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Valuing welfare losses of cruise tourism in a contingent valuation framework: Not as bad as they make it out to be

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ABSTRACT

Some impacts of cruise tourism, such as air pollution, overcrowding, traffic congestion, etc., can be described as negative externalities. Valuing them is a major challenge due to their non-market nature. The aim of this paper is to show how the potential welfare losses associated with these externalities can be estimated within a contingent valuation framework and to illustrate this with a case study. To this end, residents of the two main port cities of the Canary Islands were asked about their willingness to accept (WTA) monetary compensation for the potential welfare losses caused by cruise tourism. Although a majority of respondents believe that the benefits generated by the cruise industry outweigh the costs, results show that for those willing to accept compensation, the mean WTA estimated using a probit model with a correction mechanism for hypothetical bias was €88.50. As air and noise pollution have been identified as the most significant environmental concerns for local residents, the progressive decarbonisation of the shipping sector by 2050, as derived from EU regulations is expected to improve these issues. In the meantime, it is suggested that an annual reduction in the municipal property tax be implemented for neighbourhoods surrounding the port area affected by the externalities of cruise tourism, as a compensation mechanism. If implemented, the estimated mean WTA values would reflect a hypothetical property tax reduction of between 29 % and 32 %. Finally, limitations and suggestions for further research are provided.

1. Introduction

The Canary Islands is the fifth most popular cruise destination in the world, with almost half a million cruise passengers in 2023 (CLIA, 2024). It is therefore not surprising that cruise ships have become an integral part of the landscape in the main ports of this archipelago.

As a leisure activity, the main purpose of the cruise industry is to provide passengers with a immersive holiday experience that combines the excitement of travel with the comfort of a floating resort (Petrick and Durko, 2016). To achieve this objective, cruise lines design itineraries. These itineraries include ports of embarkation and ports of call, which together with the cruise ship itself make up the product (Alves and Santos, 2022), so that the final perception of the cruiser depends not only on the experience on board (Radic, 2017), but also on the experience of shore (Pranic et al., 2013; Buzova et al., 2018; Sun et al., 2019). This is important because while the cruise lines can control the experience on board, it is not so easy to do so on shore (Kowollik and Jonas, 2016). In fact, the cruise industry is not immune to the growing trend of tourismphobia that has become widespread over the past decade.

Tourismphobia is a phenomenon closely related to overtourism and has to do with the perception of local people that they are the losers when tourism becomes excessive (Veríssimo et al., 2020). This feeling is fuelled by the belief that the negative impacts of tourism outweigh the positive ones for local people. For this reason, it is important to analyse residents' perceptions of these impacts (Tovar et al., 2022), as they allow companies and destinations to act proactively and avoid situations in which residents reject the activity and hinder its continuity. It is in this context that this research can help inform decision making, as the main objective of this paper is to estimate in a contingent valuation framework the potential welfare losses associated with cruise tourism (such as those resulting from air and noise pollution, overcrowding, traffic congestion, etc.) using as an illustrative example the case of the two main port cities of the Canary Islands: Las Palmas de Gran Canaria (LPGC) and Santa Cruz de Tenerife (SCT).

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The negative impacts of cruise tourism, may be denoted as negative externalities and are the result of a particular economic activity that affects the well-being of third parties not directly related to that activity (Saz-Salazar et al., 2012). Valuing these externalities poses a considerable challenge given their non-market nature. Therefore, economists have traditionally addressed this valuation dilemma by using methods that rely on survey data, such as the contingent valuation method (CVM) which is the dominant approach for valuing non-market goods (Carson, 2011).

In a contingent valuation analysis, individuals are presented with a theoretical scenario describing the negative externality under consideration and the proposed policy to address it. They are then asked to express their willingness to pay (WTP) for the proposed improvement in environmental quality (externality avoided) or the monetary compensation they would demand (willingness to accept or WTA) to forgo that improvement (externality accepted). These values are considered to represent the economic benefits (or costs) of the proposed change in environmental quality, and can be aggregated in a cost-benefit framework to obtain the social benefits (or costs) of public policies that typically improve (or worsen) social welfare. Both WTP and WTA are based on Hicksian welfare constructs and can be used to quantify the monetary value of changes in environmental quality, whether WTP or WTA is the correct measure depends on how property rights are allocated (Carson, 2000). Given these potential welfare losses associated with cruise tourism, it was considered more appropriate to ask respondents about their WTA, since using measures such as WTP to forgo a loss would mean contradicting the perceived property rights structures of long-term residents affected by the cruise tourism in the Canary Islands (Saz-Salazar and García-Menéndez, 2016).

Although several studies have analysed externalities in the maritime industry (Saz-Salazar and Tovar, 2024) and ports (Saz-Salazar et al., 2012; Saz-Salazar and García-Menéndez, 2016), to the best of our knowledge, no previous study has attempted to estimate the value of the negative externalities from cruise tourism in a WTA contingent valuation framework. Thus, this article aims to fill a research gap in the literature by providing estimates of the monetary values that residents place on these externalities, while also identifying their attitudes towards a better urban environment (i.e. one that is less noisy, polluted, crowded, etc.). In this sense, in comparison with previous studies that merely have enumerated and described the externalities of cruise tourism, the present study provides a foundation for comparative research across port cities and highlights the responsibility of policymakers to incorporate these monetary values into comprehensive strategies that balance the economic benefits of cruise tourism with the imperative of safeguarding environmental quality and residents' well-being.

