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Distinctively Different: A New Approach to Valuing Architectural Amenities

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Abstract

We propose a method to estimate the capitalized value of the architectural design quality of a neighbourhood. Our economic design premium is identified by spatially differentiating property prices and design quality within neighbourhoods and comparing the differences across neighbourhoods. We apply our method to 47 conservation area neighbourhoods in England in which we analyse around 7900 property transactions and interview more than 500 residents. We find a capitalization effect of about 25.4% (£38.7k) associated with a one-step increase on a five-step scale ranging from not at all-distinctive to very distinctive. Our results suggest that this effect is at least partially driven by an architectural externality.

JEL-Code: R520, D230, C700.

Keywords: architecture, beauty, boundary discontinuity, conservation areas, design, England, property prices.

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1 Introduction

Architectural beauty can be considered a local public good – no one can be excluded from the utility derived from looking at an appealing building, nor does the architecture deteriorate as more people enjoy the view. These characteristics have straightforward implications for the social efficiency of private investment decisions. If there is a positive non-marketed architectural externality, investments into architectural quality will be suboptimal if left to free markets. As with most local public goods and spatial externalities it is therefore easy to rationalize planning policies that correct for a market failure. In fact, various planning policies aim at preserving or creating public spaces of particular heritage value or architectural beauty. In England conservation is regulated under the 1953 Historic Buildings and Monuments Act, which allows for the listing and preservation of individual buildings, with the 1967 Civic Amenities Act and later the 1990 Planning (Listed Buildings and Conservation Areas) Act regulating areas of architectural and historic interest. Many other nations have similar policies that afford protection to individual buildings or neighbourhoods that are deemed by society, and supported by law, of being particularly significant in their historical character or architectural appearance. In Europe these policies are broadly managed under the Convention for the Protection of the Architectural Heritage of Europe (The Granada Convention, 1985). Reflecting its federalist system, historic preservation in the United States is enabled under the National Historic Preservation Act, with individual states and municipalities affording varying degrees of protection for buildings deemed to have heritage value.

While the rationale for these policies to some extent rests on the assumption that an architectural externality exists, there is limited quantitative evidence that substantiates this claim. Robust evidence on the economic value of architectural design, the precondition for some of the economic benefits that can be achieved through planning, is particularly important to justify such policies in light of the economic costs that have been ascribed to restrictive planning.[1] The lack of evidence can to some extent be attributed to challenges involved in detecting effects of architectural design on the economic value of a location. For one thing, it is difficult to separate

[1] Restricitive planning may limit supply, create a regulatory tax, and reduce housing productivity and affordability (e.g. Brenner & Mühlig, 2013; Capasso et al., 2013; Cheshire & Hilber, 2008; Cheshire et al., 2011; Hilber & Vermeulen, 2014). Some studies suggest that the costs of planning are large compared to the associated benefits (Albouy & Ehrlich, 2012; Cheshire & Sheppard, 2002).

the design effect from other correlated locational factors, e.g. better infrastructure, quality of public services, or natural amenities. For another, quantifying architectural quality is difficult. Metrics that would allow differentiating the design quality of different built environments are not readily available. We aim to advance the literature by proposing a methodology that engages with both these challenges. The paper applies this methodology to an illustrative example.

To assess the economic value of an aesthetically appealing built environment we make use of a two-stage double-differencing approach. In the first stage, we differentiate an economic outcome measure as well as a design measure across spatial boundaries within a number of neighbourhoods. In the second stage, the individual within-neighbourhood boundary differences are compared across neighbourhoods. The first stage removes features that are similar within small neighbourhoods, e.g. accessibility to the city centre, transport infrastructures, natural amenities or good schools. The second stage removes all features that differ systematically across boundaries that separate different types of areas within a neighbourhood, e.g. a tax deductibility of maintenance costs, subsidies for renovation work or additional planning control that may be associated with a location in a zone of special architectural interest.

We apply our methodology to a sample of conservation areas in England. Boundaries of conservation areas are purposely drawn to protect areas that have "…special architectural or historic interest, the character or appearance of which is desirable to preserve or enhance" (Civic Amenities Act, 1967 §1). English Heritage[2] describes 'special architectural' or 'historic interest' broadly to encourage more localized interpretations of heritage, but urges Local Planning Authorities (LPAs) to ensure that they are "…able to articulate the special interest and support the designation with evidence from some form of historic characterisation" (English Heritage, 2012). It is therefore reasonable to expect that the design character within such a designated area will differ significantly from the area just outside the conservation area. At the same time, areas at both sides of the boundary can be assumed to be similar in most other respects.

As an outcome measure of economic value we concentrate on observed property prices, which should reflect the value buyers attach to all property characteristics, including the architectural

2 Also known as the Historic Buildings and Monuments Commission for England, English Heritage is an executive Non-Departmental Public Body sponsored by the Department of Culture, Media and Sport. Their role is to advise government on heritage issues in England.

value of a property itself and the area. With this approach we build on a long tradition of research on capitalization effects of local public goods that dates back to Oates (1969) at least. Our spatial differencing approach to separate the design component from other determinants of property prices is inspired by the regression discontinuity design (RDD) literature (e.g. Basten & Betz, 2013; Dell, 2010; Gibbons et al., 2013; Imbens & Lemieux, 2008; Lalive, 2008). Controlling for observable property characteristics and assuming that all unobserved locational attributes change smoothly in space, we exploit the sharp discontinuity in the design character of the built environment along a conservation area boundary to identify the capitalization effect attributable to design.

To obtain a measure of the spatial differences in design character across conservation area boundaries, we conduct quantitative interviews with residents living in these conservation areas. Among other questions we ask them to rank the distinctiveness of their area relative to nearby areas. The questions are asked in such a way that the responses can be aggregated to quantitative indices that can be matched to the spatially differentiated property prices. We also collect a relatively wide range of individual characteristics and use these to compute an index of relative design quality that is adjusted for interviewee characteristics.

Comparing the within neighbourhood differences in property prices and design quality across neighbourhoods, we find a causal design capitalization effect of about 25.4% (about £38.7k in 2003 prices) associated with a one-step increase on a five-step scale ranging from ‘not at all distinctive’ to ‘very distinctive’. This capitalization effect reflects the benefits of occupying a distinctive building and a property location near to other distinctive buildings. To identify the capitalization effect associated with being located close to other distinctive buildings exclusively, we restrict the identifying variation to those properties that are least likely to be characterized by special design quality. Buildings constructed after the end of WWII and before the designation of a conservation area presumably do not possess the design characteristics that led to designation, even if they are located within a conservation area. Moreover, these buildings have not been affected by the additional planning control that comes with designation and is supposed to improve the design standard. The estimated design capitalization effect remains close to the baseline result. We also find a design capitalization effect that is roughly within the same range when the comparison is based on properties located just outside conservation areas with and without a view onto buildings inside a conservation area. These results are suggestive of the presence of a design externality. The estimated design capitalization effect is large even in light of a standard deviation in our preferred design index of about one third. Yet, it may be an underestimate of the economic value of design quality as we exclude potential benefits to people living further away and visiting the areas. The important implication is that planning policies capable of solving the free-market coordination problem related to the architectural externality could potentially deliver sizable economic benefits.

Our results are net of a policy effect, which could depreciate the value of properties due the restriction of owners' property rights, and do not seem to be driven by a non-uniform implementation of preservation policies. We find that a one-step increase on our five-step distinctiveness score is associated with a higher annual disposable household income of £6.3k, and a higher share of academic degree holders of 9.1 percentage points. Controlling for income and ethnic differences reduces our baseline estimates by no more than four percentage points (about one sixth). Our results are somewhat sensitive to the wording in the design questionnaire and highlight the importance of using formulations that seek to abstract from personal tastes and preferences.

In general terms we contribute to a literature that has assessed the amenity value of cities (e.g. Albouy, 2009, 2012; Blomquist et al., 1988; Gabriel & Rosenthal, 2004; Gyourko & Tracy, 1991; Tabuchi & Yoshida, 2000) or neighbourhoods within cities (e.g. Brueckner et al., 1999; Carlino & Coulson, 2004; Cheshire & Sheppard, 1995; Ioannides, 2003). This literature has argued that the consumption value of cities has become increasingly important for the attraction of a highly skilled labour force and, hence, the economic success of cities (Carlino & Saiz, 2008; Glaeser et al., 2001). In using the economic value embedded in property prices as an outcome variable, we relate to a vast literature that has estimated capitalization effects of local public goods or policies (e.g. Cellini et al., 2010; Dachis et al., 2012; Dehring et al., 2008; Eriksen & Rosenthal, 2010; Gibbons & Machin, 2005; Oates, 1969) or housing externalities (e.g. Autor et al., in press; Rossi-Hansberg et al., 2010; Schwartz et al., 2006). Our study specifically contributes to a literature that has looked into design related capitalization effects, e.g. internal or external capitalization effects related to proximity to iconic architecture on residential property prices (Ahlfeldt, 2013; Ahlfeldt & Kavetsos, 2014; Ahlfeldt & Maennig, 2009) and/or the effects of building design quality on office rents (Fuerst et al., 2011; Gat, 1998; Vandell & Lane, 1989). The closest connection arguably exists to research that has analysed internal and external capitalization effects of historic landmark buildings (Ahlfeldt & Maennig, 2010; Asabere et al., 1994; Clark & Herrin, 1997; Coulson & Lahr, 2005; Coulson & Leichenko, 2004; Lazrak et al., 2010; Leichenko et al., 2001;

Listokin et al., 1998; Noonan & Krupka, 2011; Schaeffer & Millerick, 1991), and especially Koster et al. (2014) who provide compelling evidence of a premium associated with a view onto conservation areas in the Netherlands.[3] Compared to the aforementioned studies, our analysis is unique in combining a strong control for potentially correlated location effects with intuitively interpretable design metrics to which the associated economic value can be mapped explicitly.

2 Empirical strategy

Throughout the paper we distinguish between two central effects: 1) a *policy* capitalisation effect, which is the effect of legal incentives (e.g. tax deductibility of maintenance cost or subsidized renovation work) and restrictions (maintenance obligations and limited rights to alter the external appearance of a property) that often exist in zones of special architectural interest on the market price of a property; and 2) a *design* capitalization effect, which originates from the quality of the architecture of a building as well as the nearby buildings. We further distinguish three types of design capitalization effects. First, an *internal* effect, which is the effect of a building's own architectural features on its price regardless of whether these are interior (e.g. wooden floors, carved ceilings) or exterior (e.g. shape of the structure or materiality of the facade) features. Second, an external *view* effect, which is associated with the aesthetic (dis)utility derived from a direct view onto other buildings' architecture. This effect is similar to positive effects associated with a view on mountains or the sea (Jim & Chen, 2009) or the negative effects of views that are obstructed by wind farms (Gibbons, 2014). Third, an *external* visiting effect, which corresponds to the capitalized benefit of living relatively close to attractive buildings so that the design amenity can be enjoyed when purposely or accidently passing through.[4]

In this section we propose an empirical strategy that can be used to estimate the causal effect of the design quality of an area on the market value of properties. We propose a two-stage double-differencing strategy, the rudiments of which we set out in more detail in Section 2.1. In the first stage, we spatially differentiate property prices (see Section 2.2 for details) and design indices

[3] Our analysis is also broadly connected to some recent analyses of the political economy of design related planning (Ahlfeldt et al., 2014; Cheshire & Dericks, 2014; Holman & Ahlfeldt, 2014).

[4] Our use of the terminologies policy effect, internal effect, external effect, view effect and visiting effect is roughly consistent with Ahlfeldt & Maennig (2010), Ahlfeldt & Kavetsos (2014), and Koster et al. (2014).

(see Section 2.3 for details) across conservation area boundaries within neighbourhoods. In the second stage, we compare the differentiated price and design indices across neighbourhoods (see Section 2.4 for details). Our strategy is primarily designed to separate the design effect from the policy effect, but we also offer two complementary approaches to estimate the external view effect specifically. We further lay out how we apply this strategy to a set of conservation area neighbourhoods in the Greater London region.

2.1 Framework

The starting point of our strategy is the assumption that in spatial equilibrium all costs and benefits associated with residing in a property of a certain type and at a certain location must capitalize into property prices. With this assumption we build on a long tradition of research that dates back to Oates (1969) and Rosen (1974) at least, which has assumed that residents are fully mobile and there is perfect spatial competition. We believe that this assumption is particularly plausible in our case as we generally identify from spatial variation at a very fine spatial scale. We assume that the market price (P) of a property is fully described by vectors of non-design related structural (S) and locational (L) components, a regulatory component (R) that can make a property more or less attractive (taxes, height restrictions, zoning, etc.), and a design component (D). For convenience we assume a semi-log relationship, which has proven to suit actual data in a vast empirical hedonic house price literature.

$$\log(P) = Sb + Ld + \gamma R + \delta D \qquad (1)$$

, where b and d are vectors of implicit prices of non-design related housing and location attributes, and γ and δ are the implicit prices of the regulatory and design components. Let's now introduce a sharp discontinuity in D along a known boundary that separates a neighbourhood into two zones (IN and OUT) which are internally homogenous in terms of D. The price difference between two properties on both sides of the boundary is fully described by the differences in all non-design structural and locational attributes, regulatory features and the design component at both sides of the boundary.

$$\log(P^{IN}) - \log(P^{OUT}) = (S^{IN} - S^{OUT})b + (L^{IN} - L^{OUT})d + \gamma(D^{IN} - D^{OUT}) + \delta(R^{IN} - R^{OUT}) \qquad (2)$$

It is reasonable to make the identifying assumption that all non-design related locational attributes are the same on both sides of the boundary, i.e. $L^{IN} = L^{OUT}$, so they cancel out after spatial differencing. While we allow for differences in the regulatory framework across the boundary, we make the assumption that across neighbourhoods the difference between the two regulatory frameworks in the two types of areas is constant, i.e. $\delta(R^{IN} - R^{OUT}) = r$. Under these identifying assumptions it is possible to estimate the causal effect of design quality on the market price of properties if variation across neighbourhoods exists in two variables: An estimate of the (non-design) quality adjusted spatial house price differential at the boundary of the two zones $(\log(P^{IN}) - \log(P^{OUT}) + (N^{IN} - N^{OUT})b)$ and, a corresponding index of relative design quality $(D^{IN} - D^{OUT})$.

$$\log(P^{IN}) - \log(P^{OUT}) + (S^{IN} - S^{OUT})b = r + \gamma(D^{IN} - D^{OUT}) \quad (3)$$

While the empirical design implied by equation (3) is, itself, straightforward, there are notable challenges in taking this strategy to data. First, neighbourhoods need to be identified that can be categorized into two types of zones which credibly vary in D across a clearly defined boundary. Second, there must be substantial variation in the visual character $(D^{IN} - D^{OUT})$ of the two types of zones relative to each other across neighbourhoods. Third, the two types of zones (*IN* and *OUT*) in relative terms must be legally treated in the same way in all neighbourhoods.

We argue that conservation areas in England satisfy these requirements. First, the boundaries of conservation areas are purposely drawn to protect coherent areas of distinctive character, which stand out relative the rest of the neighbourhood and under best practice scenarios are supported by a conservation area appraisal that provides an evidence base to substantiate the designation. Under §69 of the 1990 Planning (Listed Building and Conservation Areas) Act, LPAs are charged with periodically reviewing their territories to determine if any new areas are worthy of designation based on special architectural or historic interest. It is, therefore, sensible to separate neighbourhoods in which conservation areas have been designated into zones that have been designated on the grounds of being distinctive (*IN*) and the rest of the neighbourhood (*OUT*), and to expect a sharp discontinuity in the appearance of the built structure at the boundary of the conservation area.

