The Hidden Effects of Climate Risk: Rising Insurance Premiums Increase Mortgage Delinquency and Drive Relocation to Safer Areas*

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Abstract

As climate change intensifies natural disasters, homeowners' insurance premiums are rising dramatically. Using microdata on insurance policies linked to households' mortgage, credit, and relocation outcomes, and employing a novel instrumental variable, we document three main findings. First, higher premiums increase mortgage and credit card delinquencies. Second, to mitigate the impact of higher premiums, households are more likely to relocate, moving to safer locations with lower insurance costs. Homes facing larger premium hikes are more likely to be acquired by corporate buyers. Third, the delinquency effect is concentrated among financially more constrained households, while the relocation effect is stronger among less constrained households who can better afford the upfront costs of moving. Our findings reveal how climate change threatens household financial stability and potentially impacts financial system resilience through the insurance channel, while showing how households mitigate the effects through relocation to lower-risk areas.

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1 Introduction

When academics and policymakers discuss the effect of climate change on households, the focus is often on the direct physical impacts of climate-related disasters, which are becoming more severe and frequent. However, climate change can also affect households financially without firsthand disaster experiences. As disaster risks increase with climate change, insurance premiums in the U.S. have surged dramatically in recent years, with projections indicating further increases due to climate change. With average annual premiums exceeding $5,000 in some states, rising insurance costs can pose a growing financial strain on households, imposing negative financial effects or pushing them toward costly adaptation.

The impact of insurance costs on mortgages warrants particular attention given their dominance in household balance sheets, representing 72% of total household debt. Since mortgage payments typically take priority in household budgets, mortgage performance provides important insights into household financial health. Rising insurance premiums can reduce available liquidity for mortgage payments, potentially increasing delinquency rates and creating ripple effects throughout the financial sector given mortgages' systemic importance.

At the same time, homeowners can mitigate the financial pressure from increased insurance costs by relocating to areas with lower climate risk and correspondingly lower insurance costs. The present value of savings from insurance premium reductions can shift the cost-benefit calculation for marginal households weighing whether to move or stay. Understanding this relocation response can shed light on one of the key ways households adapt to climate change.

We study how insurance costs affect mortgage, credit outcomes, and relocation, which have been largely unexplored in the literature. Two key obstacles have hindered research: limited data availability and identification challenges. We use a newly available dataset linking detailed insurance policy information with household-level mortgages, credit

cards, and relocation outcomes. Moreover, to identify the causal effects of insurance premium increases, we construct a novel instrumental variable for insurance premium increases.

We confirm the findings in Keys and Mulder (2024) that climate risk is associated with larger insurance premium increases. Following that, we document three main findings. First, higher premiums increase mortgage and credit card delinquencies. Second, to mitigate the impact of higher premiums, households are more likely to relocate, moving to safer locations with lower insurance costs. Homes facing larger premium hikes are more likely to be acquired by corporate buyers. Third, the delinquency effect is concentrated among financially more constrained households, while the relocation effect is stronger among less constrained households who can better afford the upfront costs of moving.

To establish causality, we employ an instrumental variable approach using two instruments for premium rate increases simultaneously. To construct our first instrument, for each household-insurance policy year, we compute the average premium rate increase at renewal across policies that renew in the same month by the same insurer in other zip codes within the same state. To mitigate concerns about endogenous renewal timing and insurer-switching, we use each policy's expiration month and insurer from the previous year rather than the actual renewal month and the new insurer. Our second instrument interacts these averages at the insurer-zip-by-renewal month level with the climate risk of the household's home.

The relevance of our instruments is based on two mechanisms. First, premium increases follow location-level trends driven by insurers' risk assessments of that location (Keys and Mulder, 2024) and state regulator approvals of insurers' rate change requests (Oh, Sen and Tenekedjieva, 2022). Therefore, a property's premium change should correlate strongly with premium changes that the same insurer implements elsewhere in the state in the same month, making our first instrument relevant. Second, Keys and Mulder (2024) find that riskier zip codes have experienced larger premium increases in recent

years. We expect that within a zip code and renewal month, the same insurer will raise premiums by more for houses that are riskier. Thus, the second instrument is also likely relevant.

Our instruments are also plausibly exogenous. Since our regressions include zip-by-insurance renewal month fixed effects, we effectively compare borrowers within the same zip code who renew their insurance policies in the same month. The within-zip-by-renewal month variation in average premium changes stems from different insurers, their rate-setting models, and the timing of their rate changes, which are subject to state regulatory approvals. Since we use the insurance policy expiration month and insurer determined in the previous policy year, the first instrument is unlikely to be subject to households' manipulation. Given these arguments, our first instrument likely satisfies the exclusion restriction: it is unlikely to affect individual borrowers' mortgage delinquency or other outcomes through channels other than insurance costs. Consequently, our second instrument, which interacts the first instrument with households' predetermined climate risk, is also likely to be exogenous.

Furthermore, we control for each borrower's credit risk score from the month preceding their insurance policy renewal to further rule out endogeneity concerns. We also control for house-level climate risk and climate risk bin-by-renewal month fixed effects to remove both fixed and time-varying effects of climate risk.

In the first part of our analysis, we demonstrate that rising insurance premiums are associated with higher probabilities of mortgage and credit card delinquency within 12 months after premium changes at policy renewals. With zip-by-insurance renewal month fixed effects, we compare households within the same zip code who renewed insurance policies in the same month, which controls for local economic factors correlated with mortgage delinquencies. When premiums increase by two standard deviations (around \$650), the probability of 60-day delinquency rises by 0.23 percentage points, representing a 14% increase relative to the mean probability (1.7%).

In addition, we find that the delinquency effects are stronger for households that are more financially constrained: those with high loan-to-value (LTV) or debt-to-income (DTI) ratios, and those with lower credit scores. Furthermore, the delinquency effect is widespread—appearing in those held by banks and GSE mortgages, indicating risks for the financial market and the Federal Government. Thus, our findings uncover broader implications for the stability of the financial system.

Similar to mortgage delinquencies, we find that larger premium increases also cause mortgage foreclosures to rise, imposing severe consequences for affected households. Additionally, higher premiums increase credit card delinquency rates and credit card utilization while worsening borrowers' credit risk scores. These results demonstrate that rising insurance premiums have broad negative effects across multiple dimensions of household finances, indicating that the mortgage delinquency effects reflect financial stress rather than mechanical relationships.

In the second part of our analysis, we examine relocation as a way to mitigate the effect of rising insurance premiums. Households can move to areas with lower climate risk and thus, lower insurance premiums. We find that larger premium increases drive households to relocate to areas with substantially lower climate risk and reduce their post-relocation insurance costs. We find that a two-standard-deviation increase in premium rates causes movers to reduce their climate risk exposure by 26%. A two-standard-deviation increase in premium rates (around $650) corresponds to a 0.24 percentage point increase in relocation probability (9% of the mean). Among movers, the same premium increases result in a 26% reduction in climate risk exposure and a $973 savings in annual premium. Assuming a discount rate of 6% (Giglio, Maggiori, Rao, Stroebel and Weber, 2021), the present value of the premium savings amounts to $11,160 within 20 years. Households likely perceive insurance premium savings from relocation as enhancing the overall benefits of moving, effectively shifting their decision-making in favor of relocation.

We also find stronger relocation responses to premium increases among households

for whom the gap between their origination mortgage rates and contemporaneous market averages is more positive. Notably, mortgage rates have risen in recent years alongside drastic increases in insurance premiums, potentially limiting the relocation response to premium increases due to the mortgage "lock-in" effect as documented by Fonseca and Liu (2024). We expect the relocation effect to strengthen as mortgage rates fall, making purchasing a new home with a mortgage financially more favorable.

Our third finding reveals that among houses that were transacted, those that experienced larger premium increases are more likely to be purchased by a corporate buyer subsequently. This pattern likely reflects the competitive advantages that institutional investors possess. They may have larger risk-bearing capacity through diversified portfolios, which allows them to reduce insurance coverage. They may also have greater market power or lower search costs in negotiating or shopping for lower insurance premiums.

Fourth, premium increases also trigger mortgage prepayment among non-relocating households. This can be explained by at least two mechanisms. On one hand, households may prepay mortgages to escape lender-imposed insurance requirements, allowing them to reduce coverage, which increases their disaster risk exposure. On the other hand, rising premiums can prompt behavioral "optimization" responses where households reassess their finances and eliminate mortgage interest payments, consistent with evidence that households focus on reducing explicit expenses rather than maximizing returns.

This paper has several important implications. Our findings underscore the significant impact of climate change on household financial resilience through the insurance market. As climate-driven disasters become more severe and frequent, they push insurance rates higher, which in turn increases households' risk of mortgage delinquency.

Importantly, our paper also highlights risks associated with insurance costs in mortgages and mortgage-backed securities, with implications for the stability of the financial sector. Since mortgages and mortgage-backed securities are central to the financial sector, increased delinquencies can destabilize financial institutions. Thus, climate change's

impact on insurance rates represents an emerging threat to broader financial stability.

Our findings carry significant implications for policymakers grappling with the issue of insurance affordability. The results suggest that insurance costs are constraining some households' liquidity, to the extent of leading to mortgage delinquencies and foreclosures. Considering that mortgage defaults can have large spillover effects on the wider economy, our research underscores the potential benefits of policy interventions, such as means-tested insurance subsidies[1] for existing homeowners. Such measures may have a limited net effect on the government budget, given that our results suggest that the Federal Government may be bearing much of the delinquency risk associated with rising insurance costs.

To the best of our knowledge, we are the first to identify the effect of property insurance premiums on households' financial and relocation outcomes. Our work contributes to several related literatures. First, we extend research on insurance and mortgage markets. Sastry (2021) shows that lenders require higher down payments from borrowers who under-insure, potentially due to post-disaster default concerns, while Sastry, Sen and Tenekedjieva (2023) find higher mortgage defaults in areas with greater insurer insolvency following disasters. We demonstrate that premium increases alone—independent of actual disasters—can also elevate default risk. This mechanism may explain Ge, Lam and Lewis (2024)'s finding that buyers of homes facing exogenous flood insurance premium increases are less likely to obtain mortgages, as lenders may anticipate higher default risks from elevated insurance costs. By highlighting the important effect of insurance premiums, we also contribute to a growing literature on insurance pricing and market dynamics.[2] Beyond insurance pricing, Jotikasthira, Kartasheva, Lundblad and

[1]See a related proposal studied by the Congressional Budget Office, `https://www.cbo.gov/publication/59918`.

[2]Cookson, Gallagher and Mulder (2024) uncovers coverage neglect in homeowners insurance market. Liao and Mulder (2021) study the effect of home equity on flood insurance demand. A few papers study the effect of insurance premiums on the housing market with mixed findings, including Georgic and Klaiber (2022) Hennighausen, Liao, Nolte and Pollack (2023), Gibson and Mullins (2020), Bakkensen and Barrage (2021), Nyce, Dumm, Sirmans and Smersh (2015), and Hino and Burke (2021). Papers on home insurance pricing include Keys and Mulder (2024), Boomhower, Fowlie, Gellman and Plantinga (2024), Oh et al.