The remainder of this manuscript is organised as follows. Section 2 briefly reviews the literature on the impact of cruise tourism on the destination and how it is perceived by residents. Section 3 presents the case study, survey design and data collection. Section 4 presents the theoretical framework and justifies the appropriateness of using a WTA valuation scenario. Section 5 presents the results. Finally, section 6 presents the discussion and conclusions.

2. Impact of the cruise industry on destination and local resident perceptions

In order to achieve the expected result (economic impact), every economic activity generates other collateral results (social and environmental impacts, known as externalities), which have become increasingly important in recent decades as society demands that companies take them into account and try to minimise those that are socially undesirable (Lantos, 2001). In fact, citizens are increasingly demanding that companies take them into account and be socially responsible if they are to have the social licence to operate. This licence depends on the local population's perception of all the impacts generated by the activity (Kaptein, 2007).

The cruise industry claims that its economic contribution is significant. According to the latest available CLIA report, the cruise industry generated a total economic impact of US$168.6 billion worldwide in 2023, an all-time high (CLIA, 2024). By regularly publishing economic impact studies, the cruise industry proactively seeks to convey the idea that it is an important source of benefits for the destinations it visits, in the form of VAT, job creation, etc. (Tovar et al., 2022). In addition to these reports, the academic world has also shown an interest in quantifying the economic benefits generated by cruise tourism in the destinations (port cities), which are related to the expenditure incurred mainly by cruisers, but also by the crews and the cruise ship. Most of these studies focus on the land-based expenditure of cruise passengers (Pino and Tovar, 2019) or cruise passengers and crew (Brida et al., 2015), although there are also studies that calculate the economic impact using regional input-output analysis (Chang et al., 2015; Vayá et al., 2017).

The other side of the coin, however, is the negative externalities of cruise tourism, such as the environmental impact of air pollution. Indeed, as a result of the still high dependence on fossil fuels, ships emit pollutants such as sulphur oxides, nitrogen oxides, particulate matter and carbon dioxide (Tovar and Tichavska, 2019). These emissions can negatively affect air quality and human health, while also contributing to climate change (Demir et al., 2015). In response to these concerns, not only have the International Maritime Organization and the European Union adopted greenhouse gas strategies to decarbonise the shipping industry by 2050 (IMO, 2023), but also the cruise industry itself has developed strategies to reduce emissions at berth and at sea by investing in technologies, infrastructure and operational efficiency (CLIA, 2024).

Despite these efforts, the environmental impact of cruise tourism goes beyond ship emissions and noise (Carić and Mackelworth, 2014). The arrival of cruise ship tourists can put significant pressure on local infrastructure, natural resources and communities. Issues such as overcrowding, increased traffic congestion and waste production have the potential to overwhelm local infrastructure and disrupt the daily lives of local people. In addition, the rapid expansion of cruise tourism in popular destinations has raised concerns about its long-term viability, as well as its impact on cultural heritage and authenticity (Brida et al., 2011; Nikčević, 2019; Lloret et al., 2021; Calatayud et al., 2022). As Paoli et al. (2017) point out, cruise tourism should be approached with a long-term perspective, integrating it into the local territorial context.

Much has been said in the literature on cruise tourism about the economic and social impact of this activity (MacNeill and Wozniak, 2018), including unprecedented events such as the Covid pandemic (Small and Osenford, 2022; Zhang et al., 2022; Poo et al., 2024), as well as about the perceptions and satisfaction of cruise passengers (Shin et al., 2023; Wondirad et al., 2023). Recently, some destinations facing problems of overtourism, such as Venice, Santorini and Dubrovnik, have developed an anti-cruise sentiment and have implemented measures to restrict the entry of cruise ships, which are responsible for harmful emissions and carry thousands of passengers (Papathanassis, 2017), while having a limited economic impact on the local community, as passenger spending is often overestimated (Kayahan et al., 2018). It is therefore not surprising that in port cities pollution, overcrowding, and congestion are becoming major concerns for local residents and stakeholders (Del Chiappa et al., 2019; Kim et al., 2021).

These concerns have not gone unnoticed by academia, as evidenced by the growing body of literature focusing on the factors that influence local residents' attitudes towards the development of cruise tourism (see, for example, Brida et al., 2012). In a recent review of this literature, Tovar et al. (2022) concluded that the final perception of cruise tourism by local residents is a complex issue that depends on site-specific factors. In their analysis of LPGC residents' perceptions of cruise tourism, they found them to be positive in terms of economic impacts but negative in terms of environmental impacts. Therefore, this paper is a step forward in providing actual knowledge of LPGC and SCT residents' perceptions

of potential welfare losses associated with cruise tourism. This is of paramount importance for local stakeholders in the cruise industry in order to better design policies and act proactively.

3. Case study, data collection and survey design

The Canary Islands are a well-known major tourist destination. In fact, 13.9 million foreign tourists visited this archipelago in 2023 (Turismo de Gran Canaria, 2024). In the same year, the two main port cities of the archipelago, LPGC and SCT, received 710,040 and 817,550 cruise passengers respectively. These figures show that the number of cruise passengers in SCT has fully recovered to pre-pandemic levels, while in LPGC it is very close to these levels (see Table 1).

