Property Insurance and Disaster Risk: New Evidence from Mortgage Escrow Data

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Property Insurance and the Cost of Climate Change

- What will be the magnitude and distribution of the economic costs from increasing disaster risk on households?
- Critical questions arising around the cost of homeowners insurance:
  - What caused the recent spike in insurance costs?
  - What is the relationship between disaster risk and premiums? How and why has it changed over time?
  - How have premium changes affected housing markets?
- **The problem:** Scarce data on premiums

What We Do in This Project

- Construct premiums using escrow payments from loan-level data to solve major data challenge on homeowners insurance premiums
- Use zipcode-level insurance expenditure indices to study where insurance premiums have changed over the last ten years
- Estimate time-varying relationship between risk and premiums
- Compare the influences of housing cost inflation and reinsurance costs in explaining premium dynamics

Homeowners Premiums Data Gaps

There is no geographically granular data about what people pay for homeowners insurance

> **Just what does home insurance cost in Florida? Estimates vary widely, and new state data might surprise you**

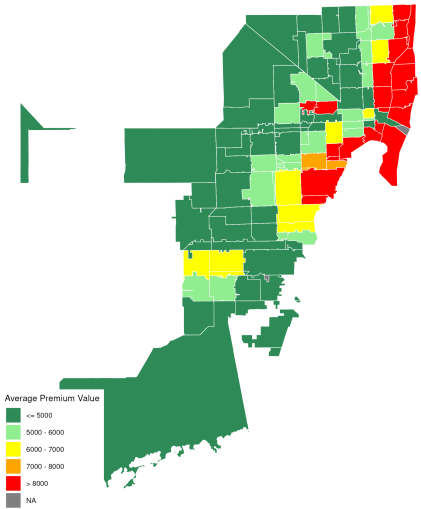
-South Florida Sun Sentinel, July 31 2023

"Which number is closest to what Florida homeowners are actually paying? It's impossible to say because the estimates are calculated based on proprietary methods"

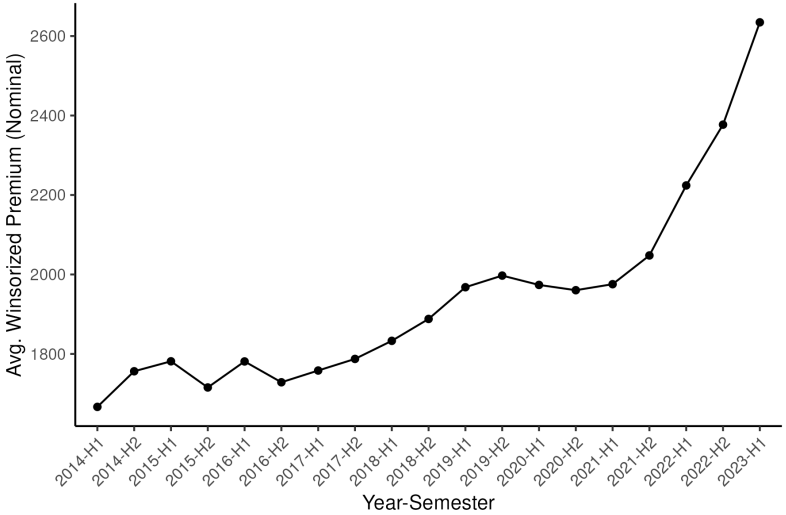
Our Approach: Inferring Premiums from Escrow Payments

- We create panel estimates of homeowner's insurance premiums paid by over 12.4 million mortgagors originated from 2014 to 2023
  - Over 47m premium observations inferred from escrow payments
  - Used to construct zipcode homeowner's insurance premium indices
- Payments to Escrow:
  Total Payment $\equiv$ Principal + Interest (P&I) + Escrow (Taxes and Insurance)
- In CoreLogic loan-level data, we observe Total Payment, P&I, and Taxes
- $\rightarrow$ Insurance = Total Payment - P&I - Taxes
- Follows method in Bhutta and Keys (2022) inferring PMI payments from mortgage escrow data

