

Cruise passengers' expenditure in the Messina port: a mixture regression approach

Romana Gargano

University of Messina, Italy
rgargano@unime.it

Filippo Grasso

University of Messina, Italy
fgrasso@unime.it

Abstract. In this study, we assess the determinants of cruise ship passengers and crew members expenditure disembarking in the port of Messina (Sicily, Italy), by applying both linear and concomitant mixture regression models. It is shown that duration of visit, nationality, occupation previous visit to Messina and satisfaction an effect on expenditures and that there are three different profile in expenditure are statistically significant. This study enables one to obtain the necessary information to implement more adequate tourism policies in a fastest growing sector in the travel market.

Received:
June, 2015
1st Revision:
January, 2016
Accepted:
May, 2016

DOI:
10.14254/2071-
8330.2016/9-2/12

Keywords: cruise passengers' expenditure, concomitant mixture finite model, Messina

JEL Classifications: C13, C83

1. INTRODUCTION

Cruise tourism is one of the faster growing sectors of global tourism, with been the fastest growing segment in the travel sector around the world. In 2014, a record 6.39 million Europeans took a cruise, 30,000 more than in 2013. This marks a 0.5% growth of Europe's source market compared to the previous year. While the year-on-year growth rate has considerably slowed down compared to previous years, it is remarkable that more Europeans than ever chose a cruise holidays in 2014 in spite of the continuing challenging economic conditions. The average annual growth in the last five years has been positive at 4.9%. This confirms that cruising remains an excellent holiday choice for millions of passengers in Europe and beyond, providing great value for money.

Italy remains Europe's third largest source market, despite a 3.1% decrease, with 842,000 passengers. The factors behind the reduction in the industry's growth rate include a decrease in capacity in the Mediterranean and the continuing economic difficulties throughout much of the European Union. Despite the decline in the Mediterranean cruises, the Italian market is dominated the Mediterranean cruises is the best choice for Italian market (79% of passengers in 2014) and the average annual passenger growth trend since the crisis began in Italy is 3.9%.

The elements that express the importance of the cruise sector are represented primarily by showy and persistent processes of expansion for over two decades characterize the cruise market, with demand flows that, in the last decade, have maintained growth rates such by doubling the total number of cruise worldwide.

Our study is based on a survey performed in Messina, the 3rd largest in Sicily (after Palermo and Catania) the 13th largest city in Italy (with a population of more than 240,000 inhabitants) and the 10th port in Italy for handled passengers in 2014. The city's main resources are its seaports (commercial and military shipyards), cruise tourism, commerce, and agriculture (wine production and cultivating citrus).

The aims of this study were to provide a starting point for a correct planning and management of tourism development, describe the profile of average tourist and estimate the different determinants of tourist spending according to the importance that each one has in global spending. In this paper most attention was focused on measuring visitor spending because it is, together with the number of visitors, a critical factor in terms of magnitude of the economic impacts. For this purpose we will use both classical linear regression model and mixture regression model according to which it is possible to hypothesize that the statistical distribution of the average expenditure carried by tourists, empirically observed on a sample is the mixture of their distributions of two or more distinct groups among them but mixed in proportions unknowns.

The paper is organized as follows: in the next section we present a review of literature, in the section 3 the survey methodology and a descriptive statistics of the main characteristics of cruise passengers and crew arriving to Messina. In Section 4 we briefly provide a description of the methodologies and in section 5 we present the empirical results. Some final remarks will conclude the paper.

