Environmental Certainty and Homeowner Investment: Evidence from Conservation Easements*

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Abstract

We study how resolving local land-use uncertainty affects household reinvestment. We assemble a nationwide panel linking single-family properties in Cotality to newly established conservation easements in PAD-US and compare homes very near an easement boundary to otherwise similar homes slightly farther away. Using property fixed effects and easement-by-year fixed effects in an event-study design, we find that homes within 100 meters of a newly formed easement experience an approximately 1.5–2% increase in assessed improvement value relative to homes 100–500 meters away, with no evidence of differential pre-trends and effects that attenuate with distance. The valuation response is mirrored by real investment behavior: by three years after formation, proximate homes are about 1.6 percentage points more likely to exhibit a change in total living area and about 1.6 percentage points more likely to change bedroom or bathroom configurations, with larger effects under a stricter adjacency definition. Heterogeneity by proxies for homeowners' relative focus on consumption versus resale value is consistent with a consumption mechanism rather than local amenity level or resale-driven effects. Together, the results indicate that reducing development uncertainty can trigger highly localized, gradual increases in reinvestment in the existing housing stock.

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1 Introduction

For most households, owner-occupied housing is the dominant component of wealth and a primary source of consumption through the flow of housing services (Campbell, 2006; Flavin and Yamashita, 2002; Piazzesi et al., 2007). This has made housing a central topic in household finance, with a large literature studying how housing wealth shapes portfolio choice, risk-taking, and financial decisions more broadly (Cocco, 2005; Sinai and Souleles, 2005; Chetty et al., 2017). Comparatively less is known, however, about how households decide to reinvest in these real assets. Unlike a firm investing in capital, a homeowner choosing to renovate or expand must weigh idiosyncratic tastes for the resulting housing attributes against the likelihood of recovering that investment at resale (Rosen, 1974; Choi et al., 2014; Giacoletti, 2021). We study how shocks that increase certainty about the surrounding environment shift this tradeoff, and with it homeowners' incentives to reinvest.

A key source of uncertainty for homeowners is the prospect of development on neighboring land. Whether an adjacent vacant parcel remains open or is converted to residential or commercial use can substantially affect the value of housing services and the returns to home improvements. We study how resolving this uncertainty affects homeowners' reinvestment decisions, using the establishment of nearby conservation easements as a setting that generates shifts in local land-use certainty. Conservation easements are voluntary, legally enforceable agreements between a landowner and a qualified conservation organization that permanently restrict development rights on private land, and are a widely used tool for conserving open space and supporting biodiversity conservation in the United States (Land Trust Alliance, 2020; Bahrami et al., 2025). Crucially, easements predominantly reflect the conservation, environmental, or legacy motives of the individual landowners rather than the preferences of adjacent homeowners (Kemink et al., 2021), who are not involved in private landowners' decisions to donate land for a conservation easement. When an easement is established on a neighboring parcel, it permanently forecloses future development, converting an uncertain land-use outlook into a credible and lasting commitment to open space.

To guide our empirical analysis, we sketch a simple framework for homeowner investment under uncertainty. A large literature shows that resolving uncertainty can accelerate irreversible investment (Bernanke, 1983; Abel and Eberly, 1994; Leahy and Whited, 1996; Bloom et al., 2007), but the homeowner setting differs from the standard firm-level framework in two important respects. First, the consumption payoff from a home improvement is idiosyncratic to the incumbent household and may not be fully transferable at resale, so the improvement may not be fully recouped in the

sale price. Second, moving risk—the household's probability of selling—creates a household-specific horizon that determines how much weight the household places on consumption versus resale payoffs. Households with lower moving risk place greater weight on the long-run consumption benefits of amenity-complementary upgrades, and so should respond more strongly when development uncertainty is resolved. Households with higher moving risk are more exposed to the risk of incomplete recoupment and so may respond less. We incorporate these features into our framework, which yields two main empirical predictions: easement formation should increase reinvestment on average, and this effect should be attenuated by moving risk. We test both predictions by examining the average investment response to nearby easement formation and its heterogeneity with respect to proxies for expected tenure.

To conduct these empirical tests, we combine nationwide information on conservation easement boundaries from the U.S. Geological Survey's Protected Areas Database (PAD-US) with property-level location and structural characteristics from Cotality to build a property-by-year panel for the 2010–2025 period. Since housing externalities decay quickly with distance (Rossi-Hansberg et al., 2010), our baseline sample focuses on single-family residential properties within 500 meters of an easement boundary. This window preserves meaningful variation in exposure to easement-induced certainty while limiting broader neighborhood differences. The resulting dataset links more than 62,000 properties to over 2,300 conservation easements nationwide and allows us to track the same properties before and after nearby land-use restrictions are imposed.

Our identification strategy leverages two complementary sources of variation: (i) cross-sectional differences in distance to the easement boundary, which govern the intensity of exposure to the resolved land-use outlook, and (ii) time-series variation at the moment an easement is established. We implement event-time specifications that interact proximity-to-boundary measures with indicators for years relative to formation, while including property fixed effects and easement-by-year fixed effects so identification comes from within-property, within-easement comparisons over time. Our main outcome is the annual value of recorded improvements in Cotality, which isolates assessor-reported changes in the structure component and is complemented by direct measures of physical investment, including changes in total living area and bedroom or bathroom configurations.

We find that conservation easement formation leads to a modest but economically meaningful increase in homeowner reinvestment in nearby properties. Homes within 100 meters of a newly formed easement experience an approximately 1.5–2% relative increase in assessed improvement value compared with homes located 100–500 meters away—equivalent to roughly $3,000 on the av-

erage property. The increase emerges around the time of easement formation and stabilizes over the subsequent two to four years, with no evidence of differential pre-trends. The effect attenuates with distance to the easement boundary and is robust across static and event-time specifications, alternative proximity measures, and estimation approaches including Poisson pseudo-maximum likelihood and linear models. These patterns are consistent with easement formation resolving highly local development risk in a way that changes the expected returns to reinvestment in existing structures. Consistent with the framework's predictions, the post-formation increase in improvement value is larger in areas with higher pre-period rates of home improvement and for longer-tenured households, but is attenuated in settings where resale considerations are more salient.

We conduct two additional tests to shore up this interpretation. First, a large literature shows that local land-use and environmental changes are capitalized into equilibrium house prices (Rosen, 1974; Chay and Greenstone, 2005; Rossi-Hansberg et al., 2010), raising the concern that our improvement-value results could reflect a broader amenity-level shock rather than incumbent reinvestment. We find no comparable discrete response in land values around easement formation, which is consistent with easements reducing the dispersion of future environmental states rather than shifting their mean, and argues against an interpretation based on immediate amenity capitalization.[1] Second, easement formation could alter moving risk by inducing ownership re-sorting, which would complicate the interpretation of our tenure-based heterogeneity results. We find no evidence of a discrete increase in sale probabilities following easement formation, ruling out interpretations based on short-run turnover or compositional changes in who owns proximate homes.

To verify that the improvement-value response reflects real investment activity rather than passive reassessment, we examine observable structural modifications recorded in annual Cotality updates. Over the window from $t = -1$ to $t = +3$, roughly 10% of properties exhibit a change in reported living area and about 6% record a change in bedroom or bathroom counts. These adjustments are about 1.6 percentage points more likely among homes within 100 meters of newly formed easements (with larger magnitudes under a stricter adjacency definition), and event-time evidence shows that physical adjustments build gradually in the years after formation, mirroring the dynamics of improvement values. Taken together, the heterogeneity patterns, the absence of land-value or turnover responses, and the real investment evidence point toward an environmental-certainty mechanism that operates through higher expected consumption value from amenity-complementary upgrades.

[1]Related work on reinvestment emphasizes neighborhood spillovers in maintenance and renovation (Pavlov and Blazenko, 2005; Helms, 2012; Irwin, 2019) and how neighborhood change affects the renovate-versus-teardown margin (Munneke and Womack, 2015).

Our study contributes to the literature on housing, collateral, and household finance (see, e.g., Schmalz et al., 2017; Defusco, 2018), which largely emphasizes price- and balance-sheet channels—including mortgage debt overhang and underinvestment (Melzer, 2017), the role of housing in household risk exposure and portfolio choice (Giacoletti, 2021), and transaction-induced spending on home-related durables and improvements (Benmelech et al., 2023). We bring the lens of investment under uncertainty—developed for irreversible corporate capital expenditure (Bernanke, 1983; Abel and Eberly, 1994; Leahy and Whited, 1996; Dixit and Pindyck, 1994; Bloom et al., 2007)—to owner-occupied housing, where reinvestment is lumpy, partially irreversible, and only imperfectly capitalized at resale (Choi et al., 2014). A key contribution is to show that the standard framework must be extended to account for idiosyncratic consumption payoffs and household-specific moving risk, both of which shape how households respond to resolved uncertainty in ways that have no counterpart in the firm-level literature. In line with real-options logic, we show that permanently resolving local development uncertainty is followed by a delayed but persistent increase in reinvestment, concentrated among households with longer expected tenure, consistent with a consumption-driven mechanism in which the option value of waiting declines as development risk is removed.

Our results also speak to work on local spillovers and the capitalization of neighborhood change in housing markets. A large body of research shows that environmental quality, public goods, and neighborhood conditions are reflected in hedonic equilibrium house prices (Rosen, 1974), with quasi-experimental evidence on price responses to pollution and other local shocks (Chay and Greenstone, 2005) and broader neighborhood externalities (Rossi-Hansberg et al., 2010). We complement this evidence by focusing on a comparatively less studied margin—homeowner reinvestment—where existing work emphasizes strategic complementarity and spillovers in maintenance and renovation (Pavlov and Blazenko, 2005; Helms, 2012; Irwin, 2019) and how neighborhood change shifts the renovate-versus-teardown decision (Munneke and Womack, 2015). We provide novel evidence that increases in certainty about the surrounding natural environment shift homeowners' property investment decisions.

Finally, because conservation easements are a key tool for biodiversity conservation, our findings relate to the growing literature on biodiversity finance and the pricing of environmental risk and conservation regulation. Existing work shows that biodiversity-related risks and regulation are priced across markets, often through direct impacts on regulated firms or land subject to conservation constraints (Bošković and Nøstbakken, 2017; Ferris and Frank, 2021; Giglio et al., 2023; Xin et al., 2023; Chen et al., 2024; Coqueret et al., 2024; Garel et al., 2024; Xiong, 2024; Akbari

et al., 2025; Sacher and Singla, 2025; Bahrami et al., 2025). We extend this emerging literature by documenting a spillover channel through which conservation actions by nearby private landowners reduce local development and environmental uncertainty and shift the reinvestment incentives of nearby homeowners. From a policy perspective, these results imply that biodiversity conservation can generate economically meaningful spillovers onto nearby developed land by changing private maintenance and renovation activity, which should be considered when evaluating the economic tradeoffs of conservation programs.

