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ORIGINAL ARTICLE

Valuing cultural heritage through non-monetary scales: a comparison

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Abstract
Economic valuation studies of cultural goods have a long history and have gained renewed interest in recent years. This paper poses a methodological challenge as the use of alternative scales to monetary ranges for the valuation of cultural heritage. A renowned archaeological site is taken as a case study, and its use value is estimated through the travel cost method (monetary value) and time spent visiting the site (non-monetary scale). According to consumption theory, we find an inverse relationship between the two scales and the intensity of demand. While the monetary approach mainly reflects the cost of accessing the good—*ceteris paribus* the preferences—the time spent approach shows that those who invest more time in the visit are fanatics, enthusiasts, dazzled youth, and educated adults. These results provide more efficient policy implications in the field of cultural management and price-marking for museums and cultural heritage institutions.

Keywords Non-market valuation · Archaeological heritage · Travel cost method · Time spent scale

JEL Z11 · Z32 · O10 · C10

1 Introduction

One of the central themes of cultural economics as a scientific discipline is the analysis of cultural goods and how they can be appreciated, i.e. the estimation of value (Throsby, 2001, 2013). Both the definition of cultural value, given its multivariate nature, and the estimation of economic value, given the difficulty of establishing

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relevant prices in non-market goods situations, constitute a permanent challenge (Hutter & Throsby, 2007; Peacock & Rizzo, 2008; Throsby, 2003). This is particularly relevant for many elements of historical heritage, which need their social value to be recognised (Klamer, 2014), in many cases in the form of tourist attraction, in order to reveal their significance as a cultural resource, associated with the values of existence and bequest, and sometimes also to reveal the scope of their economic impact and growth (Throsby, 1999). In the case of cultural institutions, where the cultural good is transformed into a service and the value is therefore materialised when it is consumed, Bille (2024) suggests incorporating the concept of cultural capital externalities as a complementary value to the private profit of cultural consumption, and which can affect society in the form of human capital accumulation and possibilities for development and well-being (Backman & Nilsson, 2018).

When estimating the value of cultural goods, techniques from environmental economics have traditionally been adopted. These are classified between stated preference methods, where the individual is forced to state the value assigned through a hypothetical contingent market, and revealed preference methods, where the value is deduced from the behaviour of individuals in parallel markets. (Snowball, 2008). Prominent among the former group are applications of the contingent valuation method (Navrud & Ready, 2002; Noonan, 2003) and choice experiment method (Bertacchini & Frontuto, 2024; Gómez-Zapata et al., 2018; Throsby et al., 2021). The second group contains applications of the travel cost method (Bedate et al., 2004; Poor & Smith, 2004) and hedonic pricing (Noonan, 2007). Comparisons of various valuation techniques for the same case study is also common (Alberini & Longo, 2006; Armbrecht, 2014; Herath & Kennedy, 2004). Today, we are witnessing a revival of these type of methods, with the extension of applications to more complex case studies such as intangible heritage or cultural ecosystems (Lourenço-Gomes et al., 2020; Gómez-Zapata et al., 2024), as well as methodological advances in be0nefit transfer (Lawton et al., 2021; Wisniewska et al., 2023) or new notions of value around concepts such as the life satisfaction approach (Baldin & Bille, 2023) or subjective well-being (Fujiwara & Campbell, 2011).

In all these exercises, the value of a cultural good is estimated on monetary scales, generally in the form of a price, toll or contribution, which are representative of individual willingness to pay, the marginal effort for accessing the good, or the opportunity cost of such an expense. Based on these premises, a methodological challenge arises in the use of non-monetary valuation scales to measure the intensity of individuals' preferences, such as the time spent enjoying the cultural good, and particularly in visiting the cultural heritage. Previous work has used this variable—time spent—to measure consumer satisfaction in cultural tourism (Del Chiappa et al., 2013; Vena-Oya et al., 2021), the value for money of a museum visit (Ashworth & Johnson, 1996), or even as a determinant of contributions in the form of willingness to pay for a cultural institution (Bakhshi et al., 2015). However, to the best of our knowledge, it has not been used to build a demand curve to determine the value of historical heritage, as we intend to do.

Non-monetary scales, such as time spent, offer a valuable approach to capturing the heterogeneity of individual preferences. As a limited resource, the allocation of time to a specific activity can serve as an indicator of the perceived utility derived

from that activity. We maintain a general hypothesis that the more a cultural good is valued, the more time is spent or enjoyed, while the lower the interest, the less time is invested. Time is therefore an opportunity cost, mediated by personal factors in the approach to accessing and enjoying the cultural good, such that there are specific groups of individuals who are willing to devote more time to consumption, while a more generalised part of the demand will spend less time. The challenge is to estimate this inverse relation in the form of a demand curve and to analyse whether consumer surplus is similar in monetary and non-monetary ranges. To find a common scale of comparison, we monetise the time invested in the form of exit prices; namely, depending on the time of consumption, which has interesting implications in the field of cultural management.

On the basis of these premises, this study therefore seeks to estimate the value of a cultural good, specifically a museumised archaeological site, using monetary (travel cost) and non-monetary (time spent) scales, and to interpret the results. As one of the most characteristic examples of cultural heritage, archaeological sites have received less attention in valuation studies, when they usually have the advantage of being single-purpose tourist destinations, which helps to compute the use value. We thus apply a double approach of the travel cost method (zonal and individual) to the case study in order to estimate the use value in monetary range, and an adaptation of the zonal method is used to classify cohorts of consumers according to the time spent and consequently deduce their non-monetary valuation range. In this context, the use of non-monetary scales in this study presents a key methodological challenge; in other words, determining whether visit duration can serve as a reliable proxy for the perceived value of a cultural site and whether it follows principles similar to those observed in traditional monetary valuation methods. Furthermore, this research aims to assess the extent to which both methodologies produce consistent cultural value estimates and how they may complement each other to enhance decision-making in heritage management.

The paper is structured in five sections. After this introduction, the literature on valuation studies in the field of archaeology and the novelty of non-monetary scales is reviewed. Section three describes the case study, the archaeological site of the Roman Villa of La Olmeda in Palencia, Spain, the research data and the methodological approach. Section four interprets the results of the comparative estimation of methods, while section five concludes.

2 Literature review

Within the broad spectrum of valuation exercises, archaeological sites have not been the most commonly used examples when compared to museums and historical monuments (Noonan, 2003; Wright & Eppink, 2016), although a wide array of different topics has been addressed. Beginning with those which determine value through stated preferences in a contingent market, some archaeological sites in Mexico have been assessed (Beltrán & Rojas, 1996), and there are also examples of the evaluation of shipwrecks in North Carolina, USA, as submerged maritime cultural resources (Whitehead & Finney, 2003). Evaluation has also been carried out of changes in

the area around the archaeological ensemble at Stonehenge (Maddison & Mourato, 2001), and there is the estimation of economic value of cultural routes based on Spanish remains and industrial heritage in Valdivia, Chile (Báez-Montenegro et al., 2016). A further example is the social performance evaluation of a recovery and preservation plan at the archaeological site of My Son in Vietnam (Tuan & Navrud, 2008). As regards the choice experiments method, we find applications for an aboriginal cultural heritage area in Queensland, (Windle & Rolfe, 2003), the archaeological ensembles of Heraklion and Knossos in Crete, Greece (Apostolakis & Jaffry, 2005a, 2005b), Hadrian's Wall in the United Kingdom (Kinghorn & Willis, 2008), as well as some stone-age sites in Denmark (Lundhede et al., 2013). As for revealed preferences through parallel markets, prominent in this framework are archaeological heritage valuation studies using the travel cost method. Examples include the archaeological area of Garni in Armenia (Alberini & Longo, 2006), the Cave of Soplao (Pérez-Álvarez et al., 2016), and the Altamira Museum (Torres-Ortega et al., 2018) in Cantabria in Spain, as well as the temple of Poseidon in Greece (Tourkolias et al., 2015) or the valuation of archaeological sites in the area of Dublin (Moro et al., 2013) using the hedonic price method.