Second, conservation areas can vary greatly in architectural style. In our survey, areas ranged from neighbourhoods with a preponderance of Georgian and Regency properties to areas of Victorian and Edwardian terraces to 1930s inter-war suburban estates. It is, therefore, reasonable to expect that the relative advantage in terms of the design amenity of conservation areas varies substantially across conservation areas.

Third, the legal treatment of properties in conservation areas is generally similar in England. Owners face heightened levels of restrictions on what they may or may not do with their property. It is a criminal offence to totally or substantially demolish any building within a conservation area without first seeking consent from the LPA. In cases where alterations to the property require planning permission, owners are also required to apply for Conservation Area Consent and applications are determined based on the enhancement and protection of the area. Restrictions typically entail control over demolition and the cutting or removal of trees of a specific size. Unlike North America, properties inside conservation areas in England do not benefit from specific funding or tax breaks.

2.2 Capitalization effects

To estimate the design related house price differential across two sides of a conservation area boundary in a neighbourhood, we make use of a spatial variant of the regression discontinuity design (RDD) (e.g. Basten & Betz, 2013; Dell, 2010; Imbens & Lemieux, 2008; Lalive, 2008). In estimating discontinuities in property prices at conservation area boundaries we concentrate on property transactions that fall within a 250m buffer inside and outside a conservation area boundary, an area that we refer to as *neighbourhood*. It is possible that properties just outside a conservation area benefit from a view onto properties located inside a conservation area. In our baseline models we exclude such properties from our sample to avoid a downward bias of the discontinuity estimate due to spillover effects. To define what we will refer to as the *view impact area* of a conservation area, we begin by drawing a 25m buffer around a conservation area in GIS. This buffer roughly corresponds to the width of half a street plus one house. While locations within this buffer in the neighbourhoods virtually always offer a view onto the conservation area as the view is just across the street, there are instances where open spaces such as parks or playing fields facilitate wider views. To account for such wider views, we overlay the conservation area and the 25m buffer with aerial photographs and manually adjust the buffer where appropriate. Figure A2 in the appendix provides an illustration of how the view impact areas were defined. Our baseline specification takes the following form:

$$\log(P_{ict}) = CA_{ic}\beta_c + DIST_{ic}\rho_c + S_{itz}b_z + (\alpha_c \times \varphi_t) + \varepsilon_{ict} \qquad (4)$$

, where P_{itc} is the transaction price of a property i selling at time t in neighbourhood c. Each neighbourhood c contains one conservation area. We control for the typical non-design related characteristics in the vector S_z, where z indexes the different variables, and b_z is the respective vector of implicit prices. The variables considered include structural characteristics such as age, floor space, number of bathrooms and bedrooms, etc. as well as a relatively wide range of location characteristics such as distance to rivers, underground stations, average school quality, etc.

We control for arbitrary shocks that are specific to any neighborhood in any year using interactions of year (φ_t) and neighborhood (α_c) fixed effects. $DIST_c$ is a vector of neighbourhood specific running variables. Each variable in the vector denotes the distance from a property *i* to the conservation area boundary within a neighbourhood *c*, taking positive values outside and negative values inside the conservation area in neighbourhood *c,* and a value of zero outside neighbourhood *c*. Similarly, CA_c is a vector of neighbourhood specific indicator variables that takes the value of one if $DIST_{ic} < 0$ and zero otherwise. We note that with $DIST_c$ we control for unobserved locational differences within each neighbourhood that are correlated with distance to the conservation area boundary so that the discontinuity parameter $\beta_c = \log \bar{P}_c^{IN} - \log \bar{P}_c^{OUT}$ can be interpreted as the premium just at the boundary ($\bar{P}_c^{IN}$ and $\bar{P}_c^{OUT}$ are the conditional mean prices inside and outside the conservation area). With the help of a well-known formula, the estimated parameter $\hat{\beta}_c$ can be translated into a percentage effect $\left(e^{\hat{\beta}_c} - 1\right)$ (Halvorsen & Palmquist, 1980) or an absolute price mark-up $\left(e^{\hat{\beta}_c} - 1\right)\bar{P}_c^{OUT}$ (Halvorsen & Palmquist, 1980). Since all control variables in S_z are demeaned (within neighbourhoods), the price mark-up for a property with average characteristics can be computed based on the parameter estimates from (4) as $\left(e^{\hat{\beta}_c} - 1\right) \times e^{\hat{\bar{\alpha}}_c}$, where $\hat{\bar{\alpha}}_c$ is the mean across the year x neighbourhood fixed effects within neighbourhood *c*.

It is likely that $DIST_c$ not only washes out non-design locational factors, but also external visiting effects, which presumably decay smoothly in space. The boundary estimate from the universe of transactions therefore represents a composite of a policy effect – which will be differentiated out in the second stage of the analysis – an internal design effect and an external view effect. Since the view effect is interesting from a welfare economics perspective we propose two complementary strategies to separate the external view from the internal design effect.

Our first approach exploits the institutional setting of conservation areas in England. Conservation areas are designated in order to protect the special character and setting of groups of historically and aesthetically relevant buildings. The conservation areas in our sample encompass groups of period buildings from the Edwardian, Georgian, Interwar, Regency, and Victorian periods all of which pre-date WWII. It is therefore reasonable to assume that, for the most part, structures constructed after WWII do not possess the characteristic design features, which have led to designation of a conservation area. In fact, the reason for protecting conservation areas is to prevent unsympathetic (re)development, which is not in keeping with the area's character. With designation, the planning authority seeks to ensure that the quality of new buildings and alterations of existing structures is appropriate to maintain the design quality of a conservation area. Since none of our zones was designated before 1967 there is a time-window of construction activity, which we can exploit to separate internal and external design effects. We make the identifying assumption that for buildings constructed after WWII, but before designation of a conservation area, there is no discontinuity in building design quality at the respective conservation area boundary and, thus, no internal design capitalization effect.

To identify the boundary discontinuity in prices of properties developed within the time-window of interest we expand equation (4) to control for the boundary effects in prices of historic properties (WWII and before) as well as properties developed after designation.

$$\log(P_{ict}) = CA_{ic}\beta_c + H_{ic}\lambda_c + (CA_i \times H_{ic})\phi_c + N_{ic}\nu_c + (CA_i \times N_{ic})\xi_c + DIST_{ic}\rho_c + S_{itz}b_z + (\alpha_c \times \varphi_t) + \varepsilon_{ict} \quad (5)$$

, where H_{ic} is a vector of neighborhood c specific indicator variables denoting whether a structure i in neighborhood c is historic (WWII and before) and N_{ic} is the same for buildings constructed after the conservation area in neighborhood c has been designated. CA_i is an indicator variable denoting whether a property is located in any conservation area. $CA_i \times H_{ic}$ and $CA_i \times N_{ic}$ are vectors of interaction terms that absorb any systematic price difference between historic or post-designation buildings across any conservation area boundary. With this approach we impose the restriction that implicit prices of the attributes we control for (the vector S_z) are the same across all properties, irrespective of their construction date cohort. Compared to the alternative of restricting the sample to properties developed within the time-window of interest we save important degrees of freedom.

Our second approach to controlling for the internal capitalization effect makes use of the 'view impact areas' introduced at the beginning of this section. We estimate a model that has a similar structure as equation (4). To focus on a view effect from outside a conservation area onto buildings inside a conservation area, we exclude transactions inside conservation areas from our sample and include transactions of buildings within the view impact areas. We replace the vector of conservation area indicator variables CA_{ic} with a vector of variables VA_{ic} denoting each of the view impact areas in each of the neighborhoods c. The distance running variables ($VDIST_c$) are defined such that they take a value of zero at the margin of the view impact area.

$$\log(P_{ict}) = VA_{ic}\beta_c^V + VDIST_{ic}\rho_c^V + S_{itz}b_z + (\alpha_c \times \varphi_t) + \varepsilon_{ict} \qquad (6)$$

We make the identifying assumption that the design quality of buildings just outside a conservation area is not systematically different between properties with and without a view onto the buildings inside a conservation area. Under the assumptions made, internal design capitalization effects can be ruled out. Since there is also no policy effect, as none of the buildings analyzed is located within a conservation area, we directly obtain net estimates of the external view effect with this approach.

No matter which of the discontinuity estimates one refers to, it is worth acknowledging that it is difficult to account for all (non-design) structural features empirically because many features are simply not observable. It is therefore reasonable to assume that our estimated price premium $\widehat{M}_c = \{\hat{\beta}_c, \left(e^{\widehat{\beta}_c} - 1\right) \times e^{\widehat{\widehat{\alpha}}_c}$ is measured with an error μ_c so that:

$$\widehat{M}_c = [\log(P^{IN}) - \log(P^{OUT}) + (S^{IN} - S^{OUT})b]_c + \mu_c \qquad (7)$$

2.3 Design indices

Quantifying the design value of an area is obviously challenging as the quality of design is inherently subjective. Moreover, suitable data, even of subjective character, is difficult to obtain. To compute an index of relative design quality ($D^{IN} - D^{OUT}$) in the spirit of equation (3) we conduct interviews with residents living in conservation areas asking them how they would rank the distinctiveness of the area they are living in relative to nearby areas on the following scale:

Optional answers	Numeric equivalent
Not at all distinctive	-2
Non-distinctive	-1
Neither distinctive nor non-distinctive	±0
Distinctive	+1
Very distinctive	+2

As listed above, we assign numeric values to each of the optional answers so that for an individual respondent *n* living in area *c* we obtain an index value $I_{nc} = \{-2, -1, 0, 1, 2\}$. We presume that by asking residents about the "distinctiveness" or their area, we minimize the influence of normative judgements and personal tastes as respondents are not asked to reflect upon the subjective beauty of their area, but rather how different it is to surrounding neighbourhoods. In part this measure is chosen to reflect part of the policy guidance that suggests areas should reflect local distinctiveness (English Heritage, 2012). To evaluate how sensitive our results are to the wording in the design questionnaire, we also ask a similar question where we replace distinctiveness with attractiveness. In a third question we ask residents explicitly how attractive the buildings in the neighbourhood are to look at. Our presumption is that each of the resulting indices are composites of a quasi-objective design differential ($D^{IN} - D^{OUT}$) and an idiosyncratic component that is driven by the respondent's tastes and attitudes, some of which are correlated with observable individual characteristics F_n and some of which are unobserved (η_n). We recover the design index that we are interested in from the following Mincer type fixed effects regressions:

$$I_{nc} = F_n g + \varphi_c + \epsilon_{nc} \tag{8}$$

, where the neighbourhood fixed effects φ_c form a conservation area neighbourhood specific design index (relative to surrounding areas) adjusted for observable individual characteristics F_n (g is the corresponding vector of coefficients). The vector F includes socio-demographic characteristics (e.g. gender, age, education, income) as well variables that are supposed to capture preferences for heritage related attributes of the area (e.g. "aware of CA status" or "would consider moving to another CA"). All variables are scaled to have a zero mean. Despite these relatively detailed controls it is inevitable that a residual component remains unexplained. Because an individual n has chosen to live in conservation area c it is likely that the error term is a composite of a component that is correlated with design value of a neighbourhood (η_{nc}) and another one that is truly random (ϑ_n), i.e. $\epsilon_{nc} = \eta_{nc} + \vartheta_n$.

The adjusted design index we recover from the first-stage regressions (7), thus, takes the following form:

$$\hat{\varphi}_c = (D^{IN} - D^{OUT})_c + \frac{1}{N_c} \sum_{n_c} \eta_{nc} \tag{9}$$

, where N_c stands for the total number of responses collected in c. Because of sorting, we expect that interviewees living in an area are more likely to report the area as (very) distinctive than the representative individual so that $cov([(D^{IN} - D^{OUT})_c], \eta_{nc}) \geq 0$.

2.4 Design valuation

By substituting (7) and (9) into (3) we arrive at our second-stage estimation equation of primary interest:

$$\widehat{M}_c = r + \gamma\hat{\varphi}_c + \omega_c \qquad (10)$$

, where $\omega_c = \mu_c - \frac{\gamma}{N_c}\sum_{n_c}\eta_{nc}$.

To the extent that the spatial differencing of property prices and design indices achieve their purposes, the slope parameter γ provides a causal estimate of the design effect. Under the assumptions made in Section 2.1, the policy effect is captured by the constant r. Because both the price premium $\widehat{M}_c$ as well as the relative design quality index $\hat{\varphi}_c$ are generated variables we bootstrap standard errors in 100 replications when estimating (10) (Pagan, 1984). There are, of course, a number of potential candidates that can give rise to empirical concerns when estimating equation (10).

Unobserved non-design structural characteristics, if correlated with design quality, are one example. To alleviate this concern to some extent, our data set from the Nationwide Building Society contains a relatively large set of structural characteristics, much larger than the data set held by the land registry, for example. To substantiate the identifying assumption that the differences in the estimated price premia across neighborhoods are indeed driven by differences in the design differential and not by systematically correlated differences in other housing features, we replicate our baseline model using various housing attributes (instead of prices) as outcome measures. In our double-differencing setting these tests corresponds to tests for discontinuities in alternative spatial variables that potentially determine the outcome measure but are not related to the phenomenon of interest. Such tests have become popular in the boundary discontinuity literature (Gibbons, et al., 2013).

Sorting – i.e. the spatial concentration of residents with similar preferences and income constraints in certain areas (e.g. Bayer et al., 2007; Bayer & McMillan, 2012; Kuminoff et al., 2013)- is a general concern in the hedonic house price literature. If conservation areas attract certain type of residents, then our boundary discontinuity estimates will partially reflect differences in preferences and income constraints across the boundary, and not only a design (and policy) effect. To the extent that such sorting into conservation areas occurs in a similar way in all neighbourhoods analysed, the sorting effect on property prices will be similar in all neighbourhoods and, thus, absorbed by the constant in second-stage equation (10). Because the design value varies significantly across conservation areas this control for sorting will unlikely be perfect. To the extent possible we address the remaining concern in robustness checks. We control for various socio-economic characteristics such as income, education, and ethnicity in the first-stage property price RDD models (equation 5-7). Alternatively, we control for differences in these neighbourhood characteristics across boundaries in the second-stage model (equation 10). A limitation of this approach is that even the most spatially disaggregated data from official neighbourhood statistics refer to statistical units (e.g. output areas), whose boundaries are not congruent with conservation area boundaries. A closer inspection reveals that the spatial statistical units are at least small enough to allow for a meaningful representation of income or educational differences across conservation area boundaries (see Section 2.3 in the appendix for details). Referring to the error structure in equation (10) we note that given the presumed positive correlation between unobserved design specific preferences and the design index $(cov([(D^{IN} - D^{OUT})_c], \eta_{nc}) \geq 0)$ there is a sorting-related downward pressure on the estimated design effect. Essentially, sorting increases the variance of our design quality index (the independent variable), which potentially mitigates the effect of the sorting-related increase in variance in the price premium (the dependent variable).

A related concern that is specific to our setup is that sorting of households with specific preferences into certain conservation areas could create a mechanical link between the price premium in an area and the reported design score. The effect would be similar to an omitted variable that impacts on the price premium as well as on the reported (relative) design quality simultaneously. According to the model of the political economy of conservation areas by Ahlfeldt at al. (2014), a rational planner will begin by designating areas of the highest design quality as designation offers the highest social returns. Assuming that such a relationship between design value and designation date holds, we make use of the latter as an instrumental variable for our design indices to remove a potential mechanical link. As an additional instrumental variable we use the density of listed buildings within a conservation area. We also note that our test of external view effects using properties with and without a view located outside conservation areas and responses by interviewees living inside conservation areas is not affected by this problem.

