.225**	**0.219**	**0.219**
1. Characteristics of cruise program (e.g., luxury, thematic etc.)	0.152	0.026	0.163	0.019	0.022	0.005	0.069	0.015
2. Passengers' characteristics (nationality, income, nutritional habits)	0.086	0.015	0.289	0.033	0.137	0.031	0.130	0.028
3. Quality	0.437	0.076	0.257	0.029	0.395	0.089	0.292	0.064
4. Expertise	0.246	0.043	0.209	0.024	0.055	0.012	0.367	0.081
5. Transportation cost , taxes, clearance	0.079	0.014	0.082	0.009	0.391	0.088	0.142	0.031
3. Cost of supplies	**0.182**	**0.182**	**0.101**	**0.101**	**0.040**	**0.040**	**0.110**	**0.110**
1. Geographic position of the ship	0.281	0.051	0.475	0.048	0.479	0.019	0.370	0.041
2. Special supplies (fueling, watering, etc.)	0.584	0.106	0.149	0.015	0.458	0.018	0.224	0.025
3. National/local legislation (e.g., sanitation)	0.135	0.025	0.376	0.038	0.063	0.003	0.406	0.044
4. Administration cost	**0.060**	**0.060**	**0.060**	**0.060**	**0.019**	**0.019**	**0.049**	**0.049**
1. Place of company's headquarter	0.250	0.015	0.250	0.015	0.875	0.017	0.200	0.010
2. Size of company	0.750	0.045	0.750	0.045	0.125	0.002	0.800	0.039
5. Financial cost	**0.047**	**0.047**	**0.378**	**0.378**	**0.314**	**0.314**	**0.261**	**0.261**
1. Way of debt payment	0.349	0.016	0.629	0.238	0.286	0.090	0.686	0.179
2. Way of claim collection	0.168	0.008	0.285	0.108	0.143	0.045	0.234	0.061
3. Parent company or affiliated company	0.484	0.023	0.086	0.032	0.571	0.179	0.080	0.021
6. Technical, upgrading, and layup cost	**0.357**	**0.357**	**0.198**	**0.198**	**0.127**	**0.127**	**0.122**	**0.122**
1. Technical and normal maintenance	0.281	0.100	0.207	0.041	0.383	0.049	0.233	0.028
2. Drydocking	0.211	0.075	0.143	0.028	0.215	0.027	0.106	0.013
3. Minimum improvements	0.095	0.034	0.100	0.020	0.134	0.017	0.159	0.019
4. Sanitation	0.132	0.047	0.390	0.077	0.143	0.018	0.164	0.020
5. Layup expenses during repairs	0.281	0.100	0.160	0.032	0.125	0.016	0.338	0.042

4. Results and discussion

The questionnaires were registered on the Expert Choice ™ software, which is designed for the processing of input based on the Analytic Hierarchy Process theory. All the evaluations, of both criteria and sub-criteria, are presented in the above **Table 3**. The determination regarding the gravity of each one of them is easily derived through the tables below, and the figures shown arise from the results.

The evaluation of each criterion signifies its importance and gravity to fulfilling the goal of the research. This value is presented both with the Global and Local values, since the Global (G) refers to the final goal, which is the research's aim itself, and the Local (L) values refer to the evaluations given to each criterion for the goal they refer to. Similarly, the participation and the gravity of every sub-criterion to the criterion it belongs to is revealed by the score of significance of each sub-criterion to the criterion it belongs to, which means it is displayed in Local (L) values, while the gravity of every sub-criterion to the research goal is displayed in Global (G) values.

The global evaluations for each sub-criterion are summed to yield overall or synthesized priorities to the research goal. The most significant alternative is the one with the highest priority.

The following tables present the evaluation of the criteria, in both countries for the SCC cruise companies, **Table 4**, and for the LCCs, **Table 5**, along with their ranking based on their significance to the final goal of the study.

The participation of the criteria composing the total cost of the SCC cruise companies in both countries is also illustrated in **Figure 3**, and that for the LCC cruise companies is displayed in **Figure 4**. Comparing the evaluation results for the SCCs in both countries reveals the similarity in some evaluations, as well as the ranking of some criteria, but also the differentiation in the evaluation and the ranking of others. Specifically, the highest gap in criteria evaluation between the two countries is depicted in the financial cost, which is the major driver for the total cost for the Italian SCC, ranking at first place, but just the 6th for the Greek SCC, with a difference in their evaluation being -0.331. Technical upgrading and layup cost is the highest valued criteria for the Greek SCC and, despite the high difference in gravity from the Italian SCC, it ranks as the second most important factor for the Italian SCC. Cost of supplies is the second criterion in significance for the Greek SCC, but it ranks at the 5th position for the Italian SCC. Voyage cost is the criterion ranking in 3rd place for the SCCs of both countries, with a small difference in the evaluation between Greek and Italian SCCs. Cost of food and beverage provision ranks at 4th position for the SCC of both countries. The difference in the gravity is also not high enough to be noticeable. The last criterion in significance for the Italian SCC and the 5th for the Greek SCC is the administration cost, which is evaluated with the same gravity, and seems to be the least important criterion, since it is evaluated at last place for the Italian SCC and at 5th place for the Greek SCC.

