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Skenario Labs

Green Promises, Brown Realities

MEASURING GREEN DIVIDENDS AND TRANSITION RISK IN RESIDENTIAL REAL ESTATE

Acknowledgements

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The GHFA is designed to accelerate the development of innovative green finance products that help homeowners improve the energy efficiency and sustainability of their properties, contributing to the UK's net-zero goals. It is part of the UK Government's Net Zero Innovation Portfolio (NZIP).

We also extend our appreciation to our valued partners, Living Places and Eunomia, for their collaboration and insights throughout this project. Their expertise and commitment have significantly contributed to our understanding of Green Dividends and Brown Discounts.

Finally, we would like to thank all those who have supported this work through their time, knowledge, and encouragement - including numerous UK banks and Local Authorities.

Department for Energy Security & Net Zero

Green Home Finance Accelerator

Part of the Net Zero Innovation Portfolio

LivingPlaces

eunomia

pwc

CARBON TRUST

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Introduction

The concepts of "green dividend" and "brown discount" have been gaining attention.

These ideas are often used to encourage environmentally friendly building practices and energy-efficient retrofits - ensuring that sometimes lengthy payback periods are made more acceptable by an uplift in the value of a property.

However, our research indicates that the reality may be more nuanced and varies significantly across different regions and residential property types in England and Wales.

Green Dividend/ Brown Discount

The term green dividend refers to the additional value that a property can gain from having a higher-than-average energy performance rating. Conversely, the brown discount describes the reduction in value for properties with lower-than-average EPC ratings, suggesting that buyers are less willing to pay high prices for less energy-efficient homes.

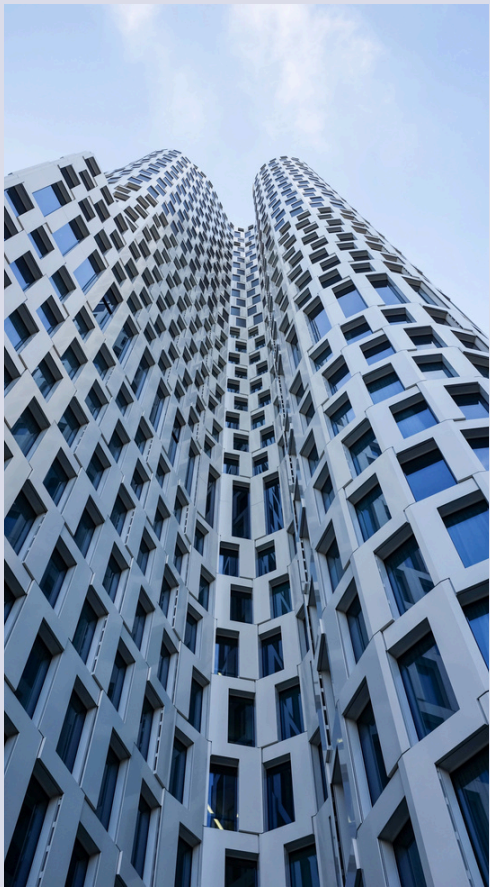
As energy costs rise and environmental concerns become more pressing, it seems natural that the value of energy-efficient properties is expected to increase.

For clarity, we will be treating dividends and discounts as changes relative to the average EPC score, which falls between 67 and 70 (corresponding to a high D or low C rating).

WHY EPCs?

EPCs are not a perfect predictor of energy performance - indeed they have been regularly described as “not fit for purpose” by those in the sustainability sector. This has led to various recommendations for change and the recent Government reform consultation.

