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Impact of incentives on tourist activity in space-time

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ABSTRACT

No tourism study to date, has examined the ability of incentives to shape the spatio-temporal behaviour of tourists. Data collected from the port of Palermo in Sicily (Italy), using traditional survey instruments as well as GPS technology, was employed to investigate the effect of incentives on cruise passengers' space-time activities. The results show the incentives' clear and significant impact in influencing the space-time activities of cruise passengers' while visiting the city. Understanding the movement patterns of visitors at destinations can give destination managers information that can assist in dealing with the negative effects of overtourism that are caused due to high concentrations of visitors in both space and time in relatively small and well-defined sites and areas.

Introduction

Historical cities have attracted so much tourism that their physical and social carrying capacities are in jeopardy (Ashworth & Tunbridge, 2000; Canestrelli & Costa, 1991; Page & Hall, 2003; Russo, 2001; van der Borg, Costa, & Gotti, 1996). While also serving as ports for the rapidly growing cruise industry (Cruise Line International Association, 2019), historic cities can be said to be in a state of volatility due to the increase in number of ships docking in the ports. This invariably leads to a high concentration of visitors from the ships in space and time in relatively small and well-defined sites and areas (De Cantis, Ferrante, Kahani, & Shoval, 2016). With ships' growing capacity and the limited number of cruise ports suitable for tourism consumption (Wang, Jung, Yeo, & Chou, 2014), cruise itineraries focus on a limited list of places that are of interest and significance to passengers. Locations in the Mediterranean that fall into this category include: Venice, Dubrovnik, Palermo, and Barcelona. These cities and ports, then, confront a challenge in terms of their carrying capacity of visitors. In recent years, the impact of tourists on large cities has faced a similar challenge; as a result, overtourism has become one of the most commonly deliberated issues in tourism in the popular media and, increasingly, in academia (Koens, Postma, & Papp, 2018).

This paper will demonstrate that Global Positioning Systems GPS technology can be an effective tool for measuring the impact of interventions – in the form of incentives – in order to modify visitors' space-time activities in a given destination. No tourism study to date, to our knowledge, has directly examined the ability of such interventions to shape the spatio-temporal behaviour or spatial choice of tourists via the use of incentives.

As one of the top twenty ports – measured in total number of cruise ship passengers – in the Mediterranean Sea (MedCruise, 2018), Palermo was selected as the case study for this paper. The mobility of cruise passengers in the city and its surroundings was

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carefully studied using high-resolution tracking data collected with GPS devices. Furthermore, the integration of data collected through GPS tracking with data derived from more traditional questionnaire-based surveys served to demonstrate the impact of the incentives on cruise passengers' behaviour in an urban destination.

Literature review

While the cruise sector has shown significant growth and impact on ports and cities, some maintain (Brida & Zapata-Aguirre, 2010; Papathanassis & Beckmann, 2011; Rodrigue & Notteboom, 2013; Wood, 2000) that more research – both theoretical and applied – must be conducted in the field. Although research on the topic has grown in recent years, studies analysing cruise passengers' activities at a port of call are harder to find (Brida, Pulina, Riaño, & Zapata-Aguirre, 2013, p.70), and only a small number of them take into account passengers' space-time behaviour at their destinations (De Cantis et al., 2016; Domènech, Gutiérrez, & Anton Clavé, 2019; Jaakson, 2004. Recently Hung, Wang, Guillet, and Liu (2019) summarized the most up-to-date knowledge in this field and verified the notion that only few studies deal with the space-time behaviour of cruise passengers at ports of call.

Impact of incentives on tourists' space-time activities

Research on incentives' effects on the spatial patterns of tourist activity in tourism scholarship and related fields is scant. Below we outline the existing research on incentives' impact on the spatio-temporal patterns of human behaviour in the fields of tourism and transportation. This is currently the area which has attracted the greatest attention; it will thus be used as a benchmark of knowledge regarding the impact of incentives on modifying the space-time activity of human agents.

Using incentives to change behavioural patterns relating to transportation

The use of incentives in the field of transportation research can be roughly divided into four sub-domains: incentives' ability to divert traffic from peak hours (‘peak avoidance’); incentives' capability to induce modal change (usually aimed at promoting public transport or green modes of transportation – cycling, walking, etc.); parking availability (this can be regarded as an incentive) and its effect on transportation patterns; and promoting ridesharing/carpooling through incentives. Studies in these fields have focused primarily on the stimulus/response effect, not generally offering broader theoretical implications regarding the impact which incentives can have in modifying space-time patterns.

Using incentives to divert traffic during peak hours (peak avoidance)

A series of publications details incentives' effects on commuting patterns in the Spitsmidjen (peak avoidance) project in the Netherlands. Ben-Elia and Ettema (2009, 2011), and Ettema, Knockaert, and Verhoef (2010) found that economic incentives were successful in changing commuting patterns by encouraging drivers to avoid commuting to and from work during peak hours (50–60% decrease). Their findings demonstrated that incentives can induce short-term modifications in commuter behaviour; however, once the incentive was discontinued, drivers returned to their former activity patterns. This finding supports the claims of some motivational theories: although the stimulus positively impacts behaviour, without altering intrinsic motivation, the external incentive's effect is short-lasting.

The most comprehensive study to date in the field of tourist activity in space and time is that of Bleimer, Dicke-Ogenia, and Ettema (2009), who examined the use of incentives in four highway sections in the Netherlands between 2006 and 2009. This study revealed that incentives can potentially influence a number of measures: making the commute onset time earlier or later, modifying the route travelled, modal change, and trip cancellation.