3.1. Data collection

As usual in survey research, particular attention was paid to the use of a pre-test form of the questionnaire to identify sources of bias, unclear wording and to test the appropriateness of the valuation scenario presented to the respondents. The pre-testing process included an initial focus group and a pilot study of 50 interviews. Following a previous study by Tovar et al. (2022) and the information gathered in this crucial phase of the research, the final survey instrument was carried out in the spring of 2023 by a market research company in the neighbourhoods of these two cities, which are closer to the port facilities and therefore potentially more exposed to emissions from ships, and also in the areas that can be considered 'tourist hot spots', since they concentrate the commercial activity and the main tourist attractions of these cities. These neighbourhoods were 'Isleta-Puerto-Guanarteme', 'Centro' and 'Vegueta, Cono Sur y Tafira' in the case of LPGC, and 'Centro-Ifara' and 'Salud-La Salle' in the case of SCTF.

In order to ensure the representativeness of the sample, quotas were set according to the demographic structure of the population of the above-mentioned neighbourhoods, and a series of strict quality control procedures were applied to improve the validity of the data. Furthermore, interviewers were instructed to emphasise both the academic nature of the study and the importance of the responses in informing policy. In essence, the objective was to convey the notion that this constituted a rigorous research project, and that the respondents' responses would bear consequences (Poe and Vossler, 2011). This resulted in a representative stratified random sample of 502 face-to-face interviews. The margin of error was 4.38 % (at the 95 % confidence level). In accordance with ethical standards, respondents were informed of the purpose of the study, consent, anonymity and data protection prior to the interviews.

3.2. Survey design

Following Bateman et al. (2002), the questionnaire was divided into four main sections. The first included the profile of the respondent and a series of attitudinal questions designed to measure the respondent's environmental awareness using the New Ecological Paradigm scale proposed by Dunlap et al. (2000). The second part consisted of a series of questions designed to gauge individuals' perceptions of the main environmental externalities of cruise tourism, such as overcrowding, congestion, noise and air pollution, which could affect the well-being of residents in both cities.

In the third part, respondents were presented with the valuation scenario. They were informed of the potential policy implications of the survey by being told that the results would be used to inform policy makers, as in Vossler and Holladay (2018). The elicitation method used was the discrete choice question format (Bishop and Heberlein, 1979), as it is incentive compatible and mimics price-taking in market behaviour (Arrow et al., 1993). Specifically, in the WTA scenario, respondents were presented with the following proposal:

> If you feel negatively affected by the externalities of cruise tourism (overcrowding, traffic congestion, noise and air pollution, etc.), would you be willing to accept an annual reduction of X € in the property tax you currently pay as compensation for the loss of well-being you would suffer? Please, it is very important that you answer this question as honestly as possible, bearing in mind (1) that the compensation received would imply a reduction in the current availability of resources to fund other public policies and services, and (2) that this proposal would only be implemented if a majority of respondents supported it. How would you vote?
>
> 1. Yes
>
> 2. No

For the dichotomous question, five different bids were considered (€10, €20, €40, €80 and €150). The total sample was allocated to the different bids using an adapted version of the model for optimal bid selection proposed by Cooper (1993). This model assumed a log-normal probability distribution for WTP, whose parameters were estimated from the responses obtained in the pilot study. A bid vector with four to six monetary levels is considered reasonably efficient (Carson and Hanemann, 2005). In accordance with prior practice in contingent valuation design (Saz-Salazar et al., 2012; Saz-Salazar and García--Menéndez, 2016), the payment method was an annual reduction in the municipal property tax currently paid by the respondents. This payment method was considered the most appropriate in terms of the credibility of the hypothetical market, as it was plausible and very familiar to the population surveyed, while minimising potential bias and protest responses. Furthermore, the bid levels were carefully selected to fall within realistic ranges relative to the existing property tax structures in both study cities (Vedel et al., 2015). This design choice enhances the plausibility of the contingent valuation scenario and reduces the risk of protesting and introducing hypothetical bias, as individuals are more likely to provide consistent responses when payment vehicles reflect familiar and credible amounts.

Finally, the last section of the questionnaire contained a series of validation questions to help interpret and validate the WTA estimates. These included socio-economic, attitudinal and behavioural indicators such as membership of neighbourhood and environmental groups, family size, gender, age, after-tax family income and educational attainment.

Table 1
Number of cruise passengers.

	2019	2020	2021	2022	2023
LPGC	721,938	266,367	220,915	491,653	710,040
SCT	739,101	228,403	188,362	542,290	817,550
Total	1,461,039	494,770	409,277	1,033,943	1,527,590

Note: LPGC = Las Palmas de Gran Canaria; SCT = Santa Cruz de Tenerife.
Source: Instituto Canario de Estadística (ISTAC).

