Heritage and Wellbeing

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Executive summary

Heritage and wellbeing

This paper looks at the relationships between heritage visits and wellbeing using data from the Understanding Society survey. We look at the impacts of different types of heritage sites and impacts across different groups in society. We attach monetary values to these impacts using the wellbeing valuation approach. This is key information because when allocating scarce public resources, we would ideally like to know the costs and benefits of different allocating decisions, and ideally we would like the benefits expressed in the same monetary units as the costs so that we can see whether an intervention is 'worthwhile' using cost-benefit analysis (CBA). The study focuses on the primary benefits of heritage, which can be defined as the direct benefits for the individual's quality of life or wellbeing from visiting or participating in heritage. This is distinct from the secondary benefits of heritage, which refer to wider economic or social impacts, such as employment creation, tourism and national reputation. We acknowledge that primary benefits make up one component (albeit a major one) of the overall value of heritage to society; primary and secondary benefits are equally important components of cost-benefit analysis.

Finally, the research also looks at the main determinants of participation in heritage using the Taking Part dataset in order to derive a better understanding of the barriers to participation.

The analysis on wellbeing uses data from the Understanding Society survey, which is a large and representative sample of the UK population. Data released in January 2013 contain information on a wealth of activities relating to engagement in sports and culture. We look at the impacts on life satisfaction, a standard measure of wellbeing in the academic and policy literature (Frey and Stutzer, 2002, Frijters, 2000), of visiting eight different types of heritage during the past year:

- Archaeological site
- Historic building
- Historic industrial site
- Historic park
- Historic place of worship
- Historic town
- Monuments (castles/forts)
- Sports heritage site

We also look at whether heritage visits have larger impacts for different population groups. We look at wellbeing impacts of heritage visits by age, socioeconomic status, health status and parental status.

The analysis, as with most studies in this area, is necessarily based on observational datasets (ie, where people have not been assigned to different conditions in a controlled experimental setting). Here cause and effect relationships are *approximated* using statistical methods and causation cannot be directly inferred and future research should

consider this further. However, in line with best-practice in wellbeing analysis, we control for all of the main determinants of wellbeing in regression analysis in order to get a better understanding of cause and effect relationships. Multiple regression analysis of the type used here is one of the optimal statistical strategies for examining causal relationships in instances like this where interventions have not been randomised and this or similar types of analyses have been used extensively in the policy evaluation literature.

We feel that any bias that may impact on our estimates of causality is likely to be *positive.* Casual estimates may become biased if there are factors that we cannot control for that drive heritage participation *and* that impact on wellbeing as well. If any such factors exist we believe that they are likely to be positive influences - ie, they are factors that both make it more likely that some people engage in heritage and that make them happy or more satisfied with their life anyway (eg, this could be due to that person's upbringing). In such circumstances, some of the observed positive relationship between heritage participation and wellbeing would be due to that person's upbringing and not wholly due to the act of engaging in heritage. Also, we may encounter additional positive bias due to reverse causality, whereby higher wellbeing causes heritage participation rather than the other way around (ie, people who feel happy are more likely to go out to visit heritage sites). We discuss the problem of reverse causality and the implications for this study in more detail below.

We, therefore, recommend that the impact and value estimates derived in this study be seen and used as <u>upper-bound</u> estimates of the impact of heritage participation on wellbeing.

Results

We find that visiting heritage in general over the past 12 months (visiting one or more of the eight different types of site) has a significant positive relationship with life satisfaction after controlling for the main determinants of life satisfaction. We find that the relationship with heritage is slightly higher than the impacts of participating in sport and the arts. As contextual information, according to analysis of the latest wave of the Taking Part dataset (2013) by DCMS 78% of adults in England engage with arts, 54% visit a museum or gallery, 36% visit a public library and 73% visit heritage sites[1].

When we look at the effects of different heritage types on their own we find that historic parks/gardens, monuments and sports heritage sites have a statistically insignificant effect on life satisfaction. Of the remaining five sites their impact in rank order of coefficient size is:

1. Historic town
2. Historic building
3. Historic industrial site
4. Historic place of worship
5. Archaeological site

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297762/Taking_Part_2013_14_Quarter_3_Report.pdf

Note that these rankings are purely in terms of coefficient size, which is our best estimate of the magnitude of impact. The impact sizes themselves may not all be statistically different from each other.

The results suggest some evidence that the following groups derive *higher* wellbeing benefits from heritage participation, but the differences were not statistically significant and hence they should be tested with larger sample sizes when more data become available:

- People with a long-standing illness or disability (compared to healthy people)
- People in 'blue-collar' occupations (compared to other occupations)
- People over 45 years of age (compared to people under 45)
- People without children (compared to parents)

Valuing heritage visits

We use these results to attach monetary values to heritage visits using the wellbeing valuation approach. We assess the amount of money we would have to *take away* from someone who visits heritage sites to return them to the level of wellbeing they would have had they not visited the sites. This is a standard measure of value used in CBA and is related to the notion of willingness to pay.

Visit type	Annual value (per person)
Heritage overall	£1,646
Historic town	£1,464
Historic building	£1,342
Historic industrial site	£1,096
Historic place of worship	£972
Archaeological site	£847

These represent values per person per year for the average number of heritage visits per year (3.4 visits) in the Understanding Society dataset. They should be seen as *use values* since we have estimated them from the relationship between using (ie, visiting) heritage and wellbeing. "Use values relate to actual use of the good in question (e.g. a visit to a castle), planned use (a visit planned in the future) or possible use". Heritage can also have *non-use* value to individuals, which refers to the value attached to maintaining some good in existence even though there is no actual, planned or possible use. This could be, for example, "an altruistic value, which might arise when the individual is concerned that the good in question should be available to others in the current generation. Or a bequest value, which is similar but the concern is for future generations" (OECD, 2006 p.86).

The determinants of heritage visits

When looking at the determinants of heritage participation using the Taking Part dataset lack of time, transport, costs and poor health are some of the main reasons reported for not visiting heritage sites. This is broadly supported by statistical analysis of the drivers behind heritage visits. The statistical analysis also shows that men, younger people, parents and poorer people are less likely to go to heritage sites.

Discussion

The findings of this study have implications for policy and future research. It creates a positive foundation and argument for the role of heritage in society and provides figures that can be used directly in CBA to inform investment decisions in heritage, but the caveats regarding causality should be noted when using the results and the results should be seen as upper-bound estimates. Experimental studies - where participation in (or encouragement to participate in) heritage is randomised - will provide the best evidence on cause and effect, but they are difficult to undertake in practice in the cultural sector. However, as new waves of Understanding Society and Taking Part become available we will be able to use the longitudinal aspect of the data to better understand causality between heritage and wellbeing.

1. Introduction

Measuring and understanding the impact of policy interventions on quality of life or wellbeing is a central part of government policy-making in the UK and many other OECD countries; it forms the underlying foundation of the *Economic case* and cost-benefit analysis (CBA) in the HM Treasury Green Book [2].

CBA compares the overall benefits of an intervention against its costs in monetary terms, where value is measured as the amount of money that would have the equivalent impact on a person's welfare as the policy does. Economists have traditionally measured people's welfare in terms of the extent to which their preferences are satisfied. This is the *preference satisfaction* account of welfare, based on the notion that "*what is best for someone is what would best fulfil all of his desires*"(Parfit, 1984 p.494).

Under the preference satisfaction account the values of non-market goods can be estimated through people's willingness to pay (WTP) for these goods or willingness to accept (WTA) a payment in compensation for not receiving these goods in actual or hypothetical markets using respectively either revealed preference (RP) or stated preference (SP) valuation techniques.

RP techniques involve inferring the implicit value that people place on non-market goods or services by examining their actual market behaviour and transactions. For example, house prices can be used to infer values for a range of factors related to the localities in which houses sit, such as access to good schools, green space and the presence of local historic assets, in so far as they impact on local house prices. SP techniques use specially constructed questionnaires which describe a hypothetical choice in order to obtain estimates of the WTP for or WTA to avoid a particular outcome.