2 Conceptual Framework

Motivated by the tension discussed above, whereby local land-use certainty can differentially affect the consumption and recouped resale value of home investments, we sketch a simple framework for homeowner investment under uncertainty. The framework highlights two features of the homeowner setting that distinguish it from the standard investment-under-uncertainty literature on the firm-level: the incumbent household's consumption payoff is idiosyncratic and not fully transferable at resale, and moving risk creates a household-specific horizon that determines how much weight the household places on consumption versus resale payoffs. Together, these features yield predictions about both the average effect of resolving environmental uncertainty on investment and heterogeneity in that effect across households.

Setup. Time is discrete. A homeowner occupies a property and can undertake a lumpy, partially irreversible improvement of size $i \geq 0$ (e.g., renovation, structural expansion) at a one-time cost $C(i)$, with $C'(\cdot) > 0$ and $C''(\cdot) \geq 0$. Let H_t denote the effective housing stock (structural quality) at time t, which evolves with maintenance and improvements and is reflected in measures such as recorded improvement values, square footage, and room configurations observable in the data. For expositional simplicity, when an improvement is undertaken at t, the housing stock increases to $H_t + i$.

The surrounding environment is summarized by a state s_t capturing the local land-use and development outlook that matters for both the household's enjoyment of the property and the market valuation of the structure at resale.[2] Prior to a conservation easement, the evolution of s_t is uncertain. We model easement formation as a shock that primarily reduces uncertainty about future land-use and nearby development, that is, it shrinks the conditional dispersion of s_{t+k}, without

[2]We use s_t as a reduced-form summary of nearby land-use prospects and neighborhood conditions; in the empirical analysis, we focus on settings where the nearby parcel is already open/vacant at baseline.

requiring an immediate change in the mean amenity level. This assumption captures the idea that the nearby parcel can already be open at baseline, but its *future use* becomes more predictable when development rights are permanently restricted through the conservation easement.

Payoffs from an improvement: consumption vs. resale recoupment. An improvement generates two conceptually distinct payoffs. First, it raises the incumbent household's flow utility while the household remains in the home. Let the incremental per-period consumption benefit from improvement i be $b(i, s_t)$, where $b_i(i, s) \geq 0$ and where the marginal benefit may depend on the environmental state (e.g., a deck or outdoor upgrade is more valuable when nearby open space is credibly preserved). Second, if the household sells the home, the improvement can raise the sale price through a hedonic schedule determined by the marginal buyer. We write the incremental resale value of improvement i in state s as

$$\Delta P(i, s) \;=\; \rho(s)\, g(i), \tag{1}$$

where $g(i)$ is the contribution of the improvement to the market value of the home under full recoupment, that is, the increment to the sale price that would obtain if the marginal buyer valued the improvement as highly as the incumbent, and $\rho(s) \in [0, 1]$ is a recoupment rate capturing how much of that potential value is actually recovered at resale. The key role of $\rho(s)$ is to capture the possibility that a marginal upgrade is poorly recovered because the future buyer's preferences differ from the incumbent's chosen i. In other words, because $b(i, s)$ can be idiosyncratic to the incumbent household, it need not be fully capitalized in $\Delta P(\cdot)$ (see, e.g., Rosen, 1974; Choi et al., 2014; Giacoletti, 2021).

Moving risk and the weight on consumption vs. resale. Households differ in the weight that they place on consumption versus resale value of their home. Let $\lambda \in (0, 1)$ denote the household's per-period probability of moving (selling) which we conceive of as a reduced-form moving risk that may vary across households and properties. A higher λ places more weight on resale recoupment and less weight on long-run consumption benefits of improvements.

To see this transparently, consider the expected present value of a one-time improvement undertaken today. Under geometric moving risk and discount factor $\beta \in (0, 1)$, the expected discounted

sum of future consumption-flow weights is

$$W_C(\lambda) \equiv \sum_{t\geq 0} \beta^t (1-\lambda)^t = \frac{1}{1-\beta(1-\lambda)}, \tag{2}$$

while the expected discounted weight on the resale payoff is

$$W_R(\lambda) \equiv \sum_{t\geq 1} \beta^t \Pr(\tau = t) = \sum_{t\geq 1} \beta^t \lambda (1-\lambda)^{t-1} = \frac{\beta\lambda}{1-\beta(1-\lambda)}, \tag{3}$$

where τ is the (random) sale time. These expressions formalize a basic intuition: when λ is low (long expected tenure), the consumption channel is relatively important; when λ is high, the resale channel (and the associated risk of incomplete recoupment of improvements) is relatively important.

Combining (1)–(3), a convenient summary representation for the expected net payoff from choosing improvement size i is

$$\Pi(i;\lambda) \approx W_C(\lambda)\,\mathbb{E}[b(i,s)] + W_R(\lambda)\,\mathbb{E}[\rho(s)\,g(i)] - C(i), \tag{4}$$

where expectations are taken over future environmental states relevant for the household's occupancy and sale horizon.[3]

How does resolving environmental uncertainty affect investment? A conservation easement reduces uncertainty about future environmental states s and affects investment incentives through two objects in (4): the expected consumption payoff $\mathbb{E}[b(i,s)]$ and the expected resale recoupment $\mathbb{E}[\rho(s)g(i)]$.

Consumption channel. If upgrades are complements to preserved amenities, so that the marginal consumption benefit $b_i(i,s)$ is higher in states associated with open-space preservation, then resolving uncertainty raises $\mathbb{E}[b_i(i,s)]$ even if the mean state changes little on impact. Intuitively, certainty reduces the likelihood of adverse realizations in which development erodes the value of amenity-complementary improvements. In addition, because major upgrades are lumpy and partially irreversible, uncertainty generates an option value of waiting that is reduced when development risk is resolved (Bernanke, 1983; Dixit and Pindyck, 1994; Bloom et al., 2007). Both forces push toward higher investment, with effects that build gradually as households plan and execute upgrades.

[3]Equation (4) is a reduced-form representation intended to highlight the two margins and the role of moving risk. Appendix A provides a more explicit dynamic formulation and conditions under which (4) is an exact value comparison.

Resale recoupment channel. Resolving uncertainty can also shift $\mathbb{E}[\rho(s)]$, but the direction is theoretically ambiguous. If easement formation reduces the likelihood of states in which nearby development would have made an upgrade obsolete, recoupment rises and resale considerations reinforce investment. But if certainty shifts the composition of marginal buyers in ways that reduce their valuation of the incumbent's chosen improvements—for instance, toward buyers with strong location preferences but their own plans for reconfiguration—then $\mathbb{E}[\rho(s)]$ can fall. Because the net effect through the resale channel is unclear without additional assumptions, the consumption channel and its interaction with moving risk constitute the primary motivation for our empirical tests.

Role of moving risk. As (2)–(3) show, λ governs the relative weight households place on consumption versus resale payoffs. Households with higher moving risk are more exposed to incomplete recoupment: because they are more likely to sell before fully enjoying the consumption benefits of an upgrade, resale recoupment weighs more heavily in their investment decision. If easement formation does not fully resolve recoupment risk—for instance, because it shifts the buyer pool in ways that reduce $\mathbb{E}[\rho(s)]$ for incremental upgrades—then higher-λ households may invest less in response to the resolution of uncertainty, or not at all.

Testable implications. The framework yields two predictions. First, we expect easement formation to increase homeowner reinvestment on average, as resolving development risk raises the expected consumption payoff from amenity-complementary upgrades and reduces the option value of waiting. Second, this effect should be attenuated by moving risk: households with higher λ place greater weight on resale recoupment and less on long-run consumption benefits, so the investment response to resolved uncertainty should be weaker—and potentially absent—among households more focused on resale.

Two assumptions underlie this interpretation and, although not direct empirical implications of the model, motivate additional tests that shore up our interpretation of the results. First, easement formation should resolve uncertainty about future land use without directly shifting the level of local amenities—otherwise, investment responses could reflect a change in the mean (future) enjoyment of the property rather than a change in its predictability. If amenity levels were to shift discretely at easement formation, we would expect to see a corresponding change in land values, which capitalize neighborhood amenities, in addition to improvement values. Second, moving risk λ should itself be unaffected by easement formation—if easements systematically alter households' propensity to sell, then λ would be endogenous to the treatment, complicating the interpretation of tenure-based heterogeneity. We test both assumptions directly in the empirical analysis.

3 Data Sources and Sample Construction

To test the framework's predictions, we assemble a nationwide panel that links residential properties to nearby conservation easements. We combine annual property records from Cotality with spatial boundaries and establishment years of conservation easements from PAD-US. This section describes (a) how we identify the uncertainty-resolution events (nearby easement formation), (b) how we measure homeowner investment and tenure horizons, and (c) how we form the main estimation sample.

3.1 Key Data Sources and Variables

Conservation easements as uncertainty-resolution events. Our central measure of a change in surrounding environmental certainty is the establishment of a nearby conservation easement. Conservation easements are voluntary, legally binding agreements through which private landowners permanently restrict development rights, typically in partnership with a qualified conservation organization. These easements are recorded in the U.S. Geological Survey's Protected Areas Database (PAD-US), version 4.0. PAD-US provides GIS polygon boundaries and institutional attributes for all protected areas across the United States, including conservation easements, and their year of establishment. We restrict the easement universe in PAD-US to conservation easements with GAP status 1 or 2, which are permanently protected from conversion and managed primarily for biodiversity conservation, so that nearby easement formation corresponds to a clear and durable resolution of uncertainty about future development.

Nearby easement formation constitutes a discrete and persistent shift in the local set of feasible future land uses, consistent with the framework's notion of a change in the state variable s. Unlike zoning and other public land-use regulations, which can be set through political processes or respond to local economic trends, easements predominantly reflect land donors' conservation, environmental, or legacy motives and are less likely to be shaped by the preferences of adjacent homeowners (Kemink et al., 2021). This institutional structure, together with the permanence of easement restrictions, makes easement formation a useful setting to study how households adjust reinvestment when local land-use uncertainty is resolved.

Home exposure to easements. To identify homes that are proximate to newly formed easements, we employ Cotality's Historical Property database. This database provides a unique property identifier (CLIP), parcel attributes (e.g., acreage), and latitude–longitude coordinates of the parcel

centroid. Because Cotality does not update every parcel every year, we carry forward reported characteristics until an update appears in subsequent tax-roll records.

We form a property-by-year panel by linking single-family residential properties to nearby conservation easements. Specifically, we compute the Euclidean distance from each parcel centroid to the boundary of the nearest GAP 1–2 easement polygon in PAD-US. For each property, we retain (i) the identity of the nearest qualifying easement, (ii) the centroid-to-boundary distance, and (iii) the easement establishment year and institutional attributes. We then construct two complementary exposure indicators. *Proximate* equals one for properties located within 100 meters of the nearest easement boundary. *Likely Adjacent* equals one if the centroid-to-boundary distance is less than or equal to an acreage-implied distance cutoff: half the side length of a square with the same area as the parcel. This acreage-adjusted measure reduces sensitivity to centroid placement and provides a parsimonious proxy for true boundary adjacency.

