

Fifty Years of U.S. Natural Disaster Insurance Policy

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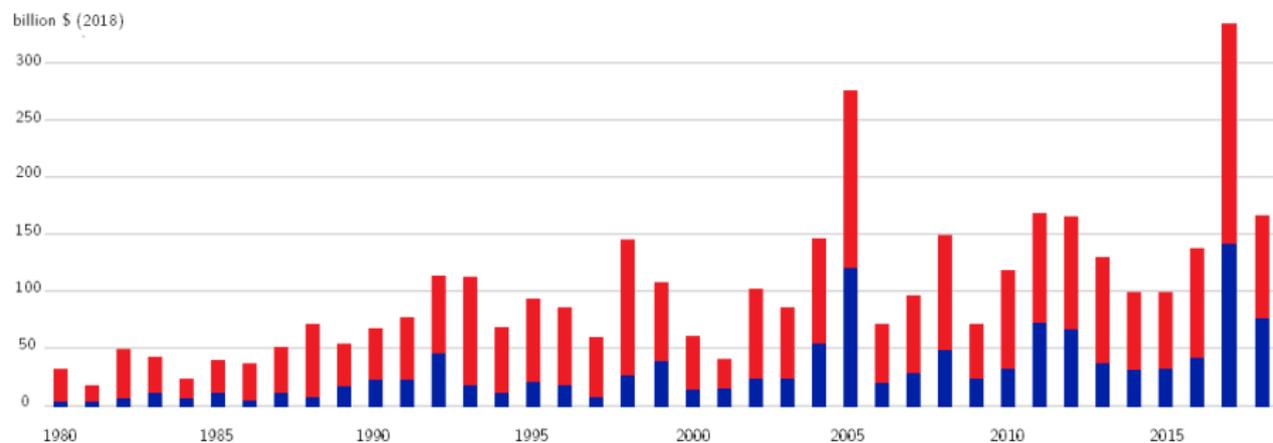
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Why Study Natural Disaster Insurance Separately?

- Natural disaster insurance has received comparably little attention in the literature
 - Huge literature on health, unemployment, social insurance...
- Conclusions from other, more commonly studied insurance markets may not generalize
 - Losses are highly spatially correlated, less frequent, and more catastrophic
- Challenges for both supply and demand sides of the market
- **This paper:** holistic review of both supply of and demand for natural disaster insurance in historical context

Natural Disaster Insurance



Global weather-related insured (blue) and uninsured (red) economic damages

Motivation



Montreal after 7/13/2023 mini-tornado & view from my Berkeley apartment at 11 am on 9/9/2020

Outline

1. Natural Disaster Insurance Supply
2. Natural Disaster Insurance Demand
3. Complementary Markets
4. Concluding Discussion

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Natural Disaster Insurance Supply

- Public markets: large geographic diversification, borrowing potential
 - National Flood Insurance Program, California FAIR Plan
- Private markets: greater insolvency risk, more stringent rate regulation, more limited geographic diversification
 - California wildfire insurance market
- Key issues: how to balance rate setting and solvency

Public Market Advantages

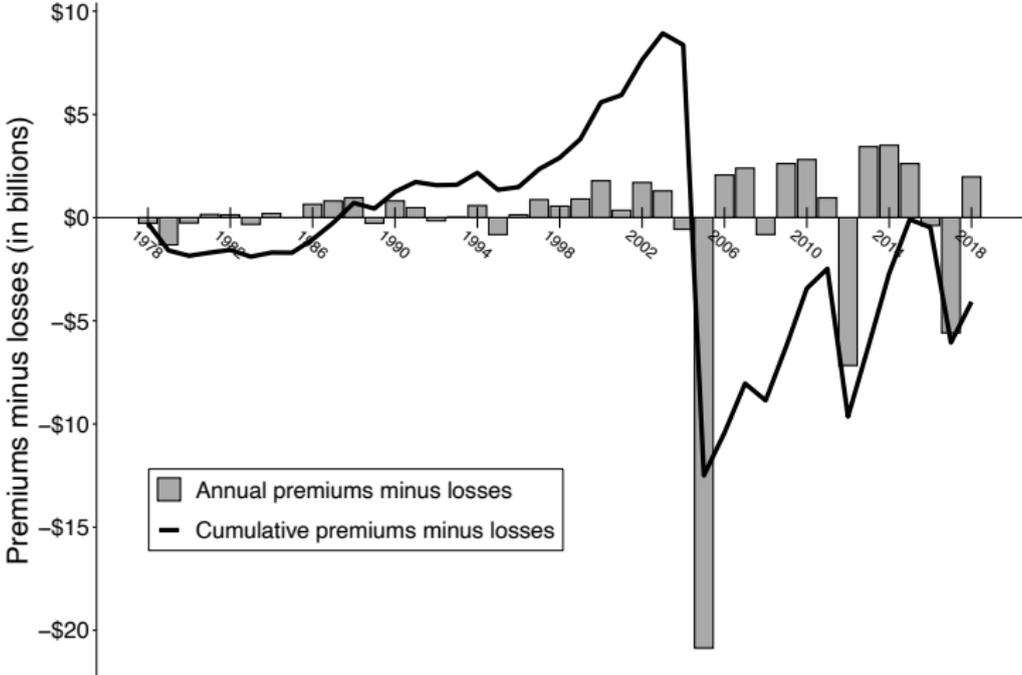
- Theoretical basis: spatially correlated, infrequent, catastrophic losses may be uninsurable by private markets (Rothschild and Stiglitz 1976)
 - Difficult to model insurers as risk neutral in this context
 - Premiums and claims are rarely in balance (unlike for health)
 - Essentially need precautionary savings (or reinsurance)
- Public provision can smooth over a larger geography
- Public provision can borrow from taxpayers to finance losses
- In addition to other benefits of public provision (e.g., reduced adverse selection)