Zhang, Fujii, and Managi (2014) studied the impacts of incentives on subway commuters in Beijing, demonstrating that incentives (in this case, fast food and a discounted train ticket) led to a decline in participant subway commuting during peak hours. Their findings point to several factors which inhibit the impact of incentives: (1) people with inflexible work schedules tended to be less influenced by incentives and (2) age had a negative effect on the stimulus's impact. In contrast, higher levels of education were generally associated with a greater willingness to modify commuting behaviour in response to an incentive. The study by Zhang et al. (2014) confirmed a preference for non-monetary incentives (a finding which the researchers attributed initially to the low price of subway tickets in Beijing). A similar study by Holguín-Veras and Aros-Vera (2014) examined how incentives affected the readiness of messengers and truck drivers to postpone out-of-hours deliveries.

Using incentives to modify mode of transportation

Transportation research has also focused on the ability of incentives to encouraging the transition from private car use to alternative modes of transportation. These studies do not directly address the relationship between incentives and spatio-temporal activity; nonetheless, a shift in modal choice induces a change in an individual's interaction with their environment, in turn impacting space-time behaviour.

Jakobsson, Fujii, and Garling (2002) examined the impact of negative incentives (fines) on private vehicle use when compared to alternative modes of transportation. This study found that imposing fines reduced car travel. Fujii and Kitamura (2003) explored the effects of a free (to user) monthly bus pass on consumers' patterns of use and perceptions of public transport. In addition to improving the image of public transportation, the study demonstrated, consumers reduced the use of private cars and increased their use of public buses. The study's hypothesis stemmed from a theoretical foundation that asserted that (some) trip decisions are ‘automatic’, originating from habit or a mental or automatic thought pattern (for more on this see Eriksson, Garvill, & Nordlund, 2008; Gärling &

Axhausen, 2003).

The impact of the availability of parking on transportation patterns

Parking can be seen as an incentive, encouraging the transition from private car use to alternative modes of transportation; it can be provided or withheld, and its availability has economic value. Donald Shoup's (2005) groundbreaking research into the effects of available parking on transportation patterns has framed this issue as a centrepiece to be taken into consideration in contemporary urban planning. Although Shoup's study did not address the direct consequences of available parking on spatio-temporal patterns, it can be easily inferred that it affects an individual's interaction with his or her environment, thereby impacting space-time behaviour. As expounded in his famous book *The High Cost of Free Parking* (Shoup, 2005), Shoup explains his thinking regarding the negative effects of free parking: driving around looking for a parking place can waste time and cause traffic jams and the cost of land and housing can increase, as can related service costs, to mention just a few of the many examples addressed by Shoup in subsequent publications (Shoup, 2006; Willson & Shoup, 1990). Referring to spatial choice, Shoup claims that an excess supply of free parking spaces distorts the spatial decision-making process; free parking reduces the real price of a journey, which in turn generates a selection bias towards places which supply this incentive.

Using incentives to encourage carpooling/trip-sharing

Research in the domain of carpooling/trip-sharing has primarily focused on identifying factors which influence carpooling; it has only addressed the use of incentives to encourage such behaviour indirectly. The two central studies in this sub-field were conducted by Brownstone and Golob (1992) and Ben-Akiva and Atherton (1977). These explain the factors affecting carpooling by making use of multiple-regression models. Brownstone and Golob (1992) demonstrated that designated parking spaces, carpool lanes, and availability lanes encouraged the public to favour carpooling. A comprehensive analysis of policy measures stimulating trip-sharing by Ben-Akiva and Atherton (1977) indicated the desirability of designated lanes and parking spaces, in addition to increasing fuel prices and supplying employers with economic incentives (matching & promotion) with which to encourage employees to engage in carpooling practices.

Incentives and spatio-temporal behaviour in tourism research

No tourism study to date, to our knowledge, has directly examined incentives' ability to modify tourists' spatio-temporal behaviour or spatial choice. Various tourism studies have focused on *destination choice behaviour*, an interdisciplinary theoretical domain linking tourism, transportation, psychology, and economics (Wang & Miller, 2014).

A relatively large body of literature examines the effects of place-image on tourist destination choice. This literature stems from basic theoretical concepts of marketing and branding, where the buyer's product-image is manipulated to encourage consumption. Several studies have shown how a positive place-image can impact perceptions of a tourist destination as well as the ability of an image to airbrush previous perceptions (Baloglu & McCleary, 1999; Beerli & Martin, 2004; Buhalis, 2000; Gallarza, Saura, & García, 2002; Gartner, 1994; Tapachai & Waryszak, 2000).

Scholars have also examined the factors broadly influencing the decision-making processes of tourists: the latter range from an initial decision to travel to everyday choices made during a stay. Major studies in this sub-domain include those by: Chon (1990); Mansfeld (1992); Um and Crompton (1990); Wong and Yeh (2009); and Gilbert and Cooper (1991). These studies offer a broad theoretical framework, pointing towards motivational influences on decision-making.

A general area of study, which is more closely related to spatial choice/behaviour, is that of destination choice behaviour, which focuses on factors influencing a consumer's destination selection. The impact of incentives on destination choice behaviour has yet to be extensively studied by researchers but its theoretical implications should be seen as elemental when studying the impact of incentives on spatio-temporal behaviour. Koppelman and Hauser (1978) were among the first to examine the variables affecting destination choice behaviour. One of their articles describes their 'Logit Choice Theory' model, which incorporates layers of perceptions and an individual's preferences. According to Koppelman & Hauser, a lack of awareness regarding all the alternatives to a destination choice (or the variables affecting them) renders the destination selection process a probabilistic one.

Wang and Miller (2014) drew inspiration from Hägerstrand's (1970) time geography in proposing a model in which the destination choice is a process involving time constraints – the consumer's time prism dictates the destination choice. The article does not refer directly to the ability of incentives to modify spatial choice, although time constraints can be seen as a negative incentive limiting choice.

