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Effect of the Historic Built Environment on Local Economic Growth in England

An Instrumental Variable Approach

Rami Zalfou

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Summary

This study investigates the effect of the historic built environment on local economic growth in England. The analysis adopts an instrumental variable (IV) strategy that exploits plausibly exogenous variation in the historical cost and feasibility of constructing durable buildings. Specifically, it instruments historic building density using local availability of different building stone types, measured through bedrock geology data from the British Geological Survey, alongside ONS data on Gross Value Added at the level of the Lower Layer Super Output Area (LSOA), and Historic England data on the spatial distribution of listed buildings. The causal effect of historic building density on local economic growth is estimated using two-stage least squares, controlling for baseline economic conditions and a rich set of geographic covariates. The results indicate that historic building density has a positive and statistically significant effect on local economic outcomes. Sectoral GVA evidence using Local Authority District (LAD) data suggests that the effects are concentrated in tourism-related activity and property-related sectors, with evidence of local economic specialisation and sectoral reallocation.

This research is part of a wider programme of work called Culture and Heritage Capital (CHC), which DCMS is leading in partnership with its arm's length bodies (Arts Council England, the British Film Institute, Historic England, and the National Lottery Heritage Fund) and the UKRI Arts and Humanities Research Council. For more information, see the Culture and Heritage Capital Portal.

Front cover: City Hall, Queen Victoria Square, Kingston upon Hull.
[Alan Bull, © Historic England Archive, DP174329]

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Executive summary

The Department for Culture, Media and Sport's (DCMS) Culture and Heritage Capital (CHC) programme seeks to improve understanding of the value generated by culture and heritage assets by treating them as capital stocks that provide a flow of benefits over time. The framework aims to strengthen the evidence base for decision-making by capturing the economic, social, wellbeing and other benefits associated with these assets. A key priority within the programme is developing robust evidence on the contribution of heritage assets to economic prosperity and place-based growth.

This research contributes to that objective by examining whether England's historic built environment supports local economic growth. Undertaken by Historic England (HE), the study investigates the relationship between the stock of historic buildings and economic performance across England, assessing whether places with greater concentrations of historic buildings experience stronger economic growth. By providing new causal evidence on the economic role of the historic built environment, the research helps to address a significant evidence gap within the CHC programme and advances understanding of heritage as a form of productive capital.

A key challenge in measuring the impact of historic buildings on economic growth is that they are not randomly distributed across the country. They tend to be concentrated in places that were already wealthy or economically important in the past, such as historic cities, ports and trading centres. As a result, simple comparisons between areas with differing levels of heritage may conflate the effect of historic buildings with the influence of these pre-existing advantages.

To address this issue, the analysis adopts an approach that isolates variation in heritage which is independent of these underlying factors. Specifically, it exploits differences in local geological conditions, such as the availability of durable building materials including limestone and sandstone. Historically, areas with access to such materials were more likely to construct long-lasting buildings that have survived into the present.

Because these geological characteristics were determined long before the emergence of modern economic patterns, they provide a credible source of exogenous variation. This allows the analysis to identify the causal effect of the historic built environment on contemporary economic outcomes, rather than simply capturing the persistence of historical prosperity.

The research employs detailed spatial data for over 30,000 neighbourhoods (Lower Layer Super Output Areas) in England, ONS estimates of Gross Value Added (GVA) in each of these neighbourhoods spanning the period from the late 1990s until 2023, alongside data from the National Heritage List for England (NHLE) and data on bedrock geology from the British Geological Survey.

The research finds strong evidence that the historic built environment is associated with higher levels of local economic activity. The results are consistent across both cross-sectional analysis and panel analysis over time. Cross-sectional estimates, capturing growth since the late 1990s, suggest that places with greater heritage density experience modest but persistent increases in economic growth. The preferred causal estimates imply that areas enjoying double the number of historic buildings experience a premium in annual GVA growth of around 0.07 percentage points. Panel estimates for the period 2010–2023, which control for baseline GVA, indicate larger effects on the level of economic activity. The preferred estimates suggest that areas with double the number of historic buildings have approximately 4% higher local GVA.

To provide an indicative sense of scale, these effects translate into economically meaningful impacts at the national level. A modest increase in heritage - for example, a 10% increase in historic buildings - is associated with around a 0.5-0.6% increase in GVA. Applied to the English economy, this corresponds to an uplift on the order of £12.5–15 billion, over the study period. Panel estimates imply effects in the range of £15–20 billion. These figures are illustrative and should be interpreted as indicative magnitudes rather than precise estimates of net national gains.

This effect remains robust across a wide range of tests and alternative model specifications, such as limiting the study period prior to 2020, excluding the London Metropolitan Area, and excluding historically industrial regions. The findings therefore support the interpretation of the historic built environment as a productive form of place-based capital rather than solely a cultural or aesthetic asset.

To further explore the mechanisms behind these effects, the analysis makes use of sector-level GVA data using similar methods. The findings suggest that the economic effects of historic buildings are concentrated in specific sectors rather than across the economy. Heritage density is particularly associated with tourism and visitor-related activities, as well as real estate and property markets. These findings are consistent with the historic built environment strengthening the identity and attractiveness of place, which in turn supports visitor demand and property values. By contrast, the research finds limited evidence that historic buildings strongly drive growth in high skill service sectors (such as IT, finance, and engineering), though further research is needed to understand their causal impact on skills and labour force composition.

This research addresses a long-standing evidence gap in heritage policy. While it is widely argued that heritage supports local regeneration and economic vitality, robust causal evidence has been limited. By using advanced statistical techniques and detailed spatial data, this study provides the most comprehensive quantitative assessment of the economic role of historic buildings in England.

The results indicate that the historic built environment can play a meaningful role in supporting local economic performance, and heritage assets should be recognised as long-term economic infrastructure. At the same time, heritage may influence the type of economic development that occurs in a place. Historic environments may specialise in activities related to the visitor economy and related sectors while being less suited to transport-intensive or logistics-based activity.

While the results provide strong evidence of a positive economic relationship, several limitations remain. Listed buildings represent only part of the historic environment, and the analysis focuses on average effects across England rather than differences between specific types of places. Future research could extend this work by examining the role of the historic built environment within urban areas and city centres, its impact on employment, wages, and business formation, and the role that public investment programmes play in realizing the economic returns from heritage assets.

Introduction

This paper forms part of the Department for Culture, Media and Sport's (DCMS) Culture and Heritage Capital (CHC) programme, which seeks to develop a stronger evidence base on the value generated by culture and heritage assets. The CHC framework treats heritage assets as capital stocks that generate flows of economic, social, wellbeing and environmental benefits over time, and aims to improve the incorporation of these benefits into policy and investment decisions. Within this context, understanding whether the historic built environment contributes to economic growth represents an important evidence gap. By estimating the causal effect of built heritage on local economic performance, this paper contributes directly to the economic evidence base underpinning the CHC programme.

The relationship between the historic built environment and local economic performance has become increasingly central to policy debates in England. Local authorities, national government, and heritage organisations regularly argue that heritage can support economic renewal by attracting visitors, strengthening place identity, and stimulating investment (see DCMS 2024, Historic England 2024, CEBR 2024, The National Lottery Heritage Fund 2016). At the same time, heritage protection may impose constraints on redevelopment, raise construction costs, or limit the ability of places to adapt to new economic conditions. Despite the prominence of these arguments, the empirical evidence on whether the inherited stock of historic buildings contributes to local economic growth, and by how much, remains limited and often difficult to interpret causally.

In this paper, the focus is on the historic built environment, defined as the stock of historic buildings and built heritage that has been inherited from the past and persists in the present landscape, including listed buildings and historically significant urban form. It can be interpreted as a form of heritage capital - a durable, place-based asset that generates flows of economic, social, wellbeing, and other benefits over time (DCMS 2024). For brevity, the paper refers to this stock as built heritage.

The paper investigates the effect of built heritage on local economic growth in England. The analysis uses data on Gross Value Added (GVA) at the Lower Layer Super Output Area (LSOA) level from the Office for National Statistics (ONS), and administrative data from Historic England on the distribution of listed buildings. The LSOA geography offers a particularly useful setting: it captures highly granular spatial variation in both the built heritage and economic performance, while remaining large enough to match consistently across official datasets. The core question is straightforward: do areas with a higher density of built heritage experience faster economic growth over the long run?