Research in psychology and behavioural economics over the last few decades has explored the role of preferences in CBA and policy evaluation more generally. One of the fundamental problems emerging from this literature can be summarised as the *context sensitivity* of preferences – a growing literature has shown that preferences can be context-dependent; people may reverse their preferences/choices and preferences can often be biased by irrelevant factors, which means that what people want may not always align well with what is best for them (see Slovic and Lichtenstein, 2006). In SP contexts survey-related biases may lead to strategic bias (people may strategise to affect policy, say, by stating an extremely high value in order to encourage policy makers to provide the good) and protest values (when even though they value the good highly, people state a zero WTP out of protest because they don't believe the government should be intervening in the particular issue or are put off by the thought of being asked to place a monetary value on the good) (see Fujiwara and Campbell, 2011). The latter may be an important consideration for the valuation of heritage sites using SP methods.

[2] HM Treasury. *ASSESSING BUSINESS CASES 'A SHORT PLAIN ENGLISH GUIDE'. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/190609/Green_Book_guidance_short_plain_English_guide_to_assessing_business_cases.pdf*

These and other related biases are, of course, well-known and documented by the SP literature and by practitioners and a number of studies have sought to derive solutions to these preference anomalies and informational problems. For example, two editions of the journal 'Environmental and Resources Economics' (in 2005 and 2010) are dedicated to methods that have been developed to deal with preference anomalies in SP studies. One key mechanism or solution is through learning by repetition and experience. The work is based on Plott's (1996) Discovered Preference Hypothesis (DPH). DPH argues that stable and consistent preferences are the product of experience gained through repetition. There are a number of studies that report reductions in the effects of anomalies, such as preference reversals, as people become familiar with the good and the institutional payment arrangements in a SP survey setting (Bateman et al., 2006, Braga and Starmer, 2005, Bruni and Sugden, 2007). Bateman et al. (2006) have recently used virtual reality simulators to communicate environmental changes to survey respondents in SP surveys. Furthermore, some CV surveys have employed deliberative workshop-formats, whereby people discuss the valuation issues with others and they can seek further information from moderators and experts (Gregory et al., 1993, Hanley and Shogren, 2005). Also background information about the survey respondents and their opinions towards the non-market good can be used to identify protest and strategic valuations.

This study proposes a new approach to non-market valuation, known as Wellbeing Valuation, that relies on people's self-reported wellbeing and that offers a solution to many of the anomalies observed in preference-based valuation methods, but which as we discuss below comes with its own set of problems and criticisms.

Self-reported wellbeing data have been gaining popularity in economics. Rather than seeking whether the policy satisfies people's preferences, we can look more directly by assessing whether the policy has impacted on people's actual wellbeing as reported by them - ie, their subjective wellbeing (SWB) - and by using the wellbeing valuation method we can attach monetary values to these impacts for the purposes of CBA. In this respect SWB data offer a new method for valuing non-market goods and outcomes. As we discuss below there are certain advantages to wellbeing valuation over traditional preference valuation methods, but there are also some problems that we should be aware of.

This paper looks at the relationships between heritage visits and SWB using data from the Understanding Society survey. We look at the impacts of different types of heritage sites and impacts across different groups in society. We attach monetary values to these impacts using the wellbeing valuation approach for use in CBA and policy evaluation. Finally, the research also looks at the main determinants of participation in heritage using the Taking Part dataset in order to derive a better understanding of the barriers to participation.

2. Heritage and wellbeing

2.1. Literature review

Our literature review unearthed very few studies on heritage and wellbeing. The literature has focused mainly on health benefits (where wellbeing is portrayed as one broad measure of health). An exception is Bickerton and Wheatley (2014, forthcoming) who, also using the Understanding Society dataset. They used regression analysis to investigate the links between wellbeing and participation in arts, culture, heritage, and sports. They found that visiting historical sites had a statistically significant impact on wellbeing which was similar to attending arts events and larger than for visiting museums, but less than that for playing sports.

In other studies Thompson et al. (2011) randomly assigned 250 hospital patients to one of two groups. The first group was given a range of heritage objects selected from the University College London Museums and Collections to hold and examine. The second group was given photographs of the same objects. Well-being was measured using the Positive and Negative Affect Scale (PANAS), a list of 10 positive and 10 negative mood adjectives, and the Visual Analogue Scale (VAS). The results showed that handling the objects had a statistically significant positive effect on wellbeing when compared with the control group. Repeat studies have been conducted by Paddon et al (2013) and Ander et al (2012), each finding similar beneficial effects of object-handling.

Lanceley (2012) explores the link between heritage-object handling amongst women facing cancer in a qualitative study. In the study ten participants conversed with a nurse specialist whilst handling heritage objects. By using psychotherapeutic techniques the conversations focused on how the women 'used' the objects. The heritage objects were found to aid discussions with the potential to provide a platform for therapeutic work that may improve the women's coping and wellbeing.

Further afield, but still within the cultural sector, other studies have looked at the relationship between museums and cultural activities (eg, arts, dancing, singing) and wellbeing and have tended to find a positive relationship using regression analysis with large national datasets such as Taking Part (Matrix, 2010, Fujiwara, 2013a, Fujiwara et al., 2014) and qualitative approaches using focus groups and in-depth interviews (Packer, 2008; Binnie, 2010).

2.2. Methodology

In this part we discuss our approach to the statistical analysis. A common approach to analysing the determinants of wellbeing in both the academic and policy literature has been through use of statistical methods such as regression analysis with large national datasets. We use regression analysis to estimate the impact that our variables of interest (heritage participation and income) have on life satisfaction. Regression allows us to control for other important determinants of life satisfaction in the model so that we can make better informed claims about the direction of cause and effect. For instance, it may be that higher income groups are more likely to visit heritage sites and we know that income has a positive effect on life satisfaction too. Therefore, any observed positive relationship between heritage visits and life satisfaction will be due to

some extent to income rather than solely being the effect of heritage participation. Regression analysis allows us to control for confounding factors[3] like income, education, health and so on, in order to make more precise claims about the effect of heritage participation on life satisfaction, but as we discuss below, we can never be entirely confident that our estimate of the effect of heritage participation on life satisfaction is not biased to some extent by third factors that confound the relationship. The following sections describe the methodology in more detail.

2.2.1. Statistical analysis

There are three aspects of the analysis. First, we look at the relationship between visiting heritage sites and SWB. Here we look at visiting heritage sites in general and specific heritage visits. Second, we look at differential impacts of heritage visits on SWB by different population groups. We look at health, parental status, age and socioeconomic group as differentiating factors. And thirdly, we use results from these analyses to derive monetary values associated with heritage visits using the wellbeing valuation approach.

In order to estimate the impact and value of engagement in heritage we need to estimate the impact that heritage visits and income[4] have on SWB - in line with the wellbeing valuation literature we focus on life satisfaction as our measure of SWB. Indeed, we could use any measure of SWB, such as happiness, but life satisfaction is preferred here since most of the wellbeing valuation literature to date has used this measure and there is good evidence to support the notion that life satisfaction can tell us something meaningful about people's wellbeing and how their lives are going. Life satisfaction has convergent validity: for example, Sandvik et al. (1993) demonstrate that there is a strong positive correlation between life satisfaction and emotions such as smiling and frowning. Urry et al. (2004) show that reports of life satisfaction are correlated with activity in the left pre-frontal cortex of the brain, which is the area associated with sensations of positive emotions and pleasure. Furthermore, life satisfaction is a good predictor of health, such as heart disease, strokes and recovery from viruses and wounds (for more details see Fujiwara and Campbell, 2011). There is also evidence that life satisfaction has content validity: Krueger and Schkade (2008) find that life satisfaction responses have sufficiently high retest reliability.

The wellbeing literature has traditionally employed single-equation models in regression analysis like the one set out in equation (1):

$$LS_i = \alpha + \beta_1 M_i + \beta_2 H_i + \beta_3 X_i + \varepsilon_i \qquad (1)$$

where LS_i is life satisfaction for individual i ; M_i is income; H_i is heritage participation; and X_i is a vector of other determinants of life satisfaction. We estimate equation (1) using the Understanding Society dataset, which contains data on heritage participation and SWB. In the analysis heritage participation (H_i) will be represented by (i) a variable denoting whether the individual has visited *any* heritage site in the last year and (ii) a vector of variables covering whether the individual has visited a specific type of

[3] Confounding factors are those that drive changes in the *both* the outcome variable and the variable of interest.