2. LITERATURE REVIEW

A review of literature reveals a large number of empirical studies aimed at measuring the demand for tourism, both in terms of number of tourists and their expenditures. Some authors have modeled expenditures levels as function of socio-demographic, trip-related and psychographic variables, plus budget constraints. Recently, Hung et al (2012) and Marcussen, (2011) have used of Ordinary Least Squares OLS estimation, in order to consider only the average response of tourist expenditure to changes in its determinants while possible differences among consumer segments are overlooked. More recently, quantile regression was adopted in tourism study by Chen and Chang (2012) on the influence of travel agents in Taiwan, and by Marrocu et al (2015) on the effect of the main determinants of tourist expenditure to non – resident tourists in Sardinia. Abbruzzo et al (2014) have introduced the use of graphical models for assessing the determinants of individual tourist spending in Uruguay, emphasizing with these models have the advantage of synthesizing and visualizing the relationships occurring within large sets of random variables, through an easy interpret output. While in literature there are numerous studies of tourist expenditure, the research of the cruise tourism expenditure has become more popular since the beginning of this decade. Kester (2003) asserts that main obstacle for the analysis of economic impacts is the absence of data describing the economic behavior of the tourist. The sudden growth in demand for cruising points to numerous impacts arising from its accelerated development. Many authors address the impacts of cruise tourism development in different ways, e.g. Carwright and Baird (1999) mention the social, technological, economic, political and environmental impacts. Brida and Zapata (2010) elaborate on economic, political, socio-cultural and environmental impacts. Gargano et al (2012) estimated the ECSI (European Customer Satisfaction Index) model parameters using a PLS (Partial Least Square) approach in order to identify the types of cruise passenger who visit Messina, and determine the main social and environmental variables that influence their levels of satisfaction. They showed that most of the tourists visiting Messina have relatively high levels of

satisfaction, but the satisfaction level was influenced by perceived value which seems to be a dimension of strategic importance as a mediator of the effects on the perception of quality satisfaction.

At the same time, economic impacts are the main topic of numerous research work for example Dwyer and Forsyth (1998) developed a framework for assessing the economic impact of cruise tourism for nation and its sub regions. Four types of travel expenditures must be calculated to measure the economic contribution of cruise industry: (1) passenger-related expenditure; (2) crew-related expenditure; (3) vessel-related expenditure; and (4) support expenditure. Henthorne (2000) in a study of factors determining expenditure of cruise passengers looks at how much money was actually spent by cruisers while in port as well as the influences on these expenditures. The results reveal that vendors who are perceived as friendly, helpful, and knowledgeable fare better than those who come across as manipulative and aggressive and that older consumers can be expected to spend more in port than their younger counterparts. It suggests that cruise lines select particular ports providing their customers with positive in port experiences and are willing to change itineraries and drop specific port of call if an inordinate number of customers experiences dissatisfaction. Brida and Risso (2010) estimated a cross-sectional regression model in order to analyze the different variables influencing cruising expenditure levels in Costa Rica. They showed that heavy spenders are distinguishable from the other segments in terms of income levels, hours spent out of the ship, nationality, age and their spending pattern.

Brida et al (2012) estimated two cross-sectional regression models for the cruise expenditures, showing that the group size the visitors travel with and the mobility the visitors have within the country are the most important variables to explain individual expenditure behaviour. They provided a better understanding of the cruise industry, considering the expenditure of cruise ship passengers disembarking in the ports of call of Montevideo and Punta del Este as a key variable in the economic analysis of the cost and benefits. Brida et al. (2014) provide a better understanding of cruise travel from passengers' characteristics and experience in two ports of call in Uruguay, they use a multivariate market segmentation analysis. The study identifies distinct segments by country of residence, occupation, locations visited in Uruguay, satisfaction and previous visits to the country.

3. DATA AND STRUCTURE OF THE QUESTIONNAIRE

Our study is based on a survey performed in Messina's city, where cruise tourism is becoming increasingly important, as a result, cruise passengers' expenditures are increasingly contributing to the local economy. 1995 to 2014 the number of cruise passengers in the City increased by 1085.95% (from 26.959 passengers in 1995 to 319750 in 2014). We interviewed cruise passengers and crew members in the cruise terminal port Messina at the end of their tour when they are returning to their cruise from March 1 to October 30 2014. We have chosen to interview tourists and crew members at the end of their tour once all the Messina city expenses had been incurred allows us to obtain a more reliable measure of tourist expenditures and to avoid its estimation (Marrocu et al. 2015, Craggs & Schofield, 2009).

