Financing Green Homes *

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Abstract

I study whether and how home energy efficiency (greenness) is priced in mortgage rates. Energy efficiency is regulator-certified rather than self-reported or voluntary, significantly limiting greenwashing concerns. Exploiting the surge in natural gas prices following the 2022 Russian invasion of Ukraine and novel Dutch mortgage-level data linking interest rates to energy performance certificates (EPC) labels, I find a 3% reduction in interest rates on green homes (EPC A) relative to brown homes (B–G). Evidence from progressively broader definitions of green, a triple-difference design by regional gas dependence, and a regression discontinuity around the Nord Stream sabotage supports a causal interpretation. Although green homes appreciate—raising financing needs and, all else equal, borrowing costs—default rates on green mortgages fall, and this effect dominates, driving the net decline in interest rates. Lenders with climate commitments—subject to stronger investor pressure—cut green rates more, while those with access to cheaper green funding do not. Lastly, more exposed regions saw an increase in the construction of green housing. Overall, I find that green homes deliver a double dividend: lower energy bills and insurance against energy price shocks.

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1 Introduction

Energy use and production account for a substantial share of global greenhouse gas emissions, with residential housing playing a central role: operation of residential buildings accounts for roughly 22% of global energy consumption and 17% of global CO_2 emissions (Clara et al., 2026), making the residential sector a key margin for mitigating climate-related externalities. Energy-efficient ("green") homes — through better insulation, heating systems, and overall energy performance — have the potential to substantially reduce household energy use and lead to lower global greenhouse gas emissions.

Mortgage financing is the primary channel through which households purchase homes and, consequently, a key mechanism through which financial markets can influence investment in energy-efficient housing. Despite the growing policy emphasis on green housing and its relevance in reducing CO_2 emissions, remarkably little is known about whether and how mortgage markets price energy efficiency. This paper asks a simple question: Is energy efficiency (greenness) priced in mortgage rates? And if so, what explains the pricing of energy-efficient housing? A key advantage of the housing setting is that energy efficiency is regulator-certified rather than self-reported or based on voluntary disclosures, which allows me to rule out greenwashing concerns that remain difficult to address in much of the existing literature on green finance.

A natural starting point is to compare mortgage interest rates on green homes with those on otherwise similar brown homes. Such comparisons, however, face important identification challenges. Green homes may differ from brown homes along dimensions that are difficult to observe or fully control for, such as construction quality or neighborhood characteristics. Moreover, mortgage rates depend not only on collateral characteristics but also on borrower attributes. If households with unobserved environmental preferences are more likely to select into green homes and are also systematically less likely to default, banks may offer lower interest rates to green-home borrowers for rea-

sons unrelated to the energy efficiency of the property itself.

To address these concerns, I exploit an exogenous shock to gas prices that differentially affects the utility expenditure of green and brown homes. The defining feature of a green home is its energy efficiency rating, which governs utility expenditure. When gas prices rise, households living in energy-inefficient (brown) homes experience a larger increase in utility expenditures. By contrast, green homes are partially insulated from energy price shocks, implying smaller increases in utility expenditure. This differential exposure identifies whether energy efficiency is priced in mortgage rates.

Using data from the Netherlands, I exploit the 2022 European energy crisis—triggered by Russia's invasion of Ukraine and the resulting surge in natural gas prices—as a large, plausibly exogenous shock to household energy costs. The Netherlands provides a natural laboratory for this analysis: although geographically distant from the conflict, it is highly dependent on imported fossil gas, so global supply disruptions translated into sharp increases in residential energy expenditures. Combining this shock with detailed loan-level data that link mortgage interest rates to regulator-verified energy performance certificates (EPCs), I study how lenders adjust mortgage pricing across homes with different levels of energy efficiency.

Identification rests on two features of the setting. The energy price shock is driven by geopolitical events rather than domestic economic conditions, while the EPC system provides a standardized, externally verified measure of building-level energy efficiency. Together, these features allow me to isolate differential exposure to energy costs across properties and to do so using a definition of "green" that avoids the ambiguity and greenwashing concerns that complicate much of the existing green-finance literature.

I obtain loan-level information from the European Data Warehouse (EDW), a centralized repository of securitized residential mortgages established by the European Central Bank. The data cover the universe of public Dutch residential mortgage-backed securities (RMBS) and include standardized information on loan terms, property character-

istics, borrower profiles, and payment performance. A unique feature of this dataset is that EPC ratings labels are observed alongside loan characteristics and borrower information, allowing a direct comparison of financing terms for properties with differing energy efficiency ratings.

I study how the gas price shock in the aftermath of the Russian invasion of Ukraine affected mortgage interest rates. I implement a difference-in-differences (DiD) design to estimate changes in mortgage pricing for green versus brown homes. In the six quarters prior to 2022Q1, the series exhibits no systematic trend, supporting the parallel trends assumption. Starting in 2022Q1—the quarter of the invasion and the onset of the energy crisis—the interest rate differential turns negative: green mortgage rates fall relative to brown mortgage rates. The gap widens gradually over time and stabilizes at around 3% decline after one year.

To corroborate the baseline finding that mortgage rates on energy-efficient properties fall after the gas-price shock, I conduct three complementary analyses.

First, I estimate rate differentials under progressively broader definitions of green homes, comparing each group to the corresponding set of brown homes (all remaining EPC categories). The narrowest definition includes only EPC A homes (baseline estimate), while subsequent categories expand to include A–B, A–C, and so forth, up to A–F. The results show that the estimated rate advantage is largest when green is defined as EPC A, and gradually diminishes as lower-rated properties are added to the green category. This pattern indicates that mortgages become more favorable for homes with higher energy efficiency, with the effect attenuating as the definition of green expands.

Second, I estimate a triple-difference specification that compares green and brown mortgage rates across regions with varying natural gas dependence. This approach helps address concerns that observed differences could be driven by differential exposure of green and brown mortgages to policy initiatives such as higher more favorable treatment of green mortgages by the government. By including green-by-time fixed effects and

exploiting cross-sectional variation in gas dependence at the Nomenclature of Territorial Units for Statistics (NUTS3) level, I isolate within-country variation in mortgage pricing linked to regional gas dependence. The results show that the decline in green mortgage rates is significantly larger in regions with higher natural gas dependence.

Third, I implement a regression discontinuity design (RDD) centered on the sabotage of the Nord Stream pipelines on September 26, 2022. The Nord Stream event generated an abrupt and unanticipated spike in European gas prices, without coinciding with major macroeconomic or policy announcements, offering a sharp discontinuity in expected energy costs. I zoom in on a 60-day window surrounding the event and find an abrupt, immediate decline in interest rates for green mortgages, with little change in brown mortgage rates. This divergence further supports the view that there is a change in mortgage interest rate for energy-efficient homes in response to a sudden change in gas prices.

Together, these three strategies, progressive expansion of green asset definition, triple-difference by gas dependence, and sharp RD timing around the Nord Stream sabotage, consistently point to a causal interpretation: decline in green mortgage interest rates in response to increase in gas prices.

Next, I visit two mechanisms through which energy price shocks affect financing costs for green homes (Lanteri and Rampini, 2025): (i) lower default risk and (ii) higher financing needs. Default rates for green and brown homes move in parallel pre-2022Q1, but diverge thereafter, with green mortgages exhibiting a modest but persistent decline in defaults—consistent with lower utility costs improving borrower cash flow. The effect, though economically small, supports a credit risk-based pricing channel. I also find that green home values appreciated more rapidly post-2022Q1, with the log-price differential stabilizing at roughly 1% after several quarters. This suggests growing market capitalization of energy efficiency attributes and higher collateral values. Taken together, these patterns indicate that the decline in credit risk from lower energy expenditures outweighs the increase in financing needs from higher collateral values, leading to lower mortgage

rates on green homes.

A back-of-the-envelope calculation confirms economic significance: while rising prices raise home values by €1,760, green homes enjoy €500 in annual utility savings and €211 in annual interest savings. Discounting the latter yields a present value of €9,170, five times the increase in home value. Combined, these savings represent a meaningful gain relative to after-tax median income (€38,000), reinforcing the interpretation that lenders respond to both improved credit quality related to the collateral.

I further examine two borrower-side forces that shape the pricing of green mortgages: pro-environmental preferences and loan purpose. In areas with a higher Green Party vote share—where households have plausibly stronger intrinsic demand for energy-efficient homes—lenders cut green mortgage rates by less, indicating that lender pricing is less elastic when buyers are already willing to pay for greenness. I next study heterogeneity by loan purpose. If lenders are responding to the collateral value of green homes, the effect should be stronger for refinance loans, where higher home values relax borrowing constraints, than for purchase loans, where higher prices increase financing needs. Consistent with this mechanism, I find that the decline in green mortgage rates is larger for refinance loans.

Finally, I evaluate two lender-side drivers: investor pressure and access to cheaper funding for green mortgages. I proxy for investor pressure using bank membership in climate alliances, and find stronger results among alliance banks. This is consistent with lenders responding to external decarbonization incentives by pricing green mortgages more favorably. In contrast, I find no significant effect when proxying for green funding advantages using banks' issuance of green RMBS. Together, these results point to investor pressure, rather than marginal funding cost, as the dominant institutional channel, underscoring the role of non-price incentives in shaping credit allocation during the energy transition.

Literature: This paper contributes to multiple streams of literature. First, it contributes

to the literature on the cost of capital and the allocation of climate-relevant assets (Bolton and Kacperczyk, 2021; Pástor et al., 2022; Ilhan et al., 2021; Seltzer et al., 2022; Zhang, 2025; Green and Vallee, 2025; Flammer, 2021). Prior work shows that higher financing costs for brown assets can accelerate decarbonization by redirecting capital toward greener firms and technologies. I extend this discussion to the household sector, which has received far less attention despite accounting for nearly one-fifth of global emissions and being predominantly debt-financed Cocco et al. (2025); Bellon et al. (2024). Using plausibly exogenous variation from an energy price shock, I provide causal evidence that the green–brown financing wedge also emerges in mortgage markets, where pricing is directly tied to the energy efficiency of the collateral. A key advantage of this setting is measurement: unlike firm-level studies where green classifications are often noisy or endogenous (e.g., due to greenwashing or supply chain outsourcing; Berg et al., 2022; Christensen et al., 2022), I observe standardized, regulator-certified energy performance ratings at the property level, allowing us to precisely identify the energy efficiency of each underlying asset and to estimate financing differentials with minimal measurement error.

Second, I contribute to the literature on household adoption of green assets and technologies (Allcott and Greenstone, 2017; Bellon et al., 2024; Fowlie et al., 2015). My findings show that energy price shocks, especially large and sudden ones, reprice the risk and value of energy-efficient homes, thereby increasing their financial attractiveness. This micro-level evidence complements prior studies on price-induced technology adoption and green transition (Popp, 2002; Allcott and Greenstone, 2012; Aghion et al., 2016; Acemoglu et al., 2016) and highlights how macro shocks can shift household portfolios toward lower-carbon assets, even in the absence of explicit policy intervention.