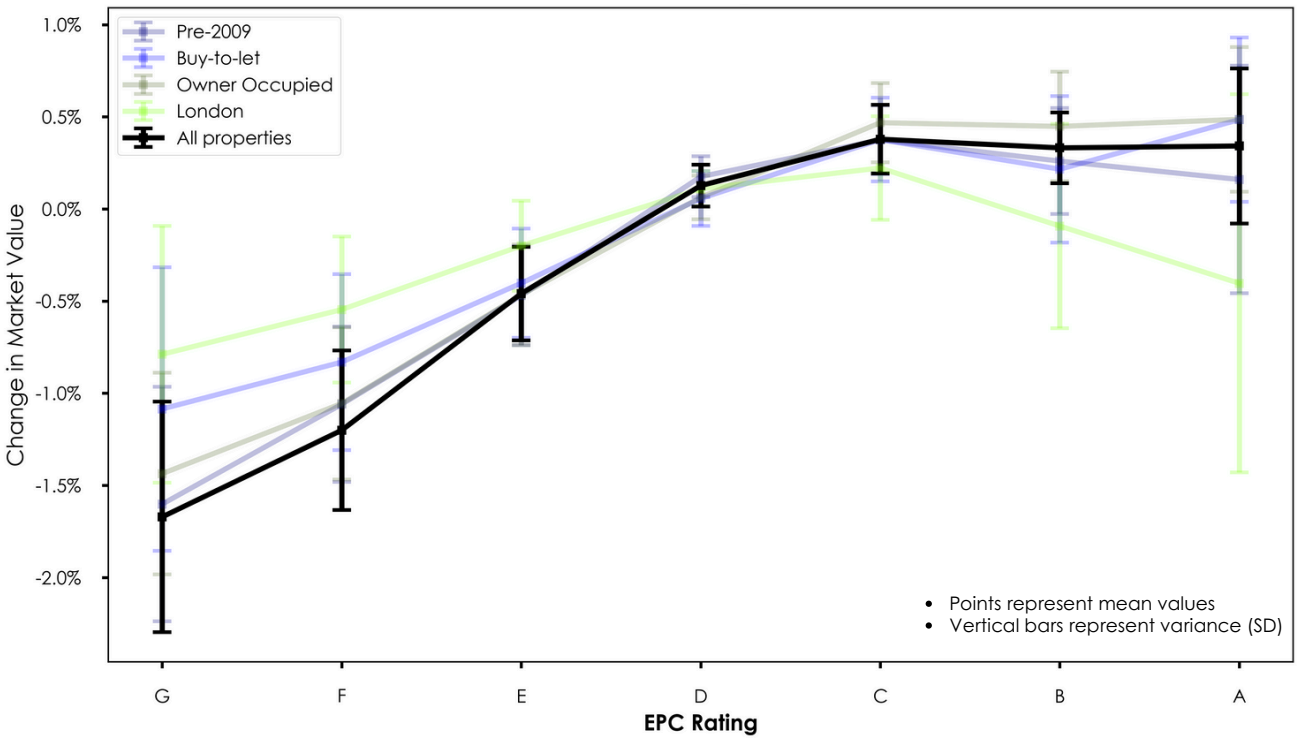
However, it is currently the best-understood and most widely used metric available to the average homebuyer. It provides information about the energy consumption and attributes of a dwelling's components.