Structured self-administered questionnaires were preferred, as they have higher response rate and the interference of the researcher is minimized (Oppenheim, 1992). The questionnaire, designed for this study, was reproduced in 5 languages (Italian, English, French, German, Spanish) and was composed of three sections for a 35 items total. The first section collects socio-demographic information on the interviewees, the second section aims to measure overall expenditure. Travel expenditure includes the total consumption of goods and services made in the city divided into seven expenditure categories: food and beverage, handicraft, clothes, personal services (hairstylist, beautician), public transport, pharmaceutical, other (telephone

and internet, watch and jewellery and museum tickets). The third part aims to obtain information about motivations, satisfaction for the city and its services and the intention to return to Messina or recommend it to other tourists. In terms of the response format, the 5-point Likert scale was used (“1” Strongly Disagree—“5” Strongly Agree), as it has been consistently documented (e.g. Andereck & Nyaupane, 2011; Vargas-Sanchez et al., 2009).

We used a two-step stratified sampling approach to select our sampling. At first, cruise ships were selected randomly from a list of boats expected to stop at the Messina port through systematic sampling. In the second stage, interviewees from travel groups were chosen to ensure equiprobability, in this layer we stratified by type of visitors and we assigned a share of 85% cruise ship passengers and 15% to crew members. We collected a total of 5.500 valid questionnaires.

Table 1 reports the socio-demography profile of all respondents (cruise passengers and crew members). Overall, the majority of survey respondents were male (52.78%); were aged 46 or older, have at least secondary education level (85.01%) and visit Messina for the first time (78%). Among the cruise passengers, 72.21 percent were travelling as family, 55.22% were more aged 55 or older (48.52%), 49.01% percent were retired, 45.55 % were on holidays from work and 1.59% were not currently working, 3.85% were students. Over 78% of passengers were from Europe countries, and of these 29% were from Italy, 12% from USA and Canada, only 8.5% from other countries. Crew members were predominantly from Asia (70%) followed by 22% from Europe and 8% from other countries; they, were more likely to be younger than 35 (85%) and they are rooms and kitchens personnel (56.45%) and engine room personnel (33.91%) especially.

Table 1

Socio-demography characteristic (%) of all respondents

	Percentage %	
1	2	
Gender	Female	47.22
	Male	52.78
Educational level	Primary school	2.27
	Middle school	12.72
	Secondary education	43.20
	University / college	37.63
	Post graduate degree	4.18
Age	18-25	9.57
	26-35	13.69
	36-45	14.64
	46-55	17.58
	56-65	30.31
	>65	14.21
Residence	Italy	27.52
	Europe	52.08
	USA and Canada	8.10
	Other countries	12.30

1		2
Occupation status*	Employed	45.55
	Retired	49.01
	Student	3.85
	Unemployed	1.59
Previous holiday in Messina	Yes	22.00
	No	78.00
Travel company*	Family	72.21
	Friends	22.54
	Single and other	5.25

*only for cruise passengers

Table 2 reports average and percentage of cruise passengers and crew members expenditure. The 95% of visitors spend at least 1 euro; in particular, cruise passengers approximately expend 88.62 euro on average and crew members expend 75.71 euro on average. They spend mainly for food and beverage (26.35 euro and 23.50 euro respectively) and clothes (28.62 euro and 25.32 respectively), but should not be underestimated expenses for personal services (10.25 and 8.95 euro respectively). Our results underestimated the expenditure incurred by cruise passengers and crew members described in a previous research of Penco (L. Penco, 2013).

Table 2

Cruise passengers and crew members expenditure

	Mean Passengers	Mean Crew M.	% Passengers	% Crew M.
Food and beverage	26.35	23.50	29.73	31.45
Handicraft	5.25	3.00	5.92	4.02
Clothes	28.62	25.32	32.30	33.89
Personal services	10.25	8.95	11.57	11.98
Public transport	5.60	1.30	6.32	1.74
Pharmaceutical	4.20	3.60	4.74	4.82
Other	8.35	9.04	9.42	12.10
Total	88.62	74.71	100.00	100.00

The mean scores and standard deviation of tourists' (cruise passengers and crew members) satisfactions on each of the 7 attributes were reported in table 3. The mean score is medium-high for overall rating of Messina city, in particular the very high score is observed in food and beverage and in the medium range for shop, kindness of local people and historical and cultural heritage, and low scores are observed for public transport and general organization.