Ramadorai (2025) uncover that insurers deny and delay claim payments as another response to losses.

In addition, our study contributes to the growing body of literature examining the intersection of climate change, natural disasters, and mortgage markets. Prior papers explore the impact of disasters on mortgage delinquencies (Gallagher and Hartley, 2017; Kousky, Palim and Pan, 2020; Billings, Gallagher and Ricketts, 2022; Issler, Stanton, Vergara-Alert and Wallace, 2024; Biswas, Hossain and Zink, 2023), pricing of mortgage-related securities (Gete, Tsouderou and Wachter, 2024; Dice, Hossain and Rodziewicz, 2024), and securitization (Ouazad and Kahn, 2022). We highlight a different channel—insurance costs—through which disaster and climate risks can affect mortgage outcomes. In so doing, we also complement recent work on climate risk in housing markets (Bernstein, Gustafson and Lewis, 2019; Baldauf, Garlappi and Yannelis, 2020; Murfin and Spiegel, 2020; Keys and Mulder, 2020; Giglio et al., 2021; Lopez and Tzur-Ilan, 2023; Ge et al., 2024; An, Gabriel and Tzur-Ilan, 2024).

Our paper also contributes to the literature on how physical climate risk affects financial markets. Acharya, Berner, Engle, Jung, Stroebel, Zeng and Zhao (2023) summarize in their review of the literature that physical risks, such as rising sea levels, extreme weather events, and heat stress, can lead to direct damages to assets and disruptions to business operations, potentially resulting in loan defaults and losses for banks. We highlight a new channel, i.e., insurance premiums, through which climate change can impose substantial risks on the financial market.

(2022), Sastry et al. (2023), and Blonz, Hossain and Weill (2024). Papers on the National Flood Insurance Program pricing include Wagner (2022a), Weill (2022), Mulder and Kousky (2023), and Mulder (2021). Marcoux and Wagner (2023) and Wagner (2022b) study insurance market design. Jung, Engle, Ge and Zeng (2023) measure insurers' exposure to climate risk.

2 Institutional background

2.1 Background

Homeowners' insurance is a critical component of the U.S. housing market. Sastry, Sen, Tenekedjieva and Scharlemann (2024) estimate that 80% of homeowners hold such policies. This high adoption rate is likely driven by mortgage lenders requiring insurance coverage as a precondition for loans. Around 30% of homeowners reported being impacted by weather events in the last five years, highlighting the importance of such coverage.[3]

The most common policy for owner-occupied residences is the "HO-3" type, which provides comprehensive coverage, including the structure, contents, and temporary living costs if the home becomes uninhabitable due to damage. These multi-peril policies typically have one-year terms with automatic renewal, subject to potential changes in rates or terms communicated through annual statements. However, it's crucial to note that standard policies often exclude certain perils, such as floods and earthquakes. Specialized policies are available to cover these excluded risks.[4] In areas where private insurance is difficult to obtain, homeowners may resort to state-sponsored "insurers of last resort," such as Citizens Property Insurance in Florida or the California FAIR plan.

2.2 Coverage

Homeowners' insurance policies typically include several key components that define the scope and extent of coverage.

First, coverage types in a standard policy usually include dwelling coverage (for the structure of the home), personal property coverage (for belongings), liability protection, and additional living expenses.[5] In terms of structure coverage, there are two dominant

[3]See Homeowners Perception of Weather Risks 2023Q2 Consumer Survey, https://www.iii.org/sites/default/files/docs/pdf/2023_q2_ho_perception_of_weather_risks.pdf.

[4]See https://content.naic.org/sites/default/files/publication-hoi-pp-consumer-homeowners.pdf.

[5]See https://content.naic.org/sites/default/files/publication-hmr-zu-homeowners-insurance.

types: "Actual Cash Value" (ACV) and "Replacement Cost Value" (RCV). ACV reimburses policyholders for the depreciated value of damaged property, meaning it deducts for age and wear. For example, if a 10-year-old roof is damaged and needs to be replaced, ACV would pay the current market value of that roof, which approximates the cost of a new one minus the accumulated depreciation of the old roof. In contrast, RCV covers the full cost to repair or replace the damaged property without depreciation deductions. This means that a policyholder would receive enough to replace the old roof with a new one of similar quality. Overall, RCV typically provides higher payouts but comes with higher premiums compared to ACV policies.

Second, deductibles are the amount the policyholder must pay out-of-pocket before insurance coverage kicks in. In our data, many policyholders choose a deductible of 0.5% of the coverage limit. The coverage limit represents the maximum amount the insurer will pay in the event of a total loss, typically set to the estimated cost to rebuild the home. Homeowners can often customize their policies by adjusting coverage limits, adding endorsements for specific valuables, or opting for higher deductibles to lower premiums.

2.3 Pricing

The cost of homeowners' insurance is primarily determined by location-specific risks, with states prone to natural disasters such as hurricanes, tornadoes, and wildfires typically having higher premiums. For instance, Florida and Louisiana have some of the highest average annual premiums, exceeding $5,700, while states like Hawaii and Vermont have much lower average costs, around $500 to $800 per year.[6] Other factors affecting pricing include the home's age, construction materials, proximity to fire stations, and the homeowner's claims history and credit score. Insurance companies use complex actuarial models to assess risk and set premiums, leading to variations in pricing among

pdf.

[6]See https://www.bankrate.com/insurance/homeowners-insurance/home-insurance-statistics/.

different insurers (Boomhower et al., 2024). Homeowners' insurance rates in the United States are subject to regulatory oversight and approval processes, which vary by state. Insurance companies typically must submit rate change requests to state insurance departments or commissions for review and approval before implementing new premiums.

3 Data

3.1 Residential Mortgage Servicing (ICE McDash Analytics)

The Residential Mortgage Servicing Database contains information from ICE McDash data. The data mainly comprise the servicing portfolios of the largest residential mortgage servicers in the US. It covers approximately two-thirds of installment-type loans in the residential mortgage servicing market. Loan-level attributes include borrower characteristics (credit scores, owner occupancy, documentation type, and loan purpose); collateral characteristics (LTV, property type, zip code); and loan characteristics (product type, loan balance, and loan status.) We restrict our sample to loans secured by single-family homes with non-missing zip code, occupancy, origination date, LTV, DTI, and credit score. We obtain this data for 2015-2023.

We rely on this data for the dependent variable of whether a mortgage is delinquent for at least 30, 60, or 90 days. This measure does not include foreclosures. We drop loans that were transferred to a different servicer during our sample period or that were terminated for an unknown reason. Voluntary prepayment also includes refinancing.

In order to include a loan in our sample, we need to be able to compute the change in premium between policy renewals. As the insurance data are provided along with December loan performance data, a loan that was prepaid, for example, in June after a premium increase in March, would be dropped from the dataset. Figure A2 plots the share of mortgages that are prepaid by the calendar month of the insurance policy expiration date. The share is approximately 7% for policies renewing in January, dropping

down to around 1% for February renewals, then rises monotonically to more than 6% for December renewals. It is unlikely these patterns are due to actual prepayment ratios changing with the insurance renewal month. Thus, we interpret the pattern in Figure A2 as being due to under-reporting of prepayment that is more severe between February and August. Therefore, in our empirical analyses, we report the results using samples with different policy renewal months and choose those with Sep-Jan renewal month as our main sample for the prepayment analysis.[7] Figure A1 plots the share of mortgages that are delinquent by the calendar month of the insurance policy expiration date. Note that delinquency reporting does not have this issue.

3.2 ICE McDash Property Insurance Module

We obtain data on insurance at the loan level from ICE McDash between 2015 and 2023. The property insurance module contains a loan identifier allowing insurance information to be matched with ICE McDash Residential Mortgage Servicing Data. Insurance data are obtained from a subset of mortgage servicers who agreed to participate and cover around three-quarters of mortgages in the servicing data.

If insurance coverage is not maintained, the servicer is liable for any damages that may result. Because of these legal responsibilities and liability risks, servicers maintain detailed data on insurance coverage and enter these data into the servicing system. When a mortgage is closed, and every year thereafter, borrowers must submit proof of homeowners' insurance.

The ICE McDash Property Insurance data include the following variables: coverage amount per loan, deductible amount, the date when the policy expires, and "Replacement Cost Value" coverage flag, which indicates the primary insurance coverage type. We restrict our sample to loans with annual insurance policies that also appeared in the ICE McDash sample in the previous calendar year. We further require that the loan is current

[7] In a previous draft, we do not make this sample restriction.

in the month before the insurance policy expires.

3.3 ICE McDash Credit Risk Insights Servicing Module (CRISM)

This dataset merges anonymized mortgage servicing records with borrower credit outcomes. Equifax matches the aforementioned ICE McDash mortgage servicing records to its credit bureau data. This merger adds other credit market outcomes for borrowers, such as the performance of their credit card debt. Equifax also uses many different data sources to identify whether a borrower has moved their residence. The data offer Risk Scores (different from FICO scores), which are generated from Equifax's proprietary credit risk model that predicts the likelihood of a borrower becoming delinquent on credit obligations.

3.4 CoreLogic Solutions Real Estate Data

We use CoreLogic's tax assessor and transaction data (Deeds and Tax Data). In addition, we also use CoreLogic Climate Risk Data, which contains structure-level data on measures of current and future climate risk for properties in the U.S. CoreLogic uses their proprietary climate model to generate measures of climate risk on nine perils. For each structure within a parcel or property, the data include a measure of Average Annual Loss (AAL) at various return periods. AAL is the expected annual loss to structure and contents generated by simulating many possible iterations of a given year and then calculating the average loss across all iterations. Thus, AALs account for the magnitude of damage resulting from events of different severity as well as the likelihood of events of different severity occurring. CoreLogic reports AALs as a share of the coverage limit, which can be understood as the replacement cost of the structure (Wylie, Amornsiripanitch, Heilbron and Zhao, 2025).

3.5 Matching Loan-Level Data with CoreLogic

We merge our loan-level insurance data to CoreLogic property-level data. This provides us with additional information about the property and its transaction history. We first identify a potential set of candidate properties by requiring an exact match on the 5-digit zip code, as well as a mortgage with the same month of origination and a loan amount rounded to the nearest thousand dollars.

We then compute a measure of match quality based on the following criteria: the dollar loan amounts match exactly; origination dates match exactly; loans have the same purpose (i.e., purchase, refinance); the loan type matches (FHA, VA or conventional). We rank potential matches based on the number of these criteria that are satisfied. As a tiebreaker, we use a distance measure based on loan amount and origination date. For each loan, we use the property with the highest quality match. 85% of loans have a property match. 56% have an exact match on all the criteria. 80% of matches have at most one of the additional criteria not met.

We use the matched data to measure the climate risk exposure (proxied by AAL) at the household level. When property-level AAL is not available due to failed matching or missing information, we use the zip-level average AAL. We sort households into three bins based on the AAL measure of their location prior to each insurance renewal. We then use climate risk bin-by-year fixed effects in our regression analyses.