[4] The estimate of the impact of income on SWB is used to derive monetary values for heritage participation. The valuation methodology is described in detail below.

heritage site. To study differential impacts by population type we re-run equation (1) using split-samples – ie, we run equation (1) for different age groups and so on. The rationale for this approach is set out below.

In X_i we control for the main determinants of life satisfaction as set out in Fujiwara and Campbell (2011) [5]:

- Household income
- Health status (including diet)
- Marital status
- Employment status
- Social relationships
- Gender
- Age
- Geographic region
- Religion
- Education

The data are described in greater detail below. All life satisfaction models in this paper are estimated using ordinary least squares (OLS) regression analysis[6].

The analysis, as with most studies in this area, is necessarily based on observational datasets (ie, where people have not been assigned to different conditions in a controlled experimental setting). Here cause and effect relationships are *approximated* using statistical methods and causation cannot be directly inferred and future research should consider this further. However, in line with best-practice in wellbeing analysis, we control for all of the main determinants of wellbeing in regression analysis in order to get a better understanding of cause and effect relationships. Multiple regression analysis of the type used here is one of the optimal statistical strategies for examining causal relationships in instances like this where interventions have not been randomised and this or similar types of analyses have been used extensively in the policy evaluation literature.

We feel that any bias that may impact on our estimates of causality is likely to be *positive.* Casual estimates may become biased if there are confounding factors that we cannot control for that drive heritage participation *and* that impact on wellbeing as well. If any such factors exist we believe that they are likely to be positive influences - ie, that they are factors that both make it more likely that some people engage in heritage and that make them happy or more satisfied with their life anyway (eg, this could be due to unique aspects of that person's upbringing). In such circumstances, some of the

[5] We also attempted to include ethnicity in the wellbeing regression but responses to the ethnicity question in Understanding Society are low which meant that we would lose a lot of observations from the regression model. Ethnicity is therefore excluded as a control variable but it should be noted that its effects will get captured to a large extent by other socio-demographic variables in the model.
[6] This assumes that the life satisfaction reporting scale (1 to 7) is cardinal. Ferrer-i-Carbonell and Frijters (2004) show that it makes little difference in wellbeing models whether one assumes cardinality or ordinality in the wellbeing variable and hence for ease of interpretation we use OLS (as is standard in much of the literature).

observed positive relationship between heritage participation and wellbeing would be due to that person's upbringing and not wholly due to the act of engaging in heritage. Also, we may encounter additional positive bias due to reverse causality, whereby higher wellbeing causes heritage participation rather than the other way around (ie, people who feel happy are more likely to go out to visit heritage sites). We discuss the problem of reverse causality and the implications for this study in more detail below.

We, therefore, recommend that the impact and value estimates derived in this study be seen and used as <u>upper-bound</u> estimates of the impact of heritage participation on wellbeing.

2.2.2. Wellbeing valuation

Background

The wellbeing valuation (WV) approach derives monetary values for non-market goods and services, like health, heritage and education, by estimating the amount of money required to keep individuals just as happy or satisfied with life in the absence of the good (ie, to keep their wellbeing constant). This is the fundamental idea that underlies welfare economic theories of value such as compensating and equivalent surplus.

Here we derive estimates of compensating surplus (CS) for heritage participation. *CS is the amount of money, paid or received, that will leave the individual in his initial welfare position following a change in the (level of a) good/service.* CS is the most widely used measure of value in CBA and is akin to the notion of willingness to pay. It is important to note, however, that values derived using WV should not generally be seen as *actual amounts* that people would be willing to pay. This is because we have not looked at people's preferences, which form the basis of purchasing decisions and market behaviour. This does not discredit the results derived from WV approach – they are simply values derived from a different theoretical measure of welfare and as we show in the Annex they are estimates of monetary value that are consistent with economic theory.

We have noted that there exist a number of problems related to preference-based valuation methods and have discussed some of the proposed solutions in the literature to date. The WV approach in itself offers a number of further solutions. First, in WV we are not reliant on a proxy market to reveal a value as in the RP method. Indeed, the WV approach can work in cases where proxy markets do not exist or where they are not in equilibrium.

Second, the WV method avoids asking people directly about their WTP/WTA and so protest and strategic responses are not a problem. SWB data are used with statistical analysis to assess how different events, activities and conditions (such as heritage participation) impact on people and their lives as they experience them and we can attach values to these impacts without having to ask people about how they think their lives would be or how much they think they would pay for something. This is a significant advantage of WV because, in many circumstances when we ask people how much they think they would pay they are unable to predict correctly how much they will adapt or get used to certain conditions and events and they tend to focus on salient aspects of the phenomenon, which do not matter so much in their actual experiences.

On the flipside, however, WV comes with its own set of problems and criticisms that should be noted and acknowledged when using and interpreting the results. For example, wellbeing responses can also be heavily influenced by contextual factors such as question order and the weather on the day (Schwarz and Clore, 2003, Schwarz and Strack, 1999), they may not reflect our experiences of events at the time (due to problems of accurate retrospection) (Kahneman, 2000, Kahneman et al., 1993) and single-item measures, such as life satisfaction and happiness, may not be broad enough to tap into or reflect all that is important to our lives (Loewenstein and Ubel, 2008). Furthermore, there are a number of technical challenges associated with deriving values from SWB data. These are discussed below and some possible solutions are offered.

This paper provides the first study of WV with heritage sites. It focuses on the *primary benefits* of heritage, which can be defined as the direct benefits for the individual's quality of life or wellbeing from visiting or participating in heritage. This is distinct from the *secondary benefits* of heritage, which refer to wider economic or social impacts, such as employment creation, tourism and national reputation. The present study, therefore, is not concerned with the economic benefits of heritage, rather it assesses the value of heritage from the perspective of people's quality of life. And we acknowledge that this is only one component (albeit a major one) of the overall value of heritage to society; primary and secondary benefits are equally important components of cost-benefit analysis.

Methodology

The WV approach uses the outputs from equation (1) (or similar statistical models) to derive values associated with non-market goods like heritage participation. This, in essence, can be achieved by using the estimates of the coefficients for income and the non-market good (respectively β_1 and β_2 in equation (1)). β_1 represents our estimate of the effect of income on life satisfaction and β_2 represents our estimate of the effect of heritage participation on life satisfaction. The ratio of these two figures is an estimate of the value of heritage participation because it shows how much extra income is required to have the same impact on life satisfaction as heritage participation does. Put another way, it is the amount of money required to keep individuals just as satisfied with life in the absence of participating in heritage (ie, to keep their wellbeing constant).

Value of heritage participation = β_2 / β_1 (2)

The technical background and details of the statistical methodology employed in the WV analysis are set out in Annex A.

2.3. Data

In the wellbeing analysis we use two UK datasets. Data on heritage participation for equation (1) come from Wave 2 of Understanding Society (2010-2011), which is a nationally representative sample of 40,000 households conducted annually in a panel format. Wave 2 of Understanding Society includes for the first time a wide variety of variables related to cultural engagement, taken from the DCMS Taking Part survey.

Hence we will use Wave 2 as a cross-sectional dataset in the analysis. Understanding Society asks whether individuals had visited any of the following eight types of heritage site in the past 12 months:

- Archeological site
- Historic building
- Historic industrial site
- Historic park
- Historic place of worship
- Historic town
- Monuments (castles/forts)
- Sports heritage site

The analysis of income and SWB for the WV model (see Annex A for details) is based on data from the British Household Panel Survey (BHPS). The BHPS is a nationally representative sample of over 10,000 adult individuals conducted between September and December of each year from 1991. Respondents are interviewed in successive waves, and all adult members of a household are interviewed. The life satisfaction question was added to the BHPS in 1997. These surveys (and analysis) can be used together because the BHPS is the predecessor to Understanding Society (Understanding Society contains more variables and a larger sample size) and the BHPS sample has now been merged in to Understanding Society, hence they are both nationally representative surveys of the UK (with significant overlap in the actual samples). We use the BHPS here to analyse income and SWB because it contains greater detail on income than Understanding Society (conversely data on heritage participation is not available in the BHPS).