Huang (2013) wrote a thesis on the spatial choices and preferences of consumers in which destination choice behaviour in a GPS paradigm was examined. This study also contains an extensive review of the literature, including models of destination choice behaviour and the use of GPS for examining transportation choices. An example of such a study, using GPS to analyse destination choice behaviour, is that of Kawaski and Axhausen (2009). As previously mentioned, it does not deal with the impact of incentives but does highlight gaps between research methodologies examining destination choice behaviour, comparing questionnaires to the use of GPS.

Using tracking technologies for data collection

Today's GPS technologies offer formidable surveying tools, facilitating the collection of high-precision data on human mobility in space and time; moreover, they do so economically. GPS data accurately records the temporal and spatial behaviours that result from

visitors' choices during their visit – attractions visited and the duration of the visit at a given attraction. Such research provides impartial information, unbiased by visitors' assessments of activities at the destination (Hallo, Manning, Valliere, & Budruk, 2005). The use of GPS data bypasses the typical limitations of data collection: the fact that visitors are not always aware of their own movements and often do not have a precise recollection of the attractions visited and the duration of a visit. These limitations were demonstrated by Asensio, Garcia, and Pol (1993), who, using questionnaire data and direct observations, reported that more than 50% of the tourists visiting an exhibition in the Velazquez Palace (Spain) stated that they remained for considerably longer than recorded by researchers. Furthermore, data collected using GPS can enhance information recorded in diaries (Wolf, Guensler, & Bachman, 2001).

Recent years have seen increased use of GPS technology to study tourist mobility in small historic cities (Modsching, 2008; Shoval, 2008; Tchetchik, Fleischer, & Shoval, 2009; van der Spek, 2008); confined attractions (like theme parks and zoos; Russo, Clave, & Shoval, 2010; Pettersson & Zillinger, 2011); nature parks (Arrowsmith & Chhetri, 2003; Harder, Bro, Tradisauskas, Alexander, & Nielsen, 2008; Hallo et al., 2012; Beeco et al., 2013; Beeco, Hallo, & Brownlee, 2014; Kidd et al., 2015); and small islands (Nielsen, 2010; Xia, Zeephongsekul, & Arrowsmith, 2009). Each location has clearly defined points of entry and exit, facilitating the researchers' selection of participants and the modelling of movement. In contrast, the study of complex, large, and multifunctional urban settings using GPS has been conducted successfully only in a limited number of cases, such as the studies of Rome (Calabrese & Ratti, 2006) and Hong Kong (McKercher, Shoval, Ng, & Birenboim, 2012; Shoval, McKercher, Ng, & Birenboim, 2011). Lately, the objective emotions of tourists in specific locations have been captured in real time using physiological sensors (Shoval, Schvimer, & Tamir, 2018). However, few studies have used GPS to examine the behaviour of cruise ship passengers at their destinations (De Cantis et al., 2016; Domènech et al., 2019; Ferrante, De Cantis, & Shoval, 2018; Paananen & Minoia, 2018).

Secluded space and controlled settings on cruise vessels (in terms of both places and people), it is acknowledged, constitute near-ideal laboratory conditions for social researchers (Papathanassis & Beckmann, 2011, p. 154). Indeed, these conditions are in evidence when studying cruise passengers' activities at their destination. This is due to the fact that a lone entry and exit point to and from a given destination means that it is possible to generate an accurate sampling scheme and detailed data collection relating to the entirety of the experience.

Setting

Palermo, Sicily – with its central location in the Mediterranean Sea, its heritage, and its port's proximity to the city centre – has become a strategic destination for many cruise operators in the Mediterranean. Despite the fact that Palermo's status as a cruise destination is a fairly recent development, it has quickly become a homeport for two cruise companies (Costa Crociere and MSC), and serves as a port of call for many others (Royal Caribbean, Holland American Line, and Norwegian Cruise Line, among others). Palermo has seen a marked increase in cruise ships docking at its port over the last decade. The year 2011 was a peak year; the so-called Arab Spring meant that many cruise companies modified their itineraries, trading in North African ports of call for more secure places like Palermo. In 2017, Palermo welcomed approximately 155 cruise ships, with more than 450,000 cruise passengers (MedCruise, 2018).

With its cultural attractions and archeological sites – representing more than 2500 years of human settlement – Palermo and its environs offer an all-encompassing experience, detailing the development of Mediterranean cultures from the eighth-century-BC Phoenicians to the Greeks and Romans. *The Godfather*, filmed in 1972, made Sicily famous and infamous around the world, a symbol of the mafia. This cultural reputation stirs apprehension and curiosity in the minds of some tourists, a fact which itself merits further analysis; it is worth examining as a psychological dimension of the tourist experience. Furthermore, the port is less than 400 m from the commercial and city centres, a fact which helps visiting passengers, who take advantage of cruise companies' organized tours. Palermo's environs also boast important tourist destinations: Monreale and its famed cathedral, Agrigento's Valley of the Temples (a UNESCO World Heritage site since 1977), and Cefalù, one of Sicily's most significant international tourist destinations (Parroco, Vaccina, De Cantis, & Ferrante, 2012). Fig. 1 maps out Palermo's more important tourist sites.

Data and methods

In order to test the impact of incentives on visitors' behaviour in Palermo, the studies focused on cruise tourists. This decision was made by considering the relatively short visit (less than one day), and the presence of a single entry-exit point. By means of the latter, it was possible to shape a study that integrated traditional questionnaire-based interviews with GPS tracking technology. After a pilot run, which was aimed at testing the survey instrument and related logistics, five days in April 2014 were selected for the survey. At that time, a cruise ship anchored in Palermo's port. The survey concerned two different passenger types: those who purchased one of the tours organized by the cruise company (not described in this work), and those who chose to tour the destination independently. The experiment regarding incentives was conducted only with the latter group, who will henceforth be referred to as *independent cruise passengers*.