Key Findings

Brown discount and transition risk

Figure 1: Summary of EPC's contribution to residential market value



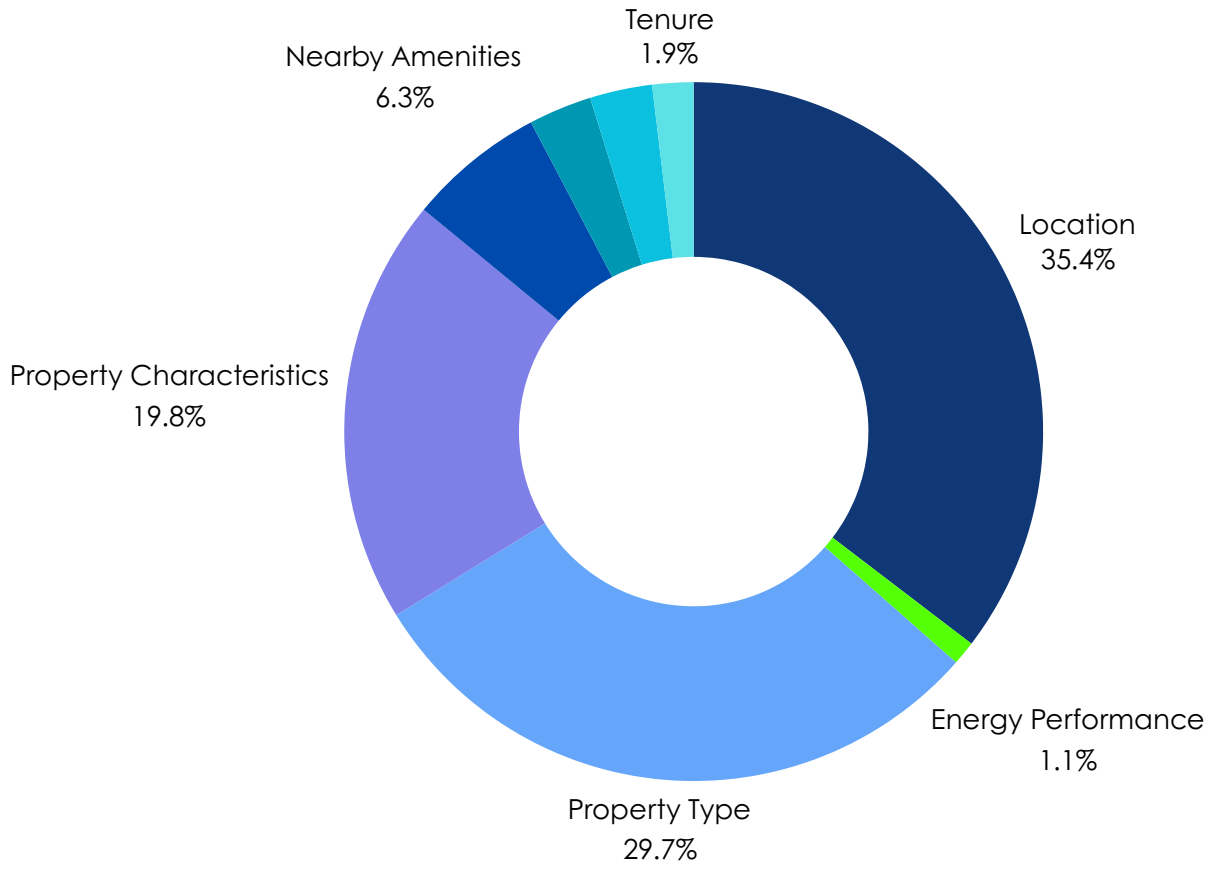
Contrary to popular belief, we **did not find a significant green dividend** in the residential property market. Properties with higher EPC ratings did not consistently sell at a premium compared to those with average ratings.

However, analyses showcased in this report reveal a clear **penalty in market value** for homes with lower EPC ratings, highlighting the growing importance of energy efficiency in the housing market.

This **brown discount** reflects the potential implications of transition risk as the economy shifts toward sustainability.

Key Findings

Figure 2: How property features impact market value



The impact of energy performance on property prices varies greatly by region and property type. For example, in London, energy performance does not have a notable impact on the price of residential properties.

This variation highlights the importance of considering local market conditions when assessing the value of energy efficiency. The graph above summarises the level of impact various characteristics have on sale price.

Our hypothesis for the sometimes substantial claims made around green dividend is due to the failure to remove other, more impactful, factors. Indications are that properties which have undergone extensive retrofits are likely to have also had other value creating works - such as renewed kitchens and bathrooms, or extensions.

Approach

To improve understanding of green dividend and brown discount, we constructed a valuation model for the residential property market in England and Wales.

We combined data from various sources, including EPC records, price paid data from the Office for National Statistics (ONS), Ordnance Survey (OS) building data, and our in-house data.