4. Theoretical framework

4.1. A measure of utility change: the compensating surplus

Given that environmental quality is a non-market good, the Hicksian compensating surplus (CS) is an appropriate measure of utility change associated with increases and decreases in environmental quality (Bergstrom, 1990). Following Johansson (1993), let us consider an individual that maximizes her utility subject to a budget constraint. Then, the individual's indirect utility function can thus be written as:

$$V = U[x(p, y, q), q] = V(p, y, q) \quad (1)$$

The quantity demanded of private goods is a function of prices (p), income (y) and environmental quality (q). The indirect utility function is decreasing in prices, and increasing in income and environmental

quality. Let us now introduce a change in the environmental quality from q_0 to q_1 and suppose that the individual has rights to the initial environmental quality level, q_0. Then the change in utility is:

$$V = V(p, y, q^1) - V(p, y, q^0) \tag{2}$$

Since the utility function is not observable, we need a monetary measure to evaluate the change in utility as the CS. If environmental quality deteriorates, as in the case of the externalities generated by cruise tourism, then CS is the minimum amount of money that must be given to the individual to compensate her for the loss of environmental quality leaving her just as well off as prior to the change. Thus CS measures the individual's willingness to accept compensation for the decrease in q, or WTA:

$$V(p, y + CS, q^1) = V(p, y, q^0) \tag{3}$$

4.2. The discrete choice model

The dichotomous choice model is the most popular approach to determining whether or not people are willing to accept a compensation for forgo a non-market good. Under this question format, within a WTA framework, respondents are offered a binary choice between two alternatives, one being the status quo policy and the other being an alternative policy that results in a decrease in environmental quality. By randomly assigning cost numbers to respondents, the researcher can determine the distribution of WTA for the good. The basic model for analysing dichotomous contingent valuation responses is the random utility model (Hanemann, 1984). Thus, if we assume that the utility function has some components which are unobservable to the researcher and are treated as stochastic, then the individual's utility function can be written as:

$$V(y, s, q) = U(y, s, q) + \varepsilon \tag{4}$$

where y is the individual's income, s is a vector of her socio-economic characteristics, q is the quality of the environment and ε is a random disturbance term with an expected value of zero. When offered a sum of money A as a compensation for a decrease in the environmental quality from q_0 to q_1, the individual will accept the offer if:

$$U(y + A, s, q^1) + \varepsilon_1 > U(y, s, q^0) + \varepsilon_0 \tag{5}$$

where ε_0 and ε_1 are identically and independently distributed (i.i.d.) random variables with zero means. According to Haab and McConnell (2002), the probability of a 'yes' response is the probability that the respondent thinks she would be better off in the proposed scenario, even with the required payment:

$$\Pr(\textit{yes to } A) = \Pr\left(U(y + A, s, q^1) + \varepsilon_1 > U(y, s, q^0) + \varepsilon_0\right) \tag{6}$$

Two additional modeling decisions are required: to choose a functional form of the utility function and to specify the distribution of its random part (ε). For the first decision, a linear form is usually assumed while for the random term of the utility function two widely used distributions are the normal and the logistic, thus a probit or logit model can be estimated in order to calculate the mean WTA and to understand how WTA responds to individual characteristics.

4.3. Willingness to pay vs willingness to accept: which is the right welfare measure?

According to standard economic theory, it is widely accepted that when income and wealth effects are small, the differences between WTP and WTA are insignificant, so that either measure would be appropriate (Willig, 1976). However, WTA is often much higher than WTP, as several meta-analyses have shown. (Horowitz and McConnell, 2003; Sayman and Onculer, 2005; Tunçel and Hammitt, 2014). In order to choose between these two measures, it is important to understand the reasons that explain this disparity. Several explanations have been suggested for this gap. A popular explanation is the theory of loss aversion (or endowment effect), which suggests that individuals are more sensitive to losses than to equivalent gains and therefore tend to demand higher compensation (WTA) for accepting a loss than what they would be willing to pay (WTP) for an equivalent gain (Kahneman and Tversky, 1979). Hanemann (1991) shows that both a substitution effect and an income effect determine the sign and size of this gap. However, even if the income effect is small, there may still be a substantial gap if the elasticity of substitution between the environmental good and the rest of the goods is sufficiently low (Hanemann, 1999). Indeed, for unique and irreplaceable environmental goods that have no close market substitutes, WTA should be greater than WTP. Tunçel and Hammitt (2014) find that studies using incentive-compatible elicitation mechanisms, such as the single-bounded dichotomous choice question format, yield smaller disparities than other studies. Finally, in experiments and surveys, the presence of uncertainty, irreversibility, and limited learning opportunities can generate commitment costs that further contribute to the discrepancy between WTP and WTA (Zhao and Kling, 2001).

Influenced by the guidelines of the NOAA Blue Ribbon Panel on Contingent Valuation (NOAA, 1993), which recommended the use of WTP questions as a conservative estimate of welfare losses, there is an overwhelming prevalence of WTP over WTA in the empirical literature, even in situations where WTA is clearly the conceptually more appropriate measure (Lloyd-Smith and Adamowicz, 2018). However, relying on WTP estimates of environmental losses, for which a WTA estimate should be used instead, can lead to misleading policy advice and inappropriate encouragement of environmentally harmful activities, as environmental losses may be underestimated (Knetsch, 2010). Therefore, in this case study, given the potential welfare losses associated with cruise tourism, it appears that local communities have the property rights to the environmental good and, accordingly, the appropriate monetary measure of the decrease in well-being associated with this loss is WTA. Indeed, it is possible that most residents would consider the existence of the situation prior to the cruise tourism as the reference state and basis for their feelings of loss, and accordingly, using WTP to forgo a loss would mean contradicting the perceived property rights.

5. Results and discussion

5.1. Respondents' perception of cruise tourism

Using a 7-point Likert scale, residents of LPGC and SCT were asked about their perceptions of cruise tourism in their city, in particular, about the environmental and economic impacts of this activity. As shown in Table 2, the results indicate that the majority of the respondents believe that the benefits generated by the cruise industry outweigh the costs, with few residents claiming the opposite as in Brida et al. (2011).

