

# Infrastructure Externalities: Estimating the Impact of Transmission Lines on Residential Property Values

Emily Hopewell

Professional Economist BSc and Apprenticeship Level 6

School of Economics

University of Kent, 2026

## **Executive Summary**

*This study estimates the effect of electricity transmission pylons on residential property prices in England and Wales, using 200,316 HM Land Registry transactions from 1995 to 2021 geocoded to 799 pylons built between 1985 and 2017. Expanding the transmission network is central to net zero and energy security, but new lines face local opposition over property value impacts. The contribution here is a focus on anticipation effects: price changes occurring before construction begins. An event study and dose-response difference-in-differences design compare homes within 1,500 metres to controls at 1,800–3,000 metres. Prices begin to fall up to eleven years before construction, by 9–13% within one kilometre, with post-construction falls exceeding 20% within 500 metres and diminishing with distance. Results hold under placebo and robustness tests. Proposed policy interventions from the Department for Energy Security and Net Zero offers payments to households within 500m; these findings suggest measurable effects could extend to around 1,000m.*

## **AI Statement**

I acknowledge the use of generative AI in *drafting/literature search* in this paper. However, the work reported remains my own.

## **Acknowledgements**

I would like to thank my line managers and colleagues, past and present, for the knowledge, experience and advice they have shared with me over the past four years. I have learned an enormous amount working alongside you, and both this dissertation and my development as an economist owe a great deal to that support. I am incredibly grateful to my family, friends and my partner for their patience and encouragement throughout the apprenticeship, I could not have done it without you. Finally, I must acknowledge my dog Benji and my cats Minnie and Robbie, who contributed nothing whatsoever to my degree but provided lots of emotional support.

## 1. Introduction

The rapid expansion of electricity transmission infrastructure is a central requirement for meeting the UK's net zero targets and accommodating growing demand for low carbon generation. New overhead transmission lines and pylons are essential to connect renewable energy sources to centres of demand and to reinforce network capacity. Despite their macroeconomic and environmental benefits, transmission projects frequently face strong local opposition. Concerns typically centre on visual disamenity, perceived health risks, noise, and critically, the potential adverse effects on residential property values. These concerns can delay projects through prolonged planning processes and judicial challenges, ultimately increasing costs and threatening timely infrastructure delivery.

Understanding the causal effect of transmission infrastructure on property prices is therefore essential. Property values capture households' willingness to pay for local amenities, disamenities and provide a market-based measure of the economic costs borne by communities living near infrastructure. Robust evidence on these effects is crucial for informing planning decisions, designing compensation schemes, and maintaining public support for the infrastructure required to achieve decarbonisation goals.

This dissertation explores how electricity transmission pylons impact residential property prices in England and Wales by examining when price adjustments occur (whether they drop before construction begins due to planning information) and how these effects vary with distance both before and after completion. The findings enhance understanding of infrastructure externalities and provide evidence relevant to policy on the timing and spatial reach of property value changes.

A key challenge in estimating the effect of transmission infrastructure on property prices is that pylons are not randomly located. Routes are typically chosen to minimise costs and opposition, often passing through areas with lower baseline land values. Simple cross-sectional hedonic regressions therefore risk producing biased or even incorrectly signed estimates if they fail to account for this non-random siting. Recent advances in the literature emphasise the importance of quasi-experimental designs that exploit variation over time and space to identify causal effects.

This study builds on these advances by combining an event study with a spatial DiD framework. Using over 200,000 residential property transactions from the HM Land Registry Price Paid Data linked to National Grid pylon locations via Ordnance Survey UPRNs, the

analysis compares price dynamics from properties located close to pylons with those slightly further away from the same infrastructure. The event study monitors price trends from fifteen years prior to construction through ten years following it, clearly pinpointing when anticipation effects occur. The DiD framework summarises the changing effects into clear average impacts for specific distance ranges and time intervals.

## **2. Literature Review**

This section reviews the theoretical and empirical literature on the relationship between electricity transmission infrastructure and residential property prices, highlighting the gaps this dissertation addresses.

### **2.1 Hedonic Pricing Theory and Infrastructure Externalities**

Rosen's (1974) hedonic pricing framework views residential property as a collection of attributes, with each attribute's value revealed in market transactions. This allows researchers to estimate the price effect of specific features, such as proximity to a pylon, while accounting for other factors. While the approach is common and established in property economics, its accuracy depends on controlling for all relevant property and neighbourhood characteristics; missing important variables can bias results.

The issue of omitted variables is especially pronounced in the literature on infrastructure externalities, as there's an underlying endogeneity problem: the placement of infrastructure is not random. Transmission lines and pylons are generally placed in regions where land costs are lower, political resistance is minimal, or specific geographic traits make routing easier. This endogeneity creates a serious challenge for conventional cross-sectional hedonic models. If infrastructure is systematically placed in areas with lower pre-existing prices, estimates that compare prices across space may confound the impact of the infrastructure itself with baseline spatial differences. Gibbons (2015) addresses this concern directly in the context of wind farm development in England and Wales by using quasi-experimental comparisons between locations where wind farms become visible and nearby locations where they are not visible controlling for fine spatial characteristics. Gibbons finds robust, causal evidence that operational windfarms nearby reduce house prices. The estimated effects are concentrated in areas where turbines are visible, amounting to price reductions of around 5–6% within 2 km, declining rapidly with distance and becoming negligible beyond typical visibility ranges.

This critique is reinforced by evidence from the wider infrastructure literature. Kiel and McClain (1995) find positive or insignificant effects of proximity to hazardous waste sites in Massachusetts using simple cross-sectional regressions, a result in which they explicitly attribute to omitted neighbourhood characteristics. Similarly, Hamilton and Schwann (1995) show that the estimated price effects of high-voltage transmission lines are highly sensitive to functional form and the treatment of spatial interactions, with negative impacts confined to properties very close to transmission infrastructure and primarily reflecting visual externalities. Together, these studies establish a methodological principle that motivates the LSOA fixed effects and spatial DiD approach adopted in this dissertation.

## **2.2 Empirical Evidence on Pylons and Transmission Lines**

Hedonic models of house prices are well established in economics, applied extensively to disamenities from noise and air pollution to flood risk and wind turbines. The evidence gap is not in the method itself but in its application to electricity transmission infrastructure, where causal identification challenges and long planning timelines have limited rigorous evidence. The existing literature on pylons and high-voltage lines is consequently small, with estimates varying substantially by methodology, geography and sample composition. An early UK contribution by Sims and Dent (2005) estimates price reductions of 6-17% for properties within 100 metres of a transmission line in Scotland, supplementing their hedonic analysis with a survey of property valuers' perceptions. However, this study has significant limitations: the sample is small and confined to one region, the methodology does not employ a quasi-experimental design capable of addressing the siting endogeneity described above, and the reliance on valuer perceptions limits the studies objectivity.

Gibbons and Tang (2024) is the most rigorous UK study to date and the main comparator for this dissertation. Using 1.4 million Land Registry transactions from 1995 and 2018, they employ a spatial DiD approach to compare property price changes near pylons before and after construction, finding a 3.6% reduction within 1,200 metres. The study's key strength lies in its quasi-experimental design, and large sample size. However, it has three notable limitations. First, they use a narrow  $\pm 5$ -year event window, which may be insufficient to avoid anticipation effects pre-construction. Second, they treat the entire pre-construction period as a single baseline, meaning that if prices begin to fall before construction, the pre-construction baseline is already partially treated, potentially biasing the estimated post-construction effect. Third, their distance bands are coarse (two categories: within and beyond 1.2km), limiting the granularity of evidence on how effects attenuate with distance.

International evidence broadly corroborates the UK findings while highlighting context-dependent variation. Thomas et al. (2017) conduct an event study of pylons constructed in California, estimating an 8.3% price reduction for encumbered properties and 4.9% for abutting properties. Their event study design is a strength, but the study is limited by a very small sample of just sixteen pylons spanning a single four-mile stretch, which were dismantled and never became operational. This prompts questions about external validity, as the price effects of temporary, inactive pylons may not match those of permanent, operational infrastructure.

The Beaulieu-Denny Grid Infrastructure report by BIGGAR Economics uses a synthetic control method to assess the impact of a major transmission line in Scotland, finding no discernible impact on property prices. However, the synthetic control consists of properties from locations comparable to the treatment group but situated away from the power line. This raises concerns around the validity of the counterfactual, and the small sample of 733 transactions limits statistical power. In contrast, Tatos, Glick and Lunt (2020) find mixed evidence in Utah, including positive price effects near transmission lines attributed to amenity enhancement such as greenways constructed beneath the lines. This finding is a useful reminder that the net effect of transmission infrastructure depends on context specific factors.