As a method for estimating the use value of cultural heritage, travel cost is a technique that has evolved since its first applications (Clawson & Knetsch, 1966; Hotelling, 1947), and it can currently be approached from two perspectives; individual and zonal. The former examines the relationship between the number of trips made by the same individual over a period of time and the costs incurred to reach that destination, together with other potentially determinant variables (Ahmed & Hussain, 2016; Brida et al., 2012; Iqbal et al., 2017; Merciu et al., 2021; Paredes Vilca, 2019). The second approach defines different geographical areas and examines the number of trips made, taking into account the ratio of visitors to the total population of each area (Bedate et al., 2004; Burch et al., 2019; Poor & Smith, 2004; Süer & Sadik, 2020; Voltaire et al., 2017). Although the individual method allows the use of microdata and the drawing of conclusions on sociodemographic variables, it has been used more in the environmental field than in the cultural sector, where recurrent visits are not so common. Taking into account the advantages and disadvantages of each approach, this paper compares the two methods in order to estimate the value assigned to an archaeological site on a monetary scale.

As regards the non-monetary scale, time spent is a variable that is not unknown in the field of cultural economics, as it has been used to measure marginal effort in studies into the economics of charity, specifically analysing how individuals donate money and/or time to support cultural heritage organisations (Ateca-Amestoy & Gorostiaga, 2022). Time spent has also been used as an opportunity cost of reading habits for leisure or work purposes (Suárez-Fernández & Boto-García, 2022) and also for non-arts work of professional artists (Throsby & Zednik, 2011). On issues closer to the consumption of historical heritage, some research has focused on factors affecting the time spent visiting cultural sites (Brida et al., 2012; Guccio et al., 2017), finding that the length of the visit is correlated with certain socioeconomic variables (gender, age, income) but specially with the motivations of tourists as well as the cultural alternatives they have. Other studies look at the time of the visit among groups of visitors and types of visits to science museums (Sandifer, 1998,

2003) or how the quality of the visit has been considered, as a monetary proxy for consumer satisfaction in urban cultural tourism (Vena-Oya et al., 2021), and also as an estimator of the value for money of a museum visit (Ashworth & Johnson, 1996). Finally, there is an emerging and interesting field of study as regards timing and tracking of visitor behaviour (Ceccarelli et al., 2024; Yalowitz & Bronnenkant, 2009).

Analysing the pricing policies of museums, Frey and Steiner (2010) undertake a comprehensive review, from the more traditional free admission schemes to price discrimination systems and the newer options of dynamic pricing based on experience and length of visit. In particular, they develop a proposal for "exit-prices", which consists of charging visitors when they leave rather than when they enter—the longer the time spent in the museum, the higher the exit price. The length of the visit thus becomes part of the economic rationale of the decision to visit a museum. Prices established depending on the length of the visit could be announced at the start of the visit, so that the consumer has all the information, and a sliding scale of prices for accumulated times might also even be included, which would induce longer visits as the average cost per minute decreases. This pricing formula takes into account the characterisation of cultural goods as experience goods, whose quality cannot be fully determined ex ante, but at the moment of consumption, such that the quality, satisfaction and length of the visit become substitute units of value (Vena-Oya et al., 2021).

This is perhaps the closest notion to our valuation approach, as we aim to measure the intensity of preferences for a cultural good through the amount of time spent consuming the good. Time is, therefore, the valuation scale which—although its opportunity cost in terms of lost wages may be considered negligible in the case of a cultural visit—does provide us with an ordinal range of valuation. Our aim will therefore be to find this trade-off between the time spent and the intensity of demand, and to detect which cohorts of consumers are more and less interested in investing more time in the consumption or visit of a cultural good, which may also prove useful for cultural policy and management.

3 Case study and methodological approach.

The *Villa Romana de La Olmeda* (hereinafter, VRO) is a rural mansion from the Lower Empire (fourth century AD) covering a surface area of 4400 m^2 and 35 rooms, in which 1450 m^2 of polychrome mosaics are preserved in situ. It is considered one of the main figurative ensembles from the Roman period preserved in Europe due to its quality and state of preservation. The archaeological site has been museumised with a building of contemporary architecture that has received several awards,[1] located in the province of Palencia, in the region of Castilla y León, Spain, this archaeological site is one of the most visited cultural resources in this region, having received 44,551 visitors in 2023 and 57,700 in 2019. It adequately fulfils the

[1] For further details, see https://www.villaromanalaolmeda.com/

analytical purposes of the research since, due to its location away from population centres, it is a destination for mostly single-purpose trips, such that it is appropriate to compute the assignment of use value through the effort involved in the trip and the length of the visit.

In order to analyse the valuation of the archaeological site, two rounds of visitor surveys were carried out in 2023; a first round in April 2023, coinciding with the highest flow of visitors during Easter Week, and which gave 438 valid responses, and a second round in July and August, in which 353 valid responses were gathered. This gave a total sample size of 791 responses. Surveys were collected in two ways: surveys carried out by surveyors (n:641), and self-completed surveys via QR codes (n:150).[2] Considering the usual volume of visitors to VRO (44,551 in 2023), the sample size is representative, with a confidence level of 95% and a sampling error of 3.48%. Although full statistical representativeness cannot be externally validated due to a lack of external benchmarks, the internal validity ensures robustness in the comparative analysis.[3] From a methodological perspective, our primary objective is the comparison between monetary and non-monetary value proxies. For this purpose, ensuring sufficient internal variation and diversity within the sample is more relevant than external representativeness, and the design of our data collection fulfils this requirement.

The survey was structured in three parts: a section of questions about the trip (place of origin, means of transport, duration, costs incurred, organised trip), another section related to visiting the VRO (time of entry and exit, relevance of the visit in the trip, number of visits made, guided tour option, willingness to pay for this option, satisfaction, and motivation for the visit), and a final section with sociodemographic and cultural consumption questions. Table 1 lists the main variables considered in the analysis, together with the descriptive statistics.

One key aspect of the methodology involves determining the travel cost parameters used in both the zonal and the individual models, with the caveat that in the former the average cost per zone will be used. Calculating this variable is by no means easy, given the diversity of opinions in the literature concerning which costs to include. The most conservative version includes only the cost of transport, accommodation and admission to the site (Bedate et al., 2004; Merciu et al., 2021; Tourkolias et al., 2015), while other works add the cost of restaurants or souvenir purchases (Pérez-Álvarez et al., 2016; Süer & Sadik, 2020). We apply both options, which we call scenario 1 (conservative version, including only transport, accommodation, and admission costs) and scenario 2 (full version, adding additional expenses such as restaurants and souvenirs).

[2] No significant variations are found in the results according to the type of survey conducted. Tests were carried out including a dummy for survey type in the estimations of the econometric models, yielding coefficients with the same sign and practically unchanged value.

[3] No official register provides detailed sociodemographic information about total visitor population to the VRO. However, the survey design aimed to capture the diversity of visitor profiles and behaviours. The final sample includes a wide range of ages (16–84 years old), income and education levels, motivations for visiting, trip types, and cultural patterns, thereby reflecting heterogeneity and ensuring internal diversity.