Specifically, 53 % of respondents 'somewhat agree', 'agree' or 'strongly agree' with the statement 'Although cruise passengers may cause some inconvenience, this is justified by the positive economic impact their spending has on the local economy', while 47 % agree with the statement 'The construction of new cruise terminals improves urban amenity for the enjoyment of citizens'. Similarly, only around 12 % of respondents agree with the idea of limiting the number of cruise ships visiting the islands.

Regarding the environmental impact of cruise ships, air and noise pollution appear to be the most important externalities of cruise tourism, with around 20 % of respondents 'somewhat agree', 'agree' or 'strongly agree' that air and noise pollution have a negative impact on their well-being. It is worth noting that Tovar et al. (2022), in a recent study conducted in LPGC, also found that local residents have a negative perception of the pollution caused by cruise ships. In the case of the inconvenience caused by the influx of cruise passengers and traffic congestion, the percentage of those agreeing is significantly lower,

Table 2
Perceived impacts of cruise tourism.

Type of impact	Mean	Std. dev.	+++
My well-being is negatively affected by air pollution from cruise ships.	2.90	1.75	19.93
My well-being is negatively affected by noise pollution from cruise ships.	2.88	1.80	19.71
Getting around the city can be uncomfortable due to the influx of cruise passengers.	2.43	1.81	16.14
When there are cruise passengers, it is more difficult to enjoy certain services, such as sitting on the terrace of a bar or taking a taxi.	2.5	1.85	17.73
It would be necessary to limit the number of cruise ships coming to the island.	2.1	1.70	11.75
The construction of new cruise terminals improves urban amenity for the enjoyment of citizens.	4.22	2.04	47.20
Although cruise passengers may cause some inconvenience, this is justified by the positive economic impact their spending has on the local economy.	4.70	1.83	53.38

Note: +++ means percentage of respondents that answered 'somewhat agree', 'agree' or 'strongly agree' on the 7-point Likert scale.

which may indicate that this is not a major inconvenience at present.

5.2. WTA estimates and their determinants

In this section, we use a probit model to estimate the mean WTA and to understand how WTA responds to individual characteristics. Although recent evidence shows that WTA may not be especially prone to hypothetical bias in comparison with WTP (Penn and Hu, 2021), we are aware that some people may feel uncertain about their answers to contingent valuation questions. This may be due to unfamiliarity with the good being valued or to insufficient information about the hypothetical market presented in the questionnaire (Voltaire et al., 2013). We therefore provide a correction mechanism for the hypothetical bias which consists of using a numerical certainty scale from 1 (very uncertain) to 10 (very certain) after the dichotomous choice 'yes/no' WTA question where respondents are asked to indicate the level of certainty by selecting a certainty score within the scale (Champ and Bishop, 2001; Atker et al., 2008). Therefore, two different models were estimated with their respective dependent variables, denoted 'yes1′ and 'yes2'. In all models, 'yes' responses are coded as '1′ and 'no' responses are coded as '0'. While in the first model no correction mechanism was applied, in the second model only those 'yes' responses scoring $\geq$9 on the certainty scale were coded as 'yes' responses, while the rest were recoded as 'no' responses even though they accepted the proposed compensation.

The estimation of an equation that accurately predicts WTA for the good, with coefficients with the expected signs and a sufficient level of explanatory power, supports the idea that the findings of the contingent valuation study are consistent with theoretical expectations (Carson, 2000). Therefore, the binary responses (yes/no) regarding the compensation offered are analysed in relation to various attitudinal and socio-economic factors using a probit model specification:

$$P(Yes=1|X_1, X_2, \ldots, X_k) = \Phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k) \quad (7)$$

where X_1, X_2, …, X_k are the explanatory variables (or regressors), including the compensation offered to the respondent, $\beta_0, \beta_1, \beta_2, \ldots \beta_k$ are the coefficients to be estimated and $\Phi(\cdot)$ is the cumulative standard normal distribution function. The definition and descriptive statistics for the set of explanatory variables are presented in Table 3.

The estimated models with their variables and coefficients are shown in Table 4. The maximum likelihood coefficients estimated indicate how the probability of accepting a certain bid amount offered is affected by the set of explanatory variables considered. Our analysis is limited to non-protest responses, as is common practice in contingent valuation

Table 3
Explanatory variables and summary statistics.