### **2.3 Anticipation Effects and Event Study Methods**

Anticipation effects arise when forward-looking market participants adjust prices in response to credible information about planned infrastructure, such as planning applications, public consultations or media coverage. The theoretical grounding is well established: under rational expectations (Muth, 1961), asset prices should capitalise all available information about future fundamentals, meaning any credible signal about a future price-relevant event should be reflected in current values when that information becomes available. Anticipation effects are documented across infrastructure contexts, for example property prices near proposed transport links rise before a line opens as improved accessibility is capitalised in advance (Gibbons and Machin 2005). The pylon context is very similar, credible information about a future disamenity should depress prices in anticipation, in the same way that information about a future amenity inflates them.

The UK transmission infrastructure planning process is especially prone to anticipation effects: the National Policy Statement for Electricity Networks Infrastructure requires

extensive public consultation, environmental impact assessment, and planning examination, a process that currently takes 12-14 years from identification of need to commissioning (Energy Systems Catapult, 2023). This prolonged and publicly visible process provides multiple signals to market participants about the likely location and timing of future infrastructure, creating the exact conditions under which anticipation effects would be expected to arise.

Although there is a solid theoretical basis for anticipation effects in the pylon context, empirical evidence remains scarce. Gibbons and Tang (2024) do conduct a parallel trends test using an event study, finding coefficients close to zero in the years immediately preceding construction, which they interpret as evidence against anticipation. However, their event window extends only  $\pm 5$  years around construction, which is too narrow to capture the effects of duration implied by the UK planning timeline. If anticipation effects materialise 9-11 years before construction, as the evidence in this dissertation suggests, prices may have already adjusted and stabilised within the period Gibbons and Tang treat as their pre-construction baseline. Their parallel trends test would therefore appear clean not because anticipation is absent, but because the price drop has already occurred outside their observation window. Evidence from infrastructure studies, including Keil and McClain (1995) discussed above, find that prices begin to respond during planning and decision stages, well before construction. If anticipation effects are significant, standard DiD approaches may underestimate true impacts, as early price drops are included in the baseline. Therefore, Gibbons and Tang's 3.6% estimate may be a lower bound, already affected by anticipation effects.

## **2.4 Research Gap and Contribution**

While hedonic methods for measuring infrastructure externalities are well established, their application to electricity transmission pylons in the UK remains limited. Two specific gaps persist in the pylon literature. First, no UK study has explicitly modelled anticipation effects, despite the strong theoretical basis and the long planning timeline that created ideal conditions for them. Second, existing dose-response estimates use broad distance categories, limiting the granularity of how effects attenuate with distance. This study addresses these by combining an event study with a more granular dose-response DiD, applying LSOA fixed effects for neighbourhood control, pylon-level clustered errors, and an extended event window ( $t-15$  to  $t+10$ ) to capture anticipation effects and inform policy valuation and compensation.

### **3. Data**

This study uses HM Land Registry Price Paid Data and National Grid pylon location data, linked through Ordnance Survey Open & ONS UPRN data, which provides geographic coordinates and LSOA identifiers. The dataset was constructed by matching addresses, geocoding, and calculating spatial distances.

#### **3.1 HM Land Registry Price Paid Data**

The main source of data is the HM Land Registry Price Paid Data (PPD), which tracks every residential property sale in England and Wales since 1995. Each entry in the dataset includes information such as the sale price, the date of the transaction, the type of property (detached, semi-detached, terraced, or flat), and an indicator showing whether the property is newly built. Prices are adjusted for inflation to constant 2025 values by using the ONS national house price index. Property-type specific deflators are applied when available (from December 2005 onward), and the all-property index is used for earlier periods. The log of this inflation-adjusted price is used as the outcome variable throughout the analysis, as it addresses the right skewed distribution of house prices and allows regression coefficients to be interpreted as approximate percentage changes in price.

The Price Paid Data lacks geographic coordinates, recording only address strings. To address this, transactions are matched to Unique Property Reference Numbers (UPRNs) using a lookup from the Urban Big Data Centre, creating a link between Land Registry records and UPRNs. UPRNs, assigned by Ordnance Survey, provide precise property coordinates and enable tracking of repeat sales at the same address, forming a property-level panel where each entry represents a separate sale.

#### **3.2 Pylon Location Data**

Electricity transmission pylon locations come from National Grid Network Route shapefiles. Each pylon has a unique identifier code (GDO\_GID), geographic coordinates, and a construction year. The construction year is central to the event study and DiD estimations. The sample includes 799 pylons built between 1985 and 2017, mostly from 1995 to 2015.

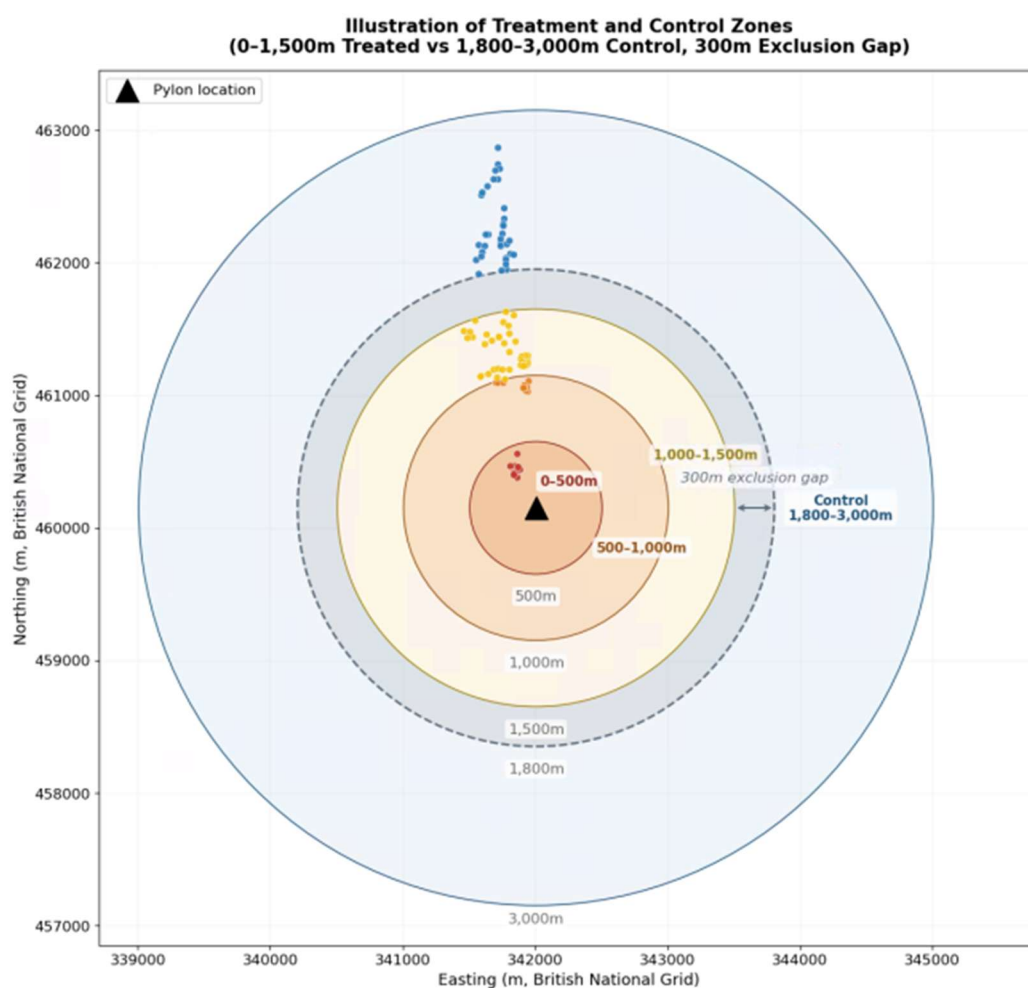
### 3.3 Geocoding and Distance Calculation

The straight-line (Euclidean) distance from each property to its nearest pylon is calculated using geocoded data. All measurements use the EPSG:27700 British National Grid, suitable for Great Britain.