A comparison of tourists satisfaction levels and cruise member satisfaction levels using t test for independent samples indicated that there are not a statistically differences significant (all p-value > 0.05).

Table 3

Mean and Standard Deviation of Cruise passengers and crew members satisfaction

	Passengers		Crew members		p-value
	Mean	SD	Mean	SD	
Food and beverage	4.585	0.104	4.604	0.037	0.184
Public transport	3.599	0.012	3.603	0.010	0.338
Shops	3.974	0.013	3.981	0.025	0.211
General Organization	3.651	0.701	3.810	0.322	0.208
Kindness of local people	4.053	0.119	4.092	0.175	0.063
Historical and cultural heritage	4.312	0.75	4.49	0.63	0.247
Overall rating of Messina city	4.101	0.187	4.062	0.106	0.073

4. THE EMPIRICAL MODEL

In this paper we assess the effect of the determinants of visitor expenditures by applying both linear model and concomitant finite mixture model. A general linear model can be written in matrix notation as:

$$Y = X\beta + \varepsilon$$

where $Y = (Y_1, Y_2, \dots, Y_n)'$ is a column vector of observations, $\varepsilon = (\varepsilon_1, \varepsilon_2, \dots, \varepsilon_n)'$ the error column vector, we assume that $\varepsilon \sim N(0, \sigma^2)$, $\beta = (\beta_0, \beta_1, \beta_2, \dots, \beta_p)'$ is the column vector of parameters, and X , called design matrix, is the $j \times p$ matrix of independent variables (with a column of 1 in the first column for the intercept).

The log of the distribution was performed in order to alleviate the potential heteroskedasticity and to normalize a distribution. The explicative variables included are related to the distinct sets, in particular: socio-demographic characteristics (age, gender, education level, residence, occupation status), trip characteristic (length of visit (in hours) and season of visit (low season or high season, use of public transports) and psychographic characteristics (previous holiday in Messina and recommendation Messina to friends and relatives).

Successively, according the idea that not all tourists have the same opportunity and desire to spend money in a specific place, we have applied a finite mixture model that provides a natural representation of heterogeneity in a finite number latent class (McLachlan e Peel, 2000) and in order to exploit the covariates, we fit a concomitant variable mixture model (Dayton and Macready, 1988). Finite mixture models are a popular technique for modeling unobserved heterogeneity or to approximate general distribution functions in a semi-parametric way. This models suggest that the statistical distribution of the average expenditure carried by tourists, empirically observed on a sample is the mixture of their distributions of two or more distinct groups among them but mixed in proportions unknowns (Kamakura e Russell 1989; Wedel e Desarbo, 2000). With this approach it is possible to identify homogeneous subsets of tourists on the basis of the estimated relationship between a dependent variable and a set of explanatory variables (socio-demographic characteristics, trip characteristics and psychographic characteristics).

The mixture is assumed to consist of K components where each component follows a parametric distribution. Each component has a weight assigned which indicates the a priori probability for an observa-

tion to come from this component and the mixture distribution is given by the weighted sum over the k components. If the weights depend on further variables, these are referred to as concomitant variables. In a concomitant variable mixture model the component probabilities of the finite mixture vary across subjects according to a vector of covariates (usually including a constant for the intercept). The mixture model is given by:

$$H(y|x, \omega, \Theta) = \sum_{i=1}^K \pi_i(\omega, \alpha) f_i(y|x, \omega, \Theta_i) \tag{1}$$

where:

- f_i – the component specific density function,
- y – the dependent variable,
- x – the vector of independent variables (predictor),
- $\omega(\alpha)$ – the concomitant variables and their parameters (α),
- Θ_i – the component specific parameter vector for the density function f_i ,
- Θ – the vector of all parameters for the mixture density function $f()$, $\Theta = (\pi_i, \alpha_i, \Theta_i)$,
- $\pi_i = p(\Theta_i)$ – the mixing weight of group Θ_i , $i=1, \dots, K$, with $\sum_{i=1}^K \pi_i(\omega, \alpha) = 1$ and $\pi_i(\omega, \alpha) > 0$ for any subject i .