Table 4 Criteria of SCCs in Greece and Italy and their ranking by significance.

Participation of the cost criteria composing the total cost of a small cruise company	SCC Greece	SCC Italy	Ranking Greece	Ranking Italy	Differences SCC (Greece-Italy)
1. Voyage cost	0.181	0.149	3	3	0.032
2. Cost of food and beverage provision	0.173	0.114	4	4	0.059
3. Cost of supplies	0.182	0.101	2	5	0.081
4. Administration cost	0.060	0.060	5	6	0
5. Financial cost	0.047	0.378	6	1	-0.331
6. Technical upgrading and layup cost	0.357	0.198	1	2	0.159

Comparing the evaluation results for the LCCs in both countries reveals the very close similarity in all evaluations, as well as the ranking, which is exactly the same for all criteria in both the Greek and Italian LCCs. Specifically, financial cost is the major driver for the total cost in LCCs, but with a substantial difference in the evaluations between the two countries. Voyage cost is the criterion ranking at 2nd place for the LCC of both countries. Cost of food and beverage provision ranks at 3rd position for the LCC of both countries. Technical upgrading and layup cost is the 4th criteria for the LCCs. Cost of supplies ranks at the 5th place in significance for the Greek and Italian LCCs.

The last criterion in significance is the administration cost for both the Greek and Italian LCCs.

The highest difference in criteria gravity to the total cost of the SCC between Greece and Italy is depicted in the criterion "financial cost", with 0.378 over 0.047 for the Italian company to the Greek one, followed by the "technical upgrading and layup cost", with 0.357 to 0.198 for the Greek SCC over the Italian. Smaller differences in the gravities of SCC criteria between the 2 countries are depicted in three criteria with higher evaluations for the Greek over the Italian SCC, which are the "cost of supplies" (0.182 to 0.101), "cost of food and beverage" (0.173 to 0.114), and "voyage cost" (0.181 to 0.149). No difference is shown for the "administration cost" between the Greek and Italian SCCs (**Figure 3**).

A very important interpretation of the results for the SCCs is that geographical area of operation may increase "financial cost" as much as 8 times more for the Central Mediterranean compared to the East Mediterranean. Instead, "technical upgrading and layup cost" may be almost double in the East Mediterranean compared to the Central Mediterranean.

On the contrary, the evaluations between the LCC of both countries do not illustrate any noteworthy difference in the evaluation of the criteria. "Financial cost" is evaluated higher for the Greek LCC over the Italian, with 0.314 to 0.261, and "voyage cost" with 0.275 to 0.239. "Cost of supplies" has been evaluated of higher significance for the Italian LCC over the Greek LCC, with 0.110 to 0.040, and "administration cost" with 0.049 to 0.019. The difference in "technical upgrading and layup cost" is not worth noticing (**Figure 4**).

Despite the significant cost differences between the SCCs, attributed to the geographical area of operation, no cost difference of similar significance is depicted among the LCC cruise ships.

Table 5 Criteria of LCCs in Greece and Italy and their ranking by significance.

Participation of the cost criteria composing the total cost of a small cruise company	LCC Greece	LCC Italy	Ranking Greece	Ranking Italy	Differences LCC (Greece-Italy)	Differences SCC-LCC Greece	Differences SCC-LCC Italy
1. Voyage cost	0.275	0.239	2	2	0.036	-0.094	-0.090
2. Cost of food and beverage provision	0.225	0.219	3	3	0.006	-0.052	-0.105
3. Cost of supplies	0.040	0.110	5	5	-0.07	0.142	-0.009
4. Administration cost	0.019	0.049	6	6	-0.03	0.041	0.011
5. Financial cost	0.314	0.261	1	1	0.053	-0.267	0.117
6. Technical upgrading and layup cost	0.127	0.122	4	4	0.005	0.230	0.076

Table 5 also displays the evaluation differences between the different sizes of cruise companies of the same country; that is, the differences between the SCC and LCC in Greece and the corresponding differences in Italy. The values reveal interesting results, which are illustrated in **Figures 5** and **6**.