Finally, I contribute to the literature on the real effects of geopolitical and energy shocks. Building on work showing that oil price shocks reallocate capital and reshape macroeconomic outcomes (Hamilton, 1983; Davis and Haltiwanger, 2001; Edelstein and Kilian, 2009; Känzig, 2021), I show that the 2022 European energy crisis, a sharp, ex-

ogenous shift in expected energy prices, produces asymmetric adjustments in mortgage pricing across green and brown homes. This highlights how geopolitical shocks can accelerate structural change in the housing market by altering the relative cost of financing carbon-intensive versus energy-efficient assets.

2 Institutional Background

On February 24, 2022, Russia invaded Ukraine, igniting the largest armed conflict on European soil since World War II. Most of the consequences are concentrated in Ukraine and along NATO's eastern frontier, but its economic repercussions extend far beyond the battlefield. The most salient transmission channel is Europe's dependence on Russian fossil fuels, particularly natural gas: prior to the invasion, Russia supplied more than 40% of the European Union's imported gas and this number fell sharply to 11% in 2024, according to the European Council's 2025 annual review of energy markets.[1]

Sanctions, pipeline disruptions, and fears of further supply cuts collectively produced a historic surge in European energy prices. Wholesale prices at the Dutch Title Transfer Facility (TTF)—the main virtual trading hub and benchmark for European natural gas—rose sharply relative to pre-war levels and remained elevated throughout 2022 and 2023, as noted by the European Securities and Markets Authority (European Securities and Markets Authority, 2024).

The Netherlands provides a compelling setting for analyzing this shock. Unlike Ukraine, Russia, or Eastern European countries, geographically, the Netherlands is among the EU countries farthest removed from the conflict zone, facing limited military or political disruption. However, it is fully exposed to the war's economic fallout through its deep integration in the European gas market. Dutch households rely heavily on gas for residential heating. Thus, although insulated from the war itself, the Netherlands experienced the significant economic consequences of the energy crisis.

[1] More details can be found at https://www.consilium.europa.eu/en/infographics/where-does-the-eu-s-gas-come-from.

Panel (A) of Figure 1 shows a sharp and persistent increase in gas prices beginning in early 2022, coinciding with the onset of the Russia–Ukraine war. Panel (B) maps this aggregate energy shock into household-level exposure by showing annual utility expenditures (for a 100-square-meter home) across EPC ratings. While utility costs rise for all households after 2022, the increase is substantially larger for energy-inefficient dwellings (EPC E–G) than for more efficient homes (EPC A–B). This divergence reflects differences in energy use across buildings, so that a common gas price shock generates much larger utility expenditure increases for less efficient properties—a source of cross-sectional variation that I exploit for identification in the next section.

3 Data and Empirical Strategy

3.1 Data

The primary data source is the European DataWarehouse (EDW), a centralized repository created by the European Central Bank to provide standardized, loan-level information on securitized assets. The dataset covers the universe of publicly disclosed residential mortgage securitizations in Europe. Each securitization is organized around a pool of underlying mortgages; throughout the paper, I refer to each such securitization pool simply as a pool. A key advantage of EDW is that it harmonizes reporting standards across institutions and time, allowing the construction of a consistent mortgage-level panel across lenders and vintages. Auto loan data from EDW have been used in prior work, such as Bena et al. (2023), who study auto loans for electric vehicles in Europe.

The key advantage of this dataset is that it allows a direct and unified link between property-level energy efficiency, mortgage origination terms, borrower characteristics, and ex-post loan performance—a combination that is largely unavailable in existing mortgage datasets. In particular, the dataset contains property-level information on EPC ratings, enabling a precise classification of homes by energy efficiency rather than relying on indirect or aggregate proxies. Mortgage-level variables capture interest rates at origina-

tion, loan amounts, and other contractual terms, while borrower-level variables include income. Finally, performance variables track account status, including default or late payment. This integrated structure enables analysis of how energy efficiency is priced at origination and how it relates to default dynamics, providing a comprehensive view of both ex-ante and ex-post outcomes through the lens of energy performance.

Other data sources: I obtain a complete list of all buildings in the Netherlands with registered energy labels from EP-Online, a public database maintained by the Netherlands Enterprise Agency (RVO). For each building, I observe its address and assigned energy label. Following Gasparini and Tufano (2025), I assign lenders to the eleven major climate alliances they identify using information from alliance websites, firm disclosures, and news sources. I use administrative data from Statistics Netherlands (CBS) on natural gas prices and average household gas consumption at the municipality level. These data are aggregated to the Nomenclature of Territorial Units for Statistics level 3 (NUTS-3), which is the finest geographic resolution available in the mortgage data. This aggregation yields a consistent measure of regional exposure to natural gas price shocks that can be matched directly to individual mortgages.

Green home definition: I define a green home as a property with an energy efficiency rating of A—the highest rating—and classify all other properties (ratings B–G) as brown. Although the term *green mortgage* has only recently gained traction as a distinct product category, such loans were historically part of standard mortgage offerings without a separate label. Under this definition, approximately 33% of homes in the sample are categorized as green, yielding a balanced split between green and brown properties. In Section 4, I show that the results are robust to alternative definitions of a green home. Throughout the paper, I use the terms green home and green mortgage interchangeably. This usage is consistent with market practice: for instance, in the UK, 97% of mortgages marketed as "green" are offered exclusively on green homes (Cocco et al., 2025). My approach, therefore, reflects both prevailing industry usage and a transparent, replicable

classification based on energy performance.

Table 1 reports summary statistics for the estimation sample. The average home value is approximately €220,000, and about 33% of properties are classified as green. The mean mortgage interest rate at origination is 2.3%, with an average loan-to-value ratio of 66%. Borrowers have an average annual income of roughly €57,000.

Figure IA.1 in the Appendix documents systematic differences in mortgage pricing, borrower characteristics, and collateral features across green and brown homes that generate offsetting forces on interest rates. On the one hand, borrowers purchasing green homes exhibit observably higher credit quality: they have higher average incomes and lower ex-post default rates, which would ordinarily predict lower borrowing costs. On the other hand, green homes are more expensive and are financed with larger loans and slightly higher loan-to-value ratios, increasing lenders' exposure and the effective cost of financing. Consistent with the presence of these opposing channels, average interest rates on green mortgages are 9 basis points higher than those on brown mortgages in unconditional comparisons. Taken together, these patterns highlight why naive comparisons of mortgage rates across energy efficiency categories are difficult to interpret and underscore the need to jointly account for borrower risk and collateral characteristics when assessing the pricing of green home financing.

3.2 Identification Strategy

My identification strategy exploits the sharp increase in European natural gas prices following the Russian invasion of Ukraine in the first quarter of 2022 as an exogenous shock to household utility expenditures. The Netherlands provides an ideal setting: although not directly involved in the conflict, its economy is highly exposed to European fossil gas markets. The sudden and persistent rise in gas prices thus constitutes a plausibly exogenous shock that differentially affects households living in green versus brown homes.

This empirical design leverages loan-level data that link mortgages directly to the EPC

ratings of the underlying properties. This granularity addresses a central challenge in the green finance literature, where firm-level classifications of "green" versus "brown" are often subject to green-washing or measurement error (Berg et al., 2022; Christensen et al., 2022). By contrast, EPC ratings provide a verifiable, property-level measure of energy efficiency at the mortgage level.

For interest rates, I estimate the following loan-level specification, where each observation corresponds to a single mortgage at origination:

$$y_{i,s,t} = \alpha_{t,s(i)} + \sum_{k \neq 0} \beta_k \times \textit{Green Home}_i \times \mathbb{1}_k + \varepsilon_{i,s,t} \tag{1}$$

where $y_{i,s,t}$ denotes the outcome, $\textit{Green Home}_i$ is defined as 1 if the underlying property has a rating of A and 0 otherwise (B-G). $\mathbb{1}_s$ is a dummy variable equal to one for period s (measured relative to the 2022Q1). $\alpha_{t,s(i)}$ is pool-by-quarter fixed effects, and $\varepsilon_{i,s,t}$ is the error term.

Identification requires that, absent the shock, the financing terms of green and brown homes would have been parallel. A key concern is that unobserved heterogeneity across borrowers, lenders, and regions could confound the estimated treatment effect. I address these concerns through a DiD design augmented with a saturated fixed effect structure that maps directly onto specific alternative explanations. First, mortgage pools may be assembled with varying underwriting standards or risk profiles. Pool-by-quarter fixed effects control for contemporaneous shocks at the security level, such as changes in funding costs, risk weights, or issuance composition.

Second, banks may adjust mortgage pricing due to their balance sheet conditions, strategic policies, or climate commitments, independent of the energy shock. Lender-by-quarter fixed effects capture these institution-specific time-varying factors, addressing this confounding factor.[2] Third, regional housing markets may evolve differently due to

[2] A significant majority of pools are issued by a single lender, so lender-by-quarter fixed effects are highly correlated with pool-by-quarter fixed effects.

differences in regional conditions. Region-by-quarter fixed effects absorb these local dynamics, ensuring that the comparison of green and brown homes is not confounded by differential regional housing cycles. Fourth, the DiD structure itself mitigates concerns about macroeconomic shocks that affect all mortgages simultaneously, since only the relative differential between green and brown homes post-shock identifies the effect.

For default and home value, I use a panel regression. The benefit of a panel regression is that I can control for the unobserved time-invariant mortgage characteristic. For mortgage i, that belongs to pool s(i), and time t, where time is the *pool cutoff quarter date*, I use the following specification:

$$y_{i,s,t} = \alpha_i + \alpha_{t,s(i)} + \sum_{k \neq 0} \beta_k \times \textit{Green Home}_i \times \mathbb{1}_k + \varepsilon_{i,s,t} \tag{2}$$

This specification is identical to that of Equation (1), except for the addition of mortgage fixed effects (α_i). Standard errors are clustered at the mortgage level.

Together, the DiD design and rich fixed effect structure rule out a wide set of alternative explanations, ranging from securitization composition, bank-level policies, to regional housing cycles, thereby strengthening the causal interpretation of the estimated green–brown financing wedge. Nevertheless, I also use a triple difference identification strategy, which I will elaborate on below.

Triple-Difference Identification Strategy: A potential concern with the baseline identification strategy is that the gas price shock may affect the risk of green and brown mortgages through channels unrelated to the energy efficiency of the home. For example, if post-war policy interventions disproportionately subsidize green mortgages, observed declines in green mortgage rates could reflect differential government support rather than differences in than energy-efficiency.

To address this concern, I implement a triple-difference design exploiting cross-regional heterogeneity in natural gas dependence. The key advantage of this design is that it al-

lows me to include green-home × time fixed effects, which absorb any nationwide, time-varying shocks that differentially affect green and brown borrowers—such as subsidies, regulatory changes, or shifts in lender preferences toward green assets. Identification, therefore, comes from differential changes in green–brown mortgage rate spreads across regions with high versus low gas dependence.