This continuous distance measure is then used to assign properties to discrete distance bands for the empirical analysis. Properties within 0-1,500 metres of a pylon constitute the treated group, while properties located 1,800-3,000 metres away form the control group. A 300-metre gap between 1,500 and 1,800 metres is excluded to avoid overlap. Treated properties are further split into bands to capture how price effects decrease with distance. The main model uses 500-metre bands due to more available data, while 300-metre bands serve as robustness checks; only 43 observations exist in the narrowest band, compared to at least 184 in each 500-metre band.

Restricting the sample to properties within 3,000 metres of a pylon is a deliberate design choice. It ensures that treated and control properties are drawn from broadly comparable local housing markets, sharing similar regional characteristics, rather than comparing pylon-adjacent properties with houses located in entirely different parts of the country. It is also chosen to be sufficiently distant that pylon effects are negligible, supported by the dose response results in Table 9, showing statistically insignificant effects at 1,000-1,500m.

**Error! Reference source not found.** illustrates the spatial design of the study. A single pylon (black triangle) sits at the centre, with rings showing the three treated distance bands: 0-500m (innermost, dark orange), 500-1,000m (orange), and 1,000-1,500m (outer treated, yellow). The grey exclusion gap (1,500-1,800m) separates treated from control properties, preventing overlap. The outermost ring (1,800-3,000m) is the control group. Property dots are clustered to the north in this example pylon, which was chosen from the sample due to properties being in each ring for demonstration.

**Figure 1: Illustration of Treatment and Control Zones**

### 3.4 LSOA Assignment

Each property is linked to its Lower Layer Super Output Area (LSOA) using the LSOA21CD field via its UPRN. LSOAs are census geographies with about 1,500 residents, used for neighbourhood fixed effects in econometric models. The sample is nearly complete, only 72 properties (<0.1%) were excluded due to missing LSOA codes.

### 3.5 Sample Construction and Event Time

The dataset lists property sales in long format, with each row representing a sale. Event time is calculated as the difference between sale year and nearest pylon's construction year, aligning all transactions by the construction event. This standardises price trends across different pylon build dates.

Two samples are analysed. For the event study, all transactions within the event window (t-15 to t+10) are included. The pre-construction window extends to t-15 to provide sufficient span

to identify anticipation effects, as a narrower window would risk missing early price responses, while also being trimmed where the sample size begins to thin. The post-construction event window runs to  $t+10$ , long enough for permanent price effects to materialise and for any construction disruption effects to dissipate, but short enough to avoid conflating pylon effects with unrelated changes in local housing markets over a longer period.

For the DiD estimation, only properties with transactions in both pre ( $t-15$  to  $t-12$ ) and either anticipation ( $t-11$  to  $t-1$ ) or post-construction ( $t+5$  to  $t+10$ ) periods are used. This ensures identification from properties observed on both sides of treatment and limits the DiD sample to pylons constructed from 2007 onwards. These period definitions are empirically justified in the Methodology section.

### 3.6 Descriptive Statistics

This section presents summary statistics for both samples used in the analysis: the event study sample of 200,316 transactions and the DiD restricted sample of 10,453 transactions.

**Table 1: Summary Statistics for Event Study Sample**

| <i>Variable</i>              | <i>Obs</i> | <i>Mean</i> | <i>Std.<br/>Dev</i> | <i>Min</i> | <i>Max</i>  | <i>Median</i> | <i>Skewness</i> |
|------------------------------|------------|-------------|---------------------|------------|-------------|---------------|-----------------|
| <i>Sale Price</i>            | 200,316    | £247,606    | 208,839             | 135        | £30,341,772 | £214,654      | 38.55           |
| <i>Log Sale Price</i>        | 200,316    | 12.25       | 0.59                | 4.90       | 17.23       | 12.28         | -0.40           |
| <i>Distance to Pylon (m)</i> | 200,316    | 1,791       | 796                 | 17.7       | 2,999.9     | 1,993         | -0.34           |
| <i>Event Year</i>            | 200,316    | 1.84        | 6.29                | -15        | 10          | 3             | -0.68           |
| <i>Sale Year</i>             | 200,316    | 2003        | 5.89                | 1995       | 2021        | 2002          | 0.94            |
| <i>Construction Year</i>     | 200,316    | 2001        | 7.19                | 1985       | 2017        | 2001          | 0.14            |

Table 1 summarises key continuous variables from the event study sample. The raw sale price is highly right-skewed (skewness = 38.55), with an average of £247,606 and a maximum exceeding £30 million, prompting the use of log transformation for analysis (skewness = -0.40). Distances to pylons range from 17.7 to nearly 3,000 metres (mean = 1,791 metres), covering both treated (0–1,500m) and control properties (1,800–3,000m). Transactions occurred between 1995 and 2021; pylons were constructed from 1985 to 2017. Event year varies from -15 to +10 after trimming extreme values.

**Table 2: Event Study Sample Characteristics**

|                                        | <i>0-1,500m (Treated)</i> | <i>1,800-3,000m (Control)</i> | <i>Total</i> |
|----------------------------------------|---------------------------|-------------------------------|--------------|
| <i>Observations</i>                    | 81,163                    | 119,153                       | 200,316      |
| <i>Unique Property</i>                 | 54,108                    | 77,510                        | 131,618      |
| <i>Unique Pylons</i>                   | 683                       | 475                           | 799          |
| <i>Unique LSOAs</i>                    | 594                       | 714                           | 1,100        |
| <i>Mean Sale Price (2025 Prices)</i>   | £263,417                  | £236,837                      | £247,606     |
| <i>Median Sale Price (2025 Prices)</i> | £228,846                  | £204,000                      | £214,654     |
| <i>Detached</i>                        | 25.8%                     | 18.6%                         | 21.5%        |
| <i>Semi-detached</i>                   | 33.1%                     | 33.6%                         | 33.4%        |
| <i>Terraced</i>                        | 34.3%                     | 34.7%                         | 34.5%        |
| <i>Flat</i>                            | 6.6%                      | 12.9%                         | 10.4%        |
| <i>Other</i>                           | 0.2%                      | 0.2%                          | 0.2%         |
| <i>New Build</i>                       | 20.8%                     | 18.4%                         | 19.4%        |

Table 2 presents sample details for treated (0-1,500m) and control (1,800-3,000m) groups. The treated group includes 81,163 transactions over 54,108 properties near 683 pylons; the control group has 119,153 transactions over 77,510 properties near 475 pylons. There are 595 unique LSOAs in the treated group and 714 in the control group. Mean property prices are higher in the treated group (£263,417 vs £236,837), largely due to a higher proportion of detached houses and fewer flats. Shares of semi-detached, terraced homes and new builds are similar. These differences highlight the need for property type and LSOA controls in the analysis to accurately measure pylon proximity effects.

**Table 3: Summary Statistics for DiD Sample**

| <i>Variable</i>          | <i>Obs</i> | <i>Mean</i> | <i>Std. Dev</i> | <i>Min</i> | <i>Max</i> | <i>Median</i> | <i>Skew</i> |
|--------------------------|------------|-------------|-----------------|------------|------------|---------------|-------------|
| <i>Sale Price</i>        | 10,453     | £227,298    | 146,215         | £1,582     | £1,679,058 | £197,221      | 2.29        |
| <i>Log Sale Price</i>    | 10,453     | 12.15       | 0.63            | 7.37       | 14.33      | 12.19         | -0.48       |
| <i>Distance (m)</i>      | 10,453     | 1,834       | 786             | 166        | 2,997      | 2,056         | -0.38       |
| <i>Event Year</i>        | 10,453     | -7.53       | 6.63            | -15        | 10         | -9            | 1.16        |
| <i>Sale Year</i>         | 10,453     | 2003        | 6.82            | 1995       | 2021       | 2002          | 0.95        |
| <i>Construction Year</i> | 10,453     | 2011        | 2.79            | 2007       | 2017       | 2011          | 0.29        |

Table 3 presents the continuous variables for the DID restricted sample of 10,453 transactions. Log transformation is appropriate: raw price skew (2.29) is lower than in the event study sample due to exclusion of extreme outliers, while log price skew (-0.48) remains

near zero. Construction years are mainly between 2007 and 2017 (mean = 2011, SD = 2.29), since only pylons built late enough for both pre and treatment-period observations meet the multi-period restriction. This narrows the set of identified pylons compared to the event study sample but ensures consistent treatment events for dose-response estimates.