The highest differences of the criteria significance between the SCC and LCC in Greece is depicted by the "financial cost", with 0.314 of the LCC over the significance of 0.047 for the SCC. Two more criteria depict a greatest significance for the LCC compared to that for the SCC: "voyage cost", with 0.275 to 0.181, and "cost of food and beverage provision, with 0.225 to 0.173, respectively. Greater significance for the SCC over the LCC is depicted in the criteria "technical upgrading and layup cost", with 0.357 to 0.127 significance. Next, significant differences are shown in the "cost of supplies" criterion, with 0.182 to 0.040, and the "administration cost", with 0.060 to 0.019 significance, respectively (**Figure 5**).

The factor of different sizes of cruise ships which are operating in the same geographical area, in this case Greece, seems to significantly differentiate two cost factors, "financial cost" and "technical upgrading and layup cost".

Respectively, the highest differences in the criteria significance between SCC and LCC in Italy is depicted by the "financial cost", with 0.378 of the SCC over the significance of 0.261 for the LCC, and by the "technical upgrading and layup cost", with 0.198 to 0.122 significance for the SCC over the LCC.

In two criteria, the Italian LCC is estimated to be of higher value over the Italian SCC, which are "cost of food and beverage provision, with 0.219 to 0.114, respectively, and "voyage cost", with 0.239 to 0.149. The difference in the gravity between the "cost of supplies" and the "administration cost" in negligible between the two types of cruise companies of Italy (**Figure 6**). Similarly, but with smaller differences, are the results for the same cost factors regarding different sizes of cruise ships operating in the same geographical area of the Central Mediterranean and, specifically, in Italy.
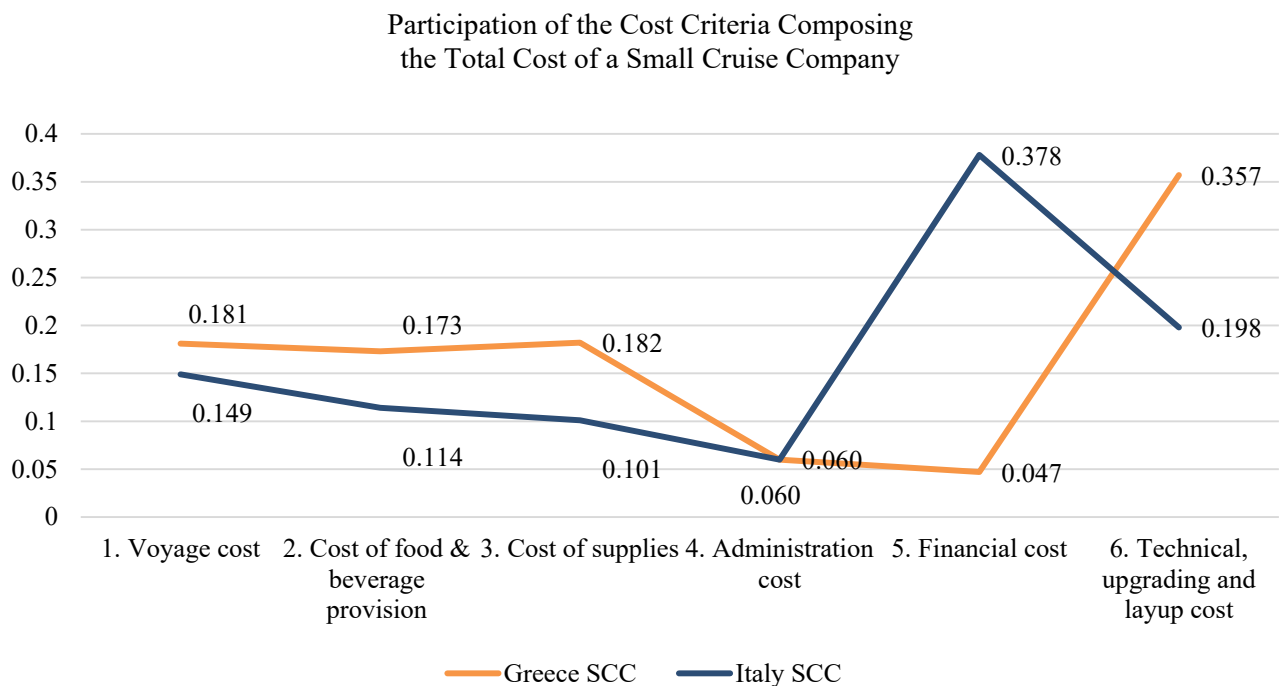