4 Climate Risk Associated with Larger Premium Increases

In Figure 1, we examine how premiums have evolved in recent years. We estimate the following regression at the zip-by-year level.

$$\Delta(Premium\ Rate)_{z,2015\ to\ t} = \gamma_z + \delta_{c,t} + \sum_{t=2016}^{2023} \beta_t ClimateRisk_z + \alpha_t Controls_z + \epsilon_{z,t},$$

where z denotes zip code, c denotes the county, and t the year. The dependent variable is the cumulative change relative to 2015 in premium rate (total premiums relative to the coverage limit, in percentages), averaged at the zip-year level. The main independent variable is CoreLogic's average measure of climate risk (AAL) at the zip level.[8] We control for zip and county-by-year fixed effects. We use only policies with deductibles set at 0.5% of the coverage limit in this analysis so that changes in deductibles do not drive the results. Figure 1 plots the estimates of β_t. The figure suggests that insurance premiums have experienced faster growth in areas with higher levels of climate risk, consistent with Keys and Mulder (2024).

5 Instrumental Variables for Premium Increase

Before proceeding to household-analysis on the effect of premium increases, we describe our instrumental variable approach in this section. One may be concerned that any observed OLS relationship between higher insurance premiums and household outcomes could be due to omitted variables. For instance, households experiencing financial distress may be more likely to have homes in disrepair and exhibit lower credit scores. These factors could potentially lead insurers to charge such households higher insurance premiums. At the same time, households' financial distress may also independently contribute to mortgage delinquency. We mitigate such endogeneity concerns in our OLS regressions by controlling for FICO score in the month preceding insurance policy renewal, as well as fixed effects such as zip-by-insurance renewal month and origination LTV, DTI bin fixed effects. To further address the identification challenge, we instrument for premium changes.

We employ two instruments for premium rate changes simultaneously. For each borrower, we first construct the average premium rate increase at renewal across policies that renew in the same month by the same insurer in other zip codes within the same state.

[8] We take the average of the climate risk measure across the primary structures in a zip code.

Rather than using the actual renewal month and insurer, we use each policy's expiration month and insurer from the previous year, to reduce concerns about endogenous renewal timing and insurer-switching. These averages at the insurer-zip-by-renewal month level form our first instrument. Second, we interact the first instrument with the climate risk of the households' address.

Our instruments should satisfy the relevance restriction for the following reasons. First, premium increases follow location-level trends driven by insurers' risk assessments (Keys and Mulder, 2024) and state regulatory approvals (Oh et al., 2022). Since premium changes only affect homeowners at renewal, a property's premium change should correlate with premium adjustments implemented by insurers in the same local area since the previous policy renewal. Second, Keys and Mulder (2024) and our Figure 1 suggest that zip codes with high levels of climate/disaster risks have experienced larger premium increases in recent years. We hypothesize that within a given location, premium increases have been proportionally larger for higher-risk properties. Thus, the second instrument should also be relevant.

Our first instrument likely satisfies the exclusion restriction for two reasons. Our instrumental-variable regressions include zip-by-insurance renewal month fixed effects, effectively comparing borrowers within the same zip code who renew their insurance policies in the same month. The within-zip-by-renewal month variation in the average premium changes stems from different insurers, including their timing of premium changes and regulatory approvals, rather than factors related to individual borrowers' mortgage delinquency and other outcomes we examine. These arguments suggest our first instrument likely satisfies the exclusion restriction. By extension, our second instrument—which interacts the first instrument with borrowers' predetermined property climate risk—should also be exogenous. Furthermore, we control for each borrower's credit risk score in the month preceding their insurance policy renewal to further rule out endogeneity. We also control for climate risk bin-by-renewal month fixed effects to remove the time-

varying effect of climate risk on households' outcomes.

6 Effect of Premiums on Mortgage Delinquencies

Table 2 estimates the following OLS regression by regressing the mortgage outcome in the 12 months following the insurance renewal.

$$Mortgage\ Delinquency_i = \beta \times Premium\ Rate\ Increase_i + Controls + FEs + \epsilon_i,$$

where i indexes households. The main independent variable, *Premium Rate Increase*, is defined as the change in premium rate at policy renewal relative to the previous policy year, set as zero when the premium rate decreases. The dependent variable is an indicator of whether the household is delinquent on the mortgage for at least 30 days in Column (1), 60 days in (2), and 90 days in (3). The main independent variable is the increase in premiums per dollar of coverage from the prior to the current policy for each household. This variable is set to zero if a policy's premium decreased or remained unchanged.

Importantly, we control for the borrowers' FICO score in the month prior to the insurance renewal. In addition, we control for the household's climate risk at their residence. By controlling for zip-by-insurance renewal month fixed effects, we effectively compare households within the same zip code who renewed their insurance policies in the same month. We also control for a battery of other fixed effects: climate risk bin-by insurance renewal year-month, mortgage origination year, loan-to-value ratio bin, FICO at origination bin, and debt-to-income ratio bin. The coefficients on premium changes are consistently positive, suggesting that when premiums increase, households are more likely to be delinquent on their mortgages.

Figure 2 presents bin-scatter plots illustrating the relationship between 60-day mortgage delinquency probability and premium changes. The figure demonstrates a positive relationship between delinquency probability and premium changes, supporting our re-

gression results.

Column (3) of Table 2 presents the first-stage results, where the dependent variable is *Premium Rate Increase*, the same as the main independent variable in the OLS regression. Both instruments described in the previous section predict premium increases with positive and statistically significant coefficients. The results indicate that households face larger premium increases when their insurers increase premiums by more in other zip codes in the same state. In addition, households facing higher climate risks experience larger premium increases than their peers in other zip codes in the same state. The large Kleibergen-Paap Wald F statistics suggest that the instruments are sufficiently strong.

Column (4) presents the second-stage results. The dependent variable is an indicator for 60-day mortgage delinquency. The coefficients on the instrumented premium increase are positive and statistically significant, suggesting that premium increases cause more mortgage delinquencies.

The instrumental-variable estimate indicates that a two-standard-deviation increase in premium rates (equivalent to a $650 increase in annual insurance payments for the average coverage limit) corresponds to a 0.21 percentage point increase (=0.05 $\times$ 2 $\times$ 0.021) in the 60-day delinquency rate, corresponding to a 12% increase relative to the sample mean. This sensitivity is 7 times as large as that reported by Di Maggio, Kermani, Keys, Piskorski, Ramcharan, Seru and Yao (2017), who found that a $940 decrease in monthly mortgage payments reduced delinquency rates by 0.5 percentage points.

The difference in magnitudes likely stems from the asymmetric effects between payment increases and decreases. Di Maggio et al. (2017) studied borrowers who qualified for mortgages at higher interest rates, suggesting these households could already afford the higher payments absent negative income shocks. Consequently, substantial payment reductions had small effects on their delinquency rates. In contrast, our study examines borrowers who initially qualified for mortgages with lower insurance payments. For these households, insurance payment increases could potentially push total monthly obli-

gations beyond some borrowers' payment capacity. Supporting this interpretation, our analysis below reveals that delinquency effects are more pronounced among borrowers who typically have smaller financial buffers to absorb increased insurance payments. This asymmetry could explain the heightened sensitivity observed in our setting compared to Di Maggio et al. (2017).[9]

6.1 Delinquency Effect Larger for More Constrained Households

If insurance premium increases present a negative liquidity shock to households, and thus lead to more delinquencies, we expect the effect to be stronger for more liquidity-constrained households. We examine this hypothesis in Table 3.

We interact *Premium Rate Increase* with four different measures of financial constraints: an indicator for households with DTI ratios at origination above 40% in Column (1); an indicator for origination LTV ratio above 80% in (2); an indicator for FICO scores at origination higher than the median in (3); and an indicator for jumbo mortgage in (4).

The estimated coefficient on the interaction term is positive and statistically significant in Columns (1) and (2), suggesting that the more constrained households are more likely to fall into mortgage delinquency due to larger premium increases. The interaction terms have negative and statistically significant coefficients, suggesting that the effect of premiums on mortgage delinquency is weaker for households with better credit scores and jumbo borrowers who are generally less liquidity-constrained.

The estimates reveal that the delinquency effect is twice as large for high-DTI households compared to low-DTI households, and five times as large for high-LTV households relative to low-LTV households. Additionally, the delinquency effect is concentrated among households in the bottom half of the credit score distribution and those with conforming mortgages. These findings demonstrate that increased premium payments im-

[9]Gallagher, Gopalan and Grinstein-Weiss (2019) find that receiving health insurance subsidies is associated with a roughly 25% decline in the delinquency rate. Their mechanism differs from ours, as it operates through reduced exposure to out-of-pocket medical expenditure risk rather than through direct insurance cost burdens.

pose greater liquidity constraints on households that already allocate substantial portions of their income to mortgage-related expenses or face existing financial constraints.

6.2 Delinquency Effect Across Investors

A natural question is whether the effect of insurance premiums on mortgage delinquencies is present for FHA and GSE loans. This would imply a risk for the federal government, particularly if insurance premiums keep rising. We are also interested in whether the delinquency effect exists in private-label MBS and banks' portfolios, exposing investors and banks to associated risks. We investigate these questions in the following analysis.

In Table A3, we repeat our instrumental-variable analysis on mortgage delinquencies across different types of mortgages. We use mortgages guaranteed by Ginnie Mae in Column (1), by Fannie Mae in (2), by Freddie Mac in (3), private mortgages that are securitized in (4), and those that remain in banks' portfolios in (5). The results suggest that the effect of premiums on delinquency exists in each subsample, although not statistically significant among private mortgages that are securitized, potentially due to a smaller sample size. The effect is the largest for mortgages guaranteed by Ginnie Mae, and the smallest for those guaranteed by Freddie Mac. Given that Ginnie Mae (Freddie Mac) has the highest (lowest) unconditional delinquency rate, this result is consistent with the idea that premium increases have a larger effect on financially more constrained households.

6.3 Delinquency Effect Not Driven by Disasters

A potential concern is that households in disaster-affected areas may experience larger insurance premium increases alongside higher delinquency rates, all as direct consequences of natural disasters. In our analyses so far, we effectively compare across borrowers within the same zip codes and renew their insurance policies within the same month, making disasters an unlikely explanation.

Regardless, we address this concern directly in Table A2. We conduct three specifications: Column (1) replicates the main specification using only zip codes that experienced natural disasters within the current calendar year or preceding two years according to First Street Foundation's Climate Data; Column (2) presents results for the remaining non-disaster-affected zip codes; and Column (3) tests whether the relationship between premium increases and the respective outcomes differs across subsamples by including interaction terms between *Premium Rate Increase* and an indicator for recently disaster-affected zip codes using the full sample.

The results provide reassuring evidence that disaster experiences do not drive our main findings. For delinquency, we find that disaster-affected areas actually exhibit a smaller, rather than larger, response to premium rate increases—possibly due to forbearance offered by mortgage servicers following disasters.