Zipcode 2023 Premiums in Miami-Dade County

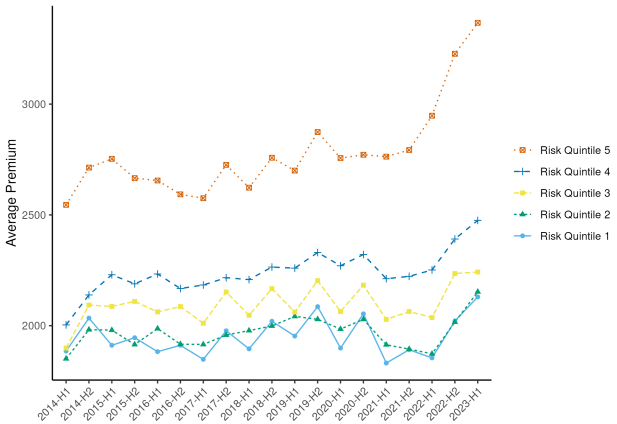


Premium Trends Over Time



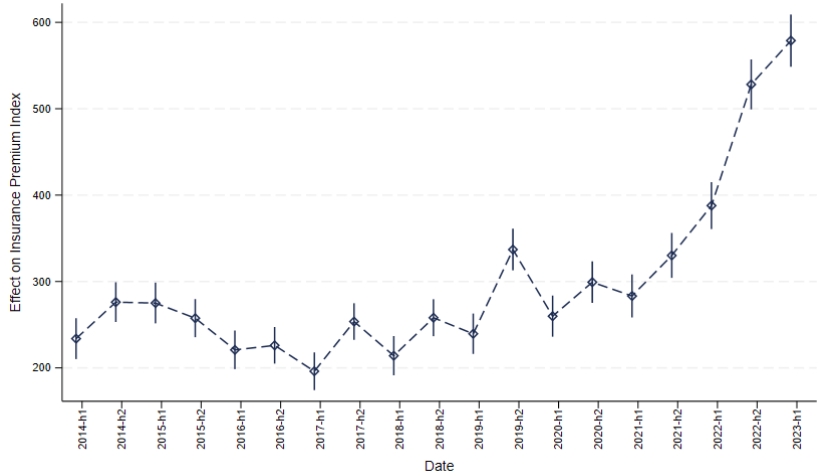
Premiums have increased **33.8%** (14.8% real) from 2020 to 2023

Premium Dynamics by Disaster Risk



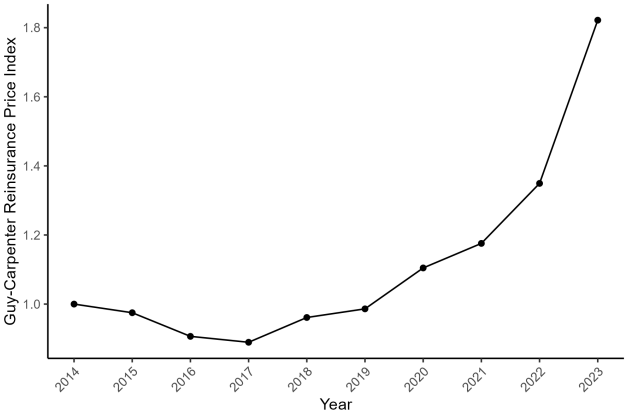
Real annual premiums have increased over $500 for zips in the top quintile of disaster risk versus only about $100 for zips in the bottom quintile

The Changing Premium Disaster Risk "Beta"



Between 2019 and 2023, the effect of +1SD disaster risk on premiums increased from \$300 to \$575 conditional on structure value controls and state fixed effects

Reinsurance and the Passthrough of Risk to Premiums



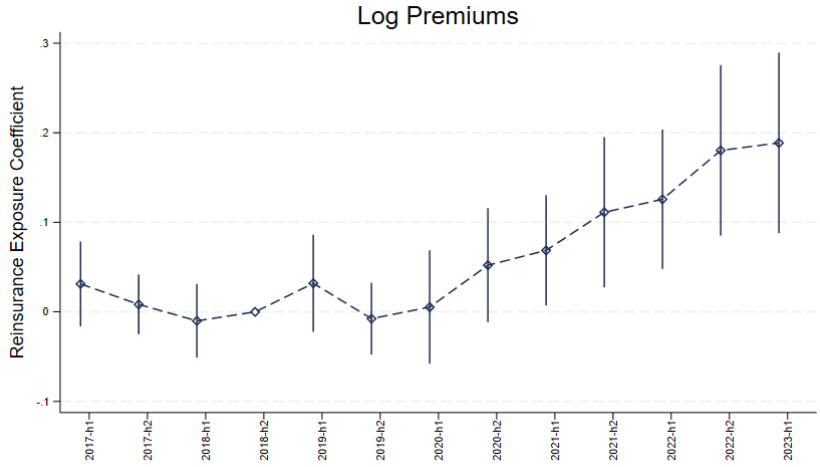
Guy Carpenter Reinsurance Rate Index

- Why has the risk-to-premium gradient increased?
- Many insurers rely on reinsurance contracts with global insurers to manage correlated catastrophic risks
- Since 2017, the cost of reinsurance has nearly doubled