So far, we have assumed that the differences in regulation of areas inside and outside conservation areas are similar in all neighbourhoods. This is generally a reasonable assumption, but there is an exception. Where councils are concerned that slow incremental change is damaging the character of the area they can also remove householders' General Permitted Development Rights via an Article 4 Direction that then further restricts alterations to property. It is possible that such extra control is more likely to be imposed in areas with a higher design value. If stronger planning controls led to a larger (negative) policy effect, we would underestimate the (positive) design effect. Since we observe the Article 4 status of a conservation area, we are able to control for the associated capitalization effects. A less obvious concern is that some LPAs could theoretically be relatively more restrictive within conservation areas than outside conservation areas and that this relative restrictiveness could be correlated with the average design quality of conservation areas relative to nearby areas within these LPAs. We are able to address arbitrary differences in the regulatory environment across LPAs by means of LPA fixed effect, but need to be careful with the interpretation in light of limited degrees of freedom (21 LPAs for 47 neighbourhoods).

3 Data and institutional setting

3.1 Sampled conservation areas

In England, the designation of conservation areas started in 1967 and continues today under provisions 69 and 70 of the Planning (Listed Buildings and Conservation Areas) Act 1990. They receive further support from the new National Planning Policy Framework (2012) where they are described as heritage assets. As of 2011 there were some 9,800 conservation areas in England, which are identified as having "special architectural or historic interest, the character or appearance of which is desirable to preserve or to enhance" (Section 69). As they are typically locally defined, they can vary greatly from place to place, but most often encompass street patterns, open spaces or groups of buildings that contribute to a sense of place and are therefore deemed as worthy of enhancement and protection. Our sampling strategy was to include conservation areas with varying levels of deprivation as described by 2007 ward level deprivation indices and conservation areas located in both inner and outer London boroughs. We selected 24 areas with relatively high levels of deprivation and 24 with low levels, and 27 conservation areas within inner London boroughs and 21 located in outer London. One of the sampled conservation areas (Courtfield) could not be considered in the analysis due to insufficient property transactions. The exact locations of the surveyed conservation areas are shown in Figure A1 in the appendix. Given the very localised notion of heritage, it is no wonder that our 47 conservation areas also varied in style from the more common Victorian housing developments, to Regency, Georgian, Edwardian and Inter-war estates. Many of the areas, like St Marks (Hackney) and Bowes Park (Haringey), were the result of speculative development whilst others like Brentham Gardens (Ealing), the Cuckoo Estate (Ealing), and Clyde Circus (Haringey) were formally planned. Properties in these conservation areas range from bungalows and low-density development in places like the Mayfield (Redbridge) to more dense terraced housing (North Kilburn, Brent), to substantial villas St (Matthias, Richmond) to Regency terraces (Oakhill, Kingston). All of the areas reflect a combination of distinctive public or private buildings (e.g. churches, libraries or shopping arcades), open spaces, trees or street patterns, which set them apart from surrounding neighbourhoods.

3.2 Property data

For the estimation of property price premia at conservation area boundaries we use transactions data related to mortgages granted by the Nationwide Building Society (NBS) between 1995 and 2010. For our selected conservation area neighbourhoods, the data for England comprise around 7,900 observations and include the price paid for individual housing units along with detailed property characteristics.[5] These characteristics include floor space (m^2), the type of property (detached, semi-detached, flat, bungalow or terraced), the date of construction, the number of bedrooms and bathrooms, garage or parking facilities and the type of heating. There is also some buyer information including the type of mortgage (freehold or leasehold). Importantly, the data set is geo-referenced (within the British National Grid coordinate system) so that it is possible to merge the transaction data to locational attributes in GIS (Geographic Information System).

Merging this information with an electronic map of 8,167 conservation areas in England, it was possible to calculate distances to conservation area borders and to determine whether the property lies inside or outside of these borders in any of the considered neighbourhoods. We further compute distances to the nearest Area of Outstanding Natural Beauty, Natural Nature Reserve, lake, river, coastline, bus stop, railway track, London Underground station as well as the average key stage 2 score weighted by distance the respective schools. A detailed description of the construction and the sources of these locational and neighbourhood variables is pro-

[5] For England as a whole Nationwide data set contains 1,088,446 transactions, approximately 10% of all transactions.

vided in the appendix to Ahlfeldt et al (2014). As neighbourhood characteristics we consider the 2005 median income (from Experian) as well as the share of population holding an academic degree, shares of various ethnic groups and a Herifindahl index of ethnic segregation (all from the 2001 census).

3.3 Residential survey

In total, we surveyed 526 residents in the sampled conservation areas. Surveys were conducted face-to-face and the sample was drawn such that homeowners and both private and social renters were included. There were 53 questions in the survey covering topics ranging from demographics, level of community involvement, attitudes toward the area in terms of likes and dislikes, attitudes toward the planning system, experiences with planning applications, experiences with objecting to applications, etc. Questions were both multiple choice and discursive allowing for longer responses to gauge more fully resident's opinions about living in their neighbourhood and about planning regulation. The quantitative data from these interviews was input into Stata and analysed.

4 Results

4.1 Capitalization effects

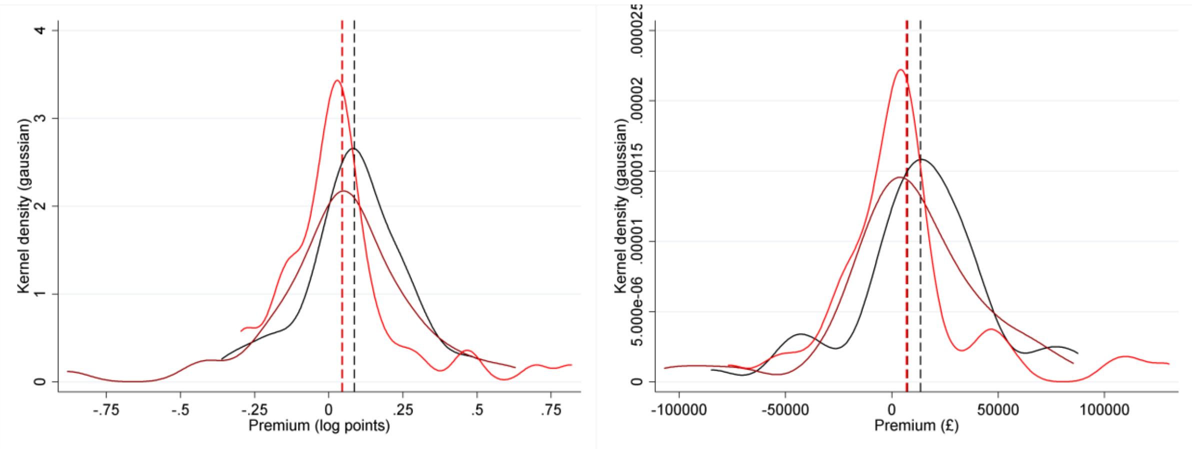
Figure 1 displays the distribution of the estimated relative ($\hat{\beta}_c$) and absolute $\left(\left(e^{\hat{\beta}_c} - 1\right) \times e^{\hat{\hat{\alpha}}_c}\right)$ price premia across all conservation areas. We report the distribution of point estimates derived from three different first-stage property price RDD models. First, the baseline model (4), which provides estimates of the composite policy, internal design as well as external view effects (black lines). Second, model (5), which identifies the effects from non-historic properties constructed before designation and, thus, includes the policy effect and the external view effect (dark red lines). Our third model (6) compares properties with and without a view outside conservation areas and, thus, provides a pure estimate of the external view effect (red lines). We lose two conservation areas in the second model and one conservation area in the third model due to insufficient of degree of freedoms.

Perhaps not surprisingly, property prices generally tend to be higher in conservation areas. This is also true for the baseline model, implying that, on average, the negative policy effect does not exceed the positive design effect. In fact, the average premium is larger than in the two other models, suggesting that the internal design effect alone is larger than the policy effect. On average, properties just inside a conservation area boundary are about 9.0% (£13,520) more expensive than properties just outside. Controlling for boundary effects on historic and post-designation buildings the mean premium is reduced to about 4.5% (£7,390). The mean premium for properties just outside conservation areas with a view onto buildings in a conservation area with 4.6% (£6803) is within the same range.

More importantly for the cross-conservation area comparison is the degree of variation. The estimated premia in the baseline model vary as much as from -30.3% to +66.6% or -£84,775 to +£87,367. Standard deviations with 19.8% or £33,383 are relatively high. Standard deviations in the estimates excluding the internal effect are even larger (25%-29%). 13 out of 47 conservation areas achieve a negative premium (baseline model). There is, thus, significant variation to be attributed to differences in design. A full list of RDD estimates (baseline model) by conservation area is provided in Table A1 in the appendix. The estimated hedonic implicit attribute prices of the various property characteristics we control for are presented in Table A2 in the appendix. They generally offer little surprise.

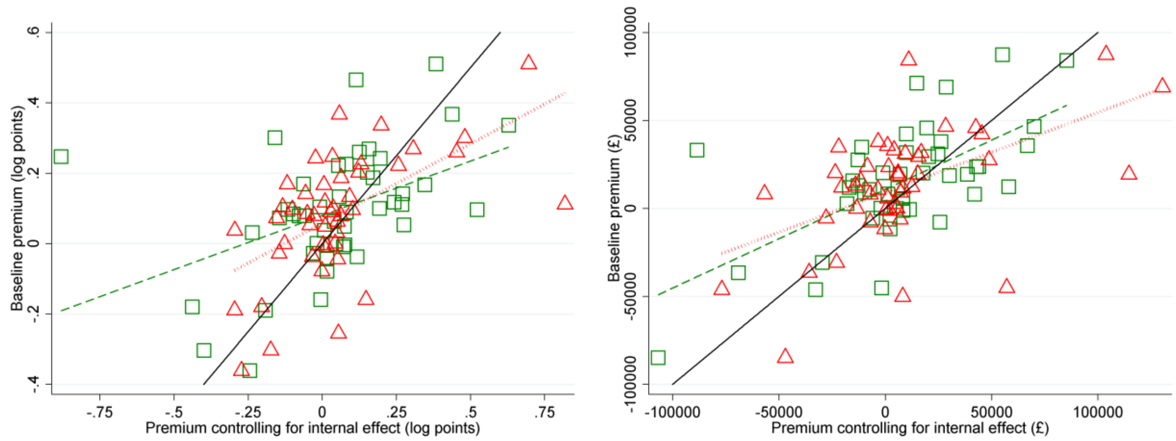
In Figure 2 we compare our baseline estimate of the price premia at the boundaries to the estimates, which control for the internal design capitalization effect. Reassuringly, we find a close correlation.

Fig. 1. Distribution of relative and absolute conservation area premiums



Notes: Black (dark red) [red] lines show the distribution of baseline equation (4) RDD estimates (equation (5) RDD estimates controlling for effects on historic and post designation properties) [equation (6) estimates focussing on view effects outside conservation areas]. Dashed lines represent the means of the distributions.

Fig. 2. RDD estimates: Baseline vs. controlling for internal effect



Notes: Green (red) squares (triangles) compare baseline equation (4) RDD estimates to equation (5) RDD estimates controlling for boundary effects on historic and post-designation properties [equation (6) estimates focussing on view effects outside conservation areas]. Green dashed (red dotted) line are the linear fits.

4.2 Design indices

In Table 1 we examine how the reported design scores correlate with individual characteristics of the respondents and some observable design related characteristics of the areas they live in. Relative to the Victorian character, which is the most frequent style and forms our base category, Georgian and Interwar styles are more likely to be reported as attractive. Also, planned estates carry a premium in the reported attractiveness scores (1). This pattern is also apparent when we ask an alternative question explicitly about the attractiveness of the buildings (5) in the area. Georgian style areas are also more likely to be reported as distinctive (3). It is important to note, however, that most non-Victorian styles apply to no more than a couple of conservation areas, so some care is warranted with the interpretation. In columns (2), (4) and (6) we replace the conservation area characteristics with conservation area fixed effects. These models provide a strong control for unobserved conservation area characteristics and, thus, more credible estimates of the effects of individual characteristics. Only few individual characteristics turn out to exhibit significant partial correlations with the design scores. Women and degree holders tend to rank their area somewhat lower in terms of attractiveness. Individuals with higher incomes or those who are in full-time employment tend to rank their areas somewhat lower in terms of distinctiveness. Individuals who reported to be likely to move to another conservation area were more likely to rank their area as attractive while individuals who were aware of the conservation area status of their areas were more likely to report it as distinctive.

Tab. 1. Design score regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Attractiveness relative to surrounding areas		Distinctiveness relative to surrounding areas		Attractiveness of buildings	
Female (dummy)	-0.124**	-0.171**	-0.006	0.021	-0.034	-0.029
	(0.059)	(0.066)	(0.067)	(0.075)	(0.080)	(0.080)
Age (years)	-0.002	-0.002	0.006**	0.004	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)
British (dummy)	0.041	0.003	0.143	0.126	0.074	0.026
	(0.106)	(0.108)	(0.104)	(0.113)	(0.109)	(0.091)
White (dummy)	0.083	-0.028	-0.031	-0.140	0.033	-0.114
	(0.110)	(0.109)	(0.098)	(0.113)	(0.102)	(0.098)
In full-time employment (dummy)	-0.195**	-0.101	-0.284***	-0.186*	-0.103	-0.045
	(0.089)	(0.096)	(0.104)	(0.101)	(0.079)	(0.070)
Income (£/year)	0.000	-0.001	-0.001*	-0.002***	0.000	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
University degree (dummy)	-0.170*	-0.178*	-0.049	-0.059	0.010	-0.028
	(0.098)	(0.104)	(0.135)	(0.133)	(0.125)	(0.104)
Homeowner (dummy)	0.045	0.076	0.008	0.115	0.033	0.106
	(0.135)	(0.143)	(0.124)	(0.135)	(0.130)	(0.115)
Years stayed at property	-0.015*	-0.013	-0.007	-0.003	-0.013*	-0.012
	(0.009)	(0.009)	(0.009)	(0.010)	(0.007)	(0.007)
Aware of CA status (dummy)	0.183*	0.029	0.346***	0.237*	0.225**	0.115
	(0.096)	(0.096)	(0.124)	(0.139)	(0.104)	(0.094)
Would consider moving to a CA	0.210***	0.195**	0.164**	0.134	0.115*	0.111
	(0.071)	(0.080)	(0.076)	(0.086)	(0.068)	(0.072)
Georgian	0.239**		0.496***		0.367***	
	(0.110)		(0.091)		(0.115)	
Regency	0.006		0.113		0.111	
	(0.157)		(0.156)		(0.215)	
Edwardian	0.028		0.020		-0.124	
	(0.116)		(0.132)		(0.110)	
Interwar	0.381***		-0.019		0.325**	
	(0.100)		(0.149)		(0.129)	
Planned	0.262**		0.133		0.242*	
	(0.098)		(0.105)		(0.133)	
Constant	0.761***	0.874***	0.758***	0.870***	1.009***	1.114***
	(0.091)	(0.042)	(0.090)	(0.039)	(0.122)	(0.039)
Conservation area fixed effects	NO	YES	NO	YES	NO	YES
Observations	524	524	524	524	521	521
R^2	0.087	0.231	0.097	0.212	0.084	0.319

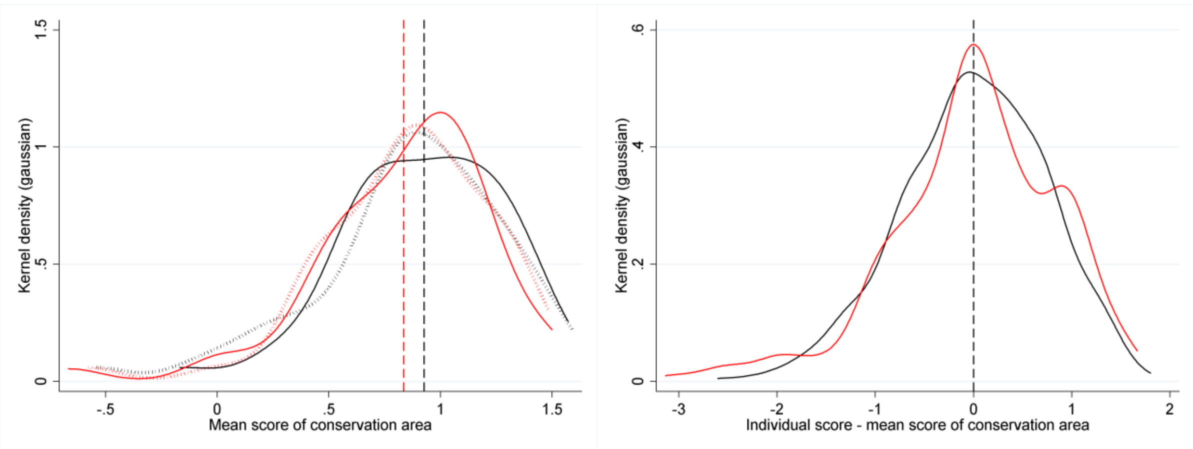
Notes: Baseline architectural style category is Victorian. All individual variables are demeaned. Standard errors in parentheses are clustered on conservation areas. A hand full of missing values in age, income and degree have been set to zero and denoted by 0,1 indicator variables. * p < 0.1, ** p < 0.05, *** p < 0.01

The fixed effects estimated in models (2), (4) and (6) are recovered and used as conservation area design indices in the remainder of the analysis (see specification 9 and corresponding discussion for details).