Estimating this relationship is empirically challenging. Built heritage is not randomly distributed across space, and its location reflects centuries of settlement patterns, resource availability, and historical shocks. Places that were historically wealthy, administratively important, or commercially central are more likely to have accumulated substantial durable built heritage and to have retained it through subsequent preservation and listing processes. These same places may also have stronger contemporary growth prospects due to persistent advantages such as market access, agglomeration economies, infrastructure, or human capital. In addition, contemporary economic conditions may affect the measurement of built heritage through mechanisms such as differential rates of demolition and redevelopment, selective conservation effort, and variation in local planning capacity. As a result, ordinary least squares (OLS) estimates of the association between built heritage and growth risk being biased by omitted variables, reverse causality, and selection into preservation.

To address these concerns, the paper adopts an instrumental variables (IV) strategy designed to isolate variation in built heritage that is plausibly exogenous to modern economic growth. The central idea is that the durability, cost, and feasibility of constructing long-lasting buildings historically depended in part on the local availability of building materials, particularly stone. Before the widespread integration of national transport networks and modern construction materials, the characteristics of the local bedrock shaped what could be quarried and used for construction at low cost, influencing the prevalence of stone-built structures and their likelihood of surviving into the present. This provides a source of variation in the contemporary density of built heritage that is rooted in long-run geological endowments rather than in recent economic performance.

Specifically, the analysis instruments the density of built heritage using measures of proximity and exposure to different bedrock geology types, derived from British Geological Survey (BGS) data. These geology-based measures predict local built heritage through historical construction technology and material availability (the relevance condition), while being plausibly unrelated to modern economic growth except through their effect on the inherited built heritage (the exclusion restriction). Importantly, the empirical specification controls for baseline economic conditions and a rich set of geographic covariates - such as population size, regional fixed effects, and flexible spatial trends in latitude and longitude - to reduce the risk that geology proxies for broad regional patterns in development. The causal effect of the density of built heritage on local growth is estimated using two-stage least squares (2SLS).

The results indicate that built heritage is associated with economically meaningful differences in both the growth and level of local economic activity. Cross-sectional estimates, which capture long-run growth performance since the late 1990s, suggest that areas with higher heritage density experience modest but persistent increases in annual GVA growth: the preferred IV estimates imply that doubling the stock of listed buildings is associated with an increase in annual growth of around 0.07 percentage points. Complementary panel estimates for the period 2010–2023, which condition on baseline economic activity and exploit within-period variation, point to larger level effects. The preferred IV specification indicates that doubling the stock of listed buildings is associated with approximately 4.1% higher local economic output (GVA). Taken together, these findings suggest that built heritage contributes to local economies through modest but persistent advantages that accumulate over time.

The findings on mechanisms suggests that the economic effects of built heritage are not evenly distributed across all parts of the economy, but are concentrated in sectors that directly benefit from historic character and place attractiveness. Sectoral analysis indicates that heritage density is most strongly associated with higher activity in tourism and property-related sectors, including real estate and housing services, consistent with heritage raising visitor demand and being capitalised into local land and property values. By contrast, there is little evidence that heritage primarily drives growth in high-skill knowledge sectors, and some evidence of lower activity in transport and routine service sectors, potentially reflecting differences in local economic specialisation and land-use constraints in historic environments. While these sectoral results are based on coarser data and should be interpreted as indicative rather than definitive, they support the interpretation of built heritage as a place-based asset that shapes how local economies grow, not just how much they grow.

This paper contributes to several literatures. First, it adds to work on the local economic impacts of place-based assets by treating the historic built environment as a measurable form of heritage capital rather than as a purely cultural or aesthetic feature. Second, it contributes to research on the persistence of historical endowments by showing how deep determinants – like geology and building material availability - can shape the spatial distribution of durable infrastructure and the contemporary economic geography of growth. Third, the paper complements existing evaluations of heritage funding and conservation programmes by shifting attention from short-run project impacts to the role of the existing stock of heritage assets as a long-run growth factor.

Background and previous research

Research and policy literatures increasingly posit a positive relationship between built heritage and economic growth, arguing that heritage assets can contribute to local and regional development through multiple channels (Cerisola and Panzera 2025; Nogare et al. 2025). These include tourism demand and place branding, the attraction of skilled workers and investment, agglomeration effects linked to cultural amenities, and broader impacts on wellbeing and social capital that may indirectly support productivity and long-run growth. According to the DCMS Cultural Heritage Capital framework (DCMS 2024), cultural heritage is conceptualized as a form of productive capital capable of generating sustained economic returns when adequately preserved and integrated into development strategies. However, despite the growing prominence of this topic in policy discourse, particularly in the context of place-based growth and regeneration agendas, robust empirical evidence on the causal effect of built heritage on economic growth remains limited. To date, much of the literature relies on conceptual models, case studies, or correlational evidence, leaving the magnitude, mechanisms, and external validity of the proposed relationship largely untested.

In this study, the focus is specifically on the built heritage (i.e. historic built environment). Specifically, the stock of historically significant buildings and urban fabric that is embedded in place and persists over long time horizons. Unlike many cultural investments that are relatively mobile or short-lived, built heritage is spatially fixed and durable, shaping the character, functionality, and perceived quality of local environments over decades. This durability implies that built heritage can influence local development not only through short-run spending effects, but also through longer-run processes of agglomeration, residential sorting, and investment dynamics.

At the same time, the expected relationship between built heritage and growth is theoretically ambiguous. Heritage designation and conservation can introduce regulatory constraints and higher adaptation costs, potentially limiting redevelopment, densification, or the reconfiguration of building stock to meet evolving economic needs. These countervailing mechanisms imply that the net effect of built heritage on local growth is ultimately an empirical question.

Empirically isolating the causal effect of built heritage on growth is challenging because heritage assets are not randomly distributed across space. Areas with dense built heritage often coincide with historically advantaged locations - such as early market towns, administrative centres, ports, or well-connected urban cores - where growth would be expected even in the absence of heritage. This creates a risk of reverse causality and omitted-variable bias, and helps explain why much of the existing evidence remains correlational.

A growing body of empirical research has examined the relationship between cultural and built heritage and various measures of economic performance across regions and cities. Several studies find evidence that built heritage endowments are positively associated with local economic outcomes. For example, Kostakis and Lolos (2024) show that cultural heritage endowment, proxied by visitation and heritage-related indices, has a positive effect on regional economic growth in Greek regions over 2000–2019, consistent with models where heritage boosts economic activity through tourism demand and broader attractiveness effects.

At the sectoral and intermediary level, empirical work also highlights the role of heritage in generating tourism demand and local prosperity. Cerisola and Panzera (2025) find that heritage tourism contributes to local economic development in Italian provinces, although they also point to potential controversies such as overtourism and community costs. Similarly, Muštra et al. (2023) document that cultural World Heritage Sites play an important role in maintaining regional economic resilience in EU contexts, particularly through domestic tourism channels.

Beyond tourism, built heritage and cultural environments have been linked to the attraction of skilled labour and human capital accumulation. Backman and Nilsson (2018) provide evidence from Swedish neighbourhoods that the local supply of built heritage and cultural amenities is positively associated with the growth of highly educated residents, suggesting amenity-led channels through which heritage influences regional attractiveness and long-term development.

Other recent research explores the policy and institutional mechanisms through which built heritage interacts with local economies. Shubbar et al. (2025) synthesizes case-based evidence on heritage tourism and urban regeneration, highlighting how heritage can act as a catalyst for economic revitalisation while also generating concerns about commercialization and authenticity. Zhang (2025) further shows, using Chinese provincial data, that heritage protection policies can enhance economic development both directly and indirectly, with tourism acting as a significant mediator and human capital amplifying the effects.

Despite these advances, the literature also points to significant gaps and caveats. Much of the evidence is correlational, focuses on tourism and visitor flows rather than broader output measures, and relies on proxies such as UNESCO World Heritage Site counts or tourism indices rather than direct measures of the stock of built heritage.

Together, these findings indicate that built heritage is plausibly linked to economic outcomes through multiple channels - tourism, skilled labour attraction, and regeneration - yet quantitative causal evidence at fine spatial scales and across different sectors is still emerging. This motivates the current paper's focus on estimating the impact of the stock of the historic built environment on local economic growth while addressing endogeneity and accounting for heterogeneity in mechanisms.