Probability $\pi_i(\omega, \alpha)$ is usually modeled by a multinomial logistic distribution with the first component as baseline, that is:

$$\pi_i(\omega, \alpha) = \frac{\exp(\omega' \alpha_i)}{\sum_{u=1}^K \exp(\omega' \alpha_u)}, \quad i = 1, \dots, K \text{ and with } \alpha_1 = 0 \text{ for model identifiability} \tag{2}$$

The parameters of the mixture model are usually estimated by maximum likelihood using the Expectation-Maximization (EM) algorithm (Dempster et al, 1977, McLachlan and Peel, 2000). The EM algorithm has the advantage of providing a general framework for estimating different kinds mixture models as often only the M-step has to be modified if different component specific models are used. In addition, already available tools for weighted maximum likelihood estimation can be applied.

Fit indices such as the log-likelihood (logLik), the Integrated Complete Likelihood (ICL; Biernacki et al. 2000), the Bayesian Information Criterion (BIC) and the Consistent Akaike Information Criterion (CAIC; the lowest score being the best solution of the appropriate number of segments) are used to determine the number of groups. They are of the form twice the negative loglikelihood plus number of parameters times k where k = 2 for the AIC and k equals the logarithm of the number of observations for the BIC. The ICL is the same as the BIC except that the complete likelihood (where the missing class memberships are replaced by the assignments induced by the maximum a-posteriori probabilities) instead of the likelihood is used.

5. RESULTS

5.1. Linear regression model

Preliminary, according to literature, a regression model in which the depend variable was total visitors' expenditure and the covariates were all the other considered variables was estimated in order to verify the possible relationship between expenditure and characteristic and satisfaction of visitors.

Table 4 presents the results of the estimation of general linear model to total expenditure of visitors (passengers and crew members). We considered all visitors together because there are not differences between two typology for expenditure and for general satisfaction. Each estimated effect must be considered as the expected response to a change in a given determinant of visitor expenditures in Messina. It is important recalling that as most covariates are binary variables and the coefficients must be interpreted as the differential effect with respect to that associated with the reference case.

Table 4

General linear model for total expenditure

	Parameters	p-value
Socio-economic characteristics		
<i>Gender (ref. man)</i>	-0.009	0.121
<i>Age</i>	0.001	0.252
<i>Occupation status (ref employed)</i>		
Unemployed	-0.081	0.002
Retired	0.061	0.001
Student	-0.110	0.000
<i>Nationality (ref Italy)</i>		
Europe	0.061	0.002
USA and Canada	0.101	0.000
Other countries	-0.032	0.052
Trip characteristics		
<i>Length of visit (in hours)</i>	0.078	0.049
Season (ref low)	-0.095	0.004
Psychographic characteristics		
<i>Previous holiday in Messina (ref never)</i>	0.051	0.000
Recommendation Messina (ref No)	0.078	0.059
<i>General satisfaction (ref 1)</i>		
2	0.002	0.061
3	0.045	0.041
4	0.035	0.001
5	0.145	0.001
Constant	4.743	0.009
R ²	0.719	

The R² value (0.719) shows high explanatory power of our model. Our results confirm previous evidence on socio-economic characteristics, gender and education level are not found to significantly influence holiday expenditure (Marrocu et al 2015, Wang et al 2006), and as for age, we find a small positive effect; in particular it possible to show that older visitors spend more than younger ones. Focusing on the occupation status, we find that unemployed and the students spend less than employed tourists. Unemployed visitors tend to spend 8% less on average, while students spend 10% less with respect to employed tourist. On the contrary, retired people tend to spend more than people still employed. Foreign tourists, in particular tourists from USA and Canada, have a significantly higher level of expenditure with respect to Italian tourists.

