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Heritage Capital and Wellbeing

Examining the Relationship Between Heritage Density and Life Satisfaction

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Summary

This study investigates the impact of local cultural heritage density on individual wellbeing in England, employing an ordinary least squares regression model with data from the National Heritage List for England (NHLE) and the Understanding Society Survey. The research evaluates the density of cultural heritage, calculated within a 1km centroid ring of a Local Super Output Area (LSOA) population centroid and self-reported life satisfaction. The findings reveal a statistically significant, positive relationship between the density of local heritage assets and self-reported life satisfaction, after adjusting for various socio-economic, neighbourhood and regional effects.

The research estimates the average individual benefit of cultural heritage near individual residences to be £515, with a collective WELLBY (Wellbeing Adjusted Life Year) value of £29 billion across England. This quantification illustrates the significant aggregate economic and wellbeing benefits of cultural heritage. These results offer insights for policymakers on the significance of heritage conservation and its potential to improve quality of life, highlighting the intrinsic value of cultural heritage in contributing to societal wellbeing and providing a compelling argument for its preservation and integration into society development and wellbeing strategies.

This research is funded by the Culture and Heritage Capital Programme.

Front cover: Eagle Works, Little Kelham, Green Lane, Sheffield, South Yorkshire. Photographed for Heritage at Risk 2019. [Alun Bull, © Historic England Archive, DP234096]

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1 Introduction

Heritage is ever-present, evident in buildings and open spaces to the very fabric of cultural identity (Historic England, 2022). From scheduled monuments to listed buildings, heritage not only preserves history and culture but also plays a pivotal role in shaping contemporary societies. Heritage itself encapsulates intricate historical, cultural, social, and economic values. It embodies both tangible and intangible elements that impact our daily lives, shaping the identity of local areas and fostering a sense of place, continuity, and community cohesion. Importantly, in providing these values, heritage has the potential to impact human well-being.

However, while the economic benefits of heritage are well-documented, its impact on well-being remains underexplored, representing a significant gap in the literature. Most studies have focused on the broader societal or economic implications of heritage or have examined heritage through the lens of participation rather than directly lived experiences. Considering heritage strictly through participation only measures the use value, which is limited at best and does not include the non-use value of heritage. This leaves a gap in understanding how heritage influences the life satisfaction of individuals living in culturally significant areas. The relationship between individual well-being and one's surroundings, especially in the context of cultural heritage, warrants further exploration.

This report aims to address the gap in understanding the relationship between cultural heritage and life satisfaction in England. To estimate the cultural heritage significance of an area, we calculated the number of historical assets within a 1km radius of the population-weighted centroid of each Lower Layer Super Output Area (LSOA) in England. This describes the density[1] of historical assets surrounding the populous areas of an LSOA. The assets included in the variable are listed buildings, scheduled monuments, protected wrecks, registered parks/gardens, battlefields and world heritage sites from the National Heritage List for England (NHLE). The theoretical underpinning of this model does not see the act of listing or designation as generating a positive wellbeing impact, instead, this is simply a measure of the cultural significance of the local area.

The population-weighted centroid identifies the average location where residents live within an LSOA. We then spatially joined these area-level cultural heritage density measures to individual-level life satisfaction data from the Understanding Society Survey and neighbourhood data supplied by the Office for National Statistics (ONS). By linking

1 This variable is density around small geographical areas focused in the most populous areas of an LSOA, thus it arguably also considers proximity as it selects heritage assets that are likely to be close to the individual who is surveyed.

the local cultural heritage density to individual outcomes, we can test the relationship between the concentration of historical assets within your local surroundings and self-reported life satisfaction while controlling for individual socioeconomic factors.

This theoretical underpinning draws from literature on cultural ecosystem services – the benefits people obtain from historical sites and landscapes. As an amenity, the cultural heritage embodied in one's environment can potentially enrich daily life and enhance well-being. This study empirically tests that premise using a robust empirical model. The results will provide evidence to inform historic preservation policies and place-based development.

The research questions guiding this analysis are:

1. Is there an association between the density of cultural heritage assets and their proximity to residential areas, and self-reported life satisfaction scores, after controlling for individual and regional factors?

2. How do different types of NHLE-listed heritage assets (e.g. listed buildings, scheduled monuments, historic parks and gardens) influence self-reported life satisfaction scores?

By exploring these relationships, this report not only aims to expand knowledge on heritage roles and impacts but also offers valuable insights for policymaking, heritage management, and community development. This aligns with Historic England's well-being strategy and resonates with ongoing academic efforts to understand and articulate the broader societal values of cultural heritage (Historic England, 2022). The subsequent sections of this report will delve deeper into the methodologies, findings, and implications of our research.

2 Culture and Heritage Capital

This research contributes to the Culture and Heritage Capital (CHC) Programme[2], led by the Department for Culture, Media, and Sport (DCMS), that sets out DCMS's ambition for a transformational and cultural change to assess the value for money of cultural and heritage assets through robust appraisal and evaluation. There is currently no consistent approach to measuring the benefits of culture and heritage to society, for inclusion within Social Cost Benefit Analysis, and without such an approach, the benefits of culture and heritage risk being understated (Sagger et al., 2021).

The fundamental aim of the CHC Programme is to develop a formal approach, using economic methodologies alongside quantitative and qualitative evidence, to ensure the economic, social and cultural values are assessed equally, and to create a robust evidence base for decision making. This will lead to publicly available statistics on the full value of culture and heritage for use in policy making and research; supplementary guidance to the HMT Treasury Green Book on valuing cultural and heritage assets, and a set of culture and heritage capital accounts (Sagger et al., 2021)

The DCMS CHC Framework conceptualises culture and heritage as a form of capital stock. This capital stock comprises assets that hold significant cultural or heritage value. Assets may include historic buildings, landscapes, archives, artefacts, traditions, and more. The stock produces *services or "flows*" that create *benefits* to society which can be monetised using economic valuation techniques. The value of culture and heritage in this context stems not just from the asset itself but also from its cultural meaning and significance (Kaszynska et al., 2022).

In the context of this research, the stock refers to nationally designated heritage assets as recorded by the National Heritage List for England (NHLE). The NHLE is the only official, up-to-date, register of all nationally protected historic buildings and sites in England – listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and battlefields.[3]

The flows of services generated by this stock occur as people form connections with the natural and built environments where they live and visit through 'clusters of positive cognition linked to the meaning of specific places' and assets (Brunelli et. al., 2022). These services are unique to the heritage stocks and are captured in the discourse on cultural heritage significance (Conservation Principles, 2008; Burra Charter, 2013), which highlights what makes the heritage special and meaningful to people through the services they provide including the sensory and intellectual stimulation linked to:

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2 https://www.gov.uk/guidance/culture-and-heritage-capital-portal

3 For more information on the NHLE *see* Section 4.2 and Appendix A.

- the aesthetic services the stock provides are articulated as perceptions of beauty, distinctiveness, attractiveness, congruence, etc.

- the authenticity associated with the stock and the unique, irreproducible character and identity of the historic environment.

- the inspirational services that foster creativity through exposure to the physical presence of cultural heritage, which can motivate people to reach higher potentials.

- the communal services as associations and memories related to cultural identity and spirituality triggered by historic buildings can support restorative experiences and positive affective outcomes (Reece et al., 2022).

It is from the services of culture and heritage capital that positive psychological impacts are generated (Reece et al., 2022) and the historic environment becomes central to people's well-being, measured here as life satisfaction (Dilani, A., 2008, Brunelli et. al., 2022). As users actively engage with their local cultural heritage or indirectly engage in choosing to live or visit an area of cultural significance, they connect with local heritage stocks and flows which results in benefits. Benefits include a stronger sense of place attachment, belonging, pride, hope, optimism for the future, amongst others. Furthermore, this study also considers that non-use value may be recognised by individuals who gain value from the option to engage in their local heritage at a later point, the knowledge of the existence of heritage or the bequest value for future generations.

Work is ongoing through the CHC programme to develop a taxonomy approach to culture and heritage capital, with a clear narrative and approach to framing the stocks, service flows and benefits of CHC.

3 Literature review

Life satisfaction is a subjective cognitive evaluation of one's quality of life based on personal criteria (Diener et al., 1985). It serves as a holistic measure of subjective well-being preferred in policy to assess determinants of wellbeing[4]. Despite method variations, life satisfaction measures yield consistent results with moderate to high correlations across scales (Eid & Diener, 2004). Life satisfaction also remains relatively stable in the short term, though it declines over extended periods as influencing factors shift (Fujita & Diener, 2005). Furthermore, temporal factors minimally skew scores, with stable components explaining 74-80% of the variance (Eid & Diener, 2004; Schimmack & Oishi, 2005).