Instrumental variable approach

Estimating the causal effect of built heritage on local economic growth is complicated by the fact that heritage is not randomly distributed across space. Places with dense stocks of listed buildings are often historically central, better connected, and may have enjoyed persistent advantages in trade, administration, or early industrialisation. These same long-run fundamentals also predict stronger contemporary economic performance, creating a risk that ordinary least squares estimates confound the effect of heritage with unobserved historical determinants of growth. In addition, reverse causality is plausible: more prosperous areas may have had greater capacity to maintain historic buildings, invest in conservation, or mobilise heritage designation. These concerns motivate an instrumental variable (IV) strategy designed to isolate exogenous variation in built heritage.

The IV approach exploits the fact that England's diverse geology has profoundly shaped the character and distribution of its built heritage. Distinct regional building traditions emerged from the stones most readily available in each area (see Historic England research on the Building Stones of England). The availability of stone historically affected both the cost of construction and the durability of the built environment, influencing the spatial distribution of the historic building stock that survives into the present. Crucially, bedrock geology is naturally determined, highly persistent over time, and predates modern patterns of economic development. This makes geological variation a plausible source of exogenous spatial differences in built heritage.

Table 1 shows the average number of listed buildings in all Lower Layer Super Output Areas (LSOAs) in England according to the proximity and local availability of limestone and sandstone. Overall, the average number of listed buildings is close to 34, but increases markedly in building stone-rich areas, particularly in areas rich in limestone and arenaceous sandstone. These stone types are considered among the most historically important building materials in England, widely used in vernacular architecture as well as in high-status ecclesiastical, civic, and domestic construction, and are strongly associated with long-lasting building stock that survives into the present. The patterns in Table 1 therefore suggest that local geological endowments are closely linked to the spatial distribution of built heritage, consistent with the idea that building stone availability shaped where durable historic structures were built and preserved.

Table 1: Average number of listed buildings according to stone availability

Overall	Stone-rich areas			Non stone-rich
	Limestone	Sandstone	Arenaceous sandstone	
33.8	43	37.4	54.3	27.4

Formally, the empirical strategy instruments local built heritage, proxied by the count of listed buildings, using measures derived from underlying geology. The first stage relates built heritage to geological endowments, capturing the idea that areas with easier access to building stones (specific bedrock types) are more likely to contain higher numbers of historic buildings. In the second stage, predicted built heritage from the first stage is used to estimate its effect on local economic growth outcomes. Identification therefore comes from variation in listed-building density that is driven by geological constraints rather than by contemporary or historical economic conditions.

For this strategy to be valid, the instruments must satisfy two conditions. Relevance requires that geology strongly predicts built heritage. This is supported by the historical role of locally available stone in shaping historical building density and durability. The exclusion restriction requires that geology affects contemporary local growth only through its impact on built heritage, and not through other channels. This assumption is more demanding, since geology could influence modern outcomes via other pathways. To mitigate this concern, the analysis includes a rich set of control variables capturing baseline economic conditions and spatial fundamentals - including initial GVA, population density, urban status, region fixed effects, and flexible geographic polynomials in latitude and longitude (detailed in the next section). The identifying variation thus comes from within-region differences in geological endowments that predict heritage intensity, net of broader spatial patterns and observable confounders.

While geology is not a perfect “as-if random” source of variation, it offers a historically predetermined factor that shaped the built environment. By leveraging this exogenous component of built heritage, the IV approach aims to recover the causal effect of built heritage on local economic growth, rather than correlations driven by persistent historical advantages or contemporary sorting.

Data and methods

Data on local economic growth comes from the ONS small area gross value added (GVA) dataset[1], aggregated at the LSOA level. Bedrock geology is measured using data from the British Geological Survey (BGS) Geology 625K dataset, specifically using the Rock Classification Scheme (RSC) variable created by the BGS[2]. Data on the density of historical buildings comes from the National Heritage List for England (NHLE)[3].

Two alternative specifications of the instrument are used. The first specification uses the bedrock geology composition within each LSOA, by overlaying the borders of LSOAs with the BGS bedrock geology data and calculating the local bedrock composition using the RCS categories. The second specification calculates the shortest Euclidean distance between LSOA centroids and the nearest bedrock location of each major bedrock type, and uses the inverse distance calculated based on it[4]. In both specifications, the presence of coal and distance to coal are treated as control variables in the main regression equation, and not as instruments. This is due to coal's strong association with early industrialization, as it may affect modern economic growth through persistence channels other than the presence of built heritage.

The basic model uses a cross-sectional dataset, where the first stage model takes the following form:

$$asinh(Listed\_Buildings_i) = Bedrock_i' \, \delta_1 + X_i' \, \delta_2 + f(location_i) + \, v_i$$

Where i is the LSOA, $Listed\_Buildings_i$ refers to the number of listed buildings within each LSOA, $Bedrock_i'$ is a set of instruments (either local bedrock composition, or the distance of each LSOA centroid to each bedrock source), X_i' includes a set of control variables

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[1] Office for National Statistics (ONS) (2025) *UK small area gross value added (GVA) estimates: 1998 to 2023 edition*, Office for National Statistics. Available at: https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/uksmallareagvaestimates (Accessed: *January 2026*).
[2] British Geological Survey (BGS) (n.d.) *BGS Geology 625k*. British Geological Survey. Available at: https://www.bgs.ac.uk/datasets/bgs-geology-625k/ (Accessed: *January 2026*).
[3] Historic England (2026). *National Heritage List for England (NHLE) geo-coded dataset* [GIS dataset]. Open Data Hub. Retrieved January 19, 2026, from https://historicengland.org.uk/listing/the-list/data-downloads
[4] Inverse-distance instruments are commonly used in spatial settings to translate exogenous geographic proximity into continuous variation in treatment intensity. In this specification, the shortest Euclidean distance is computed between each LSOA centroid and the nearest mapped bedrock location of each major bedrock type, and the instrument is defined as the inverse of this distance using the formula z = 1/(distance+1), which ensures a smooth decay in exposure with distance and avoids extreme values at very small distances.

(population density[5], region dummy variables, urban/rural status, GVA in 1998[6], and distance to coal sources or local availability of coal). $f(location_i)$ is a set of spatial controls (controlling for latitude and longitude using a cubic polynomial function[7] which controls for spatial trends within regions.

The number of listed buildings is transformed using the inverse hyperbolic sine transformation (asinh). The number of listed buildings is strongly skewed with a long right tail, and many LSOAs with zero listed buildings. While the standard log transformation is commonly used to deal with right skew, the strong concentration of zero values limits its usefulness in this case.

The second stage model takes the following form:

$$CAGR_i = \beta_1 \; asinh(\widehat{Listed\_Buildings_i}) + X_i' \, \beta_2 + f(location_i) + \; \varepsilon_i$$

Where $CAGR_i$ is the Compound Annual Growth Rate for GVA, $\widehat{Listed\_Buildings_i}$ is the predicted value from the first-stage regression, and X_i' includes the same set of control variables as in the first stage regression. In this regression, β_1 yields the causal effect of the number of listed buildings on the annual growth rate.

Interpreting the effect of asinh(Listed_Buildings) depends on the level of listed buildings. At higher values, the transformation behaves approximately like a logarithm, so changes can be interpreted in proportional terms: for example, doubling from 50 to 100 increases asinh(Listed_Buildings) by about 0.69 (≈ ln 2), implying an effect on the outcome of approximately β × 0.69, where β is the estimated regression coefficient. By contrast, at low values the transformation is closer to linear, so effects reflect absolute changes in the transformed variable: increasing from 0 to 1 raises asinh(Listed_Buildings) by about 0.88, and from 1 to 2 by about 0.56. This implies larger marginal effects at very low levels, which diminish as the number of listed buildings increases (see Bellemare and Wichman 2020).

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5 LSOAs are constructed to contain broadly similar population sizes. As a result, variation in their physical area (km²) provides a useful inverse proxy for population density, and this measure is used here accordingly.

6 1998 is the earliest available GVA measure at the LSOA level.

7 The function takes the following form:
$lat + long + lat^2 + long^2 + lat.long + lat^3 + long^3 + lat^2.long + lat.long^2$ When adding region fixed effects, his specification becomes inestimable causing the design matrix to lose full rank (i.e., become singular). For this reason, the specification with regional fixed effects uses only first- and second-order terms ($lat,\ long,\ lat^2,\ long^2,\ lat.long$), which control for smooth spatial trends while remaining identifiable.