**Table 4: DiD Sample, Observation Counts by Period and Distance Band**

| <i>Period</i>                     | <i>0-500m</i> | <i>500-1,000m</i> | <i>1,000-1,500m</i> | <i>1,800-3,000m</i> | <i>Total</i> |
|-----------------------------------|---------------|-------------------|---------------------|---------------------|--------------|
| <i>Pre (t-15 to t-12)</i>         | 184           | 664               | 746                 | 2,552               | 4,146        |
| <i>Anticipation (t-11 to t-1)</i> | 231           | 794               | 839                 | 3,176               | 5,040        |
| <i>Post (t+5 to t+10)</i>         | 64            | 195               | 207                 | 801                 | 1,267        |
| <i>Total</i>                      | 479           | 1,653             | 1,792               | 6,529               | 10,453       |

Table 4 shows observation counts for periods and distance bands in the DiD restricted sample: 4,146 in the pre-period (t-15 to t-12), 5,040 in the anticipation period (t-11 to t-1), and 1,267 in the post-construction period (t+5 to t+10). The anticipation period has more observations due to its longer duration. In the 500-metre specification, pre-period counts vary from 184 (0-500m) to 2,552 (control band). The smallest group, 64 observations in the post-period 0-500m band, remains adequate for reliable estimation since errors are clustered at the pylon level.

**Table 5: DiD Sample Characteristics by Distance Band**

|                                        | <i>0-500m</i> | <i>500-1,000m</i> | <i>1,000-1,500m</i> | <i>1,800-3,000m</i> | <i>Total</i> |
|----------------------------------------|---------------|-------------------|---------------------|---------------------|--------------|
| <i>Observations</i>                    | 479           | 1,653             | 1,792               | 6,529               | 10,453       |
| <i>Unique Properties</i>               | 172           | 598               | 663                 | 2,354               | 3,787        |
| <i>Unique Pylons</i>                   | 27            | 42                | 44                  | 52                  | 84           |
| <i>Unique LSOAs</i>                    | 17            | 34                | 47                  | 109                 | 153          |
| <i>Mean Sale Price (2025 Prices)</i>   | £258,259      | £244,780          | £241,219            | £216,780            | £227,298     |
| <i>Median Sale Price (2025 Prices)</i> | £235,385      | £216,399          | £207,147            | £184,915            | £197,221     |
| <i>Detached</i>                        | 30.1%         | 24.1%             | 23%                 | 12.6%               | 17.0%        |
| <i>Semi-detached</i>                   | 23.2%         | 31%               | 34.7%               | 31.8%               | 31.8%        |
| <i>Terraced</i>                        | 39.7%         | 36.9%             | 34.2%               | 39.2%               | 38.0%        |
| <i>Flat</i>                            | 7.1%          | 8%                | 8.1%                | 16.4%               | 13.2%        |
| <i>Other</i>                           | 0%            | 0%                | 0%                  | 0%                  | 0%           |
| <i>New Build</i>                       | 38.4%         | 21.8%             | 17.2%               | 12.9%               | 16.2%        |

Table 5 summarises the DiD restricted sample by distance from pylons, covering 10,453 transactions for 3,787 properties, 84 pylons, and 153 LSOAs, a smaller sample due to the multi-period restriction. Mean property prices decrease with distance (£258,259 at 0-500m vs. £216,780 at 1,800-3,000m), reflecting compositional differences rather than direct proximity effects. The 0-500m band has more detached houses (30.1%) and fewer flats (7.1%), plus a higher share of new builds (38.4% vs. 12.9% in the control band), likely due to recent developer activity near infrastructure. Potential confounds from these differences are addressed in the analysis through controls and regression specifications.

Tables 4 and 5 show the scope and structure of the DiD sample. The multi-period restriction reduces sample size compared to the event study but focuses identification on within-neighbourhood property comparisons by treatment timing. The dose-response design estimates separate coefficients by distance band and period, allowing analysis of the pylon effect's magnitude and changes over time.

### 3.7 Variable Summary

Table 6 lists the variables in the analysis. The outcome variable is the natural log of inflation-adjusted sale price. Treatment intensity is measured by distance band dummies as detailed in the geocoding section. Property controls include type dummies (detached as the reference) and a new build indicator. Fixed effects are at LSOA and sale-year levels. Standard errors are clustered at the pylon level as explained in methodology.

**Table 6: Variable Summary**

| <i>Variable</i>          | <i>Description</i>                                                                               | <i>Source</i>               |
|--------------------------|--------------------------------------------------------------------------------------------------|-----------------------------|
| <i>Log_price</i>         | Natural log of inflation-adjusted (2025) transaction prices                                      | HM Land Registry; ONS HPI   |
| <i>Distance_to_pylon</i> | Euclidean distance (metres) to nearest pylon, used to define distance bands                      | National Grid; OS Open UPRN |
| <i>Distance_band</i>     | Categorical distance band dummies (0-500m, 500-1,000m, 1,000-1,500m, 1,800-3,000m)               | Derived                     |
| <i>Period</i>            | Categorical period indicator: pre (t-15 to t-12), anticipation (t-11 to t-1), post (t+5 to t+10) | Derived                     |
| <i>Property_type</i>     | Property type dummies: detached (baseline), semi-detached, terraced, flat, other                 | HM Land Registry            |
| <i>New_build</i>         | Dummy variable = 1 if new build, 0 otherwise                                                     | HM Land Registry            |
| <i>LSOA21CD</i>          | Lower Layer Super Output Area code, used for neighbourhood fixed effects                         | ONS Open UPRN               |
| <i>Sale_year</i>         | Calendar year of transaction, used for year fixed effects                                        | HM Land Registry            |

|                |                                                       |               |
|----------------|-------------------------------------------------------|---------------|
| <i>GDO_GID</i> | Pylon identifier, used for clustering standard errors | National Grid |
|----------------|-------------------------------------------------------|---------------|

## 4. Methodology

This section describes how pylon proximity affects home prices using an event study and a Difference-in-Differences (DiD) estimator. The event study tracks price shifts around pylon construction to identify when treated and control property values diverge, informing the periods used in DiD models, which measure price effects by distance and time.

### 4.1 Research Hypothesis:

The null and alternative hypothesis are as follows:

$H_0$ : Pylon construction has no statistically significant effect on residential property prices within 1,500 metres of the pylon, either before (anticipation) or after construction.

$H_1$ : Pylon construction has a statistically significant effect on residential property prices within 1,500 metres of the pylon, with effects emerging during the anticipation period (prior to construction) and persisting in the post-construction period.

### 4.2 Hedonic Pricing framework

The analysis is grounded in Rosen's (1974) hedonic pricing framework, which views residential property as a differentiated good, with price reflecting structural, locational, and environmental attributes. The framework breaks down transaction prices to measure the impact of specific factors, such as proximity to pylons, while controlling for other variables. Using log-transformed prices corrects skewness in raw data and allows coefficients to represent percentage changes.

### 4.3 Event Study Specification

The event study estimates dynamic treatment effects by including a full set of event-time indicator variables interacted with treatment status. This allows the price effect of a pylon proximity to vary flexibly across event time, rather than imposing a single static treatment effect. The specification is:

$$\ln(\text{Price}_{it}) = \alpha + \sum_k \beta_k \cdot I(k = t - c_i) \cdot \text{Treated}_i + X_i\gamma + \delta_t + \tau_{l(i)} + \varepsilon_{it}$$

Where  $\ln(\text{Price}_{it})$  is the log inflation adjusted sale price of property  $i$  in year  $t$ , and  $c_i$  is the construction year of the nearest pylon. The indicator  $I(k = t - c_i)$  equals one when the

property is sold  $k$  years relative to construction. Event year  $k$  ranges from -15 to +10, with  $k=-1$  as the omitted reference category.  $Treated_i$  equals 1 for properties within 1,500 metres and zero for control properties (1,800-3,000m), as defined in the Data section. The coefficients  $\beta_k$  capture the log-price difference between treated and control properties at each event year, relative to  $k=-1$ .

$X_{it}$  is a vector of property controls (property type and new build indicator, as described in Table 6),  $\delta_t$  denotes sale year fixed effects,  $\tau_{l(i)}$  denotes LSOA fixed effects, and  $\varepsilon_{it}$  is the error term. The event study serves two purposes: first, it checks if pre-treatment coefficients are zero, confirming parallel trends; second, it pinpoints when anticipation effects arise, guiding DiD period definitions. The event study uses the entire unrestricted sample outlined in the data section.