Table 1 Descriptive statistics of the variables used

Variable	Type (1)	Description	Min	Max	Mean	Stand. Dev
DURATION	C	Total length of the trip (days)	0	300	4.88	19.357
PASSENGER	D	Number of passengers in the car (no answer is taken in organised coach trips)	1	7	3.16	1.220
TRANSPORT	N	Transport method. 0 = Car 1 = Coach 2 = Various	0	2	0.11	0.364
TRAVEL COST 1	C	Sum of costs (in euros) incurred visiting the VRO (Scenario 1)	0	655.76	44.69	66.995
TRAVEL COST 2	C	Sum of costs (in euros) incurred visiting the VRO (Scenario 2)	0	902.66	81.67	118.318
ORGANISED	N	0 = Standard trip. 1 = The visit is included in a trip organised by agencies or organisations	0	1	0.07	0.261
ZONE	O	Respondent's area of origin, according to Fig. 1	1	5	2.85	1.06
TIME_SPENT	C	Length of the visit (expressed in minutes) (2)	14	419	75.34	44.489
SESSION	N	Visiting hours. 0 = Morning hours; 1 = Afternoon hours	0	1	0.36	0.481
PURPOSE	N	0 = Single-purpose trip, 1 = Multipurpose trip	0	1	0.83	0.376
PROFILE	N	Visitor profile. 1 = Maximum relevance of the VRO, 2 = Medium relevance of the VRO (same relevance for all the activities), 3 = VRO is not relevant	1	3	2.04	0.744
TOTAL VISITS	D	Number of visits made to the VRO previously	1	29	1.74	2.104
FIRST VISIT	N	0 = This is not the first visit to the VRO. 1 = This is the first visit to the VRO	0	1	0.74	0.440
GUIDED TOUR	N	0 = I did not hire a guided tour. 1 = I hired a guided tour	0	1	0.36	0.479
WTP GUIDED	C	Answer to the question: "The guided tour is currently free. However, if you had to put a price on it, how much would you be willing to pay for this service?"	0	25	5.9218	4.03979
MOTIVATED_ARCHAEO	N	0 = Interest in archaeology does not motivate the visit. 1 = Interest in archaeology motivates the visit	0	1	0.39	0.489
MOTIVATED_ARCHITECTURE	N	0 = Interest in architecture does not motivate the visit. 1 = Interest in architecture motivates the visit	0	1	0.02	0.149
SATISFACTION	O	Satisfaction with the visit. Ranked from 1 (not at all satisfied) to 5 (fully satisfied)	2	5	4.70	0.575
GENDER	N	0 = Male. 1 = Female. 2 = I prefer not to answer	0	2	0.55	0.503
AGE	C	Age reported by respondent	16	84	49.76	16.447

Table 1 (continued)

Variable	Type (1)	Description	Min	Max	Mean	Stand. Dev
STUDIES	O	Level of studies attained. 0 = No studies, 1 = Compulsory education, 2 = Secondary education/Middle Vocational Training, 3 = Higher Vocational Training, 4 = Degree, 5 = Master's Degree, 6 = PhD	0	6	3.58	1.364
INCOME	O	Monthly income. 0 = No income, 1 = Less than 400€. 2 = From 400€ to 799€. 3 = From 800 to 1,119€. 4 = From 1,200€ to 1,599€. 5 = From 1,600€ to 1,999€. 6 = From 2,000€ to 2,399€. 7 = From 2,400€ to 2,799€. 8 = From 2,800 to 3,199€, 9 = From 3,200€ to 3,599€, 10 = More than 3,600€:	0	10	4.84	2.785
CONSUM_ARCHAEO	O	Frequency of visits to archaeological/ heritage sites. 0 = No visits, 1 = Less than 3 times/year, 2 = From 3 to 6 times/year, 3 = From 7 to 10 times/year, 4 = More than 10 times/year	0	4	2.12	1.163
CONSUM_PERFORMING	O	Frequency of performing art shows attendance. 0 = No attendance, 1 = Less than 3 times/year, 2 = From 3 to 6 times/year, 3 = From 7 to 10 times/year, 4 = More than 10 times/year	0	4	1.54	1.131
CONSUM_MUSEUM	O	Frequency of museum attendance. 0 = No visits, 1 = Less than 3 times/year, 2 = From 3 to 6 times/year, 3 = From 7 to 10 times/year, 4 = More than 10 times/year	0	4	2.17	1.149
TOTAL CULTURAL CONSUM	O	Frequency of cultural consumption. Sum of the frequency results (0–4) obtained for the six types of cultural consumption (archaeology, museums, libraries, cinema, performing arts, music performances)	0	24	11.12	4.562

(1) N = Nominal O = Ordinal D = Discrete. C = Continuous; (2) Computed as the difference between the time of the visit recorded on the ticket and the time at which the survey is conducted

Source: Own elaboration

The following clarifications are also required. Firstly, computation of accommodation, catering and shopping expenses is deduced from interviewees' statements in the surveys, as is the admission fee to the VRO within the official tariffs. As regards calculating transport costs, three hypotheses are put forward. For most tourists, who come in their own car (90.27% of the sample), the cost of transport is taken to be that declared in the daily allowances of civil servants in Spain (*Ministerio de Hacienda y Función Pública*, 2023), which is €0.26 per kilometre, to which toll costs (if declared) can be added. In this case, the cost of individual transport is derived by dividing the cost incurred in the journey (round trip) from the town of origin, divided by the number of accompanying persons (survey). For tourists coming by coach, the reference cost per kilometre is taken as €1.745. Lunar et al. (2019) divided by the number of standard passengers reported by the Spanish Transport and Logistics Observatory. For journeys made by several modes of transport, an ad hoc calculation was made according to the detailed information provided by the respondent.

As regards computing the travel costs for each individual, one of the main difficulties posed by the model is the treatment of multipurpose trips, i.e. cases where the visit to the site in question forms part of a trip where other activities are involved. In this case, assigning the entire travel cost to the asset under evaluation would be biased by overestimation, whereas ignoring this profile of visitors would also lead to erroneous estimates (Kuosmanen et al., 2004). There are numerous approaches in the literature on how to deal with this constraint. Most are based on assigning only a percentage of the total cost of the trip to the good in question, either with ex post adjustments to the computation of all costs (Voltaire et al., 2017), or with ex ante adjustments (Tourkolias et al., 2015) by weighting the costs according to the time spent at the site in question compared to the total duration of the trip. We chose to weight the relative relevance of the visit in the decision to make the multipurpose trip, such that we defined three profiles of visitors.[4] A first profile declared maximum relevance of the VRO within their trip (n:203), for which the total cost of the trip was computed. A second profile of medium relevance (n:352) was composed of visitors expressing similar importance of all the activities undertaken, and for which the trip cost weighted by the trip duration ratio was considered. The third profile (n:236) encompassed individuals who state that the VRO has a residual relevance within the trip. The cost of the trip is therefore not representative of valuation effort and, consequently, is not computed, except for the value of the admission fee to the site.

We now describe the basic parameters of analysis of the first valuation method—the travel cost in its zonal approach—in which the demand function takes the following form:

[4] These profiles are therefore proposed following respondents' stated preferences, presuming that they are more accurate, although some works (Guccio et al., 2017) find that stated preferences (through questionnaires) and revealed preferences (e.g. through GPS information) may diverge for certain cultural tourist profiles.

$$\frac{V_z}{P_Z} = f(TC_z)$$

where V_z is the number of visitors originating in area z, P_z is the total population of area z, and TC_z is the average travel cost of visitors to area z. This is therefore a spatial demand curve, where the proportion of visitors is an inverse function of the degree of distantness or travel cost. As can be seen, one key aspect for calculating the zonal travel cost is the definition of the zones of affluence. Although the first works in this line of study delimited zones looking for equidistance to the point of origin, (Clawson & Knetsch, 1966), more recent studies make the delimitation on the basis of administrative divisions (Voltaire et al., 2017). In this work, we take a provincial delimitation (NUTS3) in the areas closest to the site, and a regional scope (NUTS2) for the more distant areas, considering only peninsular visitors (Torres-Ortega et al., 2018). The sample for applying the zonal approach travel cost thus gives a total of 771 respondents, excluding foreigners.