By merging these datasets, we developed a comprehensive model to predict property prices and assess the impact of EPC ratings.

This analysis helped us identify the presence of a brown discount but did not support the existence of a strong green dividend.

Using a machine learning algorithm, XGBoost, we processed the data to predict residential property prices with a mean absolute percentage error (MAPE) of 15%. This error rate suggests our model is reasonably accurate in predicting property values.

With our model, we examined the effects of EPC ratings on house prices. We used Shapley values to determine the independent contribution of each EPC rating to the overall property value. This has been done to **isolate the impact of energy efficiency** from other value influences.

To explore the variations by region and residential property type, we conducted multiple comparisons with the same valuation model, adjusting the dataset according to specific criteria.

Detailed Findings

By examining various cuts of the data we can draw a nuanced understanding of how energy performance impacts property values across different segments of the housing market.

Analysis of High EPC Properties

When analysing the structure of properties with high EPC ratings (A and B), we identified several notable peculiarities. A large proportion of these properties are large, relatively expensive detached houses.

Only around 30% of these properties are terraced, compared to ~50% for other EPC ratings.

Additionally, these homes tend to be recently built properties with 74-82% built after 2009. EPC B and especially EPC A properties often have a much larger floor area and market value on average.

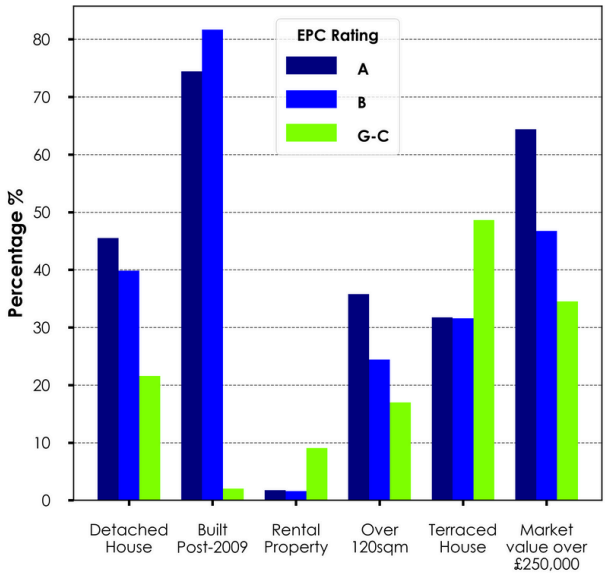


Figure 3: Property characteristics by EPC Rating

FINDINGS

High EPC properties largely represent a specific typology of expensive, large, newly built homes. In these cases, **the value added by a high EPC rating may be marginal because the properties' high value is driven by other factors, such as location, size, and age**.

This typology suggests that the presence of a green dividend in these properties may be more reflective of the inherent characteristics of high-value homes rather than the EPC rating itself.

Exclusion of New Build Properties

Newly built properties tend to have higher EPC ratings due to modern construction standards and building regulations, which emphasise energy efficiency.

These properties do not always behave in the market the same way as existing homes often attracting a different buyer profile.

New build pricing can be influenced by factors such as developer incentives, government schemes, and concerns around build quality.

To refine our analysis, we excluded properties constructed after 2009. The rationale behind this cut was to examine whether the inclusion of modern, energy-efficient homes was masking a potential green dividend in older housing stock.