Homeowner investment outcomes. We measure homeowner investment using annual information from Cotality over the 2010–2025 period. Our primary outcome is *improvement value*, which captures the assessed value of physical structures (dwellings and additions) separately from underlying land value. Because major improvements are costly and partially irreversible, changes in improvement value provide a value-based proxy for lumpy investment activity.

To complement value-based measures and to distinguish physical change from passive reassessment, we track discrete changes in reported square footage from tax-roll updates. Square-footage expansions capture economically meaningful additions and major structural renovations. We also observe changes in bedrooms and bathrooms, which proxy for substantial interior reconfigurations that may accompany or substitute for footprint expansions.

3.2 Sample Construction

We construct the estimation sample by merging Cotality's annual property panel with the PAD-US easement universe described above. The starting universe consists of all single-family residential properties observed in Cotality between 2010 and 2025 with valid geographic coordinates and nonmissing outcome variables.

We restrict attention to properties located within 500 meters of at least one GAP 1–2 conservation easement established in 2010 or later. For each property, we assign the nearest qualifying easement based on the centroid-to-boundary distance defined above and retain the associated estab-

lishment year. Properties without a qualifying easement within 500 meters are excluded. Merging this spatial linkage with annual investment outcomes yields a property-by-year panel in which each property is mapped to a specific nearby easement, its exposure distance, and event time relative to easement establishment. This panel forms the basis for the empirical analyses that follow.

3.3 Descriptive Statistics

Easements represent the majority of biodiversity conservation efforts over the past couple of decades. For instance, Bahrami et al. (2025) show that between 2010 and 2024 there have been over 11,000 conservation easements formed in the U.S., representing over two-thirds of the total newly formed biodiversity conservation areas. Figure 1 illustrates the widespread use of conservation easements across the U.S. as well as a slight concentration in the north-central part of the country.

[Insert Figure 1 about here.]

Approximately 25% of the 11,000 easements formed between 2010 and 2024 enter into our sample, which requires homes to be located within 500 meters of the easement's boundary. Figure B.1 plots the number of single-family residential properties located within 500 meters of each conservation easement boundary, conditional on entering our sample. Most conservation easements are associated with relatively few nearby properties, while a smaller subset lies in denser residential settings. Figure B.2 shows that this skew is mirrored by the average size of the easements in our sample.

Table 1 reports descriptive statistics for single-family residential properties in our main estimation sample, measured at event time $t = -1$, the year immediately prior to conservation easement formation. The table summarizes a cross-section of 62,052 residential properties located within 500 meters of a GAP 1 or GAP 2 conservation easement boundary. We refer to properties located within 100 meters of the boundary as *Proximate* (6,684 properties) and properties located between 100 and 500 meters as *Non-proximate* (55,368 properties). Reporting statistics at $t = -1$ characterizes the baseline property prior to easement formation.

[Insert Table 1 about here.]

Proximate properties have an average assessed improvement value of $138,433 (median $103,466; standard deviation $140,073), an average total assessed value of $206,923, and average square footage of 2,223. These figures are 5% to 10% larger than the corresponding statistics in the non-proximate

subsample. Proximate homes are about 4 years older on average and equally likely to be owner occupied. By construction, proximate properties are located closer to the conservation easement boundary, with an average distance of 55 meters, compared to an average distance of 323 meters for non-proximate properties. Approximately 21% of homes within 100 meters are *Likely Adjacent*, while virtually none of the homes outside that 100-meter band are designated as such. The conservation easements linked to proximate properties have an average size of 276 acres, compared to 205 acres for easements linked to non-proximate properties, with substantial dispersion in both cases. The average easement establishment year is 2016 for both proximate and non-proximate properties, consistent with our focus on easements formed after 2010 to ensure sufficient pre-formation observations.

4 Identification Strategy

The core idea underlying our empirical approach is that the formation of a conservation easement resolves uncertainty about future land use in the immediate surrounding area, with effects that attenuate with distance from the easement boundary. In this logic, residential properties located very close to a newly formed easement experience a larger change in certainty about nearby land use than properties located slightly farther away within the same local environment, even though both sets of properties are exposed to the same broader neighborhood-level and macroeconomic conditions. Accordingly, we use proximity to a newly formed conservation easement as a measure of the degree to which nearby residential properties are exposed to the resolution of local land-use uncertainty generated by easement formation.

This approach is consistent with evidence from the housing externalities literature documenting that local land-use changes generate spillovers that decay smoothly with distance. In particular, Rossi-Hansberg et al. (2010) show that housing externalities associated with urban development have a half-life of approximately 300 meters. Applying this decay rate to our setting implies that, within a 500-meter bandwidth, properties closest to the easement boundary experience substantially larger changes in exposure to easement-induced land-use certainty than properties located near the outer edge of the bandwidth. Importantly, our empirical strategy does not rely on sharp treatment–control comparisons, but instead exploits continuous spatial variation in exposure around the same easement boundary.

4.1 Primary Specification

Our primary specification estimates the effect of easement formation on nearby property outcomes using an event study design that combines event time with cross-sectional variation in proximity to the easement boundary. Let T_j denote the establishment year of easement j and define $Post_{j,t} = \mathbf{1}[t \geq T_j]$. We estimate:

$$\mathbb{E}[Y_{i,t} \mid \alpha_i, \beta_{j,t}] = \exp\Big(\alpha_i + \beta_{j,t} + \gamma\, Proximate_i \times Post_{j,t}\Big), \tag{5}$$

where $Y_{i,t}$ is an outcome for property i in year t (e.g., assessed improvement value), α_i are property fixed effects, and $\beta_{j,t}$ are easement-by-year fixed effects capturing any shocks common to all properties in the vicinity of easement j in year t. We estimate Equation (5) using Poisson pseudo-maximum likelihood (PPML), which accommodates skewed, nonnegative outcomes without logging and allows for high-dimensional fixed effects (Cohn et al., 2022). We also report OLS specifications using the same fixed effects structure for outcomes such as improvement value and square footage.

The main explanatory variable of interest in this baseline specification is the interaction between $Post_{j,t}$ and $Proximate_i$. In the simplest specification, these are both indicator variables: $Post_{j,t}$ is an indicator that takes the value of one in every year t starting with the formation of conservation easement j, while $Proximate_i$ is an indicator that takes the value of one if property i is located within 100 meters of the boundary of the nearest conservation easement j, and zero if it is located between 100 meters and 500 meters from this boundary. The property-level fixed effects absorb the main effect of $Proximate_i$, while the easement-by-year fixed effects absorb the main effects of $Post_{j,t}$. As a result of this fixed effects structure, identification comes from within-easement, within-property comparisons over time, isolating how property outcomes in the immediate vicinity evolve relative to those of slightly more distant properties when the easement removes local land-use uncertainty.

In alternative specifications, we relax these discrete definitions. To examine dynamic responses and assess the presence of pre-formation trends, we replace $Post_{j,t}$ with a full set of event-time indicators relative to the year of easement formation. We also replace the proximity indicator with a continuous measure of distance (in kilometers) from the property centroid to the easement boundary, allowing outcomes to vary smoothly with spatial proximity. Finally, we employ our *Likely Adjacent* indicator as a third measure of how sensitive a home is likely to be to the effects of easement formation. These specifications provide complementary evidence on both the timing and spatial decay of responses to easement formation.

4.2 Identifying Structural Changes

We implement a related strategy to study observable homeowner investment behavior by examining changes in residential structures around easement formation. In addition to analyzing total square footage as an outcome in Equation 5, we also analyze discrete adjustments to interior configurations, including changes in square footage as well as the number of bedrooms and bathrooms. In this analysis, the outcome is defined as an indicator equal to one if a residential property experiences any change in the relevant structural characteristic between the year prior to easement formation and three years later. We estimate regressions of the form:

$$\Delta Outcome_i^j = \beta_j + \gamma\, Proximate_i + \epsilon_i, \tag{6}$$

where $\Delta Outcome_i^j$ denotes the relevant within-property change indicator (e.g., any change in square footage, bedrooms, or bathrooms) for residential property i located near conservation easement j, and β_j denotes easement fixed effects. Because the outcomes are defined as within-property changes over a fixed horizon, time-invariant property characteristics are differenced out by construction. This specification isolates whether properties located closer to the easement boundary are more likely to undergo observable structural changes following the resolution of nearby land-use uncertainty.

As in the improvement value regressions, we estimate alternative specifications that replace the *Proximate* indicator with continuous distance to the easement boundary and our *Likely Adjacent* indicator. We also examine the timing with which any observed effects manifest by adjusting the years over which we measure structural changes. Throughout the analysis, we allow for spatial correlation in unobserved shocks by clustering standard errors at the easement level, reflecting the fact that properties surrounding the same conservation easement may be exposed to common local influences.

4.3 Assessing Pre-Formation Trends

A key identifying assumption underlying our empirical approach is that, absent conservation easement formation, residential properties located closer to eventual easement boundaries would have evolved similarly to properties located slightly farther away. To assess the plausibility of this assumption, we examine pre-formation trends in key outcomes prior to easement establishment. Specifically, we estimate a sequence of event-time regressions using data from the four years prior to formation, from $t = -4$ through $t = -1$. These specifications are closely related to Equation (5), in that they

all estimate differences in property outcomes between each year and year $t = -1$. The difference is that here we replace the post-formation indicator with an indicator for a given pre-formation event year between $t = -4$ and $t = -2$. All specifications retain the same fixed effects structure and standard error clustering as in the baseline analysis.

We begin by examining assessed improvement values and square footage, summarizing the results in Figure 2, where each panel shows the estimated coefficients and confidence intervals for the interaction between proximity and event time in the four years prior to easement formation. Panel A presents these pre-formation estimates for home improvement values. The estimates are small in magnitude and statistically indistinguishable from zero throughout the pre-formation period, with no evidence of divergence as easement formation approaches. We also assess whether similar patterns emerge for observable changes in property size. Panel B reports the corresponding pre-formation estimates for total square footage (Figure B.4 does the same for the number of bedrooms and bathrooms). Across all outcomes, the estimated coefficients are close to zero, indicating that there are no significant trends in home characteristics in the years leading up to easement formation.

[Insert Figure 2 about here.]

5 Environmental Certainty and Improvement Values

This section presents our main estimates of how homeowners adjust investment behavior following the formation of a nearby conservation easement. Building on the identification strategy outlined in Section 4, we compare residential properties located very close to a newly formed easement boundary to otherwise similar properties located slightly farther away. Our empirical approach exploits within-property variation over time and includes easement-by-year fixed effects, which absorb local shocks common to all properties surrounding the same easement. The evidence presented in Section 4.3 supports the key identifying assumption of this analysis, indicating that proximate and non-proximate properties do not exhibit differential trends prior to easement formation.