Heritage plays an important role in shaping individual well-being, offering both tangible and intangible benefits that resonate with both people who actively engage with heritage but also with those who do not. The use benefit is explored by Wheatley and Bickerton (2019) who find a positive association between life satisfaction and frequent visits to historic attractions in the UK using the 'Understanding Society' dataset. Further, Macdonald et al. (2023) explored the relationship between mental health and exposure to heritage, suggesting that frequent exposure to heritage sites correlates with a reduced likelihood of distress. The authors also noted that individuals in areas with lower socioeconomic outcomes had limited access to heritage.

The Young HUNT Study highlighted the positive associations between cultural activity participation and self-perceived health, life satisfaction, and mental health among adolescents in Norway (Hansen et al., 2015). Those who frequently participated in cultural activities reported better health outcomes. Girls aged between 16-19 benefited most from being culturally active. Lagunes-Cordoba et al. (2022) highlighted the benefits of leisure activities, including heritage engagement, on well-being among psychiatrists and trainees in Mexico. Engagement in leisure activities such as heritage resulted in lower stress, greater confidence in stress management, and more satisfaction with their social support.

Despite this, research on the non-use value of heritage on wellbeing is less explored. Ateca-Amestoy, Villarroya, and Wiesand (2021) studied the relationship between various modes of engagement with cultural heritage and life satisfaction. Using data from the Eurobarometer in 2017, the study focused on cultural heritage across EU members. It explored both direct (use) and indirect (non-use) values of heritage and individual subjective well-being. Significant to this study, the non-use value is based on a question that asked respondents whether they 'lived near any cultural heritage that is related to Europe's culture and history.' Life satisfaction was posited as a function of proximity to heritage resources, and various modes of heritage participation (including tangible,

4 For the purpose of this study, life satisfaction refers from here on as the quantitative measurement, whereas wellbeing may be referred to as the outcome.

intangible, digital, and volunteering). The authors found that the chances of being more satisfied with one's life increase with volunteering activities, visits to heritage institutions, and digital engagement – though found no significance in living in a culturally significant area. However, this approach was survey-based, subjective, and not based on known assets when it comes to the operationalisation of heritage variables, unlike the present report which uses an objective measure of proximity to and density of heritage assets based on administrative data.

In a study focusing on ecological migrants in the Kalajun World Natural Heritage Site, the importance of livelihood capital and social adaptation in influencing life satisfaction was emphasised, particularly among Kazakh herders (Hu et al., 2023). Other research highlighted the role of peers in shaping the cultural identity, life satisfaction, and school values of cultural minority students, emphasising the significance of discussing cultural values related to heritage (Vietze et al., 2019).

Mak, Coulter, and Fancourt (2021) discuss whether the positive impacts of engagement in cultural events such as visiting museums and heritage sites are impacted by the neighbourhood effects, such as local deprivation. They find that there is a greater positive impact of engaging with cultural events for mental health when from areas of greater deprivation, however, they do not find this association with life satisfaction. The authors also find evidence that not only does individual socioeconomic characteristics result in a lower level of access to heritage for those who are more deprived, but also that areas that are more deprived result in less engagement because there are fewer cultural opportunities (e.g., unsafe, culturally deprived, and undesirable). This can lead to unequal access, subsequently resulting in cultural events exacerbating social inequality.

Cross-country, and even within-country, comparisons of life satisfaction scores can be challenging due to cultural biases in how people self-report subjective wellbeing (Diener, Inglehart, and Tay, 2012). Cultural differences may exist within a country due to regional, industrial, and metropolitan differences. While some of these can be alleviated by only looking at England, it is important to consider and control for differences across geographical spaces.

Studies have currently focused on participation, or qualitative questionnaires on the significance of their cultural identity in their area. Despite this, no study has tried to identify and test a measure of the cultural heritage of a small geographic region against life satisfaction. Given cultural heritage is non-exclusionary, and participation can often be passive through interactions with both tangible and intangible heritage, previous studies are likely to ignore a significant degree of the use value and perhaps even completely the non-use value. This represents a significant gap in our understanding of the impact cultural heritage has on society.

4 Data

4.1 Geographical scope and unit of analysis

Local Super Output Areas (LSOA) were established in 2001 for a geographical boundary based on spatial proximity, and natural boundaries alongside homogeneity of dwelling type and tenure (Melo, 2021). An average LSOA has approximately 600 households and 1,500 residents. This study identifies LSOAs as naturally suited for exploring the localised effects of heritage. We seek to delve into a more localised understanding of how the concentration of heritage assets within communities may be associated with the life satisfaction of residents.

The choice of unit of analysis in studying neighbourhood effects has generated mixed findings. Knies, Burgess, and Propper (2008) studied postcode areas containing approximately 9,000 residents in Germany, finding significant negative effects of living in less affluent neighbourhoods in OLS models, however when controlling for unobserved heterogeneity this was positive but insignificant. Contrarily, Melo (2021) finds that the determinants of life satisfaction do not vary significantly between population sizes of 500 to 10,000 using the UK population. Given the similarities between our dataset and Melo's (2021), and the inability to control for individual unobserved characteristics in a cross-sectional design, we conclude that LSOAs are an appropriate unit of analysis.

4.2 National Heritage List for England

The National Heritage List for England (NHLE) originated in 1882 when the first powers of protection were established. The NHLE was formally launched by Historic England (then English Heritage) as an online, publicly available and searchable database in 2011, and is the only official and up-to-date statutory list of all protected historic buildings and sites in England. The NHLE therefore exists as a significant source of information about our built heritage. Unique to this study is the aggregation of data that can be used as an econometric variable.

Table A1 in Appendix A illustrates the requirements and criteria for buildings and other historical assets to be designated[5], with principles that have remained relatively consistent over time. This stability, alongside the long time that listings have been available for buildings, allows for a consistent measure of cultural heritage levels.

5 Else specified, designated from here on forward will refer to all data that is held within the NHLE.

Our main variable of interest is created through these NHLE data. This is done by aggregating all designated assets including buildings, scheduled monuments, wrecks, parks and gardens, and registered battlefields. Subsequently, we map these points and polygons onto a map of England. We then take the population centroids of LSOAs and draw a 1-kilometre[6] buffer around these points and estimate how many listed buildings, scheduled monuments, wrecks parks and gardens, and registered battlefields are within these buffer areas. This provides us with our variable to proxy the level of cultural heritage within the LSOA. Disaggregation of these assets and different grades within listing buildings are considered and the effects are explored.

4.3 Understanding Society Data

The individual-level data used in this analysis come from Understanding Society (University of Essex, Institute for Social and Economic Research, 2023), a large longitudinal household study in the UK containing over 40,000 individuals annually from 2009 onwards. Understanding Society was developed from its predecessor, the British Household Panel Survey (BHPS), which was established in 1991.

The LSOAs are then matched with heritage data. These heritage data come from the National Heritage List for England, as detailed in previous sections, with considerations for challenges such as spatial autocorrelation, data completeness, and local variations. The final estimation sample contains 24,823 individuals across 14,675 households and 10,396 LSOAs.

The key dependent variable is self-reported life satisfaction, derived from the question “How satisfied are you with your life overall?” Responses are reported between 1-7 scale, with 1 indicating ‘completely dissatisfied’ and 7 indicating ‘completely satisfied’, serving as the subjective well-being outcome measure.

6 1km was chosen as it provides a localised count of the number of designated assets. Evidence for this choice of distance is provided in the results section.

4.4 Control Variables

Control variables fromUnderstanding Society (2023), ONS (2023a; 2023b) and Ministry of Housing, Communities & Local Government, 2019) are selected to capture factors that may influence both life satisfaction and relationships with heritage. They include:

- **Socioeconomic Factors**: Education level, household size, number of children, household income, employment status, home ownership, house prices and mental health
- **Demographic Factors**: Age, gender, marital status, ethnicity, religion
- **Health Factors**: Self-reported health status measured on restrictions to mobility
- **Neighbourhood and regional effects**: IMD (Index of Multiple Deprivation) scores, population density, urban/rural and Government Office Regions, and local house prices

In what follows, we motivate the inclusion of our control variables, and in particular, why excluding them could lead to omitted variable bias. Note, however, that including or excluding our control variables makes little difference to our results.

Table 1: Variables considered in the study and their impacts on life satisfaction.

Variable	Impact on Life Satisfaction (LS)	Confounding Factors Impacting Historic Assets Level
Age	Age can influence life satisfaction through various channels. Younger individuals may have fewer responsibilities and experience higher life satisfaction. However, life satisfaction is often associated with higher ages, possibly due to increased wisdom and contentment.	Age may influence the perception and enjoyment of local heritage. Evidence demonstrates an association between age and engagement with historic assets and cultural heritage.
Household Income	Higher levels of household income are commonly associated with greater life satisfaction, as it provides access to better resources, opportunities, and overall quality of life.	Household income may influence the location where individuals choose to reside, potentially increasing the likelihood of living in an area with cultural heritage significance. It may also offer more financial freedom to access and appreciate local heritage.