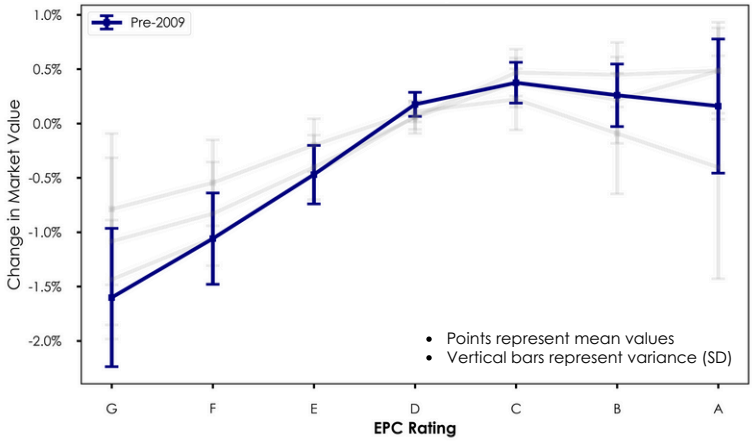


Figure 4: Effect of EPC on market value in pre-2009 builds

FINDINGS

Excluding properties built after 2009 did not change the findings, as there remained no strong evidence of a price increase from EPC C upwards, reaffirming that energy efficiency does not consistently boost property values.

A **significant price increase was noted from EPCs G, F, and E - suggesting a brown discount** where lower-rated properties are devalued potentially due to regulatory risks and retrofitting costs.

Excluding new builds showed no significant green dividend for existing homes, indicating that higher EPC ratings alone don't boost property values in a market dominated by older homes. This contradicts our hypothesis that new builds suppressed the green dividend, while retrofitted older homes would fetch higher prices.

Impact of Tenure on EPC-Related Price Effects

We also explored the impact of EPC ratings on market value across different tenure types, specifically comparing buy-to-let and owner-occupied properties.

This analysis was conducted to improve understanding as to how ownership intentions might influence the perceived value of energy efficiency.

The reasoning for this is that the fundamental purpose of the property purchase is different, therefore market activity may vary.

Our expectation was that we would see a greater impact on value for buy-to-let assets as regulations incentivise greater energy efficiency in those assets.

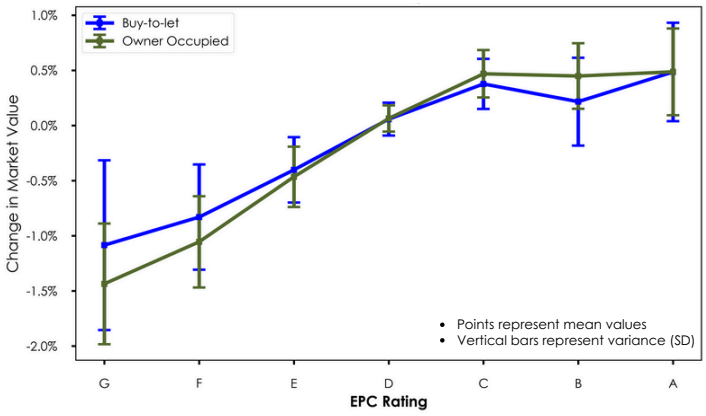


Figure 5: Effect of EPC on market value by tenure type

FINDINGS

The analysis showed similar EPC rating effects on market value for buy-to-let and owner-occupier properties, though the impact was slightly smaller for buy-to-let, especially at lower EPC levels.

This finding challenges the prediction that transition risks and market regulations would create a more significant discount for low EPC-rated rental properties. One possible explanation is that landlords may not be as concerned about energy efficiency since **heating costs typically fall on tenants** rather than themselves. Additionally, privately rented properties are clustered in cities, where other value drivers are more prevalent (see page 9).

The reduced impact of low EPC ratings on market value in the buy-to-let sector might reflect this disconnect between energy performance and direct financial responsibility for energy costs.

Regional Variation - London

A major part of our analysis and what we have subsequently built into our models are the regional variations

When investigating the impacts of this variation, London stood out as an outlier showing almost no relationship between EPC ratings and house prices - and in some cases a negative one.

Exploring the geographical variability highlighted similarly strong regional differences on the effect of EPC on house prices.