5.1 Baseline Results

We begin by examining how the assessed value of existing structures responds to conservation easement formation. Our outcome of interest is *Improvement Value*, which captures the tax-assessor–reported contribution of built structures to total property value. Because this measure excludes

land value by construction, it provides a direct proxy for value-relevant investment in the physical structure of the property, without presupposing the specific form such investment may take.

Figure 3 presents estimates of Equation (5) in event time, normalizing easement formation to occur at time zero. The markers report point estimates of the relative difference in *Improvement Value* between homes located within 100 meters of the easement boundary and those located between 100 and 500 meters away, relative to that same difference one year prior to easement formation. In the PPML estimator that we employ, a coefficient of 0.01 corresponds to an approximate 1% change in improvement value.

[Insert Figure 3 about here.]

We find an approximate 1.5% to 2% increase in *Improvement Value* for homes most proximate to newly formed conservation easements. The difference emerges in the year of easement formation and stabilizes within two to four years. Importantly, we observe no evidence of differential movements in improvement values in the years preceding easement formation, consistent with the identifying assumption that proximate and non-proximate homes follow similar trajectories absent the resolution of nearby land-use uncertainty.

Table 2 complements the dynamic evidence from Figure 3 by estimating a more aggregated post-formation specification based on Equation (5). The key regressors are interactions between a post-formation indicator and alternative measures of boundary proximity. Here, we exclude the year of easement formation (i.e., time 0 in Figure 3) and set the post-formation indicator to one for all years after the easement is in place. Unless otherwise noted, specifications include easement-by-year and parcel fixed effects and standard errors clustered at the easement level.

[Insert Table 2 about here.]

Column (1) uses a continuous measure of distance to the easement boundary. The coefficient on *Post* $\times$ *Distance (km)* is -0.038 (s.e. 0.017), implying that homes located farther from the boundary experience smaller post-formation increases in improvement value. The magnitude suggests that a 0.5 km increase in distance is associated with an approximately 1.9% smaller post-formation change in improvement value.

Column (2) replaces our continuous measure of distance with the same discrete indicator for homes located within 100 meters of the boundary used in Figure 3. The estimated coefficient of 0.017 (s.e. 0.006) implies that proximate homes experience an approximately 1.7% larger post-formation

increase in improvement value relative to homes located 100–500 meters away. We find a similar magnitude effect in Column (3) using the *Likely Adjacent* indicator, which captures parcels whose centroid is sufficiently close that a square parcel with the same acreage would touch the boundary.

Finally, Column (4) uses our main *Proximate* indicator in an OLS specification. The coefficient of 3,142 indicates that homes within 100 meters of newly formed easements experience an increase in assessed improvement value of approximately $3,142 relative to homes located 100–500 meters away. Given a mean improvement value of approximately $121,000, this estimate corresponds closely to the proportional effects reported in the PPML specifications.

5.2 Evaluating the Environmental Certainty Mechanism

The conceptual framework in Section 2 yields two testable predictions. First, easement formation should increase homeowner reinvestment on average, as resolving development risk raises the expected consumption payoff from amenity-complementary upgrades and reduces the option value of waiting. The evidence on improvement values presented in Section 5.1 is consistent with this prediction. Second, the positive effect of easement formation on homeowner reinvestment should be attenuated by moving risk: households with higher λ place greater weight on resale recoupment and less on long-run consumption benefits, so the investment response should be weaker among households more focused on resale. Our conceptual framework also assumes that easement formation primarily resolves uncertainty without directly shifting amenity levels or household mobility—assumptions we evaluate through the response of land values and sale probabilities to easement formation.

Heterogeneity by moving risk. A central implication of the framework is that moving risk governs how households weight consumption benefits versus resale recoupment. As shown in Equations (2)–(3), lower moving risk (lower λ) increases the weight on the consumption component $W_C(\lambda)\mathbb{E}[b(i,s)]$, whereas higher moving risk places relatively more weight on the resale component $W_R(\lambda)\mathbb{E}[\rho(s)g(i)]$, and with it the risk of incomplete recoupment. Therefore, if easement formation increases investment primarily through the consumption channel, the proximate post-formation increase in improvement value should be larger among households with longer expected tenure and weaker in settings where resale considerations dominate. Because the direction of the resale channel is theoretically ambiguous (as discussed in Section 2), a purely resale-driven mechanism does not deliver a signed prediction about λ-heterogeneity, making the pattern of tenure-based heterogeneity a useful diagnostic for distinguishing between the two channels.

Table 3 presents the results from heterogeneity tests using different proxies for the relative importance of consumption benefits versus resale recoupment. Columns (1)–(4) use the *Proximate* treatment measure (within 100 meters) and report the baseline post-formation effect along with interactions with these proxies. Column (5) repeats the exercise using the *Likely Adjacent* treatment definition. All specifications are estimated using PPML and include easement-by-year and parcel fixed effects, with standard errors clustered at the easement level.

[Insert Table 3 about here.]

Columns (1) and (2) interact the proximate effect with neighborhood-level proxies for the level of property sales and property reinvestment, respectively.[4] The interaction term in Column (1) is negative, indicating that the positive investment response to easement formation attenuates in areas with higher home turnover (i.e., areas in which local homeowners may pay more attention to resale value). Column (2) shows the opposite coefficient with respect to a measure of the area's home investment rate (i.e., areas in which local homeowners may pay more attention to consumption value). Column (3) proxies for the relative focus on consumption with a homeowner's tenure in their property, finding that the post-easement investment increase is larger for longer-tenured households. These patterns are consistent with our conceptual framework's predictions regarding how environmental certainty affects homeowners via a consumption-based channel: when households expect to remain in the home, they internalize more of the flow benefits from amenity-complementary upgrades, so resolving development risk generates a more positive investment response.

In Columns (4) and (5) we combine our neighborhood churn and investment measures into a more powerful proxy for λ from our conceptual framework. Specifically, we interact our *Proximate* indicator with the local area's resale rate scaled by its investment rate. The negative and statistically significant interaction indicates that the post-formation effect of proximity to the easement boundary is attenuated in settings where resale considerations are relatively more salient. Taken together, the tenure and sale-propensity interactions are consistent with an investment response operating primarily through incumbent consumption incentives, modulated by expected tenure.

Evidence against amenity shifts or homeowner sorting. A remaining concern is that the increase in assessed improvement value could reflect a shift in the mean of the environmental

[4]These measures compute the average property sale rate and the average change in improvement value for all properties within 500 meters of the easement in the five years prior to easement establishment. We then standardize the measures across our sample.

state s, that is, a broader amenity shock capitalized into property values, rather than a reduction in the dispersion of future environmental states. This distinction matters because a shift in amenity levels would be expected to capitalize into both land values and improvement values, whereas incumbent reinvestment in response to resolved uncertainty should appear primarily in the structure component. A second concern is that easement formation itself alters moving risk λ by inducing compositional changes in ownership through sorting or turnover, rather than changing reinvestment incentives for incumbents. Figures B.5 and B.6 address these possibilities by replicating the baseline event-study design with land value and sale probability outcomes, using the same treatment definition and fixed effects as in the main specifications.

Figure B.5 shows little evidence of a discrete or sustained increase in calculated land values for proximate homes relative to homes located 100–500 meters away. Point estimates fluctuate around zero and are statistically indistinguishable from zero in most post-formation years. This pattern is difficult to reconcile with a pure amenity-level interpretation: if easement formation were primarily shifting the mean of s, we would expect land values, which capitalize neighborhood amenities independently of incumbent investment decisions, to respond alongside improvement values. The finding that the valuation response appears concentrated in the structure component instead points toward incumbent reinvestment as the operative mechanism.

Figure B.6 shows no sharp or persistent increase in sale probabilities for proximate homes following easement formation. Although estimates are noisy, there is no systematic upward shift in turnover among treated properties. The absence of a pronounced sale response mitigates interpretations based on immediate sorting or compositional changes in who owns proximate homes after the easement is recorded.

Taken together, these results support the environmental-certainty mechanism emphasized in the conceptual framework: Improvement values rise following easement formation, and the effect is stronger when moving risk is lower and weaker where resale incentives dominate, while land values and turnover exhibit no comparable discrete response. This combination of findings is most consistent with easements increasing reinvestment by raising the expected consumption value of improvements and reducing the incentive to delay, rather than purely reflecting a capitalized amenity shock or ownership re-sorting.

6 Structural Changes and Real Investment

The increase in assessed improvement values documented above could reflect changes in the valuation of existing structures, real upgrades to the housing stock, or both. We therefore test whether easement formation is associated with observable structural modifications recorded in administrative property files. We begin with panel regressions for the level of total living area, which use the same property-by-year panel structure and fixed effects design as our improvement value tests, and then examine discrete structural changes over a fixed horizon and in event time.

Table 4 estimates post-formation effects on the level of total living area (square footage) using the same event-time panel structure as Equation (5). Columns (1)–(3) report PPML estimates using three alternative measures of exposure to the easement treatment, while Column (4) reports OLS estimates using our *Proximate* indicator. As in the main results, all specifications include parcel fixed effects and easement-by-year fixed effects and cluster standard errors at the easement level.

Using a continuous measure of distance, Column (1) indicates that homes located farther from the easement boundary experience smaller post-formation increases in square footage. Using the discrete *Proximate* indicator, Column (2) implies that homes within 100 meters of newly formed easements experience an approximately 0.7% larger post-formation increase in living area, while Column (3) indicates slightly larger effects using the *Likely Adjacent* indicator. The corresponding OLS estimate in Column (4) is roughly 14 additional square feet. Relative to a mean living area of approximately 1,971 square feet, this magnitude represents a modest but economically meaningful expansion of the housing stock among the most exposed homes.

[Insert Table 4 about here.]

While Table 4 documents changes in the level of living area, Table 5 focuses on whether homes experience *any* observable structural adjustment over a fixed horizon. Specifically, the outcomes are indicators equal to one if a property experiences a change between $t = -1$ and $t = +3$ in (i) total living area or (ii) bedroom or bathroom counts. This design parallels Equation (6) by differencing out time-invariant property characteristics and comparing properties at different distances from the same easement boundary.

Columns (1)–(3) estimate the probability of a square-footage adjustment, and Columns (4)–(6) estimate the probability of a bedroom or bathroom change. Homes within 100 meters of newly formed easements are approximately 1.6 percentage points more likely to adjust square footage and

1.6 percentage points more likely to modify bedroom or bathroom configurations by year three. Using the stricter *Likely Adjacent* definition, the corresponding increases are approximately 3.0 and 3.6 percentage points, respectively. Given baseline change rates of roughly 10% for square footage and 6% for bedroom/bathroom modifications, these estimates imply economically meaningful relative increases in the probability of structural adjustment among homes most exposed to the resolution of nearby land-use uncertainty.

[Insert Table 5 about here.]