Variable	Impact on Life Satisfaction (LS)	Confounding Factors Impacting Historic Assets Level
Health	Physical and mental health influences life satisfaction. Good health is positively correlated with higher life satisfaction.	Good health enables individuals to enjoy and access local heritage more easily, potentially leading to a greater appreciation of their surroundings.
Home Ownership	Homeownership can impact disposable income and security. Individuals who own their homes may have higher life satisfaction due to increased financial stability.	The impact of homeownership on historic assets is less directly observed, but it may influence financial freedom and the availability of new developments in the area, which could affect historic assets.
Children	Children can have both positive and negative effects on life satisfaction. While they can bring fulfilment to people's lives, they also come with responsibilities, financial implications, and stressors that may decrease life satisfaction.	Children may impact the level of interactions individuals have with their local heritage, both positively and negatively. Their presence may foster a desire to explore cultural heritage, but the associated responsibilities may limit the time available for such activities.
Employment	Employment and job satisfaction are linked to life satisfaction. Factors such as job security, work-life balance, and career advancement can significantly impact LS.	Employment status may influence an individual's leisure time and resources available to explore local heritage. Job-related stress could also affect their ability to enjoy cultural heritage fully.
Ethnicity	Cultural and social factors associated with different ethnic groups can impact life satisfaction.	Cultural identity may significantly influence how individuals perceive and engage with heritage. Different ethnic groups may have varying degrees of attachment to designated historic assets, resulting in diverse impacts on life satisfaction.
Population Density	Population densities can impact social interactions, sense of place, and access to public goods, potentially influencing life satisfaction.	Areas with higher population densities may experience increased levels of designated historic assets due to greater demand and historical significance.
IMD Scores	IMD scores of an area reflect levels of deprivation, including income, employment, health, education, crime, and living environment, which can impact life satisfaction.	Areas with higher levels of deprivation may struggle to maintain the condition of local heritage, potentially limiting access and appreciation of historic assets.

Appendix B provides literature as to where these conclusions come from.

5 Methodology

This study uses an ordinary least squares (OLS) regression approach to estimate the relationship between cultural heritage density and life satisfaction. The empirical model is specified as follows:

$$LS_i = \beta_0 + \beta_1 \, HeritageDensity_i + \beta_2 \, X_i + R_i + \varepsilon_i$$

Where LS_i is the life satisfaction level reported by individual i, measured on an ordinal 1-7 scale. $HeritageDensity_i$ represents the number of designated heritage assets within a 1km radius of an LSOA population weighted centroid, X_i is a vector of control variables and ε_i describes an idiosyncratic error term.

Regional fixed effects include the government office regions of England and an Urban / Rural classification, represented by R_i account for time-invariant factors like local policies and economic conditions.

Controlling for individual characteristics, regional, and neighbourhood effects helps isolate the specific effect of local heritage density. The OLS regression is estimated on a single cross-section of the Understanding Society data, with standard errors clustered at the household level to account for correlations within households.

Endogeneity is likely to become a problem for all independent variables when considering life satisfaction. It will be difficult to tell whether people who live in areas of significant cultural heritage experience increased levels of life satisfaction, or whether happier people decide to live in areas of higher cultural heritage. Another potential source for endogeneity may arise because of unobservable factors, such as an individual personality or values, that may impact an individual's life satisfaction. For example, people who are more interested in history may be more likely to live in areas with significant cultural heritage.

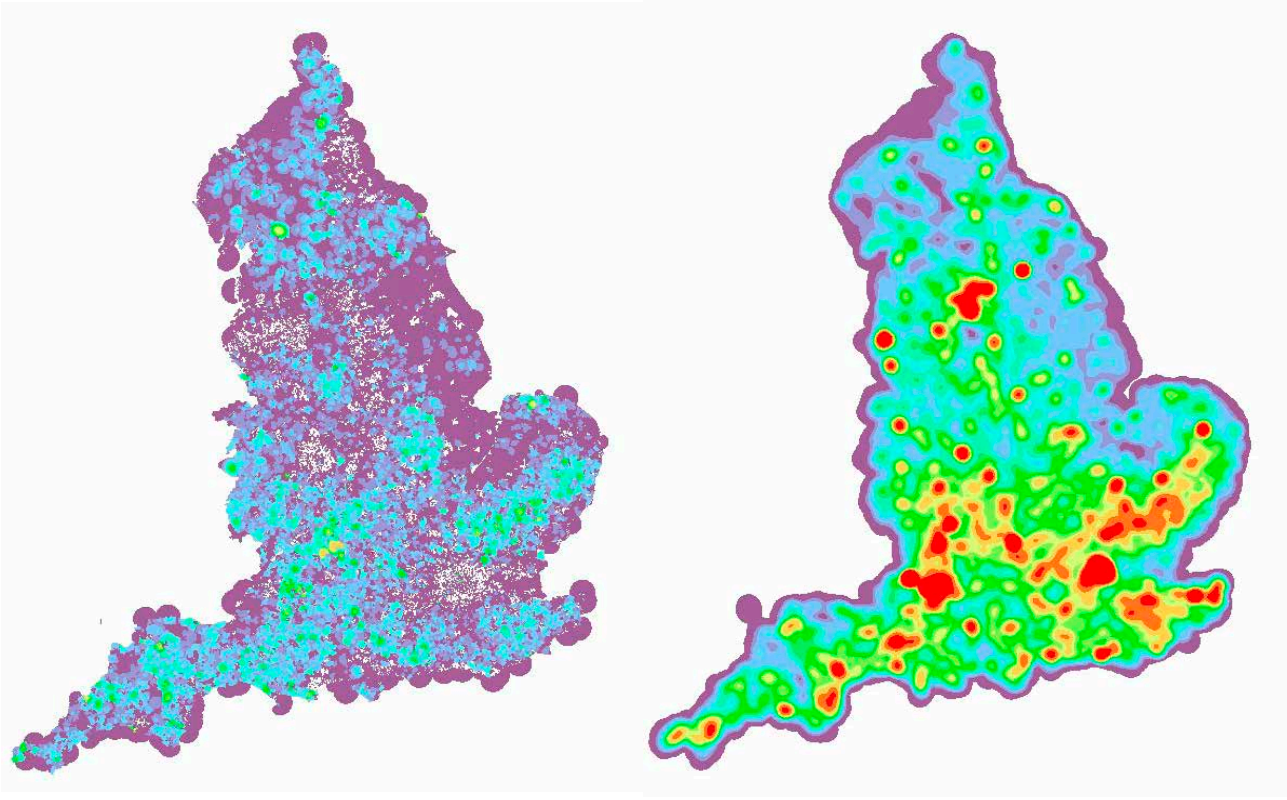
An obvious potential solution to this problem of endogeneity is to use of longitudinal datasets and individual fixed effects. However, this does not bring many advantages in our scenario due to two reasons. Firstly, there is not a large amount of variation in designation data throughout this survey. Secondly, the act of designation is not described as having a positive well-being effect, instead, it is meant to be a measurement of the level of cultural heritage significance of a place.

6 Results

6.1 Descriptive Analysis

Table C1 in Appendix C provides descriptive statistics of the estimation sample used in the model. From an initial pool of 36,055 respondents, 7,616 were excluded due to their location in Wales, Scotland, and Northern Ireland. An additional 2,223 were omitted due to non-responses to the key dependent variable: life satisfaction. A further 1,388 respondents were dropped due to no responses to the selected control variables. This resulted in a sample size of N = 24,823 participants. The interviews were conducted from January 2017 to May 2019, with 12,325 participants in 2017, 11,277 in 2018, and 1,221 in 2019.

There was a notable variability in the number of designated assets across Local Super Output Areas (LSOA). The mean number of assets was 32.26, but a high standard error of 67.124 indicates significant dispersion. This non-uniform distribution of assets suggests potential skewness in the data. The kernel density plot in Appendix D Figures D1 and D2 further supports this, indicating a high concentration of LSOAs (Local Super Output Areas) with fewer assets. Given this distribution, a logarithmic transformation is deemed appropriate for subsequent analyses.



Figures 1 and 2: The kernel density of designated assets in England.