Independent passengers were chosen using a stratified random sampling through a pseudo-systematic selection procedure, with strata given by the different survey day/s. The sampling interval was a function of the number of passengers disembarking on each day; typically, it was 1 for every 20 passengers. Each selected passenger filled out one opening questionnaire and one closing one. The former consisted of a few brief questions, aimed at collecting information regarding the passengers' socio-demographic information (e.g., nationality and age group) and other details (such as previous visits to Palermo and group characteristics). All passengers surveyed were given a GPS data logger with which to record data on their space-time behaviour during their trip to Palermo. The

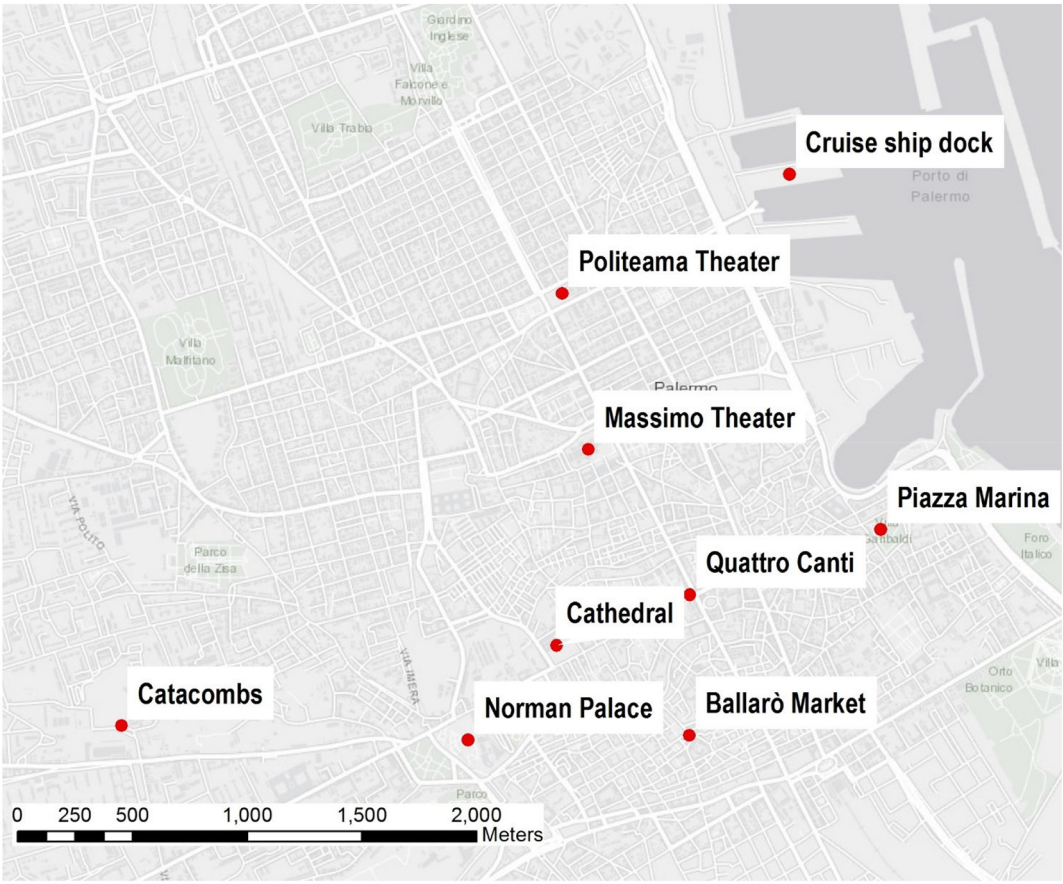

Fig. 1. Main attractions in Palermo in relation to location of the cruise ship moorings.

study was approved by the ethical committee of the University of Palermo, and the participants were informed that all the collected information were anonymous and used only for research purposes. As for the tracking device, Globalsat DG-200 and Mobile Action IgotU data logger devices were used; they collect tracking data from the received GPS signal at very accurate time intervals (that we set at 10 s) and location, with an error margin of about 5–10 m from the actual location. They are small devices (about the third of the size of a regular smartphone) and the participant don't need to perform any type of action, since the loggers are collecting locations in time and space automatically.

The pilot survey indicated that the majority of cruise passengers were directed through the centre of the city from the main road, instead of following a coastal path where other points of interest were located. A subset of independent cruise passengers subsequently received an incentive aimed at modifying their spatio-temporal behaviour. The incentive was a discounted ticked for the Museum of the Holy Inquisition and a €4 gift card for a coffee bar near Lo Steri Palace, both located in Piazza Marina (Fig. 2). Dating from 1603, when Lo Steri Palace was the site of the Holy Inquisition, the museum contains drawings and poems which cover the prison walls. The goal of the incentive was not only to verify if the cruise passengers had visited the suggested location; it was also aimed at measuring differences in spatio-temporal behaviour in Palermo between those who received the incentive and those who did not. Over half of the independent cruise passengers received the incentive; the other half did not.

On concluding their visit and prior to returning to the ship, participants returned the GPS devices and were asked to complete the closing questionnaire. The aim of the latter was to gather data about the tourist sites visited, the level of satisfaction with each site, the general level of satisfaction, and the expenditure pattern at the destination by category. Information relating to the category of annual family income was also requested.