6.4 Delinquency Effect is Robust When Coverage Changes

One concern is that delinquencies stem from borrowers' inattention to premium increases and subsequent failure to adequately fund their escrow accounts that pay for both mortgages and insurance. In Table A1, we examine the delinquency effects for households that switched between Replacement Cost Value and Actual Cash Value coverage. Because these households actively changed insurance policy type, they likely noticed the premium changes. The results suggest that the delinquency effect is similar for these households to that in the full sample in Table 2. This result suggests that delinquencies reflect the financial pressure due to rising premiums rather than simple oversight.

6.5 Foreclosure and Other Credit Outcomes

In Table 4, using the instrumental variable approach, we find that premium increases also cause a small increase in foreclosure probabilities. The estimate suggests that a two-standard-deviation increase in premiums leads to a 0.01 percentage point increase

in the probability of foreclosure, corresponding to 10% of the mean. The magnitude being smaller is consistent with our earlier finding that the insurance premium-induced delinquencies cure over time. However, as the premium increases were more drastic in the last two years of our sample and foreclosure takes time, the effect on foreclosure may increase in the future.

In Table 4, we also examine other credit outcomes using the instrumental variable approach. The results suggest that a two-standard-deviation increase in premiums leads to a 0.09 percentage point (or 2%) increase in credit card delinquency, a 0.1 percentage point increase in credit card utilization, and a 0.4 decrease in credit risk score. The effect on credit card delinquencies is smaller compared to the effect on the 60-day mortgage delinquency rate, likely because households can avoid credit card delinquency with a small minimum payment.

These results demonstrate that rising insurance premiums have broad negative effects across multiple dimensions of household finances, indicating that the mortgage delinquency effects reflect financial stress rather than mechanical relationships.

7 Effect of Premiums on Relocation

One way for households to mitigate the effects of rising insurance costs is to relocate to lower-risk areas to reduce future insurance costs. Even though insurance premiums are likely capitalized into house prices (Ge et al., 2024), given house prices typically adjust slowly to recent changes, they are thus unlikely to fully reflect recent premium increases. Table 5 tests this relocation hypothesis using the matched ICE McDash–Equifax Credit Risks Insight Servicing (CRISM) sample. Because we require movers to have prepaid their mortgage, we restrict the sample in this exercise to borrowers whose home insurance renews between September and January, as the prepayment rate is less biased for these borrowers.

Column (1) presents the OLS regression examining whether larger premium increases

trigger more household relocation. The dependent variable equals one if borrowers changed addresses within 12 months of insurance renewal, based on credit bureau data. The primary independent variable is the premium rate increase for each borrower, consistent with our main specification. The estimated coefficient on *Premium Rate Increase* is positive and statistically significant, indicating that households are significantly more likely to relocate when experiencing larger premium increases. Column (2) presents the first-stage result of the instrumental variable regression. Our instruments are still highly relevant in this smaller sample. Column (3) presents the second-stage result. The estimates on *Premium Rate Increase* are highly similar between the OLS and the instrumental variable regressions. A two-standard-deviation increase in premium rates corresponds to a 0.2 percentage point increase in relocation probability, equivalent to 7% of the mean.

7.1 Relocation Effect Depends on Mortgage Rate "Lock-In"

In Table 5, Column (4) repeats Column (1) with the addition of an interaction term between *Premium Rate Increase* and the difference between households' mortgage rate at origination and the average mortgage rate in the month of insurance rate renewal. The interaction term exhibits a positive and statistically significant coefficient, suggesting that households facing a more positive gap between origination mortgage rate and contemporaneous mortgage rates are more likely to relocate following premium increases.

This finding aligns with Fonseca and Liu (2024), who demonstrate that elevated mortgage rates reduce household mobility. Notably, mortgage rates have risen in recent years alongside drastic increases in insurance premiums, potentially limiting the relocation response to premium increases due to the mortgage "lock-in" effect. We expect the relocation effect to strengthen as mortgage rates fall, making purchasing a new home with a mortgage financially more favorable.

7.2 Effect of Premiums on Relocation Outcomes

If households move to a less risky location, they could save on insurance premiums. Next, we examine whether larger insurance premium increases lead households to move to less risky locations and reduce insurance costs in Table 6 using the instrumental variable approach.

In Column (1), the dependent variable is the change in climate risk. For non-movers, this variable equals zero; for movers, it equals the difference between average climate risk in the destination zip codes and origin property-specific climate risk. We control for the following fixed effects: zip-by-insurance renewal year, climate risk bin-by-renewal year, as well as origination year, FICO, LTV, and DTI. The estimated coefficient on *Premium Rate Increase* is negative and statistically significant, indicating that households experiencing larger premium increases achieve larger reductions in their climate exposure through relocation. Combined with the magnitude from Table 5, the climate risk reduction for movers is substantial, representing 26% of the mean.

As households move to safer locations in response to larger premium increases, their premiums should decline. We next examine how initial premium rate increases affect households' subsequent premium changes, and how this effect is different for movers. The dependent variables are changes in premium rates in Column (2), and changes in log total premiums in Column (3), both measured as changes from 12 months after the insurance renewal, at which we measure *Premium Rate Increase* on the right-hand side. Different from Column (1), we add an interaction term between *Premium Rate Increase* and an indicator for moving within 12 months after renewal.[10]

In both Columns (2) and (3), the positive coefficients on *Premium Rate Increase*, 0.316 and 0.215, indicate that for non-movers, larger premium increases in policy year $t-1$ are associated with subsequent premium increases in policy year t. This pattern can

[10] As a result, we have two endogenous variables and two first stages. We also add an interaction term between our first instrument and the indicator for moved as the third instrument in both first stages.

emerge despite our zip-by-renewal year fixed effects when households exhibit sticky insurer choice and certain insurers implement consecutive rate increases than others more frequently.

The results differ markedly for movers. Larger premium increases in $t-1$ are associated with subsequent premium reductions in t: the estimated coefficients on *Premium Rate Increase* $\times$ *Moved* are negative and statistically significant, -2.603 in Column (2) and -2.824 in Column (3); these interaction effects more than offset the positive main effect of *Premium Rate Increase*, resulting in a net negative relationship for movers.

Based on Column (2), a two-standard-deviation increase in premium rates is associated with a 0.03 (=0.3 $\times$ 0.05 $\times$ 2) percentage point premium rate increase for non-movers versus a 0.23 (=(0.3-2.6) $\times$ 0.05 $\times$ 2) percentage point reduction for movers. Scaling by average coverage limits of \$374,242, movers' premium savings translate to \$973 (=2.6 $\times$ 0.05 $\times$ 2 $\times$ \$374,242 / 100) compared to non-movers. If this saving stays the same, assuming a discount rate of 6% (Giglio et al., 2021), the present value of the premium savings amounts to \$11,160 within 20 years or \$13,846 within 33 years.[11] Households likely perceive these savings from relocation as enhancing the overall benefits of moving, effectively shifting their decision-making in favor of relocation.

7.3 Relocation Effect Larger for Less Constrained Households

Relocation entails significant upfront costs. Although premium increases may push the net surplus of moving to be positive, financially constrained households may lack the liquidity to afford relocation. In Table 7, we sort households into terciles based on their FICO scores at origination. We then repeat the OLS regression from Column (1) of Table 5, adding interaction terms between *Premium Rate Increase* and indicators for households in the second and third FICO terciles.

The *Premium Rate Increase* coefficient remains positive and statistically significant at

[11] In our data, the probability a borrower moves in a year is 0.03, implying that the average borrower stays in a house for 33 years.

0.016. This magnitude suggests that borrowers in the lowest FICO tercile experience an increase in relocation probability by 0.16 percentage points following a two-standard-deviation increase in premium rate. Both interaction terms are also positive and statistically significant: 0.009 for the second tercile interaction and 0.012 for the third tercile interaction. These estimates indicate that the relocation response is 56% larger for those in the middle tercile and 75% larger for those in the highest tercile. These findings support the hypothesis that households with greater financial flexibility are better positioned to absorb the upfront costs of relocation when premiums rise.

7.4 Corporate Buyers

As households move due to higher premiums, who are the buyers of those vacated homes? We hypothesize that the buyers are more likely to be a corporation when the insurance premium increase is larger. Corporate buyers have larger risk-bearing capacity through diversified portfolios, which allows them to reduce insurance coverage. They may also have greater market power or lower search costs in negotiating or shopping for lower insurance premiums.

In Table 8, we examine whether the buyers of vacated homes are more likely to be corporations when properties faced larger premium increases. Column (1) presents OLS estimates using an indicator for whether the buyer is a corporation as the dependent variable and *Premium Rate Increase* as the independent variable. The coefficient on *Premium Rate Increase* is positive and statistically significant. The magnitude suggests that a two-standard-deviation increase in premium rates raises the probability that the buyer is a corporation by 0.4 percentage points—a 5.4% increase relative to the sample mean. Columns (3)-(4) present instrumental variable estimates, which confirm the OLS findings.

8 Mortgage Prepayment without Relocation

We hypothesize that premium increases may drive mortgage prepayment even among households that do not relocate, as homeowners seek to either escape mandatory insurance requirements or reduce explicit monthly expenses in response to rising costs. Table 9 examines this hypothesis by analyzing the relationship between premium increases and non-relocation mortgage prepayment. Column (1) presents OLS estimates with an indicator for households prepaying mortgages without relocating as the dependent variable and *Premium Rate Increase* as the independent variable. Columns (2) and (3) present instrumental variable results for robustness.

The results confirm our hypothesis. A two-standard-deviation increase in premium rates corresponds to a 0.14 percentage point increase in non-relocation prepayment probability, representing a 3% increase relative to the sample mean. This finding suggests two potential mechanisms underlying this behavior.

The first mechanism involves households paying off mortgages to escape lender-imposed insurance requirements. By prepaying their mortgages, homeowners eliminate the mandatory coverage requirement and gain the option to reduce or cancel insurance, though this strategy exposes them to greater financial risk from potential disasters.

The second mechanism reflects a behavioral response where rising insurance costs prompt households to seek relief from other monthly expenses. When confronted with higher premiums, households may choose to eliminate mortgage interest payments through prepayment. However, this behavior may reflect suboptimal decision-making: households overlook the opportunity costs of forgoing investing their savings to pay off mortgages. This mechanism aligns with research showing that households often overlook opportunity costs in financial decision-making, focusing on eliminating explicit expenses while ignoring potential investment returns on capital (Liebersohn, Jambulapati and Fitzpatrick, 2024).

Column (4) replicates Column (1) while adding an interaction term between *Premium Rate Increase* and the difference between households' mortgage rates at origination and the average mortgage rate in the month of insurance rate renewal. Unlike the relocation results, the coefficient on the interaction term is statistically insignificant. This finding is consistent with the notion that households' decision of prepaying mortgages without purchasing new homes is not affected by changes in mortgage rates.