Figures 1 and 2 present kernel densities of listed buildings (excluding other historical assets), highlighting concentrations across England. A significant number of designated assets are in London and the Southeast. This is further supported by Table E1 in Appendix E breaks down the mean, total, minimum, and maximum amount of designated assets per 1km population centroid ring by region. This highlights the importance of controlling for both regional effects, as well as offering insights into the likelihood of areas having designated assets. Notably, the number of designated assets may also be highly correlated with levels of average income, thus the importance of socioeconomic variables is highlighted.

Figures F1 and F2 in Appendix F present a Moran's I analysis[7] of designated assets within the 1km centroid rings around the LSOA population centroid, with a positive score of 0.849 suggesting the presence of spatial autocorrelation. LSOAs with higher levels of designated assets tend to be proximate to others with similar asset levels. These areas may also share similar socioeconomic characteristics. This introduces a methodological challenge: autocorrelation can manifest either at the household level or the LSOA level. To address this, household clustering is employed in the results section, while LSOA clustering is explored in the robustness section[8].

6.2 Regression results

Table 2 presents the results of the regression analysis, highlighting the impact of numerous factors on life satisfaction. Model 1 includes individual-level variables known to influence life satisfaction, such as household income, age, number of children in the household, degree education, relationship status, home ownership, health, religion, and job status. Model 2 extends the analysis by introducing neighbourhood effects, incorporating the Index of Multiple Deprivation (IMD) scores and population density as contextual variables. Finally, Model 3 incorporates regional fixed effects to account for regional variations within England. The R-squared for Model 3 is 0.259, indicating that approximately 25.9% of the variance in life satisfaction is explained by the predictors included in the model. Life satisfaction is a complex construct influenced by numerous individual, contextual, and environmental factors. Evidence has suggested that 80 to 90% of the variation in life satisfaction can be attributed to personality traits (DeNeve and Cooper, 1998).

Across all three OLS models, we find consistent and statistically significant evidence for the impact that the variable heritage, and the number of designated assets within the 1km ring.

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7 Local Moran's I is a statistical tool that identifies statistical clusters of high and low concentration given an attribute, in this example the number of designated assets.

8 As shown later, clustering at household and LSOA level made little difference to the standard errors in our results.

Table 2: Regression model results.
For the full table *see* Appendix G.

Coefficient	Model 1	Model 2	Model 3
Designated assets (log)	0.022***	0.021**	0.025***
Household monthly income (log)	0.055***	0.052***	0.053***
Age	-0.037***	-0.037***	-0.037***
Age Squared	0.000***	0.000***	0.000***
Number of Children	-0.022**	-0.021**	-0.021**
Women	0.199***	0.199***	0.199***
Degree	0.053**	0.049**	0.049**
Mental Health	0.063***	0.063***	0.063***
Index of Multiple Deprivation	-0.001*	-0.001*	-0.002*
Rural			-0.013
Intercept	1.702***	1.763***	1.738***
R-sqr adj.	0.305	0.305	0.305
Observations	24,823	24,823	24,823
Neighbourhood Effect	No	Yes	Yes
Region Fixed Effects	No	No	Yes

* <0.05, ** <0.01, *** <0.001 [9, 10]

Model 3 reveals that this variable has a statistically significant and positive coefficient of 0.025 (p = 0.000). Indicating, that, on average, a 1% increase in the density of heritage assets near an individual's residence is associated with a 0.00025 increase in reported life satisfaction, while controlling for other variables. We estimate the effect of the increase in cultural heritage by a fraction of a standard deviation of 1.7%. The level of cultural heritage differs significantly across geographies in England, however, is also prevalent to some degree across all of England. Therefore, it affects a large proportion

9 Asterisks (*) mark significance levels: more asterisks denote stronger statistical significance, highlighting data points or trends with high confidence in their difference from a null hypothesis.

10 Adjusted R-squared value (R-sqr adj.) shows the proportion of variance explained by the model, adjusted for the number of predictors. Higher values indicate better fit while accounting for model complexity.

of people, making aggregation meaningful. This finding suggests that a higher density of designated heritage assets near an individual's residence is associated with a small yet meaningful increase in reported life satisfaction while accounting for other relevant factors, in line with our hypothesis.

Drawing a comparison to urban green spaces, increasing the log of the coverage of urban green spaces by 1ha (a mean of about 23ha) in a 1km radius around households in major German cities has been found to increase life satisfaction by 0.0068 points on a 0 to 10 scale, or 0.0047 when rescaled to a 1 to 7 scale (Krekel et al., 2016). A similar impact has been found in Great Britain for green spaces (White et al., 2013). It should be noted, however, that these studies use fixed-effects estimators, exploiting within-individual variation in green space coverage around households, and are thus not directly comparable to the present study. The similarity of impacts, however, suggests that heritage assets are in approximately the same ballpark of effect sizes as these other neighbourhood amenities.

To further explore the drivers of cultural heritage on life satisfaction, we distinguish between Grade I and II* and Grade II listed assets,[11] which are the main drivers of the number of designated assets within the main variable. When tested individually, both Grade I and II* and Grade II listed buildings have significant and positive impacts on life satisfaction (Table 3). However, when both are modelled simultaneously, Grade II retains significance at the 5% level, however, Grade I and II* lose all significance. This change might be attributed to a high correlation between the two of 0.75, suggesting areas with elevated levels of Grade I and II* listed assets also have elevated levels of Grade II listed assets. Therefore, the abundance of smaller, more common Grade II listed buildings, rather than the presence of large, rare, Grade I and II* buildings, appear to be the primary drivers of the association between cultural heritage and higher life satisfaction.

11 Grade I and Grade II* were tested independently but no meaningful changes were noted.

Table 3: Regression coefficients and T-values[12] for Grade I and II listed buildings.

Listed buildings	Model 4		Model 5		Model 6	
	Coeff	T-Value	Coeff	T-Value	Coeff	T-Value
Grades I and II*	0.032**	3.17			0.008	0.57
Grade II			0.026***	3.87	0.021*	2.28

* <0.05, ** <0.01, *** <0.001

Next, we disaggregate the effects of different types of heritage assets. Table 4 shows that listed buildings are the main driving force for significance in our key variable. The only exception is historic parks and gardens; however, it would be difficult to disentangle the positive life satisfaction impact associated with urban green spaces and the heritage element (Krekel et al., 2016). One reason for the lack of significance in other variables may be due to the frequency they appear in the data, with registered wrecks only appearing 8 times within our 1km boundaries.

Table 4: Coefficients and significance of different designated assets on life satisfaction.[13, 14]

Heritage category	Logarithmic	Frequency
Listed buildings	0.24***	782,509
World Heritage sites	-0.009	691
Scheduled Monuments	0.02	11,390
Protected wrecks	-0.09	8
Parks and Gardens	0.078**	6,864

* <0.05, ** <0.01, *** <0.001

12 T-values measure the difference between a sample statistic and its hypothesised value, relative to variability in the data. High t-values suggest significant differences.

13 We test for both logarithmic and non-logarithmic variables as the relationship might be less exponential for other assets but find no significant difference between the findings.

14 Frequencies may be higher than the actual number of assets that exist within the category because they can be counted in multiple centroid rings.

Finally, we consider different ranges of distance for our centroid rings around the population density. We would expect that as our variable increases the predicting power of the variable to decrease, as assets from further afield are considered that are not accessed day-to-day. These results are summarised in below.

Table 5: Spatial decay of distance to our variable of interest.[15]

Distance	Heritage	Standard Error	T-value
500m	0.019	0.007	2.95
1km	0.025	0.006	3.92
2km	0.020	0.007	2.63
3km	0.023	0.009	2.60
4km	0.023	0.010	2.27
5km	0.025	0.011	2.33

15 Standard errors indicate the precision of sample estimates. Smaller errors relative to the coefficient mean more reliable estimates of the population parameter.

6.3 WELLBY (Wellbeing Adjusted Life Year) approach for monetising life satisfaction impacts

To understand life satisfaction in line with the WELLBY guidance from the HM Treasury Green Book, we adjusted the scale of life satisfaction scores. Our study used a 0-10 scale, differing from the usual 1-7 scale. In Model 3, we transformed the coefficient of 0.025 to 0.040 to fit this scale.[16]

Using the mean WELLBY value of £13,000 (in 2019 prices) as a benchmark, we find that each additional heritage asset within a 1km area increases the WELLBY value by an average of £15.85. When considering a more conservative estimate – a lower WELLBY value of £10,000 – alongside the lower bound of the coefficient's 95% confidence interval, the monetary benefit of each additional asset is estimated to be around £6.09.