Finally, we examine the timing of these structural adjustments using event-time specifications. Figure 4 plots coefficients from regressions where the dependent variable is an indicator equal to one if a home's reported living area differs from its pre-formation baseline ($t = -1$). The plotted coefficients represent the relative probability of a square footage change for homes within 100 meters of the easement boundary compared to homes located 100–500 meters away, relative to the same difference at $t = -1$.

[Insert Figure 4 about here.]

We observe no evidence of differential pre-trends in the likelihood of square-footage changes prior to easement formation. Beginning around the year of formation and strengthening over the subsequent three years, we find that proximate homes exhibit a higher probability of square footage adjustments. By year three, the point estimates imply an increase of roughly 1.5–2 percentage points relative to the comparison group.

Figure 5 presents analogous event-time estimates for changes in bedroom or bathroom counts relative to baseline. Again, pre-formation coefficients are statistically indistinguishable from zero. Post-formation estimates rise gradually, with proximate homes exhibiting a higher likelihood of bedroom or bathroom modifications beginning one to two years after easement formation and reaching approximately 1–2 percentage points by years three and four.

[Insert Figure 5 about here.]

The gradual emergence of these physical adjustments mirrors the pattern documented for improvement values and is consistent with the mechanisms emphasized in the conceptual framework: major upgrades are lumpy and partially irreversible, so resolving development risk can reduce the option value of waiting and lead households to initiate projects that take time to plan, complete,

and appear in administrative records. Taken together, the panel estimates, fixed-horizon change measures, and event-time dynamics indicate that easement formation is associated with real changes to the physical housing stock, not solely valuation or reassessment effects. Nearby easement formation coincides with measurable expansions and reconfigurations of proximate homes, consistent with households initiating lumpy reinvestment projects after uncertainty about future nearby development is resolved.

7 Conclusion

This paper examines how resolving local land-use uncertainty shapes homeowner reinvestment. We focus on conservation easement formation as a setting in which nearby development rights are permanently restricted, generating a discrete and persistent change in the predictability of future land use without clear immediate affects on neighborhood amenity levels. Linking the spatial boundaries and establishment years of conservation easements in PAD-US to nationwide administrative property panels from Cotality, we compare homes located very close to newly formed easement boundaries with homes slightly farther away in the same local environment.

Our main finding is that easement formation increases investment in the housing structure. Homes within 100 meters of a newly formed easement experience an approximately 1.5–2% increase in assessed improvement value relative to homes 100–500 meters away, with no evidence of differential pre-trends. Importantly, this valuation response is accompanied by economically meaningful *real* adjustments: by three years after formation, proximate homes are about 1.6 percentage points more likely to exhibit a change in total living area and about 1.6 percentage points more likely to change bedroom or bathroom counts (relative to baseline change rates of roughly 10% and 6%, respectively), with larger magnitudes for homes that likely border the newly formed easement. The effect attenuates with distance and emerges around formation, with structural adjustments building gradually over the subsequent years. Together, these patterns are consistent with easement-induced certainty changing the expected returns to reinvestment in a highly local manner and inducing households to undertake lumpy upgrades that materialize over time.

Additional tests suggest that the investment response operates primarily through incumbent incentives rather than resale-driven capitalization or ownership re-sorting. Consistent with our conceptual framework, the increase in improvement value is stronger when local home investments are high or expected tenure is longer and weaker in settings where resale incentives are relatively

more salient. At the same time, we find little evidence of discrete post-formation changes in land values or sale probabilities for the most proximate homes.

Taken together, these results suggest that permanently resolving local development risk can spur household reinvestment in existing homes, with effects concentrated among households that expect to remain in place and thus internalize the flow benefits of amenity-complementary upgrades. More broadly, the findings highlight a mechanism through which environmental protection and land-use certainty can shape private investment decisions in the built environment.

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Figure 1. Easement Protected Areas in the US

This figure depicts the spatial distribution of easement biodiversity-protected areas in the contiguous U.S. Dark green shading indicates areas with permanent biodiversity protections in place (those with GAP status codes 1 and 2). The data used to produce this figure are from the PAD-US database, version 4.0, from USGS.

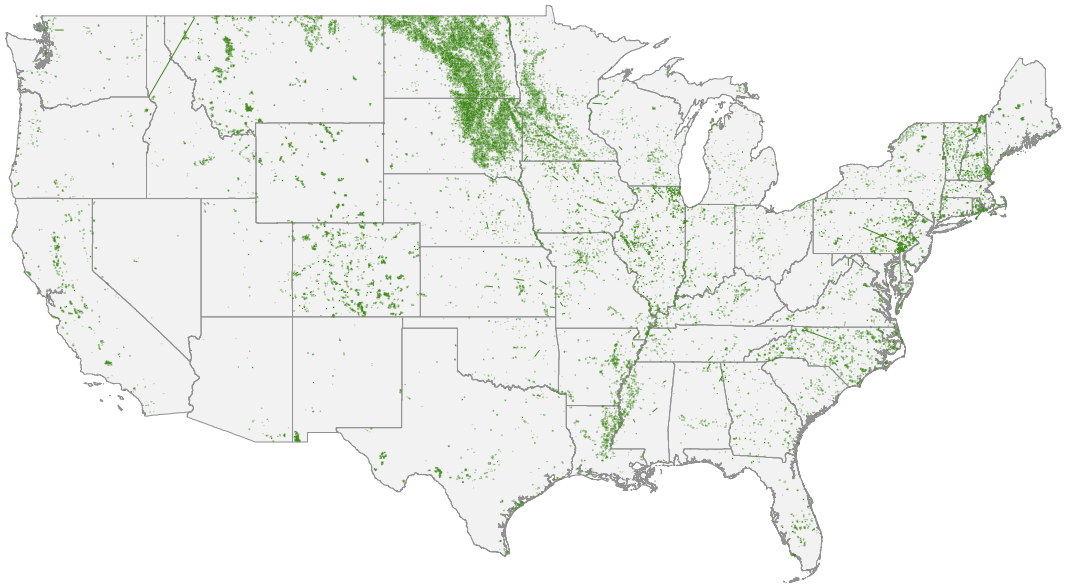
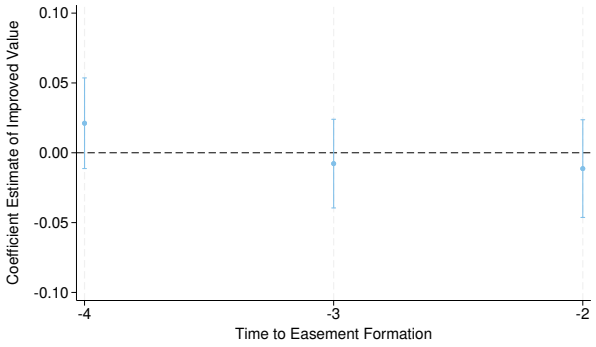
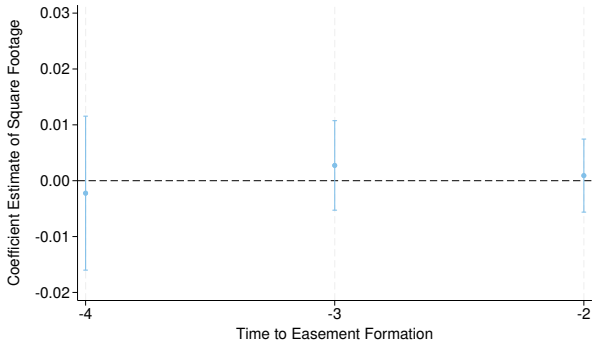


Figure 2. Improvement Value and Square Footage Prior to Easement Formation

This figure depicts the results from estimating Eq. (5) in the full panel in each of the four years leading up to easement formation at time 0. The point estimates are derived from separate Poisson Pseudo Maximum Likelihood regressions of *Improvement Value* (Panel A) and *Square Footage Change* (Panel B) on the interaction between event year indicators and an indicator for whether a home is within 100 meters of the newly formed conservation easement (with homes located 100–500 meters away serving as the comparison group). Coefficients are reported relative to the omitted baseline period $t = -1$. The capped bars indicate 90% confidence intervals based on standard errors clustered at the easement level. The data used to produce this figure are from Cotality and the USGS.



(A) Improvement Value



(B) Square Footage Change

Figure 3. Improved Value Evolution

The x-axis represents years in event time around a conservation easement formed at time 0. The point estimates are derived from a single Poisson Pseudo Maximum Likelihood estimator that regresses *Improvement Value* on the interaction between event years and an indicator for whether a home is within 100m of the newly formed conservation easement. All estimates depict the relative change in *Improvement Value* for homes within 100m of the newly formed easement, which we denote *Proximate* homes, compared to homes 100m-500m away, and are relative to the year before the conservation easement's formation. Each estimate is accompanied by 90% confidence intervals based on standard errors clustered at the easement level. All conservation easements come from the PAD-US database of biodiversity protected areas and thus represent permanent commitments to maintain the natural state of the land.

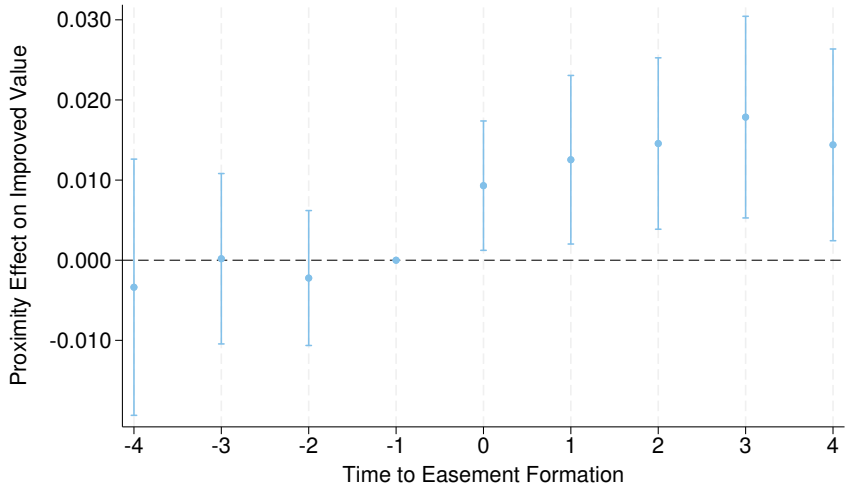


Figure 4. Evolution in the Probability of Square Footage Adjustments

The x-axis reports event time relative to conservation easement formation (time 0). The dependent variable is an indicator equal to one if a property's square footage differs from its baseline value at $t = -1$. Each point estimate is obtained from a separate regression for the indicated event year and reports the coefficient on a *Proximate* indicator equal to one for homes located within 100 meters (*Proximate*) of the newly formed easement (with homes located 100–500 meters (*Non-proximate*) serving as the comparison group). All specifications include area fixed effects. Event time $t = -1$ is normalized to zero. Error bars represent 90% confidence intervals based on standard errors clustered at the easement level. Conservation easements are drawn from the PAD-US database and represent permanent restrictions on future development.