9 Conclusion

Climate change is driving increasingly severe natural disasters, causing homeowners' insurance premiums to rise dramatically. Using new microdata on insurance policies linked to mortgage and credit outcomes, combined with a novel instrumental variable approach, we establish three key findings. First, premium increases significantly raise mortgage and credit card delinquency rates, creating direct financial stress for households. Second, households respond to higher premiums by relocating to safer areas with lower insurance costs. When they vacate their properties, corporations are more likely to purchase these homes, particularly when premium increases are substantial. Third, the effects vary systematically by household financial constraints: delinquency impacts concentrate among financially constrained households, while relocation responses are stronger among less constrained households who can afford the upfront moving costs.

Our findings highlight an understudied effect of climate change on household financial resilience. As more severe disasters linked to climate change push insurance premiums higher, we demonstrate that households are at greater risk of financial distress, especially those who are more financially constrained. This underscores the considerable financial strain that climate change imposes on homeowners.

The paper also points to the risks that rising insurance costs pose for mortgages and mortgage-backed securities. Delinquencies represent negative shocks for parties with exposure to mortgage default risk, a significant portion of the financial sector. Thus, our

findings not only illustrate the direct impact on households, but also uncover broader implications for financial stability as insurance costs rise due to climate change.

For policymakers addressing the issue of insurance affordability, our findings carry critical implications. The results suggest that increasing insurance premiums severely limit household liquidity, driving some to mortgage delinquency. Given the broader economic consequences of mortgage defaults, our research underscores the potential value of policy measures like means-tested insurance subsidies to mitigate these effects.

Our findings also reveal that households actively mitigate rising insurance costs by relocating to safer areas, suggesting that insurance markets serve as an important mechanism for climate-driven demographic change. This relocation response has significant implications for residential sorting patterns, as premium increases may accelerate the exodus from high-risk areas while potentially concentrating vulnerable populations who cannot afford to relocate.

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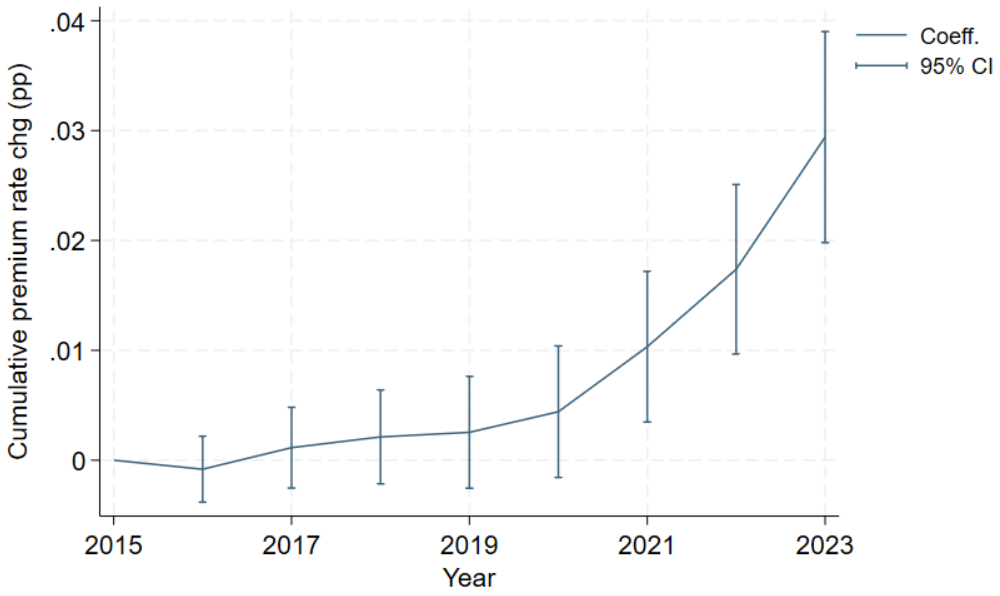
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FIGURE 1

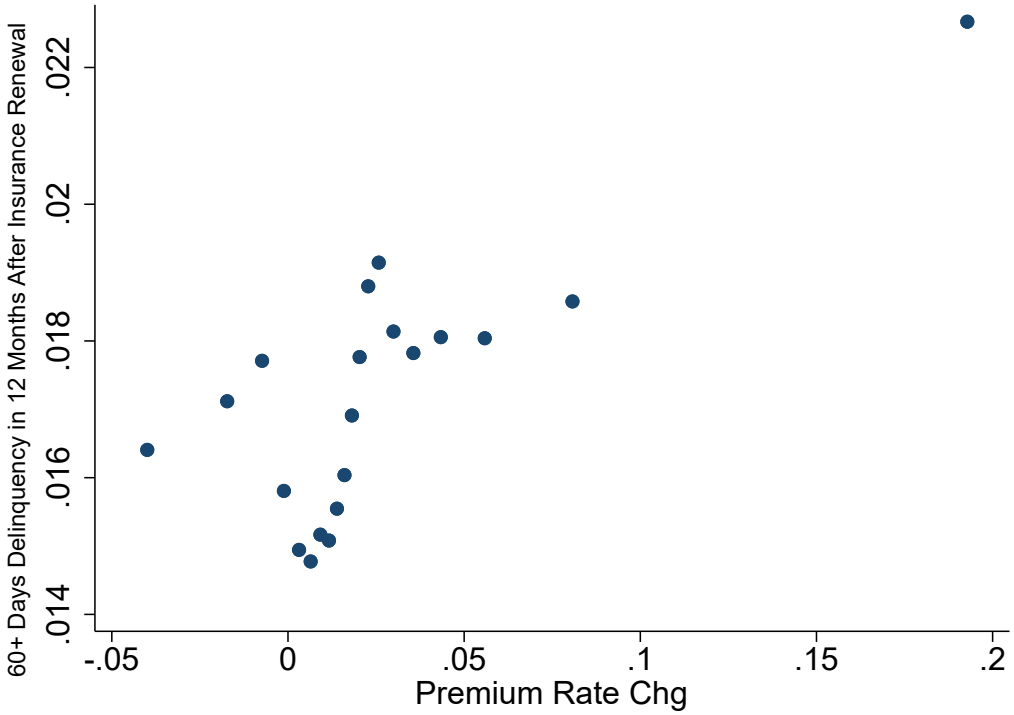
PREMIUMS HAVE INCREASED MORE IN HIGH-CLIMATE-RISK AREAS



NOTES: Source: ICE McDash, decennial census (controls).
In Figure 1, we examine how premiums have evolved in recent years. We estimate the following regression at the zip-by-year level. $\Delta(Premium\ Rate)_{z,2015\ to\ t} = \gamma_z + \delta_{c,t} + \sum_{t=2016}^{2023} \beta_t ClimateRisk_z + \alpha_t Controls_z + \epsilon_{z,t}$, where z denotes zip code, c denotes the county, and t the year. The dependent variable is the cumulative change relative to 2015 in premiums relative to the coverage limit (in percentages), averaged at the zip-year level. The main independent variable is CoreLogic's composite measure of climate risk averaged across primary structures at the zip level. We use only policies with deductibles being 0.5% of the coverage limit in this analysis so that changes in deductibles do not drive the results. The figure plots the estimates of β_t and the corresponding 95% confidence interval. We require the deductible (as a percentage of the coverage limit) and coverage type (ACV or replacement cost) do not change. This measure is constructed using within-loan changes in premium only.

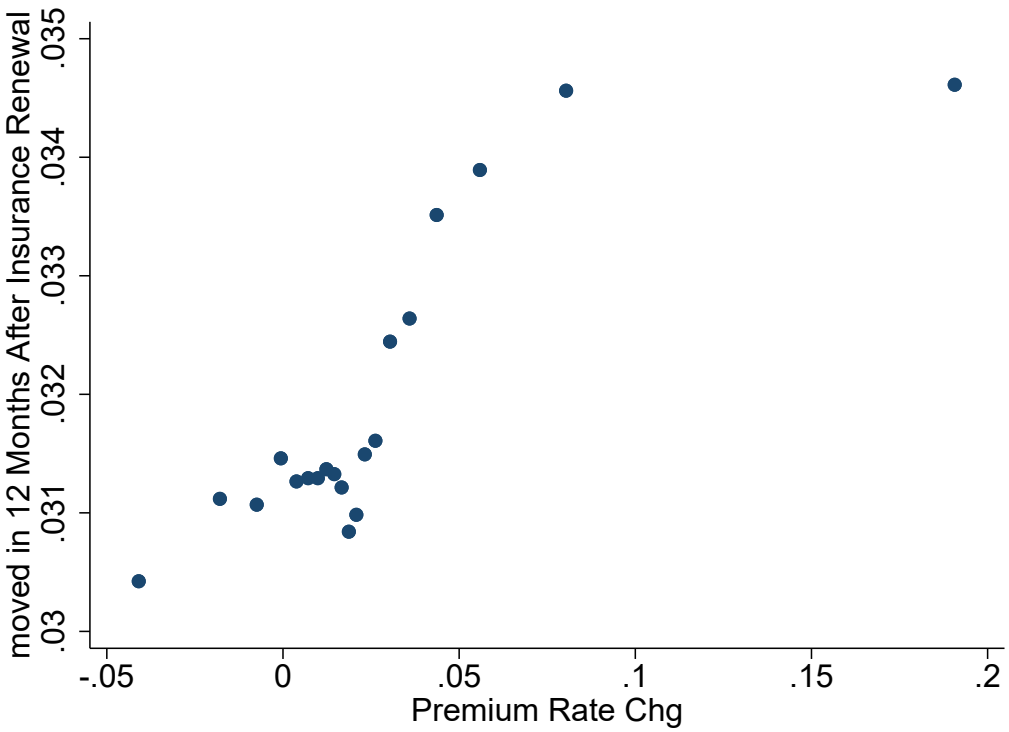
FIGURE 2

MORTGAGE DELINQUENCY AND PREMIUM RATE INCREASES



NOTES: Source: ICE McDash.
This figure is a bin-scatter plot of 60-day mortgage delinquency against changes in annual insurance premium rate (insurance premiums as a percentage of the coverage limit). We control for FICO score in the month preceding insurance renewal, and the following fixed effects (FE): insurance policy start month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE, 5-digit zip FE. We drop loans where the servicing is transferred within a year of policy reset and where the loan was not current as of the reset month.