Figure 3 plots the distribution of the reported relative design scores across to conservation areas (left) as well as the distribution of individual deviations from the area means (right). The between distributions of design scores peak close to one, which implies that on average the sampled conservation areas were considered as *distinctive* and *attractive* compared to nearby areas. Only 5% of conservation areas received negative mean design scores and, thus, lean towards being *not distinctive* or being *not attractive*. There are quite a few areas that are at the margin of being *distinctive* or *attractive* or at the margin of being *very distinctive* or *very attractive*. Within conservation areas the distribution of individual scores is clearly concentrated around the mean score of the area. About 52.6% (50%) of the answers are within a ±0.5 range of the mean conservation area distinctiveness (attractiveness) score. Only about 18.6% (15%) of the individual scores are outside a ±1 windows. There seems to be some consensus on the design value of the area.

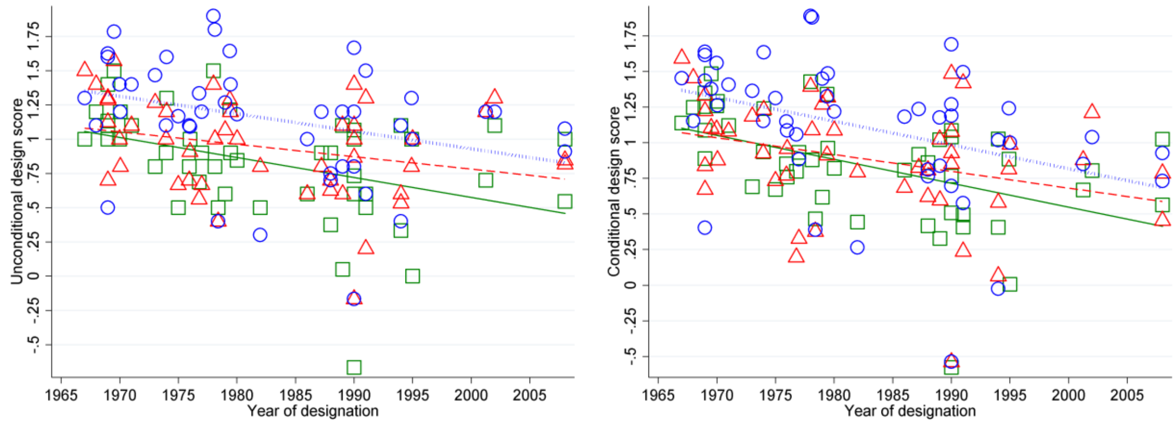
In Figure 4 we make an attempt to externally validate the design scores. As expected, conservation areas characterised by higher design quality were designated earlier. Our preferred and, presumably, more objective design measure distinctiveness shows a stronger correlation with the designation date, suggesting that it better captures design elements that were considered during the designation process. More generally, Figure 4 suggests that our design indices indeed capture the phenomenon of interest and that the designation date might serve as a predictor of design quality.

Fig. 3. Within and between neighbourhood distribution of design scores



Notes: Black (red) lines show the distribution of attractiveness (distinctiveness) scores. Dashed lines show the means of the distributions. Dotted lines (left) show the between-neighbourhood distribution after adjusting for observable interviewee characteristics.

Fig. 4. Design quality vs. year of designation

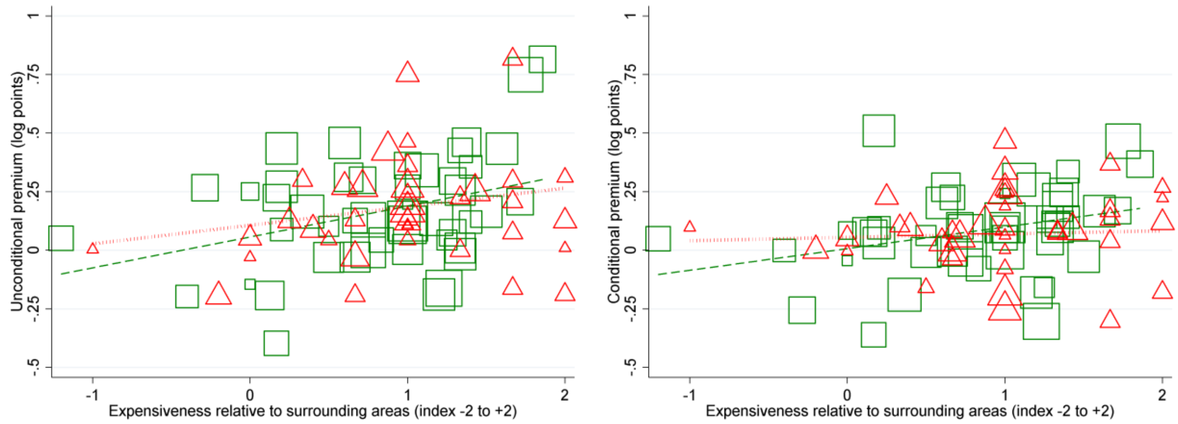


Notes: Green (red) [blue] squares (triangles) [circles] compare the adjusted relative distinctiveness scores (relative attractiveness) [how attractive buildings are to look at scores] to the year of designation of a conservation area.

4.3 Design valuation: Descriptive evidence

At the heart of our empirical strategy is the comparison of an objective price premium derived from actual market transactions and a reported measure of relative design value collected in quantitative surveys. To cross-validate the interview-based collection process, we compute an index of "expensiveness" based on a question that was otherwise phrased exactly as those inquiring about the design features of primary interest. As shown in Figure 5 we find a positive correlation between the reported expensiveness scores and our estimated price premia. Not surprisingly, home owners seem to be particularly aware of the price premium (or discount) their area achieves. The correlation is stronger when structural differences are conditioned out in the first-stage RDD, which indicates that these seem to be accounted for to some extent by the respondents.

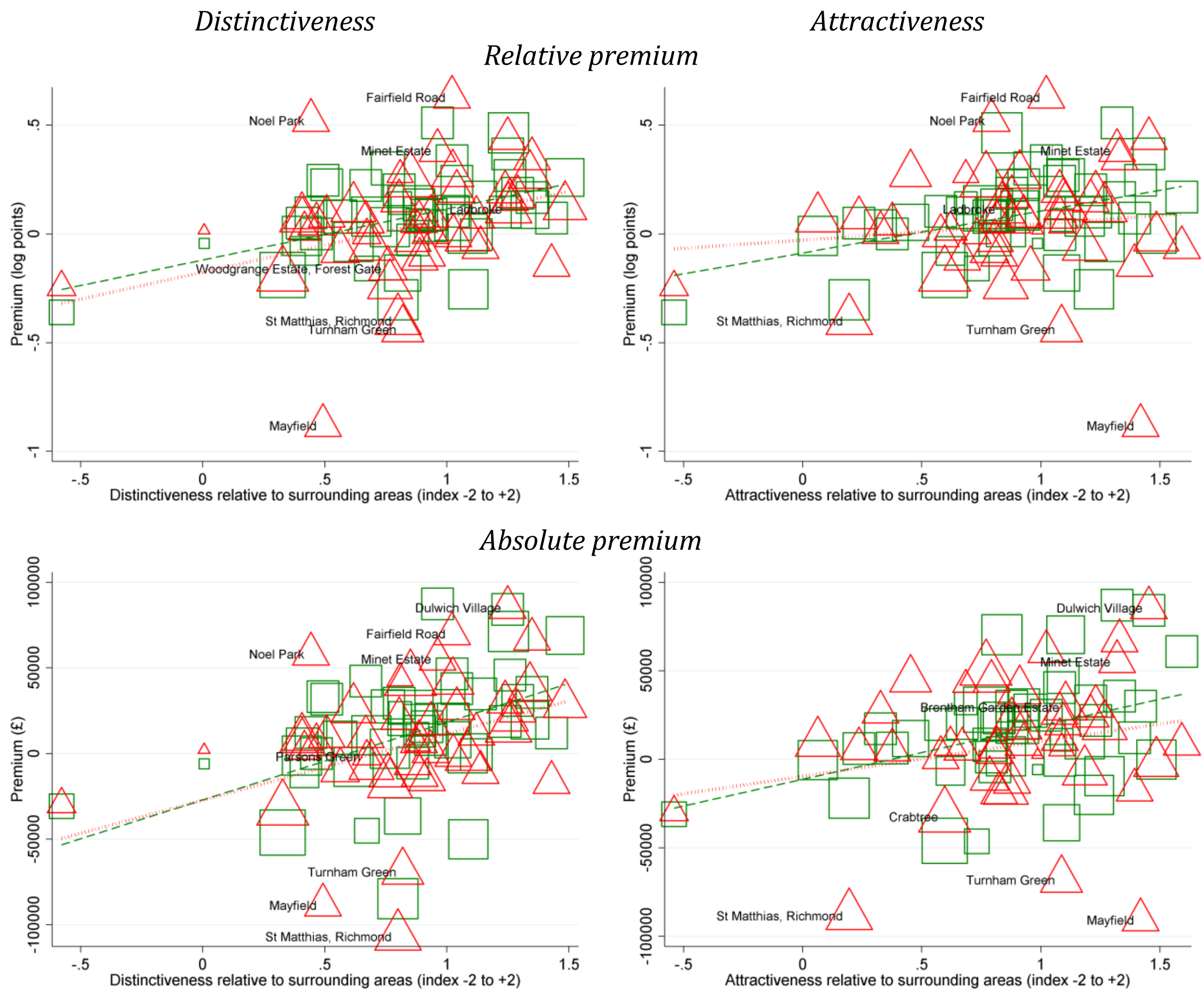
Fig. 5. Estimated and reported conservation area premium



Notes: Green (red) squares (triangles) indicate the responses by owners (renters). The size of the markers is proportionate to the number of responses in a conservation area. Dashed (dotted) lines are weighted (by number of responses) linear fits for owners (renters). Unconditional estimates exclude property characteristics and distance trends. Conditional estimates are the baseline results.

Figure 6 illustrates the relationship between our estimated price premia and the design indices summarized in equation (10). We compare the relative ($\hat{\beta}_c$) and absolute $\left(\left(e^{\hat{\beta}_c}-1\right)\times e^{\hat{\bar{\alpha}}_c}\right)$ property price premia estimated according to our baseline specification (specification 4, green squares) as well as when controlling for internal effects (specification 5, red triangles) to the (adjusted) relative distinctiveness and attractiveness scores of the areas. There is a generally positive and well defined relationship between property price premium and the design score in all four panels. Outliers are labelled in all panels if they are more than 1.5 standard deviations from the weighted (by number of respondents) linear prediction. The correlation between the estimated price premia is generally stronger with the distinctiveness score than with the attractiveness score, which confirms our notion that the former is our preferred design measure because it is, likely, less subjective. Overall, the patterns revealed by Figure 6 are suggestive of a relatively strong and positive link between the design value of an area and a property price premium achieved.

Fig. 6. Conservation area premium vs. design index



Notes: Green (red) squares (triangles) compare baseline RDD estimates (RDD estimates controlling for boundary effects on historic and post-designation buildings) to relative design indices. The size of the markers is proportionate to the number of responses in a conservation area. Dashed (dotted) line is the weighted linear fit.

4.4 Design valuation: Baseline econometric analysis

In Table 1 we present econometric estimates of the relationship between the estimated price premium (conditional boundary discontinuities according to equation 4) and the relative distinctiveness index (adjusted for interviewee characteristics) by conservation area. We begin with the baseline model excluding distance trends in the first-stage property price RDD models in column 1. In column 2 we use the estimated premium from the baseline model (in log points), which includes distance trends in the first-stage. In column 3 we use the same price premium estimates, but expressed in terms of absolute premia (in £). In columns 4 and 6 we attach higher weights to areas where the design scores are based on a larger number of individual design scores. In columns 5 and 6 we add some controls describing the architectural style of an area (dummy variables, Victorian being baseline), whether the area was developed as a planned estate, or whether there is additional planning control through an Article 4 Directive.

We find a positive and precisely estimated impact of distinctiveness on property prices, which is very consistent across specifications. Our baseline estimate in column 2 implies that a one-step increase on our five-step scale from not at all distinctive (-2) to very distinctive (+2) is associated with an about 25.4% ($\exp(0.23) - 1$) property price premium. The corresponding absolute premium amounts to about £38.6k (column 3). A one standard deviation increase in relative distinctiveness (0.387) implies an increase in property value of 9.8% (£14.9k). Our estimates are not particularly sensitive to excluding the distance trend in the first-stage property price RDD estimates, which indicates that unobserved location characteristics are of limited concern. A comparison between column 1 and 2 results does also not indicate the existence of strong visiting effects as these presumably are absorbed by the distance trends in the RDD estimates in (2). Minimally, the positive visiting effect is smaller than the negative effect of other unobserved variables that are correlated with distance to the boundary. Finally, the robustness to the added control variables (in 5 and 6) seems to suggest that the design effect is not driven by particular architectural styles or special planning control through Article 4.

Table 3 replicates Table 2 replacing the distinctiveness with the attractiveness score. In line with Figure 6 the attractiveness effect is qualitatively similar, but slightly smaller. A one-step increase on our five-step scale from not at all attractive (-2) to very attractive (+2) is associated with an about 23.6% ($\exp(0.212) - 1$) property price premium. The corresponding absolute premium amounts to about £35.8k (column 3). A one standard deviation increase in relative attractiveness (0.41) implies an increase in property value by 9.7% (£13k). As in Table 2, excluding the distance trends from the price premium RDD model leads to a lower design premium, which is not suggestive of a strong visiting effect. Compared to the distinctiveness effects, the attractiveness effects are more sensitive to the controls added in models 5 and 6. If the distinctiveness and attractiveness effects are estimated conditional to each other, both effects are generally reduced. The two effects seem difficult to separate empirically, which is not surprising given that they capture different shades of a similar phenomenon. Overall, however, the distinctiveness effect tends to stay somewhat closer to the baseline results. This is in line with the logic behind designation, which has at its heart the protection and enhancement of distinctive areas (English Heritage, 2011). Full estimate results are in Table A3 in the appendix.