A limitation of the cross-sectional model is that GVA data is measured in nominal terms, which yields a growth rate that captures both real growth and nominal growth due to inflation, and presents a risk of measurement error for β_1. To address this limitation, the model is extended to a panel data model with GVA as the dependent variable. The first stage model takes the following form:

$$asinh(Listed\_Buildings_{it}) = Bedrock_i' \, \delta_1 + X_{it}' \, \delta_2 + f(location_i) + \ v_{it}$$

Where t is the year. X_{it}' is expanded to include year fixed effects and GVA levels in 2010. The second stage model takes the following form:

$$log\ (GVA_{it}) = \beta_1 asinh\ (\widehat{Listed\_Buildings_{it}}) + X_{it}' \, \beta_2 + f(location_i) + \ \varepsilon_{it}$$

This panel model uses log(GVA) as the dependent variable, and data from 2010 to 2023, as the NHLE dataset on listed buildings starts in 2010. Additional robustness checks use data from 2010 to 2020 to ensure that results are not driven by high inflation rates following the COVID pandemic, and exclude the London Metropolitan Area and historically industrial regions to ensure that outlier areas are the main drivers of estimated results.

To examine mechanisms, the analysis makes use of ONS data on GVA by industry at the Local Authority District (LAD) level[8]. GVA by industry is only available at the LAD level and the ONS does not produce similar data at the LSOA level. This data allows for examining the effect of listed buildings on GVA in specific sectors including the tourism sector and other relevant sectors.

Results

Descriptive statistics

Table 2 reports descriptive statistics for the main variables used in the analysis. The cross-sectional dataset contains 31,810 LSOAs. Across all LSOAs, the mean number of listed buildings is 33.8, while average local economic growth in the cross-section is at 3.58% per year, and the mean population is 1,675, consistent with the typical size of LSOAs. The coal-related controls show that the average LSOA is located 84.4 km from the nearest coal-bearing geology, while the mean share of coal within LSOAs is 0.57%, implying that

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[8] Office for National Statistics (2021) *GVA by industry by local authority: time-series dataset (Version 1)*. Office for National Statistics. Released 11 January 2021. Available at: https://www.ons.gov.uk/datasets/gva-by-industry-by-local-authority/editions/time-series/versions/1 (Accessed: January 2026).

coal presence is relatively rare at the LSOA level but remains important to account for given its strong historical link to industrialization and long-run development patterns.

Table 2: Descriptive statistics

Cross-sectional data	
Observations	31,810
Mean number of listed buildings	33.8
Mean CAGR (%)	3.58
Mean population	1,675
Mean distance to coal (km)	84.4
Mean share of coal (%)	0.57
Mean latitude	52.37983
Mean longitude	-1.207977
Region (%)	
North	29.0
Midlands	19.1
South	51.9
Panel data	
Observations	445,339
Mean number of listed buildings	33.5
Mean GVA (millions of pounds)	44.39

The table also reports average spatial coordinates, with a mean latitude of 52.38 and mean longitude of -1.21, broadly reflecting the geographic centre of the LSOA sample within England. In terms of regional distribution, 51.9% of LSOAs are in the South, compared to 29.0% in the North and 19.1% in the Midlands[9], which is consistent with the higher concentration of population and administrative units in southern England.

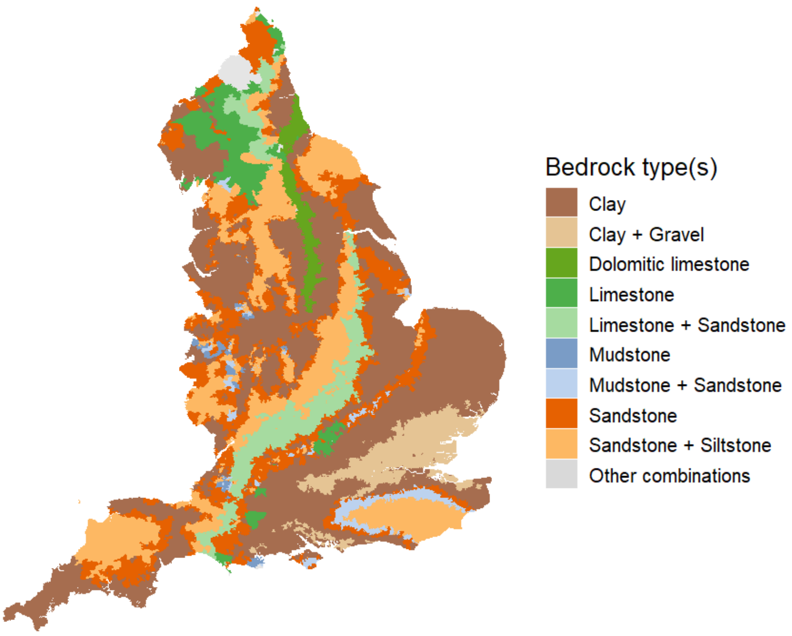
The panel dataset contains 445,339 LSOA-year observations, using annual GVA as the dependent variable to reduce reliance on nominal long-run growth rates and to exploit within-period variation. Summary statistics in the panel indicate a similar average level of built heritage, with a mean of 33.5 listed buildings, suggesting that the heritage measure is stable across specifications. Mean annual GVA is £44.39 million per LSOA[10].

Figure 1 presents three maps illustrating the relationship between England's bedrock geology and the spatial distribution of listed buildings.

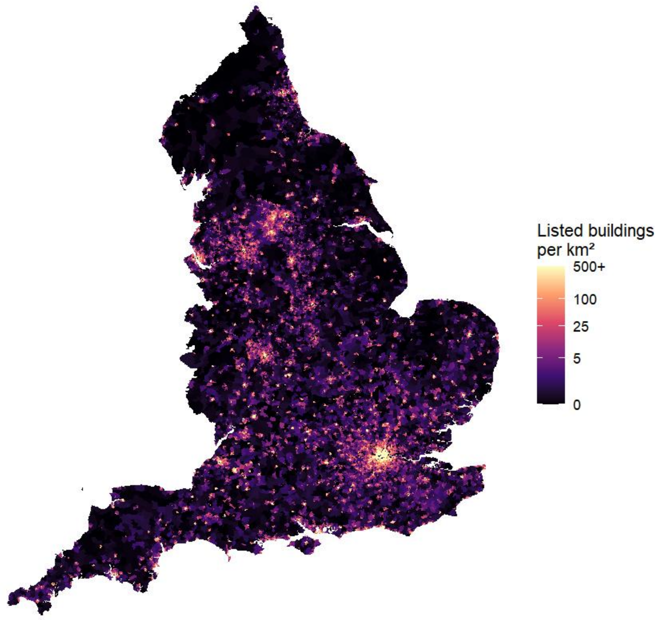
[9] Regions are defined using ONS ITL1 geographies aggregated into North (North East, North West, Yorkshire and the Humber), Midlands (West Midlands, East Midlands), and South (London, South East, South West, East of England).
[10] For descriptive statistics on the instrumental variables, see Appendix Table A1.

Figure 1: Geology and listed buildings in England

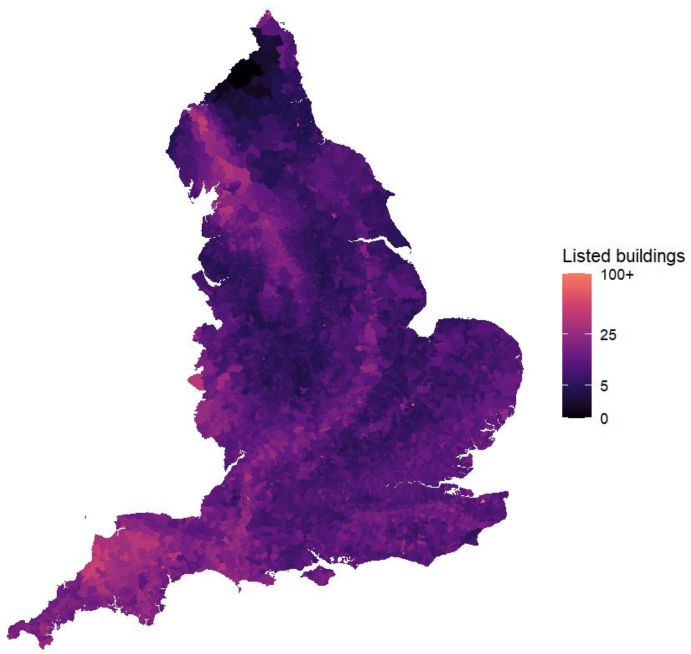
(a) Bedrock geology map of England



(b) Distribution of listed buildings



(c) Variation in the number of listed buildings due to bedrock geology



Source: Author’s own maps based on BGS and NHLE data

Panel (a) shows the dominant bedrock types across England based on British Geological Survey data[11]. The map highlights the considerable geological diversity of the country, with distinct belts of sandstone, limestone, clay, mudstone, and mixed formations running across regions. For example, limestone formations are particularly visible across parts of the Midlands and northern England, while sandstone dominates in areas such as the north-west and parts of the south-west. Clay and mixed sedimentary formations are more common in the south-east and eastern regions. These geological patterns reflect long-run natural endowments that historically influenced the availability and cost of local building materials.