A description of the data can be found in Annex B.

2.4. Results

A range of standard model checks were performed on the data such as tests for multi-collinearity and influence/existence of outliers. These tests are briefly described in Annex C. Footnote 8 provides some guidance on how to interpret the results from the statistical models shown in Table 1.

2.4.1. Heritage and wellbeing

Heritage visits in general

Visiting heritage sites in general over the past 12 months (visiting one or more of the eight different types of site) is significantly and positively related to life satisfaction (after controlling for the main determinants of SWB as per best-practice). We find that the effect for heritage is slightly higher than the impacts of participating in sport and the arts, although it should be noted that the differences are not statistically significant. The

results for sport and arts closely replicate the findings from Fujiwara et al. (2014)[7] and Bickerton and Wheatley (forthcoming)[8].

Table 1. Heritage participation and life satisfaction [9]

Dep var Life satisfaction	Coefficients	St. Error
Age	-0.049***	0.004
Age-squared	0.001***	0
Employed	0.247***	0.033
Retired	0.537***	0.049
Student	0.303***	0.056
Male	0.007	0.02
Log-Income	0.129***	0.016
Married	0.212***	0.027
Divorced	-0.113**	0.047
Widowed	-0.216***	0.063
Separated	-0.364***	0.078
High Education	-0.008	0.02
Wales	0.009	0.047
Scotland	-0.007	0.036
NI	0.097**	0.047
London	-0.142***	0.038
Can rely on friends	0.305***	0.02
Poor Health	-0.393***	0.011
Religious	0.008	0.02
Freq. of drinking alcohol	0.003	0.006
Freq. of eating fruit and veg	0.025***	0.007
Plays sport	0.047*	0.024
Participates in arts	0.056	0.047
Visits any type of heritage	0.079***	0.025
Constant	5.380***	0.16
N	21,403	
R-sq	0.17	

[7] Note, however, that participating in the arts is not significant in the model here, but it was only just significant at the 10% level in Fujiwara et al. (2014).

[8] Note that Bickerton and Wheatley (2014) use an Ordered Probit model and input mean values for missing variables (rather than deleting them as is done here) so the coefficient sizes cannot be directly compared to the results in Table 1.

[9] **Coefficients** indicate a positive or negative relationship with life satisfaction of the variable in question. The size of the coefficient represents the impact in absolute terms on life satisfaction (measured on a seven-point scale). For example, Table 1 shows that being employed increases one's life satisfaction by 0.247 points. The **standard error** is a measure of the precision of the coefficient estimate. **Statistical significance** uses information on the standard error to assess whether the observed association between the variable of interest and life satisfaction (as demonstrated by the size of the coefficient) is not just purely down to chance. The significance test assesses the likelihood of observing the reported relationship between the two variables if no relationship actually existed (known as the null hypothesis). The lower the probability, the more confident we are that a relationship actually exists. In Table 1 we show when a coefficient has a probability of less than 1%, 5% and 10% of being observed if there were actually no relationship between the variables.

*Notes: *** significance at <1%; ** significance at <5%; * significance at <10%. OLS cross-sectional regression analysis. Footnote 8 provides some guidance on how to interpret the results in Table 1.*

Different types of heritage site

We also assessed the impact of visiting heritage by different types of heritage site. We ran eight separate regression models for the following eight heritage visits (controlling for the same other explanatory variables in Table 1):

- Archeological site
- Historic building
- Historic industrial site
- Historic park
- Historic place of worship
- Historic town
- Monuments (castles/forts)
- Sports heritage site

Five out of the eight types of site were statistically significant (all eight types of site had a positive relationship with life satisfaction). Visits to historic parks/gardens, monuments and sports heritage sites were insignificant and we note that historic parks/gardens has a low coefficient compared to the other heritage variables. It is not clear from the regression results or variable definition why this should be the case, but it should be noted that the 5% confidence interval for historic parks/gardens (-0.033 , 0.048) does contain the value of the coefficients for the other two insignificant heritage variables and hence, it is not statistically possible to reject the hypothesis that the impact on wellbeing from visiting historic parks or gardens is equal to that for monuments (castles / forts) or sports heritage sites.

Among the statistically significant heritage variables we found that visits to the following types of heritage are associated with increases in life satisfaction (in rank order of effect size[10]).

- ✓ Historic town
- ✓ Historic building
- ✓ Historic industrial site
- ✓ Historic place of worship
- ✓ Archeological site

Table 2. Visits to different types of heritage and life satisfaction

Heritage variable	Coefficients	St. Error
Historic town/city	0.070***	0.021
Historic building	0.064***	0.021
Historic park/garden	0.007	0.021
Industrial heritage site	0.052**	0.022

[10] Note that these rankings are purely in terms of coefficient size, which is our best estimate of the magnitude of impact. The impact sizes themselves may not all be statistically different from each other.

Place of worship	0.047**	0.022
Monument (castle/fort)	0.021	0.02
Archaeological site	0.040*	0.024
Sports heritage site	0.025	0.038

*Notes: *** significance at <1%; ** significance at <5%; * significance at <10%. Models run separately for each heritage variable. All other explanatory variables (from Table 1) are controlled for but not shown.*

Heritage visits for different population groups

We estimate the impact of heritage participation across different population groups, which assesses the extent to which there are heterogenous wellbeing impacts of heritage participation. We look at differential impacts on wellbeing by age, accessibility, socioeconomic status and parental status. For accessibility we would have liked to have focused on people with mobility issues (relevant to the topic of improving access to heritage), but responses to the mobility question are too low in Understanding Society to run regression models with sufficient sample size. We therefore look at whether people report a long standing illness or disability as a proxy for having accessibility issues.

This is undertaken using split-sample analysis rather than interactive variable models. Split-sample analysis runs the wellbeing model for different sample groups rather than interacting heritage visits with the population characteristic in question. This means that split-sample models are equivalent to full sample models where all of the explanatory variables are interacted. The benefits of split-sample methods are that (i) the results are easier to interpret (there is no need to add coefficients together) and that (ii) using interactive models relies on having a good working knowledge of all possible interactive effects in the model if one does not decide to interact all variables. To be cautious we use split-sample methods which interact all variables for lack of a priori evidence that some variables should be interacted and others not. T-tests performed on the difference in coefficient sizes across the split-samples were not significant for any of the categories, indicating that there are no statistical differences in the results across different population groups.

The results suggest, therefore, that there may be some evidence that the following groups derive higher wellbeing benefits from heritage participation, but this should be tested with larger sample sizes when more data become available to discern statistically significant differences:

- People with a long-standing illness or disability (compared to healthy people)
- People in 'blue-collar' occupations (compared to other occupations)
- People over 45 years of age (compared to people under 45)
- People without children (compared to parents)

Table 3 shows the coefficient sizes (associations with life satisfaction) for general heritage visits (to any of the eight site types) by different population groups.

Table 3. Heritage visits and life satisfaction by different population groups

Health	Coefficients	St. Error

Disability/health limits	0.101**	0.046
No health limits	0.067**	0.029
Socioeconomic status		
Employer/Manager/Professional	0.035	0.062
Otherwise	0.076**	0.034
Age		
Over sample median age (>45)	0.105***	0.037
Under sample median age (<45)	0.052	0.033
Parental status		
No children	0.079***	0.029
Parent	0.059	0.048

*Notes: *** significance at <1%; ** significance at <5%; * significance at <10%. Models run using split-samples separately. All other explanatory variables (from Table 1) are controlled for (but not shown). T-tests for the differences in coefficient sizes across the split-sample models were not statistically significant.*

2.4.2. Wellbeing valuation of heritage visits

The wellbeing impacts estimated in Tables 1 to 3 can be used to derive values using the WV approach as described in Annex A. We assess the amount of money we would have to *take away* from someone who visits heritage to return them to the level of wellbeing they would have had they not visited heritage sites/areas. As discussed, this is the concept of compensating surplus and is related to the notion of willingness to pay. We attach values to heritage variables that were statistically significant (at the 10% level) in Tables 1 to 3, but for completeness we also show values for the insignificant heritage variables, although recommend against using the latter in impact assessments and CBA since they are not statistically significant.