Tab. 2. Distinctiveness effects (internal and external view)

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium in conservation area relative to surrounding areas					
	log points	log points	£	log points	log points	log points
Distinctiveness relative to surrounding areas (-2 to 2)	0.219***	0.226***	38673.767***	0.235***	0.209***	0.221***
	(0.062)	(0.043)	(9241.742)	(0.060)	(0.059)	(0.073)
Constant	-0.081	-0.103**	-18908.555**	-0.120**	-0.133**	-0.145**
	(0.050)	(0.042)	(8530.462)	(0.054)	(0.055)	(0.062)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends	-	Yes	Yes	Yes	Yes	Yes
2nd stage controls	-	-	-	-	Yes	Yes
WLS	-	-	-	Yes	-	Yes
N	47	47	47	47	47	47
r2	0.26	0.24	0.20	0.20	0.35	0.34

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 2nd stage controls consist of the following variables: Dummy variables for the architectural styles Georgian, Regency, Edwardian, Interwar (baseline architectural style category is Victorian), dummy variable for planned estate, dummy variable for Article 4. WLS estimates are weighted by the number of survey responses in an area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Tab. 3. Attractiveness (internal and external view)

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium in conservation area relative to surrounding areas					
	log points	log points	£	log points	log points	log points
Attractiveness relative to surrounding areas (-2 to 2)	0.160**	0.212***	35783.0***	0.192***	0.115	0.119*
	(0.065)	(0.052)	(9892.9)	(0.066)	(0.078)	(0.068)
Constant	-0.038	-0.101**	-18166.48*	-0.088	-0.069	-0.136*
	(0.060)	(0.045)	(9642.2)	(0.060)	(0.111)	(0.077)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends	-	Yes	Yes	Yes	Yes	Yes
2nd stage controls	-	-	-	-	Yes	Yes
WLS	-	-	-	Yes	-	Yes
N	47	47	47	47	47	47
r2	0.16	0.23	0.19	0.17	0.79	0.81

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 2nd stage controls consist of the following variables: Dummy variables for the architectural styles Georgian, Regency, Edwardian, Interwar (baseline architectural style category is Victorian), dummy variable for planned estate, dummy variable for Article 4. WLS estimates are weighted by the number of survey responses in an area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.5 Design valuation: External view effects

From a welfare economics perspective it is primarily the architectural externality, which is of interest when it comes to the economic value of building design quality. Having separated the design effect from the policy effect we now attempt to estimate the external view effect specifically. In Table 4 we estimate design capitalization effects using the price premia estimated according to the extended RDD specification (5). Because we identify these price premia from a smaller subset of property transactions we lose some conservation areas due to limited degrees of freedom. We consider price premia that stem from the full specification (columns 3 and 6), but also experiment with controlling for effects on historic properties (WWII and before), but not for properties developed after designation (columns 1-2 and 4-5) as well as excluding distance trends (columns 1 and 4) in the first-stage price premium RDD. We combine these measures with our distinctiveness (columns 1-3) and attractiveness (columns 4-6) scores.

Our preferred model in column 3 implies a 24.1% increase in property value associated with a one-step increase on the distinctiveness score (9.9% per standard deviation), which is remarkably close to the baseline model (Table 2, column 2). Including variation from properties (re)developed after a conservation area has been designated, counter to our expectations, decreases the design effect, but the effect stays within the same range (columns 1 and 2).

We obtain very different results when replacing the distinctiveness score with the attractiveness score (column 4-6). We find no significant correlation between the price premia and the attractiveness score, which further adds to the notion that reported attractiveness seems to be an imperfect proxy of the market perception of the value of design quality.

In Table 5 we focus on the view impact areas outside conservation areas. The price premia used as dependent variables are based on a comparison between properties located outside conservation areas with and without a direct view onto buildings inside conservation areas (equation 6). We experiment with including (columns 4-6) and excluding (columns 1-3) distance trends in the first stage when computing the price premia. Because prices are not differentiated across the conservation area boundary, but across boundaries of view impact areas outside conservation areas, it seems useful to use an absolute measure of the design value of buildings inside the conservation areas (columns 3 and 6). We note that an attractive feature of this setup is that the design score is based on the preferences stated by people living inside conservation areas while the property price premia are based exclusively on the valuation by buyers who have purchased properties outside conservation areas.

We find evidence for a positive external view effect in the preferred models that control for distance trends in property prices (4-6). Excluding distance trends results in significantly smaller design effects which, once more, is not in line with the presence of a sizable external visiting effect. The combination of our preferred measures of price premium (conditional on distance trend) and design quality (distinctiveness) in column 5 yields a design effect that is within the range of the distinctiveness effects in Table 4 (1-3) and the baseline model (Table 2, column 2). This is a notable and reassuring result given that the price premia are identified from a different set of properties. Moreover, this consistency suggests that the design effect in the baseline model (Table 2, column 2) is to a significant extent attributable to an architectural externality.

Tab. 4. Effects on properties developed after WWII and before designation

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium in conservation area relative to surrounding areas (log points)					
Distinctiveness relative to surrounding areas (-2 to 2)	0.160**	0.175**	0.216**			
	(0.064)	(0.076)	(0.090)			
Attractiveness relative to surrounding areas (-2 to 2)				-0.001	0.036	0.077
				(0.095)	(0.094)	(0.101)
Constant	-0.075	-0.109	-0.135	0.059	0.005	-0.024
	(0.063)	(0.076)	(0.090)	(0.081)	(0.080)	(0.084)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st. stage dist. trend effects	-	Yes	Yes	-	Yes	Yes
1st. stage historic effects	Yes	Yes	Yes	Yes	Yes	Yes
1st. stage post-des. effects	-	-	Yes	-	-	Yes
N	45	45	44	45	45	44
r2	0.081	0.086	0.106	0.000	0.004	0.015

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 1st. stage historic effects (1st. stage post-des. effects) indicates that price premium is estimated conditional on boundary effects on historic (post-designation) properties. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Tab. 5. Effects on outside properties with a view on conservation areas

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium in view impact area relative to surrounding areas (log points)					
Attractiveness relative to surrounding areas (-2 to 2)	0.081 (0.054)			0.175*** (0.063)		
Distinctiveness relative to surrounding areas (-2 to 2)		0.095 (0.074)			0.179* (0.094)	
Buildings are attractive to look at (-2 to 2)			0.076 (0.048)			0.124*** (0.039)
Constant	-0.065 (0.054)	-0.071 (0.055)	-0.077 (0.052)	-0.109** (0.053)	-0.102 (0.066)	-0.090** (0.044)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends				Yes	Yes	Yes
N	46	46	46	46	46	46
r2	0.052	0.061	0.061	0.106	0.096	0.071

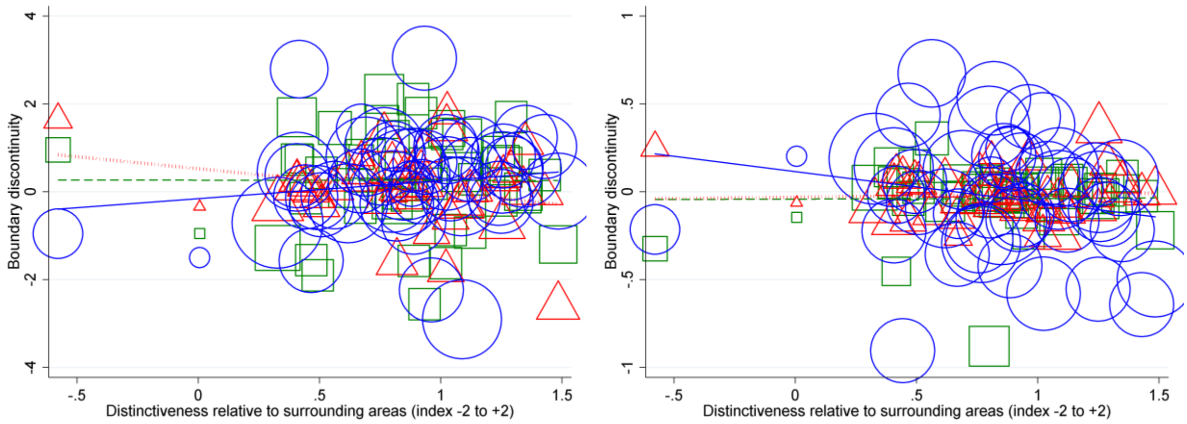
Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to placebo view impact area boundary trends. * p < 0.1, ** p < 0.05, *** p < 0.01.

4.6 Design valuation: Robustness

We have run a number of additional robustness tests, which we summarize in this section. The results generally substantiate the interpretation and conclusions presented so far. Estimation results are reported in appendix Tables A4-A9 in the appendix.

We begin by showing correlations between estimated boundary effects in various property characteristics and relative design quality scores across conservation areas in Figure 7. Parametric estimates are presented in Table A4 in the appendix. We find no significant correlation when instead of the log of sales price we consider the log of floor space, the log of the number of bedrooms, the log of the age of the structure, whether a property has a garage or central heating or whether the property is held in leasehold as a dependent variable in our first-stage RDD (equation 4). These complementary results make it arguably less likely that our estimated design capitalization effects are driven by internal property characteristics that are correlated with design value.

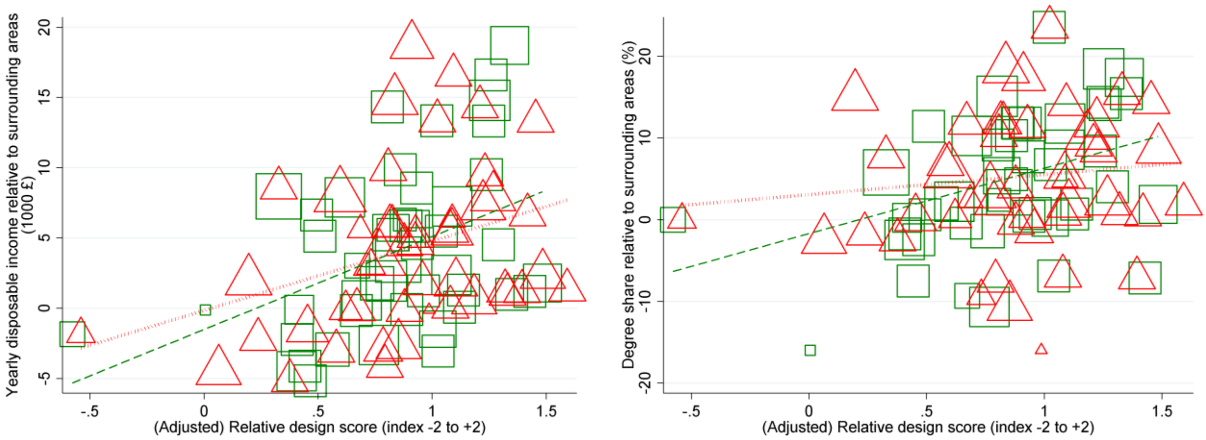
Fig. 7. Boundary effects in covariates vs. relative design quality



Notes: Y-axis shows first-stage RDD estimates according to the baseline equation (4) using the following dependent variables: Log of floors space (left, green squares and dashed fitted line), log of number of bedrooms (left red triangles and dotted fitted line), log of age of structure (left blue circles and solid fitted line), having a garage (right green squares and dashed fitted line), having central heating (right red triangles and dotted fitted line) and property being held in leasehold (right blue circles and solid fitted line). Otherwise the graphs are comparable to the upper left panel in Figure 6. The size of the markers is proportionate to the number of responses in a conservation area.

In the second set of robustness tests reported in Table A5 we experiment with including and excluding various sets of control variables in the first stage (estimation of price premia and adjustment of design indices) and the second stage (estimating the design effect). We find that omitting property and locational characteristics from the first-stage property price RDD models leads to larger coefficients, which is in line with a correlation between the design quality and other features of a building. In contrast, the results tend to change marginally only if the relative design scores are not adjusted for interviewee characteristics in a design quality first-stage. As evident from Figure 8 there is a positive correlation between income and educational differences across boundaries and differences in design quality across boundaries. A one step-increase on our (differenced) distinctiveness score is associated with a £6,260 higher (differenced) disposable income and a 9.1 percentage point higher (differenced) share of academic degree holders. These results support the view that wealthy households sort into areas of particular architectural value due to design preferences that sharply increase in income (Brueckner, et al., 1999). Controlling for income, education and ethnicity in the first-stage price premium RDD, however, only moderately reduces the baseline distinctiveness effect by three percentage points or about one sixth. We obtain similar results when controlling for neighborhood effects and allowing for heterogeneity in the design effect with respect to income and education in the second stage (Table A6 in the appendix).

Fig. 8. Relative income and education vs. design quality



Notes: Green (red) squares (triangles) compare adjusted relative distinctiveness scores (adjusted relative attractiveness scores) to relative income differences (income within inside 250m buffer – income within outside 250m buffer) in the left panel. Green (red) squares (triangles) compare the relative design measures to relative degree shares (degree share within inside 250m buffer – degree share within outside 250m buffer area) in the right panel. The size of the markers is proportionate to the number of responses in a conservation area. Dashed (dotted) line is the weighted linear fit.

In the third set of robustness tests reported in Table A7 we address a potential mechanical link between price premia and design indices due to sorting related preference shocks that could simultaneously impact on the dependent and the independent variable. Building on the evidence provided in Figure 4 we use the conservation area designation date as an instrumental variable for our design indices. As a second instrumental variable we use the number of listed buildings normalized by the surface area of a conservation area. The distinctiveness effect remains within close range of the OLS results, no matter whether we use price premia estimated according to the baseline (equation 4) or extended (equation 5) RDD model. The distinctiveness effect also remains statistically significant in the baseline model and when we control for effects on historic buildings. The effect becomes insignificant if we further control for effects on post-designation buildings, possibly due to a relatively weak IV first stage (F-stat = 8.65). The attractiveness effect, once more, is less robust. The point estimates tend to increases, but the standard errors increase disproportionately, which is not surprising given the weak first stage (F-stat = 2.6).

In the fourth set of robustness tests reported in Table A8 we combine the Article 4 status control variable with LPA fixed effects in the second-stage model (equation 10) to provide a very strong control for regulatory heterogeneity. The results need to be interpreted with care given that the number of fixed effects with 21 is large compared to the number of available observations. We find design effects which are generally positive and sizable, although frequently not statistically significant due to relatively large standard errors. Interestingly, we find positive and significant effects that are within the range of the baseline estimates not only for distinctiveness but also for attractiveness when using the premia obtained from the more demanding property price RDD model (equation 5).

In the fifth set of robustness tests reported in Table A9 we address the concern that the view estimates reported in Table 5 could be driven by unobserved locational factors that are highly localized near to conservation areas and correlated with the (reported) design quality of conservation areas. We conduct a falsification exercise by estimating the property price premia associated with a location within 50 meters of a conservation area, but outside our defined view impact areas. We expect that if a highly localized unobserved effect existed that was unrelated to, but correlated with, our design measure, it would also show up in the resulting placebo price premia. Reassuringly, we consistently find small and insignificant effects when replicating Table 5 using the placebo price premia as dependent variable.