Variable	Description	Mean (SD)	% of 1s
Economic factors			
BID	Monetary compensation (WTA) randomly offered to the respondent among the 5 bids considered (€)	60.7 (51.6)	
FAM_INCOME	1 if respondent's household monthly income after taxes is $\geq$ €3300, 0 otherwise		20.6
Respondents characteristics			
AGE	Respondent's age	46.1 (16.2)	
GENDER	1 if the respondent is male, 0 otherwise		51.4
RESIDING_LPGC	1 if the respondents resides in Las Palmas de Gran Canaria, 0 otherwise		54.6
RETIRED	1 if the respondent is retired, 0 otherwise		16.5
FAMILY_SIZE	The total number of household members residing in a dwelling unit	2.7 (1.4)	
Environmental awareness			
RIGHT_MODIFY	Respondent's agreement with the statement "Humans have the right to modify the natural environment to suit their needs" (1 = strongly disagree; 7 = strongly agree)	3.5 (2.0)	
NAT_BALANCE	Respondent's agreement with the statement "The balance of nature is very delicate and easily upset" (1 = strongly disagree; 7 = strongly agree)	5.6 (1.5)	
Environmental quality			
AIR_QUALITY	Respondent's perception of the quality of the air in their city on a typical day (1 = very poor; 7 = excellent)	4.25 (1.96)	
Cruise tourism impact			
AIR_NOISE_POL	This variable was created by taking into account the respondent's answers to two questions asking her to rate, on a 7-point Likert scale (1 = not at all affected; 7 = extremely affected), the extent to which her exposure to air and noise pollution from cruise ships affects her well-being. It takes a value of 1 if she rated her exposure as $\geq$ 4 in both questions, otherwise it takes a value of 0.		26.5
CRUISE_DISTURB	1 if the respondent gave a score $\geq$4 on a 7-point Likert scale (1 = not at all affected; 7 = extremely affected) for her agreement with the next three statements: "Getting around town can be uncomfortable due to the influx of cruise passengers", "Certain services, such as sitting on the terrace of a bar or taking a taxi, are more difficult to enjoy when cruise passengers are present" and "It would be necessary to limit the number of cruise ships coming to the island". Otherwise it takes a value of 0.		8.6
URB_AMENITY	Respondent's agreement with the statement "The construction of new cruise terminals improves urban amenity for the enjoyment of citizens" (1 = strongly disagree; 7 = strongly agree)	4.6 (1.9)	
POSITVE_EI	Respondent's agreement with the statement "Although cruise passengers may cause some inconvenience, this is justified by the positive economic impact their spending has on the local economy" (1 = strongly disagree; 7 = strongly agree)	4.9 (1.8)	

Table 4
WTA determinants: Probit regression.

Variable	Yes 1	Yes 2
	Coefficient (Z-statistic)	Coefficient (Z-statistic)
CONSTANT	−3.5639 *** (−3.47)	−3.1134 *** (−4.15)
BID	0.0073 *** (3.07)	0.0033 * (1.86)
FAM_INCOME	−0.9341 *** (−3.25)	−0.4075 * (−1.72)
AGE	0.0208 ** (2.01)	0.0159 ** (2.07)
GENDER	0.3461 (1.49)	0.3215 * (1.75)
RESIDING_LPGC	0.5435 ** (2.04)	0.4454 ** (2.11)
RETIRED	−1.5376 *** (−4.03)	−0.7907*** (−2.58)
FAMILY_SIZE	0.3175 *** (3.03)	0.1146 * (1.68)
RIGHT_MODIFY	0.1872 *** (2.80)	0.1100 ** (2.17)
NAT_BALANCE	0.3111 *** (3.52)	0.2556 *** (3.74)
AIR_QUALITY	−0.1559 * (−1.82)	−0.0285 (−0.45)
AIR_NOISE_POL	1.5983 *** (3.62)	0.6251 *** (2.63)
CRUISE_DISTURB	1.4730 * (1.91)	0.5499 (1.46)
URB_AMNITY	−0.0028 (−0.05)	0.0393 (0.75)
POSITIVE_EI	0.0758 (1.06)	0.0027 (0.05)
N (observations)	267	267
Log likelihood	−87.0848	−133.8958
Pseudo R-squared	0.3879	0.2242
LR Chi-squared (p-value)	110.35 (0.0000)	77.38 (0.0000)
Mean WTA (€) (95 % confidence interval)	98.45 (91.59–105.31)	88.50 (82.34–94.66)

Note: ***, ** and * mean significant at 1 %, 5 % and 10 %, respectively.

analysis (Morrison et al., 2000). Protesters are those respondents who do not report their true WTA, and thus report a value of zero because they object to some aspect of the constructed valuation scenario, such as the payment vehicle or insufficient information. (Meyerhoff and Liebe, 2006). How to appropriately deal with protest responses is contentious. As WTP has become the dominant valuation metric in applied contingent valuation studies, WTA remains underrepresented in both theoretical and applied research on protest behaviour. As protesters are generally regarded as outside the market, they should be excluded from the analysis used to derive WTA estimates, as their inclusion may otherwise bias WTA estimates (Villanueva et al., 2017). This approach aligns with the methods employed in previous studies on WTA (see, for example, Saz-Salazar et al., 2012; Saz-Salazar and García-Menéndez, 2016). In this study, the valuation scenario was carefully pre-tested to ensure that it was both consequential and credible, while the compensation levels were kept plausible and reasonable (Vossler and Holladay, 2018). The objective was to minimise the occurrence of protest responses.

After excluding the protest responses, those willing to accept compensation for the potential loss of well-being caused by the externalities of cruise tourism represent 78 % of the sample when the dependent variable is 'Yes 1′ and 72 % of the sample when the dependent variable is 'Yes 2'. The regression results show that in both models, the BID variable has the expected sign and is statistically significant, indicating that the larger the bid offered, the greater the probability of the respondent accepting it, as in McGurk et al. (2020). In fact, the percentage of 'yes' responses for each bid offered is quite well behaved for the two dependent variables considered, as this percentage increases as the bid offered to the respondent increases. The variable FAM_INCOME also has the expected sign, indicating that individuals with higher incomes are less likely to accept the compensation offered. This result is consistent with the diminishing marginal utility of income (Groothuis et al., 1998). Unexpectedly, respondents that stated to be retired are less willing to accept a compensation. This result is counterintuitive, as Saz-Salazar et al. (2023) show that less affluent individuals have a higher WTA. The fact of residing in Las Palmas de Gran Canaria (RESIDING_LPGC) and the variable AGE are positively and significantly correlated with the respondent's WTA, while GENDER has no relationship with the likelihood of accepting monetary compensation. FAMILY_SIZE is a variable that also shows a positive correlation with the likelihood of accepting the compensation offered, i.e. as the size of the family increases, so does the WTA of the respondent. Indeed, having more family members increases household expenses and reduces the family's disposable income, so any compensation received can be a great help.