The validity of this approach relies on the existence of cross-regional heterogeneity in natural gas dependence. Appendix Figure IA.2 shows that average annual household gas consumption varies markedly across NUTS-3 regions in the Netherlands. The difference between regions at the 90th and 10th percentiles is approximately 45%, indicating substantial heterogeneity in exposure to the energy price shock.

4 Results

My first set of tests examines the effect of gas price shocks on mortgage interest rates for green (EPC A) vs. brown (EPC B-G) homes. If price energy efficiency is not priced into mortgages, then the gas price shock will not affect interest rates. However, if the increase in lower credit risk lowers the interest rate on mortgages. On the other hand, if demand for these homes increases, lenders may increase interest rates.

I find that mortgage interest rates on green homes decline sharply and persistently relative to brown homes following the 2022 energy price shock. A DiD specification shows that green mortgage rates fall by about 3% beginning in 2022Q1, with no evidence of pre-trends. Three complementary tests confirm that this differential repricing reflects energy efficiency rather than correlated borrower demand or policy changes. First, progressively broadening the definition of green homes from EPC A to lower-efficiency categories reveals a monotonic attenuation of the effect, indicating that the pricing response is concentrated among the most energy-efficient properties. Second, a regression discontinuity around the Nord Stream pipeline sabotage—an abrupt and plausibly exogenous escalation of European gas prices—shows an immediate decline in green mortgage rates that

is absent for brown homes. Third, a triple-difference design exploiting regional variation in natural-gas dependence demonstrates that the green rate reduction is significantly larger where energy efficiency is most valuable. Together, these tests provide consistent evidence that lenders reprice mortgage contracts in response to changes in the energy efficiency of the collateral.

Table 2 reports the baseline DiD estimates of the effect of the energy price shock on mortgage interest rates for green relative to brown homes. Column (1) shows that, following the shock, interest rates on green mortgages decline by about 3.1 % relative to brown mortgages. Column (2) addresses the concern that differential regional housing market dynamics drive the results by absorbing NUTS3-by-quarter fixed effects; the estimated effect remains virtually unchanged. Column (3) further controls for lender-by-quarter fixed effects to account for time-varying lender-specific pricing policies or credit supply shifts; the estimate remains stable. Across all specifications, the coefficient on Post $\times$ Green Home is negative, highly statistically significant, and tightly estimated, with magnitudes ranging from 3.1 to 3.7 %, indicating a robust relative decline in interest rates on green mortgages after the energy price shock.

Figure 2 plots quarterly differences in the log of mortgage interest rates between green and brown homes. The coefficients exhibit no pre-trend in the six quarters leading up to 2022Q1, providing reassuring evidence that green and brown mortgage rates evolved in parallel before the event. Starting in 2022Q1, the differential turns negative, indicating that green mortgage rates decline (relative to brown mortgage rates). The magnitude of the effect grows over the subsequent quarters, reaching a stable difference of roughly after about one year. This pattern suggests that the pricing wedge is persistent rather than transitory, consistent with a structural shift in the way lenders price green versus brown mortgages.

Broadening green home definition: I next examine how the interest rate response varies with the stringency of the green home definition. If mortgage rate adjustment is

related to energy efficiency, the effect should be strongest when green homes are defined narrowly as the most energy-efficient properties and should decline as the definition is expanded to include less efficient homes. A monotonic attenuation in the estimated effect would be consistent with the notion that the observed interest rate reductions are driven by energy efficiency rather than by unobserved differences across borrowers or policies.

Figure 3 implements this exercise using the same specification as column (1) of Table 2, while progressively expanding the definition of green homes from EPC A only to EPC A–B, EPC A–C, and ultimately EPC A–F, with all remaining properties in each specification classified as brown. The estimated decline in mortgage rates is largest under the most restrictive definition and attenuates steadily as less energy-efficient homes are included. This monotonic attenuation indicates that changes in mortgage interest rates are concentrated among the most energy-efficient properties, consistent with mortgage rates reflecting energy efficiency.

Nord Stream pipeline sabotage: Figure 4 plots the evolution of average mortgage interest rates for green and brown homes over a 60-day window surrounding the Nord Stream pipeline sabotage on September 26, 2022 (vertical line). The sabotage led to a sharp and permanent increase in European natural gas prices, creating a plausibly exogenous shock to the relative value of energy-efficient housing. Panel (A) shows a visible decline in interest rates on green mortgages immediately following the event, consistent with lenders lowering the cost of financing energy-efficient properties as their energy-saving attributes became more valuable in the new high-price environment.

Panel (B) shows that interest rates on brown mortgages also decline slightly after the event, but the magnitude of the reduction is notably smaller and less persistent than for green mortgages. This divergence suggests that the market response was concentrated among homes with the highest energy efficiency. The contrast between Panels (A) and (B) is consistent with the interpretation that the event shifted lender pricing in a way that favors green collateral, rather than reflecting a general repricing of mortgage credit.

Triple Difference: I now turn to the results of this regional heterogeneity analysis, which leverages the fact that natural gas dependence varies substantially across regions to assess whether the decline in green mortgage rates following the energy price shock is systematically stronger where energy efficiency is most valuable. A key advantage of this design is that it allows me to include green-home × time fixed effects, which absorb any nationwide, time-varying shocks that differentially affect green and brown mortgages, for instance, changes in government support.

Table 5 examines whether the decline in mortgage interest rates for green homes is stronger in regions more exposed to natural gas price shocks. The first row shows that, on average, green mortgage rates fall by about 1.9–2.6 percent in logs relative to brown mortgages after 2022Q2, consistent with earlier results. The second row introduces an interaction with a dummy for high natural gas dependence, and the coefficients remain negative and statistically significant across all specifications. The magnitudes are larger than the baseline, indicating that the rate reduction is more pronounced in areas with higher reliance on natural gas. These results support a triple-difference interpretation: the effect of the shock on green–brown rate spreads is amplified in regions where energy efficiency is most valuable, reinforcing the conclusion that lenders' pricing response is tied to the collateral's energy-saving attributes.

Figure 7 shows that the decline in relative mortgage rates is most pronounced in regions with higher NUTS3-level gas dependence, with no evidence of differential pre-trends. The green–brown spread becomes increasingly negative in the quarters following 2022Q1, consistent with lenders adjusting pricing more aggressively for energy-efficient collateral precisely where energy savings are most valuable. This pattern reinforces our interpretation that the observed repricing is driven by the collateral channel, rather than differences in borrower composition or demand-side behavior.

Change in borrower characteristics : An important alternative explanation for the decline in mortgage interest rates is that borrower characteristics changed after the event,

rather than lenders repricing green collateral. If green homebuyers after 2022Q2 had systematically higher income or better credit profiles, we might observe lower interest rates even without any change in collateral risk. To rule out this selection channel, we examine borrower income as a proxy for borrower quality.

Table IA.1 in the Appendix reports regressions of borrower income on the interaction between a post-2022Q2 dummy and the green-home indicator. Across all specifications, the coefficients are small, negative, and statistically insignificant, indicating no systematic change in borrower income for green relative to brown homes after the event. This finding suggests that borrower composition did not shift in a way that could explain our main result, reinforcing the interpretation that the observed decline in interest rates reflects lenders' reassessment of collateral risk rather than changes in borrower quality.

Taken together, these results show that the energy price shock led lenders to systematically favor energy-efficient collateral. The decline in mortgage rates is concentrated among the most efficient homes, appears precisely when energy costs rise, and is strongest in regions where energy savings matter most. This pattern is difficult to reconcile with shifts in borrower demand or broad credit conditions and instead points to a repricing of mortgages based on the energy efficiency of the underlying property.

5 Mechanisms

This section shows that the decline in mortgage rates for energy-efficient homes following the energy price shock reflects both improved borrower fundamentals and lenders' institutional incentives. Green mortgages exhibit significantly lower default rates in the post-period, indicating that lower utility expenditures improve household cash flow and repayment capacity. At the same time, green homes appreciate more than comparable brown homes, implying that energy efficiency becomes increasingly capitalized into collateral values when energy prices rise. These improvements in borrower risk and collateral quality translate into stronger pricing responses for refinance loans—where higher

home values directly relax borrowing constraints—and are attenuated in regions with stronger intrinsic demand for green housing. On the supply side, lenders facing greater investor and stakeholder pressure through climate-alliance participation reduce green mortgage rates more aggressively, while access to green securitization markets plays no meaningful role. Together, the evidence points to a mechanism in which energy efficiency improves both cash flow and collateral values, and these effects are transmitted to credit prices primarily through lender incentives rather than funding-cost advantages.

Default: Table 3 reports the effect of the energy price shock on mortgage default. Across all specifications, the effect is negative and highly significant, indicating that default rates on green mortgages decline relative to brown mortgages after the shock. The magnitude of the estimates ranges from 2.4 to 3.2 basis points (on a percentage-point scale), and the results remain robust to the inclusion of region-by-quarter and lender-by-quarter fixed effects. These findings suggest that households in energy-efficient homes experience improved repayment performance in the post-period, consistent with the hypothesis that lower utility expenditures free up cash flow and reduce the probability of default.

Figure 5 plots the quarterly difference in default between green and brown homes. Prior to 2022Q1, default rates for green and brown mortgages moved closely in parallel, supporting the parallel trends assumption. Following 2022Q1, default rates on green mortgages decline relative to those on brown mortgages, with the effect becoming more pronounced and persistent over time. This pattern is consistent with the hypothesis that households in energy-efficient homes face lower utility expenditures, freeing up cash flow and reducing their probability of default.

Home values: One possibility is that the improved loan performance we observe is unrelated to changes in collateral values, perhaps because property prices do not respond to the shock. Some studies document limited capitalization of energy-efficiency attributes into house prices, suggesting that the benefits of lower utility expenditures could accrue

entirely through improved household cash flow. To assess this possibility, we first examine how relative home values evolve in the post-period.

Table 4 reports the effect of the post-2022Q2 period on the relative values of green versus brown homes. Across all specifications, the interaction term is positive and highly significant, indicating that green homes appreciate more than brown homes after the shock. The estimated effect implies that green homes gain roughly 0.6–0.8 percent more in log home values relative to brown homes, depending on the set of fixed effects included. The magnitude of the coefficient remains stable when controlling for region-by-quarter and lender-by-quarter fixed effects, suggesting that the result is not driven by regional price trends or lender composition. Overall, the table shows that the market capitalization of energy efficiency attributes increased following the shock, consistent with the view that energy efficiency became more valuable during a period of elevated energy prices.

Figure 6 shows the estimated quarterly difference in the log of home values between green and brown homes. The estimates reveal no systematic differences prior to 2022Q1, supporting the validity of the parallel trends assumption. Beginning in 2022Q1, green homes appreciate more rapidly than brown homes, with the differential rising steadily for several quarters before stabilizing at roughly 1 percent in log terms. This pattern indicates that the relative value of green homes increased in the post-period, consistent with growing market capitalization of energy-efficiency attributes during a period of elevated energy prices.