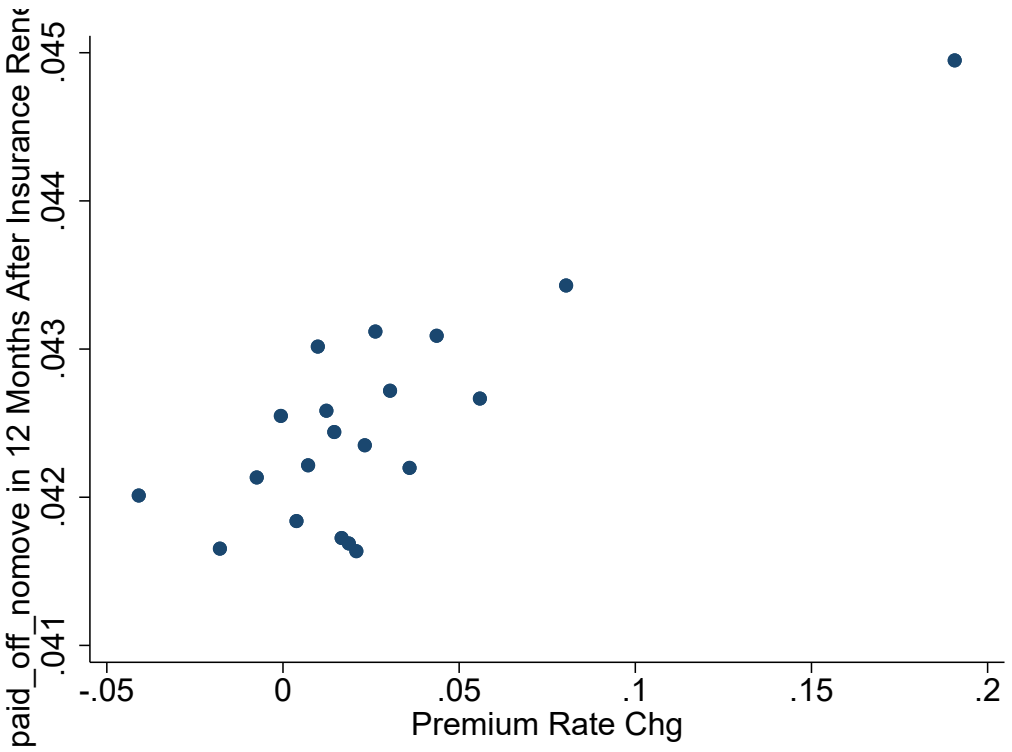
FIGURE 3
MOVING AND PREMIUM RATE INCREASES



NOTES: Source: ICE McDash and CRISM.
This figure is a bin-scatter plot of probability of household moving against changes in annual insurance premium rate (insurance premiums as a percentage of the coverage limit). We control for FICO score in the month preceding insurance renewal, and the following fixed effects (FE): insurance policy start month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE, 5-digit zip FE. We drop loans where the servicing is transferred within a year of policy reset and where the loan was not current as of the reset month. We only keep loans with insurance renewals occurring between September and January.

FIGURE 4

MORTGAGE PREPAYMENT WITHOUT MOVING AND PREMIUM RATE INCREASES



NOTES: Source: ICE McDash and CRISM.
This figure is a bin-scatter plot of probability of household prepaying mortgage without moving against changes in annual insurance premium rate (insurance premiums as a percentage of the coverage limit). We control for FICO score in the month preceding insurance renewal, and the following fixed effects (FE): insurance policy start month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE, 5-digit zip FE. We drop loans where the servicing is transferred within a year of policy reset and where the loan was not current as of the reset month. We only keep loans with insurance renewals occurring between September and January.

TABLE 1

SUMMARY STATISTICS

	Mean	SD	25 Pctl	Median	75 Pctl
30-Day Delinquent	0.05	0.22	0.00	0.00	0.00
60-Day Delinquent	0.02	0.13	0.00	0.00	0.00
90-Day Delinquency	0.01	0.10	0.00	0.00	0.00
Number of Insurers	231.00	0.00	231.00	231.00	231.00
Jumbo	0.03	0.18	0.00	0.00	0.00
Zip Had Recent Disaster	0.23	0.42	0.00	0.00	0.00
Premium Rate Increase	0.03	0.06	0.00	0.00	0.03
Premium Rate Change	0.01	0.07	-0.01	0.00	0.03
Insurer Other-Zip Avg Prem Increase	0.02	0.03	0.01	0.02	0.03
Premium Rate	0.48	3.96	0.28	0.39	0.57
Credit Score Before Renewal (MacDash)	760.68	70.57	724.00	780.00	812.00
Climate Risk (Raw)	-6.73	0.70	-7.13	-6.78	-6.32
Climate Risk (Standardized)	0.00	1.00	-0.57	-0.07	0.58
DTI	33.24	11.09	25.00	34.00	42.00
FICO at Origination	738.19	68.19	701.00	752.00	787.00
LTV	73.53	19.52	61.75	77.41	89.55
Premium $ Changes	111.63	438.30	12.00	60.00	156.00
Annual Premium $	1,529.06	1,280.21	864.00	1,224.00	1,800.00
Coverage Limit	374,242.49	531,526.67	214,000.00	297,400.00	424,000.00
Credit Score before Renewal (CRISM)	771.11	66.05	742.00	794.00	821.00
Orig Mtg Rate - Current Avg	-0.24	1.67	-0.89	0.05	0.81
Premium as % of P&I Payment	15.50	29.77	7.66	11.90	18.83
Moved	0.03	0.18	0.00	0.00	0.00
Prepaid without Moving	0.04	0.20	0.00	0.00	0.00
Prepaid	0.12	0.33	0.00	0.00	0.00
Cash-Out Refinance	0.02	0.13	0.00	0.00	0.00
No-Cash-Out Refinance	0.03	0.16	0.00	0.00	0.00
Credit Utilization	11.29	15.99	1.65	6.50	15.94
Any Line Delinquent	0.11	0.32	0.00	0.00	0.00
Change in Credit Risk Score	-16.52	33.60	-20.00	-7.00	-1.00
Share of Lines Delinquent	0.03	0.11	0.00	0.00	0.00
Credit Card delinquent	0.06	0.23	0.00	0.00	0.00
Any First Mortgage Delinquent	0.02	0.14	0.00	0.00	0.00
Credit Score before Renewal (CRISM)	771.11	66.05	742.00	794.00	821.00
Climate Risk Change	0.01	0.12	0.00	0.00	0.00
Premium Rate Change	0.01	0.10	-0.01	0.01	0.03
New Zip Avg Premium Rate minus Old Own	0.03	0.22	-0.05	0.04	0.13
Moved to Lower Climate Risk	0.01	0.09	0.00	0.00	0.00
Moved to Higher Climate Risk	0.02	0.14	0.00	0.00	0.00
Change in Log Premium	0.07	0.17	0.01	0.06	0.13
Mortgage Rate Change	-0.09	1.31	-0.75	0.00	0.38
Change in Log P&I Payments	0.01	0.09	0.00	0.00	0.00
Change in Log P&I Payments + Premium	0.01	0.08	0.00	0.01	0.02
Insurer Premium Share	0.46	1.72	0.01	0.05	0.21
Insurer HHI	682.52	215.27	595.96	611.07	644.02
Insurer Premium Share (State)	1.62	3.73	0.02	0.25	1.21
Insurer HHI (State)	987.39	323.33	773.11	933.29	1,153.14

NOTES: Source: ICE McDash, CRISM, CoreLogic, First Street, Census ACS.

TABLE 2
MORTGAGE DELINQUENCY RATES INCREASE WITH PREMIUMS

	(1)	(2)	(3)	(4)	(5)
	Mortgage Delinquency			Premium Rate	Delinqueny
	30-Day	60-Day	90-Day	Increase	60-Day
Premium Rate Increase	0.074***	0.033***	0.022***		0.021***
	(71.74)	(53.03)	(46.19)		(18.11)
Insurer Other-Zip Avg Prem Increase				0.910***	
				(329.27)	
Insurer Other-Zip Avg Prem Increase × Climate Risk				0.041***	
				(23.12)	
Previous Premium Rate	0.000	0.000	0.000	0.000	0.000
	(1.46)	(1.57)	(1.44)	(1.39)	(1.54)
Credit Score/1k before Renewal	-0.896***	-0.369***	-0.222***	-0.042***	-0.363***
	(-348.53)	(-253.66)	(-225.81)	(-135.43)	(-243.09)
Climate Risk	0.000*	0.000	0.000	0.000***	0.000***
	(1.83)	(0.24)	(1.17)	(4.00)	(3.39)
OLS/2SLS Stage	OLS	OLS	OLS	1st Stage	2nd Stage
Sample	All	All	All	All	All
Zip-by-Renewal Month FE	Y	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y	Y
Y Mean	0.050	0.017	0.011	0.025	0.017
Y SD	0.219	0.130	0.102	0.051	0.128
X Mean	0.026	0.026	0.026	0.000	0.025
X SD	0.055	0.055	0.055	0.029	0.051
N	46,595,848	46,595,848	46,595,848	40,255,597	40,255,597
Kleibergen-Paap Wald F stat					54,890

NOTES: Source: ICE McDash and CRISM. This table presents the relationship between premium rate increases and mortgage delinquencies. The dependent variable is an indicator for whether the mortgage is 30 days past due in Column (1), 60 days past due in (2) and (5), 90 days past due in (3), and *Premium Rate Increase* in (4). Columns (1)-(3) present OLS estimates, where the main independent variable is the change in premium rate, i.e., change in premium as a percentage of the coverage limit. Column (4) presents the first-stage result and (5) the second-stage of instrumental variable estimates. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the households' residence. We also control for the following fixed effects (FE): 5-digit zip by insurance policy renewal month FE, climate risk bin by insurance policy renewal month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE 3
HETEROGENEOUS EFFECTS OF PREMIUM INCREASES ON MORTGAGE DELINQUENCY

	(1)	(2)	(3)	(4)
	60-Day Mortgage Delinquency			
Premium Rate Increase	0.023***	0.011***	0.049***	0.034***
	(35.74)	(19.50)	(56.03)	(52.95)
Premium Rate Increase × High DTI	0.030***			
	(26.98)			
Premium Rate Increase × High LTV		0.044***		
		(41.30)		
Premium Rate Increase × High Credit Score			-0.045***	
			(-47.10)	
Premium Rate Increase × Jumbo				-0.021***
				(-10.14)
Previous Premium Rate	0.000	0.000	0.000	0.000
	(1.57)	(1.57)	(1.57)	(1.57)
Credit Score/1k before Renewal	-0.369***	-0.368***	-0.368***	-0.369***
	(-253.62)	(-253.73)	(-253.57)	(-253.63)
Jumbo				-0.000***
				(-3.09)
Sample	All	All	All	All
OLS/2SLS Stage	OLS	OLS	OLS	OLS
Sample	All	All	All	All
Zip-by-Renewal Month FE	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y
Y Mean	0.017	0.017	0.017	0.017
Y SD	0.130	0.130	0.130	0.130
X Mean	0.026	0.026	0.026	0.026
X SD	0.055	0.055	0.055	0.055
N	46,595,855	46,595,855	46,595,855	46,595,855

NOTES: Source: ICE McDash and CRISM. The dependent variable is an indicator for whether the household experiences a 60-day past due on mortgage within the 12 months after insurance policy renewal. We present the OLS estimates. We interact *Premium Rate Increase* with four different measures of financial constraints: an indicator for households with DTI ratios at origination above 40% in Column (1); an indicator for origination LTV ratio above 80% in (2); an indicator for FICO scores at origination higher than the median in (3); and an indicator for Jumbo mortgage in (4). We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the households' residence. We also control for the following fixed effects (FE): 5-digit zip by insurance policy renewal month FE, climate risk bin by insurance policy renewal month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE 4
EFFECTS OF PREMIUM INCREASES ON FORECLOSURE AND OTHER CREDIT OUTCOMES