The results for heritage visits from Tables 1 to 3 are used as estimates of β_2 in equation (A7) in Annex A for valuation. The estimate for income (β_1) comes from data on lottery winners as discussed in Annex A. Note that we use a non-linear form for the income variable to account for the diminishing marginal utility of income and hence the actual calculation of value (CS) in equation (2) becomes a little more involved. This is discussed in Annex A.

Table 4. Value of visiting heritage sites

Visit type	Coefficient	Value
Significant variables		
Heritage overall	0.079	£1,646
Historic town	0.07	£1,464
Historic building	0.064	£1,342
Historic industrial site	0.052	£1,096
Historic place of worship	0.046	£972
Archaeological site	0.04	£847
Insignificant variables		
Sports heritage	0.025	£533
Castles/forts	0.021	£449

Historic park/garden	0.007	£150

Notes: For completeness we show values for the insignificant heritage variables as well.

Table 5. Value of visiting heritage sites by population group

Health	Coefficients	Value
Disability/health limits	0.101**	£2,085
No health limits	0.067**	£1,403
Socioeconomic status		
Employer/Manager/Professional	0.035	£743
Otherwise	0.076**	£1,585
Age		
Over sample median age	0.105***	£2,164
Under sample median age	0.052	£1,096
Parental status		
No children	0.079***	£1,646
Parent	0.059	£1,240

Notes: Values are for visiting any heritage site(s). For completeness we show values for the insignificant variables as well.

These represent values per person per year. Note that the coefficient size (and monetary value) of heritage overall is marginally larger than any of the single heritage sites on their own (*heritage overall* is a composite variable made up of all of the types of heritage site). This is because frequency of visits for *heritage overall* will be higher than frequency of visits for any single type of heritage site.

Although three types of heritage site (sports, castles/forts, parks/gardens) were statistically insignificant, for completeness we show the values for them at the bottom of Table 4.

The values in Table 4 should be seen as *use values* since we have estimated them from the relationship between using (ie, visiting) heritage sites and wellbeing. "Use values relate to actual use of the good in question (e.g. a visit to a castle), planned use (a visit planned in the future) or possible use". Heritage can also have *non-use* value to individuals, which refers to the value attached to maintaining some good in existence even though there is no actual, planned or possible use. This could be, for example, "an altruistic value, which might arise when the individual is concerned that the good in question should be available to others in the current generation. Or a bequest value, which is similar but the concern is for future generations" (OECD, 2006. p.86).

The values are representative for the average person for the average number of heritage visits per year. Table 6 describes the sample mean and median values for a range of demographic and socio-economic variables from the Understanding Society data to provide more information on the 'average person'.

Table 6. Sample characteristics of the Understanding Society data

Characteristic	Sample mean	Sample median
Age	47	46

Gross household income (monthly)	£3,646	£2,888
Visited heritage sites in last 12m	63%	N/A
Number of heritage visits per year	3.4	3
Have a degree	42%	N/A
Married	50%	N/A
Employed	54%	N/A
Life satisfaction (scale of 1-7)	5.2	6
Number of children	0.54	0

Notes: Employment status shows percentage employed compared to all other labour force status categories (includes inactive, unemployed, retired, long term sick and students).

As comparators we look at the value for participating in sport and the arts and visiting libraries from Fujiwara et al. (2014):

- The value for playing sport is £1,127 per year per person.
- The value for participating in the arts is £1,084 per year per person.
- The value of visiting libraries frequently is £1,359 per year per person.

The findings from this paper and Fujiwara et al. (2014) suggest that most types of sporting and cultural activity have broadly the same level of value of around £1,000 - £2,000 per person per year. Note that the value of sport based on the results from Table 1 is £993 per person per year, which is very similar and not statistically different to the value of sport estimated by Fujiwara et al (2014).

The current study suggests that visiting heritage sites has a slightly larger value than sport and other forms of culture (although this is not a statistically significant difference).

3. Determinants of heritage participation

3.1. Literature review

The Centre for Economic and Business Research (CEBR) (2007) used the Taking Part dataset to assess the factors associated with an increased likelihood of attending heritage sites. The top three factors that increase the probability of attending are: (i) being taken to heritage sites as a child; (ii) being a volunteer; and (iii) access to a car in the household. Other important positive drivers are socio-economic class, high education and good health. Contrasting this, ethnic minorities are less likely to visit.

There is an inverted U-shaped relationship with age, where attendance rises to a peak during 45-64 years and then wanes beyond this point. Regional variations appear between more urban and rural areas, with attendance in London being significantly lower than the South or East of England.

Wineinger (2011) employs a similar methodology to understand the key drivers of heritage attendance, breaking down the analysis by type of heritage site, again using the Taking Part dataset. He uses the 2007/2008 wave of Taking Part and a sample size of about 25,000.

The main drivers were found to be whether respondents had also visited museums or galleries and whether they had car access and internet access. On top of this living with a partner, being taken to heritage sites as a child and being older were found to increase the likelihood of participating.

There were also factors that were found to reduce the likelihood of going to heritage sites. The main ones were living in social housing and watching 5+ hours per day of television. Being an ethnic minority and having lower levels of education also reduced likelihood and in terms of access, disability was found to reduce the probability of visiting a park/garden but not other heritage sites. Income was found to be insignificant as a driver. The suggestion is that the effect is via socio-economic background rather than income itself.

Taken together these two studies have several commonalities, which is unsurprising given the similar data and methods. A consistent finding is that there is higher attendance amongst those from higher socio-economic classes, white and aged 45-64. Access was also found to be a factor, with car access and being located closer to heritage sites increasing the probability of attending. Income was not found to increase heritage participation in most cases.

3.2. Methodology, data and results

This part of the research relies solely on the Taking Part dataset. This is because we are not reliant on having any particular measure of wellbeing for the analysis (we do not need any wellbeing variables) and Taking Part allows us to exploit a larger sample size and a much richer set of heritage variables.

The Taking Part survey is commissioned annually by the Department for Culture Media and Sport (DCMS). Taking Part surveys around 14,000 adult individuals per year (as of 2011) from 2005 as a repeated cross-section survey and asks a wide range of questions on involvement and attitudes concerning arts, culture and sport. Taking Part is a representative sample of the population in England. In this paper we use five waves of the data (2005 – 2011), which results in a sample size of about 100,000 individuals for the statistical analysis. Descriptions of the variables used from Taking Part can be found in Annex B. We employ two different methods.

(i) Descriptive analysis of people's stated reasons

A unique aspect of Taking Part is that people are asked what they perceive to be the main barriers to visiting heritage sites. We can use descriptive statistics to rank these self-reported barriers and compare them against findings from the statistical analysis that we shall also undertake in (ii). Table 7 ranks the top self-reported barriers in terms of the frequency with which they are stated.

Table 7. Top 10 self-reported barriers to visiting heritage sites

Barrier	% reporting factor as a barrier
Difficult to find time	32%
Not really interested	31%

Health isn't good enough	17%
Lack of transport	9%
Never occurred to me	7%
It costs too much	6%
I wouldn't enjoy it	3%
Not enough info on what's available	2%
No one to go with	2%
Have been in past/no need to go again	1%

(ii) Statistical analysis

We revisit Wineinger's analysis (2011), but with some additions and changes. We run a logit model to estimate the impacts of different factors on likelihood of visiting heritage sites. We look at probability of visiting any type of heritage site. This generally replicates Wineinger's econometric methodology closely, but we make two changes. First, rather than looking at three different types of heritage visits we look at whether the individual visited any of the eight heritage sites in the data. Second, we use five waves of the Taking Part data to maximise sample size and increase generalisability of the results.

We also included variables that align with the variables we used in the heterogenous effects models (ie, parental status, disability, socio-economic class, age) and a richer set of employment status variables. We tried to add two potentially important additional control variables in the model: (i) time taken to travel to heritage sites, which we think is an important determinant of visit probability and may have significant impacts on the statistical analysis; and (ii) people's views on the importance of heritage sites. However, response rates for these two questions in Taking Part are low meaning that the full regression models could not be implemented.