Borrower heterogeneity: I examine two borrower-side dimensions that may shape the pricing of green mortgages: loan purpose and local pro-environmental preferences. If lenders are responding primarily to the collateral value of energy-efficient homes, the interest-rate response should be stronger for refinance loans, where higher collateral values directly relax borrowing constraints, than for purchase loans, where higher home prices instead raise financing needs. At the same time, in regions where households exhibit stronger intrinsic demand for energy efficiency, lenders should cut green mortgage

rates by less, because pricing is less elastic when borrowers are already willing to pay for greenness.

Table 6 tests these predictions. Columns (1) and (2) show that the decline in mortgage interest rates is significantly larger for refinance loans than for purchase loans across specifications. This pattern supports the interpretation that lenders are capitalizing the improved collateral value of green homes into lower borrowing costs, rather than simply responding to shifts in borrower demand.

To capture variation in pro-environmental preferences across regions, I use Green Party vote share at the NUTS-3 level, constructed from national and European parliamentary election results reported in Schraff et al. (2023). Columns (3) and (4) show that in areas with stronger green political support, the interest-rate discount on green mortgages is smaller, consistent with lenders facing less price sensitivity when borrowers already place a higher value on energy-efficient housing.

Lender heterogeneity: Table 7 evaluates two lender-side mechanisms that could drive lower interest rates on green mortgages: investor pressure and access to cheaper green funding. To proxy for investor pressure, I use banks' participation in major climate alliances identified in Gasparini and Tufano (2025). The Climate Alliance Dummy equals one if a lender belongs to at least 6 of the 11 major alliances during the sample period, corresponding to approximately the top quartile of membership intensity. Columns (1) and (2) show that alliance banks cut interest rates on green homes more aggressively than non-alliance banks, consistent with lenders responding to external stakeholder and investor incentives to favor energy-efficient collateral. Appendix Figure IA.4 plots the estimated interaction coefficients separately for lenders participating in each climate alliance.

I next test whether access to cheaper green funding explains the pricing differential using lenders' issuance of green asset-backed securities. The Green ABS dummy equals one if the lender has issued green-labelled RMBS during the sample period, where the green label—assigned by the data provider—indicates pools dominated by high-efficiency (A-

rated EPC) mortgages.[3] Columns (3) and (4) show that this interaction is small and statistically insignificant, implying that lenders with access to green securitization markets do not reduce green mortgage rates more than other banks.

6 Additional Results

Back of the envelope calculation: while rising prices raise home values by €1,760, green homes enjoy €500 in annual utility savings and €211 in annual interest savings. Discounting the latter yields a present value of €9,170, five times the increase in home value. Combined, these savings represent a meaningful gain relative to after-tax median income (€38,000), reinforcing the interpretation that lenders respond to both improved credit quality related to the collateral.

Green home construction: So far, the paper shows that higher energy prices increase the value of energy efficiency in housing. A natural follow-up question is whether property markets respond by constructing more energy-efficient homes.

Figure 8 plots the estimated coefficients from a regression of a green-home indicator (multiplied by 100) on interactions between construction-year dummies and NUTS-3–level natural-gas dependence. The coefficients are normalized to zero in the base year and reported with 95% confidence intervals. We find that in regions more dependent on natural gas, the share of green homes rises sharply in post-war construction, with no evidence of differential pre-trends. This pattern indicates that higher expected energy savings strengthen incentives to invest in energy-efficient building technologies, leading to greater adoption of green construction in gas-intensive regions over time.

7 Conclusion

This paper investigates how energy price shocks shape the financing costs of energy-efficient homes. Using detailed loan-level data from the Dutch mortgage market linked

[3] Green RMBS consists primarily of mortgages backed by properties with EPC labels of A.

to regulator-certified EPC ratings, I exploit the surge in natural gas prices following the Russian invasion of Ukraine as a plausibly exogenous shock. Across a DiD design, a triple-difference specification exploiting variation in regional gas dependence, and a regression discontinuity around the Nord Stream sabotage, I consistently find that lenders lower interest rates on green homes relative to brown homes. I further show that this repricing is stronger for more energy-efficient properties, more pronounced in refinance loans where collateral matters most, and amplified among banks subject to investor climate commitments. On the borrower side, default rates decline. Together, these results provide causal evidence that energy efficiency is priced in mortgage contracts.

While the findings of this paper primarily contribute to the climate-finance literature, energy costs are becoming an increasingly important economic margin for two reasons. First, the rapid expansion of AI-driven data centers is creating a large and persistent source of electricity demand in advanced economies (International Energy Agency, 2025). Second, rising geopolitical tensions raise the risk of renewed energy price shocks.

This paper's findings have important distributional implications. Findings show that green homes are disproportionately owned by higher-income households, presumably because they are more expensive, and given that housing is the primary asset for most households, the benefits of energy efficiency are likely concentrated among wealthier segments of the population. Lower utility expenses and cheaper credit reduce the user cost of housing for green-home owners, leading to price appreciation and improved refinancing terms for existing owners and lower financing costs for new buyers. Together, these effects amplify the wealth gains to households that already own or purchase energy-efficient homes. Consequently, climate policies that raise energy prices—such as carbon taxes or cap-and-trade systems—may have regressive distributional consequences (Känzig, 2023; Bigio et al., 2025), exacerbating wealth inequality by disproportionately benefiting higher-income, green-home owners while imposing higher utility costs on households living in less efficient properties.

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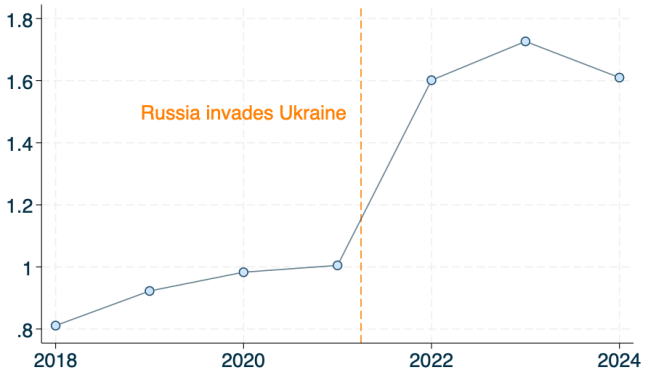
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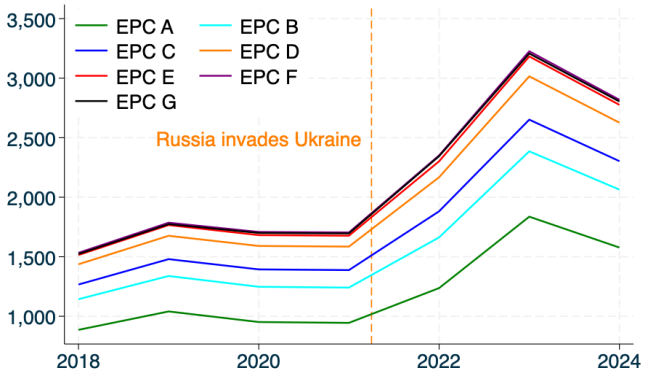
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Figure 1: **Gas Prices and Annual Utility Expenditure by EPC**

Panel (A) plots the average gas price in euros per cubic meter from 2018 to 2024. The vertical dashed line marks the first quarter of 2022, corresponding to the onset of the Russia–Ukraine war. Panel (B) shows annual utility expenditure in euros for a 100 square meter home, reported separately by EPC rating from 2018 to 2024.



(A) Gas price (€/m^3)



(B) Annual utility expenditure by EPC (€)

Figure 2: **Effect of Energy Price Hike on Green vs. Brown Mortgage Interest Rates**

This figure plots the estimated effect of the energy price hike on mortgage interest rates for green relative to brown homes, with 95% confidence intervals. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors are clustered at the mortgage level. The x-axis is in quarters, and the vertical dashed line indicates the first quarter of 2022 (quarter 0).

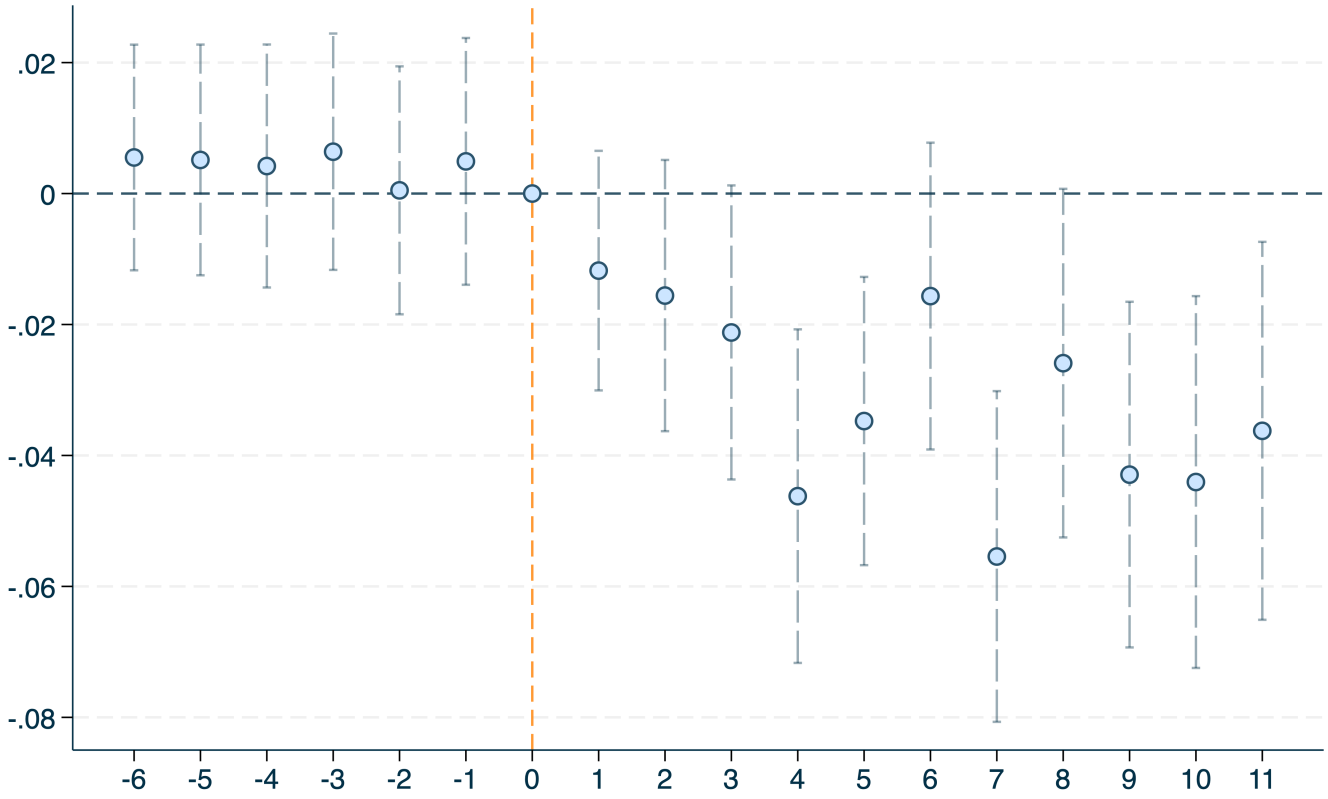


Figure 3: **Effect of Energy Price Hike on Mortgage Interest Rates: Role of EPC Rating**

This figure plots the estimated effect of the energy price hike on mortgage interest rates for alternative definitions of green properties, with 95% confidence intervals. The baseline definition includes only A-rated homes; subsequent categories expand to include A–B, A–C, and so on, up to A–F (excluding G). In each case, brown properties are defined as all remaining EPC categories not included in the green group. Standard errors are clustered at the mortgage level.