Panel (b) maps the distribution of listed buildings per square kilometre using data from the National Heritage List for England. The density of listed buildings is highly uneven across space. Clusters appear in historically dense and economically significant regions, particularly in major cities. Conversely, lower densities are observed in many rural or historically less built-up areas.

Panel (c) presents the component of listed building density predicted by geological variation. This map isolates the variation in listed buildings that can be attributed to differences in bedrock composition, holding other factors constant. The spatial pattern is noticeably smoother and reflects the presence of certain bedrock types; areas with limestone and sandstone - materials historically well suited for durable masonry construction - tend to exhibit higher predicted densities of listed buildings. These are areas with a higher-than-expected concentration of listed buildings, relative to places with similar population density and economic characteristics, largely reflecting their proximity to bedrock containing high-quality building stone.

Cross-sectional models

Table 3 reports cross-sectional estimates of the relationship between built heritage and local economic growth, using inverse distance to bedrock geology as the instrument. The dependent variable is the compound annual growth rate (CAGR) of GVA, and the key explanatory variable is the inverse hyperbolic sine of the number of listed buildings.

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[11] The map only shows the largest bedrock categories for simplicity. See Appendix table A1 for a full list of bedrock variables used in the analysis.

Table 3: Cross sectional regression results using inverse distance as an instrument

	Dependent variable: CAGR			
	OLS	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)
asinh(Listed_Buildings)	0.019***	0.139***	0.015**	0.104***
	(0.007)	(0.037)	(0.007)	(0.041)
GVA in 1998	Y	Y	Y	Y
Spatial polynomials	Y	Y	Y†	Y†
Population density	Y	Y	Y	Y
Urban status	Y	Y	Y	Y
Distance to coal	Y	Y	Y	Y
Region fixed effects	-	-	Y	Y
Observations	31,810	31,810	31,810	31,810
R^2	0.018	0.009	0.018	0.014
Weak instrument test	-	80.612***	-	66.304***
Endogeneity test	-	9.905**	-	3.918*

*p<0.1; **p<0.05; ***p<0.01

†: Spatial polynomials are restricted to the first and second degrees when using region fixed effects.

The baseline OLS specification without region fixed effects (column 1) yields a small positive coefficient on heritage density (0.019, significant at the 1% level). Once region fixed effects are included (column 3), the estimated coefficient declines to 0.015. The IV estimates yield a substantially stronger effect of built heritage on economic growth. In the baseline IV specification (column 2), the coefficient on asinh(listed buildings) is 0.139 and statistically significant at the 1% level. When region fixed effects are included (column 4), the estimated coefficient remains positive and statistically significant (0.104), indicating that the positive relationship persists even when comparing LSOAs within the same region.

Instrument strength is high in both IV specifications. The weak instrument test statistics are 80.6 in column (2) and 66.3 in column (4), comfortably above conventional thresholds, implying that the bedrock geology instruments strongly predict built heritage in the first stage. Moreover, the endogeneity test rejects exogeneity of the heritage variable in both cases ($p<0.05$ in column 2 and $p<0.1$ in column 4), supporting the interpretation that OLS estimates are biased and that an IV strategy is warranted.

The magnitude of the IV coefficients implies a substantively meaningful effect of built heritage on local economic growth, though the average estimate should be interpreted with some caution given likely non-linearities in the relationship. In the preferred specification with region fixed effects, the coefficient of 0.104 indicates that a one-unit increase in asinh(Listed_Buildings) is associated with a 0.104 percentage point increase in annual GVA growth. Because the inverse hyperbolic sine transformation approximates the logarithm once the number of listed buildings moves beyond very small values, this can be interpreted in approximate proportional terms for most LSOAs with a non-trivial stock of heritage assets. In this range, a doubling of listed buildings is associated with an increase in annual GVA growth of around 0.07 percentage points. While modest in annual terms, this represents a non-trivial uplift relative to typical growth rates and would compound over time into meaningful differences in local economic performance. At the same time, this estimate reflects an average effect across areas with very different levels of heritage, and subsequent analysis suggests that the marginal impact may vary across the distribution. The substantially larger IV estimates relative to OLS further indicate that naive specifications likely understate the true effect, consistent with attenuation or omitted variable bias.

Table 4 reports IV results where the instrument set is based on local bedrock composition within each LSOA. These results are consistent with Table 3 and, if anything, imply even larger point estimates. In the baseline IV specification (column 2), the estimated coefficient is 0.221 ($p<0.01$). When region fixed effects are added (column 4), the coefficient remains sizeable at 0.159 ($p<0.05$). As with the distance-based instruments, the first-stage diagnostics indicate strong instrument relevance, with weak instrument statistics ranging from 72.6 to 65.1 across specifications.

Table 4: Cross-sectional regression results using composition as an instrument

	Dependent variable: CAGR			
	OLS (1)	*IV* (2)	*OLS* (3)	*IV* (4)
asinh(Listed_Buildings)	0.019*** (0.007)	0.211*** (0.052)	0.015** (0.007)	0.159** (0.056)
GVA in 1998	Y	Y	Y	Y
Spatial polynomials	Y	Y	Y†	Y†
Population density	Y	Y	Y	Y
Urban status	Y	Y	Y	Y
Composition - coal	Y	Y	Y	Y
Region fixed effects	-	-	Y	Y
Observations	31,810	31,810	31,810	31,810
R^2	0.018	0.005	0.018	0.006
Weak instrument test	-	72.64***	-	65.11***
Endogeneity test	-	12.29***	-	5.17*

*p<0.1; **p<0.05; ***p<0.01

†: Spatial polynomials are restricted to the first and second degrees when using region fixed effects.

Taken together, the cross-sectional evidence supports three main conclusions. First, the OLS results suggest only a weak correlation between built heritage and GVA growth. Second, the causal IV estimates are consistently larger and statistically significant across alternative instrument constructions, showing that built heritage has a positive causal effect on local economic growth. Third, the strong first-stage diagnostics and significant endogeneity tests indicate that the geology-based instruments provide credible identifying variation and that treating heritage density as exogenous in cross-sectional regressions is likely inappropriate.

The IV coefficients remain positive and significant even after including region fixed effects and spatial polynomials. This suggests that the estimated effect is not solely driven by broad regional differences or geographic trends, but reflects meaningful variation in built heritage within regions that is plausibly tied to exogenous geological conditions.

Panel models

Table 5 reports panel estimates of the relationship between built heritage and local economic performance, using log Gross Value Added (GVA) as the dependent variable and the inverse hyperbolic sine of listed buildings as the key explanatory variable, and instrumenting for heritage density using inverse distance to bedrock geology. Across all specifications, the estimated association is positive and precisely estimated: in the baseline OLS models (Columns 1 and 3), a higher density of listed buildings is associated with significantly higher GVA ($\beta \approx 0.144–0.142$). Instrumenting heritage density using inverse distance measures yields similar but slightly attenuated effects. The IV coefficient remains large and statistically significant in both specifications ($\beta = 0.111$ in Column 2 and $\beta = 0.059$ in Column 4, $p<0.01$), suggesting that the positive relationship is not driven solely by reverse causality or omitted local characteristics. The first-stage diagnostics indicate that the instrument is very strong (weak instrument F-statistics above 900 in both IV models). Overall, the results are consistent with a robust positive causal effect of built heritage on local economic activity, and remain stable after controlling for baseline GVA, year fixed effects, population density, urban status, proximity to coal, and region fixed effects.

Table 5: Panel regression results using inverse distance to bedrock

	Dependent variable: Log(GVA)			
	OLS	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)
asinh(Listed_Buildings)	0.144^{**}	0.111^{***}	0.142^{***}	0.059^{***}
	(0.001)	(0.005)	(0.001)	(0.006)
GVA in 2010	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Spatial polynomials	Y	Y	Y†	Y†
Population density	Y	Y	Y	Y
Urban status	Y	Y	Y	Y
Distance to coal	Y	Y	Y	Y
Region fixed effects	-	-	Y	Y
Observations	445,339	445,339	445,339	445,339

	Dependent variable: Log(GVA)			
	OLS	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)
R^2	0.180	0.177	0.177	0.164
Weak instrument test	-	1146***	-	949***
Endogeneity test	-	0.048	-	40.02***

*p<0.1; **p<0.05; ***p<0.01

†: Spatial polynomials are restricted to the first and second degrees when using region fixed effects.