	(1) Mortgage Foreclosure	(2) Credit Card Delinquency	(3) Credit Utilization	(4) Credit Risk Score
Premium Rate Increase	0.001***	0.009***	1.407***	-4.168***
	(2.64)	(3.77)	(8.31)	(-12.06)
Previous Premium Rate	0.000	-0.000**	0.019**	-0.156**
	(1.50)	(-2.43)	(2.53)	(-2.37)
Credit Score/1k before Renewal	-0.028***	-1.742***	7.515***	58.770***
	(-108.68)	(-622.29)	(83.47)	(286.99)
Climate Risk	-0.000	-0.000	-0.015	-0.052***
	(-0.62)	(-1.64)	(-1.43)	(-3.01)
OLS/2SLS Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
Sample	All	All	All	All
Zip-by-Renewal Month FE	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y
Y Mean	0.001	0.058	11.503	-16.344
Y SD	0.030	0.233	16.284	34.023
X Mean	0.025	0.024	0.024	0.024
X SD	0.051	0.050	0.050	0.050
N	40,255,590	34,348,900	34,287,543	34,348,892
Kleibergen-Paap Wald F stat	56605.261	52756.745	52685.077	52756.862

NOTES: Source: ICE McDash and Equifax Credit Risks Insight Servicing (CRISM).
This table presents results analyzing the effect of premium increases on mortgage foreclosure and other credit outcomes, presenting the second stage of instrumental variable regressions. The dependent variables are: (1) an indicator for mortgage foreclosure in the 12 months after insurance renewal; (2) an indicator for credit card delinquency in the 12 months after insurance renewal; (3) the change in credit card utilization, measured as peak utilization percentage in 12 months post-renewal minus pre-renewal utilization; (4) the change in risk score, measured as minimum score in 12 months post-renewal minus pre-renewal score. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the households' residence. We also control for the following fixed effects (FE): 5-digit zip by insurance policy renewal month FE, climate risk bin by insurance policy renewal month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE 5
MOVING PROBABILITIES INCREASE WITH PREMIUMS

	(1) Moved	(2) Premium Rate Increase	(3) Moved	(4) Moved
Premium Rate Increase	0.022***		0.024***	0.024***
	(21.61)		(9.85)	(20.72)
Insurer Other-Zip Avg Prem Increase		0.927***		
		(312.75)		
Insurer Other-Zip Avg Prem Increase × Climate Risk		0.055***		
		(23.77)		
Prem Rate Increase × (Orig Mtg Rate - Current Avg)				0.292***
				(6.63)
Orig Mtg Rate - Current Avg				0.053***
				(6.66)
Previous Premium Rate	-0.000*	0.001	-0.000	-0.000*
	(-1.75)	(1.55)	(-1.17)	(-1.72)
Credit Score/1k before Renewal	0.014***	-0.041***	0.009***	0.014***
	(15.47)	(-80.39)	(9.57)	(15.68)
Climate Risk	-0.001***	0.000***	-0.001***	-0.001***
	(-9.20)	(6.56)	(-7.28)	(-9.21)
OLS/2SLS Stage	OLS	1st Stage	2nd Stage	OLS
Sample	Sep-Jan	Sep-Jan	Sep-Jan	Sep-Jan
Zip-by-Renewal Month FE	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y
Y Mean	0.032	0.025	0.027	0.032
Y SD	0.176	0.051	0.163	0.176
X Mean	0.026	0.000	0.025	0.026
X SD	0.054	0.029	0.051	0.054
N	14,635,764	12,587,529	12,587,529	14,560,292
Kleibergen-Paap Wald F stat			48908.952	

NOTES: Source: ICE McDash and Equifax Credit Risks Insight Servicing (CRISM). This table presents the effect of premium rate increases on relocation probability. The dependent variable is an indicator for whether the household relocates in Columns (1), (3) and (4), and premium rate increase in (2). Columns (1) and (4) present OLS estimates. The main independent variable is the change in premium rate, i.e., change in premium as a percentage of the coverage limit. Column (2) presents the first stage of an instrumental variable regression, while Column (3) presents the corresponding second stage. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the households' residence. We also control for the following fixed effects (FE): 5-digit zip by insurance policy renewal month FE, climate risk bin by insurance policy renewal month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE 6
THE EFFECT OF INSURANCE PREMIUM INCREASES ON MOVER CLIMATE RISK CHANGES AND PREMIUM CHANGES

	(1) Δ Climate Risk × 1M	(2) Δ Premium Rate	(3) Δ Log Premium
Premium Rate Increase	-8.615***	0.316***	0.215***
	(-2.97)	(61.17)	(29.29)
Premium Rate Increase × Moved		-2.603***	-2.824***
		(-46.49)	(-32.30)
Moved		-0.009***	0.038***
		(-6.15)	(13.43)
Previous Premium Rate	-0.059	-0.003	-0.006
	(-1.41)	(-1.44)	(-1.47)
Credit Score/1k before Renewal	0.545	-0.038***	-0.036***
	(0.57)	(-35.00)	(-19.22)
Climate Risk (Standardized)	-28.706***	-0.000	-0.001***
	(-54.93)	(-0.83)	(-5.94)
OLS/2SLS Stage	2nd Stage	2nd Stage	2nd Stage
Sample	All	All	All
Zip-by-Renewal Year FE	Y	Y	Y
Climate Risk Bin-by-Renewal Year FE	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y
Y Mean	4.816	0.012	0.069
Y SD	183.155	0.097	0.164
X Mean	0.025	0.025	0.025
X SD	0.051	0.050	0.050
N	12763160	11490524	11489279
Kleibergen-Paap Wald F stat	55122	36762	35905

NOTES: Source: ICE McDash and Equifax Credit Risks Insight Servicing (CRISM).
This table presents the effect of premium rate increases on mover outcomes, presenting the second-stage results. The dependent variables are: (1) change in climate risk (new zip climate risk minus old house climate risk); (2) change in premium rate; (3) change in the natural log of dollar premiums. The main endogenous, independent variable is the change in premium rate, i.e., change in premium as a percentage of the coverage limit. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the borrowers' old residence. We also control for the following fixed effects (FE): 5-digit zip, climate risk bin by insurance policy renewal year FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE 7
THE HETEROGENEOUS EFFECT OF PREMIUM INCREASES ON MOVING

	Moved
Premium Rate Increase	0.016***
	(5.61)
FICO Tercile 2	-0.000
	(-0.57)
Premium Rate Increase × FICO Tercile 2	0.009**
	(2.34)
FICO Tercile 3	-0.002**
	(-2.37)
Premium Rate Increase × FICO Tercile 3	0.012***
	(4.47)
Previous Premium Rate	-0.000
	(-1.63)
Credit Score before Renewal	0.000***
	(3.72)
OLS/2SLS Stage	OLS
Sample	All
Zip-by-Renewal Month FE	Y
Climate Risk Bin-by-Renewal Month FE	Y
Orig: Yr, FICO, LTV, DTI FE	Y
Y Mean	0.032
Y SD	0.176
X Mean	0.026
X SD	0.054
N	14635764

NOTES: Source: ICE McDash and Equifax Credit Risks Insight Servicing (CRISM). This table presents the effect of premium rate increases on moving across three bins of FICO at origination. The dependent variable is an indicator for moving. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal. We also control for the following fixed effects (FE): 5-digit zip by insurance policy renewal month FE, climate risk bin by insurance policy renewal month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE 8
THE EFFECT OF INSURANCE PREMIUM INCREASES ON BUYER CORPORATE INDICATOR

	(1) Corporate Buyer	(2) Prem Rate Increase	(3) Corporate Buyer
Premium Rate Increase	0.041***		0.035**
	(6.51)		(2.42)
Insurer Other-Zip Avg Prem Increase		0.939***	
		(164.24)	
Insurer Other-Zip Avg Prem Increase × Climate Risk		0.054***	
		(11.94)	
Lagged Premium Rate		0.004	0.008
		(1.32)	(1.23)
Credit Score before Renewal		-0.049***	-0.162***
		(-32.87)	(-25.36)
Climate Risk		0.001***	0.003***
		(4.53)	(5.70)
OLS/2SLS Stage	OLS	1st Stage	2nd Stage
Sample	Buyers	Buyers	Buyers
Zip FE	Y	Y	Y
Climate Risk Bin-by-Year FE	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y
Y Mean	0.073	0.028	0.066
Y SD	0.260	0.055	0.249
X Mean	0.030	0.000	0.028
X SD	0.060	0.030	0.055
N	1,239,487	853,509	853,509
Kleibergen-Paap Wald F stat			13,982.953

NOTES: Source: ICE McDash, Equifax Credit Risks Insight Servicing (CRISM), and CoreLogic.
This table presents results analyzing the effect of premium increases on whether buyers of transacted homes are corporate buyers, as indicated in CoreLogic data. The dependent variable is an indicator for whether the buyer is a corporate buyer or not in Column (1). The dependent variable is *Premium Rate Increase* in Column (2). The dependent variable is an indicator for whether the buyer is a corporate buyer or not in Column (3). Column (1) presents OLS estimates, while Column (2) presents the first-stage result and Column (3) presents the second-stage of the instrumental variable regression. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the borrowers' old residence. We also control for the following fixed effects (FE): 5-digit zip, climate risk bin by insurance policy renewal year FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