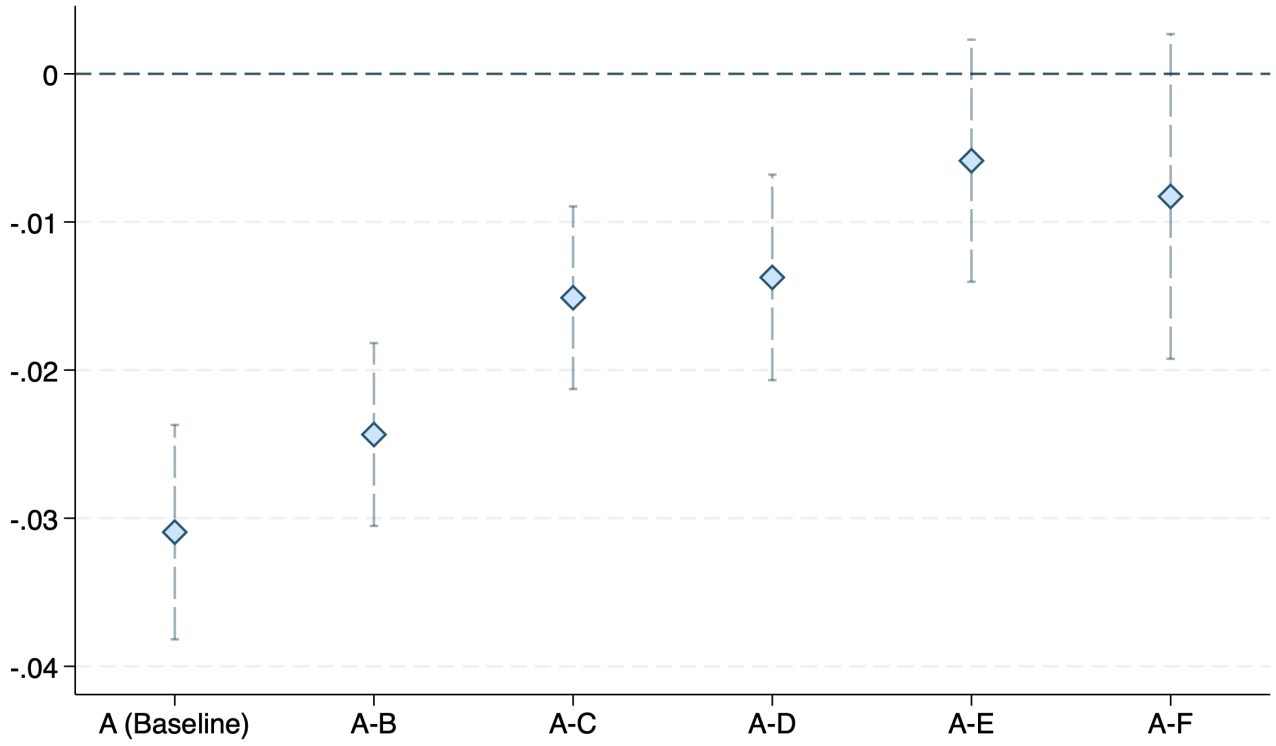
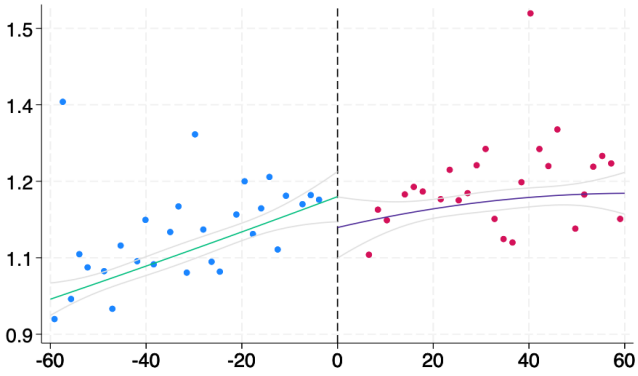
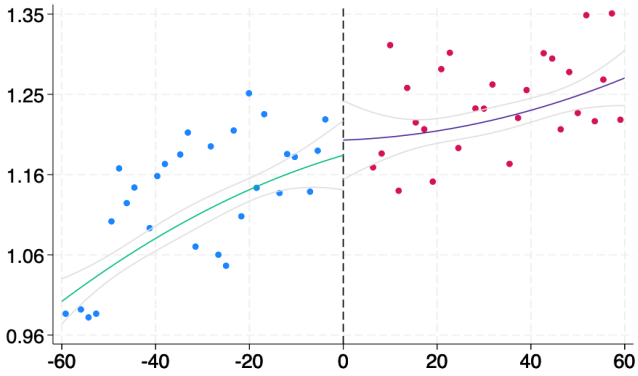


Figure 4: **Green vs. Brown Mortgage Interest Rates Around the Nord Stream Sabotage**

This figure plots average mortgage interest rates over a 60-day window centered on September 26, 2022, the date of the Nord Stream pipeline sabotage (vertical line). Panel (A) reports rates for green homes, and Panel (B) reports rates for brown homes. Day 0 corresponds to September 26, 2022.



(A) Green home interest rate (%)



(B) Brown home interest rate (%)

Figure 5: **Effect of Energy Price Hike on Green vs. Brown Mortgage Default**

This figure plots the estimated effect of the energy price hike on mortgage default for green relative to brown homes, with 95% confidence intervals. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors are clustered at the mortgage level. The x-axis is in quarters, and the vertical dashed line indicates the first quarter of 2022 (quarter 0).

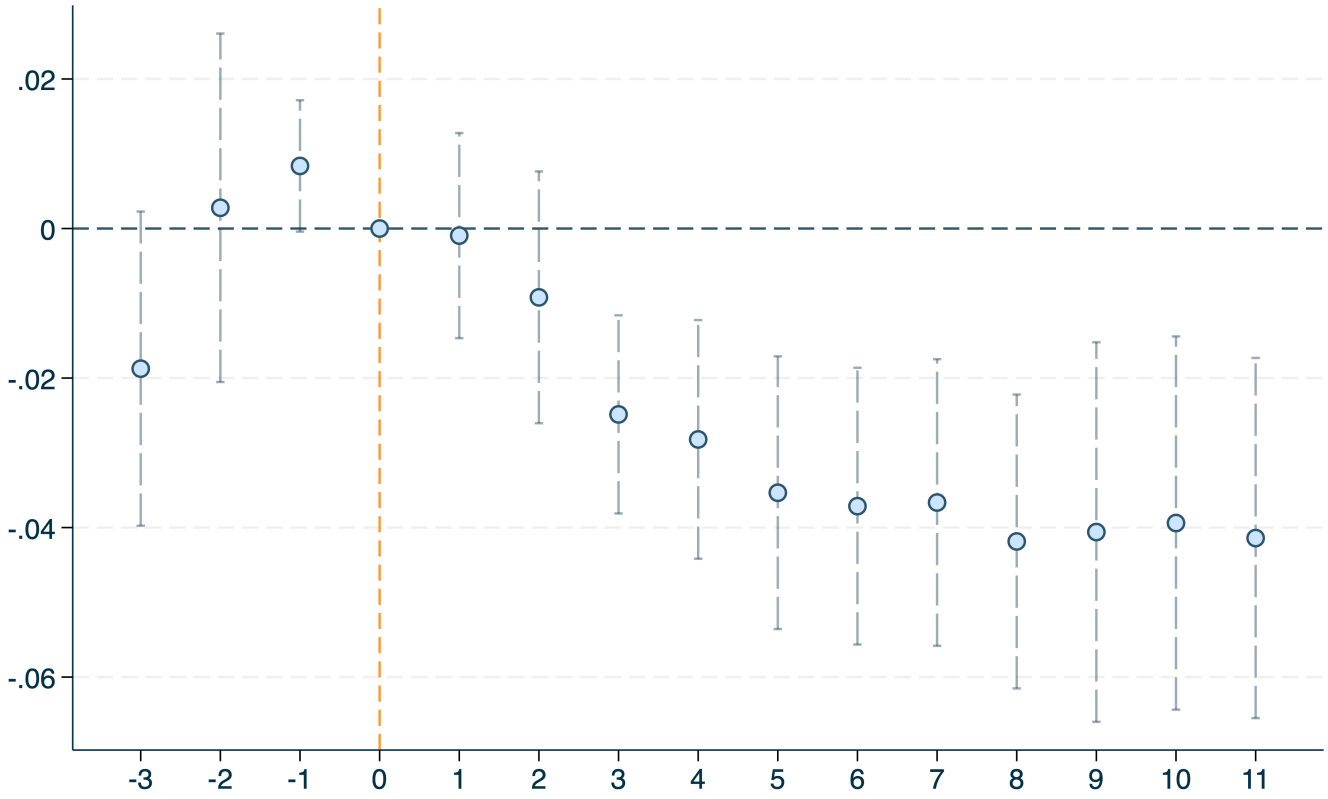


Figure 6: **Effect of Energy Price Hike on Green vs. Brown Home Values**

This figure plots the estimated effect of the energy price hike on home values for green relative to brown homes, with 95% confidence intervals. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors are clustered at the mortgage level. The x-axis is in quarters, and the vertical dashed line indicates the first quarter of 2022 (quarter 0).