In terms of magnitude, the log–asinh specification can be interpreted approximately as a log–log model for areas with a sufficiently large stock of listed buildings, where the transformation behaves similarly to the logarithm. In the preferred IV specification with region fixed effects (Column 4), the coefficient of 0.059 implies that a doubling of listed buildings is associated with an increase in GVA of around 4.1%, while a 10% increase corresponds to approximately a 0.6% increase in GVA. These are economically meaningful effects, particularly as they reflect persistent differences in the level of local economic activity over the 2010–2023 period, conditional on baseline GVA. At the same time, for LSOAs with very small numbers of listed buildings, the transformation is closer to linear, and the estimates are better interpreted as reflecting the impact of incremental increases in heritage stock rather than proportional changes. Overall, the results are consistent with a robust positive causal effect of built heritage on local economic activity, and remain stable after controlling for baseline GVA, year fixed effects, population density, urban status, proximity to coal, and region fixed effects.

Table 6 extends the panel analysis by instrumenting heritage density with local bedrock geology composition, rather than inverse-distance measures, to test whether the results are robust to an alternative source of exogenous variation. Across all specifications, the coefficient on asinh(Listed_Buildings) remains positive and highly statistically significant. In the OLS models (Columns 1 and 3), the estimated association is very similar to the baseline results ($\beta \approx 0.144$–0.142). The IV estimates using geology composition are smaller in magnitude but remain precisely estimated ($\beta = 0.056$ in Column 2 and $\beta = 0.049$ in Column 4, $p<0.01$), indicating that higher listed-building density has a positive effect on local GVA. First-stage diagnostics confirm that the instrument is strong, with weak-instrument F-statistics comfortably above 1000 in both IV specifications. Endogeneity tests reject the null of exogeneity ($p<0.1$ throughout), reinforcing the case for an instrumental-variable approach.

Table 6: Panel regression results using bedrock composition

	Dependent variable: Log(GVA)			
	OLS	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)
asinh(Listed_Buildings)	0.144***	0.056***	0.142***	0.049***
	(0.001)	(0.007)	(0.001)	(0.008)
GVA in 2010	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Spatial polynomials	Y	Y	Y†	Y†
Population density	Y	Y	Y	Y
Urban status	Y	Y	Y	Y
Composition - coal	Y	Y	Y	Y
Region fixed effects	-	-	Y	Y
Observations	445,339	445,339	445,339	445,339
R^2	0.180	0.164	0.177	0.160
Weak instrument test	-	1121***	-	1054***
Endogeneity test	-	14.32***	-	4.86*

*p<0.1; **p<0.05; ***p<0.01

†: Spatial polynomials are restricted to the first and second degrees when using region fixed effects.

In the panel specification with log GVA as the dependent variable, the pattern of results differs from the cross-sectional case, with OLS estimates exceeding their IV counterparts. This likely reflects upward bias in OLS driven by time-varying omitted factors (such as local regeneration activity or other local investment shocks) that both enhance economic performance and are correlated with higher concentrations or preservation of listed buildings. By contrast, the IV strategy isolates plausibly exogenous variation in heritage driven by geological factors, removing these confounding influences and yielding a smaller but more credible causal estimate.

Robustness checks

Table 7 provides a set of robustness check by re-estimating the panel IV models using restricted samples. Panel A restricts the sample to the years 2010 to 2020, reducing the scope for price-level changes to influence the results, particularly due to the post-COVID pandemic inflation. This restriction helps address the concern that the estimated relationship between heritage density and economic activity could be mechanically affected by inflation dynamics. The estimated effect of heritage density closely mirror the full-sample findings, suggesting that the positive effect of heritage density on local economic activity is not driven by inflation effects and is robust across specifications.

Table 7: Robustness checks

	Dependent variable: Log(GVA)			
	Distance IV		*Composition IV*	
	(1)	(2)	(3)	(4)
Panel A: Years 2010 to 2020				
asinh(Listed_Buildings)	0.111***	0.059***	0.059***	0.052***
	(0.006)	(0.006)	(0.008)	(0.009)
Observations	349,909	349,909	349,909	349,909
R^2	0.172	0.157	0.159	0.155
Panel B: Excluding industrial regions				
asinh(Listed_Buildings)	0.103***	0.058***	0.047***	0.056***
	(0.006)	(0.006)	(0.008)	(0.008)
Observations	393,946	393,946	393,946	393,946
R^2	0.177	0.163	0.161	0.162
Panel C: Excluding London Metropolitan Area				
asinh(Listed_Buildings)	0.103***	0.069***	0.078***	0.065***
	(0.005)	(0.005)	(0.007)	(0.007)
Observations	380,113	380,113	380,113	380,113
R^2	0.449	0.447	0.448	0.446
Controls				
GVA in 2010	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Spatial polynomials	Y	Y†	Y	Y†
Population density	Y	Y	Y	Y
Urban status	Y	Y	Y	Y
Composition/distance to coal	Y	Y	Y	Y
Region fixed effects	-	Y	-	Y

*p<0.1; **p<0.05; ***p<0.01

†: Spatial polynomials are restricted to the first and second degrees when using region fixed effects.

Panel B repeats the analysis excluding the industrial belt regions (North West England, Yorkshire and The Humber, and The West Midlands). The resulting coefficients are in line with the main results. This robustness test shows that the results are not mainly driven by low growth rates in post-industrial areas in England.

Panel C repeats the analysis excluding the London metropolitan area, providing a robustness check against the concern that the main results are driven disproportionately by London’s exceptional economic scale, sectoral composition, and heritage stock. Reassuringly, the estimated effects also confirm those found in the full sample.

Heterogeneity analysis

To understand what type of area is driving the result, an interaction model is estimated in table 8, separating areas into four bins according to the number of listed buildings (0 to 3, 4 to 10, 11 to 30, and 31 or more). The causal effect of listed buildings on growth is estimated for each of these bins using the same model framework as above and the same set of controls.

Table 8: Heterogeneity analysis

	Dependent variable: log(GVA)			
	Distance IV		*Composition IV*	
	(1)	(2)	(3)	(4)
asinh(Listed_Buildings)	-0.040	-0.088^{***}	0.003	0.025
	(0.034)	(0.033)	(0.046)	(0.046)
asinh(Listed_Buildings): 4 to 10 listed bldgs.	0.873^{***}	0.627^{***}	0.540^{***}	0.573^{***}
	(0.119)	(0.122)	(0.198)	(0.201)
asinh(Listed_Buildings): 11 to 30 listed bldgs.	0.449^{***}	0.224^{**}	-0.173	-0.163
	(0.108)	(0.110)	(0.209)	(0.205)
asinh(Listed_Buildings): 31 or more listed bldgs.	0.071^{*}	0.177^{***}	0.144^{***}	0.272^{***}
	(0.040)	(0.038)	(0.055)	(0.055)
Region fixed effects	-	Y	-	Y
Observations	445,339	445,339	445,339	445,339
R^2	0.204	0.213	0.218	0.220

*p<0.1; **p<0.05; ***p<0.01
Note: All regressions control for baseline GVA, year fixed effects, and population density.

In the baseline category (areas with 0 to 3 listed buildings), the estimated effect is small and negative or statistically indistinguishable from zero across specifications. In contrast, areas with a moderate number of listed buildings (4 to 10) show consistently large and statistically significant positive effects across all models. This suggests that marginal increases in heritage stock are most strongly associated with local economic growth in areas where heritage is present but not dominant. For areas with 11 to 30 listed buildings, the results vary by IV specification. Finally, in areas with 31 or more listed buildings, the estimated effects are generally positive but smaller in magnitude, consistent with diminishing marginal returns to additional heritage stock in areas where heritage is already highly concentrated.

Overall, the results point to a non-linear relationship between heritage density and economic growth impacts. The largest marginal economic benefits appear to occur in areas with moderate existing heritage density, while effects are weaker in areas with very low or very high concentrations of listed buildings. This pattern is consistent with the coexistence of positive amenity and agglomeration effects alongside potential development constraints in areas with very high heritage density.