We thus delimit the following source areas (Fig. 1): (1) Local area, which includes only the province of Palencia, where the VRO is located (average travel distance: 57.83 km); (2) Border area, which includes neighbouring provinces (average distance: 117.57 km); (3) Intermediate zone, which includes non-border provinces and other adjacent regions (average distance: 280.02 km); (4) Central zone composed of non-adjacent, mostly inland regions (average distance: 438.20 km);

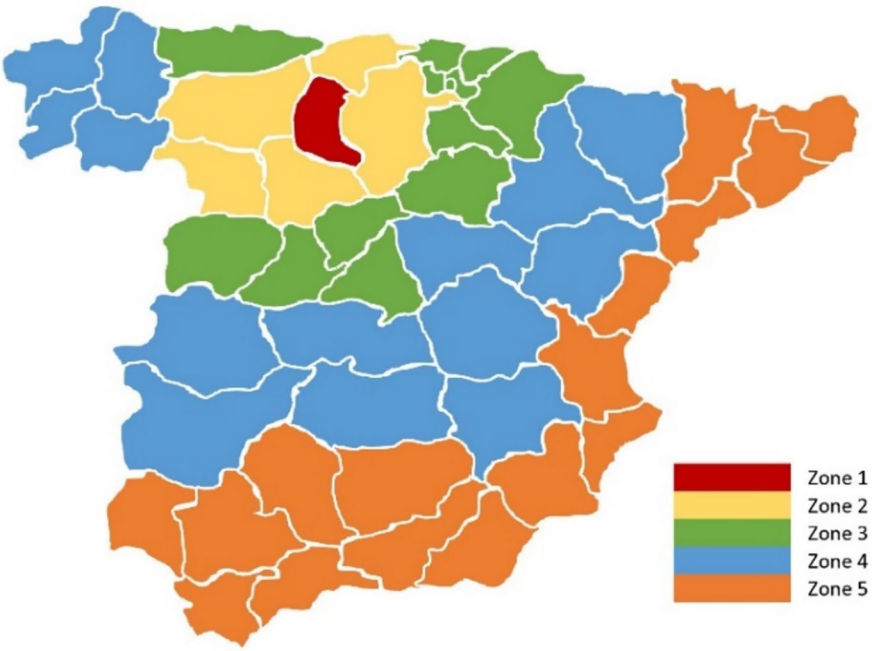

Fig. 1 Map of delimitation of visitor origin zones. *Source*: Own elaboration

Table 2 Descriptive statistics of the zonal travel cost method

Zone	V_z = number of visitors	P_z = population	$VR_Z = (V_z / P_z)^*$ 100,000	GDP per capita	TC1 = mean cost scenario 1	TC2 = mean cost scenario 2
1	71	159,123	44.62	25,235.00€	13.40 €	37.07€
2	197	2,080,354	9.47	24,290.52€	21.96 €	46.02€
3	368	11,686,538	3.15	32,918.81€	52.84 €	93.90€
4	44	7,130,969	0.62	23,030.57€	62.64 €	110.45€
5	91	22,812,393	0.40	23,225.57€	65.49 €	120.46€

Source: Own elaboration based on field survey and computational parameters. Population and GDP: INE 2021

(5) Peripheral zone, which includes regions of the southern and eastern coast of the peninsula (average distance: 747.92 km).[5]

Areas balanced in economic and demographic terms have been proposed, as can be seen in Table 2, where the descriptive statistics used to calculate the demand function of the zonal method can be found. These data make it possible to plot the demand curve, through which the consumer surplus can be obtained. This then makes it possible to estimate the value assigned to the VRO in monetary terms.

Secondly, the individual travel cost method is proposed. In this method, the demand function takes the following form:

$$V_i = f(TC_i, Z_i)$$

where V_i is the number of trips per individual to the study site, TC_i is the total cost of the trip made, and Z_i is a vector that includes control variables such as sociodemographic characteristics (age, sex, income and education) and behavioural characteristics (reason for visit, satisfaction, etc.). This method makes it possible to extract information on the consumer's profile and consumption behaviour. The travel cost variables—for both scenarios 1 and 2—maintain the same calculation rule as in the zonal method.

Finally, the methodological approach used to approximate the value assigned to cultural heritage using non-monetary time scales is discussed. The length of the visit is not seen to determine the frequency of visits by the same individual, such that the individual approach does not fit well with our purpose of using time as a valuation scale. However, a regression was performed to find out the variables related to time spent visiting the VRO. These were mostly behavioural, but also sociodemographic, such as age, income, and educational level. Cluster analysis was also used to verify the existence of certain groupings among visitors, with

[5] The average distances of each zone are mentioned to show the progressive remoteness of each. However, to compute the travel cost of each respondent the distance from the declared place of origin is considered.

a high level of intra-group homogeneity, but with major differences in their visit duration. By describing these groups and by calculating the average visit time of each, it was possible to apply an adaptation of the zonal travel cost method, in this case taking as a grouping the clusters of individuals obtained, rather than the zones of origin, and taking as a valuation variable the time dedicated to the visit, rather than travel cost. With this, we can build a demand function that crosses consumer quotas with their intensity of preference for the cultural destination—measured in terms of time spent. The descriptive statistics of the variables used to calculate this part of the research can also be seen in Table 1.

4 Results and discussion

4.1 Valuation through monetary scales: travel cost method

We present the valuation results of the archaeological heritage case study under the approaches of monetary scales (travel cost method, zonal, and individual) and non-monetary scales (time spent on the visit). In the zonal travel cost approach, the demand curve is obtained in two steps, based on the data shown in Table 2. First, the basic demand curve is plotted (Fig. 2), which takes the average travel cost of each zone (TC1 and TC2) as the dependent variable, and the visitor rate (VR_z) as the independent variable, both in scenario 1 of contained costs, and scenario 2 of broader travel costs. For both scenarios, the plotted curve shows a negative slope, which supports the expected hypothesis that the higher the travel cost, the lower the proportion of visits. Subsequently, by means of linear interpolation, and considering infinitesimal variations in the marginal cost of travel, the final demand curve is built (Fig. 3). This represents the number of visitors in absolute terms who would come from each area vis-à-vis infinitesimal variations in the cost of travel, which is assimilated to the price or marginal valuation for the consumption of the cultural good (Greffe, 1999). These curves constitute the demand functions of the archaeological site and reproduce visitors' marginal willingness to pay for the visit (Bedate

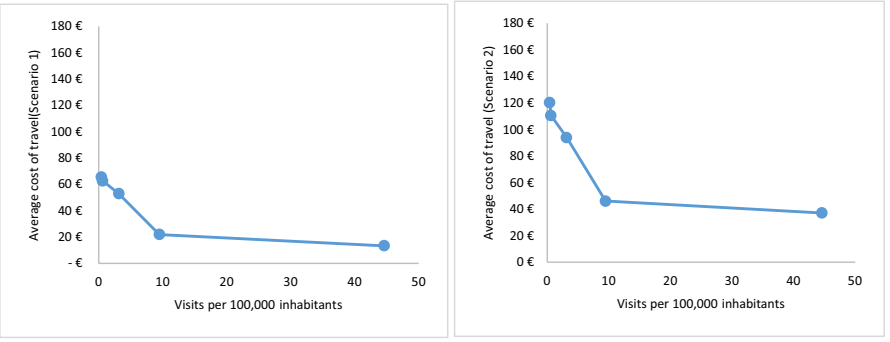

Fig. 2 Basic VRO demand curves. Travel cost model (cost scenario 1 and 2). *Source*: Own elaboration