The variable NAT_BALANCE, which identifies respondents who strongly agree with the statement 'The balance of nature is very delicate and easily upset', is positively and significantly associated with respondents' WTA as expected, as these individuals are likely to be more environmentally conscious. However, in the case of the variable RIGHT_MODIFY, which is statistically significant in both models, the positive correlation found is unexpected as these individuals would be expected to be less environmentally conscious. On the other hand, and not surprisingly, respondents who reported a positive perception of air quality in their city on a typical day (AIR_QUALITY) were less likely to accept compensation.

Finally, the variable (AIR_NOISE_POL) is positive and statistically significant, indicating that respondents who believe that their exposure to air and noise pollution from cruise ships affects their well-being are more likely to accept compensation. This confirms our previous findings that air and noise pollution appear to be the most important environmental problems for local residents. The low statistical significance of the variable CRUISE_DISTURB in the first model, and the lack of statistical significance in the second model, could suggest that overcrowding and traffic congestion are not seen as major issues. Finally, although respondents have a positive perception of the economic impact of cruise tourism on the local economy (POSITIVE_EI) and of the improvement in urban amenity resulting from the construction of new cruise terminals (URB_AMNITY), these two variables are not statistically significant.

Based on these two probit models with explanatory variables, the mean amounts of WTA were calculated using the following formula as in Mutandwa et al. (2019):

$$Mean\ WTA = \frac{\beta_i \overline{X}_i}{\beta_0} \tag{8}$$

where β_0 is the estimated coefficient of the bid amount offered to the respondent and $\beta_i \overline{X}_i$ are the coefficients of the independent variables multiplied by their respective means. The mean WTA from the first model is €98.45, while for the second model, where a correction mechanism for hypothetical bias was applied, it is about 10 % lower (€88.50) (see Table 4). Now, in order to know the magnitude of the welfare measures obtained, and considering that the payment method used in this study was an annual reduction in the municipal property tax, we compare the mean WTA estimates with the average amount paid in real property tax by a house owner in LPGC in 2023. So, considering that the latter figure was €309.8, the estimated mean WTA values would represent a hypothetical reduction in this tax of between 29 % and 32 % for those potentially affected by the externalities of cruise tourism. For SCT these percentages are very similar considering that the average amount paid in property tax was €302.9.

5.3. Aggregation

The CVM is particularly valuable in cost-benefit analysis because it aims to estimate the total benefits and costs of a change in environmental quality, helping policy and decision makers to assess the feasibility and desirability of environmental projects and policies. Therefore, the potential loss of well-being resulting from the externalities of cruise tourism are estimated in monetary terms. In doing so, several assumptions are made. First, it is necessary to define the population potentially affected by these externalities (Bateman et al., 2006). In this respect, we considered a double aggregation criterion. On the one hand, the population of the neighbourhoods potentially affected by cruise tourism,

which was 328,721 inhabitants in 2023, and on the other hand, in order not to overestimate the potential loss of well-being of the local population, we have also taken into account the number of families (126, 431). Secondly, to correct for the presence of hypothetical bias, the mean WTA chosen is €88.5. Finally, it is necessary to consider both a discount rate and a time horizon. The reported average discount rate for transport sector projects in OECD countries is 4.64 % for impacts occurring in the first 30 years (OECD, 2018), which is exactly the discount rate chosen in this study. Similarly, as air and noise pollution appear to be the most important externalities of cruise tourism for local residents, a time horizon of 26 years was chosen. This period corresponds to the interval between the EU's target year for achieving carbon neutrality in the shipping industry and the year in which the survey was conducted. Thus, multiplying the mean WTA (€88.5) by the population of the above-mentioned neighbourhoods, we find the present values of the potential loss of well-being shown in Table 5.

Assuming that only families living in the neighbourhoods surrounding the port area are affected by the externalities of cruise tourism, and using a discount rate of 4.64 %, has resulted in a conservative estimate of the potential welfare loss of €166.99 million over a 26-year time horizon.

5.4. Discussion

The choice of a measure (WTP or WTA) to accurately assess the monetary value of the impact of changes on the welfare of individuals is typically based on legal entitlements over the environment. However, as noted by Lienhoop and Macmillan (2007), discrepancies often arise between perceived entitlement structures and legal situations, potentially resulting in the incorrect use of legal entitlements as the criteria for the choice of a measure. Therefore, in such cases, valuations based on the WTA measure would provide more useful guidance for any consideration of policy changes (Nguyen et al., 2021). This is precisely the criterion adopted in this case study since damage assessment would likely benefit from using the appropriate measure instead of the near-exclusive reliance on WTP commonly observed in applied work on contingent valuation.