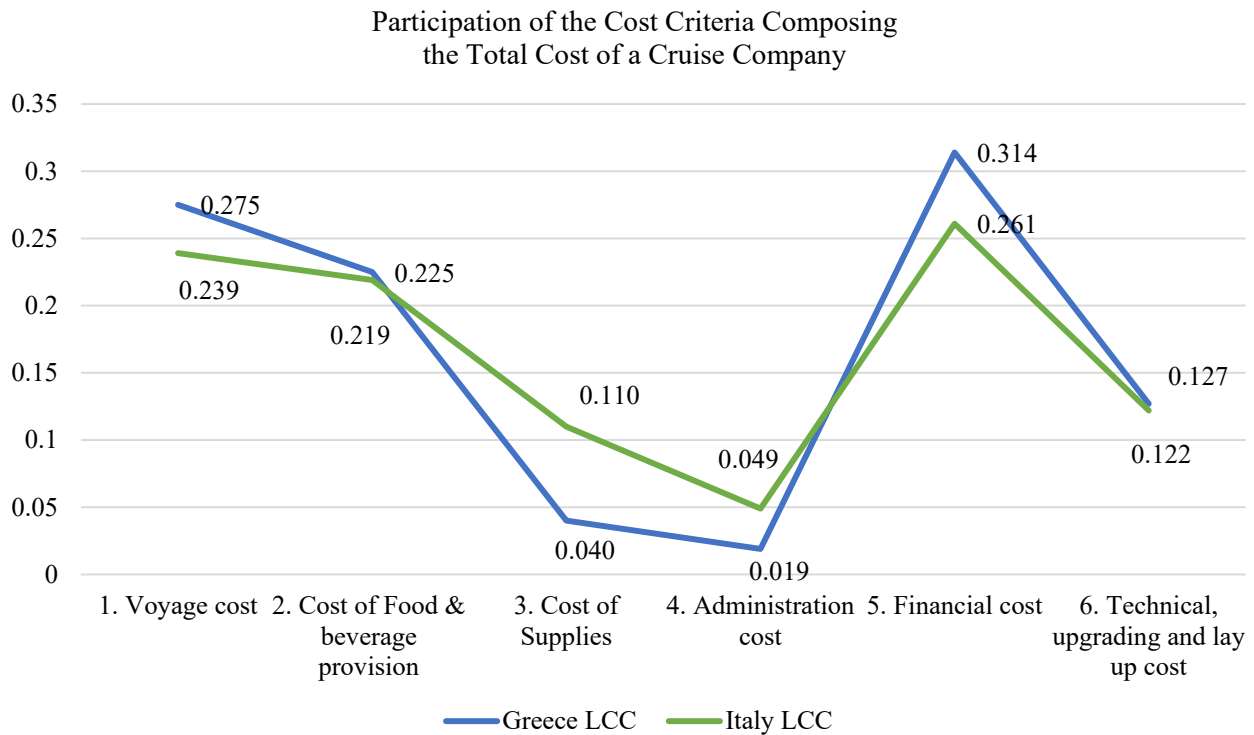**Figure 3** Criteria differences between small cruise companies in Greece and Italy.

Participation of the Cost Criteria Composing
the Total Cost of a Cruise Company

Figure 4 Criteria differences between large cruise companies in Greece and Italy.

Participation of the Cost Criteria Composing
the Total Cost of a Small and a Large Greek Cruise Company
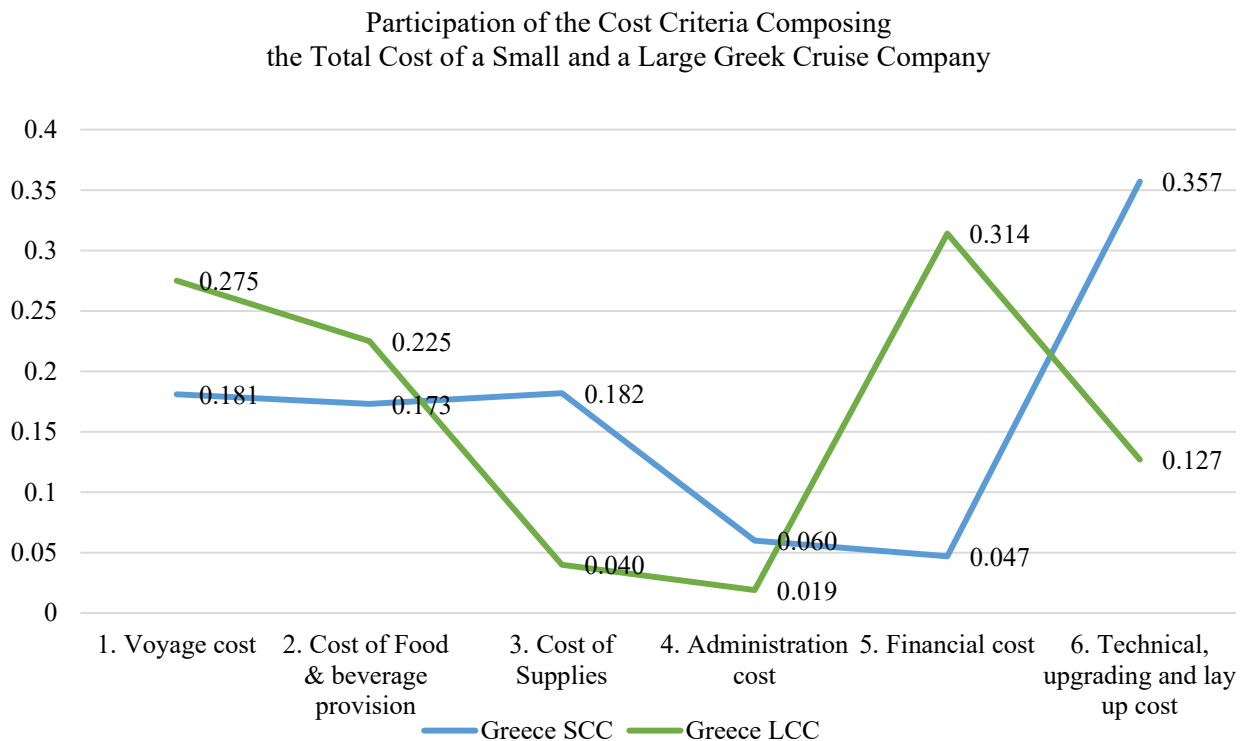
Figure 5 Significance differences between SCC and LCC in Greece.