#### 4.4 Difference-in-Differences Specification

The DiD employs a dose-response design, estimating a separate coefficient for each combination of distance band and period:

$$\ln(Price_{it}) = \alpha + \sum_m \sum_n \beta_{mn} (Band_{m,i} \times Period_{n,it}) + X_i\gamma + \delta_t + \tau_{l(i)} + \varepsilon_{it}$$

Where  $Band_{m,i}$ , indicates whether property  $i$  falls within distance band  $m$ , with the control band as the omitted reference, and  $Period_{n,it}$  indicates whether the transaction falls in the anticipation or post period, with the pre-period as the omitted reference. The coefficients  $\beta_{mn}$  capture the log-price difference between each treated band and the control in each treatment period, relative to the pre-period baseline. This yields six headline coefficients in the main specification: three distance bands interacted with two treatment periods. The construction disruption period ( $t=0$  to  $t+4$ ) is excluded to ensure post period coefficients reflect permanent capitalisation rather than temporary disruption.

#### 4.5 Identification Assumptions

Causal identification relies on two key assumptions. First, parallel trends (without pylon construction, treated and control properties would have similar price paths) are checked using event studies and F-tests of pre-treatment coefficients. Second, the stable unit treatment value assumption (SUTVA) requires that treating one property doesn't affect others, supported by a 1,500-1,800m exclusion gap that maintains spatial separation between groups.

LSOA fixed effects are used instead of property fixed effects because staggered pylon construction leads to identification issues in standard two-way fixed effects estimation, as shown by Callaway and Sant'Anna (2021). Additionally, only 862 properties span both sides of the treatment event, making this subsample too small and non-random for reliable analysis.

LSOA fixed effects avoid these issues while providing tighter neighbourhood control than the postcode fixed effects used by Gibbons and Tang (2024), as LSOAs contain approximately 1,500 residents compared to around 8,000 per postcode sector. Calendar-year fixed effects absorb macroeconomic shocks common to all properties each year. Together, the two sets of fixed effects identify the treatment effect from within-neighbourhood variation across time.

#### **4.6 Statistical Inference**

For the event study, standard errors are clustered at the pylon level as the main specification. A serial autocorrelation test (Wooldridge) confirms the preference for clustered standard errors, the test yields a coefficient of 0.499 ( $p < 0.001$ ,  $n = 68,643$ ). An equivalent test on the DiD restricted sample yields 0.485 ( $p < 0.001$ ,  $n = 6,666$ ). Since clustered standard errors are robust to both heteroskedasticity and serial correlation within clusters, while heteroskedasticity-robust standard errors are not, clustered standard errors are the preferred specification throughout. Heteroskedasticity is additionally confirmed by a Breusch-Pagan test ( $p < 0.001$ ), providing further justification.

### **5. Results**

This section summarises the empirical results in three parts. Event study results show treatment effect patterns and check parallel trends. DiD estimates measure anticipation and post-construction effects by distance. Robustness checks test the reliability of the findings using alternative methods, placebo assignments, and distance bands.

#### **5.1 Event Study Results**

The event study model is estimated on 53,429 observations using the combined treatment group (0-1,500m) against the control group (1,800-3,000m), with pylon-level clustered standard errors. The model achieves an  $R^2$  of 0.690, indicating that LSOA fixed effects, year fixed effects, property type and new build controls together explain approximately 69% of the variation in log house prices.

The event study is designed to identify the timing at which prices of treated properties (0-1,500m) begin to diverge from those of control properties (1,800-3,000m), and to test whether parallel trends hold in the pre-construction baseline. Because the treated group is aggregated across all three distance bands, the coefficients should not be interpreted as estimated of the price effect at any distance, that is the role of the dose response DiD.

Table 7 presents the event study coefficients by year. The results reveal a clear anticipation pattern. Coefficients are small and statistically insignificant from t-15 to t-12, consistent with the parallel trends assumption holding over the baseline window. From t-11 onwards, the treatment effect becomes significant: the coefficient at t-11 is -0.119 ( $p=0.032$ , \*\*), reaching its largest magnitude at t-9 (-0.137,  $p=0.052$ , \*) and most precisely estimated at t-19 (-0.128,  $p=0.006$ , \*\*\*). This implies that treated properties were transacting at approximately 12-14% below control properties a decade before construction, consistent with the 12–14-year anticipation window implied by the UK’s transmission planning timeline. Coefficients then attenuate back toward zero from t-8 onward, plausibly reflecting growing uncertainty about the final route during the planning process before turning mildly negative again in the early post-construction period.