Mechanisms

To shed light on potential mechanisms, Table 9 decomposes local economic activity into broad sectoral components and re-estimates the IV (inverse distance) model using LAD-level panel data. The dependent variable is log GVA measured separately for total output and for eight sector aggregates constructed from detailed SIC classes (Tourism, High-skill services, Low-skill services, Non-market services, Transport, Real estate, Construction, and Imputed rents). The specification mirrors the baseline approach by instrumenting heritage density with geology-based variation, while controlling for year fixed effects, urban status, population density, distance to coal, and geographic location (second order polynomials in latitude and longitude). This exercise is inherently more demanding than the LSOA-based analysis because the sectoral GVA data are only available at the LAD level, yielding a substantially smaller sample (around 2,700 observations) and a coarser spatial unit. As a result, the estimates should be interpreted as suggestive rather than definitive, and the sector-specific patterns are not expected to be as stable or robust as in the main results. Despite these limitations, the LAD-level results provide some evidence of heterogeneity in how heritage density relates to different parts of the local economy. The IV estimate for total GVA remains positive and statistically significant, consistent with the main findings that built heritage is associated with higher aggregate economic activity. On a sector basis, the largest positive association appears in Tourism, which aligns closely with the interpretation that built heritage can raise visitor demand and strengthen place-based attractiveness.

Positive and significant effects are also observed for Real estate ($\beta = 0.158$) and Imputed rents ($\beta = 0.136$), suggesting that heritage may be capitalised into property-related activity and housing services. By contrast, the estimates are negative for several sectors. Heritage density is associated with lower GVA in Low-skill services ($\beta = -0.222$) and Transport ($\beta = -0.212$), while the coefficient for High-skill sectors is not statistically significant. Construction shows no clear relationship. These negative or null results should be treated with caution given the smaller sample, the aggregation to LAD boundaries, and the fact that sectoral GVA categories are likely to be more sensitive to measurement error. Moreover, some negative coefficients may reflect sectoral reallocation effects - heritage-rich places may specialise more strongly in tourism- and property-related activity - rather than implying an overall reduction in economic performance.

Table 9: IV regression results using LAD-level data and GVA sectors

	Dependent variable: Log(GVA)								
	Total	Tourism	High skill services	Low skill services	Non-market services	Transport	Real estate	Construction	Imputed rents
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
asinh(Listed_Buildings)	0.105***	0.163***	-0.105	-0.222***	0.245***	-0.212***	0.158***	0.013	0.136***
	(0.025)	(0.028)	(0.065)	(0.034)	(0.030)	(0.041)	(0.046)	(0.029)	(0.022)
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Population density	Y	Y	Y	Y	Y	Y	Y	Y	Y
Distance to coal	Y	Y	Y	Y	Y	Y	Y	Y	Y
Latitude and longitude	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,781	2,754	2,736	2,736	2,736	2,754	2,736	2,754	2,736
R^2	0.614	0.555	0.323	0.465	0.642	0.345	0.493	0.491	0.725
Weak instrument test	40.09***	41.43***	26.54***	26.54***	26.54***	41.43***	26.54***	41.43***	26.54***
Endogeneity test	45.33***	54.01***	69.37***	80.01***	50.21***	52.90***	14.07***	52.90***	5.09*

*p<0.1; **p<0.05; ***p<0.01

Note: GVA is categorized by grouping detailed SIC industry classes into a smaller set of economically interpretable sectors. Tourism captures industries most directly linked to visitor demand and local amenity value, including Accommodation and food services (55–56) and Arts, entertainment and recreation (90–93). High-skill services include knowledge-intensive and professional activities: Information and communication (58–63), Financial and insurance activities (64–66), and professional/scientific services such as Legal (69), Head offices and management consultancy (70), Architecture and engineering (71), and Other professional, scientific and technical activities (72–75). Low-skill services group more routine and consumer-facing activities, including Wholesale and retail trade (45–47), Administrative and support services (81–82), Other service activities (94–96), and related local services. The Non-market services sector category covers Public administration and defence (84), Education (85), Human health (86–87), and Social work (88). Transport includes Land/air transport (49–51) and Warehousing and postal/courier activities (52–53). Construction includes 41–43. Finally, Real estate (68)) refers to the market-facing real estate activity, while Imputed rents (68IMP) captures the imputed housing services component of GVA. This classification provides a tractable sectoral breakdown while preserving a meaningful distinction between tourism/amenity-related activity, public services, and different types of local services.

In terms of identification, the instrument remains relevant but is notably weaker than in the main LSOA-based panel models: weak-instrument F-statistics range from roughly 26 to 41 across columns, comfortably above conventional thresholds but far below the extremely strong first-stage diagnostics observed in the main results. Endogeneity tests strongly reject exogeneity across most specifications, supporting the use of IV in this setting. Overall, the LAD-level sectoral results are consistent with the main conclusion that built heritage is positively linked to local economic activity, and they tentatively suggest that the strongest associations operate through tourism and property-related sectors, but the evidence is less robust and should be interpreted as exploratory.

The sectoral results suggest that the economic effect of built heritage may operate partly through specialisation and sectoral reallocation. Heritage density appears to cause a shift away from more routine, lower value-added activities and towards amenity- and place-based sectors that benefit directly from historic character. The strongest positive association is observed for tourism-related GVA, consistent with the interpretation that heritage assets raise visitor demand and support local consumption in accommodation, food services, and cultural recreation. At the same time, the negative coefficient for low-skill services points to a pattern in which heritage-rich places may experience partial replacement of routine service activity - such as certain retail and local services - by tourism-oriented demand and related spending. This is consistent with a mechanism of local economic specialization rather than simply “more of everything.”

A similar logic may explain the negative relationship between heritage density and transport and logistics. Heritage-rich places are often characterised by historic urban form, constrained street layouts, protected built environments, and planning restrictions that limit large-scale infrastructure expansion. These characteristics may reduce the likelihood that such areas evolve into major transport hubs, freight nodes, or warehousing centres, implying that transport activity is comparatively lower in heritage-intensive local economies. In this sense, heritage may shape the type of development a place can accommodate, reinforcing specialisation into sectors compatible with conservation and amenity value rather than heavy logistics or large-scale transport-oriented land use.

The results provide little evidence that heritage density disproportionately attracts high-skill, knowledge-intensive activity. The coefficient for the high-skill sector is negative and statistically insignificant, suggesting that the heritage–GVA relationship does not appear to be driven primarily by the expansion of finance, ICT, or professional services.

Taken together, these patterns are consistent with the idea that built heritage may influence local economic development partly by shaping comparative advantage:

supporting tourism and property-related activity while being less compatible with transport-intensive functions, and without clear evidence of a distinct pull effect on high-skilled employment as suggested by previous research (Backman and Nilsson 2018).

Discussion and conclusion

This paper set out to estimate the causal effect of England's built heritage stock on local economic performance. Across both cross-sectional growth regressions and panel models of annual GVA levels, the results consistently indicate that built heritage density has a positive effect on local economic outcomes. In cross sectional data, this relationship is substantially stronger under instrumental variables (IV) estimation than under ordinary least squares (OLS), suggesting that simple correlations between heritage and growth are likely biased by endogeneity. The IV approach exploits plausibly exogenous variation in the historical feasibility and cost of constructing durable buildings, using bedrock geology as a source of variation in listed-building density that predates modern economic development.

The cross-sectional results show that OLS estimates provide only weak evidence of a positive relationship between heritage density and long-run local growth. By contrast, the IV estimates are consistently positive and statistically significant across two alternative instrument constructions - distance-to-bedrock measures and within-LSOA bedrock geology composition. The preferred IV specifications imply economically meaningful effects: increases in listed-building density are associated with higher subsequent GVA growth rates, even when comparing places within the same broad region and controlling flexibly for baseline GVA, spatial trends, urban status, population density, and coal-related geography.

The panel evidence strengthens this conclusion. Using annual log(GVA) as the dependent variable and exploiting LSOA-year variation, the IV estimates remain positive, precisely estimated, and robust to alternative instrument constructions. The panel models also address an important limitation of the cross-sectional CAGR specification - that long-run growth is measured in nominal terms and may embed inflation dynamics. Restricting the panel to the years 2010 to 2020 (before the post-pandemic inflation increase in 2021) yields the same results, suggesting that the estimated relationship is not an artefact of post-COVID inflation or macroeconomic conditions. Likewise, excluding London and the industrial belt regions confirms that the findings are not driven by outlier regions with unusually high heritage density and region-specific economic dynamics.