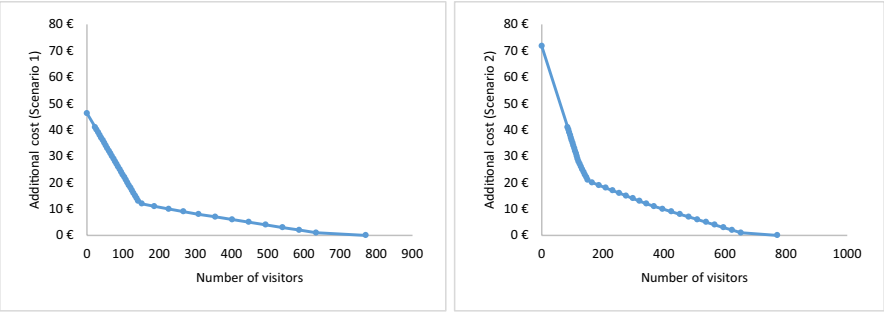

Fig. 3 Final VRO demand curves. Travel cost model (cost scenario 1 and 2). *Source*: Own elaboration

et al., 2004). Following welfare analysis, the area under the curve thus represents the economic value which, in this case, has been revealed through the travel market. At the individual level, the valuation per individual ranges from €9.61 (cost scenario 1) to €15.45 (scenario 2).[6] Values are consistent with those reflected in other studies, with estimates ranging from $8.00 to $19.26 for the historic city of Maryland (Poor & Smith, 2004), slightly higher than the €3.75 estimated for the Cathedral of Palencia or the €3.98 estimated for the Museum of Burgos (Bedate et al., 2004), and noticeably lower than those obtained in a more recent study on the Citadel of Roses (Gerona), which gives a value of €26.41 (Burch et al., 2019). With regard to archaeological heritage, the results are consistent with the individual value obtained through the zonal method for the National Museum of Altamira, which is €18.55 (Torres-Ortega et al., 2018). It should be noted that the individual value obtained for the VRO exceeds—by some distance—the official VRO price rates, which are €5 and €1.5 the reduced rate, with €3.59 being the average price declared in the survey.

In the individual travel cost model, estimation is performed through econometric techniques. The number of visits declared by each respondent is modelled as a function of travel cost and a set of explanatory variables commonly used in the literature on cultural demand and in studies using the individual travel cost method (Brida et al., 2012; Merciu et al., 2021) such as age, educational attainment or visit motivation. In addition, the empirical nature of our dataset suggested that certain trip-related characteristics (such as the relative importance of the site within the overall trip as captured by the *PROFILE* variable), as well as behavioural aspects

[6] Considering the total number of visitors in 2023 (44,551), we could estimate the accumulated value of the consumer surplus to be between 428,209.39 € and 756,357.55 €. If we take into account that the current budget of the VRO is 785,442.00 € (Source: *Diputación de Palencia*), we obtain a first approximation to a cost-benefit analysis, where the social return covers between 54.52% and 96.30% of public expenditure, which may offer rational justification for the provision of the cultural heritage ensemble following a merit good argument.

(e.g. hiring a guided tour), could also be associated with individual visit intensity. As a result, they were also included in the model. Although the literature is not conclusive regarding the functional form that the estimation should take—given that the dependent variable (number of visits) takes integer and positive values that are generally not very high—the use of count models is suggested. A priori, the most appropriate is the Poisson model (Brida et al., 2012). However, it poses the severe restriction that the mean of the dependent variable must be equal to its variance (Iqbal et al., 2017), a condition that is not met in our study. In addition, the test proposed by Cameron and Trivedi (2013) confirms the overdispersion of the data, such that the estimation was finally performed with a negative binomial model, whose results are not biased, despite the overdispersion, by introducing an error term that allows systematic differences to be considered (Haab & McConnell, 2002). In addition, it seems reasonable to also use the version of the negative binomial models for truncated variables (Hardin & Hilbe, 2015) and to compare which model best fits the data. Both models are applied, in turn, for transportation cost scenarios 1 and 2 (conservative and more generous, respectively, as pointed out in Sect. 3). The results for both scenarios and for both regression models are shown in Table 3. As can be seen, for all specifications, their sign remains stable for the variables, although there is some variation in the coefficients. According to Hilbe (2009), the values of the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) statistics show a significant difference between the models, with the truncated negative binomial model showing lower values in the statistics and, thus, a better fit.

Under both scenarios, travel cost presents negative coefficients, which supports the inverse relationship between demand intensity and cost of the trip. In addition, the number of visits presents positive values in certain behavioural variables; for example, the motivation for the visit being based on the interest in archaeology or contemporary architecture. In addition, hiring a guided tour is related to a higher number of visits. While the variable refers to the current visit, we interpret this as an indicator of greater engagement with the site and the interest of the visit. Repeat visitors often seek to deepen their understanding, discover new aspects, or engage in more structured learning opportunities, which makes them more inclined to opt for this kind of enriched visit format. On the other hand, the PROFILE variable—which takes higher values as visitors attach less relevance to the VRO within their trip—presents a negative coefficient, such that multipurpose tourism has an inverse effect on repeat visits to the site. Viewed from the opposite perspective, a greater number of visits is linked to a higher perceived relevance of the site within the trip (single-purpose trips), suggesting that prior experience in VRO reinforces its value and motivates more intentional engagement. In terms of sociodemographic variables, age is directly related to a higher number of visits, reflecting the cumulative effect of having had more opportunities and time to engage with the site across the life course. The negative result of the educational level variable is striking. However, this may be explained by the sociodemographic characteristics of the visiting population from the local area, who have a lower travel cost and, therefore, higher visit repetition (2.72 visits compared to the general average of 1.74 visits), even though the level of education in this eminently rural and aged area is lower than the average, phenomenon that can be explained by the "brain drain" in this region

Table 3 Individual travel cost estimation. Regression results for two travel cost scenarios

Variables/model	Negative binomial model		Truncated negative binomial model	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
C	0.7277*** (0.1559)	0.6678*** (0.1555)	− 17.0884 (471.6963)	− 17.1256** (409.0247)
Travel cost 1	− 0.0029*** (0.0062)	–	− 0.0109*** (0.0019)	–
Travel cost 1	–	− 0.0010*** (0.0003)	–	− 0.0015** (0.0006)
Guided tour	0.1900*** (0.0664)	0.1874*** (0.0665)	0.4829*** (0.1688)	0.4096** (0.1637)
Age	0.0078*** (0.0020)	0.0077*** (0. 0658)	0.2155*** (0.0052)	0.0193*** (0.0051)
Motivated_archaeo	0.1418** (0.0661)	0.1085* (0.0658)	0.26124 (0.1645)	0.1471 (0.1601)
Motivated_architecture	0.4389** (0.1943)	0.4100** (0.1946)	1.1740** (0.5063)	0.9623* (0.4922)
Studies	− 0.0573** (0.0235)	− 0.0586** (0.0235)	− 0.1210*** (0.5903)	− 0.1415** (0.0577)
Profile	− 0.1962*** (0.0456)	− 0.1737*** (0.0459)	− 0.5432*** (0.1137)	− 0.3874*** (0.1060)
LR chi2(8)	69.8900	57.0300	04.0400	62.0200
Prob > chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0266	0.0217	0.0541	0.0357
LR test of alpha = 0 chibar2(01)	114.1900	117.0100	515.2200	524.2100
Prob > = chibar2	0.0000	0.0000	0.0000	0.0000
AIC	2578.4280	2591.2880	1663.1970	1695.2230

Table 3 (continued)

Variables/model	Negative binomial model		Truncated negative binomial model	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
BIC	2620.4880	2633.3480	1705.2570	1737.2830

Source: Own elaboration. *p value < 0.1; **p value < 0.05; ***p value < 0.01

(González-Leonardo & López-Gay, 2019). That is why for this specific case study the sign of the variable studies runs inversely to what is common in the theory of cultural consumption.