To evaluate the impact of incentives on cruise passengers' space-time behaviour, several techniques have been implemented. Exploratory spatial data analyses have been conducted using 3D spatial charts, proposed by Shoval (2008), in order to demonstrate similarities and differences between those cruise passengers who received an incentive and those who do not. A grid of 200 by 200 m^2 cells was generated, with the number of passengers and average amount of time spent in each cell calculated. In a second step, the number of passengers and the average amount of time spent in the area under study were derived for both the sub-groups under analysis. Having determined a dichotomous variable, assuming a value of 1 if the cruise passenger visited the Piazza Marina area and 0 if not, it was possible to measure the effect of incentive on the visit to Piazza Marina by mean of a Pearson's Chi-square test of independence and corresponding odds ratios (Agresti, 2018). Finally, in order to take into account the effect of other individual

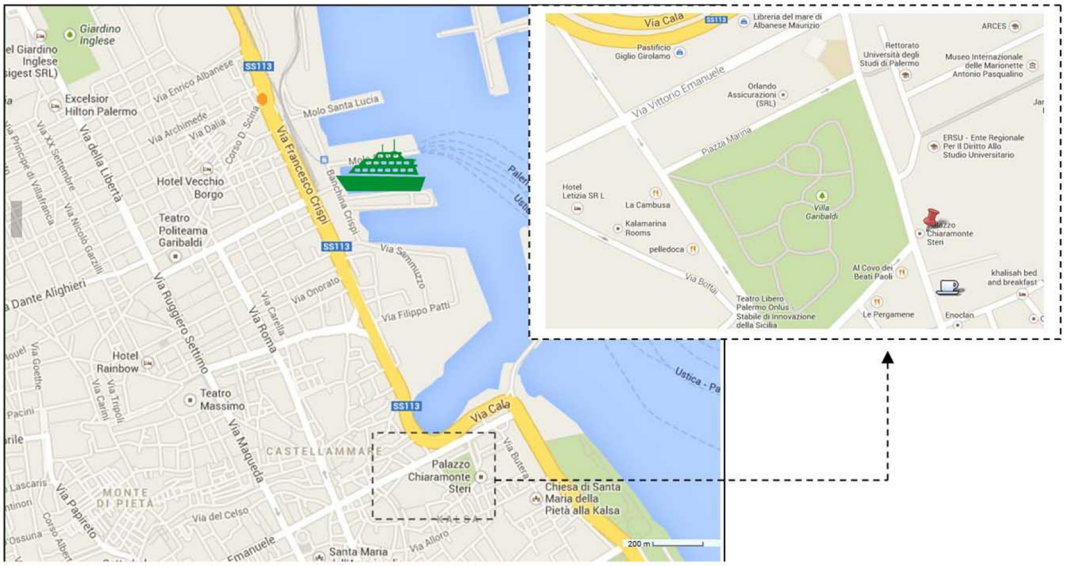

Fig. 2. Location of the area in which incentive can be applied in relation to the location of cruise ship moorings.

characteristics eventually associated with the visit of the study area, a logistic regression model was estimated in which the probability of visiting Piazza Marina was modelled as a function of a set of covariates (Hilbe, 2009) including: having received the incentive or not; age category; education; income; and previous visits to the city.

Results

The experiment took place over a five-day period, during which a total of 234 cruise passengers not participating in a tour arranged by the cruise company (i.e., independent cruise passengers) were interviewed. Of the passengers, 54% received the incentive (n_1 = 127) and 46% (n_2 = 107) did not (control group). There was a notable willingness on the part of the passengers to participate in the survey as well as to receive the incentive. A summary of the main features of the two passenger groups is reported in Table 1.

A rather uniform distribution can be observed in terms of age from the results at an aggregate level. This confirms Marti (1991), which empirically identified a false impression that cruise passengers consist mainly of older retirees. On the other hand, people with a high school diploma or lower comprised 44% of the sample; people holding a Master of Arts or a PhD degree comprised 22%. Approximately 50% of the sample had an annual family income which exceeded €40,000. Of the interviewed passengers, 83% were visiting Palermo for the first time. An analysis of the distribution of cruise passengers according to socio-demographic characteristics

Table 1
Distribution of the two groups, according to socio-demographic characteristics.

Variables	Categories (valid cases)	Incentive		χ^2 test p-value
		No (n = 127) (row %)	Yes (n = 107) (row %)	
Gender	Male (n = 121)	45.5	54.5	0.990
	Female (n = 112)	45.5	54.5	
Age	18–35 (n = 45)	37.8	62.2	0.228
	36–45 (n = 66)	54.5	45.5	
	46–55 (n = 57)	49.1	50. 9	
	56 or above (n = 65)	40.0	60.0	
Educational level	High school or lower (n = 104)	38.5	61.5	0.115
	Bachelor (n = 73)	49.3	50.7	
	Master of Arts or PhD. (n = 53)	54.7	45.3	
Income	Less than 20,000 € (n = 28)	39.3	60.7	0.336
	20,001–40,000 € (n = 53)	47.2	52.8	
	40,001–60,000 € (n = 51)	54.9	45.1	
	More than 60,000 € (n = 64)	39.1	60.9	
Is your first visit to Palermo?	Yes (n = 195)	45.1	54.9	0.681
	No (n = 39)	48.7	51.3	