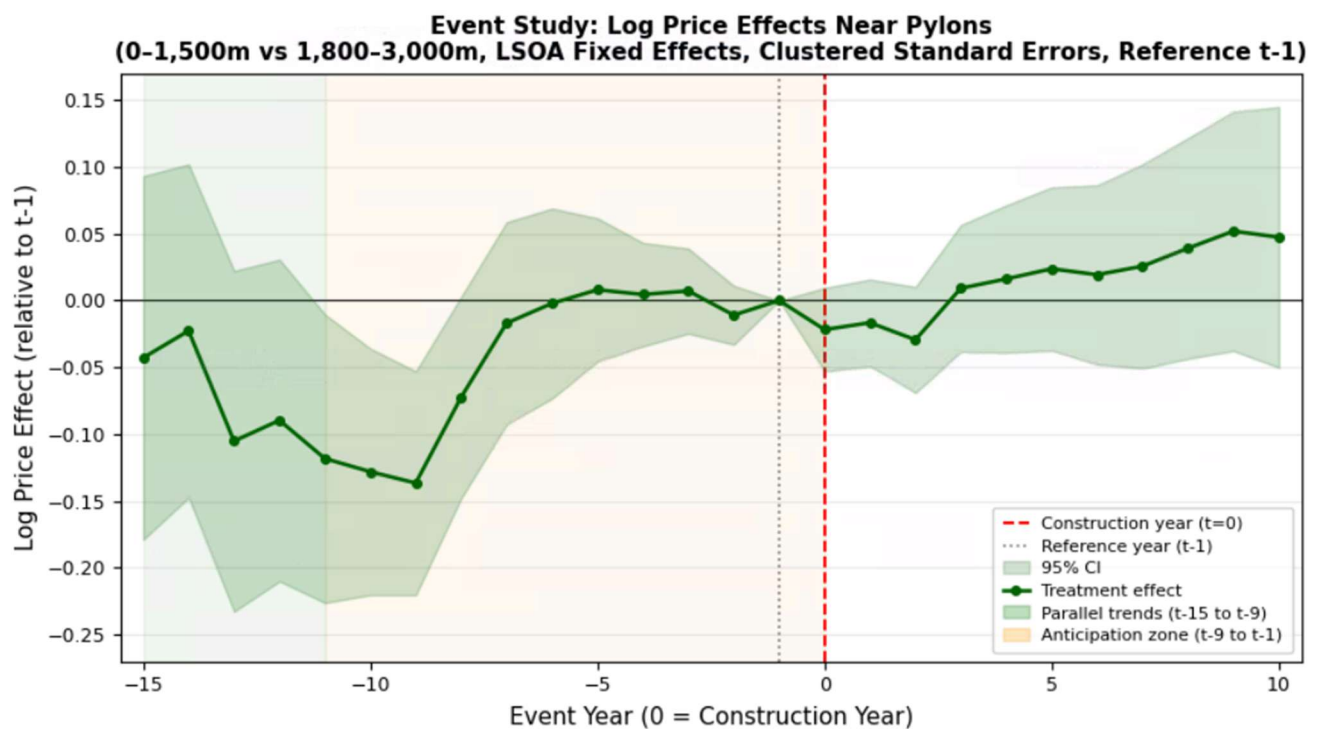
**Table 7: Event Study Coefficients**

| <i>Eventyear</i> | <i>coefficient</i> | <i>std_err</i> | <i>lower_ci</i> | <i>upper_ci</i> | <i>p_value</i> | <i>significance</i> |
|------------------|--------------------|----------------|-----------------|-----------------|----------------|---------------------|
| -15              | -0.0428            | 0.0694         | -0.1788         | 0.0931          | 0.5367         |                     |
| -14              | -0.0226            | 0.0636         | -0.1473         | 0.1020          | 0.7218         |                     |
| -13              | -0.1051            | 0.0650         | -0.2325         | 0.0222          | 0.1057         |                     |
| -12              | -0.0896            | 0.0614         | -0.2099         | 0.0307          | 0.1443         |                     |
| -11              | -0.1182            | 0.0550         | -0.2261         | -0.0103         | 0.0318         | **                  |
| -10              | -0.1280            | 0.0470         | -0.2202         | -0.0359         | 0.0064         | ***                 |
| -9               | -0.1365            | 0.0427         | -0.2202         | -0.0528         | 0.0014         | ***                 |
| -8               | -0.0723            | 0.0385         | -0.1478         | 0.0031          | 0.0601         | *                   |
| -7               | -0.0169            | 0.0386         | -0.0925         | 0.0587          | 0.6608         |                     |
| -6               | -0.0021            | 0.0363         | -0.0732         | 0.0689          | 0.9530         |                     |
| -5               | 0.0081             | 0.0273         | -0.0455         | 0.0616          | 0.7681         |                     |
| -4               | 0.0045             | 0.0197         | -0.0342         | 0.0432          | 0.8181         |                     |
| -3               | 0.0072             | 0.0162         | -0.0246         | 0.0390          | 0.6581         |                     |
| -2               | -0.0109            | 0.0112         | -0.0329         | 0.0111          | 0.3323         |                     |
| -1               | 0.0000             |                | 0.0000          | 0.0000          | 1.0000         |                     |
| 0                | -0.0217            | 0.0159         | -0.0530         | 0.0095          | 0.1727         |                     |
| 1                | -0.0166            | 0.0165         | -0.0490         | 0.0158          | 0.3157         |                     |
| 2                | -0.0293            | 0.0202         | -0.0689         | 0.0102          | 0.1461         |                     |
| 3                | 0.0092             | 0.0242         | -0.0383         | 0.0566          | 0.7048         |                     |
| 4                | 0.0162             | 0.0282         | -0.0390         | 0.0713          | 0.5659         |                     |
| 5                | 0.0237             | 0.0312         | -0.0373         | 0.0848          | 0.4459         |                     |
| 6                | 0.0193             | 0.0342         | -0.0477         | 0.0863          | 0.5722         |                     |

|    |        |        |         |        |        |
|----|--------|--------|---------|--------|--------|
| 7  | 0.0257 | 0.0390 | -0.0507 | 0.1021 | 0.5099 |
| 8  | 0.0391 | 0.0421 | -0.0434 | 0.1216 | 0.3529 |
| 9  | 0.0519 | 0.0457 | -0.0376 | 0.1414 | 0.2557 |
| 10 | 0.0474 | 0.0497 | -0.0501 | 0.1448 | 0.3406 |

The post-construction coefficients in Table 7 should also be read with the same nuance in mind. The event study is not the appropriate tool to estimate permanent price effects, the treatment group is aggregated across all distance bands, and since the Price Paid Data begins in 1995, pylons build in the mid to late 1990s contribute fewer observations at the beginning of the event window than later built pylons do at the end, meaning that the sample composition is not constant across event time. The mild positive drift observed from  $t+5$  onward is consistent with the 1,000-1,500m band recovering pulling the aggregate coefficient upward, rather than indicating a genuine price recovery for properties close to pylons. The wide confidence intervals (a consequence of clustering at the pylon level, which is the conservative and correct approach given that all properties near the same pylon share identical treatment timing) further caution against reading precise estimates from the post-construction window. The event study results motivate the period definitions used in the DiD: post construction magnitudes and distance gradients are estimated there.

**Figure 2: Event Study, Log Price Effects Near Pylons**



The event study shows the log price difference between treated (0-1500m) and control (1800-3000m) properties by year, using  $t-1$  as the reference to avoid construction effects. Several features are notable in Figure 2. The coefficients within the green-shaded region ( $t-15$  to  $t-9$ ) remain near zero and are statistically insignificant, indicating no meaningful difference in pre-period values and supporting the parallel trends assumption. Additionally, the data reveals an anticipation effect, with a pronounced dip observed from  $t-11$ , where coefficients decline to approximately -0.13 to -0.14 (representing a 13–14% price reduction) at  $t-10$  and  $t-9$ . From  $t-8$  onward, the coefficients gradually return toward zero, reflecting the slow resolution of uncertainty regarding the final route. Post-construction coefficients ( $t=0$  to  $t+5$ ) are slightly negative before drifting upward. The upward post-construction drift reflects averaging of price effects across distance bands, the dose-response DiD in Table 9 show that the 1,000-1,500m band recovers while closer bands do not, pulling the aggregate coefficient toward zero. The widening confidence intervals from  $t+7$  to  $t+10$  result from a smaller number of pylons contributing observations at this far end of the post-construction window. Specifically, pylons constructed later in the sample lack  $t+7$  to  $t+10$  observations within Land Registry coverage, reducing the effective number of treatment clusters during those event years and contributing to smaller samples at the event window's end.

The event study results motivate the DiD period definitions used in the main specification defined in Table 8. The pre-period is defined as  $t-15$  to  $t-12$ , where parallel trends hold under clustered standard errors. The anticipation period begins at  $t-11$ , where the first significant divergence appears under clustered SEs. The construction disruption period ( $t=0$  to  $t+4$ ) is excluded, and the post construction period runs from  $t+5$  to  $t+10$ .

**Table 8: DiD Period Definitions**

| <i>Period</i>       | <i>Event Years</i> | <i>Interpretation</i>                                                  |
|---------------------|--------------------|------------------------------------------------------------------------|
| <i>Pre-period</i>   | $t-15$ to $t-12$   | Baseline: parallel trends hold under clustered standard errors         |
| <i>Anticipation</i> | $t-11$ to $t-1$    | Forward-looking capitalisation of expected disamenity                  |
| <i>Excluded</i>     | $t=0$ to $t+4$     | Construction disruption; not informative about permanent price changes |
| <i>Post</i>         | $t+5$ to $t+10$    | Realised, permanent price effect after construction completes          |

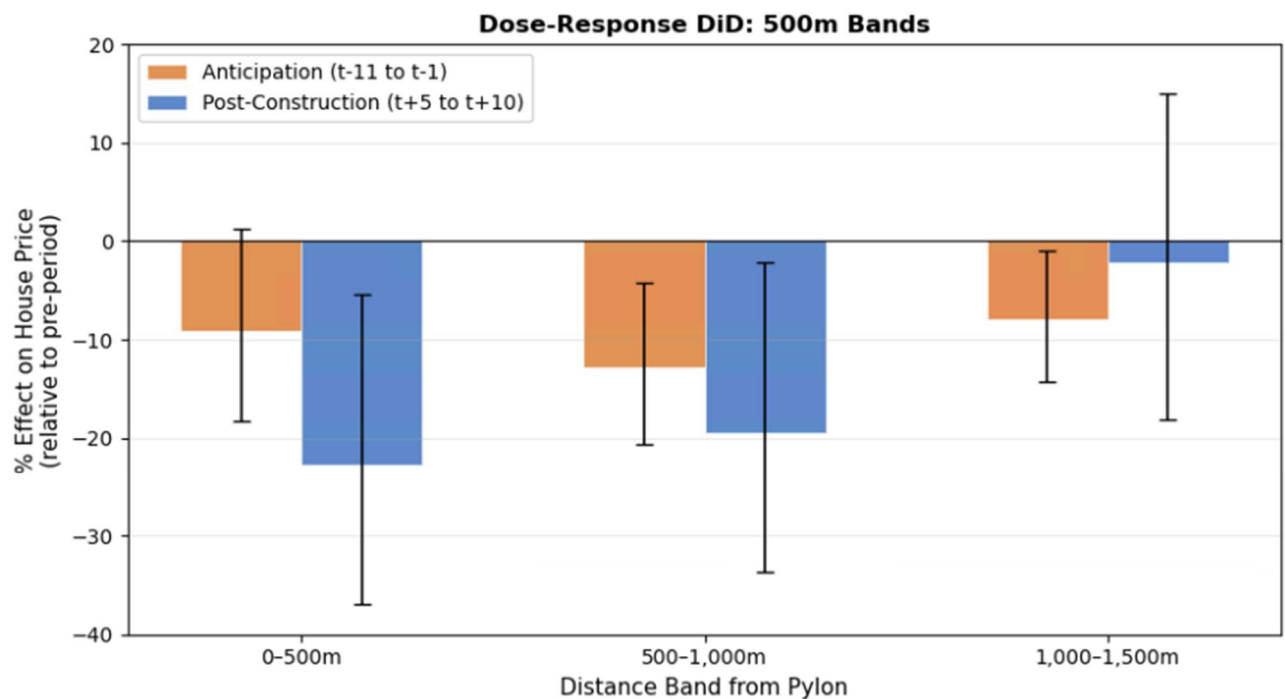
## 5.2 Difference-in-Differences Results

Table 9 presents the main DiD results using 500-metre bands, estimated on the restricted sample of 10,453 observations with standard errors clustered at the pylon level. The model achieves an  $R^2$  of 0.729, and the reference category is the control band (1,800-3,000m) in the pre-period (t-15 to t-12). Property type controls perform as expected and are all highly significant ( $p < 0.001$ ). Relative to detached properties (the omitted reference category), flats transact at a 61.6% discount, terraced at 45.1%, and semi-detached at 33.2%. New build properties command a 14.8% premium relative to existing stock ( $p < 0.001$ ). Coefficients are reported as both log-point estimates and approximate percentage effects.