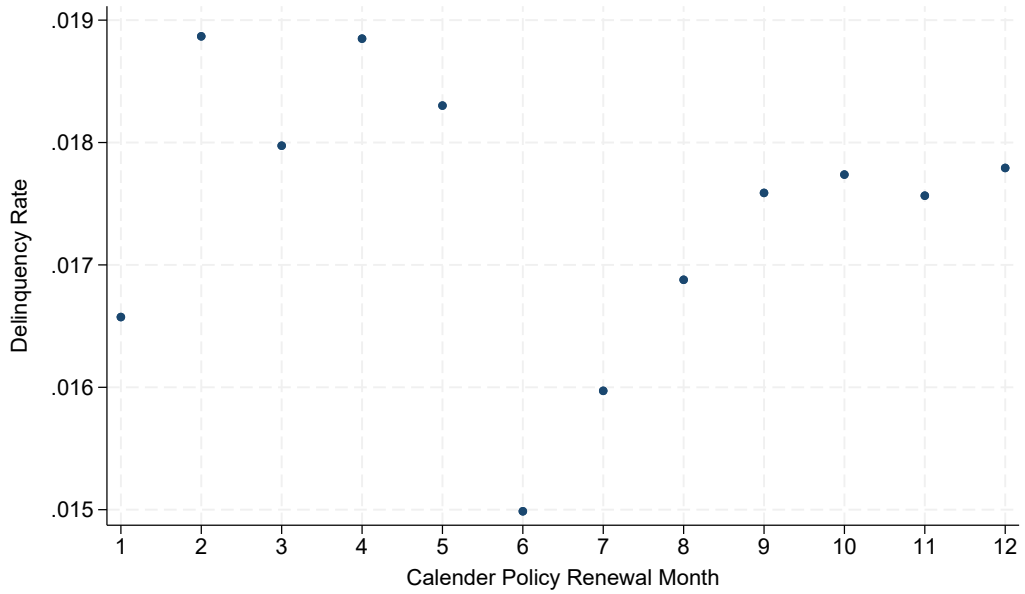
TABLE 9
THE EFFECT OF PREMIUM INCREASES ON MORTGAGE PREPAYMENT WITHOUT MOVING

	(1) Prepay Mtg w/o Moving	(2) Premium Rate Increase	(3) Prepay Mtg w/o Moving	(4) Prepay Mtg w/o Moving
Premium Rate Increase	0.014***		0.012***	0.014***
	(12.54)		(4.42)	(10.68)
Insurer Other-Zip Avg Prem Increase		0.927***		
		(312.75)		
Insurer Other-Zip Avg Prem Increase × Climate Risk		0.055***		
		(23.77)		
Prem Rate Increase × (Orig Mtg Rate - Current Avg)				-0.036
				(-0.66)
Orig Mtg Rate - Current Avg				0.072***
				(6.91)
Previous Premium Rate	-0.001*	0.001	-0.000	-0.001*
	(-1.95)	(1.55)	(-1.52)	(-1.90)
Credit Score/1k before Renewal	0.065***	-0.041***	0.051***	0.065***
	(64.88)	(-80.39)	(49.84)	(64.83)
Climate Risk	0.000***	0.000***	0.000***	0.000**
	(2.60)	(6.56)	(2.86)	(2.51)
OLS/2SLS Stage	OLS	1st Stage	2nd Stage	OLS
Sample	Sep-Jan	Sep-Jan	Sep-Jan	Sep-Jan
Zip-by-Renewal Month FE	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y
Y Mean	0.042	0.025	0.037	0.043
Y SD	0.201	0.051	0.188	0.202
X Mean	0.026	0.000	0.025	0.026
X SD	0.054	0.029	0.051	0.054
N	14,635,764	12,587,529	12,587,529	14,560,292
Kleibergen-Paap Wald F stat			48908.952	

NOTES: Source: ICE McDash and Equifax Credit Risks Insight Servicing (CRISM). This table presents the effect of premium rate increases on the probability of prepaying mortgage without relocation. The dependent variable is an indicator for whether the household paid off mortgage without relocating in Columns (1), (3) and (4), and premium rate increase in (2). Columns (1) and (4) present OLS estimates. The main independent variable is the change in premium rate, i.e., change in premium as a percentage of the coverage limit. Column (2) presents the first stage of an instrumental variable regression, while Column (3) presents the corresponding second stage. We control for the borrower's credit risk score in the month prior to the insurance renewal, the premium rate before the renewal, and the standardized climate risk of the households' residence. We also control for the following fixed effects (FE): 5-digit zip by insurance policy renewal month FE, climate risk bin by insurance policy renewal month FE, mortgage origination year FE, LTV bin FE, DTI bin FE, FICO bin FE. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

FIGURE A1

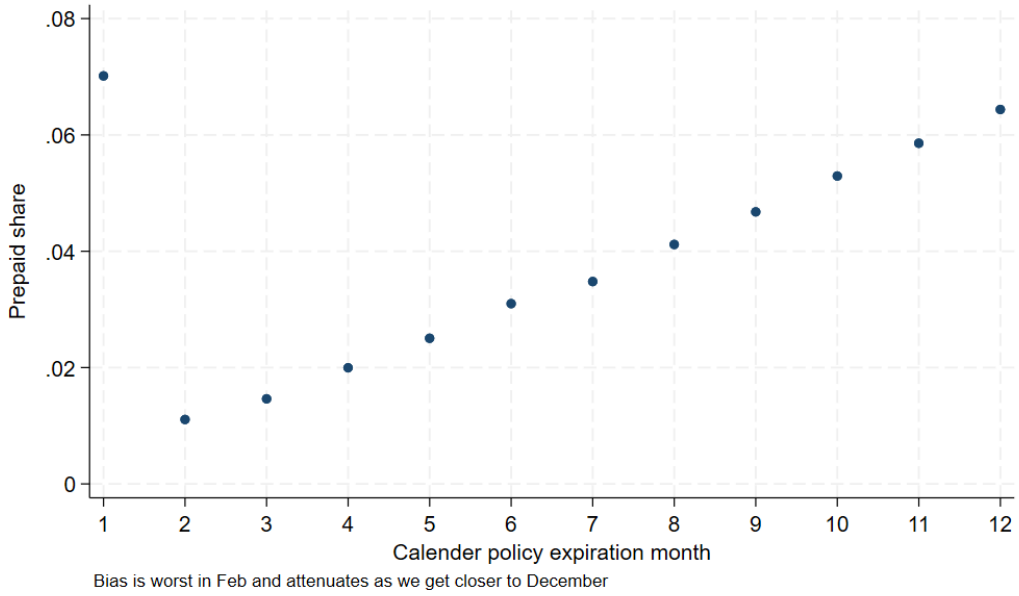
SHARE OF DELINQUENT MORTGAGES REPORTED BY INSURANCE RENEWAL MONTH



NOTES: Source: ICE McDash.
This figure plots the share of mortgages that are delinquent reported by the calendar month of the insurance policy expiration date.

FIGURE A2

PROBABILITIES OF MORTGAGE PREPAYMENT REPORTED BY INSURANCE RENEWAL MONTH



NOTES: Source: ICE McDash and CRISM.
This figure plots the share of households that prepaid their mortgages reported by the calendar month of the insurance policy expiration date.

TABLE A1
DELINQUENCY EFFECT WHEN COVERAGE CHANGES

	(1)	(2)	(3)	(4)
	60-Day Mortgage Delinquency			
Premium Rate Increase	0.028***	0.033***	0.023***	0.032***
	(16.41)	(48.15)	(9.61)	(47.73)
Premium Rate Increase × More Coverage		-0.002*		
		(-1.65)		
Premium Rate Increase × Less Coverage				-0.003*
				(-1.68)
Previous Premium Rate	0.000**	0.000	0.002***	0.002***
	(2.27)	(1.21)	(2.59)	(11.16)
Credit Score/1k before Renewal	-0.331***	-0.368***	-0.349***	-0.370***
	(-127.23)	(-252.28)	(-63.34)	(-248.70)
Climate Risk	0.000	-0.000	-0.000	-0.000
	(0.07)	(-0.08)	(-0.32)	(-0.08)
More Coverage		0.001***		
		(7.18)		
Less Coverage				0.001***
				(9.29)
OLS/2SLS Stage	OLS	OLS	OLS	OLS
Sample	More Coverage	All	Less Coverage	All
Zip-by-Renewal Month FE	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y
Y Mean	0.016	0.017	0.016	0.017
Y SD	0.125	0.130	0.124	0.130
X Mean	0.026	0.026	0.045	0.026
X SD	0.058	0.053	0.095	0.054
N	3,859,334	42,158,885	794,269	39,035,828

NOTES: Source: ICE McDash.
This table presents results testing whether the effect of premium increases on mortgage delinquency exists for borrowers who increased or decreased coverage. The dependent variable is an indicator for whether the mortgage is delinquent in the 12 months after insurance policy renewal. The main independent variable is the change in premium as a percentage of the coverage limit. Column (1) uses households who changed coverage from "Replacement Cost Value" to "Actual Cash Value". Column (3) uses households who changed coverage from "Actual Cash Value" to "Replacement Cost Value". Columns (2) and (4) use the full sample. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE A2
DELINQUENCY EFFECT AND RECENT DISASTERS

	(1)	(2)	(3)
	60-Day Mortgage Delinquency		
Premium Rate Increase	0.026***	0.037***	0.035***
	(25.54)	(48.40)	(45.66)
Premium Rate Increase × Disaster			-0.006***
			(-4.98)
Previous Premium Rate	-0.000	0.000	0.000
	(-0.74)	(1.56)	(1.57)
Credit Score/1k before Renewal	-0.390***	-0.362***	-0.369***
	(-158.62)	(-226.76)	(-253.66)
Climate Risk	0.000	-0.000	-0.000
	(1.42)	(-0.53)	(-0.52)
Disaster			0.000
			(.)
OLS/2SLS Stage	OLS	OLS	OLS
Sample	Disaster	No Disaster	All
Zip-by-Renewal Month FE	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y
Y Mean	0.021	0.016	0.017
Y SD	0.144	0.125	0.130
X Mean	0.032	0.024	0.026
X SD	0.065	0.051	0.055
N	10,990,938	35,588,084	46,579,029

NOTES: Source: ICE McDash and First Street.
This table presents results testing whether the effect of premium increases on mortgage delinquency are driven by borrowers who experience recent disasters. The dependent variable is an indicator for whether the mortgage is delinquent in the 12 months after insurance policy renewal. The main independent variable is the change in premium as a percentage of the coverage limit. Column (1) uses households in zip codes that experience recent disasters. Column (2) uses households in zip codes that did not experience recent disasters. Columns (3) uses the full sample. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.

TABLE A3
MORTGAGE DELINQUENCY EFFECT ACROSS INVESTOR TYPES

	(1)	(2)	(3)	(4)	(5)
			60-day Delinquent		
Premium Rate Increase	0.022***	0.016***	0.012***	0.023	0.020***
	(3.88)	(9.43)	(6.85)	(1.09)	(3.36)
Previous Premium Rate	0.001	0.000	0.000	0.005	0.000**
	(1.21)	(0.33)	(1.52)	(1.59)	(2.38)
Credit Score/1k before Renewal	-0.440***	-0.250***	-0.234***	-0.384***	-0.481***
	(-43.68)	(-26.12)	(-35.68)	(-6.98)	(-7.69)
Climate Risk	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.99)	(-0.00)	(-0.01)	(-0.00)	(-0.92)
OLS/2SLS Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
Sample	GNMA	FNMA	FHLMC	Private Securitized	Bank Portfolio
Zip-by-Renewal Month FE	Y	Y	Y	Y	Y
Climate Risk Bin-by-Renewal Month FE	Y	Y	Y	Y	Y
Orig: Yr, FICO, LTV, DTI FE	Y	Y	Y	Y	Y
Y Mean	0.030	0.011	0.010	0.026	0.021
Y SD	0.171	0.106	0.100	0.160	0.144
X Mean	0.031	0.023	0.023	0.020	0.022
X SD	0.058	0.049	0.049	0.048	0.048
N	6,800,917	15,284,196	12,409,886	435,562	3,607,939
Kleibergen-Paap Wald F stat	8,761.032	1,980.027	2,268.665	2,991.098	442.303

NOTES: Source: ICE McDash.
This table presents the effect premium increases on mortgage delinquency across investor types. Column (1) uses mortgages guaranteed by Ginnie Mae, (2) by Fannie Mae, (3) by Freddie Mac, (4) private mortgages that are secularized, and (5) those remain in banks' portfolio. The main independent variable is the change in premium as a percentage of the coverage limit. Standard errors are corrected for clustering at the zip code level. ***p<0.01, **p<0.05, *p<0.1.