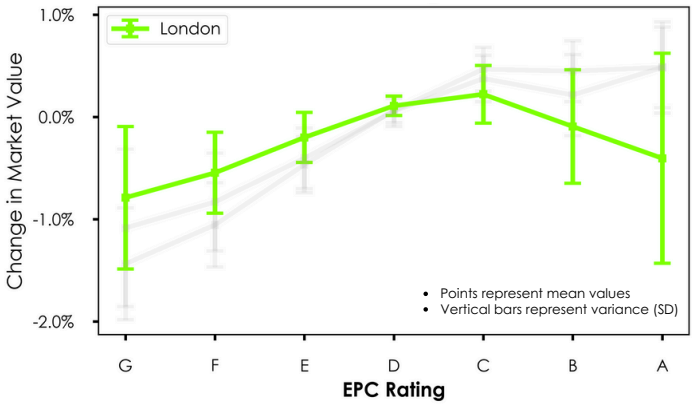


Figure 6: Effect of EPC on market value in London

Figure 6 shows huge variability within the London market (indicated by the vertical lines) on each extreme of the energy efficiency spectrum.

FINDINGS

High variability within London and **no strong relationship between EPC and house prices** overall. As such we can largely take from this that EPC ratings had very little weight as a predictor of value in the London region.

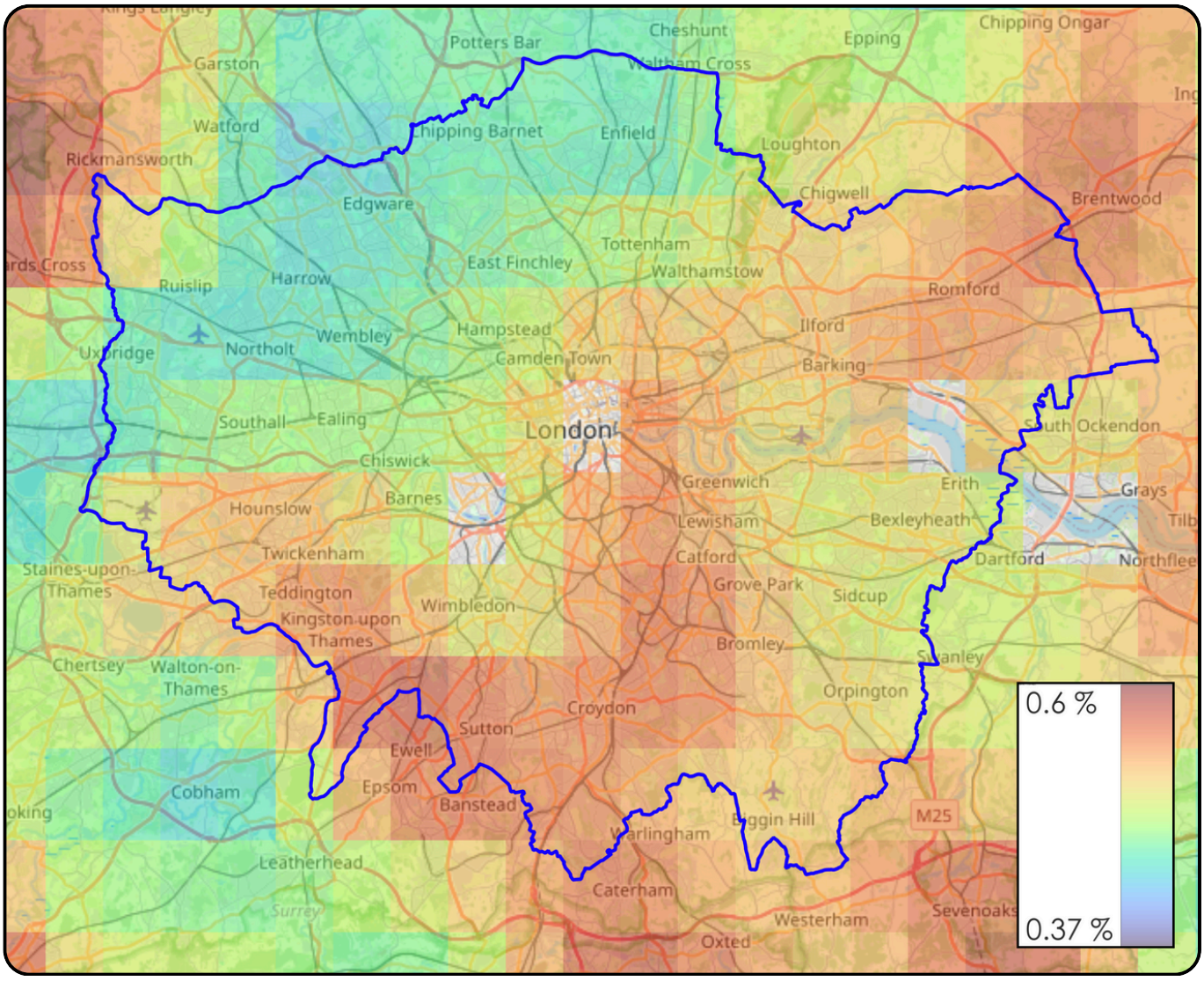
Possible explanation is the high volume, rapid housing market in the area overpowering any possible effects from energy efficiency.