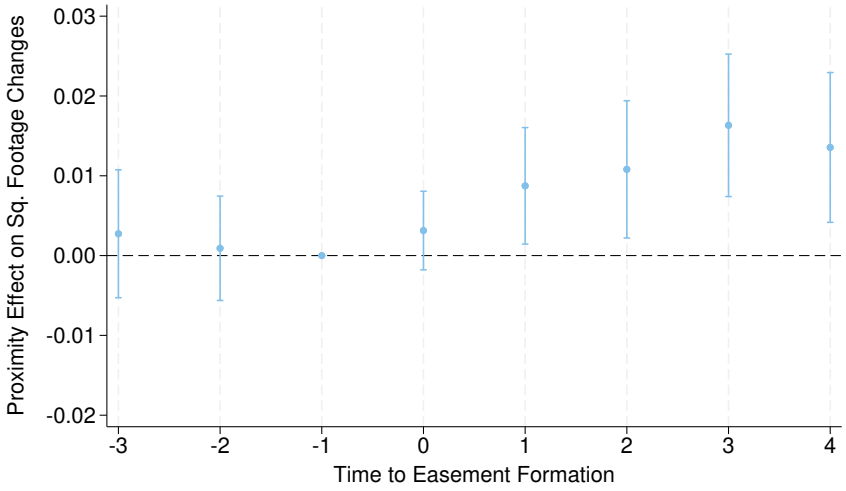


Figure 5. Evolution in the Probability of Bedroom and Bathroom Changes

The x-axis reports event time relative to conservation easement formation (time 0). The dependent variable is an indicator equal to one if a property's number of bedrooms or bathrooms differs from its baseline value at $t = -1$. Each point estimate is obtained from a separate regression for the indicated event year and reports the coefficient on a *Proximate* indicator equal to one for homes located within 100 meters of the newly formed easement (with homes located 100–500 meters serving as the comparison group). All specifications include area fixed effects. Event time $t = -1$ is normalized to zero. Error bars represent 90% confidence intervals based on standard errors clustered at the easement level. Conservation easements are drawn from the PAD-US database and represent permanent restrictions on future development.

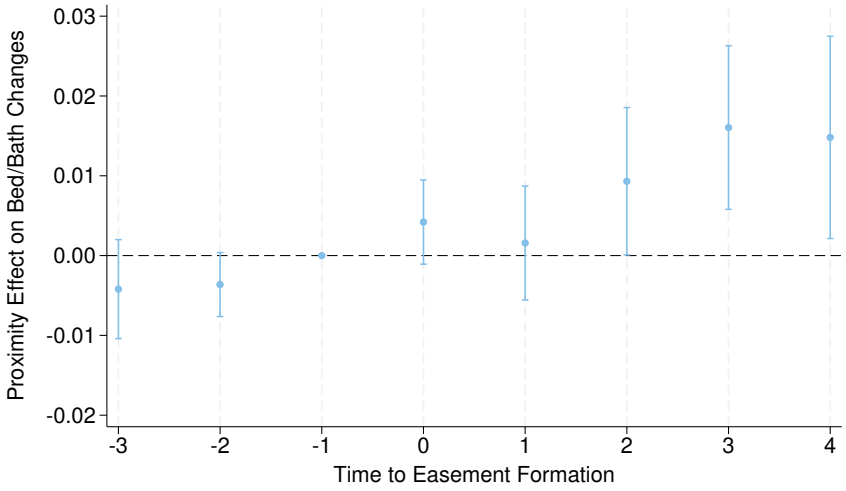


Table 1. Descriptive Statistics

This table presents descriptive statistics for residential properties in our main estimation sample, evaluated at event time $t = -1$ (the year immediately prior to conservation easement formation). The sample consists of 62,052 residential parcels located within 500 meters of a GAP 1 or GAP 2 easement boundary, with 6,684 parcels located within 100 meters of the boundary (*Proximate*) and 55,368 parcels located between 100 and 500 meters (*Non-proximate*). Reported statistics summarize parcel characteristics measured at $t = -1$. Differences for distance to the easement boundary are mechanical by construction. Easement characteristics are assigned based on the nearest GAP 1 or GAP 2 protected area within the same state.

	Proximate (< 100m)			Non-proximate (100–500m)		
	Mean	Median	SD	Mean	Median	SD
Assessed Improvement Value ($)	138,433	103,466	140,073	125,456	87,500	131,082
Total Assessed Value ($)	206,923	179,767	259,634	184,851	172,424	279,024
Calculated Land Value ($)	63,825	33,600	116,746	60,856	26,400	134,222
Square Footage	2,223	2,098	2,330	2,140	1,832	2,348
Bed/Bath Number	5.5	5.0	2.6	6.0	5.0	2.7
Owner Occupied Indicator	0.83	1.00	0.37	0.82	1.00	0.38
Sold Indicator	0.04	0.00	0.20	0.04	0.00	0.19
Property Year Built	1982	1976	32	1976	1980	33
Likely Adjacent Indicator	0.21	0.00	0.41	0.00	0.00	0.08
Distance to Boundary (m)	55.27	55.26	26.88	323.42	318.87	113.72
Easement Size (acres)	275.90	56.00	722.20	204.77	46.00	667.61
Easement Establishment Year	2016	2016	3.21	2016	2016	3.19
Observations		6,684			55,368	

Table 2. Environmental Certainty and Home Improvement Value

This table reports the effect of conservation easement formation on assessed *Improvement Value* (the tax-assessor reported value of built structures) for single-family homes located near easement boundaries. The key regressors are interactions between *Post* (an indicator equal to one for years after easement formation) and measures of boundary proximity. *Distance* (km) is the property's minimum distance to the easement boundary. *Proximate* equals one for homes within 100 meters of the boundary (with the comparison group 100–500 meters away). *Likely Adjacent* equals one if the parcel centroid is sufficiently close that a square parcel with the property's acreage would touch the boundary. Columns (1)–(3) report PPML estimates (coefficients may be interpreted approximately as proportional changes), and column (4) reports OLS estimates in levels. All specifications include area-by-year (area-time) fixed effects and parcel fixed effects. Standard errors are clustered at the easement level and reported in parentheses. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	(1) Improvement Value	(2) Improvement Value	(3) Improvement Value	(4) Improvement Value
Post × *Distance (km)*	-0.038**			
	(0.017)			
Post × *Proximate*		0.017***		3142**
		(0.006)		(1254)
Post × *Likely Adjacent*			0.015*	
			(0.008)	
Area-time FEs	Yes	Yes	Yes	Yes
Parcel FEs	Yes	Yes	Yes	Yes
Model	PPML	PPML	PPML	OLS
Mean Dep. Var.	121,255	121,255	121,297	121,255
No. Areas	2,513	2,513	2,512	2,513
Observations	461,527	461,527	461,299	461,527
R-sq.	0.99	0.99	0.98	0.98

Table 3. Heterogeneity in the Effect of Environmental Certainty on Home Improvement Value

This table reports heterogeneity in the effect of conservation easement formation on assessed *Improvement Value* for single-family homes located near easement boundaries. Each column reports estimates from a Poisson pseudo-maximum likelihood (PPML) specification. Columns (1)–(4) use an indicator for homes located within 100 meters of the easement boundary (*Proximate*) as the treatment measure and report the baseline effect (*Post* × *Proximate*) along with its interaction with the indicated heterogeneity variable: (i) pre-formation neighborhood churn, (ii) pre-formation neighborhood investment intensity, (iii) baseline tenure, and (iv) relative sale propensity. Column (5) instead uses the *Likely Adjacent* treatment measure—defined as parcels sufficiently close to the boundary that their acreage would touch the easement—and reports both the baseline effect (*Post* × *Likely Adjacent*) and its interaction with relative sale propensity. Where indicated, heterogeneity measures are standardized. All specifications include area-by-year (area-time) fixed effects and parcel fixed effects. Standard errors are clustered at the easement level and reported in parentheses. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	(1) Improvement Value	(2) Improvement Value	(3) Improvement Value	(4) Improvement Value	(5) Improvement Value
Post × *Proximate (within 100m)*	0.017***	0.018***	-0.003	0.048***	
	(0.006)	(0.006)	(0.017)	(0.017)	
Post × *Likely Adjacent*					0.053***
					(0.020)
Post × *Proximate* × *Std. Pre-churn*	-0.011*				
	(0.006)				
Post × *Proximate* × *Std. Pre-investment*		0.016*			
		(0.009)			
Post × *Proximate* × *Tenure (baseline)*			0.002*		
			(0.002)		
Post × *Proximate* × *Relative Sale Propensity*				-0.040**	
				(0.017)	
Post × *Likely Adjacent* × *Relative Sale Propensity*					-0.047**
					(0.022)
Area-time FEs	Yes	Yes	Yes	Yes	Yes
Parcel FEs	Yes	Yes	Yes	Yes	Yes
Model	PPML	PPML	PPML	PPML	PPML
Mean Dep. Var.	121,256	121,093	121,256	121,256	121,298
No. Areas	2,513	2,513	2,513	2,513	2,513
Observations	461,527	461,527	461,527	461,527	461,527
R-sq.	0.99	0.99	0.99	0.99	0.99

Table 4. Environmental Certainty and Home Square Footage

This table reports the effect of conservation easement formation on the level of total living area (Square Feet) for single-family homes located near easement boundaries. The dependent variable is parcel-level square footage. The key regressors are interactions between *Post* (an indicator equal to one for years after easement formation) and measures of boundary proximity. *Distance* (km) is the property's minimum distance to the easement boundary. *Proximate* equals one for homes within 100 meters of the boundary (with the comparison group 100–500 meters away). *Likely Adjacent* equals one if the parcel centroid is sufficiently close that a square parcel with the property's acreage would touch the boundary. Columns (1)–(2) report PPML estimates and columns (3)–(4) report OLS estimates. All specifications include area-by-year (area-time) fixed effects and parcel fixed effects. Standard errors are clustered at the easement level and reported in parentheses. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	(1) Sq. Ft.	(2) Sq. Ft.	(3) Sq. Ft.	(4) Sq. Ft.
Post × *Distance (km)*	-0.014***			
	(0.004)			
Post × *Proximate*		0.007***		14.054***
		(0.002)		(4.834)
Post × *Likely Adjacent*			0.010**	
			(0.004)	
Area-time FEs	Yes	Yes	Yes	Yes
Parcel FEs	Yes	Yes	Yes	Yes
Model	PPML	PPML	PPML	OLS
Mean Dep. Var.	1,970.88	1,970.88	1,971.30	1,970.88
No. Areas	2,405	2,405	2,404	2,405
Observations	432,156	432,156	431,874	432,156
R-sq.	0.96	0.96	0.96	0.96