Caution should be given with this interpretation, as the act of listing or designation is not predicted to make this increase, instead, this should be considered as a measure of cultural heritage. Additionally, the regression model incorporates a logarithmic variable for designated assets, indicating that the rate of monetary benefit tends to decrease with each additional unit. This suggests diminishing returns, especially beyond a certain number of heritage assets.[17]

Furthermore, we calculate the total impact that this measure of cultural heritage has on the average individual within our model. We do this by taking the average number of designated assets within the 1km centroids and multiplying this by the value of an additional heritage asset. When using a WELLBY value of £13,000 we estimate that in England the effect is worth £514.86. Adopting the lower-bound coefficient, this decreases to £257.27, and further decreases to £197.90 when using a WELLBY value of £10,000.

A unique perspective on monetising the influence of heritage incorporates the asset count within the 1km centroid circle for each LSOA (Lower Layer Super Output Area). By calculating the count of assets within these 1km centroid rings for all LSOAs and factoring in their respective populations, we derive values for each LSOA. These values are then aggregated to estimate the overall WELLBY value in England, projected at £29 billion, with a conservative estimate of £11bn – this latter value incorporates both the diminished WELLBY value (£10,000) and the lower coefficient boundary. Table 6 provides a detailed breakdown.

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16 The coefficient, 0.022, undergoes a transformation by being divided by 7 and then multiplied by 11 resulting in a converted coefficient of 0.038.

17 The logic for using logarithmic variables is detailed in section 6.1 and appendix E.

Table 6: WELLBY (Wellbeing Adjusted Life Year) value estimations for heritage assets.

WELLBY Analysis	Lower Estimate	Central Estimate	Upper Estimate
1-10 Heritage coefficient	0.02	0.04	0.059
Increase in 1 asset	0.00061	0.00122	0.00183
WELLBY Analysis (£10,000)			
Individual Average	£197.90	£396.05	£594.19
England total	£11,167,240,886	£21,667,527,513	£33,528,757,081
Per asset	£6.09	£12.18	£18.28
WELLBY Analysis (£13,000)			
Individual Average	£257.27	£514.86	£772.44
England total	£14,517,413,153	£29,052,398,679	£43,587,384,205
Per asset	£7.92	£15.84	£23.76
WELLBY Analysis (£16,000)			
Individual Average	£316.64	£633.67	£950.70
England total	£17,867,585,419	£35,756,798,374	£53,646,011,329
Per asset	£9.74	£19.50	£29.25

While no study has attempted to do such an analysis before, the research found using stated preference techniques that households within the catchment of a high street are willing to pay an estimated £6.31 to £7.80 annually to maintain the historic character of their high streets (Lawton et al., 2021). Similarly, it was found residents would be willing to pay £9.63 per household for city visitors/residents and £6.14 for non-visitors/non-residents to preserve historic buildings from the damage associated with climate change (ibid). These findings from this study suggest that not only are individuals willing to pay for cultural heritage, but they also realise the benefits in their life satisfaction.

7 Robustness

To improve the reliability and validity of our findings, we conducted several robustness checks. These include the sensitivity of our results to alterations in model specifications, variables, and assumptions. A consistent outcome across different test scenarios bolsters our confidence in the estimated relationship between heritage density and life satisfaction.

7.1 Coefficient stability

We test for the impact of house prices at the LSOA level. Evidence suggests that areas that are more distinctive, and conservation areas, have a property premium that might confound with heritage and life satisfaction (Ahlfeldt et al., 2012; Ahlfeldt and Holman, 2017). We do not, however, find any significance with house prices, though a drop in the significance of house income suggests that this variable accounts well for the price of rent. The variable neither makes a difference to our coefficient of interest nor the number of designated.

The existence of differences between local authorities may impact the relationship between designated assets and well-being. To test this, we included local authority fixed effects[18] in the model. This makes a trivial difference in either the magnitude or significance of the variable, suggesting that differences in local policies and accessibility to guidance do not impact the effect of this variable. This may lead to further support that this variable is working as a proxy of local cultural significance as opposed to the policy impact of, for example, listing a building.

We transformed the primary variable into a binary format, assigning a “1” if above the median level of designated assets. We find significance ($p = 0.012$), with a positive coefficient of 0.043. Assigning a binary dummy using the top 25th percentile produces a strongly significant result with a coefficient of 0.079 ($p = 0.000$).

Finally, the presence of unobservable factors that change over time but our constant across individuals may be present in our findings. During the period of examination, there were socio-political events such as the Brexit negotiations, political instability and several general elections, and terrorist attacks that may have impacted life satisfaction. We test for this by including a time-fixed effect[19] in our model, which makes a negligible effect on our dependent variable but suggests a significant difference in reported life satisfaction in 2019 compared to 2017.

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18 Local authority fixed effects control for time-invariant characteristics specific to the local authority.

19 Time-fixed effects control for effects that are constant across individuals but vary over time.

To estimate the percentage of listed buildings within each 1km centroid ring, we utilised Unique Property Reference Number (UPRN) data. The UPRN uniquely identifies every spatial address in the UK. We counted the number of UPRNs and listed buildings within each 1km ring, then divided the number of listed buildings by the total number of UPRNs to calculate the percentage of properties that were listed. When modelled using the raw counts, the variable is significant with a p-value of 0.034 and a coefficient of 0.611. However, when we took the natural logarithm of both the number of UPRNs and listed buildings before calculating the percentage, there was a significant positive association (coefficient = 0.165, p = 0.002).

7.2 Model specification tests

Due to detected heteroskedasticity[20] via a White test, all models incorporated robust standard errors. To address autocorrelation among households, we clustered standard errors at the household level. Considering the potential for autocorrelation at the LSOA (Lower Layer Super Output Area) level – given correlations between the “Designated assets” and neighbourhood/regional variables – we evaluated cluster effects here. The effect on standard errors was minor, showing a marginal improvement in significance. Furthermore, this was tested at the local authority level in case of similarities within a local authority, with comparable results with no real impact on the standard errors. We also tested the robustness of results to clustering standard errors at the local authority level. As with clustering at the LSOA level, this had minimal impact on standard errors and significance levels.

The Ramsey RESET (Regression Equation Specification Error Test) is used to test for the omission of important variables or the incorrect functional form in a regression model. This test suggests a potential omitted variable bias[21]. This should not be unexpected in a study on life satisfaction that does not control for individual fixed effects due to the prominent level of variation of life satisfaction being down to often unobservable characteristics such as individual personality traits. The fixed effects approach is deemed unsuitable primarily as the well-being impact that the number of designated buildings causes in this model is not deemed to be due to the well-being impact from listing or designation, but instead a measure of pre-existing cultural heritage that is in the area.

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20 Heteroskedasticity is when the variance of an error term is not constant across observations. Heteroskedasticity does not affect the coefficient but can lead to biased standard errors, affecting the conclusions drawn by the paper.

21 Omitted variable is when the model fails to consider one or more relevant variables, leading to potential bias in the coefficient.

We evaluated variance inflation factor scores (VIFs) to detect multicollinearity[22]. Except for the variables age and age squared, no VIF (Variance Inflation Factor Scores) score surpassed 4, implying minimal multicollinearity concerns in our dataset. Specifically, our key variable, “Designated assets,” highlighted a VIF score of 1.1. Omitting “age squared” had an inconsequential effect on the designated assets variable’s significance or coefficient.

7.3 Model selection and estimation

Given the ordinal nature of our dependent variable, life satisfaction, an ordered logistic regression and ordered probit regression were deemed an appropriate alternative to the linear regression model. This approach allows for an understanding of the shifts between ordered categories of the outcome variable.

The primary linear regression model yielded a coefficient of 0.025 for the number of designated assets. This coefficient suggests that a 100% increase (or a doubling) in the original number of designated assets variable corresponds to an increase in the continuous life satisfaction score by 0.025 units, ceteris paribus. In contrast, the ordered logistic regression model produced a coefficient of 0.037 and the ordered probit produced a coefficient of 0.023 for designated assets. This value indicates that a 100% increase in the number of designated assets variable is associated with an increase in the odds of transitioning to a higher category of life satisfaction by 0.037 and 0.022 units respectively, holding other factors constant. While the linear regression assumes a continuous outcome, the ordered logistic regression operates under the premise of ordinal categories. Therefore, a comparison of the scale should not directly be done. Notably, in both models, the number of designated assets remains significant and meaningful.

The control variables also keep their significance, including household income, age, and children, retained their statistical significance in both the primary and robustness models.

22 Multicollinearity is when two or more variables in a model are correlated, leading to bias in their coefficients.

8 Discussion

This study provides evidence of a statistically significant, positive relationship between the density of heritage assets near one's residence and self-reported life satisfaction. A 1% increase in the number of designated heritage sites within a 1km radius was associated with a 0.00025 rise in life satisfaction scores on average (p=0.000), indicating density to cultural heritage holds a small yet meaningful association with subjective well-being. Put differently, a 1 unit increase in the level of cultural heritage density in this model is associated with an increase in life satisfaction that is equivalent to £15.84, and on average across England, individuals gain an increase in life satisfaction that is equivalent to £514.86. This relationship persisted after accounting for individual socioeconomic characteristics, neighbourhood, and regional variations. The results were robust to several changes in specification.