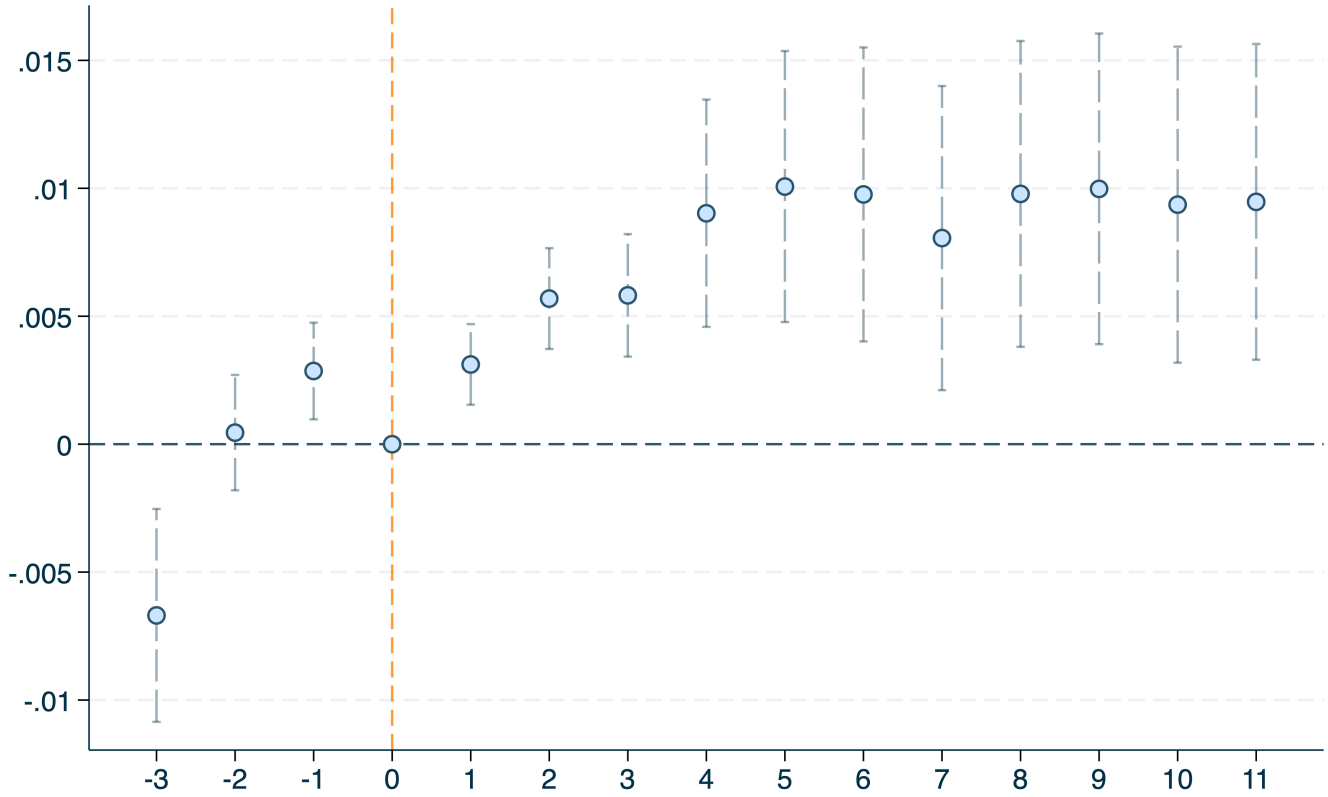


Figure 7: **Effect on Green vs. Brown Mortgage Interest Rates: Role of Regional Gas Consumption**

This figure plots the estimated effect of the energy price hike on mortgage interest rates for green relative to brown homes by regional gas consumption, with 95% confidence intervals. Regional gas consumption is the average annual residential natural gas use per home (private dwelling) at the NUTS-3 level. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors are clustered at the mortgage level. The x-axis is in quarters, and the vertical dashed line indicates the first quarter of 2022 (quarter 0).

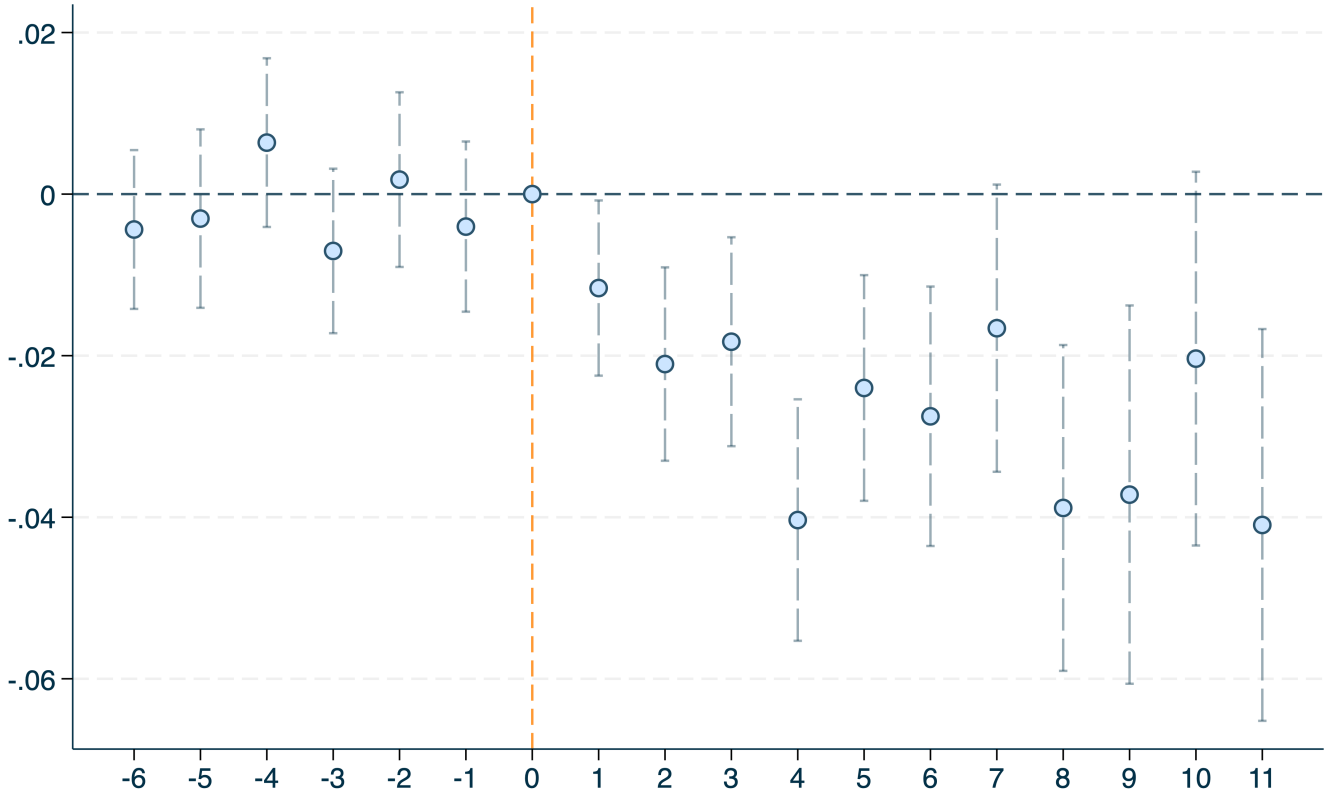


Figure 8: **The Effect of Energy Price Hike on Regional Green Home Construction**

This figure plots the effect of the energy price hike on green homes construction (green-home indicator × 100) by regional gas consumption, with 95% confidence intervals. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Regional gas consumption is defined as the average annual residential natural gas use per home (private dwelling) at the NUTS-3 level. Data on energy labels come from EP-Online, a public database maintained by the Netherlands Enterprise Agency (RVO) that covers all buildings in the Netherlands with a registered energy label. Standard errors are clustered at the NUTS-3 level.

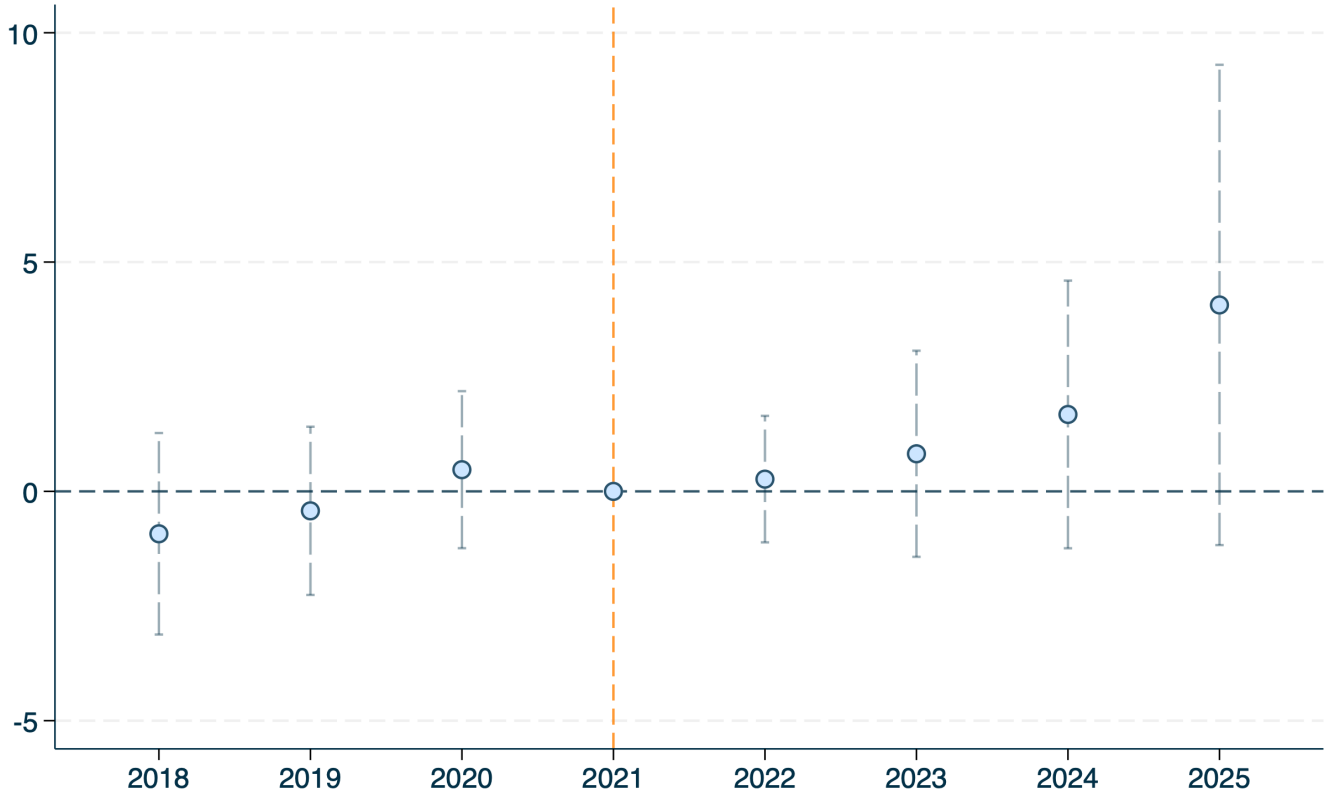


Table 1: **Summary Statistics**

This table presents summary statistics. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G.