As no previous study has attempted to monetise the environmental impact of cruise tourism on local communities in a WTA framework, our research is unique in this respect and therefore our results cannot be directly compared with previous research on this area. Nevertheless, in a study similar to ours, Saz-Salazar et al. (2012) also used a WTA framework to estimate the loss of well-being resulting from the environmental externalities caused by the expansion of the port of Valencia in Spain. They found that the mean WTA ranged in between €97.5 and €116.3. The proximity of these estimates with our own provides external validation for the present findings and underscores the appropriateness of the WTA approach in capturing welfare losses from environmental degradation, where—unlike with marketed goods—individuals cannot simply avoid consumption (Clinch and Murphy, 2001). In any case, the estimates obtained in this study would be meaningless if they were not based on an underlying value construct. Indeed, these monetary estimates have passed some minimal tests of theoretical validity, as the results show with reasonable explanatory power that WTA decreases with income and increases with the bid offered to the respondent, or in other words, the results are consistent with the underlying principles of economic theory.

Table 5
Potential loss of wellbeing (€).

	Aggregation criterion	
	Residents (328,721)	Number of families (126,431)
Present value (Horizon time: 26 years; disc. rate: 4.64 %; mean WTA: €88.5)	434,176,543	166,990,775

6. Conclusions, limitations and further research

The assessment of environmental damage, such as that associated with cruise tourism, is inherently challenging due to its non-market nature. In the presence of externalities, market transactions fail to fully capture individuals' preferences, leading to suboptimal outcomes. Consequently, the incorporation of a monetary value for these externalities is crucial for the formulation of effective environmental policy, particularly in light of the growing community opposition to cruise tourism in numerous port cities.

Our results show that, when indicating their WTA, respondents mainly thought in terms of air and noise pollution, as these externalities appear to be the most important among the various externalities resulting from cruise tourism. This is likely to be due to growing public awareness of climate change and its consequences. Given the EU's mandate for ports to provide onshore power supply by 2030 (Spengler and Tovar, 2021) and its goal for the shipping sector to be fully decarbonised by 2050, it is reasonable to conclude that the externalities associated with cruise tourism will not be a significant concern for residents of these two cities once the transition to carbon neutrality is complete.

However, and in the meantime, the results of this study show that over 70 % of the sample would be willing to accept monetary compensation for the potential loss of wellbeing caused by cruise tourism. The mean WTA estimate ranged from €88.50 to €98.45, depending on whether a correction mechanism for hypothetical bias was applied, indicating that the average respondent would be willing to accept this compensation for the potential loss of well-being resulting from cruise tourism in these port cities. In practical terms, these WTA estimates would correspond to a hypothetical reduction in property taxes of approximately 30 % for those potentially affected by the externalities of cruise tourism.

Although the monetisation of the environment is the subject of considerable debate (Hausman, 2012), it is nevertheless a necessary component of any comprehensive assessment of the environmental impact of cruise tourism on the well-being of local communities in port cities. Without such an assessment, policy decisions that fail to take these values into account may prove to be incomplete and misleading. From a policy perspective, integrating WTA values into cost–benefit analysis (CBA) ensures that the true social costs of cruise tourism are properly accounted for, preventing policy decisions from being biased in favour of short-term economic gains while overlooking longer-term welfare losses. A CBA that incorporates non-market valuation results, and is conducted properly, ensures that the trade-offs between economic growth, environmental quality, and community well-being are made explicit, aligning with the principles of welfare economics (Boardman et al., 2018; Freeman et al., 2014).

In light of the significant policy implications that emerge from this study, it is essential to acknowledge its limitations. First, despite its widespread acceptance, contingent valuation is not a flawless technique, as its hypothetical nature could result in the elicited estimates of WTA not providing a robust basis for decision-making (Hausman, 2012). However, in this particular case, the use of a numerical certainty scale has served to provide a correction mechanism for the hypothetical bias, resulting in a more conservative estimate of WTA. Second, more research is needed as the results reported here represent a first exploratory attempt in this specific context. It would therefore be necessary to replicate the survey in other port cities where these externalities are also a major challenge, in order to confirm the validity of this valuation technique in this particular context. Consequently, this study provides a reference framework that can facilitate comparative analysis across different geographical contexts and inform evidence-based policy-making aimed at promoting more sustainable tourism development and urban planning in port cities. Third, it would be necessary to apply a sample-selection model, a common practice in the WTP literature, as a means to address the possible presence of sample-selection bias due to

the dropping of protest responses and thereby ensuring that welfare estimates remain unbiased (Johnston et al., 2017). And fourth, and most importantly, a feature of contingent valuation is that the WTA values obtained depend on the information provided to respondents in the hypothetical market described in the questionnaire and on the respondents' prior beliefs. Therefore, a key question is what is the optimal level of information, as the information provided in the valuation scenarios affects WTA values (Ajzen et al., 1996). In this particular case, respondents were informed about (i) the good being valued (environmental externalities of cruise tourism), (ii) the potential policy implications of the survey, and (iii) the fact that the compensation received would imply a reduction in the current availability of resources to fund other public policies. However, respondents were not informed about data on actual emissions from cruise ships in ports, as this information is not currently available, as air pollution characteristics are usually collected from monitoring stations rather than surveys (Li et al., 2018). In fact, the vast majority of studies, as in our case, use subjective self-reported air pollution levels instead of objective monitor measures. Therefore, when this additional information becomes available, it would be necessary to investigate whether the provision of this additional information could have an impact on the WTA values and consequently on the aggregated welfare loss estimates.

CRediT authorship contribution statement

Salvador del Saz Salazar: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Beatriz Tovar:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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