Table 5. Environmental Certainty and Structural Changes

This table examines whether conservation easement formation is associated with discrete structural modifications to nearby single-family homes. The sample is restricted to observations three years after formation ($t = +3$). The dependent variables are indicators for structural changes relative to the pre-formation baseline ($t = -1$): Δ Sq. Ft. equals one if the total living area differs from its baseline value, and Δ Bed/Bath equals one if the number of bedrooms or bathrooms changes relative to baseline. Columns (1)–(3) estimate the probability of square footage changes, and columns (4)–(6) estimate the probability of bedroom/bathroom modifications. *Distance* (km) is the property's minimum distance to the easement boundary. *Proximate* equals one for properties within 100 meters of the boundary (with the comparison group 100–500 meters away), and *Likely Adjacent* equals one if the parcel centroid is sufficiently close that a square parcel with the property's acreage would touch the boundary. All specifications include area fixed effects, and standard errors are clustered at the easement level (reported in parentheses). Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	(1) Δ Sq. Ft.	(2) Δ Sq. Ft.	(3) Δ Sq. Ft.	(4) Δ Bed/Bath	(5) Δ Bed/Bath	(6) Δ Bed/Bath
Distance (km)	-0.028**			-0.026**		
	(0.012)			(0.012)		
Proximate		0.016***			0.016***	
		(0.005)			(0.006)	
Likely Adjacent			0.030***			0.036***
			(0.010)			(0.012)
Area FEs	Yes	Yes	Yes	Yes	Yes	Yes
Model	OLS	OLS	OLS	OLS	OLS	OLS
Mean Dep. Var.	0.10	0.10	0.10	0.06	0.06	0.06
No. Areas	1,441	1,441	1,440	1,052	1,052	1,051
Observations	46,519	46,519	46,475	34,062	34,062	34,032
R-sq.	0.25	0.25	0.25	0.08	0.08	0.08

ONLINE APPENDIX

Appendix A Conceptual Framework Details

This appendix provides a simple dynamic formulation under which Eq. (4) is an exact expected present value comparison.

Sale process and payoffs. Time is discrete. A household faces an exogenous per-period probability of moving (selling) $\lambda \in (0,1)$. Let $\tau \in \{1,2,\dots\}$ denote the sale time, with

$$\Pr(\tau = t) = \lambda(1-\lambda)^{t-1}.$$

The household discounts at factor $\beta \in (0,1)$ and chooses a one-time improvement size $i \geq 0$ at $t = 0$ with cost $C(i)$. While the household remains in the home, the improvement yields an incremental flow payoff $b(i, s_t)$, where $\{s_t\}$ is the environmental/development state process. At sale time τ, the improvement yields an incremental resale payoff

$$\Delta P(i, s_\tau) = \rho(s_\tau) g(i),$$

where $g(i)$ is the engineering contribution of the upgrade and $\rho(s) \in [0,1]$ is a state-dependent recoupment rate.

Expected present value. The incremental expected present value of choosing i at $t = 0$ is

$$\Pi(i;\lambda) = \mathbb{E}\left[\sum_{t=0}^{\tau-1} \beta^t \, b(i, s_t)\right] + \mathbb{E}[\beta^\tau \rho(s_\tau) g(i)] - C(i), \tag{A.1}$$

where expectations are taken over the joint distribution of τ and $\{s_t\}$.

Decomposition and weights. Assume τ is independent of the state path $\{s_t\}$. Then $\Pr(\tau > t) = (1-\lambda)^t$ and

$$\mathbb{E}\left[\sum_{t=0}^{\tau-1} \beta^t \, b(i, s_t)\right] = \sum_{t \geq 0} \beta^t (1-\lambda)^t \, \mathbb{E}[b(i, s_t)]\,,$$

and

$$\mathbb{E}[\beta^\tau \rho(s_\tau) g(i)] = \sum_{t \geq 1} \beta^t \lambda (1-\lambda)^{t-1} \, \mathbb{E}[\rho(s_t) g(i)]\,.$$

For expositional convenience, if we summarize state dependence using expectations taken over a representative future state distribution (e.g., under stationarity), this yields

$$\Pi(i;\lambda) = W_C(\lambda) \, \mathbb{E}[b(i,s)] + W_R(\lambda) \, \mathbb{E}[\rho(s) g(i)] - C(i), \tag{A.2}$$

where

$$W_C(\lambda) = \sum_{t \geq 0} \beta^t (1-\lambda)^t = \frac{1}{1-\beta(1-\lambda)}, \qquad W_R(\lambda) = \sum_{t \geq 1} \beta^t \lambda (1-\lambda)^{t-1} = \frac{\beta\lambda}{1-\beta(1-\lambda)}.$$

Lower moving risk (smaller λ) increases $W_C(\lambda)$ and reduces the relative importance of the resale-weight term $W_R(\lambda)$ in (A.2).

Appendix B Appendix Figures

Figure B.1. Distribution of Homes Around Protected Areas

This figure plots the distribution of residential properties around protected areas in the main sample. Each observation corresponds to a distinct GAP 1 or GAP 2 easement, entered once, and reports the number of unique residential properties located within 500 meters of the easement boundary. Properties are counted once per protected area. The distribution is highly right-skewed, indicating that most easements are adjacent to a small number of residential properties, while a minority are associated with a larger number of nearby parcels.

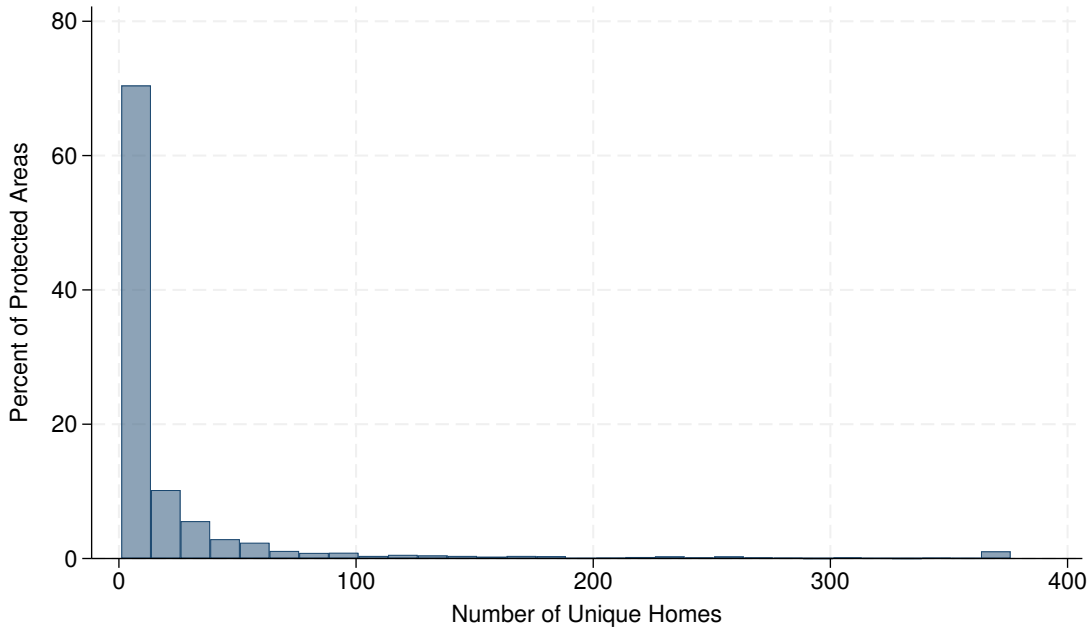


Figure B.2. Distribution of Easement Size

This figure plots the distribution of easement sizes in the main sample. Each observation corresponds to a distinct GAP 1 or GAP 2 easement, entered once, and reports the total acreage of the protected area. The distribution is highly right-skewed, indicating that most easements in the sample are relatively small in area, while a small number cover larger protected areas.

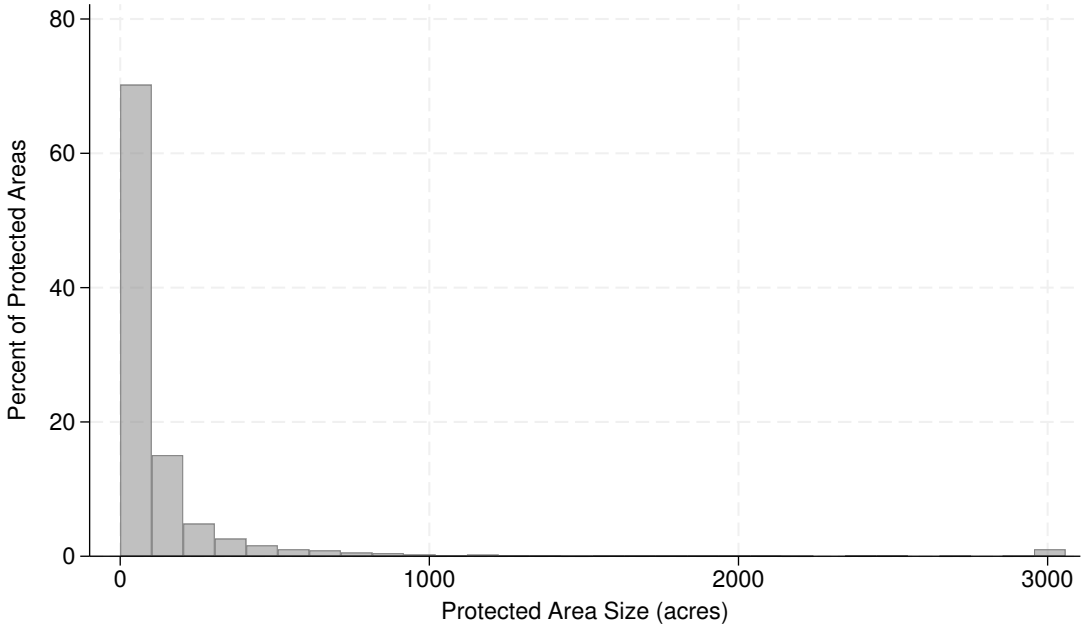


Figure B.3. Distribution of Assessed Improvement Value

This figure plots the distribution of *Assessed Improvement Values* for residential properties in the main estimation sample. Assessed improvement value reflects the tax-assessor–reported value of built structures and excludes underlying land value. The distribution is shown separately for homes located within 100 meters of a conservation easement boundary (*Proximate*) and homes located between 100 and 500 meters of the boundary (*Non-proximate*). Values above the 99th percentile are excluded for visual clarity. Improvement values are measured in thousands of dollars ($'000). The data used to produce this figure are from Cotality and the USGS.