Identifying Effect of Reinsurance Costs on Disaster Risk Pass-Through

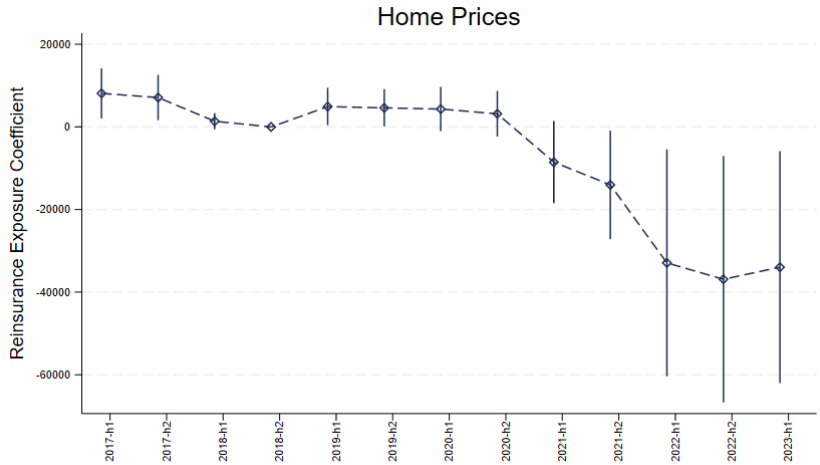
- **Question:** How much of the increase in the passthrough of risk to premiums can be explained by the "reinsurance shock"?
- Reinsurance take-up is driven by exposure to correlated catastrophic fire and wind losses
- We measure each county's reinsurance exposure by the correlation between its losses and state-level losses
- Diff-in-diff: Compare premium changes in cat-exposed zipcodes by reinsurance exposure with risk-by-time and structure value controls

Reinsurance Shock Increased Premiums for Correlated Cat Risks



Re Shock increased annual premiums by over $500 among zips in the top decile of reinsurance exposure

Higher Premiums Led to Lower Home Values



Relative home prices in average reinsurance-exposed zip fell $14,000

Unpacking Homeowners Insurance Dynamics

- Average premiums increased $520 between 2020 and 2023
  - 50% can be explained by rising structure values and another 30% by the rising premium passthrough of disaster risk
- Increase in disaster risk premium passthrough primarily caused by higher reinsurance costs for correlated cat risks
- Reinsurance shock slowed home price growth
  - Cat-exposed home values still increased by over $150,000 between 2020 and 2023
  - High (albeit noisy) implied capitalization of premiums
  - Potential channels: Shifting beliefs, less coverage, availability, mortgage market

Conclusion

- Construct novel panel dataset of zipcode-level homeowners insurance premiums
- Estimate first passthrough of disaster risk to premiums
- Capital frictions with reinsurance market volatility increase the costs of insuring catastrophic risk
- $\rightarrow$ Higher potential costs of insuring increasing wildfire and hurricane risks with climate change

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Thank you! - Philip.Mulder@wisc.edu

Inferring Premiums Example

Zip Code	Date	Total Payment	Principal + Interest	Taxes	Insurance
34239	2015Q2	9200.88	6422.88	1301.22	1476.78
34239	2016Q1	9092.04	6422.88	1307.96	1361.20
34239	2017Q1	9194.64	6422.88	1291.32	1480.44
34239	2018Q1	9069.12	6422.88	1305.74	1580.50
34239	2019Q1	9408.36	6422.88	1327.67	1657.81
34239	2020Q1	9647.28	6422.88	1357.61	1866.79
34239	2020Q3	9725.64	6422.88	1357.61	1945.15
34239	2021Q1	9680.16	6422.88	1403.95	1853.33
34239	2022Q1	10095.84	6422.88	1397.79	2275.17
34239	2023Q1	11133.36	6422.88	1402.01	3308.47