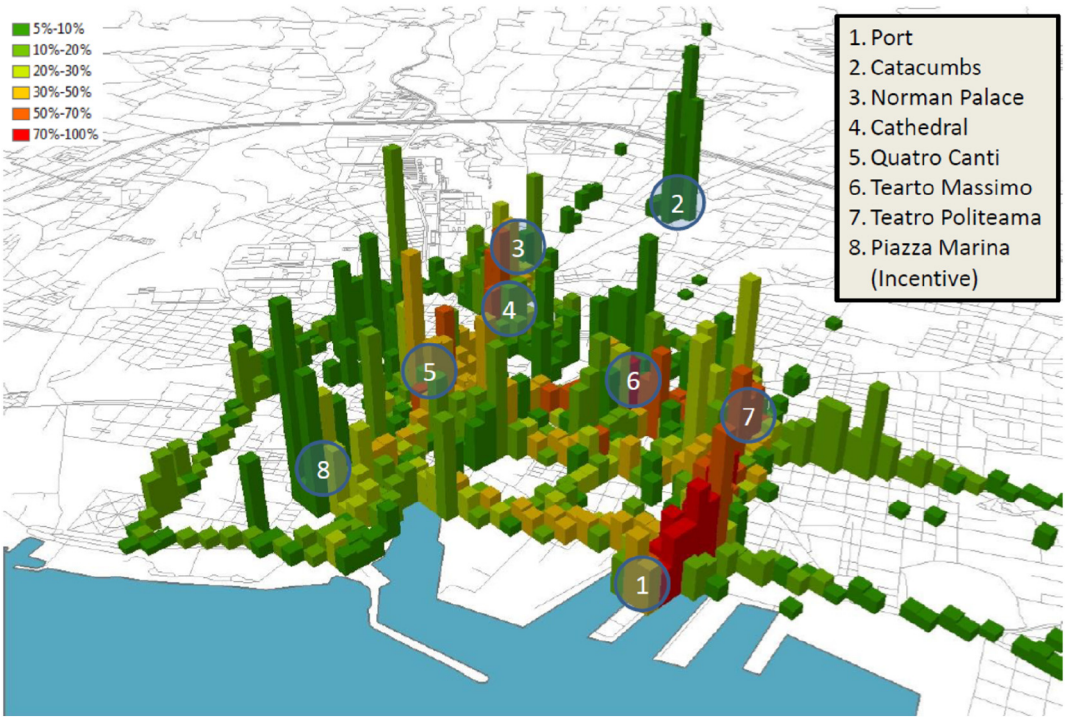

Fig. 3. Spatial pattern of cruise passengers in relation to the place visited and the average time spent.

and the offered incentive revealed no significant differences in terms of gender, age, educational level, income, and previous visits to Palermo.

The impact of the incentive on the visitors' space-time activities

Given the complex nature of spatial data, simplifications were necessary in order to obtain an effective graphical representation. Fig. 3 shows the spatial behaviour of the 234 cruise passengers in the centre of Palermo; each cell's colour relates to the number of cruise passengers passing through it. The columns' height is proportional to the average amount of time spent in each cell.

The location of all the passengers near the port was unsurprising. A systematic component in the cruise passengers' movements was found: more than 50% of participants were located in the port area, the Politeama Theatre (attraction no. 6), the Massimo Theatre (attraction no. 5), Piazza Pretoria (attraction no. 4), and the cathedral (attraction no. 3). The Norman Palace (attraction no. 7) and Piazza Marina (attraction no. 2) displayed the highest values, representing the greatest amount of time spent at these attractions.

However, if the two groups' activity patterns are analysed separately, several differences in their spatio-temporal behaviour are revealed. Figs. 4a and 4b show the activity patterns of cruise passengers who did not receive the incentive and those who did, respectively. An analysis of these figures highlights different activity patterns: despite the majority of attractions visited being very similar for the two groups, a much higher share of cruise passengers with the incentive visited Piazza Marina (attraction no. 8), including the highest average time spent in this area, relative to the control group.

In order to quantify the impact of the incentive on those visiting the Piazza Marina area, the analysis computed the number of cruise passengers visiting this part of Palermo (Fig. 5) and the total time spent, by virtue of the accuracy of the GPS tracking data. The contingency table (Table 2) describes the activities of cruise passengers – both those who received and those who did not received the incentive – when they visited Piazza Marina. The average duration of the visit for the two groups is also reported in absolute and relative terms.

An analysis of Table 2 demonstrates the incentive's significant impact on the visit to Piazza Marina, with more than 60% of cruise passengers who received the incentive visiting Piazza Marina, compared to less than 45% of those without it (Chi-squared test of independence p-value = 0.011; OR = 1.96; Confidence Intervals = 1.16–3.29). Table 3 also shows a much higher average time spent in Piazza Marina for those passengers with the incentive, compared to those who did not receive it (39.24 min versus 11.03 min respectively); notably, the time spent at the destination (approximately 4 h on average) was very similar between the two groups.

In order to assess the influence of the incentive on the visit to Piazza Marina, and by controlling for other characteristics which may have had an effect on cruise passengers' behaviour, a logistic regression model was deployed. The dichotomous outcome (visiting Piazza Marina or not) was modelled in relation to having received or not received the incentive and other individual characteristics.

A much higher probability of visiting Piazza Marina for those with the incentive can be observed in the analysis in Table 4 and the