Participation of the Cost Criteria Composing
The Total Cost of a Small and a Large Italian Cruise Company
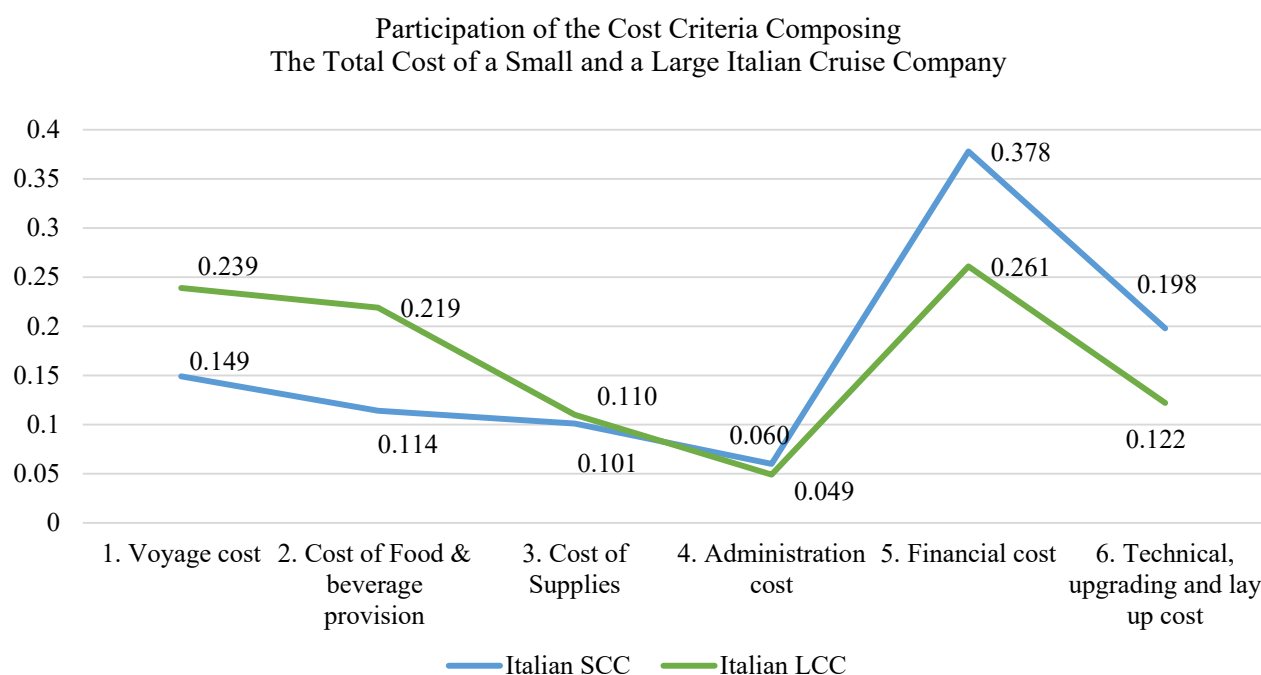
Figure 6 Significance differences between SCC to LCC in Italy.

The significance differences of the sub-criteria between the SCCs of the two countries are illustrated by **Figure 7** and those between the LCCs of Greece and Italy by **Figure 8**.