Table 8. Determinants of heritage visits

Dependent Variable: Heritage_overall	Coefficient	Std. error
Male	-0.257***	0.026
Age	0.037***	0.004
Age-sq	-0.000***	0.000
Live couple	0.183***	0.026
Children	-0.139***	0.029
Income	0.030***	0.005
White	0.502***	0.033
Socioeconomic	0.248***	0.029
Housing	-0.249***	0.037
Some HE	0.354	0.301
Alevels	0.118	0.300
Trade	-0.101	0.303
High gcse	-0.038	0.300
Low gcse	-0.230	0.301
Degree	0.555*	0.300
Other qual	-0.193	0.303
No qual	-0.426	0.299
Internet	0.181***	0.029

Car	0.237***	0.031
Disability	-0.094***	0.027
Radios	0.226***	0.024
Hightv	-0.523***	0.033
Historytv	0.540***	0.025
Arttv	0.488***	0.041
Heritage_web	1.078***	0.036
Theatre	1.101***	0.373
Parents_museum	0.148***	0.038
Parents_heritage	0.391***	0.036
Parent_enc_perform	-0.034	0.030
Religious	0.139***	0.029
PT employed	0.113*	0.062
FT employed	-0.095	0.060
Unemployed	0.022	0.038
Self-employed	-0.030	0.042
Retired	0.332***	0.053
Student	0.148*	0.082
Constant	-2.087***	0.314
N observations	40,370	
R-squared	0.18	

*Notes: Logit model. *** significance at <1%; ** significance at 5%; * significance at <10%. Coefficients show impacts on log odds ratios. R-squared = Pseudo R-squared.*

As discussed above, we would have liked to have included time taken to travel to heritage sites and opinions regarding the importance of heritage sites in the main regression model in Table 8, but could not. Instead, therefore, just for information in Table 9 we run a simple regression model where heritage visits are regressed on time taken to travel to heritage sites (in hours) and opinions regarding importance of heritage sites.

Table 9. Determinants of heritage visits (travel time to heritage sites and importance of heritage sites)

Dependent variable Heritage_overall	Coefficients	Std. error
Travel time	-0.08**	0.033
Importance of heritage	0.352***	0.083
Constant	-1.253	
N	1,732	
R-squared	0.01	

*Notes: Logit model. *** significance at <1%; ** significance at <5%; * significance at <10%. Coefficients show impacts on log odds ratios. R-squared = Pseudo R-squared.*

As one would expect longer travel times reduce likelihood of visiting and caring for heritage increases likelihood of visits, although these results should be caveated with the fact that the models do not control for other variables.

3.3. Discussion of the results

Some of the findings from the self-reported analysis in Table 7 are replicated in the regression analysis in Table 8. For example, retired people are more likely to visit which may be demonstrating a time-constraint effect. Ill health (proxied by disability) is negatively correlated with heritage visits and income is positively associated supporting the findings for health and costs from the self-reported analysis. Next we compare the main findings of this analysis with previous studies (ie, the CEBR and Wineinger studies).

Childhood
A consistent finding across all studies (this one, Wineinger (2011) and CEBR (2007)) is that there is a positive association between being taken to museums and heritage sites as a child and attending them as an adult. There were mixed findings for the question asking whether the respondents' parents encouraged performing when they were a child, which could proxy for self-esteem and interest in culture. We did not find a significant effect, but Wineinger (2011) found a significant negative effect for the case of castle visits.

Demographic factors
Demographic findings were very consistent across all studies, although there was some variation in terms of the magnitude of the impact. In all models females were more likely to attend sites than males and those that were older were more likely to attend. Again, in all cases, ethnic minorities were less likely to attend.

Family makeup also has consistent, and statistically significant, effects. Those living as a couple were more likely to attend heritage sites, in all cases. Those that have children were less likely to attend heritage sites.

Socio-economic factors
Contrary to the other studies we find that income has a statistically significant positive effect on heritage participation even after controlling for socio-economic status (although the size of the effect is not very large). This is in line with the results from Fujiwara (2013) who found that low income reduced the likelihood of visiting museums. All studies find that those from higher socio-economic classes are more likely to visit heritage.

Education
Overall having a degree increases the probability of going to heritage sites and other qualifications have markedly smaller effects, if any effect at all.

Lifestyle (including religion)
Across all of the models, lifestyle variables have a very similar effect on the likelihood of visiting heritage sites. Consistent with previous studies, we find that having access to a car and the internet increases likelihood of visiting heritage sites.

Watching TV for more than five hours per day is negatively associated with heritage visits and conversely having more than three radios at home is positively associated with visits. Religious people are more likely to visit heritage sites.

Employment Status
Our model suggests that those who have more free time are more likely to visit heritage sites, with the exception of the unemployed, but this may be because they are searching for jobs or have income constraints. Students, retired people and people working part time are more likely to visit heritage sites than full time employed people.

4. Discussion

This study looks at the impact of heritage participation on wellbeing and monetises the impacts using the wellbeing valuation (WV) approach. We also looked at the determinants of why people visit heritage sites. After noting issues around causality we find that:

i. Visiting heritage sites is positively associated with life satisfaction after controlling for a wide range of determinants of wellbeing.
ii. The effect of heritage visits is larger than the effects of sport and engagement with the arts (although not statistically different).
iii. Visiting historic towns/cities has the largest association with wellbeing. Visits to monuments, historic parks/gardens and sports heritage sites were found not to have a statistically significant effect.
iv. The wellbeing impacts of heritage visits are bigger for (a) people with a long-standing illness or disability (compared to healthy people); (b) 'blue-collar workers' (compared to other occupations); (c) people over 45 years of age (compared to people under 45); and (d) people without children (compared to parents). But it should be noted that these differences were not statistically significant.
v. Lack of time, transport, costs and poor health are some of the reported reasons for not visiting heritage sites.
vi. This is broadly supported by statistical analysis of the drivers behind heritage visits. The statistical analysis also shows that men, younger people, parents and poorer people are less likely to go to heritage sites.

In terms of valuation these results imply that:

- ✓ People value visiting heritage sites in general at £1,646 per year.

- ✓ The values of visiting the following types of site are: Historic towns/cities (£1,464); Historic buildings (£1,342); Historic industrial site (£1,096); Historic places of worship (£972); Archaeological sites (£847).

Although we note the potential problem of bias in the statistical results and recommend that the figures in this report be used as upper-bound estimates, these are important findings with implications for policy and future research. It creates a positive foundation and argument for the role of heritage in society and provides figures that can be used directly in CBA. As new waves of Understanding Society and Taking Part (which will include a time-series element for some of the survey respondents) become available we will be able to use panel data methods to better understand causality. Also, if primary data could be collected on specific institutions and sites it would be possible to analyse the wellbeing impacts and values of specific sites. But, clearly it would also be helpful to

develop some robust experimental studies where participation (or encouragement to participate) in heritage is randomly assigned across different groups so that we can infer causality with confidence - to verify our findings here and to re-assess some of the insignificant findings. It need not always be the case that we randomise the actual intervention, activity or programme (if this is difficult), and instead it is possible to work with data where *encouragement* to participate in heritage is randomised.

Annex A

A.1. The Wellbeing Valuation approach: Statistical methodology

The results from equation (1) can be used in the WV method. At the simplest level the CS (or value) of heritage participation can be derived as:

$$CS = {}^{\beta_2}/_{\beta_1} \qquad \text{(A1)}$$

Formally, values (CS and ES) can be measured as follows using the WV method. Using the indirect utility function, CS for a non-market good (ie, a good that has a positive effect on welfare) can be stated as follows:

$$v(p^0, Q^0, M^0) = v(p^1, Q^1, M^1 - CS) \qquad \text{(A2)}$$

where $v(\cdot)$ is the indirect utility function; M = income; Q = the good being valued (ie, heritage visits); p = prices. The *0 superscript* signifies the state before Q is consumed (or without the good) and the *1 superscript* signifies the state after consumption (or with the good). In our analysis in this paper Q refers to heritage participation. In practice in WV using an 'observable' measure of welfare (ie, self-reported wellbeing rather than preferences) it is possible to estimate the marginal rate of substitution between M and Q to measure CS using the *direct utility function* $u(\cdot)$:

$$u(Q, M, X) \qquad \text{(A3)}$$

where X is a vector of other determinants of welfare (u). Empirically what we measure is:

$$LS(Q, M, X) \qquad \text{(A4)}$$

where LS = life satisfaction.