5 Conclusion

We have presented a unique method to estimate the economic value of architectural design. Our method separates the design effect from correlated location effects by differentiating property prices and design character across spatial boundaries within neighborhoods and comparing the differences in property prices and design across neighborhoods. We implement this method using conservation area boundaries as a source of discrete variation in design character. We obtain our indices of capitalized value and design scores using a combination of econometric techniques and qualitative methods. The estimated design value is large. Our baseline estimate suggests a capitalization effect of about 25.4% of property value (£38.7k in 2003 prices) associated with a one-step increase on a five-step scale ranging from not at all distinctive to very distinctive. The effect seems to a large extent attributable to an architectural externality, which provides some rationale for planning policies that seek to preserve and enhance the architectural quality of the built environment. More research, however, is needed to assess the effectiveness of planning policies to achieve this goal as well as the associated costs.

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Appendix to:
Distinctively different: A new approach to valuing architectural amenities

1 Introduction

This technical appendix provides complementary material not reported in the main paper for brevity. The material presented comprises maps that illustrate the spatial setting of our study (Section 2), complementary results that are not essential for the message of the main paper but may be of interest to some readers (Section 3), and various robustness checks that substantiate the interpretations and conclusions presented in the main paper (Section 4). The appendix is not designed to stand alone or replace the reading of the main paper.

2 Data

2.1 Conservation area locations

Our sampling strategy was to include conservation areas with varying levels of deprivation as described by 2007 ward level deprivation indices and conservation areas located in both inner and outer London boroughs. We selected 24 areas with relatively high levels of deprivation and 24 with low levels and 27 conservation areas within inner London boroughs and 21 in located in outer London. Figure A1 maps the resulting sample of conservation areas included in our study. We note that Courtfield was initially sampled but eventually excluded from the analysis due to insufficient property transactions.

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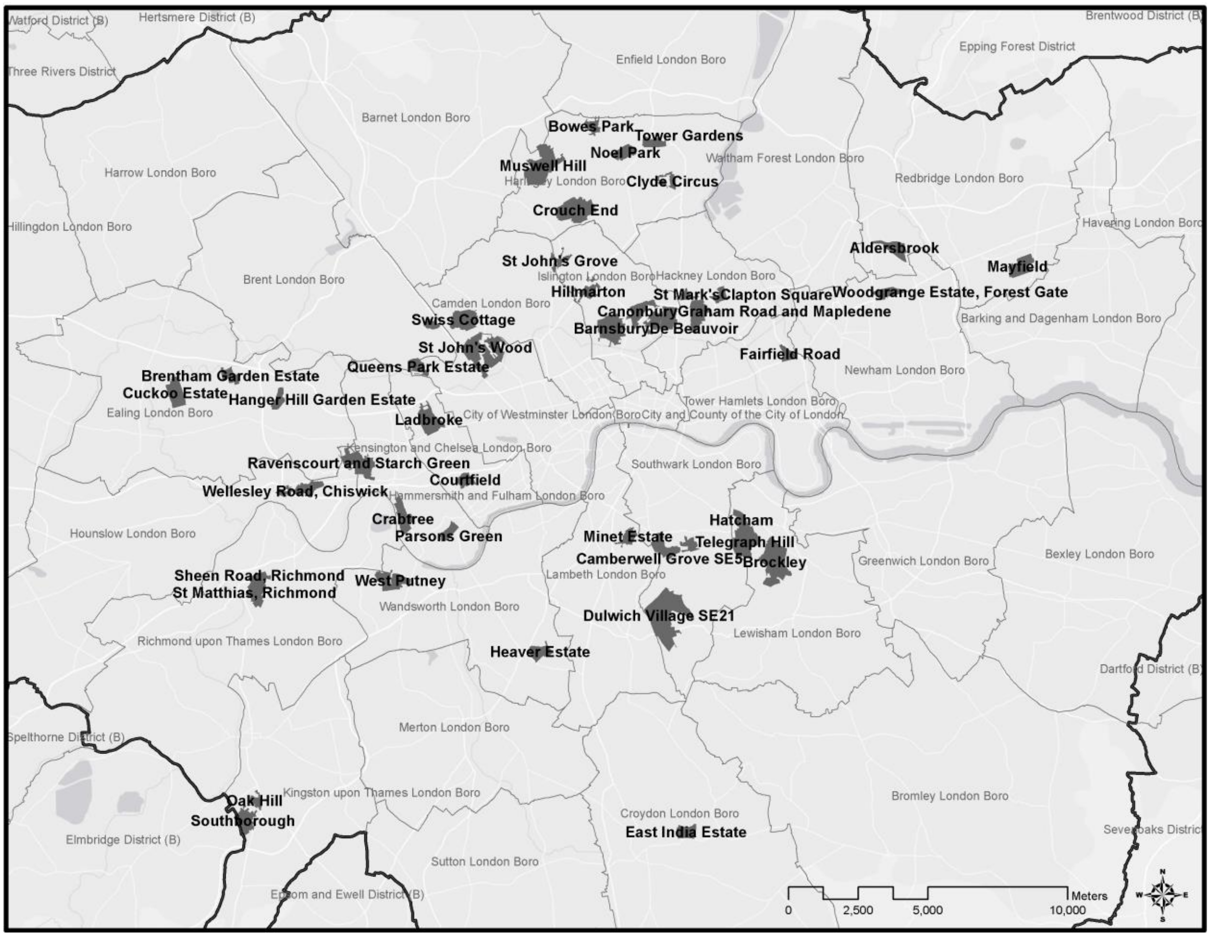
Fig A1. Conservation area locations



Notes: Dark shaded areas are the sampled conserveration areas. ESRI topographic map in the background. Borough boundaries based on a shapefile from Office for National Statistics.

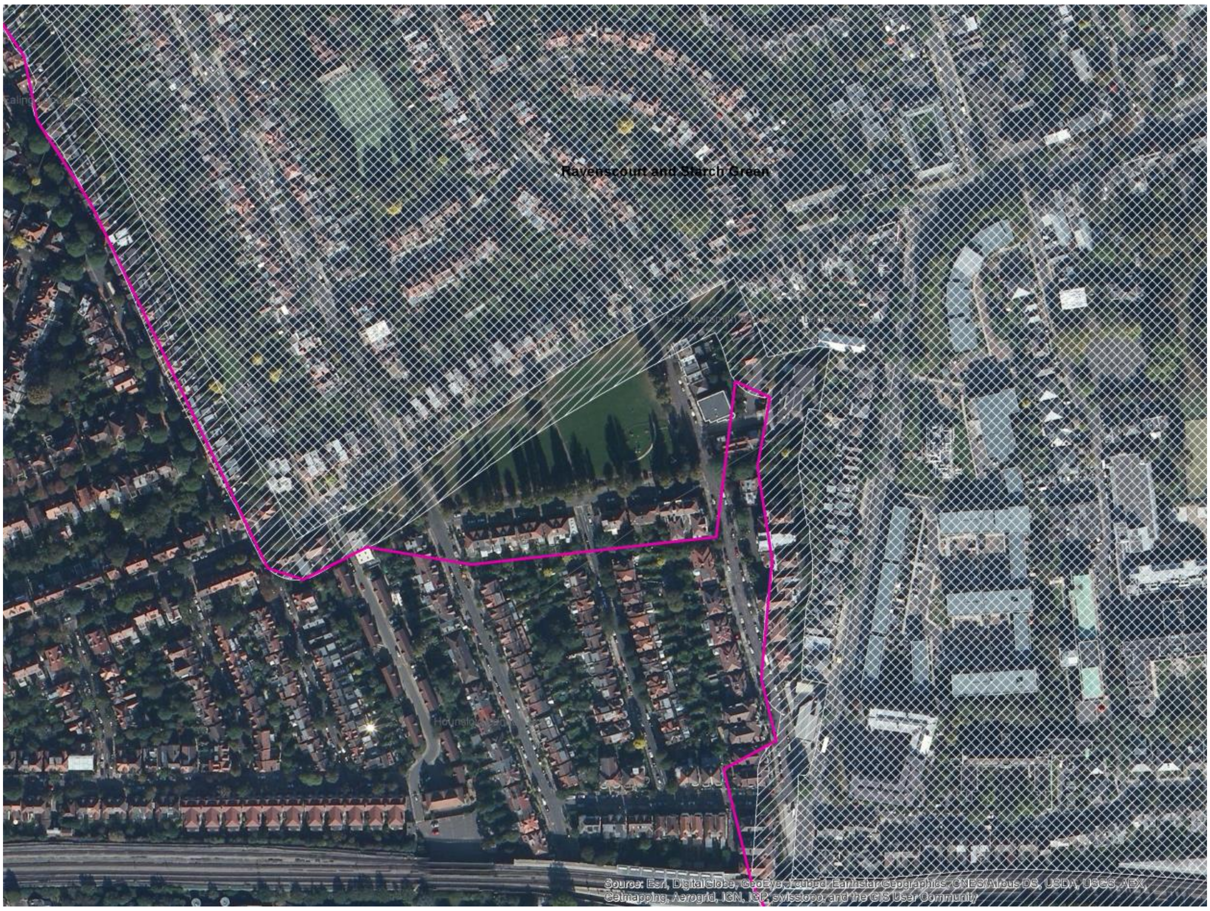
2.2 Definition of view impact areas

We refer to the area outside a conservation area from which the buildings inside the conservation area are visible as the view impact area. To approximate the view impact area of a conservation area we begin by drawing an outside 25m buffer area around the conservation area, which is about the width of half a street plus one house in a typical neighborhood. As illustrated in Figure A2a this buffer area provides a reasonable approximation of the view impact area in many circumstances where there is a view across the street. In some cases, however, wider views are facilitated by open spaces such as parks or playing fields. In such instances we manually adjust the shape of the view impact area using the 25m buffer area as a starting point. For ease of adjustment, we slightly simplify the geometry of the 25m buffer (reduce the number of edges) before we adjust the boundaries. Figure A2b illustrates an example where a manual adjustment was made to provide a better approximation of the view impact area.

Fig A2a. View impact area

Notes: Cross-hatched area is the conserveration area. Hatched area is the 25m buffer. Thick solid line show the view impact area. ESRI topographic map in the background.

Fig A2b. View impact area

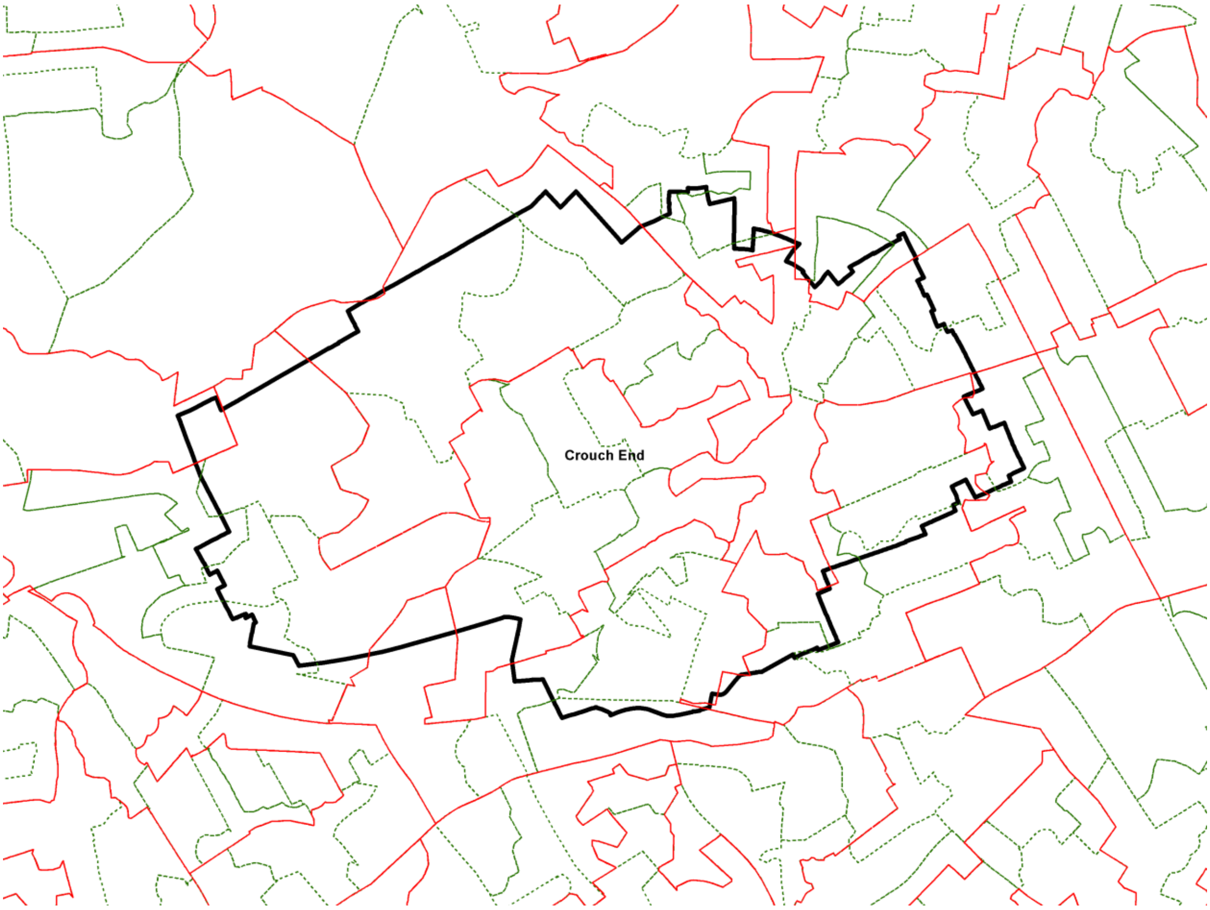


Notes: Cross-hatched area is the conserveration area. Hatched area is the 25m buffer. Thick solid line show the view impact area. ESRI topographic map in the background.

2.3 Conservation areas and census unit boundaries

To assess whether building design quality attracts certain types of households more than others and to control to some extent of the effects associated with such sorting we match neighbourhood characteristics to our data. Such data refer to spatial statistical units whose boundaries are typically not congruent with conservation area boundaries. We use disposable household income estimates by Experian available at the level of lower level super output areas as well as the share of population holding an academic degree and various measures of ethnic composition available at output area level. For an exemplary conservation area we overlay the different boundaries in Figure A3. As expected, the conservation area boundaries differ significantly from those of the (super) output areas. However, it is also evident that (super) output areas are sufficiently small to ensure that for each conservation area there are at least a couple of (super) output areas with the majority of their surface area within the conservation area. It is therefore expected that a comparison of the aggregate of (super) output areas within and outside the boundary of a conservation area will be informative with respect to the actual differences across the boundary. In merging the neighbourhood data to our data base we proceed as follows. To control for neighbourhood composition in the first-stage property price RDD we merge the neighbourhood variables to transactions based on the (super) output areas a transaction falls in. To aggregate neighbourhood statistics inside and outside the conservation area boundary we make use of the allocation of transactions to (super) output areas as an intermediate input. Essentially, we compute the means over transactions inside and outside the conservation area and within the 250m buffers. This approach is asymptotically equivalent to a spatial interpolation weighted by population as long as turnover proportionate to population.

Fig A3. Conservation areas and census unit boundaries



Notes: Black thick line is the conserveration area boundary. Thin solid red lines are boundaries of lower level super output areas. Thin dotted green lines are boundaries of output areas.

3 Complementary evidence

3.1 Conservation area details

In the main paper we have provided a range of descriptive and econometric comparisons between our estimated property price premia and the adjusted relative design indices. In Table A1 we tabulate the estimated boundary premia along with the design indices and some additional information by conservation area.