	Obs.	Mean	Std. Dev.	50%
Property:				
Green Home (%)	163K	32.8	47.0	0
Value (000 €)	126K	220.4	188.5	175.9
Mortgage:				
Interest rate (%)	163K	2.3	1.2	1.8
Amount (000 €)	163K	121.9	118.6	90.5
LTV (%)	123K	66.1	31.3	70.8
Applicant:				
Income (000 €)	161K	56.9	35.0	49.3
DTI (%)	160K	12.4	14.3	7.9
Performance:				
Default (%)	3.96M	0.04	2.1	0

Table 2: **Effect of Energy Price Hike on Green vs. Brown Mortgage Interest Rates**

This table reports estimates of the effect of the 2022 energy price shock on mortgage interest rates. Post is an indicator equal to one for quarters after 2022Q1. Green home equals one if the property has an EPC rating of A (on a scale from A to G). Pool ID denotes the mortgage pool. Region corresponds to NUTS-3 geographic units in the Netherlands. Standard errors are clustered at the mortgage level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	log(Interest Rate)		
	(1)	(2)	(3)
Post × Green Home	-0.031***	-0.036***	-0.037***
	(0.0037)	(0.0038)	(0.0038)
Fixed Effects			
Pool ID × Quarter	✓	✓	✓
Region × Quarter	—	✓	✓
Lender × Quarter	—	—	✓
Observations	163,404	156,245	154,618

Table 3: **Effect of Energy Price Hike on Green vs. Brown Mortgage Default**

This table reports estimates of the effect of the 2022 energy price shock on mortgage default. Post is an indicator equal to one for quarters after 2022Q1. Default equals one from the first period a loan is reported in default. Green home equals one if the property has an EPC rating of A (on a scale from A to G). Pool ID denotes the mortgage pool. Region corresponds to NUTS-3 geographic units in the Netherlands. Standard errors are clustered at the mortgage level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	Default Dummy (×100)		
	(1)	(2)	(3)
Post × Green Home	-0.024***	-0.029***	-0.032***
	(0.0075)	(0.0068)	(0.0075)
Fixed Effects			
Loan ID	✓	✓	✓
Pool ID × Quarter	✓	✓	✓
Region × Quarter	—	✓	✓
Lender × Quarter	—	—	✓
Observations	3,960,241	3,817,356	3,726,678

Table 4: **Effect of Energy Price Hike on Green vs. Brown Home Values**

This table reports regressions estimating the effect of the energy price shock on home values. Post is a dummy variable equal to one for quarters after the first quarter of 2022. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors, clustered at the mortgage level, are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	log(Home Value)		
	(1)	(2)	(3)
Post × Green Home	0.0079***	0.0065***	0.0060***
	(0.0019)	(0.0020)	(0.0021)
Fixed Effects			
Loan ID	✓	✓	✓
Pool ID × Quarter	✓	✓	✓
Region × Quarter	—	✓	✓
Lender × Quarter	—	—	✓
Observations	3,895,204	3,756,115	3,674,894

Table 5: **Effect on Green vs. Brown Mortgage Interest Rates: Role of Regional Gas Consumption**

This table reports estimates of the effect of the 2022 energy price shock on mortgage interest rates by regional gas consumption. High Gas Consumption is an indicator equal to one if a NUTS-3 region's average annual residential gas use per dwelling is in the top tercile of the national distribution. Post is an indicator equal to one for quarters after 2022Q1. Green home equals one if the property has an EPC rating of A (on a scale from A to G). Pool ID denotes the mortgage pool. Region corresponds to NUTS-3 geographic units in the Netherlands. Standard errors are clustered at the mortgage level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	log(Interest Rate)		
	(1)	(2)	(3)
Post × Green Home	-0.019***	-0.026***	-0.025***
	(0.0041)	(0.0045)	(0.0045)
Post × Green Home × High Gas Consumption	-0.031***	-0.025***	-0.027***
	(0.0050)	(0.0062)	(0.0061)
Fixed Effects			
Pool ID × Quarter	✓	✓	✓
Region × Quarter	—	✓	✓
Lender × Quarter	—	—	✓
Observations	162,123	155,037	153,517

Table 6: **Effect on Green vs. Brown Mortgage Interest Rates: Role of Borrower Characteristics**

This table reports estimates of the effect of the 2022 energy price shock on mortgage interest rates by borrower characteristics. Refinance Dummy equals one if the loan purpose is remortgage and zero otherwise. Green party vote share is measured at the NUTS-3 level as the share of votes cast for Green parties, using election results from Schraff et al. (2023). Post is an indicator equal to one for quarters after 2022Q1. Green home equals one if the property has an EPC rating of A (on a scale from A to G). Pool ID denotes the mortgage pool. Region corresponds to NUTS-3 geographic units in the Netherlands. Standard errors are clustered at the mortgage level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	log(Interest Rate)			
	(1)	(2)	(3)	(4)
Post × Green Home	-0.025***	-0.030***	-0.0741***	-0.0737***
	(0.0040)	(0.0041)	(0.00785)	(0.0095)
Post × Green Home × Refinance Dummy	-0.025***	-0.028***		
	(0.0066)	(0.0067)		
Post × Green Home × Green Party Vote Share			0.004***	0.0035***
			(0.0006)	(0.0008)
Fixed Effects				
Pool ID × Quarter	✓	✓	✓	✓
Region × Quarter	—	✓	—	✓
Lender × Quarter	—	✓	—	✓
Observations	163,317	154,554	122,711	115,694

Table 7: **Effect on Green vs. Brown Mortgage Interest Rates: Role of Lender Characteristics**

This table reports estimates of the effect of the 2022 energy price shock on mortgage interest rates by lender characteristics. The Climate Alliance Dummy equals one if the lender is a member of at least 6 out of 11 major climate alliances during the sample period (corresponding to about the 75th percentile of membership). The Green ABS Dummy equals one if the lender issued a Green ABS during the sample period. Post is an indicator equal to one for quarters after 2022Q1. Green home equals one if the property has an EPC rating of A (on a scale from A to G). Pool ID denotes the mortgage pool. Region corresponds to NUTS-3 geographic units in the Netherlands. Standard errors are clustered at the mortgage level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	log(Interest Rate)			
	(1)	(2)	(3)	(4)
Post × Green Home	-0.023***	-0.031***	-0.030***	-0.036***
	(0.0045)	(0.0046)	(0.0038)	(0.0038)
Post × Green Home × Climate Alliance Dummy	-0.035***	-0.025***		
	(0.0082)	(0.0083)		
Post × Green Home × Green ABS Dummy			-0.0058	0.0014
			(0.014)	(0.014)
Fixed Effects				
Pool ID × Quarter	✓	✓	✓	✓
Region × Quarter	—	✓	—	✓
Lender × Quarter	—	✓	—	✓
Observations	163,317	154,554	163,317	154,554

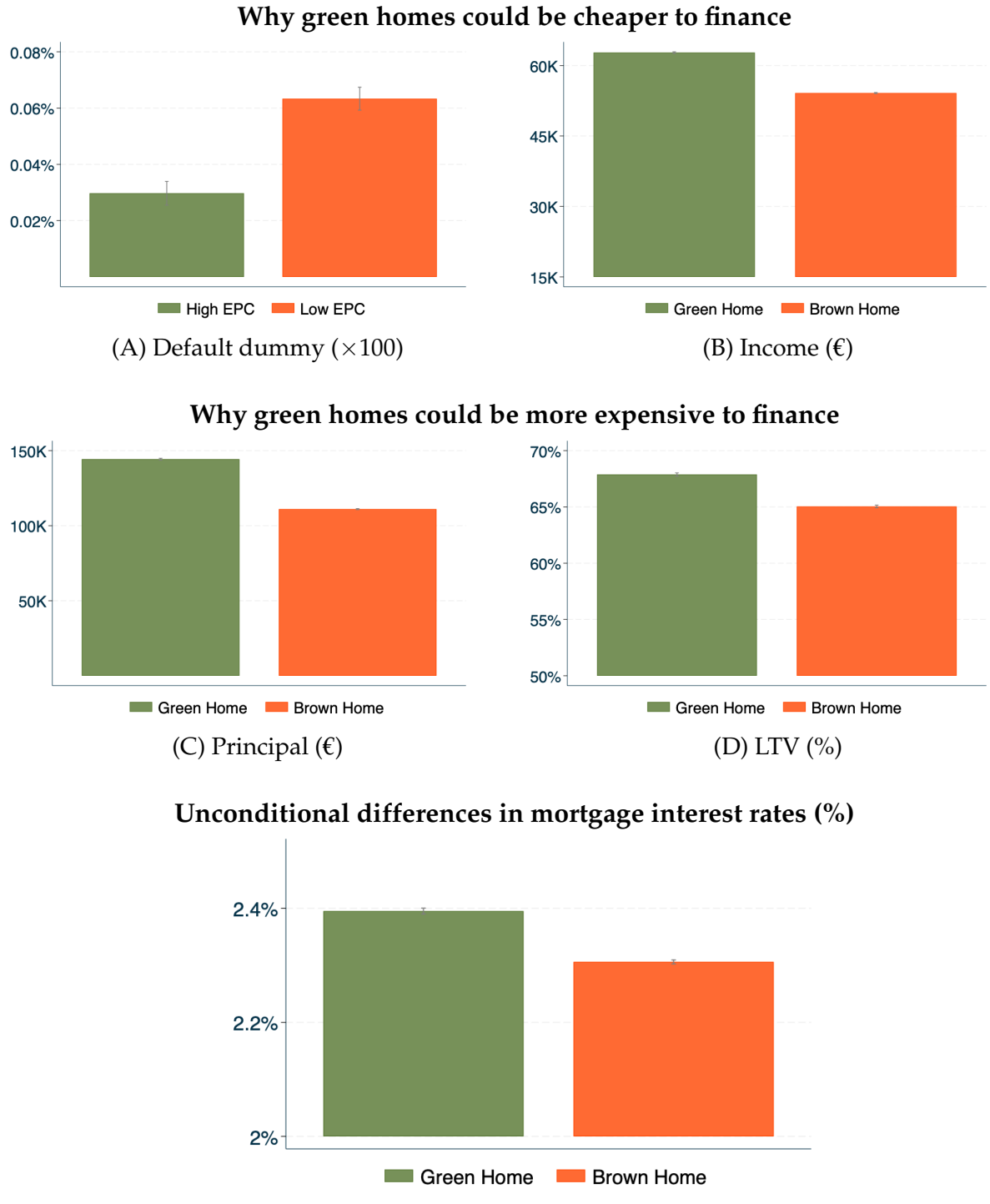
Internet Appendix

Financing Green Homes

A Appendix

Figure IA.1: **Unconditional Differences Between Green and Brown Mortgages**

This figure plots unconditional mean values of key mortgage and borrower characteristics for loans on green (green bars) and brown (orange bars) homes. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Panel (A) reports the default dummy (multiplied by 100), and Panel (B) reports the borrower income. Panel (C) reports principal values, and Panel (D) reports LTVs. The Panel in the bottom reports interest rates.