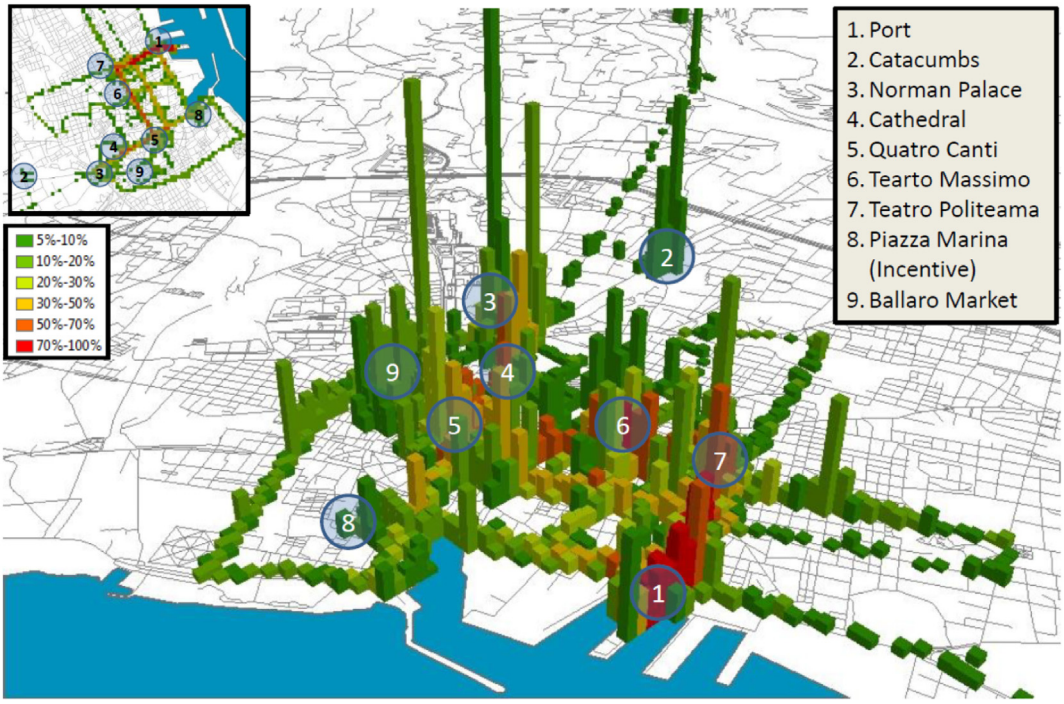

Fig. 4a. Spatial pattern of cruise passengers who did not receive the incentive.

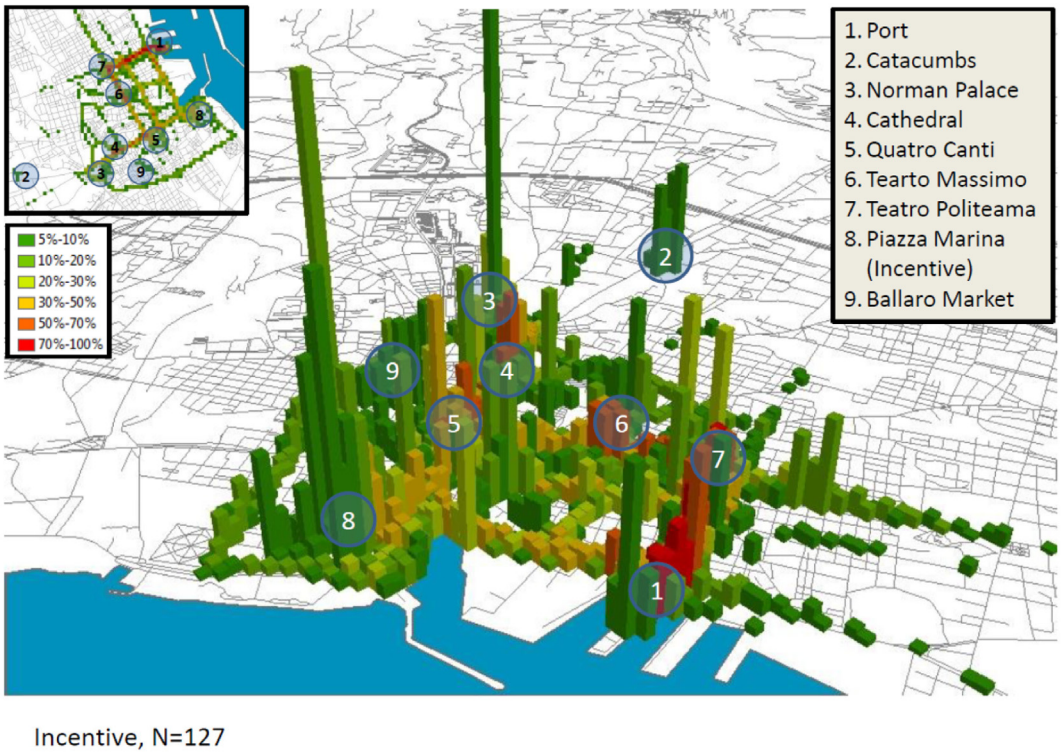

Fig. 4b. Spatial pattern of cruise passengers who received the incentive.

Fig. 5. Area of Piazza Marina to visit under consideration.

Table 2
Distribution of the two subgroups visiting Piazza Marina.

		Actual visit to Piazza Marina?		Total
		Yes	No	
Incentive	Yes	78	49	127
	Row %	61.4%	38.6%	100.00%
Incentive	No	48	59	107
	Row %	44.9%	55.1%	100.00%
	Total	126	108	234
	Row %	53.8%	46.2%	100.00%

Table 3
Time spent in the Piazza Marina area by the two subgroups.

	Total time (mins)	Average (mins)	Average time spent at destination (mins)	%
Incentive	3060.76	39.24	244.58	16.04%
No incentive	529.67	11.03	242.22	4.57%

graph in Fig. 6. The odds ratio is 2.777, with a value of predicted probability of visit at around 67%, when compared to about 43% for the control group. That is, even by controlling for other individual characteristics which may affect cruise passengers' behaviour at their destination, the incentive plays a decisive role in modifying their behaviour. Moreover, this effect is related not only to the probability of visiting the area, but also to the time spent in that area, with important implications from a destination management point of view.

Discussion and conclusion

The application of an incentive by which to influence consumers' behaviour is an age-old practice whose origins can be traced back to the early days of the marketing of many economic activities (O'Keefe, 2012). The effectiveness of commercial strategies on consumers' behaviour is well known and documented. This paper presented an innovative approach for measuring the effectiveness of incentives on tourists' behaviour, based on the use of GPS technology. The approach not only facilitates measuring the effectiveness of a stimulus but also measuring mobility-related variables, both of which are of particular relevance to destination management. These

Table 4
Results from a logit model of an actual visit to Piazza Marina in relation to incentives offered and other socio-demographic characteristics.