Significant differences can be seen even within different parts of London - notably a much lesser relationship between efficiency and value in North East London, and a greater one in South London (see page 10).

High regional variability across England and Wales - inner-city areas with busier housing markets tend to show smaller effects from EPC ratings (see page 11)

Regional Variation - London

Figure 7: Brown discount heatmap of Greater London

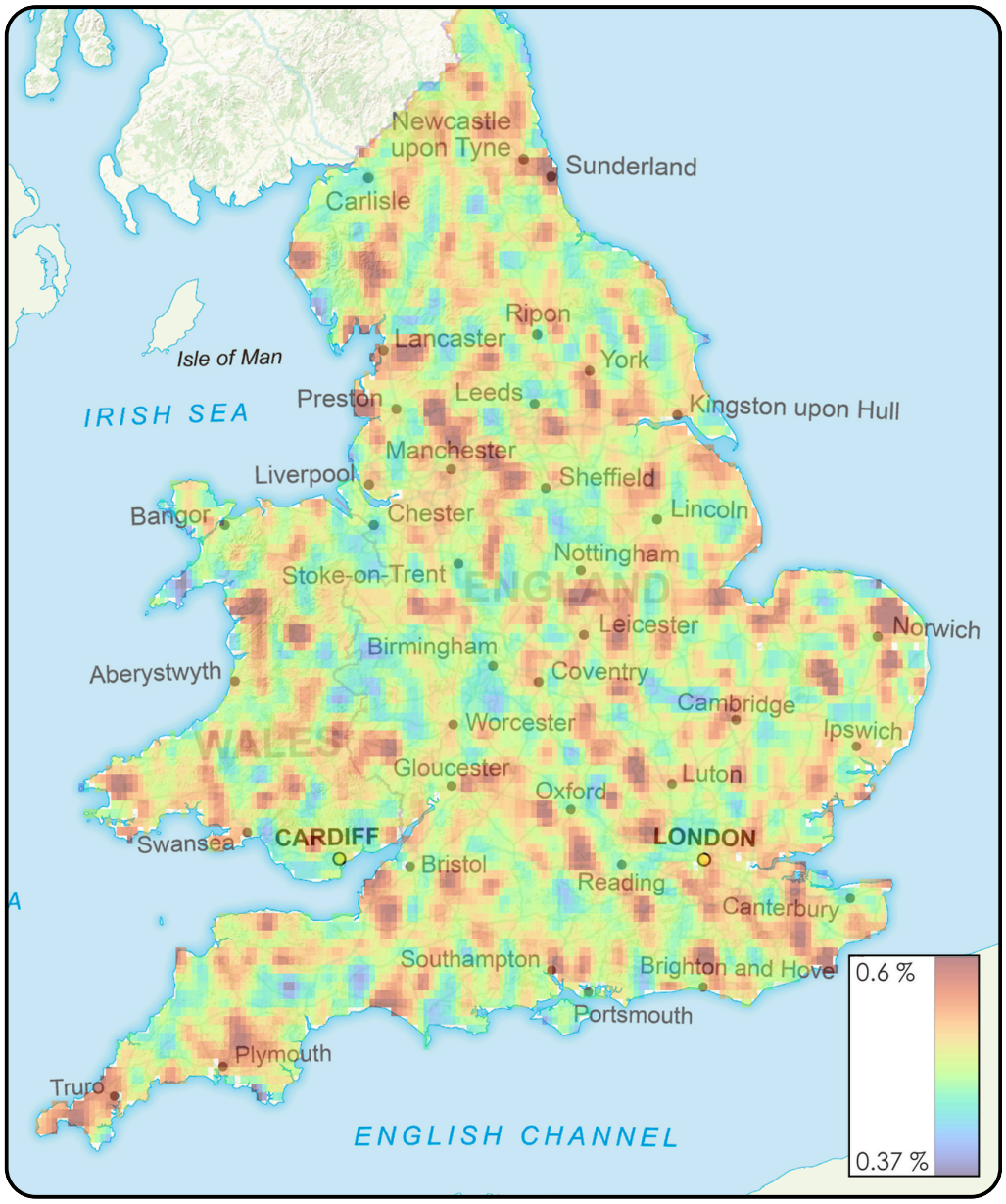


This figure shows the change in a residential property's market value in the Greater London area following an increase from EPC G to D. Warmer colours indicate stronger impact on market value.

Please note that this is specifically showing Brown Discount effects only, and not Green Dividends. As such stronger correlations indicate poor EPCs impacting more negatively on values.

National Results

Figure 8: Brown discount heatmap of England and Wales



This figure shows the percentage change in a residential property's market value in England and Wales following an increase from EPC G to D. The values are averaged into 15km2 grids where warmer colours indicate stronger negative impact on market value and cooler colours indicate a smaller impact.

This graphic is intended to be indicative and naturally masks interesting regional variations. We will cover these in greater detail in future if there is interest.

Summary

Brown discount and transition risk

The Green Dividend is not in evidence

There simply isn't a clear and obvious green dividend in any part of the residential real estate markets we have looked at. This may be for a number of reasons, and it may develop in the future; however for now it does not exist.

Brown Discount and its Implications