According to significance comparison (see **Figure 7**), it is expected that the sub-criteria with the highest differences should belong to the criteria where such difference exists between the SCCs of the two countries. Therefore, as is illustrated, the sub-criteria of financial cost presenting the highest gap in gravity are the "way of debt payment", "sanitation", and the "way of claim collection". Other noticeable differences in sub-criteria evaluation are depicted in the criterion technical upgrading and layup cost. Specifically, the most noticeable differences are shown in "layup expenses during repairs" and in "technical and normal maintenance". Additionally, from other criteria, "special supplies" presents a significant difference between the Greek and Italian SCCs. On the contrary, both sub-criteria of administration cost show identical gravity for both countries' SCCs.

Respectively, the sub-criteria with the biggest difference of significance between the LCC of both countries (see **Figure 8**) are "parent company or affiliated company" and "way of debt payment", while the differences in the significance of other sub-criteria are not considered extreme.

Respectively, the comparison of the sub-criteria between the Greek and the Italian LCCs reveals moderate differences compared to those of the SCC differences. "Parent company or affiliated company" is of higher value for the Greek LCC over the Italian (0.179 to 0.021); "home port" with 0.065 to 0.018, "crew cost" with 0.142 to 0.085, "transportation cost, taxes, clearance" with 0.088 to 0.031, and "quality" with 0.089 to 0.064, are the sub-criteria with higher gravity for the Greek LCC over the Italian. On the opposite side, "way of debt payment" with 0.179 to 0.090, "expertise" with 0.081 to 0.012, "national/local legislation" with 0.044 to 0.003, and "layup expenses during repairs" with 0.042 to 0.016, are the sub-criteria evaluated as being more significant for the Italian LCC over the Greek LCC.

A significant outcome of this study is that cruise ship operators should consider the high "financial cost" for SCCs before investing or inaugurating cruise itineraries in the Central Mediterranean. Comparatively, an LCC operating in the same geographical area will demand less "financial cost" (**Figure 3**). Additionally, a cruise ship operator in the East Mediterranean would

face an increased "technical upgrading and layup cost" in case an SCC is selected to offer cruise itineraries (**Figure 6**).

"Voyage cost", "cost of food and beverage provision", and "cost of supplies" will be higher for a small cruise ship operating in the East Mediterranean compared to the same type of ship operating in the Central Mediterranean (**Figure 3**). In both areas, an LCC will have to cope with higher "voyage cost" expenses compared to those of an SCC (**Figures 5** and **6**).

A noticeable gap in "financial cost", "technical upgrading and layup cost", "cost of supplies", and "voyage cost" is depicted between the Greek SCC and the Greek LCC, which might be attributed to the cruise itineraries in the Aegean Sea and East Mediterranean approaching more ports and destinations.

Regarding the role of the sub-criteria in the total cost of the cruise company, it is expected that the most significant influence will be related to the criteria they belong to. "Way of debt payment", "way of claim collection", "layup expenses during repairs", and "technical and normal maintenance", are influenced both by the size and the area of activity of the cruise company. "Special supplies" and "layup expenses during repairs" are influenced by the different areas of a cruise company's base and activity, and only for the SCCs. "Ballast cost", "crew cost", "expertise", "home port", "national/local legislation", and "transportation cost, taxes, clearance" are influenced by the different areas of activity among the LCCs.