While the effect size may not be as substantial as some other predictors, the positive association between cultural heritage assets and life satisfaction highlights the potential role of heritage in contributing to community well-being. Life satisfaction is influenced by various personal, social, and environmental factors. Therefore, while cultural heritage represents an aspect of community well-being, it is one of many factors contributing to overall life satisfaction.

These findings align with previous studies linking engagement with heritage and cultural participation to enhanced well-being in the UK and Europe (e.g. Wheatley and Bickerton, 2019; Ateca-Amestoy et al., 2021; Macdonald et al., 2023). However, our analysis provides uniquely quantitative evidence of the relationship between local cultural heritage assets and life satisfaction, above and beyond individual usage patterns. While existing research has focused on participation and attitudes, this study empirically demonstrates the passive effects of place-based cultural heritage on residents' quality of life.

The results controlled for demographic, socioeconomic, and regional factors that may influence both life satisfaction and the density of cultural heritage. However, several limitations to using heritage designation data must be acknowledged. First, the positive association could stem from unobserved variables not captured in the models, such as community identity, social capital, environmental aesthetics, and other area-based factors that often accompany historic areas. Disentangling these mediating pathways requires further investigation.

Second, potential data quality issues in designation completeness or accessibility must be considered. Data completeness of the heritage assets measures could be influenced by local factors; priorities of areas with higher or lower levels of deprivation may impact the resources available at the local authority level. Additionally, varying policies and resource levels among local authorities over time might affect the existence of heritage and/or could influence the positive, or negative effects, stemming from cultural heritage.

The designation may also not fully reflect the quality, significance, or economic/social value of these amenities. Accessibility to the heritage is another factor, as culturally significant designated assets concentrated in one area or not publicly accessible may not contribute to life satisfaction.

Third, endogeneity concerns like resident self-sorting must be considered. Individuals with a greater affinity for heritage may choose to reside near historic sites, confounding the relationships. Longitudinal analyses leveraging panel data techniques are needed to elucidate causal mechanisms, however, both a lack of cultural heritage-related variables in the understanding society dataset and cultural heritage taking time to vary within an area make this difficult to evaluate.

Given these limitations, caution is warranted in implying causality. While the limitations to using heritage designation data must be acknowledged, currently there is no simple accounting approach to define a region’s quality of cultural heritage. Further research is required to determine the mechanisms by which cultural heritage may impact wellbeing.

Nevertheless, this study demonstrates a robust link between proximate cultural heritage assets and life satisfaction, highlighting the externalities generated by place-based historic resources. These previously underexplored spillover effects underscore the importance of heritage preservation and community development policies that enhance access to local cultural heritage. With further verification, such initiatives can potentially serve as pathways to improving well-being at the population level.

9 Conclusion and policy recommendations

This study investigated the relationship between proximity to cultural heritage assets and life satisfaction. Using nationwide data from the Understanding Society Survey and designated assets from the National Heritage List for England, our analysis provides robust evidence of a positive association between local cultural heritage density and subjective well-being. This indicates that living closer to historic and cultural sites holds a modest but meaningful link to well-being. The findings highlight previously underexplored spillover effects of place-based heritage, suggesting preservation policies that increase access to historic resources can serve as pathways to improving community quality of life.

This research presents a unique methodological approach to understanding how the value of heritage can be quantified and monetised with the WELLBY approach accepted by the UK's HM Treasury. On its own, the findings can be used to advocate for the protection and importance of cultural heritage – evaluating the non-market value that everyday heritage has on individuals' wellbeing. This report forms part of a series of reports that will aim to better articulate the value of culture and heritage capital, helping to ensure that the economic, social and cultural values are assessed when making policy decision-making (Sagger et al., 2021).

The association between cultural heritage and life satisfaction provides empirical evidence to inform policy decisions, not just for its intrinsic value but for its contribution to public wellbeing. The findings allow for a better understanding of the costs and benefits associated with preservation projects, or the costs associated with the decline or destruction of cultural heritage. The focus allows for the Social Cost Benefit Analysis (SCBA) to be expanded away from the more tangible, market-based, to the non-market values in line with the changes to the HM Treasury Green Book guidance. This report may also contribute to assisting in a framework to design a national account for cultural heritage capital.

In addition to the practical uses, this report can also advocate for policy recommendations that would support historic preservation programs, better accessibility to local heritage and community integration of heritage. Policymakers aiming to improve social welfare should consider cultural heritage a unique lever, not just for its intrinsic historical value but its ability to enhance community well-being.

Future studies can build upon this work through longitudinal analysis, exploring heterogeneous effects across demographic subgroups, assessing impacts of different heritage asset types, and incorporating perceived historic character. Such efforts would provide additional evidence to inform policies balancing preservation, development, and well-being.

10 Appendices

A: Criteria for designation

Table A1: Designation criteria for the different categories of heritage assets.
This table serves as a guide to understanding the selection process for heritage designation, highlighting the importance of both tangible and intangible attributes that contribute to an asset's historic value. The full guidance can be found on Historic England's website.

Category	Criteria for designation
Listed Buildings	● Buildings must be over 30 years old, with exceptions in exceptional circumstances. ● Buildings must have special architectural or historic interest, such as innovative architecture, association with an important person or event, or evidence of past features of interest. ● The building should retain a significant portion of its original form, features, and materials. Modifications are considered part of historical evolution. ● Listing can occur due to its relationship with other listed buildings or structures, forming historically significant groups or ensembles. ● Both interior and exterior features are considered during the process.
Scheduled Monuments	● Monuments must be of national importance due to rarity, completeness, or historic associations. ● Significant historical associations, rarity, periods, or completeness are represented. ● The monument should be reasonably intact or have significant remains, structures, or features contributing to its historical value.
Protected Wrecks	● Wrecks must have historical, archaeological, or artistic value. ● They should contribute to knowledge or represent important aspects of social, maritime, or naval history.
Registered Parks and Gardens	● Parks or gardens must have special architectural, historical, and landscape significance. ● The design, layout, and features of the park or garden should be of exceptional quality.
Registered Battlefields	● Battlefields must have had a demonstrable impact on English history and the landscape. ● Archaeological remains and historic records must provide evidence of the battle and its significance.

B: Additional literature on control variables and confounding impact on heritage

Income and socioeconomic status

Income and income rank amongst comparative peers have been often found to be dominant in determining the mechanism by which income affects life satisfaction (Boyce, Brown, and Moore, 2010). Utility and income are not linked, but the increase in income rank amongst peers will increase life satisfaction. FitzRoy and Nolan (2021) suggest that household income, rank, and reference income are all significant explanatory variables, contrasting previous works suggesting that the inclusion of rank can make nominal income insignificant.

Demographic factors

Age is highly correlated with the likelihood of accessing heritage (Department for Media, Sport and Culture, 2016); therefore, controlling for age is important in this study. Age has been measured to have a U-shaped phenome across multiple differing studies and methodologies, where life satisfaction with age peaks at both early age and old age, while decreases in the middle-age (Terence, Powdthavee, and Oswald, 2015; Blanchflower, 2020). However, the impact of this is debated, with Bartram (2020) suggesting that the impact while statistically significant might be minimal. Empirically, the U-shaped phenomenon of age is also supported by looking at anti-depressant use in society peaking at the age of 40 before decreasing afterwards (Blanchflower and Oswald, 2008). This may be paradoxical as circumstances associated with age, such as increases in wages are associated with greater life satisfaction, whereas health issues that come with old age may be negatively associated with age (Orben et al., 2022), yet are in line with a midlife nadir in human well-being.

Zhao et al. (2022) conducted a comprehensive study analysing the human capital (HC), social capital (SC), and psychological capital (PC) of intangible cultural heritage. Their findings underscored the importance of considering gender, age, place of residence, and education level socio-demographic factors when analysing the status and well-being of individuals involved in preserving intangible cultural heritage. Demographic variables are intricately linked to heritage; thus, the omission of these variables could lead to omitted variable bias.

Individuals who perceive themselves as religious tend to report higher levels of life satisfaction, even after accounting for other variables (Choirina et al., 2021). The intertwining of religious practices and heritage in many cultures suggests that religiosity could confound the relationship between heritage and life satisfaction. For instance, in societies where religious practices are embedded in cultural heritage, it might be

challenging to disentangle the individual effects of heritage and religiosity on life satisfaction. Therefore, when examining the impact of heritage on life satisfaction, religion is an important attribute to consider.