4.2 Valuation through non-monetary scales: time spent

We now approach the valuation of the good under study through non-monetary scales, such as time spent. Our intention, therefore, is not to measure the intensity of the number of visits, but the intensity of the time spent thereon, in order to find a trade-off between time and demand and then evaluating the good. For this reason, we do not use the individual travel cost model, but an adaptation of the zonal model, where we replace visitors' geographical areas by demand quotas after characterisation. The methodological approach at this point is thus divided into three stages: analysing what determines the length of the visit; clustering demand by homogeneous groups; and constructing the demand function and interpreting it.

As regards the first point, since the duration of the visit variable takes positive integer values ranging from one to *N*, it is again appropriate to use count models. Because of the overdispersion shown by the data, the negative binomial regression and truncated negative binomial regression models were selected. Both models were estimated and showed very similar results in this case, since the mean of the dependent variable is much higher. However, a lower value in the AIC and BIC statistics of the truncated model indicates a better fit, such that this model was used for interpretation. Variables mainly related to the organisation and realisation of the visit, and cultural consumption indicators are used. The results shown in Table 4 evidence that one of the factors which most positively influences the visit duration is hiring a guided tour, and the organisation of the trip, which is logical. Although with a very low coefficient, travel cost at an individual level (as detailed in Sect. 3) seems to be positively and significantly related to visiting time, suggesting some consistency between willingness to make effort in monetary terms—travel cost—and non-monetary terms—visiting time. This result is further coherent when considered alongside the individual travel cost method results. If visitors with higher travel costs make fewer trips to the archaeological site, it is reasonable to assume that they would seek to maximise their utility from each visit by extending their time spent at the site. In fact—and in terms of cultural consumption patterns—the results reflect new longer visits for those who usually visit archaeological sites, as opposed to those who visit museums or attend performing arts, thus reflecting correlation by affinity to the object of study. In contrast, results show that most of the sociodemographic indicators do not significantly affect the length of the visit, except income, with an inverse relation. This leads us to consider that the factors involved in trip planning and affinity to the cultural object are the ones that classify demand regarding time invested. To estimate whether the length of the visit was mainly determined by the option of taking a guided tour, the same regression was performed for the portion of the sample that did not take this option, with almost the same significant variables being found for the two samples (Appendix 1). Time spent is not therefore determined by the guided tour, but by a pool of behavioural variables related to the design of the

Table 4 Explanatory factors of visit duration (full sample)

C Variable	Negative binomial model Coefficient (Std. Error)	Truncated negative binomial model Coefficient (Std. Error)
C	4.1289*** (0.0580)	4.1289*** (0.0581)
Guided tour	0.3974*** (0.0304)	0.3975*** (0.0304)
Organised	0.2164*** (0.0550)	0.2164*** (0.0550)
Consum_museum	− 0.0689*** (0.1530)	− 0.0689*** (0.1530)
Consum_performing	− 0.0268** (0.0133)	− 0.0268** (0.0133)
Consum_archaeo	0.0925*** (0.0141)	0.0925*** (0.0141)
Travel cost 1 (a)	0.0011*** (0.0003)	0.0011*** (0.0002)
Studies	0.0133 (0.0112)	0.0133 (0.0112)
Age	− 0.0002 (0.0009)	− 0.0002 (0.0009)
Income	− 0.0202** (0.0063)	− 0.0202** (0.0063)
Gender	− 0.0037 (0.0277)	− 0.0037 (0.0277)
LR chi2	344.1900	343.9200
Prob > chi2	0.0000	0.0000
Log likelihood	− 3702.6896	− 3702.6701
Pseudo R2	0.0444	0.0444
LR test of alpha = 0 chibar2(01)	7053.8600	7053.9000
Prob > = chibar2	0.0000	0.0000
AIC	7429.3790	7429.3400
BIC	7485.4590	7485.4200

(a): analysis for Travel Cost 2 (greater expenditure) yields similar results

Source: own elaboration. *p value < 0.1; **p value < 0.05; ***p value < 0.01

trip and to cultural affinities. This can be considered as proof of the robustness of the results obtained.

Secondly, consumers in the full sample were classified using the multivariate cluster analysis technique in order to find groups that were significantly similar but distinct from one another. Together with the time spent variable and its determinants, sociodemographic variables were considered. Using the K-means technique and ANOVA analysis to contrast significant differences between groups, six clusters were found, the interpretation of which is summarised below according to the mean characterisation variables in Table 5. Selection of the number of clusters was based on the elbow method, which examines the decline in the within-cluster sum of

Table 5 Descriptive statistics of cluster characterisation

Variable	Cluster					
	Spike	VRO-fanatics	Archaeo-fanatics	Young wow	Grey panther	Tourist in a rush
n	8	16	87	126	267	287
Time_spent	395.88	198.06	115.24	79.17	77.03	44.23
Total visits	1.13	2.63	2.16	1.35	1.93	1.57
Guided tour	1.00	0.69	0.74	0.36	0.49	0.07
First visit	0.88	0.44	0.69	0.79	0.71	0.77
Travel cost 1	207.48	50.71	54.55	36.03	57.07	29.19
Travel cost 2	324.61	115.03	92.71	56.93	110.29	54.13
Consum_ archaeo	3.13	2.06	3.01	1.95	2.02	1.98
Total cultural consume	11.63	9.63	12.70	11.25	11.04	10.72
Passenger	4.00	3.13	3.17	3.50	3.16	3.00
Duration	2.63	2.88	3.36	2.89	5.89	5.45
Purpose	0.38	0.81	0.67	0.70	0.84	0.94
Profile	1.00	1.81	1.61	1.84	1.84	2.49
Satisfaction	4.63	4.94	4.92	4.73	4.81	4.56
Motivated_ archaeo	0.63	0.13	0.48	0.25	0.43	0.40
Gender	0.50	0.50	0.55	0.59	0.58	0.51
Age	52.63	55.75	53.03	21.69	60.47	50.71
Studies	3.75	3.25	3.68	3.03	3.69	3.70
Income	4.63	4.44	5.33	1.62	5.60	5.44
Session	0.25	0.69	0.29	0.40	0.28	0.44
Zone	3.13	3.88	2.82	2.71	2.94	3.01
WTP guided	7.63	8.44	5.66	5.35	5.80	6.16

Source: own elaboration

squares (WCSS) as the number of clusters increases (Han et al., 2012). Results indicate a clear inflection point at six clusters, suggesting this to be the optimal solution. The corresponding WCSS values and the graphical representation supporting this choice are provided in Appendix 2.

SPIKE cluster: This is a small group composed of eight visitors belonging to the sample, with a visit duration five times the average (395.88 min compared to the average of 75.34 min).[7] All except one are first-time visitors to the VRO. They booked a guided tour, which they obviously extended, in most cases in the morning. They display high cultural consumption, which is particularly focused on visits to archaeological sites, and in general they made a single-purpose trip whose main

[7] Rather than considering this group of visitors as outliers due to the excessive length of their visit, we have chosen to retain them as an expression of the diversity and peculiarity of visitors, based on the fact that the main results of the research (clusters and characterisations, and demand curves) remain stable when they are excluded from the analysis.

motivation was their interest in archaeology, and whose cost is almost four times the average because they come from distant places. They also seem to be expert visitors and to be very interested in the archaeological site.

VRO-fanatic cluster: This is a small cluster made up of visitors who are loyal to the VRO, with an average number of 2.63 visits to the site, which is much higher than the average of 1.74 for the total sample. Their interest and motivation for archaeology are below average, although they still have a very high visit time—slightly over three hours—and most are repeat visitors (53% compared to an average of 26%), even though they come from areas far away from the VRO. In general, they have the highest levels of satisfaction with the visit.