(A) Default dummy ($\times 100$)

(B) Income (€)

(C) Principal (€)

(D) LTV (%)

Figure IA.2: **Regional Variation in Natural Gas Consumption**

This figure shows the average annual residential natural gas consumption across NUTS-3 regions in the Netherlands in 2019, measured in cubic meters (m^3). Darker shades indicate greater dependence on natural gas, while lighter shades correspond to lower levels of consumption. Regions without available data are shown in white. The measure reflects natural gas use in residential homes (private dwellings).

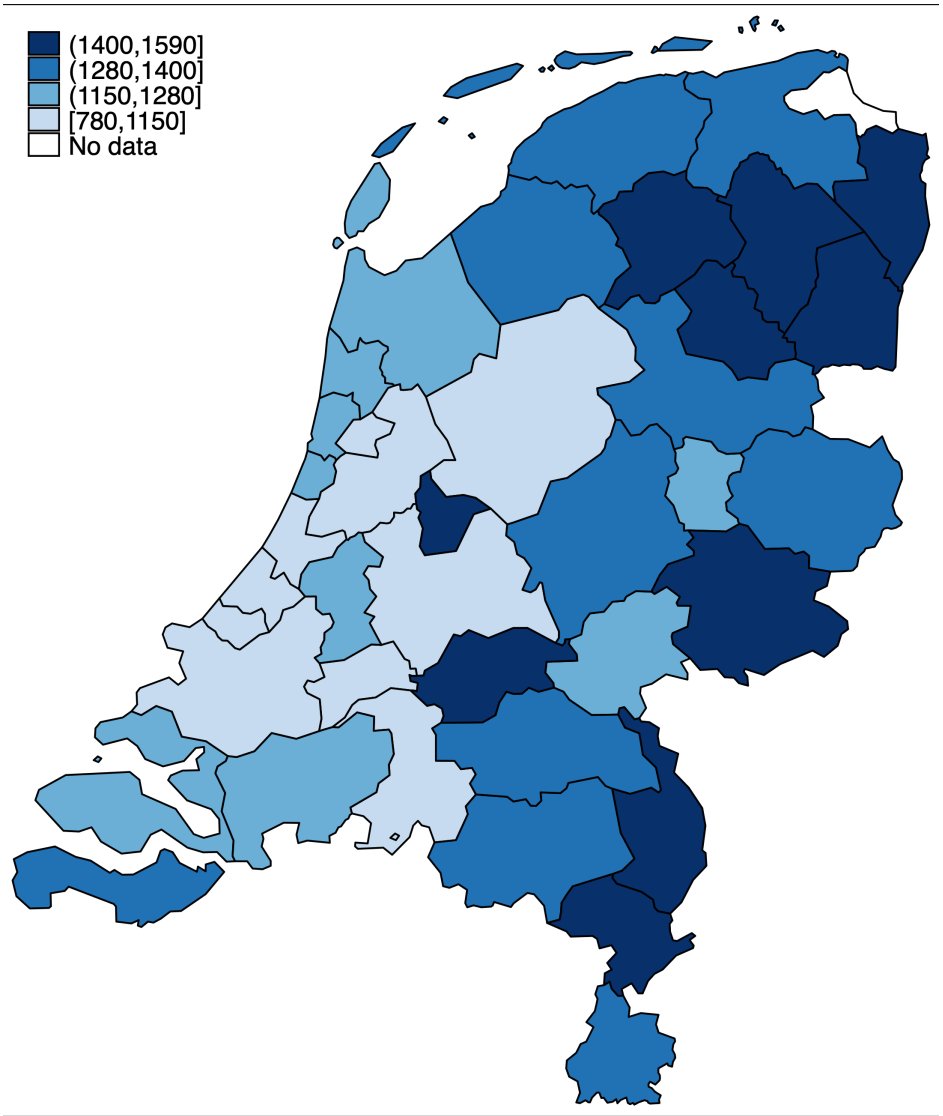
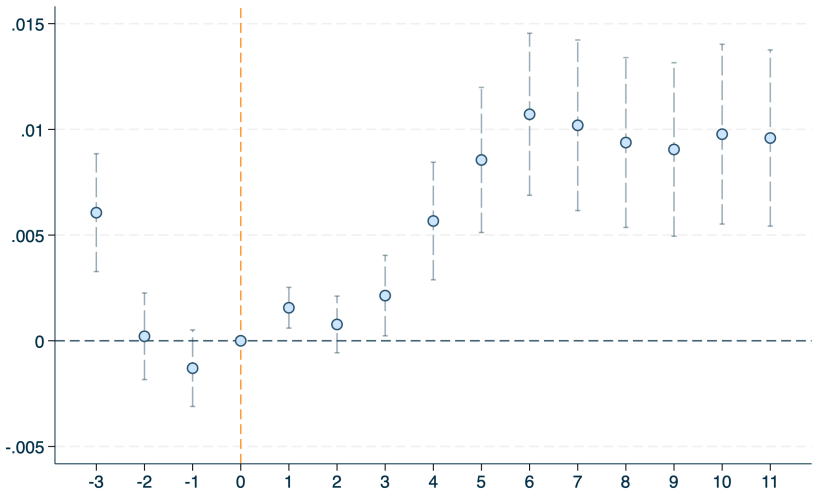
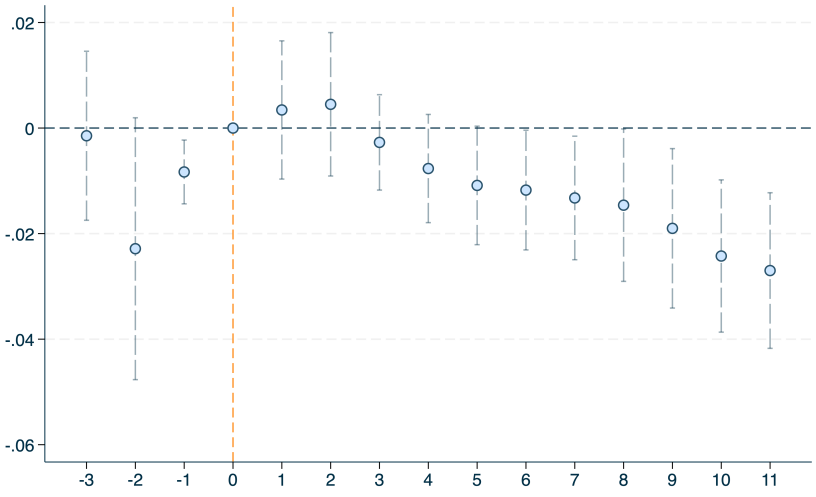


Figure IA.3: **Green vs. Brown Home Value and Mortgage Default by Regional Natural Gas Dependence**

This figure plots the estimated effect of the energy price hike on home values (Panel A) and mortgage default (Panel B) for green relative to brown homes by regional gas consumption, with 95% confidence intervals. Regional gas consumption is the average annual residential natural gas use per home (private dwelling) at the NUTS-3 level. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors are clustered at the mortgage level. The x-axis is in quarters, and the vertical dashed line indicates the first quarter of 2022 (quarter 0).



(A) log(home value) (%)



(B) Default dummy (×100)

Figure IA.4: **Effect on Green vs. Brown Mortgage Interest Rates: Role of Climate Alliances**

This figure plots the estimated effect of the energy price hike on mortgage interest rates for green relative to brown homes by climate alliance membership. Regressions are estimated separately for each alliance, with the climate alliance dummy equal to one if the lender was ever a member. The list of alliances follows Gasparini and Tufano (2025). Darker and lighter bars represent 95% and 99% confidence intervals, respectively. Green homes are defined as those with an EPC rating of A, and brown homes as those with ratings B–G. Standard errors are clustered at the mortgage level.

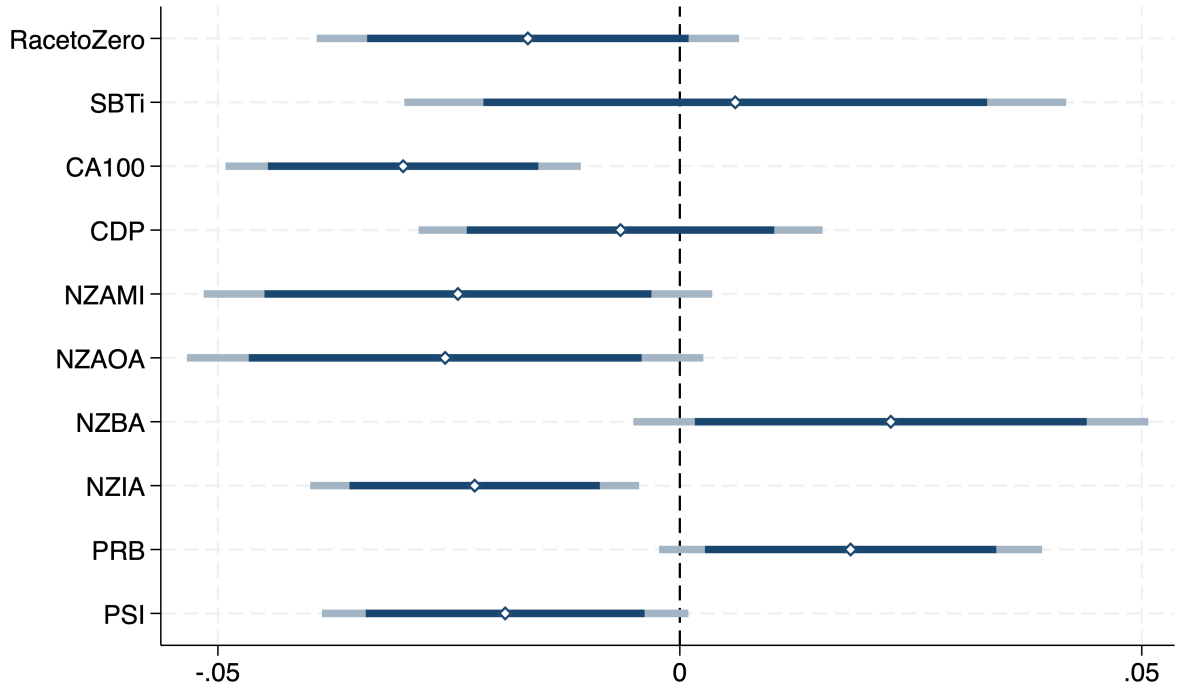


Table IA.1: **Borrower Income Composition for Green vs. Brown Homes Around the Energy Price Hike**

This table reports estimates of the effect of the 2022 energy price shock on mortgage borrower income. Post is an indicator equal to one for quarters after 2022Q1. Green home equals one if the property has an EPC rating of A (on a scale from A to G). Pool ID denotes the mortgage pool. Region corresponds to NUTS-3 geographic units in the Netherlands. Standard errors are clustered at the mortgage level and reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Dependent variable	log(Income)		
	(1)	(2)	(3)
Post × Green Home	-0.013	-0.014	-0.013
	(0.011)	(0.012)	(0.012)
Fixed Effects			
Pool ID × Quarter	✓	✓	✓
Region × Quarter	—	✓	✓
Lender × Quarter	—	—	✓
Observations	174,170	167,693	165,402