Neighbourhood effects

Environment and neighbourhood may have a greater effect on individuals' life chances than their own characteristics (e.g., Maarten van Ham and Manley, 2012a; van Melo, 2021). Therefore, to understand the determinants of current life satisfaction, it is important to consider neighbourhood effects. These include the income levels of an individual's neighbours (Knies, Melo, and Zhang, 2020;), local employment rates (Melo, 2021) and population density. Furthermore, controlling for spatial fixed effects (Melo, 2021) helps to eliminate time-invariant conditions. Controlling for these factors will help strengthen the analysis of neighbourhood effects on life satisfaction while accounting for factors that might simultaneously affect life satisfaction and proximity to and density of heritage assets.

The non-random sorting of individuals into neighbourhoods based on sociodemographic and economic conditions, along with associated selection issues, prevents causality so caution is required in the inclusion of these variables (Maarten van Ham and Manley, 2012a; Maarten van Ham and Manley, 2012b; Gibbons and Overman, 2012). Studies using quasi-experimental designs through institutionally driven programmes find an insignificant impact of neighbourhood improvement on adult outcomes (Timmermans et al., 2020).

C: Descriptive statistics

Table C1: Descriptive statistics for the study's variables.
This table offers a snapshot of the dataset's characteristics, showing means, standard deviations, and range values for key variables, which helps in understanding the sample's composition and the distribution of heritage assets and life satisfaction among participants.

Variable	Mean	Standard Deviation (SD)	Min	Max
Satisfaction with life overall	5.153	1.48	1	7
Designated assets in LSOA (1km)	32.271	67.03	0	1409
Household income monthly	3,638.83	5,765.42	0	781,313.80
Age	49.276	18.44	16	102
Children (in-house)	0.747	1.09	0	11
Undergraduate degree	0.409	0.492	0	1
Index of Multiple Deprivation LSOA	21.307	14.93	1.01	88.03
Population Density	4.254	12.72	0.03	241.44

Relationship	Mean	%
Divorced	1,596	6.4%
Living as couple	2,560	10.3%
Married	13,380	53.9%
Civil Partnership	148	0.6%
Separated but legally married	379	1.5%
Single and never married/in a civil partnership	5,432	21.9%
Widowed	1,333	5.4%

Sex	Mean	%
Men	11,124	44.8%
Women	13,704	55.2%

Home	Mean	%
Local/Social Rented	3,572	14.4%
Other	337	1.4%
Owned outright	8,869	35.7%
Owned with mortgage	9,469	38.1%
Rented	2,581	10.4%

Health limits moderate activities	Mean	%
Yes, limited a lot	2,031	8.1%
Yes, limited a little	4,371	17.4%
No, not limited at all	18,709	74.5%

Job Status	Mean	%
Full-time student	1,466	5.9%
Long Term sick or disabled	691	2.8%
On maternity leave	137	0.6%
Other	1,254	5.1%
Paid employment(ft/pt)	12,099	48.7%
Retired	6,210	25.0%
Self-employed	2,077	8.4%
Unemployed	889	3.6%

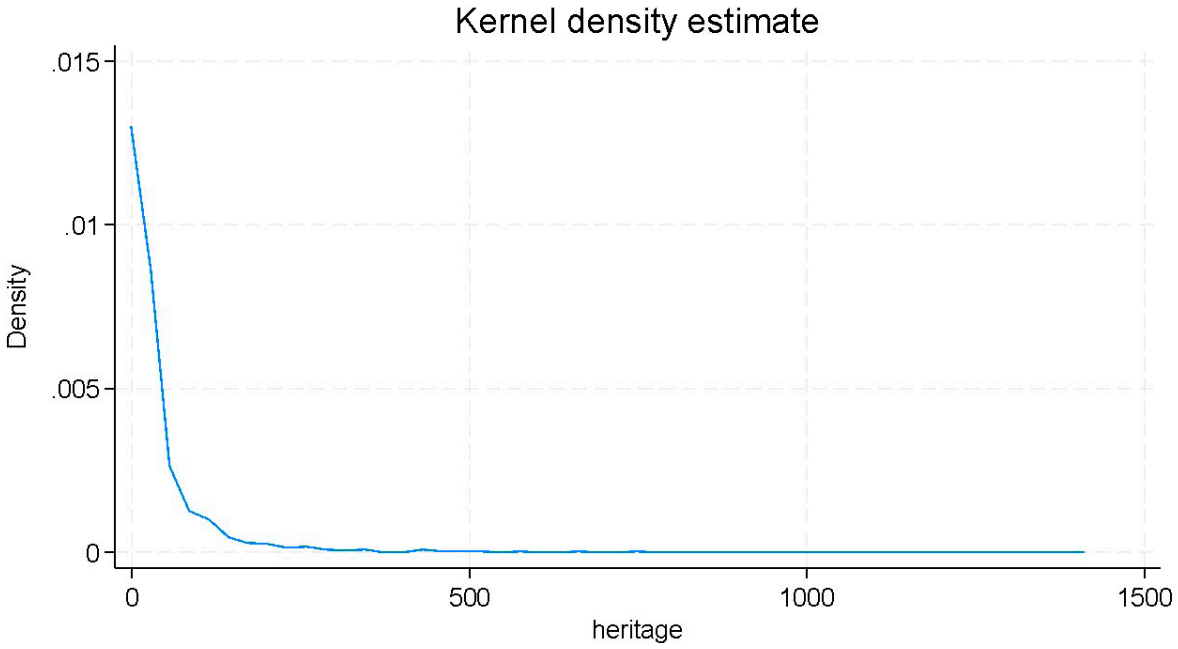
Ethnicity	Mean	%
Black	1,142	4.6%
Mixed	2,391	9.6%
Other	183	0.7%
White other	1,001	4.0%
White British	18,934	76.3%
Asian	1,177	4.7%

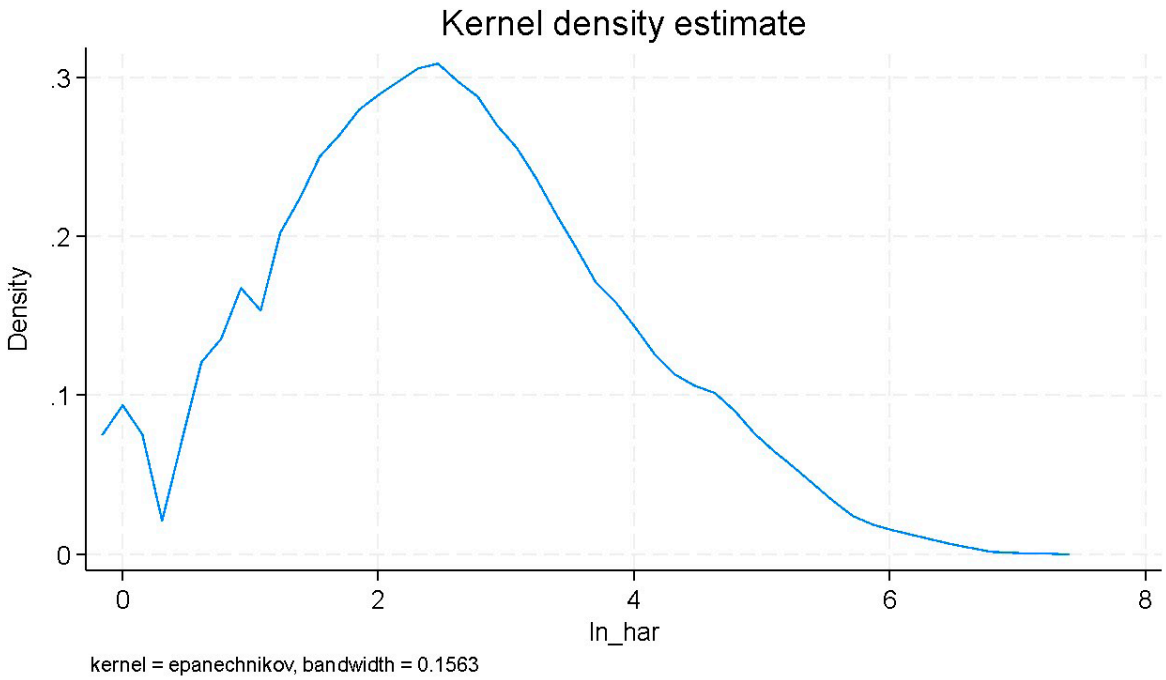
Religion	Mean	%
Buddhist	98	0.4%
Christian	10,712	43.1%
Hindu	487	2.0%
Jewish	96	0.4%
Muslim/Islam	1,728	7.0%
No religion/missing	11,143	44.9%
Other	296	1.2%
Sikh	274	1.1%