Focusing on trip characteristic our findings show that the visitor who pass more hours in the city spend more money, and that tourists taking their holidays during the high season period (mainly July and August)

tend to expend less. A possible explanation is that in this months in the shops there are the summer sale or that during the high season period tourists tend to compensate the travel expenditure (in July and August cruise prices increase) with the expenditures for shopping.

Observing the results on the psychographic characteristics, it's possible to show that visitors with previous holiday in Messina spend 5% more than to first time ones. This result, in line with some previous evidence (Rosenbaum and Spears, 2005, Marrocu et al 2015), may be due to the fact that returning tourists are likely to have spent satisfactory holidays in the past and therefore are more inclined to spend more money.

Finally focusing the attention on satisfaction levels, we find that more satisfied visitors tend to spend more respect to unsatisfied ones, supporting the idea that higher satisfaction levels result in significant increases of expenditure.

5.2. Concomitant mixture model

The concomitant variable finite mixture model (1) is fitted to a response variable y_i defined as the logarithm of total expenditure of visitors during the visit at Messina. In this study, the logarithm of total expenditure of visitors during the visit at Messina by concomitant variable finite mixture model (1) is modeled in order to individualize the possible factors influencing expenditure in visitors (cruise passengers and crew members) with different satisfaction levels (concomitant variables). This choice is due the awareness that higher satisfaction levels result in significant increases of expenditure and, which in turn, may depend on different covariates, within each subgroup. The mixture regression models represent the methodologically adequate solution, because it allows us to study if the visitors expenditure depends on various factors in visitors with different satisfaction levels (concomitant variables).

In this paper, conditionally on the latent class, we assume that y_i follows a Gaussian distribution with mean $\mu_s(x) = x'\beta^s$ and variance σ_s^2 . The marginal distribution of y_i is given by (1) with the multinomial logit model (2) for the component probabilities π_i , In order to choose the number K of latent classes, we first fit the model without covariates. Once the number of latent classes have been chose, the covariate are selected using the standard Wald test. The number of components K of our model is selected according AIC, BIC, logLik, and ICL. The results are reported in table 5; the four criteria agree in selecting a model with $K=3$.

Table 5

Selection of the number of components K in the concomitant Gaussian mixture model

<i>K</i>	<i>logLik</i>	<i>AIC</i>	<i>BIC</i>	<i>ICL</i>
2	-168.684	356.396	335.684	353.842
3	-164.654	329.337	331.702	342.166
4	-173.570	337.168	347.887	373.897
5	-175.569	359.321	348.654	384.326

The following step is to identify regressors by using the BIC again from the our three component finite mixture model identified above. Different Gaussian mixture models with three components are fitted: a model with all covariates ignoring the group (level of satisfaction), a model with all covariates considering the group (level of satisfaction) as concomitant variables, different models with only few covariates and the groups as concomitant.

The BIC value is used for models comparison and we preferred the model with BIC smaller. The final model is a concomitant Gaussian mixture model including the constant and five covariates: nationality (in this model we considered the nationality as binary variable where 0 is Italian and 1 is non Italian), length of visit, season, previous holiday in Messina, recommendation to Messina.

Table 6 shows the parameter estimates, the standard error, z value and *p*-values. It is important emphasize that the three components are very well separated and that the first subpopulation is composed mainly by visitors with high levels of general satisfaction, the second subgroup is mainly constituted by visitors with medium-high levels, finally the third component is formed by visitors with low satisfaction levels.