**Table 9: DiD Results, 500m Distance Bands**

| <i>Band</i>                                     | <i>Coef</i> | <i>SE</i> | <i>% Effect</i> | <i>Lower CI</i> | <i>Upper CI</i> | <i>P-Value</i> | <i>Sig</i> |
|-------------------------------------------------|-------------|-----------|-----------------|-----------------|-----------------|----------------|------------|
| <b><i>Anticipation Period (t-11 to t-1)</i></b> |             |           |                 |                 |                 |                |            |
| <i>0-500m</i>                                   | -0.0948     | 0.0549    | -9.04%          | -0.2025         | 0.0129          | 0.0845         | *          |
| <i>500-1,000m</i>                               | -0.1378     | 0.0480    | -12.87%         | -0.2319         | -0.0437         | 0.0041         | ***        |
| <i>1,000-1,500m</i>                             | -0.0823     | 0.0367    | -7.90%          | -0.1543         | -0.0103         | 0.0250         | **         |
| <b><i>Post Construction Period</i></b>          |             |           |                 |                 |                 |                |            |
| <i>0-500m</i>                                   | -0.2581     | 0.1032    | -22.75%         | -0.4604         | -0.0558         | 0.0124         | **         |
| <i>500-1,000m</i>                               | -0.2168     | 0.0992    | -19.49%         | -0.4112         | -0.0225         | 0.0288         | **         |
| <i>1,000-1,500m</i>                             | -0.0210     | 0.0918    | -2.08%          | -0.2009         | 0.1589          | 0.8190         |            |

Figure 3 translates the DiD coefficients from Table 9 into a dose-response chart, with orange bars for anticipation effects (t-11 to t-1) and blue bars for post-construction effects (t+5 to t+10), including 95% confidence intervals. The figure highlights three points. First, anticipation effects are present across all treated bands (roughly 8–13%), indicating early market response. Second, post-construction impacts are greater and decrease rapidly with distance, exceeding 20% within 500m but nearly zero at 1,000–1,500m. Third, the increase in magnitude from anticipation to post-construction for the closest properties suggests markets underestimate disamenity during planning, relevant for compensation policies.

**Figure 3: Dose-Response DiD**

These results lead to rejection of the null hypothesis: pylon construction has a statistically significant effect on residential property prices both before and after construction, with anticipation effects emerging at t-11 and post construction effects persisting through t+10.

### 5.3 Robustness Checks

Three robustness checks are conducted to assess the sensitivity of the main findings.

#### 300 Metre Distance Bands

Table 10 presents the DiD results re-estimated using finer 300-metre distance bands as a robustness check, estimated on 10,454 observations with an  $R^2$  of 0.732.

#### Dynamic DiD Parallel Trends F-Test

A formal F-test on the nine pre-period interaction coefficients (three distance bands by three years, t-15 to t-12) yields an F-statistic of 1.436 and a p-value of 0.186, indicating no significant difference in pre-treatment trends between treated and control properties. This supports the parallel trends assumption for the DiD estimates.

#### Placebo Test

A placebo test randomly assigns properties to distance bands and re-estimates the DiD specification. Three out of four placebo coefficients are statistically insignificant ( $p > 0.10$ ), while one shows marginal significance ( $p = 0.038$ ). This general lack of significant placebo effects supports the validity of the main results, suggesting they're unlikely due to distance band setup or spatial correlation.

**Table 10: DiD Results- 300m Distance Bands (Robustness)**

| <i>Band</i>                              | <i>Coef</i> | <i>SE</i> | <i>% Effect</i> | <i>Lower CI</i> | <i>Upper CI</i> | <i>P-Value</i> | <i>Sig</i> |
|------------------------------------------|-------------|-----------|-----------------|-----------------|-----------------|----------------|------------|
| <i>Anticipation Period (t-11 to t-1)</i> |             |           |                 |                 |                 |                |            |
| 0-300m                                   | -0.0097     | 0.0342    | -0.96%          | -0.0766         | 0.0573          | 0.7776         |            |
| 300-600m                                 | -0.1803     | 0.0637    | -16.50%         | -0.3052         | -0.0555         | 0.0046         | ***        |
| 600-900m                                 | -0.1065     | 0.0482    | -10.10%         | -0.2010         | -0.0119         | 0.0273         | **         |
| 900-1,200m                               | -0.1303     | 0.0377    | -12.22%         | -0.2042         | -0.0564         | 0.0005         | ***        |
| 1,200-1,500m                             | -0.0241     | 0.0365    | -2.39%          | -0.0957         | 0.0474          | 0.5084         |            |
| <i>Post Construction Period</i>          |             |           |                 |                 |                 |                |            |
| 0-300m                                   | -0.2803     | 0.1500    | -24.44%         | -0.5742         | 0.0137          | 0.0616         | *          |
| 300-600m                                 | -0.3288     | 0.0976    | -28.02%         | -0.5200         | -0.1376         | 0.0007         | ***        |
| 600-900m                                 | -0.1838     | 0.0999    | -16.79%         | -0.3797         | 0.0120          | 0.0658         | *          |
| 900-1,200m                               | -0.1255     | 0.0842    | -11.79%         | -0.2904         | 0.0395          | 0.1360         |            |
| 1,200-1,500m                             | 0.0933      | 0.0915    | 9.77%           | -0.0861         | 0.2726          | 0.3802         |            |

The findings for the 300-metre range support those seen in the main 500-metre results. The middle-distance bands (300-600m, 600-900m, 900-1,200m) show consistently significant anticipation effects, with the 300-600m band exhibiting the largest anticipation discount (-16.50%,  $p = 0.005$ ). The 0-300m band is insignificant in the anticipation period (-0.96,  $p = 0.778$ ), which is likely because of a very small sample size (only 43 pre-period observations, as mentioned in the data section) rather than a true lack of anticipation. Similarly, the 1,200-1,500m band is insignificant for both periods, suggesting that treatment effects diminish with distance.

After construction, the strongest effects in the 300-metre specification occur at 300-600m (-28.02%,  $p = 0.001$ ), while the 0-300m band shows a large but only marginally significant

effect (-24.44%,  $p=0.062$ ), again likely due to the small sample size. The attenuation with distance mirrors the 500-metre results: the effect weakens progressively from 300-600m through to 1,200-1,500m, where it becomes positive and insignificant. The consistency of the dose-response pattern across both band specifications strongly indicates that the measured effects are real and not simply a result of how the distance bands were chosen.

## **6. Discussion**

### **6.1 Anticipation Effects and Forward-Looking Housing Markets**

This dissertation's key finding is the identification of anticipation effects: property prices start to diverge between treated and control areas about nine to eleven years before construction, matching the UK transmission planning timeline. This supports the idea that housing markets respond quickly to credible information about future changes. The UK's planning process, with public consultations and assessments, provides signals about upcoming infrastructure, encouraging these anticipation effects.

Existing UK studies implicitly assume that the pre-construction period represents a valid counterfactual, the results here challenge that assumption. If anticipation effects depress prices years before construction, then DiD designs that treat the entire pre-construction period as untreated will underestimate the true impact of pylons. The 3.6% headline estimate reported by Gibbons and Tang (2024), for example, may represent a lower bound if part of the effect has already been capitalised into prices.

The magnitude of the anticipation effects is economically meaningful as during the anticipation period, properties within one kilometre of a future pylon experience price reduction of around 9-13%. This suggests that households revise expectations substantially in response to planning activity and that the costs of infrastructure development are borne over a much longer period than construction alone. From a welfare perspective, this finding implies that households may experience capital losses for many years before any formal compensation mechanisms are triggered.