In other words, we use life satisfaction as the measure of SWB or utility. Equation (A4) is usually estimated by applying regression analysis to panel or cross-sectional survey data to measure the impact of non-market goods on life satisfaction. Here we use one wave of Understanding Society and hence run the following life satisfaction function (assuming cross-sectional data):

$$LS_i = \alpha + \beta_1 \ln(M_i) + \beta_2 Q_i + \beta_3 X_i + \varepsilon_i \qquad \text{(A5)}$$

where we use a logarithmic format for income to capture the diminishing marginal utility of income.

Substituting equation (A5) into (A2):

$$LS_i\left(\alpha + \beta_1 [\ln(M]_i^0\right) + \beta_2 Q_i^0 + \beta_3 X_i^0 + \varepsilon_i\right) = \left(\alpha + \beta_1 [\left(\ln(M]_i^1 - CS\right)\right) + \beta_2 Q_i^1 + \beta_3 X_i^1 + \varepsilon_i\right)$$

(A6)

and solving for CS gives,

$$CS = M^0 - e^{\left[\ln(M^0) - \frac{\beta_2}{\beta_1}\right]} \qquad \text{(A7)}$$

Equation (A7) is the derivation of compensating surplus using measures of SWB (here life satisfaction). It provides an estimate of the value people place on Q using the WV approach. Here M^0 is assumed to be sample average income and the term $e^{[\cdot]}$ accounts for the logarithmic format of the income variable in the income model, which was employed to account for the diminishing marginal utility of income. The ratio element from equation (2) ($^{\beta_2}/_{\beta_1}$) is retained in (A7).

Fujiwara (2013b) shows that there are a number of advantages in estimating the impact of income on SWB separately in a second model (ie, deriving an estimate for β_1 outside of equation (1)). The main technical issue involved in estimating equation (1) is that we have a robust estimate of the *causal effect* of income and the non-market good (heritage) on life satisfaction. In other words, we require unbiased estimates of β_1 and β_2. This has been especially problematic for income. The income variable in life satisfaction models suffers from endogeneity due to reverse causality and selection effects and measurement error which all tend to lead to *downward* bias in the income coefficient in models like equation (1). Since the income coefficient acts as the denominator in the calculation of value (as shown in equation (A7)), this leads to an *upward bias* in the value of non-market goods using the WV method. As a result, we have sometimes seen implausibly high values for non-market goods in the WV literature in the past. For example, in some studies the value of employment was estimated to be about £23,000 per month in addition to wage income[11] and the costs associated with drug and alcohol problems to be around £9 million per year[12].

Estimating the wellbeing impact of income separately allows us to use methods dedicated to establishing the causal effect of income. Here we use data from the British Household Panel Survey (BHPS) on lottery winners to estimate the causal effect of income using an instrumental variable (IV) approach. Instead of incorporating heritage into the IV model for lottery winners, using two separate models permits us to estimate equation (1) for the whole sample (hence maximising sample size for heritage participation) and to estimate the income model for lottery players only (hence deriving a more robust estimate of the causal effect of income). This is the *Three Stage Wellbeing Valuation* (3S-WV) approach (Fujiwara, 2013), which involves estimating the impact of heritage participation on SWB (β_2) from equation (1) and the impact of income on SWB (β_1) separately, but using a similar sample. This is the same WV methodology that we apply in Fujiwara et al. (2014) "*Quantifying and Valuing the Wellbeing Impacts of Culture and Sport*" for the value of sports and cultural activities.

[11] Clark and Oswald (2002).
[12] Powdthavee and van den Berg (2011).

A main issue regarding the use of results from two separate models in estimating monetary values is that samples from the different models need to be matched or at least be reasonably similar (which is of course something that comes naturally if the β coefficients in (2) come from the same regression model as in equation (1)). The heritage model in equation (1) will be representative of respondents in Understanding Society, which is itself intended to be representative of the UK population. IV methods, however, under two staged least squares (2SLS) do not use data on the whole survey sample as regression methods do. Instead, 2SLS estimates are the causal effect for a generally unidentifiable complier (to the instrument) sub-group, known as the local average treatment effect for compliers. Since we cannot observe who the compliers are here, we cannot say anything about the distribution of their background characteristics, which makes it hard to extrapolate results from our income model to other sample groups[13].

We, therefore, use the control function method with the IV rather than 2SLS. With lottery data, the control function derives the sample average effect of income rather than the local average effect. And since, as suggested by Apouey and Clark (2009), a large proportion of the UK population play lotteries (about 70%) the results from our income model should be reasonably generalisable. Indeed, we find that when comparing differences in characteristics (such as age, income and educational background) between small to medium-sized lottery winners and the general population there are very few variables that are statistically different. We, thus, assume that the results from the income model and the heritage model (equation (1)) are *both* representative of the UK population (the BHPS data are also representative of the UK). Hence the results can be used together to estimate the value of heritage visits in equation (A7).

In sum, valuation figures in (A7) are estimated using two separate models, whereby the effect of heritage visits on life satisfaction (β_2) is estimated from a model like (1) or (A5) and the effect of income (β_1 in equation (1) or (A5)) is estimated separately in the income model to ensure that it has a more robust causal interpretation. A full description and rationale for the approach can be found in Fujiwara (2013).

A.2. The income model

In the income model we use an instrumental variable (IV) approach, which eliminates the correlation between the error term and the income variable due to measurement error and/or endogeneity. A number of IVs for income have been proposed and employed in the SWB literature. These include spouse's income, industrial sector and spouse's education level (Pischke, 2010). These IVs are problematic as it is not clear that they satisfy the exclusion restriction and exogeneity criteria (especially the latter). An arguably more robust IV for income is lottery wins amongst lottery players, since by law winnings are random among lottery players and, by comparing small versus mid-sized lottery winners, we can assume that the exclusion restriction also holds. Lottery wins have been used in the SWB literature before by Lindahl (2005), Apouey and Clark (2009), Fujiwara (2013) and Gardner and Oswald (2007) and here we closely follow

[13] It can, however, probably be assumed that there are no 'never-takers' in this IV set-up, which narrows down the external group to which we are extrapolating the LATE.

Fujiwara (2013). Understanding Society does not ask people about lottery wins, but we do have extensive data on lottery playing in the BHPS and hence use the BHPS dataset to estimate the causal impact of income on life satisfaction to input as β_1 in equation (2).

It should be noted that the heritage variables in equation (1) can also suffer from similar biases to the income coefficient. We examined the Understanding Society dataset for potential natural experiments or IVs that would allow us to get robust estimates of the causal effect of participation in heritage on SWB, but there were no clear candidates in the dataset. We therefore rely on regression analysis and a 'selection on observables' assumption to motivate the heritage and wellbeing model in equation (1), with the caveat that β_2 is likely to be biased upwards as discussed in the main body of the report. As discussed above, for these reasons we recommend that the results here be used as **upper-bound estimates** of the impact and value of heritage participation on wellbeing.

One important facet of the analysis is that whilst life satisfaction responses are taken pertaining to the time of the survey interview, respondents are asked about heritage participation over the past year, which should help to subdue the effects of reverse causality because the activity precedes the response to the life satisfaction question[14]. To maximise our ability to infer causality from these results we control for all the main determinants of life satisfaction in X_i as possible given the data. The selection on observables assumption is the standard assumption employed in nearly all SWB studies to date and hence our heritage and wellbeing model in equation (1) is as robust as the large majority of published academic journal papers on the subject. And overall, for the wellbeing valuation task our study is likely to be more robust due to the way we have estimated the income model. However, the caveats on causality discussed above should be noted.