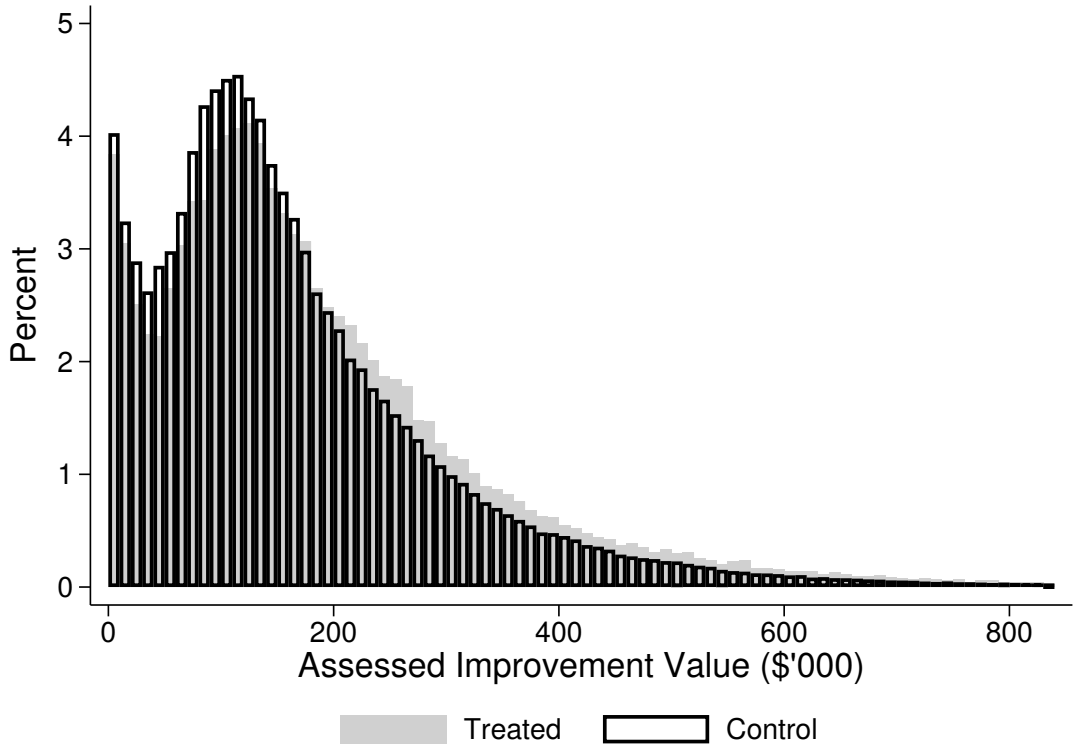


Figure B.4. Bed/Bath Changes Prior to Easement Formation

This figure depicts the results from estimating Eq. (5) in the full panel in each of the four years leading up to easement formation at time 0. The point estimates are derived from a single OLS specification that regresses Bed/Bath Changes on the interaction between event year indicators and an indicator for whether a home is within 100 meters of the newly formed conservation easement (with homes located 100–500 meters away serving as the comparison group). Coefficients are reported relative to the omitted baseline period $t = -1$. The capped bars indicate 90% confidence intervals based on standard errors clustered at the easement level. The data used to produce this figure are from Cotality and the USGS.

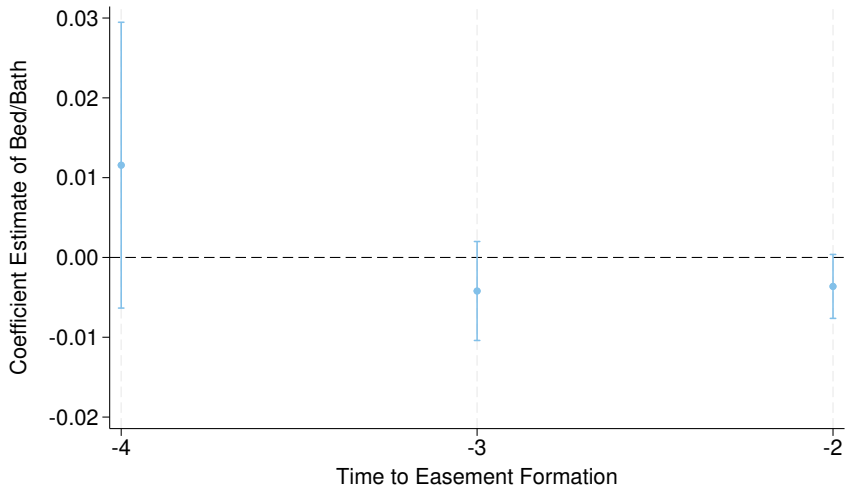


Figure B.5. Calculate Land Value Evolution

The x-axis represents years in event time around a conservation easement formed at time 0. The point estimates are derived from a single Poisson Pseudo Maximum Likelihood estimator that regresses *Calculated Land Value* on the interaction between event years and an indicator for whether a home is within 100m of the newly formed conservation easement. All estimates depict the relative change in *Calculated Land Value* for homes within 100m of the newly formed easement, which we denote *Proximate* homes, compared to homes 100m-500m away, and are relative to the year before the conservation easement's formation. Each estimate is accompanied by 90% confidence intervals based on standard errors clustered at the easement level. All conservation easements come from the PAD-US database of biodiversity protected areas and thus represent permanent commitments to maintain the natural state of the land.

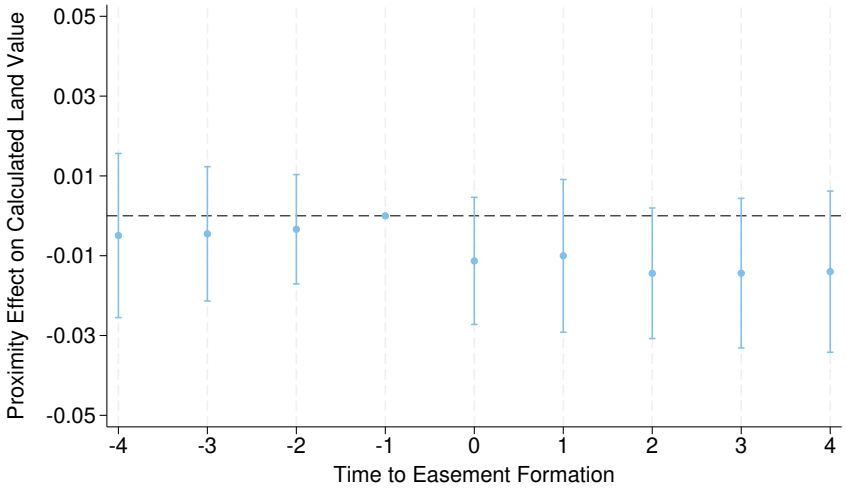
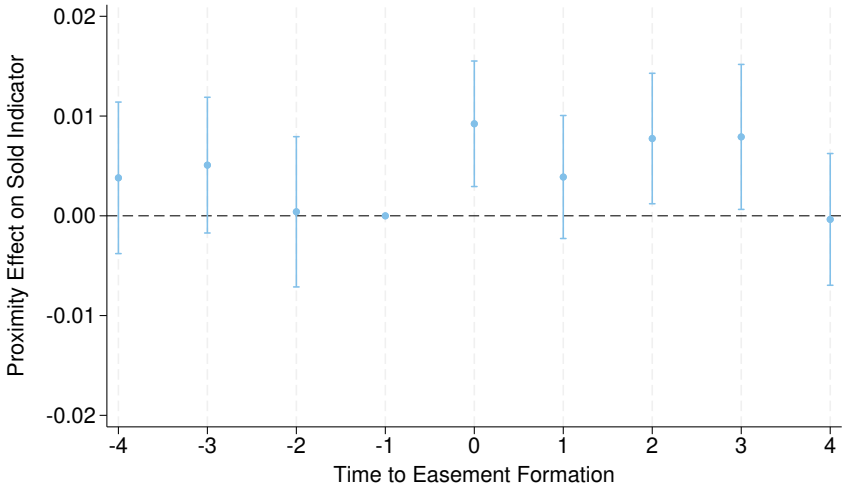


Figure B.6. Sale Probability Evolution

The x-axis represents years in event time around a conservation easement formed at time 0. The point estimates are derived from a single Poisson Pseudo Maximum Likelihood estimator that regresses *Sold Indicator* on the interaction between event years and an indicator for whether a home is within 100m of the newly formed conservation easement. All estimates depict the relative change in *Sold Indicator* for homes within 100m of the newly formed easement, which we denote *Proximate* homes, compared to homes 100m-500m away, and are relative to the year before the conservation easement's formation. Each estimate is accompanied by 90% confidence intervals based on standard errors clustered at the easement level. All conservation easements come from the PAD-US database of biodiversity protected areas and thus represent permanent commitments to maintain the natural state of the land.



Appendix C Appendix Tables

Table C.1. Robustness Test: No Joint Ownership

This table reports estimates of how assessed Improvement Value (the tax-assessor reported value of built structures) evolves for single-family homes close to newly formed conservation easements. The key regressors are interactions between Post (an indicator for years after easement formation) and either Distance (km) to the easement boundary (continuous) or Proximate, an indicator for homes within 100 meters of the boundary (with the comparison group 100–500 meters away). All columns include single-family homes in proximity to the borders, excluding any joint ownership. Columns (1)–(2) use PPML (coefficients can be interpreted approximately as proportional changes), and columns (3)–(4) use OLS. All specifications include area-by-year (area-time) fixed effects and parcel fixed effects. Standard errors are clustered at the easement level (reported in parentheses). Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Improvement Value	(2) Improvement Value	(3) Improvement Value	(4) Improvement Value
Post × Distance (km)	-0.029*		-5,952**	
	(0.016)		(2,677)	
Post × Proximate		0.008**		1,430*
		(0.004)		(771)
Area-time FEs	Yes	Yes	Yes	Yes
Parcel FEs	Yes	Yes	Yes	Yes
Model	PPML	PPML	OLS	OLS
Mean Dep. Var.	125,432	125,432	125,432	125,432
No. Areas	2,251	2,251	2,251	2,251
Observations	428,318	428,318	428,318	428,318
R-sq.	0.99	0.99	0.98	0.98

Table C.2. Heterogeneity by CBSA Type

This table reports estimates of how home Square Feet changes around conservation easement formation as a function of proximity to the easement boundary. Columns (1)–(2) use a cross-sectional design where the dependent variable is an indicator for a change in square footage from t = –1 (pre) to t = +3 (post), and regress this outcome on Distance (km) (column 1) or Proximate (column 2) for homes with *Non-metro* CBSA type; these specifications include area fixed effects. Columns (3)–(4) use the same design as columns (1)-(2), but for homes with *Metro* CBSA type. Standard errors are clustered at the easement/area level (reported in parentheses). Statistical significance is indicated as follows: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

	(1) Δ Sq. ft. (t = -1 to t = +3)	(2) Δ Sq. ft. (t = -1 to t = +3)	(3) Δ Sq. ft. (t = -1 to t = +3)	(4) Δ Sq. ft. (t = -1 to t = +3)
Distance (km)	-0.048**		-0.023**	
	(0.021)		(0.010)	
Proximate (within 100m)		0.006		0.019***
		(0.009)		(0.005)
Area FEs	Yes	Yes	Yes	Yes
CBSA Type	Non-metro	Non-metro	Metro	Metro
Mean Dep. Var.	0.42	0.42	0.33	0.33
No. Areas	570	570	865	865
Observations	9,465	9,465	36,748	36,748
R-sq.	0.81	0.80	0.80	0.80