### **6.2 Post-Construction Effects and Distance Attenuation**

Post-construction estimates reveal a clear and intuitive dose-response pattern. Properties within 500 metres of a pylon experience price reductions exceeding 20%, with somewhat

smaller but substantial effects at 500-1,000 metres. Beyond approximately one kilometre, the effect becomes economically small and statistically insignificant.

The results also show that anticipation effects do not fully account for post-construction losses. Price discounts approximately double for the closest properties once pylons are built, indicating that uncertainty resolution and the physical presence of infrastructure matter. Buyers may initially capitalise expected disamenity conservatively, with the full effect realised only once the pylon becomes a fixed feature of the landscape.

### **6.3 Limitations**

Several limitations should be noted. First, non-stationary tests like the Augmented Dickey-Fuller are not used since the model relies on cross-sectional data, with identification based on proximity to pylons rather than time series in aggregate prices; therefore, spurious regression is not an issue. Second, Euclidean distance is used to assign properties to pylon, which does not account for topography or screening vegetation that may visually shield some homes. Third, property fixed effects aren't used because the distance band variable is constant for each property, making property and distance band dummies perfectly collinear and preventing treatment effect identification. Instead, LSOA fixed effects allow for neighbourhood-level control and preserve identification from cross-sectional variation in treatment intensity. Fourth, the potential for reverse causality, that falling houses attract pylon development, is dismissed as National grid routing decisions are determined by engineering and planning constraints, and the observed price declines up to eleven years before construction suggest the causal direction is from pylons to prices.

### **6.4 Policy Implications**

The findings indicate that property value effects extend beyond the scope of proposed community benefit arrangements. The Department for Energy Security and Net Zero has consulted on a Bill Discount Scheme for Transmission Network Infrastructure recognises households living within 500 metres of new or significantly upgraded transmission infrastructure in Great Britain, with support linked to construction. The evidence here suggests that price effects emerge well before construction and extend beyond this area.

Taking account of anticipation effects and spatial variation could help community benefits better reflect where and when local impacts arise. The evidence points to two areas that may merit consideration. First, timing: price effects emerge around nine to eleven years before construction, so households near proposed routes experience measurable impacts for nearly a

decade before support becomes available. A planning-stage component, linked for example to public consultation or planning application, could address this. Second, distance: while the 500-metre boundary provides a clear and objective basis for eligibility, this study finds statistically significant price effects up to 1,000 metres. A wider boundary, potentially with support tapered by distance, would align more closely with this evidence.

At a broader level, transparent recognition of property value impacts may help reduce opposition by signalling that local costs are acknowledged, potentially supporting faster and less contentious infrastructure delivery.

## **7. Conclusion**

This dissertation investigates the causal effect of electricity transmission pylons on residential property prices in England and Wales, focusing on anticipation effects and spatial variation. Leveraging a large administrative dataset with spatial detail, it employs an event study and dose-response DiD framework to pinpoint the timing and scale of price changes.

Evidence shows that property prices react well before construction, with anticipation effects emerging up to eleven years in advance due to the lengthy, information-rich planning process for UK transmission infrastructure. These effects are economically substantial and become more pronounced after pylons are built, with post-construction price drops of over 20% for homes within 500 metres. The impact declines quickly with distance and is negligible beyond one kilometre.

These findings highlight that standard pre-construction baselines may be skewed by early price responses, causing underestimation of infrastructure externalities. By modelling anticipation explicitly, the study provides a fuller account of the costs faced by households near transmission lines.

On the policy front, the findings are most relevant to how community benefits for transmission infrastructure are designed. The proposed Bill Discount Scheme recognises households living near new or significantly upgraded assets, with eligibility set at 500 metres to give a clear and objective boundary. The evidence here suggests that property value effects extend to around 1,000 metres, which supports considering a wider spatial eligibility threshold. Because price responses emerge during the planning phase, when support becomes available may also merit consideration. Distributional factors may be relevant too: if pylons

disproportionately affect areas with lower socioeconomic backgrounds, the design of community benefits could take account of the profile of affected households.

Future research could apply this approach to other infrastructure types, examine differences between urban and rural areas, or study mitigation strategies like undergrounding and landscape screening. A formal distributional analysis of who bears transmission expansion costs, and how community benefits are distributed relative to those costs, would add further insight. Ultimately, the results emphasise the need for infrastructure delivery to be guided by credible evidence of its local economic impacts.

## Bibliography

Callaway, B. and Sant'anna (2021) 'Difference-in-Differences with Multiple Time Periods', *Journal of Econometrics*, Available here: [Difference-in-Differences with multiple time periods - ScienceDirect](#)

Department for Energy Security Net Zero (2025) Electricity Bill Discount Scheme for transmission network infrastructure: Policy position, *GOV.UK*, Available here: [Electricity Bill Discount Scheme for transmission network infrastructure: policy position \(accessible webpage\) - GOV.UK](#)

Gibbons, S. (2015). Gone with the wind: Valuing the visual impacts of wind turbines through house prices, *Journal of Environmental Economics and Management*, Available here: [Gone with the wind: Valuing the visual impacts of wind turbines through house prices - ScienceDirect](#)

Gibbons, S. and Machin, S. (2005) Valuing rail access using transport innovations. *Journal of Urban Economics*, Available here: [Valuing rail access using transport innovations - ScienceDirect](#)

Cheng Keat Tang and Gibbons, S. (2024) Are friends electric? Valuing the social costs of power lines using house prices, Available here: [Are friends electric? Valuing the social costs of power lines using house prices - ScienceDirect](#)

Hamilton, S.W. and Schwann, G.M, (1995) Do High Voltage Electricity Transmission Lines Affect Property Value? *Land Economics*, Available here: [Do High Voltage Electric Transmission Lines Affect Property Value? on JSTOR](#)

Kiel and McClain, (1995) House Prices during Siting Decision Stages: The case of an Incinerator from Rumor through Operation. *Journal of Environmental Economics and Management*, Available here: [House Prices during Siting Decision Stages: The Case of an Incinerator from Rumor through Operation](#)

Muth, J.F (1961) Rational Expectations and the Theory of Price Movements. *Econometrica*, Available here: [Rational Expectations and the Theory of Price Movements on JSTOR](#)

National Policy Statement for electricity networks infrastructure (EN-5), (2025), *GOV.UK*, Available here: [National Policy Statement for electricity networks infrastructure \(EN-5\), 2025 \(accessible webpage\) - GOV.UK](#)

Report to Scottish Renewables, BIGGAR Economics (2024), Available here: [House Prices: Impact of Beauldy-Denny Grid Infrastructure report](#)

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition, *Journal of Political Economy*, Available here: [Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition on JSTOR](#)

Sims, S. and Dent, P. (2005) High-voltage Overhead Power Lines and Property Values: A Residential Study in the UK. *Urban Studies*. Available here: [High-voltage Overhead Power Lines and Property Values: A Residential Study in the UK - Sally Sims, Peter Dent, 2005](#)

Thomas, C. and Welke, G. (2017) Effect of HVTLs on Property Value: An Event Study. Available here: [v20n2-the-effect-of-HVTLs-on-property-values.pdf](#)

Lunt, T and Tatos, T (2020) Property Value Impacts from Transmission Lines, Subtransmission Lines, and Substations. Available here: [Property Value Impacts from Transmission Lines, Subtransmission Lines, and Substations](#)

Winser, Energy Systems Catapult (2023) 'New power lines can be built in half the time', Available here: [New power lines can be built in half the time - Energy Systems Catapult](#)

Data

HM Land Registry (2025). Price Paid Data, Available here: [Price Paid Data - GOV.UK](#)

House Price Statistics - UK House Price Index (2026) Data.gov.uk. Available here: [House Price Statistics - UK House Price Index](#)

National Grid (2025). Network Route Maps, Available here: [Network route maps | National Grid](#)

Office for National Statistics (2021), 2021 Census, Available here: [2021 Census - Census of Population - Data Sources - home - Nomis - Official Census and Labour Market Statistics](#)

ONS UPRN Directory (2025) Available here: [ONS UPRN Directory \(April 2025\) \(Epoch 117\) | Open Geography Portal](#)

OS Open UPRN Ordnance Survey. Available Here: [OS Open UPRN | Data Products | OS](#)

Urban Big Data Centre (2025). Price Paid Data to UPRN Lookup, Available here: [Urban Big Data Centre Price Paid Data to UPRN Lookup](#)