ARCHAEO-fanatic cluster: This cluster meets the expectations of a classic profile of high cultural consumption and interest in archaeology. They make a high number of visits, although for 70% of the group it is the first exploration visit to the archaeological site. They also have a high percentage (74%) of guided tours, with an average duration of 1 h and 55 min.

Young WOW Cluster: With an average visit duration of 1 h and 19 min, this cluster brings together very young people (21.96 years old on average), with an average level of cultural consumption. They have the lowest level of education, as 65% of them are still in their student years. Approximately only one fifth had visited the VRO previously, and they have the lowest rate of archaeology consumption. However, they attach considerable importance to the site within the trip, with 30% of them being single-purpose travellers, compared to an average of 17%. Approximately one third enjoyed a guided tour and displayed above average satisfaction. They have the second lowest travel cost data, only behind the "Tourist in a rush", which is consistent with their limited income.

GREY panthers cluster: The cluster with the highest average age and income level. With the exception of the group of fanatics, they have the highest proportion of repeat visitors. In addition, almost half did a guided tour, spending an average of 1 h and 17 min visiting the site. Most are multipurpose visitors, and it is striking that despite being the ones who report the highest income their willingness to pay for the guided tour is below average.

Cluster Tourists IN A RUSH: Middle-aged individuals with medium–low cultural consumption who, for the most part, did not have a guided tour. They present the most multipurpose travel profile, since only 6% of them make the trip exclusively to visit the VRO, and they register the lowest average travel cost. In addition, they are the ones who attach the least importance to the VRO within their trip. They dedicate only 45 min to the visit—most of them in the afternoon session—which is a factor related to a lower dedication of time.

It is worth highlighting that the characterisation of the clusters reinforces the finding in Table 4 regarding the overall positive relationship between visit duration and travel cost except for the "Grey Panthers" group, who incur higher travel costs, especially when restaurant and shopping expenses are taken into account (scenario 2, Travel Cost 2). This may be due to their high-income level. In fact, together with "Tourists in a Rush", they are the visitors with the highest income level and the shortest visit duration, which explains the inverse relationship in Table 4.

Using a procedure analogous to the zonal travel cost, the demand function is represented (Fig. 4), taking the average time of the visit and the volume of demand of the different consumer groups (basic demand curve) as variables, or the infinitesimal variation between consumption and time spent (final demand curve). As can be seen, the slope of the demand curves is negative, also evidencing the trade-off between demand intensity and time spent, on the understanding that in this case the time scale operates as an opportunity cost.

In addition to the *SPIKE group*, whose visit is exceptionally long, those who exhibit the highest intensity of preferences are the *VRO-fanatics cluster*. They are loyal to the archaeological site, visit it regularly, and show maximum satisfaction. These are followed by the *ARCHAEO-fanatics*, who are characterised by high cultural consumption and motivation related to archaeology. With a more moderate visit time—albeit still above average—are the *Young WOW cluster*, for whom the VRO is an unexpected discovery, and the *GREY Panther cluster*, with older and high-income level individuals. The cluster reflecting the lowest intensity of preference are individuals who have shown less interest in the site, in that they have not used guided tours and have scheduled a multipurpose trip, where the VRO has only residual relevance.

The results therefore demonstrate an assimilable demand curve with which to deduce the value assigned to the cultural heritage element, albeit on a temporal scale. Unlike the monetary scales, which eminently reflect the cost of accessing the asset in question (zonal approach) modelled by certain sociodemographic and motivational variables (individual approach), approximation to time invested allows us to distinguish which groups of consumers are willing to spend more time enjoying their visit and then valuing the good further. These are those who demonstrate a certain fanaticism, affinity or degree of training, which aligns with the best-known results of the theory of cultural consumption.

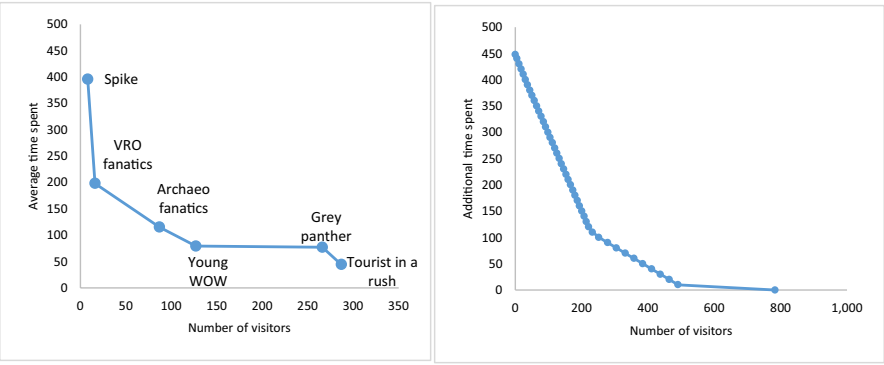

Fig. 4 Basic demand curve and final demand curve. Time spent model. *Source*: Own elaboration

4.3 Comparison between monetary and non-monetary scales and management implications

As presented in Table 4, the empirical results indicate a direct relationship between visit duration and travel cost. Consequently, the valuation estimates derived from the two scales through the calculation of consumer surplus are expected to yield comparable results. Nevertheless, it is difficult to make an assimilable validation of the computation of the consumer surplus in time invested on a scale such as the monetary one that is understandable to all, since the estimate in terms of lost wages is insignificant in the computation of minutes. However, we opted for an operational valuation solution, with utilities for the field of cultural management, which is to qualify the time invested by the group least interested in the cultural good, as the last marginal price, which everyone would always pay, and which is, as a hypothesis, the official VRO rate, i.e. €5. Based on this time-consumption quota (*tourists in a rush*), we can thus calculate the proportional intensity of the time invested by each group of consumers, and multiply these units by the minimum price of €5. This allows us to calculate the prices that each cluster would potentially be willing to accept with each amount of time spent. The results are shown in Table 6 and should logically be understood as a hypothetical, but not far-fetched, situation that could, for example, inspire a proposal for exit prices based on proportionally time spent quotas (Frey & Steiner, 2010).

With this monetisation of time spent, we obtain demand curves similar to those shown in Fig. 4, resulting in a computation of consumer surplus worth 101.66 min in time scale, which would be equivalent to a monetary value of €11.49.[8] This is an intermediate figure in the valuation range according to the travel cost method (€9.62 and €15.45), which gives some reliability to the result. Furthermore, it reinforces the conclusion drawn from previous analyses; the willingness to make an effort in economic terms and in terms of time is comparable, thus confirming that visit duration can also serve as a reasonable proxy for the value assigned to a cultural asset.

Nonetheless, one possible criticism of this pricing scheme could be that price itself influences visitor behaviour, such that charging higher fees for longer visits may discourage some visitors from extending their stay, which would not be an optimal outcome from a management perspective—particularly for a public good that aims to maximise its educational value. Therefore, alternative pricing schemes based on decreasing marginal admission rates are proposed, wherein the per-minute cost declines as the visit duration increases. Specifically, two pricing models are introduced: one based on quadratic root functions, and another based on logarithmic functions. The results of the two applications are also shown in Table 6.

The price under the first scheme was calculated using the following formula; maintaining the allocated base price of five euros for the shortest visit time and increasing the customised price at a decreasing rate based on the square root function:

[8] This value is obtained both by calculating consumer surplus and from the monetized time-spent demand curves, as a computation of the value of time in the marginal units of the length of the last cluster (44.23 min) quoted at the basic entry price (€5), and allocating the same value to any slot of time.