Table 6

Gaussian mixture model with concomitant variables

Component 1	Estimate	Std. Error	z value	Pr(> z)
Constant	0.147	0.096	-1.527	0.127
Nationality	0.164	0.076	2.141	0.031
Length of visit (in hours)	1.320	0.233	5.650	0.000
Season (ref low)	-0.005	0.003	-0.747	0.451
Previous holiday in Messina (ref no)	0.077	0.041	1.901	0.058
Recommendation Messina (ref no)	0.027	0.029	8.335	0.000
Component 2	Estimate	Std. Error	Z value	Pr(> z)
Constant	0.141	0.962	-0.146	0.882
Nationality (<i>ref. Italy</i>)	1.072	0.141	7.557	0.000
Length of visit (in hours)	-0.070	0.117	-0.599	0.549
Season (ref low)	-2.362	1.591	-1.484	0.138
Previous holiday in Messina (ref no)	1.072	0.141	7.557	0.000
Recommendation Messina (ref no)	-0.187	0.116	-1.677	0.117
Component 3	Estimate	Std. Error	z value	Pr(> z)
Constant	0.149	0.099	-1.557	0.122
Nationality	2.302	1.691	-1.564	0.135
Length of visit (in hours)	1.320	0.233	5.650	0.000
Season (ref low)	0.027	0.029	8.335	0.000
Previous holiday in Messina (ref no)	2.844	0.259	10.983	0.000
Recommendation Messina (ref no)	0.077	0.041	1.901	0.058

6. CONCLUSIONS

In this paper we proposed to estimate expenditure distribution by general linear model and by concomitant Gaussian mixture model.

Our analysis was based on sample 5.500 of cruise ship passengers and crew members face to face interviews conducted in spring – summer 2014. The case study was Messina, a Mediterranean port of call in the island of Sicily (Italy). Empirically a general linear model has been run to investigate what socio-demographic, trip-related and psychographic characteristics may have potential effect (influence) on cruise tourists expenditure in Messina. Successively, a concomitant Gaussian mixture model was used for the analysis

of heterogeneous populations, such as visitors and tourists, in order to explain part of heterogeneity with known explanatory variables. In this contest the applications of standard statistical models, such as linear regression, model the population average, which is the mean response of all individuals, without considering the existence of possible subpopulations.

A descriptive framework it is possible note that the 95% of visitors interviewed has spent at least 1 euro, and an economic benefit that should not be overlooked is the value of return visitation and word of mouth recommendations. The survey data indicated that the 78% of visitors has the high likelihood of recommending Messina visited to family and friends.

According previous evidence our results confirmed the role played by foreign nationality on cruise visitors expenditure; occupational status (students and unemployed spend less to retired and employed), duration and period of visit (the visitors who pass more hours in Messina and visit the city in high season period spend more money). Moreover the visitors with previous holiday in Messina spend more than first time ones; and the cruise ship visitors more satisfied spend more respect to unsatisfied ones. Finally, our concomitant Gaussian mixture model showed indeed that the three components of our model are well separated, so that we can affirm that the total expenditure is significantly different according to different satisfaction levels. In particular our model showed that the expenditure is influenced by different factors in the subgroups of cruise ship visitors. In the first subpopulation, that is composed mainly by visitors with high levels of general satisfaction, the nationality, the length of visit and recommendation Messina have a significant influence on total expenditure; the second subgroup, composed mostly by visitors with medium-high levels, only nationality and previous holiday in Messina are statistically significant, finally the third component, composed by visitors with low satisfaction levels; length of visit, season period and previous holiday in Messina have significant influence on total expenditure in Messina.

In conclusion, this research suggests several characteristics of the cruise ship experience that should be considered when examining this visitor market. The our survey uncovered a array of perceptions around the behavior and economic impacts of different visitor types and the factors that influence the economic benefits these visitors generate. These results should have some obvious implications for those developing travel services directed at specific activity groups and for businesses engaging with, and hosting, cruise ships in any port.

ANNOTATION

This article was conceived and prepared by both authors, however Romana Gargano is the author of paragraphs 2, 3, 4 and 5, Filippo Grasso wrote paragraphs 1 and 6.

REFERENCES

- Abbruzzo, A., Brida, J.G., Scuderi, R., (2014), Determinants of individual tourist expenditure as a network: Empirical findings from Uruguay, *Tourism Management* Vol. 43, pp. 36-45.
- Biernacki, C., Celeux, G., Govaert, G., (2000), Assessing a Mixture Model for Clustering with the Integrated Completed Likelihood. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 22, no. 7, pp. 719-725.
- Brida, J.G., Bukstein, D., Garrido, N., Tealde, E., (2012), Cruise passengers' expenditure in the Caribbean port of call of Cartagena de Indias: A cross-section data analysis, *Tourism Economics*, Vol. 18, no. 2, pp. 431-447.
- Brida, J.G., Rizzo, W.A., (2010), Cruise passengers expenditure analysis and probability of repeat visits to Costa Rica: a cross-section data analysis. *Tourism Analysis* Vol. 15, no. 4, pp. 425-434.