Government Office Region	Mean	%
North East	1,150	4.6%
North West	3,309	13.3%
Yorkshire and the Humber	2,671	10.8%
East Midlands	2,301	9.3%
West Midlands	2,678	10.8%
East of England	2,672	10.7%
London	3,594	14.5%
South East	3,840	15.5%
South West	2,613	10.5%

Urban or rural area, derived	Mean	%
Urban area	19,875	80.1%
Rural area	4,953	19.9%

D: Kernel Density





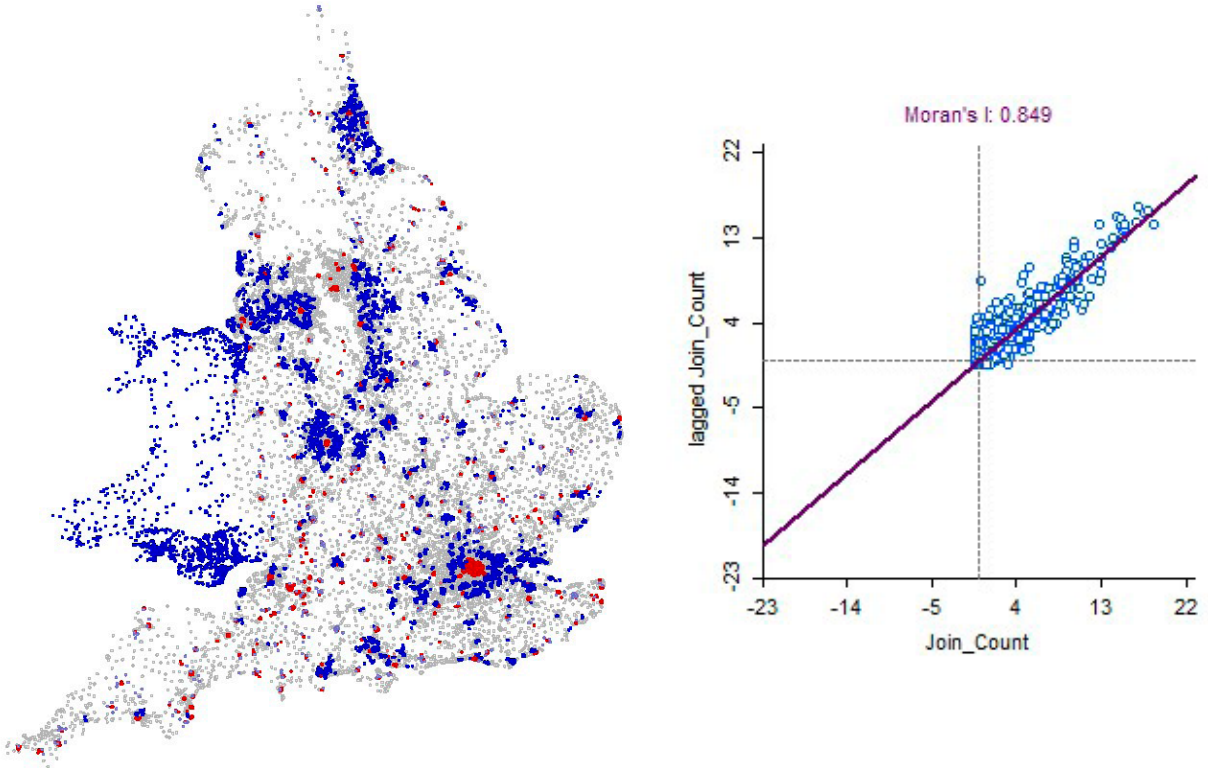
Figures D1 and D2: Kernel density plots for the number of designated assets and their logarithmic transformation across England.
These figure illustrate the non-unifrom distribution of heritage assets, which informs the choice of using a the logarithimic variable, where each unit increase on the axis represents a tenfold increase in the value of heritage density. Heritage is the non-logarithmic transformed variable. ln_har is the logarithmic transformed variable.

E: Regional breakdown of the number of designated assets

Table E1: The number of designated assets considered in this model by government office region.
This table gives insights into the geographic distribution of heritage assets across England, revealing variations in heritage density that could influence regional differences in life satisfaction. Please note that designated assets can be considered more than once in this model. Designated assets that are not within the 1km centroid rings are not considered.

Government Office Region	Designated Assets	Mean	Total	Min	Max
Northeast	1,150	18.25	22,993	0	465
Northwest	3,309	16.3	53,948	0	622
Yorkshire and the Humber	2,671	32.23	86,100	0	666
East Midlands	2,301	22.53	51,837	0	459
West Midlands	2,678	20.82	55,768	0	615
East of England	2,672	33.48	89,462	0	747
London	3,594	47.43	170,465	0	1202
Southeast	3,840	34.36	131,941	0	895
Southwest	2,613	53.86	140,730	0	1409

F: Moran I



Figures F1 and F2: A Local Moran's I cluster map and scatter plot.
The map shows clusters of high (red) and low (blue) heritage asset densities, indicating spatial patterns in the distribution of cultural heritage and suggesting areas with similar socioeconomic characteristics. The scatterplot shows the statistical relationship between a location of cultural heritage and its neighbours, indicating that areas of high and low cultural heritage cluster together.

G: Full regression model results

Table G1: The comprehensive regression analysis results assessing life satisfaction impacts. Key findings include a positive association between heritage density and life satisfaction, alongside significant control variables including income and health. This table underscores cultural heritage's value alongside traditional wellbeing determinants, providing a statistical basis for policy implications.

Coefficient	**Model 1**	**Model 2**	**Model 3**
Designated assets (log)	0.022***	0.021**	0.025***
Household monthly income (log)	0.055***	0.052***	0.053***
Age	-0.037***	-0.037***	-0.037***
Age Squared	0.000***	0.000***	0.000***
Number of Children	-0.022**	-0.021**	-0.021**
Women	0.199***	0.199***	0.199***
Degree	0.053**	0.049**	0.049**
Mental Health	0.063***	0.063***	0.063***
Index of Multiple Deprivation	-0.001*	-0.001*	-0.002*
Population density		0.000	0.000
Relationship (Baseline = Married)			
Divorced	-0.187***	-0.185***	-0.183***
Living as couple	-0.029	-0.026	-0.026
Civil Partnership	-0.008	-0.009	-0.009
Separated but legally married	-0.243***	-0.242***	-0.244***
Single and never married/ in a civil partnership	-0.260***	-0.258**	-0.258***
Widowed	-0.133**	-0.131**	-0.132**

* <0.05, ** <0.01, *** <0.001

	Model 1	Model 2	Model 3
Home Ownership (Baseline = Renting)			
Local/Social Rented	-0.01	-0.001	0.000
Other	0.0.27	0.03	0.033
Owned outright	0.081*	0.078*	0.076*
Owned with mortgage	0.095**	0.092**	0.091**
Health (Baseline = Severely limited in moderate activities)			
Yes, limited a little	0.419***	0.417***	0.419***
No, not limited at all	0.804***	0.800***	0.802***
Job Status (Baseline = FT/PT Employed)			
Full-time student	0.164***	0.162***	0.160***
Long term sick or disabled	-0.287***	-0.285***	-0.282***
On maternity leave	0.186	0.184	0.185
Other	0.031	0.031	0.031
Retired	0.276***	0.274***	0.275***
Self-employed	0.056	0.054	0.057
Unemployed	-0.258***	-0.255***	-0.255***
Ethnicity (Baseline = White British)			
Black	-0.114***	-0.105***	-0.101***
Mixed	-0.166***	-0.157***	-0.154***
Other ethnic group	-0.096	-0.097	-0.09
White other	0.028	0.024	0.019
Asian	-0.073	-0.067	-0.068

* <0.05, ** <0.01, *** <0.001

	Model 1	Model 2	Model 3
Religion (Baseline = Christian)			
Buddhist	0.064	0.063	0.07
Hindu	0.054	0.053	0.054
Jewish	0.218	0.216	0.217
Muslim/Islam	0.085*	0.096*	0.096**
No religion/missing	-0.046*	-0.046*	-0.046*
Other	-0.027	-0.025	-0.026
Sikh	-0.055	-0.056	-0.06
Government Office Region (Baseline = London)			
Northeast			0.053
Northwest			0.02
Yorkshire and the Humber			-0.026
East Midlands			0.065
West Midlands			0.035
East of England			0.013
Southeast			-0.011
Southwest			-0.022
Rural			-0.0013
Intercept	1.702***	1.763***	1.738***
R-sqr adj.	0.305	0.305	0.305
Observations	24,823	24,823	24,823
Neighbourhood Effect	No	Yes	Yes
Region Fixed Effects	No	No	Yes

* <0.05, ** <0.01, *** <0.001

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