"Parent company or affiliated company" and "size of company" seem not to differentiate their contribution to the total cost of the cruise company, neither because of the size, nor because of the base and area of activity of the cruise company.
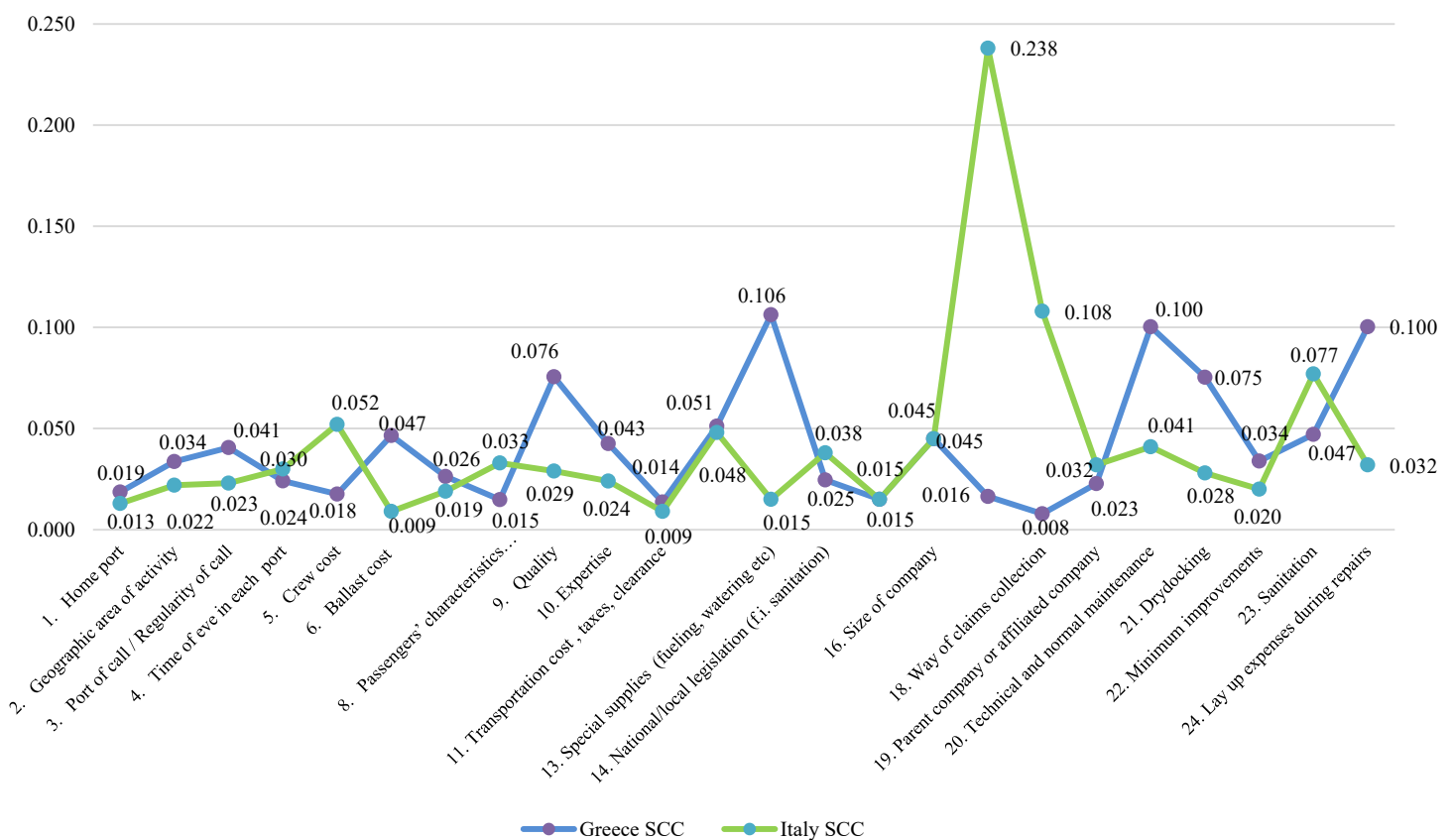

Figure 7 Sub-criteria differences between small cruise companies of Greece and Italy.