- Brida, J. G., Scuderi, R., Seijas, M.N., (2014), Segmenting Cruise Passengers Visiting Uruguay: a Factor–Cluster Analysis, *International Journal of Tourism Research*, Vol. 16, pp. 209–222.
- Brida, J.G., Zapata Aguirre, S., (2010), Cruise tourism: Economic, socio-cultural and environmental impacts. *International Journal of Leisure and Tourism Marketing*, Vol. 1, no. 3, pp. 205-226.
- Chen, C. M., Chang, K. L., (2012), The influence of travel agents on travel expenditures. *Annals of Tourism Research*, Vol. 39 no. 2, pp. 1258-1263.
- Craggs, R., Schofield, P., (2009), Expenditure-based segmentation and visitor profiling at the Quays in Salford, UK. *Tourism Economics*, Vol. 15, no. 1, pp. 243-260.
- Dayton, C.M., Macready, G.B., (1988), Concomitant-Variable Latent-Class Models, *Journal of the American Statistical Association*, Vol. 83, no. 401, pp. 173-178.
- Dempster, A.P., Laird, N.M., Rubin, D.B., (1977), Maximum Likelihood from Incomplete Data Via the EM-Algorithm, *Journal of the Royal Statistical Society B*, Vol. 39, pp. 1-38.
- Dwyer, L., Forsyth, P., (1998), Economic significance of cruise tourism, *Annals of Tourism Research*, Vol. 25, no. 2, pp. 393–415.
- Gargano, R., Avena, G., Mondello, M., (2012), Cruise tourism in Messina: A study on the perception of services. *Rivista Italiana di Economia Demografia e Statistica*, Vol. LXVI, no. 3/4, pp. 119-126.
- Henthorne, T.L., (2000), An analysis. of expenditures by cruise ship passengers in Jamaica. *Journal of Travel Research*, Vol. 38, pp. 246-250.
- Hung, W. T., Shang, J. K., Wang, F. C., (2012), Another look at the determinants of tourism expenditure, *Annals of Tourism Research*, Vol. 39, no. 1, pp. 495-498.
- Kamakura, W. A., Russell, G. J., (1989). A Probabilistic Choice Model for Market Segmentation and Elasticity Structure, *Journal of Marketing*, Vol. 26, pp. 379-390.
- Kester, J.G.C., (2003), *Cruise tourism*, *Tourism Economics*, Vol. 9, no. 3, pp. 337–350.
- Marcussen, C. H., (2011), Determinants of spending by Danish travellers. *Anatolia*, Vol. 22 no. 1, pp. 47-55.
- Marrocu, E., Paci, R., Zara, A., (2015), Micro-economic determinants of tourist expenditure: A quantile regression approach, *Tourism and Management* Vol. 50, pp. 13-30.
- McLachlan G., Peel D., 2000. *Finite Mixture Model*. Wiley, New York
- Wang, Y., Rompf, P., Severt, D., Peerapatdit, N. (2006), Examining and identifying the determinants of travel expenditure patterns, *International Journal of Tourism Research*, Vol. 8, no. 5, pp. 333-346.
- Penco L., Il business crocieristico. Imprese, strategie, territorio, Franco Angeli, Milano, 2013
- Rosenbaum, M. S., Spears, D. L., (2005), Who buys that? Who does what? Analysis of cross-cultural consumption behaviours among tourists in Hawaii. *Journal of Vacation Marketing*, Vol. 11, no. 3, pp. 235-247.
- Wedel, M. E. Desarbo W. 2000. A Review of Recent Developments in Latent Class Regression Models. In BAGOZZI P. RICHARD (eds). *Advanced Methods Of Marketing Research*, Cambridge, UK: Blackwell, pp. 352-388.