However, a brown discount is evident across most regions and property types, indicating that buyers are factoring inefficiency into their purchasing decisions. Properties with lower EPC ratings (E, F, and G) are likely less desirable due to higher energy costs and perceived riskiness.

The extent of the brown discount varies by region and tenure, suggesting that its impact is not uniform and can be modulated by localised market dynamics.

Transition Risk in the Housing Market

Transition risk refers to the financial risks arising from the shift to a low-carbon economy. In the context of the housing market, properties with low EPC ratings face potential devaluation as buyers and investors try to manage risk. This risk may be heightened by:

Future Legislation: The UK Government may consider policies aimed at reducing carbon emissions in the built environment. Proposed regulations such as stricter mandatory minimum EPC standards for property transactions could amplify the brown discount.

Energy Costs: Fluctuating energy prices, especially during energy crises, disproportionately impact less efficient homes, further devaluing these properties in the eyes of buyers.

It is also possibly that rising numbers of environmentally conscious buyers may prioritise greener options when purchasing homes; however while this has impacted some markets, there is little evidence for it so far here.

Addressing Transition Risk

The findings of this report suggest that while the brown discount currently reflects market trends, its magnitude and significance could grow as legislation tightens and sustainability becomes an even greater priority. Policymakers and market participants alike must anticipate these shifts to minimise risk and maximise the benefits of greener properties.

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