Tab A1. Conservation area details

Conservation area		Trans.		RDD premium (baseline)			Survey			Architectural	Planned
N	Name	In	Out	Rel.	t-stat	Abs. £	N	Attr.	Dist.	Style / period	Estate
1	Aldersbrook	66	59	0.20	2.15	29406	10	1.21	0.80	Edwardian	Yes
2	Barnsbury	172	72	0.27	2.68	45774	10	1.09	1.26	Georgian, Victorian	No
3	Bowes Park	50	161	-0.01	-0.23	-1180	15	0.06	0.41	Victorian	No
4	Brentham Garden Estate	41	35	0.26	2.90	68979	14	1.10	1.48	Edwardian	Yes
5	Brockley	181	287	0.08	1.75	10691	15	1.18	0.69	Victorian	Yes
6	Camberwell Grove	69	117	0.19	1.85	31045	10	0.88	1.29	Victorian, Edwardian	Yes
7	Canonbury	72	91	0.17	1.61	35655	10	1.33	1.35	Victorian	Yes
8	Clapton Square	68	73	0.10	0.82	13059	10	0.67	0.89	Victorian	No
9	Clyde Circus	33	135	0.05	0.80	5718	10	0.24	0.41	Victorian	No
10	Crabtree	130	68	-0.19	-2.89	-46117	20	0.60	0.33	Victorian, Edwardian	Yes
11	Crouch End	232	169	0.10	2.33	18723	10	1.23	1.24	Victorian	No
12	Cuckoo Estate	90	105	-0.04	-0.86	-6099	1	0.99	0.01	Interwar	Yes
13	De Beauvoir	91	13	0.11	0.70	19376	14	0.91	1.34	Victorian	Yes
14	Dulwich Village	42	210	0.37	5.75	84133	10	1.45	1.25	Victorian, Edwardian	Yes
15	East Canonbury	96	25	0.08	0.81	15649	10	0.83	0.92	Victorian	Yes
16	East India Estate	122	158	0.08	1.87	9161	11	0.79	0.56	Victorian, Edwardian	No
17	Fairfield Road	83	27	0.34	3.57	46561	10	1.02	1.02	Victorian, Edwardian	No
18	Graham Road and Mapledene	164	25	0.13	2.08	19502	10	0.81	0.89	Victorian	Yes
19	Hanger Hill Garden Estate	25	20	-0.26	-1.37	-50110	14	1.22	1.09	Interwar	Yes
20	Hatcham	38	87	0.03	0.33	2724	15	0.85	0.77	Victorian	Yes
21	Heaver Estate	142	183	0.06	1.39	11459	5	1.09	0.88	Victorian	Yes
22	Hillmarton	80	109	0.23	5.48	31705	10	0.93	0.51	Victorian	Yes
23	Holly Grove	52	98	0.00	-0.05	-580	10	1.08	1.12	Georgian, Victorian	No
24	Ladbroke	60	6	0.47	1.19	71244	16	0.84	1.25	Regency	Yes
25	Mayfield	31	109	0.25	4.02	33129	10	1.42	0.49	Interwar	Yes
26	Minet Estate	39	28	0.51	2.91	87367	10	1.32	0.96	Victorian	Yes
27	Muswell Hill	254	108	0.12	1.95	23642	20	0.77	0.85	Victorian	Yes
28	Noel Park	80	94	0.10	1.77	12293	10	0.79	0.44	Victorian	No
29	North Kilburn	40	60	0.10	1.04	20194	10	0.58	1.03	Victorian	Yes
30	Oak Hill	43	85	-0.08	-1.12	-11646	8	0.62	0.42	Regency, Victorian	No
31	Overcliffe, Gravesend	5	45	-0.36	-2.12	-30744	6	-0.54	-0.58	Victorian	No
32	Parsons Green	19	29	-0.16	-0.99	-45123	6	0.73	0.67	Victorian	Yes
33	Queens Park Estate	36	77	0.07	0.68	11948	10	1.39	1.43	Victorian	No
34	Ravenscourt and Starch Green	60	209	0.09	1.45	20068	10	0.93	0.94	Victorian, Edwardian	No

Table continues on next page

Tab. A1 continued

Conservation area		# trans.		RDD premium (baseline)			Survey			Architectural	Planned
N	Name	In	Out	Rel.	t-stat	Abs. £	N	Attr.	Dist.	Style / period	Estate
35	Sheen Road, Richmond	38	25	0.04	0.24	8213	9	0.33	0.93	Victorian	No
36	Southborough	27	134	-0.04	-0.64	-7840	15	1.27	0.62	Victorian	No
37	St John's Grove	36	118	0.24	2.51	37896	10	1.08	1.04	Victorian	No
38	St John's Wood	74	81	0.17	1.66	34760	10	1.59	1.14	Victorian, Edw., Interwar	Yes
39	St Mark's	57	71	0.05	0.32	8038	13	0.45	1.02	Victorian	Yes
40	St Matthias, Richmond	97	13	-0.30	-4.05	-84775	16	0.20	0.80	Victorian	No
41	Swiss Cottage	146	87	-0.03	-0.47	-5556	10	0.81	0.86	Victorian	No
42	Telegraph Hill	139	121	0.00	0.01	101	15	1.49	1.08	Victorian	Yes
43	Tower Gardens	34	30	0.00	0.00	-57	10	0.38	0.47	Edwardian	Yes
44	Turnham Green	46	40	-0.18	-1.22	-36486	13	1.09	0.82	Victorian	No
45	Wellesley Road, Chiswick	72	68	0.22	2.90	42262	10	0.88	0.67	Victorian	Yes
46	West Putney	64	107	0.14	2.63	23742	5	0.69	0.81	Victorian, Edwardian	No
47	Woodgrange Estate	31	60	0.30	3.51	27559	11	0.96	0.76	Victorian	Yes

Notes: # trans. gives the number of transactions within an *In*side and *Out*side 250m buffer area from a conservation area. Rel. is the relative price premium at the boundary in log points. Likewise, Abs. is the respective premium in £. Attr. indicates relative attractiveness. Dist. similarly stands for distinctiveness.

4.1 Hedonic estimates

In computing the price premia at the conservation area boundaries according to equations 4-6 (in the main paper) we control for a broad range of property and locational characteristics. We report the estimated implicit hedonic prices estimated in different variations of the price premium RDD models in Table A2. Columns (1-3) are variants of equation (4), where (2) is the baseline model (equation 4), (1) omits distance to conservation area boundary trends and (3) adds neighbourhood controls (income, degree share and ethnical mix). Columns (4-8) are variants of equation (5), where (7) is the model reported in equation (5), columns (4-6) omit distance trends and/or controls for boundary effect on post-designation buildings, and (8) adds neighbourhood controls. Columns (9-11) are variants of equation (6) used to estimate the premia associated with locations in view impact areas outside conservation areas, where (10) is the standard models, (9) omits distance trends and (11) adds neighbourhood controls.

The results are generally very consistent across specifications and in line with economic intuition. Larger properties in terms of floor space, number of bedrooms and bathrooms are more expensive as are detached, semi-detached and terraced houses (as opposed to flats). New properties sell at a premium, but among other properties older properties achieve a premium in some, but not all specification, possibly reflecting a premium for historical style and character. Leasehold (as opposed to freehold) is associated with a significant discount as expected. The only surprising parameter estimate among the structural characteristics is the negative coefficient of a garage, which indicates that properties with a garage are likely to have some unobserved negative features (e.g. unfavourable architectural style). Although we identify from variation within very small neighbourhoods where many locational attributes should be similar there is sufficient within neighbourhood variation to identify some significant effects for a number of features in a range of models. As an example we find positive effects associated with being close to a lake, or being located in an area where average key-stage 2 test scores in local schools are high. The negative effect of proximity to a bus stop likely reflects negative effects associated with a location at a major road (e.g. noise, pollution) where busses typically pass through.

The effects of the neighbourhood variables also come with little surprise. Where incomes and education levels tend to be higher property prices also tend to be higher. The ethnic variables are more difficult to interpret due to collinearity. They are primarily included to absorb as many correlated characteristics as possible. Conditional on differences in education and income levels we find that diversity is associated with a premium.

Tab. A2. Hedonic implicit prices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Log sales price										
Building age (years)	0.001**	0.001**	0.001***	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Floor size (m^2)	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
New property (dummy)	0.117**	0.130**	0.134***	0.138***	0.148***	0.064	0.070	0.071	0.139***	0.147***	0.145***
	(0.053)	(0.052)	(0.051)	(0.045)	(0.044)	(0.048)	(0.046)	(0.047)	(0.047)	(0.047)	(0.045)
Leasehold (dummy)	-0.086***	-0.084***	-0.084***	-0.078***	-0.075***	-0.079***	-0.077***	-0.075***	-0.119***	-0.119***	-0.122***
	(0.015)	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.023)	(0.023)	(0.023)
Garage (dummy)	-0.014**	-0.013**	-0.011**	-0.017***	-0.017***	-0.016***	-0.015***	-0.013***	-0.015**	-0.015**	-0.012*
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)
Central heating (dummy)	-0.003	-0.003	-0.003	-0.001	-0.001	-0.002	-0.002	-0.002	0.003	0.003	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
No. of bathrooms	0.034***	0.034***	0.028***	0.036***	0.036***	0.030***	0.030***	0.025***	0.022*	0.024*	0.017
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.013)	(0.012)	(0.012)
No. of bedrooms	0.081***	0.081***	0.085***	0.084***	0.084***	0.085***	0.086***	0.089***	0.087***	0.088***	0.091***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.009)	(0.008)	(0.008)
Detached house (dummy)	0.123***	0.117***	0.118***	0.128***	0.119***	0.122***	0.113***	0.115***	0.110**	0.108**	0.107**
	(0.027)	(0.027)	(0.026)	(0.027)	(0.027)	(0.026)	(0.027)	(0.026)	(0.046)	(0.045)	(0.044)
Semi-detached house (dum-	0.064***	0.068***	0.071***	0.070***	0.074***	0.069***	0.072***	0.076***	0.045**	0.049**	0.053**
my)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.022)	(0.023)	(0.022)
Terraced house (dummy)	0.058***	0.060***	0.063***	0.070***	0.073***	0.067***	0.070***	0.073***	0.035	0.035	0.040*
	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.024)	(0.024)	(0.024)
Distance to nearest National	0.003	0.010	-0.002	0.001	0.008	0.000	0.007	-0.004	0.016	0.019	0.013
Park	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.019)	(0.020)	(0.016)
Distance to nearest Area of	-0.041***	-0.036**	-0.017	-0.058***	-0.052***	-0.063***	-0.058***	-0.037**	-0.027	-0.040*	-0.016
Outstanding Natural Beauty	(0.016)	(0.016)	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.019)	(0.021)	(0.019)
Distance to nearest Natural	-0.006	-0.001	0.002	-0.015	-0.006	-0.017	-0.009	-0.003	0.014	0.008	0.012
Nature Reserve	(0.014)	(0.014)	(0.012)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.019)	(0.020)	(0.015)
Distance to nearest lake	-0.039**	-0.034**	0.000	-0.043***	-0.036**	-0.043***	-0.037**	-0.004	-0.056***	-0.060***	-0.011
	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.020)	(0.022)	(0.020)
Distance to nearest river	0.003	0.007	-0.002	0.016	0.017	0.014	0.015	0.008	0.014	0.023	0.025*
	(0.014)	(0.014)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.015)	(0.016)	(0.014)
Distance to nearest coastline	-0.009	-0.004	-0.014	-0.018	-0.013	-0.021	-0.016	-0.026	-0.015	-0.023	-0.045***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.019)	(0.019)	(0.017)
Distance to nearest bus stop	0.228***	0.220***	0.164***	0.253***	0.247***	0.262***	0.251***	0.199***	0.169***	0.143**	0.071
	(0.041)	(0.043)	(0.043)	(0.041)	(0.042)	(0.040)	(0.041)	(0.041)	(0.055)	(0.057)	(0.056)
Distance to nearest railway	-0.016	-0.010	0.008	-0.019	-0.015	-0.020	-0.016	0.001	-0.035	-0.034	-0.006
tracks	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.022)	(0.023)	(0.020)

Table continues on next page

Tab. A2 continued

Dist. to nearest underground stations	-0.010	-0.015	-0.015	-0.014	-0.021	-0.014	-0.021	-0.020	0.011	0.020	0.026
	(0.016)	(0.016)	(0.015)	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.019)	(0.020)	(0.018)
IDW of Key stage 2 score per MSOA	0.043**	0.045**	0.046**	0.042**	0.042*	0.035	0.035	0.039*	0.027	0.047	0.043
	(0.021)	(0.023)	(0.023)	(0.021)	(0.022)	(0.022)	(0.023)	(0.023)	(0.036)	(0.038)	(0.036)
Degree share (%)			0.002***					0.002***			0.004***
			(0.001)					(0.001)			(0.001)
Median Income (in 1000 £)			0.003***					0.003***			0.005***
			(0.000)					(0.000)			(0.001)
Share of White at total population			0.066					0.108			0.019
			(0.168)					(0.159)			(0.228)
Share of Mixed at total population			0.179					0.283			-0.344
			(0.227)					(0.219)			(0.317)
Share of Asian at total population			0.111					0.085			0.142
			(0.178)					(0.165)			(0.237)
Share of Black at total population			-0.080					-0.058			-0.009
			(0.170)					(0.154)			(0.236)
Constant			0.203***					0.194***			0.172*
			(0.071)					(0.069)			(0.092)
CA x neighborhood	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	-
CA distance x neighborhood	-	Yes	Yes	-	Yes	-	Yes	Yes	-	-	-
Historic x neighborhood	-	-	-	Yes	Yes	Yes	Yes	Yes	-	-	-
Hist. x CA x neighborhood	-	-	-	Yes	Yes	Yes	Yes	Yes	-	-	-
Post-designation x neighb.	-	-	-	-	-	Yes	Yes	Yes	-	-	-
Post-designation x CA neighb.	-	-	-	-	-	Yes	Yes	Yes	-	-	-
View x neighborhood	-	-	-	-	-	-	-	-	Yes	Yes	Yes
View distance x neighb.	-	-	-	-	-	-	-	-	-	Yes	Yes
Year x neighborhood	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	4,137	4,137	4,137
r2	0.920	0.922	0.925	0.925	0.927	0.927	0.929	0.931	0.923	0.926	0.932

Notes. Standard errors in parentheses are clustered on year x conservation area cells. CA neighborhood indicates conservation area specific indicator variables. CA distance x neighborhood indicates conservation area specific distance to conservation area boundary trends (0 at boundary). Historic x neighborhood indicates indicator variables denoting historic buildings (before WWII) in a given neighborhood. Post-designation x neighb. Similarly indicates indicator variables denoting properties constructed after designation in a neighborhood in a given neighborhood. View x neighborhood indicates indicator variables denoting properties outside a conservation area with a view onto buildings in a conservation area within a given neighborhood. View distance x neighb. indicates conservation area specific distance to view impact area boundary trends (0 at boundary). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.2 Attractiveness and distinctiveness

In Section 4.4 in the main paper we discuss how spatial differences across conservation area boundaries in distinctiveness and attractiveness are associated with differences in property prices. Because of the relatively low number of observations and the relatively high collinearity of the two design indices (correlation coefficient close to 0.6) we prefer to estimate attractiveness and distinctiveness in separate models. Moreover, the distinctiveness and attractiveness effects, because they capture different shades of a similar phenomenon, are difficult to interpret conditional on each other. In Table A3 we nevertheless include both variables simultaneously in models that are otherwise identical to Tables 2 and 3 in the main paper. As mentioned in the main paper the distinctiveness effects tends to remain somewhat closer to the results reported in Tables 2 and 3 in the main paper. The effect of a one-step increase in distinctiveness *and* attractiveness in Table A3 is within the range of a one-step in increase in distinctiveness *or* attractiveness in Tables 2 and 3 in the main paper suggesting that in each case we capture the effects of the same phenomenon.