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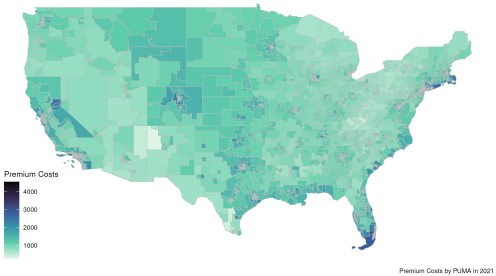
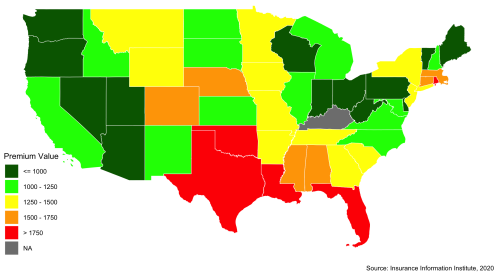
NAIC and Census Data



2021 Homeowners Premiums by PUMA from Census



2022 State Average Premiums from Insurance Information Institute

Comparing Escrow Premiums to Other Publicly Available Estimates

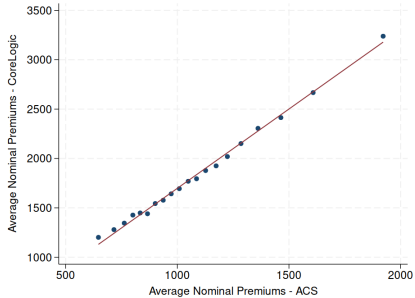


Figure: Corelogic Escrow vs ACS

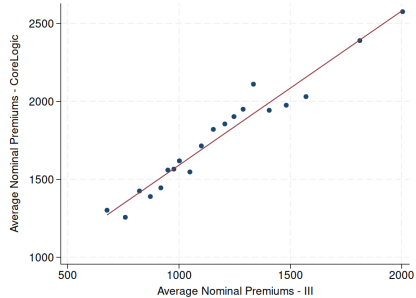
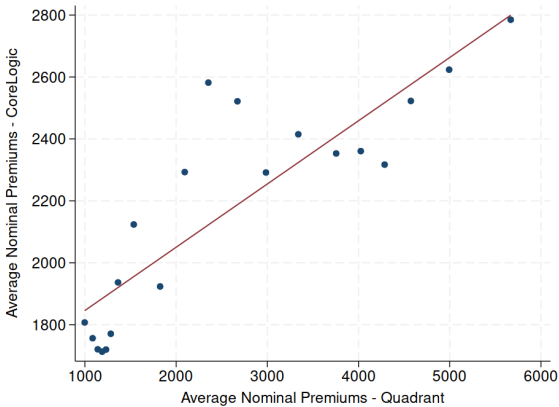


Figure: Corelogic Escrow vs NAIC

Note level shift - our premiums run about $500 to $1,000 higher
Why? Extra things in escrow (HOA, flood insurance), different population (owner-occupied borrowers with conventional mortgages)

Comparing Escrow Premiums to Proprietary Quadrant Data



- Most commonly used data right now for zipcode insurance premiums
- Quadrant infers insurer prices for given set of attributes from insurer rate filings
- Our concerns:
  - Wide price dispersion – how do buyers shop?
  - Insurers can set a price but deny policies
  - Unclear if Quadrant can capture insurers' increasing use of granular proprietary risk models

Return

Defining State Reinsurance Exposure

Insurers report gross homeowners premiums written in each state and the total dollars of premiums ceded to reinsurers

- Reinsurance contracts are not reported at the state level

Our proxy for state-level reinsurance exposure:

- R_i is the amount of reinsurance ceded and g_{is} is gross premiums written by insurer i in state s.
- Total premiums written by i is $G_i = \sum_{s \in S}$ and the share of their premiums ceded to reinsurance is $\frac{R_i}{G_i}$.
- State s's *reinsurance exposure* is the average ratio of the share of premiums ceded reinsurers weighted by the amount of premiums each insurer writes in the state:

$$E_s = \frac{1}{G_s} \sum_{i \in I} g_{is} * \frac{R_i}{G_i}$$

Return