Table 6 Intensity and monetisation of time invested. Proposal of exit prices

Cluster	n	Time spent	Intensity of time spent	Exit prices (proportional basis)	Price per minute (proportional basis)	Exit prices (quadratic root basis)	Price per minute (quadratic root basis)	Exit prices (logarithm basis)	Price per minute (logarithm basis)
Spike	8	395.88	8.95	44.75€	0.11 €	14.96 €	0.04 €	7.85 €	0.02 €
VRO-fanatics	16	198.06	4.48	22.39€	0.11 €	10.58 €	0.05 €	6.94 €	0.04 €
Archaeo-fanatics	87	115.24	2.61	13.03€	0.11 €	8.07 €	0.07 €	6.24 €	0.05 €
Young wow	126	79.17	1.79	8.95€	0.11 €	6.69 €	0.08 €	5.75 €	0.07 €
Grey panther	267	77.03	1.74	8.71€	0.11 €	6.60 €	0.09 €	5.72 €	0.07 €
Tourist in a rush	287	44.23	1	5 €	0.11 €	5.00 €	0.11 €	5.00 €	0.11 €

Source: Own elaboration

$$P_{\text{quadratic root}}(t) = k * \sqrt{t}$$

where t is time spent and k is a constant derived by dividing the base price (five euros) by the square root of the shortest visit duration.

In the proposal under the logarithmic scheme, the price was calculated using the following formula, maintaining the allocated base price of five euros for the shortest visit time and increasing the customised price at a decreasing rate based on the natural logarithm function.

$$P_{\text{logarithm}}(t) = c * \ln(1 + t)$$

where t is time spent and c is a constant derived by dividing the base price (five euros) by the natural logarithm of one plus the shortest visit duration.

In both pricing schemes, admission fees continue to be determined based on visit duration. However, they exhibit decreasing average per-minute prices, thereby encouraging longer visits and greater enjoyment of the cultural asset. This is particularly relevant from an economic perspective, since in addition to ethical considerations and the social value generated by cultural consumption (Klamer, 2014; Throsby, 2003), promoting extended visits—even at a lower average price than shorter ones—can prove beneficial for economic management. Longer visits have the potential to generate additional revenue streams for museums and heritage sites, such as increased spending in on-site restaurants or souvenir shops (Frey & Steiner, 2010).

These results are essentially of operational interest for cultural management because—noticing the existence of groups differentiated by their willingness to devote time to the visit—establishing exit prices that should be previously announced to the visitor could be feasible when complementary options are programmed to enrich the visit. It would therefore serve as a guide of exit pricing where users can gauge a longer stay, with incentives for an enriched cultural content, logically, paying a higher price. Taking up the importance attached by Sung et al. (2008) to electronic devices during the visit, various downloadable electronic guides that vary in length could be developed, ranging from basic content to more detailed and complementary explanations. Another option would be to develop "explanatory pills" so that each individual could select which ones they would like to listen to, where the final price would be calculated according to the number of pills selected. In short, the idea is to segment the permanent cultural good into club good options tailored to the interests, preferences and dedication of the different consumers. However, the operational implementation of this pricing system ultimately falls within the scope of action of managers and policy-makers, who can strategically set the exit prices and tailor the scales in a more accurate way, as well as design complementary knowledge or entertainment activities to encourage longer stays by visitors.

5 Conclusions

In a context of renewal of valuation techniques for non-market goods, this research estimates the use value of an archaeological site—the Roman Villa of La Olmeda in Palencia—on the Castilian plain of Spain. For this purpose, the travel cost technique is applied, in the zonal and individual approach, to estimate value in monetary scales, and an adaptation of the zonal approach using the time spent by visitors, as a non-monetary value scale. The case study adapts perfectly to the requirements of the two models, both because of its location—which implies forced displacement for the visit—and because of how the site is enjoyed, through the dedication of leisure time.

As expected, we found a negative relationship between the travel cost and the volume of demand, modelled by certain determinant variables such as motivation, interest in archaeology and how the trip and the visit are organised. Similarly, the existence of a trade-off between time spent and intensity of demand was found. One particularity here was that—regardless of access costs—there is a smaller group of consumers who are willing to spend more time on the visit and who are related to fans of the site, those interested in archaeology, wowed young people, and educated adults. On the other hand, there is a larger group of visitors who spend less time and who relate to the cultural heritage good in a more lax manner, as sporadic consumption and showing less clear affinity.

The valuation results of the cultural asset in terms of individual consumer surplus are estimated to range between €9.6 and €15.45, depending on the assumptions of more or less contained travel costs, but which are significantly higher than the current official box-office prices. Analysis of time spent would make it possible to establish a battery of exit prices by quotas of time spent on the visit, on the basis of the intensity differentiated and revealed by the different groups of consumers, starting from the quotation of the last quota at the official admission price. This battery is staggered in six prices between €5 and almost €45. The usefulness of this proposal is operational, as it could inspire a policy of formative enrichment of the visit, segmenting the cultural offer into club good options, quoted at different time-intensity prices, even by scaling the value of time, establishing price advantages (less than proportional increases) for longer visit times. This could be a major challenge for museum management as it involves the visitor not only in the decision to enter the museum, but also in the anticipated choice of the length of the visit.

While the study provides useful insights into the comparison of monetary and non-monetary valuation approaches, some methodological limitations should be acknowledged. First, the two valuation scales do not share a common unit of measurement, which limits direct comparability and restricts the interpretation to patterns of consistency rather than equivalence. Second, both travel cost and time spent are effort-based proxies that may be influenced by contextual constraints or behavioural factors. Finally, the results are tied to the specific context of a single archaeological cultural heritage site, which may limit the generalisability of the findings. Broadly speaking, archaeological sites follow a prescribed route, with little scope for extending the visit, whereas, for instance, fine art museums

contain greater artistic diversity, which can also lead to more varied visiting times, and might enrich the analysis. These caveats do not undermine the contribution of the analysis, but rather anticipate new challenges for cultural economic analysis, and in particular open up fresh avenues of exploration concerning the need and interest in measuring the value of cultural heritage on non-monetary scales and the policy and management implications this might give rise to.

Appendix 1. Explanatory factors of visit duration (restricted sample, excluding visitors taking guided tour)

	Visitors not taking guided tour (N = 509)	
C	Negative binomial model	Truncated negative binomial model
Variable	Coefficient (Std. Error)	Coefficient (Std. Error)
C	4.1580*** (0.0717)	4.1580*** (0.0717)
Guided tour	–	–
Organised	0.2084 (0.2639)	0.2084 (0.2639)
Consum_museum	− 0.0621**** (0.0194)	− 0.0622*** (0.0194)
Consum_performing	− 0.0150 (0.0165)	− 0.0150 (0.0166)
Consum_archaeo	0.0592*** (0.0180)	0.0592*** (0.0062)
Travel cost 1 (a)	0.0007** (0.0003)	0.0007*** (0.0003)
Studies	0.0120 (0.0136)	0.0120 (0.0046)
Age	0.0004 (0.0012)	0.0004 (0.0012)
Income	− 0.0249*** (0.0079)	− 0.0249*** (0.0079)
Gender	0.03310 (0.0341)	0.03310 (0.0341)
LR chi2	37.3400	37.3300
Prob > chi2	0.0000	0.0000
Log likelihood	2295.5167	− 2295.5033
Pseudo *R*2	0.0081	0.0081
LR test of alpha = 0 chibar2(01)	2887.9500	2887.9800
Prob > = chibar2	0.0000	0.0000
AIC	4613.033	4613.007
BIC	4659.590	4659.564

(a): analysis for Travel Cost 2 (greater expenditure) yields similar results

Source: own yelaboration. **p* value < 0.1; ***p* value < 0.05; ****p* value < 0.01

Appendix 2. Elbow method calculations for selection of *k* in *k*-means cluster

Number of clusters	Within cluster sum of squares (WCSS)
2	955,046.75
3	591,913.88
4	398,975.98
5	316,091.90
6	191,318.80
7	178,924.57
8	164,266.43
9	162,683.80

Source: Own elaboration

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Data availability The datasets generated during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest Author Luis César Herrero-Prieto has no conflict of interest to declare that are relevant to the content of this article.

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