Based on the experts' opinion, it is apparent that almost all cost categories, except for "financial cost", are neither affected by the headquarters of the cruise company, nor by the area of cruise activity, between cruise ships of similar size and the itinerary offered (see **Tables 4** and **5**). Significant differentiations, though, are revealed in cost categories among different size and different passengers' target operating in the same area (**Table 5**, **Figure 5**). Relatively to the cost categories, similarities or differentiations are depicted also in the sub-criteria comparing evaluation (**Figures 7** and **8**).
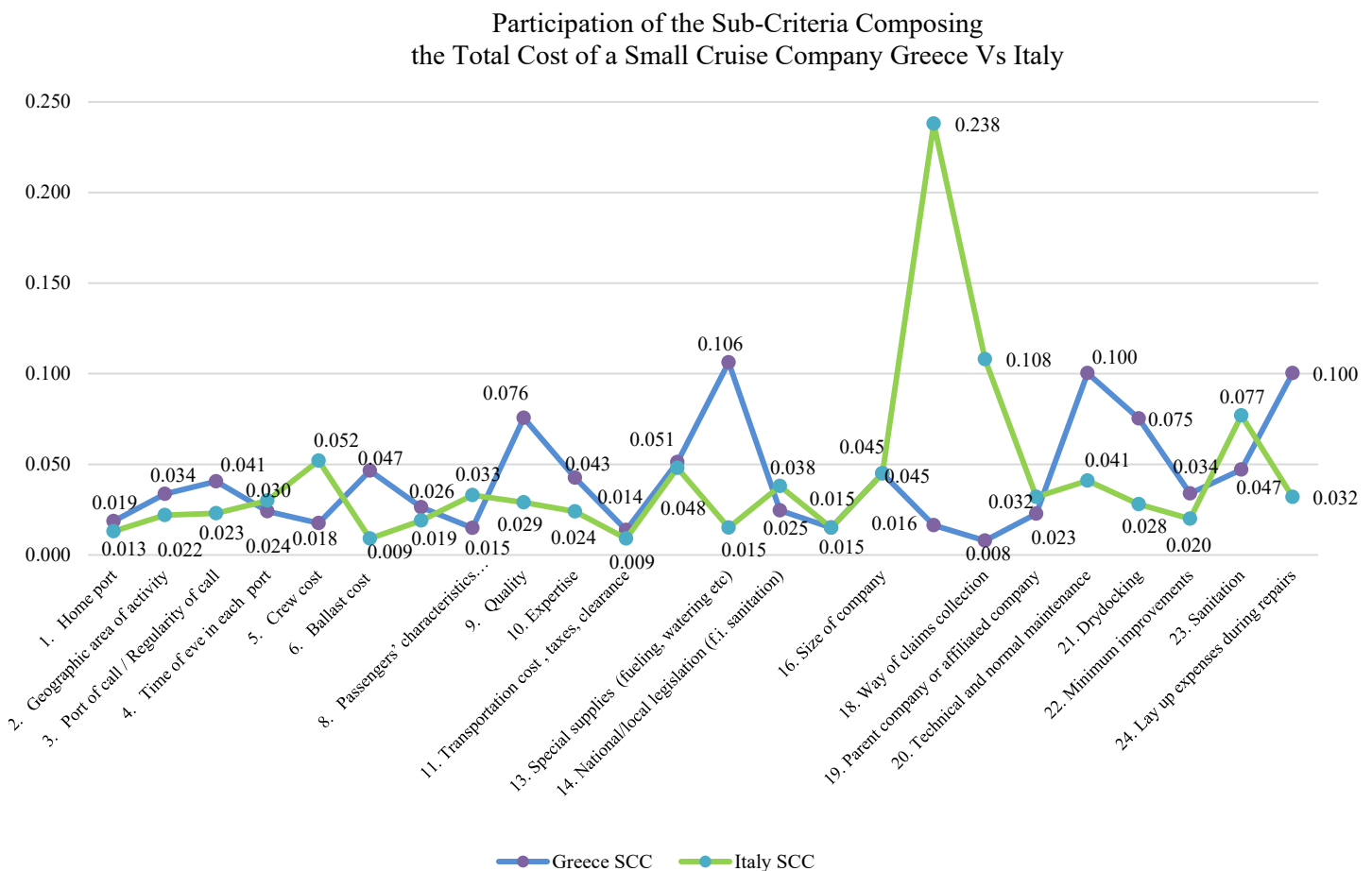

Figure 8 Sub-criteria differences between large cruise companies of Greece and Italy.

5. Conclusions

The case study of this research included a large-size cruise company and a small-size cruise company in Greece, and a similar couple of companies in Italy. The comparative analysis also implies a differentiation in the specific area of activity, which is the East Mediterranean where most of the Greek home porting cruises are conducted, and the Central Mediterranean being the region of most Italian home porting cruises. Individual cost factors should, in each case, be considered and evaluated separately. Ultimately, as much as cost-cutting contributes to improving the company's financial performance, both quantitative and qualitative "discounts" on cruise ship products threaten to reduce the competitiveness and, ultimately, cruise ship sales.

In addition to controlling the financial situation of the company, the cost is not only an evaluation element for investment financing, but also for the attraction of funds from investors. Therefore, a more careful, deliberate, and detailed assessment of all cost factors will yield more reliable results for the competitiveness and survival of a business.

It is implied that banks, tour operators, and other cooperating industries, such as land transport, catering, and tourist ports, will be affected by the differences in cost categories between cruise ships of different sizes, as well as by the different geographical areas in which they operate. This research could contribute in many ways to the international literature, but also to investors, operators, and cooperative businesses of the cruise industry.

Regardless the absence of similar research considering different sizes of cruise companies and different home porting countries, it is obvious that the results cannot be generalized, for several reasons and limitations. One of them is the fact that both companies are mainly operated in a specific geographical area (mostly the Mediterranean region), and the need for an extended study, including more cruise companies, operating in different geographic areas (e.g., the Caribbean, Alaska, and North America), as well as with different market segments (e.g., premium, luxury, and mass). The assessment of COVID-19 impacts on the global cruise market was not considered in the present study because it is a temporary condition and business context that will not reveal the real financial values of the industry. Instead, COVID-19 influence can be assessed more accurately once the pandemic is eliminated and its negative effects cease. Despite the aforementioned limitations of the research, the results strongly support the role of the size of the cruise ship, as well as the geographical area of cruise operation, in the cost configuration of specific cost factors and, ultimately, on the total operation cost of the cruise ship.

Acknowledgments

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