Taken together, the evidence supports the interpretation of built heritage as a form of place-based capital: a durable, spatially fixed asset that can contribute to local economic performance over long horizons. While the implied annual growth effects in the cross-section are modest in percentage-point terms, they can still translate into non-trivial cumulative differences in economic outcomes over long periods, particularly for significant changes in heritage density.

The difference in magnitudes between the cross-sectional CAGR and panel log-GVA results reflects the different time horizons and outcomes being modelled. The cross-sectional estimates capture average annual growth over a long period beginning in 1998, and therefore reflect a highly smoothed measure of economic performance across multiple economic cycles, which attenuates the implied annual effect. By contrast, the panel specification conditions on baseline GVA in 2010 and captures differences in subsequent levels of economic activity over 2010–2023. As such, it reflects the cumulative impact of heritage on local economic performance over this period.

The LAD-level sectoral analysis provides suggestive evidence on how heritage density translates into higher economic activity. Although these results should be interpreted cautiously due to the smaller sample size and coarser geography, the pattern is informative. The strongest positive effects are observed in tourism-related GVA and in real estate and rental values, consistent with mechanisms in which historic character raises visitor demand, strengthens place identity, and is capitalised into land and property markets. In other words, heritage appears most strongly linked to sectors that directly benefit from amenity value and place-based attractiveness.

At the same time, the sectoral results indicate that the relationship is not uniform across the economy. Heritage density is negatively associated with low-skill services and transport, and there is no clear evidence of positive effects on high-skill services. This points toward a mechanism of specialisation and sectoral replacement: heritage-rich areas may increasingly orient towards tourism and property-related activity while becoming less likely to develop as logistics hubs or centres of routine service provision. In transport and warehousing, this pattern is plausible given that historic urban form, conservation constraints, and limited space for infrastructure expansion may reduce comparative advantage in transport-intensive land uses. Similarly, the negative relationship with low-skill services may reflect demand reallocation (for example, away from some routine local services and toward visitor-oriented consumption).

The lack of evidence for a strong high-skill channel is also notable. While prior research shows that cultural heritage attracts skilled individuals in Sweden (Backman and Nilsson

2018). The present results do not show a clear expansion of high-skill service sector output. One interpretation is that built heritage in England functions primarily through consumption-amenity and land value channels (tourism and property) rather than through a strong productivity channel linked to knowledge-intensive clustering. Findings from other contexts may also have limited validity in the UK context, where differences in heritage abundance and geographic clustering can play a role. Alternatively, it may reflect limitations of the LAD sectoral data, where high-skill activity is concentrated in a small number of places and may be difficult to detect reliably in a small sample. Further research is needed to understand the effect of built heritage on the clustering and growth of creative industries (see Cerisola 2024).

The IV strategy helps address the limitations of previous research by isolating the component of heritage density driven by long-run geological endowments, rather than by modern economic conditions or contemporary preservation capacity. The strong first-stage diagnostics across the main models provide reassurance that geology is highly predictive of listed-building density, and the consistent second-stage results across instruments and samples support the interpretation that heritage density has a positive causal effect on local economic outcomes.

Despite the robustness checks, several limitations remain and should qualify the interpretation. Listed buildings are an imperfect measure of the total built heritage. Listing captures formally protected assets rather than the full historic built environment, and listing intensity may reflect administrative and institutional factors. Moreover, the measure does not capture quality, condition, accessibility, or the extent to which heritage is actively used as an economic asset. As a result, the estimated effects should be interpreted as the impact of measured listed-building density rather than of heritage value more broadly.

The sectoral results are explicitly exploratory. The LAD-level sample is relatively small, and the aggregation from LSOAs to LADs can mask within-district variation. While the pattern of tourism and real estate effects aligns with the main interpretation, additional work using richer outcome data - such as employment by sector, firm entry, wages, or property transaction values at finer spatial scales - would be valuable for establishing mechanisms more conclusively.

Finally, the models estimate average effects across England, but the impact of heritage may be heterogeneous. The returns to built heritage are likely to differ between urban and rural areas, between high-demand and low-demand housing markets, and between places with different levels of accessibility and complementary infrastructure. Understanding this heterogeneity is important for policy, particularly for targeting regeneration interventions and heritage investment.

The robustness tests and the maps shown in the descriptive section suggest that the main source of variation in the explanatory variable (instrumented heritage density) come from rural areas that are rich in good quality building stone, as compared to areas with similar populations and economic scale. In the LATE (local average treatment effect) framework, these areas can be considered the compliers whose treatment varies due to the instrument, and the effect of heritage density identified in this paper is likely driven by this category of regions. In contrast, heritage density in highly urbanized and economically central regions is less likely to vary due to geology, where the effects of human activity (urbanization., economies of scale, transport networks, etc) is far more dominant. This does not imply a null effect for heritage density on economic growth in urban areas, but it does limit the external validity of the estimated effect. Future work can explore the effect of heritage density in urban areas specifically by modelling its distribution within cities, using more granular within-city variation and exploiting other possible instruments like the damage to heritage from WWII destruction and post-war rebuilding.

From a policy perspective, the paper findings support the view that the historic built environment can be an economically productive asset, and not only a cultural or aesthetic good. However, the results also imply that heritage-led growth is likely to operate through specific channels - tourism and property markets - rather than through broad-based expansion of all sectors. This underscores the importance of complementary investments (such as public realm improvements, accessibility, visitor infrastructure, and adaptive reuse policies) that help places convert heritage assets into sustained economic returns, while managing potential trade-offs related to land-use constraints and sectoral displacement.

Overall, the paper contributes to emerging quantitative evidence on the economic role of cultural and built heritage, and highlights the value of combining fine-grained spatial economic data with historically grounded identification strategies. Future research could extend this approach by examining heterogeneity in effects across different types of places, by incorporating outcomes related to employment, wages, and firm dynamics, and by directly testing the role of complementary policies and investments in amplifying the economic returns to built heritage.

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Appendix

Table A1: Bedrock types used as instrumental variables

Bedrock type	Distance (Km)	Inverse distance	Composition
Arenaceous rock	69	0.050	0.013
Clay	101	0.266	0.207
Coal	84	0.050	0.006
Conglomerate	328	0.004	0.000
Diamictite	496	0.002	-
Dolomitic limestone	125	0.049	0.020
Feldspathic sandstone	84	0.050	0.006
Gravel	104	0.266	0.207
Lignite	424	0.003	-
Limestone	36	0.135	0.069
Mudstone	14	0.258	0.120
Quartzite	479	0.002	-
Schist	442	0.002	-
Sandstone	4	0.539	0.366
Seatearth	389	0.003	-
Siltstone	5	0.515	0.341
Volcanic rock	446	0.002	-

Note: The table shows mean values across all LSOAs in the cross sectional data. Distance is measured in Kilometres. Composition measures the average area within LSOAs that is accounted for by the bedrock type (Note that different bedrock types are not mutually exclusive and are present in layers). Some bedrock types are present in the United Kingdom but are not present inside of England, and therefore appear in the distance data but not in the composition data. The bedrock categories are based on the British Geological Survey RCS categories, with some categories consolidated into broader groups. Dolostone (DOLO) was re-coded as dolomitic limestone (DOLMST). Several carbonate sub-types - micritic limestone (MLMST), calcilutite (CALPL), calcarenite (CALSIR), and calcareous sandstone (CALSST), were combined into a single limestone (LMST) category. Unconsolidated sandstone (SANDU) and wacke (WACKE) were combined as sandstone (SDST). Fine-grained siliciclastic rocks - siltstone (SILT), siltstone and mudstone (SR), and siliceous siltstone (SIS), were grouped as siltstone (SLST). Mud-rich sedimentary rocks - pelite (PEL), pelite and greywacke (PELGP), semi-pelite (SEMPEL), and ferruginous mudstone (FECRTE), were combined as mudstone (MDST). Quartz arenite (QAREN) was re-coded as quartzite (QZITE), and breccia (BREC) was re-coded as conglomerate (CONG). Volcanic lithologies - volcanic intrusive rock (VCIR), volcanic subvolcanic rock (VCSR), lava (LAVA), tuff (TUF), mafic volcanic intrusive rock (MVCIR), and mafic volcanic subvolcanic rock (MVCSR), were grouped into a single volcanic (VOLC) category. Finally, psammite (PSAMM) was re-coded as schist (SCH).

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