Variables	Categories	β	Exp (β)	Inf. CI 95%	Sup CI 95%	Sig.
Incentive	Yes (no = ref)	1.020	2.774	1.472	5.228	0.002
Age	18–35 (ref)					0.203
	36–45	−0.098	0.907	0.358	2.298	0.837
	46–55	0.524	1.689	0.631	4.520	0.296
	56 or above	−0.403	0.668	0.252	1.769	0.417
Educational level	High school or lower (ref)					0.839
	Bachelor	0.206	1.228	0.583	2.586	0.588
	MoA or Ph.D.	0.003	1.003	0.450	2.235	0.994
Income	Less than 20,000 (ref)					0.435
	20,000–40,000	0.601	1.824	0.668	4.984	0.241
	40,000–60,000	0.667	1.949	0.715	5.314	0.192
	More than 60,000	0.851	2.342	0.837	6.553	0.105
First visit?	Yes (No = Ref)	−0.446	0.640	0.287	1.430	0.277
Constant		−1.463	0.232			0.006

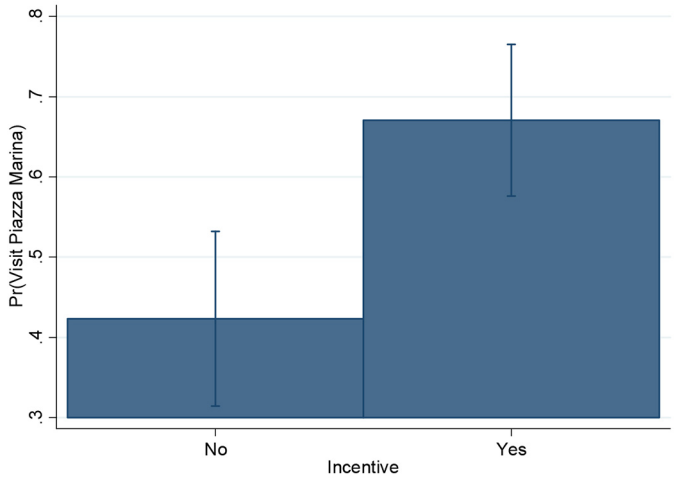

Fig. 6. Results of the logit model in terms of predicted probability of visiting Piazza Marina for those who received the incentive and those who did not.

variables include: the total time spent in a given area, the average time spent, and the overall spatial pattern of the visit measured to a degree of accuracy regarding accurate time and spatial detail. From a methodological point of view, the use of incentives, integrated with traditional data-collection forms (questionnaire-based survey) and new tracking technologies (e.g., GPS devices) facilitates the collection of a variety of data, which can be used to formulate new theories regarding complex human behaviour and the impact of incentives. The authors of this research contend that it offers a methodological approach for the measurement of the effect of a given incentive, through replicable and standardized indicators of space-time behaviour.

To the best of our knowledge, no tourism study to date has directly examined the ability to modify spatio-temporal behaviour or the spatial-choices of tourists using incentives. Theoretically, the proposed method of measuring the impact of incentives improves our understanding of the capacity to influence the behaviour of cruise passengers at their destination by offering varied incentives. Empirically, the incentives offered in this study proved effective and were not particularly expensive. This seems to demonstrate considerable potential for destination management, modifying cruise passengers' behaviour by means of simple and cost-effective incentives.

Considering that destination managers are faced with the issue of paying enough or not paying at all when making strategic decisions, the possibility of measuring the impact of incentives facilitates a cost-benefit analysis. The latter is related to the effect of any given incentive at the destination in question, and specifying the type of incentive to be offered. An understanding of the space-time behaviour of cruise passengers at their destination and the factors influencing their movements contains vital implications for destination planning, transport development, planning new attractions or managing existing ones, and managing the social, environmental, and cultural impact of cruise tourism at its destinations (Lew & McKercher, 2006). Comprehending how cruise passengers' time-space activities can be modified by means of incentives is also of great theoretical and pragmatic importance.

The spatio-temporal data collected via the Global Positioning Systems (GPS) and analysed through the Geographic Information Systems (GIS) can provide us with an in-depth understanding of the movement patterns of cruise passengers at their destination. It can accurately measure appropriate interventions – such as offering incentives – in order to give destination managers crucial

information about the experiences and behaviour of cruise passengers at their destination. GPS data facilitates an accurate recording of temporal and spatial behaviour that results from decisions made by cruise passengers during a visit ashore. This behaviour includes which attractions are visited, the average duration of the visit, the route taken, whether or not transportation is used (and which mode is chosen), and – most importantly in the context of this paper – the impact of incentives on space-time activities.

Limitations and possible future research directions

A clear limitation of this research is the assumption that the study took place in a controlled environment. In reality, aside of the incentives given, and the individual characteristics considered in the statistical model, several other variables affected the cruise passengers' mobility in Palermo, for example, the street layout, aesthetic appeal of different places, sense of safety and security, and other extrinsic and intrinsic motivations could have played a role. It should be noted that in this specific study the fact that we had a control group from each cruise ship that did not received the set of incentives and had the same amount of time to visit Palermo, under similar weather conditions, serves as a way to isolate various influences on the visitors during their visit to Palermo. Moreover, the inclusion of individual characteristics in the statistical model implemented, allows for controlling for potential effects of passengers' characteristics on space-time behaviour. However, other variables not considered in the present study may have an effect on tourist behaviour. This limitation should be dealt with in future research by conducting such research in a more controlled environment such as a theme park. We identified two additional directions for future research: the first is regarding the nature and level of incentives which are required to modify the effective space-time behaviour of tourists at their destination. It should be interesting and valuable to identify what is the type and level of incentive that is the most effective. The second direction for future research could be the implementation of smartphones into the research design. It will allow sending information regarding incentives in real time and in relation to the location of the visitor in the destination. This will allow for better understanding about the impact and effectiveness of real time incentives to visitors that many of them are using their smartphones during their whole visit in the destination.

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