Tab. A3 Attractiveness & distinctiveness

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium in conservation area relative to surrounding areas					
	log points	log points	£	log points	log points	log points
Distinctiveness relative to surrounding areas (-2 to 2)	0.183*	0.144**	24969.48**	0.164*	0.101	0.124
	(0.096)	(0.064)	(11427.5)	(0.084)	(0.082)	(0.089)
Attractiveness relative to surrounding areas (-2 to 2)	0.057	0.131*	21822.7	0.111	0.168**	0.167*
	(0.087)	(0.077)	(15171.5)	(0.088)	(0.072)	(0.085)
Constant	-0.101**	-0.150***	-26741.6**	-0.158**	-0.169***	-0.186***
	(0.044)	(0.053)	(13616.6)	(0.059)	(0.060)	(0.068)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends	-	Yes	Yes	Yes	Yes	Yes
2nd stage controls	-	-	-	-	Yes	Yes
WLS	-	-	-	Yes	-	Yes
N	47	47	47	47	47	47
r2	0.275	0.294	0.248	0.236	0.423	0.414

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 2nd stage controls consist of the following variables: Dummy variables for the architectural styles Georgian, Regency, Edwardian, Interwar (baseline architectural style category is Victorian), dummy variable for planned estate, dummy variable for Article 4. WLS estimates are weighted by the number of survey responses in an area. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5 Robustness

5.1 Alternative outcome measures

A popular means to validate boundary discontinuity estimates is to demonstrate that an estimated discontinuity exists in the outcome measure of interest only, and not in other observables which potentially determine the outcome, but are not related to the phenomenon of interest. In our context we are not primarily interested in whether or not there exists a discontinuity across conservation area boundaries, on average, but whether individual discontinuities are correlated with differences in design quality across these boundaries. In this double-differencing setting the analogical validation test, thus, is to rerun the first and second stages using alternative property features as economic outcome variables in the property first stage. Table A4 reports six variants of this approach. We find no significant correlation when considering the log of floor space, the log of the number of bedrooms, the log of age of the structure, whether a property has a garage or central heating or whether the property is held in leasehold as a response variable in our first-stage RDD models (according to equation 4). These complementary results make it arguably less likely that our estimated design capitalization effects are driven by unobserved internal property characteristics that are correlated with design value.

Table A4 Boundary effects in covariates vs. relative design quality

	(1) Boundary discontinuity in log of floor space	(2) Boundary discontinuity in log of number of bed rooms	(3) Boundary discontinuity in log of age of structure	(4) Boundary discontinuity in property having a garage	(5) Boundary discontinuity in property having central heating	(6) Boundary discontinuity in property being held in leasehold
Distinctiveness relative to surrounding areas (-2 to 2)	0.029	-0.468	0.595	0.059	-0.022	-0.128
	(0.369)	(0.381)	(0.400)	(0.058)	(0.066)	(0.123)
Constant	0.210	0.482	-0.277	-0.087	0.003	0.069
	(0.365)	(0.297)	(0.358)	(0.063)	(0.058)	(0.123)
1st-stage survey controls	YES	YES	YES	YES	YES	YES
1st-stage distance trends	YES	YES	YES	YES	YES	YES
N	47	47	47	47	47	47
r2	0.000	0.053	0.049	0.017	0.005	0.025

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. Dependent variables 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area or view impact area boundary trends. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.2 Controls

In computing the price premia at the conservation area boundaries according to equations (4) and (5) (in the main paper) we control for a broad range of property and locational characteristics (see section 4.2 in this appendix for the hedonic implicit prices). Similarly, we adjust our design measures for observable interviewee characteristics (see Table 1 in the main text). In columns (1-3) of Table A4 we experiment with omitting these controls in the first-stage regressions used to compute the price premium and design measures. Column (1) reports a model where both first-stages are estimated excluding any controls, i.e. we compare raw differences in prices and reported design quality across conservation areas. Compared to the baseline model the distinctiveness effect increases by about 25%. If we add interviewee characteristics to the design first stage (but no controls to the property price premium RDD) the distinctiveness effect increases further by some additional 10% (column 2). Adding controls to the price premium RDD only (no adjustment of the reported distinctiveness scores) yields results that are very close to the baseline model.

In columns (4-5) we further expand the set of controls in the first-stage property price premium RDD to include variables that capture income, education and ethnicity of the local residents. Despite the evidence for residential sorting of high income and high education households into conservation areas with high relative design quality (see Figure 7 in the main paper) the distinctiveness effect remains remarkably robust. Compared to the baseline model (Table 2, column 2) the effect is reduced by about three percentage points (about one sixth) (column 4). In column (5) we add the neighbourhood controls to the first-stage price premium RDD of Table 3, column (2) model. The attractiveness effect is reduced by slightly more than 10%, but remains significant. Similarly, we add neighbourhood controls to the price premium first stage of Table 5, column (6) in column (6). The design effect remains virtually unchanged.

Tab. A4. Robustness I – First- and second-stage controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium relative to surrounding areas (log points)					
	Conservation area	Conservation area	Conservation area	Conservation area	Conservation area	View impact area
Distinctiveness relative to surrounding areas (-2 to 2)	0.307***	0.341***	0.228***	0.187***		
	(0.060)	(0.073)	(0.046)	(0.051)		
Attractiveness relative to surrounding areas (-2 to 2)					0.182***	
					(0.065)	
Buildings are attractive to look at (-2 to 2)						0.123***
						(0.047)
Constant	-0.088*	-0.120**	-0.103**	-0.084*	-0.088	-0.105*
	(0.053)	(0.059)	(0.041)	(0.049)	(0.063)	(0.059)
1st-stage survey controls	-	Yes	-	Yes	Yes	Yes
1st-stage property controls	-	-	Yes	Yes	Yes	Yes
1st-stage distance trends	-	-	Yes	Yes	Yes	Yes
2nd-stage census controls	-	-	-	Yes	Yes	Yes
N	47	47	47	47	47	46
r2	0.274	0.317	0.257	0.199	0.212	0.061

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area or view impact area boundary trends. 1nd-stage census controls indicates that price premium is estimated conditional on 2001 census characteristics (including income, share of white population, share of black population, share of mixed non-white population, and a Herfendal index of ethnic mix. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.3 Sorting

In Figure 7 in the main paper we correlate differences in education and income across the inside and outside 250m conservation area boundary buffers with our indices of relative design quality. The corresponding (unweighted) regressions are shown in columns (1) and (2) of Table A5. Educational and income differences significantly increase with the relative design quality of an area. Since our differences in property prices across conservation areas also are significantly positively correlated with our preferred relative design index (columns 3 and 4) the question arises to which extent correlation between property price premia and design quality is driven by sorting. In column (5) we expand the baseline second-stage model (equation 4) to control for income and educational differences across conservation area boundaries. Moreover we control for the income and educational levels within the inner 250m buffer; and interact these with our preferred relative design quality measure to allow for heterogeneity in design preferences with respect of income and education. This is a relatively demanding model given the limited number of observations. Still, the design effect proves robust and is only moderately reduced compared to the baseline estimate. Similarly the expanded model (equation 5), which controls for internal design effects, remains robust (column 6). Briefly summarized, we find evidence for design quality related sorting, but little evidence that the estimated premium is driven by this sorting.

Tab A5. Robustness IV: Income effects

	(1) Yearly disposable income relative to surrounding areas (1000 £)	(2) Degree share relative to surrounding areas (%)	(3) Price premium relative to surrounding areas (log points)	(4) Price premium relative to surrounding areas (log points)	(5) Price premium relative to surrounding areas (log points)	(6) Price premium relative to surrounding areas (log points)
Distinctiveness relative to surrounding areas (-2 to 2)	6.260**	9.073**			0.226***	0.200**
	(2.484)	(3.756)			(0.078)	(0.101)
Yearly disposable income relative to surrounding areas (1000 £)			0.009**		0.003	0.022
			(0.004)		(0.017)	(0.026)
Degree share relative to surrounding areas (%)				0.005**	-0.003	-0.015
				(0.002)	(0.014)	(0.025)
Yearly disposable income inside conservation areas (1000 £)					0.000	-0.092
					(0.030)	(0.079)
Relative distinctiveness x income inside CA					0.002	0.058
					(0.033)	(0.058)
Relative distinctiveness x degree share inside CA					0.003	0.010
					(0.027)	(0.059)
Degree share inside conservation areas (%)					0.003	0.027
					(0.020)	(0.035)
Constant	-1.228	-3.157	0.061**	0.073**	-0.103*	-0.142
	(2.033)	(3.229)	(0.026)	(0.029)	(0.059)	(0.093)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	-	-	Yes	Yes	Yes	Yes
1st-stage distance trends	-	-	Yes	Yes	Yes	Yes
1st. stage historic effects	-	-	-	-	-	Yes
1st. stage post-des. effects	-	-	-	-	-	Yes
N	47	47	47	47	47	43
r2	0.176	0.181	0.096	0.067	0.332	0.327

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 1st. stage historic effects (1st. stage post-des. effects) indicates that price premium is estimated conditional on boundary effects on historic (post-designation) properties. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In Table A6 we address the concern that there may be a mechanical endogeneity problem in the relationship between our price premium and design quality measures because preference-based sorting could have effects similar to neighborhood shocks that impact on both the dependent and the independent variables at the same time. To avoid this mechanical endogeneity problem we use two instrumental variables for the design measures in the second stage (equation 10): The date of conservation area designation (assuming that high design quality areas are designated first) and the number of listed buildings normalized by the surface area of a conservation area. We apply a 2SLS estimation to our baseline second-stage model (columns 2 and 5), the baseline model excluding first-stage distance trends (columns 1 and 4) and the expanded model controlling for internal design effects (columns 3 and 6). We obtain first-stages in the 2SLS for our distinctiveness measure of borderline strength (F-stat = 8.65). The second-stage results are generally robust and within the range of the respective OLS results, although the most demanding model yields an insignificant design estimate (column 3). The attractiveness results are less compelling. The first stages are weak (F-stat <3) and the second-stage confidence intervals are correspondingly large.

Tab. A6. Robustness III – IV models

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium inside conservation area boundary relative to surrounding areas (log points)					
Distinctiveness relative to surrounding areas (-2 to 2)	0.246*** (0.090)	0.162* (0.096)	0.204 (0.142)			
Attractiveness relative to surrounding areas (-2 to 2)				0.364 (0.237)	0.205 (0.198)	0.291 (0.445)
Constant	-0.103 (0.070)	-0.049 (0.082)	-0.125 (0.127)	-0.219 (0.197)	-0.095 (0.168)	-0.211 (0.422)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends	-	Yes	Yes	-	Yes	Yes
1st. stage historic effects	-	-	Yes	-	-	Yes
1st. stage post-des. effects	-	-	Yes	-	-	Yes
N	47	47	44	47	47	44

Notes: Estimation method is 2SLS in all models. Instrumental variables for the design measures are the conservation area designation date and the number of listed buildings normalized by the surface area of conservation area. Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 1st. stage historic effects (1st. stage post-des. effects) indicates that price premium is estimated conditional on boundary effects on historic (post-designation) properties. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.4 Regulatory heterogeneity

We have, thus far, argued that there is little reason to expect that there is systematic variation in the relative regulatory restrictiveness in conservation areas taking aside the Article 4 status, which we have controlled for in the baseline models. This is because more restrictive LPAs are likely more restrictive inside conservation areas as well as outside conservation areas, thus, the differences cancel out. In Table A6 we allow for arbitrary differences in the regulatory environment across

LPAs by means of LPA fixed effects that we add to a number of second-stage models (equation 10). We generally find positive and sizable design effects. The coefficient estimates are, however, somewhat unstable and frequently insignificant due to large standard errors. This is not surprising in light of the limited degrees of freedom given 21 fixed effects in a model with only 46-47 observations. Notably, the effects are positive, significant, and within the range of the baseline estimates in the more demanding models that control for the internal design effect.

Tab. A6. Robustness IV –LPAs fixed effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium inside conservation area boundary relative to surrounding areas (log points)					
Distinctiveness relative to surrounding areas (-2 to 2)		0.096*		0.224*		0.302**
		(0.052)		(0.123)		(0.146)
Attractiveness relative to surrounding areas (-2 to 2)	0.098		0.162		0.270**	
	(0.114)		(0.141)		(0.116)	
Article 4	0.010	0.003	-0.164	-0.194	-0.158	-0.184
	(0.077)	(0.072)	(0.138)	(0.125)	(0.164)	(0.163)
Constant	-0.004	0.005	-0.043	-0.076	-0.134	-0.139
	(0.086)	(0.054)	(0.118)	(0.095)	(0.110)	(0.125)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends	Yes	Yes	Yes	Yes	Yes	Yes
1st. stage historic effects	-	-	Yes	Yes	Yes	Yes
1st. stage post-des. effects	-	-	-	-	Yes	Yes
2nd stage LPA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	47	47	47	47	46	46
r2	0.720	0.723	0.574	0.604	0.621	0.650

Notes: Estimation method is 2SLS in all models. Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to conservation area boundary trends. 1st. stage historic effects (1st. stage post-des. effects) indicates that price premium is estimated conditional on boundary effects on historic (post-designation) properties. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.5 Placebo view impact area

Since the view impact areas used in the models reported in the main paper are possibly measured with error and because the good views could at least theoretically be correlated with very local unobserved amenities we make use of placebo view areas in a falsification exercise. We define as a placebo view area the area just outside the actual view impact area, but within 50m of a conservation area. We then compute property price premia according to equation (6) using the placebo view impact areas instead of the actual view impact areas. Finally, we replicate Table 5 from the main paper using placebo view impact property price premia as dependent variable in Table A8. Reassuringly, we find not positive and significant effect in the placebo estimates. For one of the design measures (column 3 and 6) we even found negative and statistically significant effects. The results do not support the presences of an unobserved local amenity that is correlated with the conservation areas' design value, thus, we consider this falsification exercise successful.

Tab. A8. Robustness V – Placebo outside view effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Price premium in placebo view impact area relative to surrounding areas (log points)					
Distinctiveness relative to surrounding areas (-2 to 2)	-0.050			-0.059		
	(0.047)			(0.058)		
Attractiveness relative to surrounding areas (-2 to 2)		-0.036			-0.030	
		(0.039)			(0.037)	
Buildings are attractive to look at (-2 to +2)			-0.060*			-0.061*
			(0.036)			(0.034)
Constant	0.014	0.006	0.039	0.030	0.009	0.048
	(0.041)	(0.040)	(0.039)	(0.040)	(0.033)	(0.032)
1st-stage survey controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage property controls	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage distance trends				Yes	Yes	Yes
N	42	42	42	42	42	42
r2	0.026	0.015	0.058	0.030	0.009	0.050

Notes: Standard errors in parentheses are bootstrapped in 100 iterations. 1st-stage survey controls indicates that design measure is adjusted for interviewee characteristics. 1st-stage property controls indicates that price premium is estimated conditional on structural and location characteristics. 1st-stage distance trends indicates that price premium is estimated conditional on distance to placebo view impact area boundary trends. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.