A.2.1. Estimating the income model using lottery wins

The income model uses the BHPS data on lottery wins as an instrumental variable to provide exogenous changes in income. We look at the impact of lottery wins among the population of lottery players because for lottery players wins are by law random and this creates a strong instrument for income. We use a *control function* approach which allows us to extrapolate the results from the small sample of lottery players to the general population. Under more traditional IV estimators, such as the Wald estimator and two-stage least squares, we are only able to derive causal effects for an unobservable sub-sample of lottery players (i.e., the compliers to the instrument) which makes the results less generalisable. The control function allows us to derive estimates of the sample average effect of income on life satisfaction, rather than just the local average complier effect of income. The results for the control function are as follows:

Table A1. The causal effect of income on life satisfaction

First stage regression

Dependent variable: log (household income)

Independent variables	Coefficient	St. Error

[14] This relates to the notion of *Granger Causality*. It should be noted that chronological precedence (of the activity) is a necessary but not sufficient condition for causality.

lottery win	0.102***	0.015
previous lottery wins	6.82e-06***	0
constant	9.999***	0.007
N	10,461	

Control Function

Dependent variable: life satisfaction

Independent variables	Coefficient	St. Error
log (household income)	1.103***	0.252
previous lottery wins	-0.00001***	0
$\widehat{v_2}$	-1.108	0.26
$\widehat{v_2} \cdot \ln(M)$	0.011*	0.006
constant	-5.777**	2.53
N	10,328	

Notes: * significance at <10%, ** significance <5%, *** significance <1%. Heteroscedascity-robust standard errors used.
Source: Fujiwara (2013).

This provides our estimate for the income model which is β_1 in equation (A7). We find that the *causal effect* of a log-point increase in household income is to increase life satisfaction by 1.103 index points per year (β_1 = 1.1). We use this estimate for the effect of income on life satisfaction in all of the value estimations. A full description of the income model can be found in Fujiwara (2013).

Annex B

B.1. Variables

Table B.1. Descriptions of variables

B.1a). Variables used in wellbeing analysis of heritage sites (Understanding Society)

Variable Name	Description
Life Satisfaction	1-7 scale of self-reported life satisfaction
Age	Age of individual
Age-squared	Age of individual squared
Employed	Self-employed/Paid PT,FT =1, Otherwise = 0
Retired	Retired =1, Otherwise =0
Student	Student = 1, Otherwise = 0
Male	Male =1, Female =0
Log-Income	Log of household income
Married	Married/Civil Partnership =1, Otherwise =0
Divorced	Divorced =1, Otherwise =0
Widowed	Widowed =1, Otherwise =0
Separated	Separated =1, Otherwise =0
High Education	Degree/High degree =1, Otherwise =0
Wales	Live in Wales =1, Otherwise =0
Scotland	Live in Scotland =1, Otherwise =0
NI	Live in Northern Ireland =1, Otherwise =0
London	Live in London =1, Otherwise =0
Can rely on friends	A lot =1, Otherwise =0
Poor Health	Poor Health =1, Otherwise =0
Religious	Belong to a religion =1, Otherwise = 0
Freq. of drinking alcohol	Scale from "Not At All" to "Almost Every Day"
Freq. of eating fruit and veg	N. portions of fruit/veg eaten per day
Plays sport	Plays individual or team sports =1, Does not =0
Participates in/audience to arts	Mentioned =1, Not mentioned =0
Visited historic town/city	Mentioned =1, Not mentioned =0
Visited a historic building	Mentioned =1, Not mentioned =0
Visited a historic park/garden	Mentioned =1, Not mentioned =0
Visited an industrial heritage site	Mentioned =1, Not mentioned =0
Visited a church/place of worship	Mentioned =1, Not mentioned =0
Visited a castle/fort	Mentioned =1, Not mentioned =0
Visited an archaeological site	Mentioned =1, Not mentioned =0
Visited a sports heritage site	Mentioned =1, Not mentioned =0
Visits any type of heritage	If visited any heritage site =1, Otherwise =0
Split-sample variables	
Disability	Long-standing illness/disability =1, Otherwise =0
Ethnicity	White British =1, Otherwise =0

Socio-economic Status	Employer/Manager/Professional =1, Otherwise =0
Older	Age is above median (>45) = 1, Otherwise =0
Children	If have children =1, If no children =0

Note: All heritage variables are for visits over the past 12 months

B.1b). Variables used in determinants of heritage visits analysis (Taking Part)

Variable	Description
Heritage_overall	1= Visited any heritage site; 0=otherwise
Male	1=Male; 0=Female
Age1	Age of individual
Age-sq	Age of individual squared
Live couple	1=Living as a couple; 0=otherwise
Children	1=Have children; 0=otherwise
Income	Individual income
White	1= White ethnicity; 0=otherwise
Socioeconomic [15]	1=NS-SEC 1-4; 0=NS-SEC 5-8
Housing	1=Living in social housing; 0=otherwise
Some HE	1= Some Higher Education; 0=otherwise
Alevels	1= Have A-Levels; 0=otherwise
Trade	1= Trade qualification; 0=otherwise
High_GCSE	1=5 or more A*-C GCSEs; 0=otherwise
Low_GCSE	1=Less than 5 A8-C GCSEs; 0=otherwise
HE	1= Degree; 0=otherwise
OtherQual	1= Other qualifications; 0=otherwise
NoQual	1= No qualifications; 0=otherwise
Internet	1= Internet at home; 0=otherwise
Car	1= Household has car; 0=otherwise
Disability	1= Has disability; 0=otherwise
Radios	1= 3+ radios in house; 0=otherwise
HighTV	1= Watch 5+ hours TV per day; 0=otherwise
HistoryTV	1= Watch History on TV; 0=otherwise
ArtTV	1= Watch Art on TV; 0=otherwise
Heritage_Web	1= Visit Heritage websites; 0=otherwise
Theatre	1= Visit theatre regularly; 0=otherwise
Parents_Museum	1= Taken to museum as child; 0=otherwise
Parents_Heritage	1= Taken to heritage sites as child; 0=otherwise
Parent_Encourage_Perf	1= Parents encouraged perform; 0=otherwise
Religious	1= Religious; 0=otherwise
PT employed	1= Part-Time employed; 0=otherwise
FT employed	1= Full-time employed; 0=otherwise
Unemployed	1= Unemployment; 0=otherwise
Self-employed	1= Self-employed; 0=otherwise

[15] NS-SEC groups defined as: 1= Large employers & higher management; 2= Higher professional; 3= Lower management & professional; 4 = Intermediate; 5 = Small employers & own account; 6 = Lower supervisory & technical; 7= Semi-routine; 8= Routine.

Retired	1= Retired; 0=otherwise
Student	1= Student; 0=otherwise

Annex C

C.1. Diagnostic tests of life satisfaction models

The wellbeing models contain the main determinants of life satisfaction and have R-squared values of around 15% (all R-squared values were statistically significant under the standard F-tests), which is consistent with the main research findings in this area. The evidence suggests that around 80% - 90% of the variation in SWB and life satisfaction is due to personality traits (DeNeve and Cooper, 1998) and so these (relatively small) R-squared values do not warrant any concern here. The direction and size of the impacts (coefficients) for the explanatory variables in the life satisfaction models were all in line with previous findings in the wellbeing literature.

Including heritage in the life satisfaction models increases the adjusted R-squared which signals that heritage participation explains additional variation in life satisfaction and hence these variables should be a part of the life satisfaction models. Visual inspection of the data did not show up any outliers that could adversely affect the regression results.

In respect to the validity of inference and hypothesis testing: (i) we checked the variance inflation factors (VIFs) in the models and found that no variable was troublesome - none were over the accepted threshold value of 4 (except for age and age-squared which is to be expected since they are functions of each other) and indeed the VIFs for the heritage variables were around 1 indicating that there is no inflation of the standard errors for these variables; (ii) visual inspection of the residuals showed them to be normally distributed (although this issue does not matter so much in large sample sizes like this); (iii) we employ heteroskedasticity-robust clustered standard errors (clustered at the household level to account for non-independence of errors at the household level) in all models.

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