An Example: The U.S. National Flood Insurance Program

NFIP

- Federal program administered by FEMA
- > 95% national flood insurance market share
- > 5 million contracts written annually
- > 4.6 billion of premium revenue nationally
 - Smooth risk across the country
- > 1.3 trillion of assets insured
- > 20 billion of debt to the Treasury
 - Large financing capacity

NFIP Premiums Less Losses



Policy Solutions

- Reducing premium subsidies in 2012 and 2014 (Wagner 2022)
- Premium reform to price more variables
- Updating flood maps to reflect current risk levels (Hino and Burke 2022)
 - Approximately 20% of maps were last updated 15 years ago
- Enforcing mandatory insurance purchase requirement in high-risk flood zones
- Buyouts and managed retreat?

Additional Private Market Challenges

e.g., California Wildfire Insurance

- Different contract structure
 - Natural disaster insurance coverage is bundled with other perils
 - e.g., Basic fire coverage covered by homeowners' insurance
- Different geographic coverage
 - Markets are regulated at the state-level
 - e.g., Market coverage is the state of California
- Different borrowing potential
 - Private insurers can't borrow from taxpayers
 - e.g., Tax regulation limits accumulation of reserves
- Different market structure
 - Competitive markets, no subsidies
 - e.g., 220 insurers, rate increases limited to 7% annually without review

High Market Concentration and Low Geographic Diversification

- Increase likelihood that individual firms may lack claims history information to assess risk
 - Competition discourages insurers from sharing risk information
- Decrease ability of insurers to cross-subsidize payouts across space
 - Catastrophic and spatially correlated nature of natural disaster risk decreases likelihood of breaking even

Solvency Concerns

- Greater risk of insolvency arises because private insurers are not backed by state or federal funding
 - i.e., they cannot borrow from taxpayers like the NFIP
- Claims must be financed through premium and investment revenue or through reinsurance
 - Capital requirements to self-finance are likely prohibitive
 - Financial markets can help (more later)

Stringent Rate Regulation

- Private markets cannot operate at a loss like the NFIP
- Greater tension between setting premiums that allow insurers to remain solvent and charging rates that homeowners can afford
- Increasing regulation of private markets
 - California prohibits non-renewals (recent)
 - California requires regulatory approval for rate increases exceeding 7% per year
 - California regulates what variables can be priced
 - California limits what risk models can be used for pricing

Policy Implications

- Non-renewals, premium increases, insurer exits...

July 21, 2023

PETER COY

Why California and Florida Have Become Almost Uninsurable

Climate change is an obvious factor, but the states' governments share a large part of the blame.

By PETER COY

July 14, 2023

Insurer's Retreat in Florida Signals Crisis With No Easy Fix

Farmers is ending some policies in the Sunshine State as insurers struggle with the rising costs of covering climate change-related damage. No one can agree on whom to blame.

By EMILY FLITTER

June 4, 2023

Allstate Is No Longer Offering New Policies in California

Like State Farm, which announced a similar move last week, Allstate cited worsening climate conditions that had made doing business there difficult.

By RYAN MAC

May 31, 2023

Climate Shocks Are Making Parts of America Uninsurable. It Just Got Worse.

The largest insurer in California said it would stop offering new coverage. It's part of a broader trend of companies pulling back from dangerous areas.

By CHRISTOPHER FLAVELLE, JILL COWAN and IVAN PENN

May 7, 2023

GUEST ESSAY

Your Homeowners' Insurance Bill Is the Canary in the Climate Coal Mine

Wharton's Ben Keys on how climate change is already reshaping the insurance and housing markets — and how our denial is only making the problem worse.

By BENJAMIN KEYS

Policy Solutions

- Public-private partnerships?
 - e.g., expanded state funding for adaptation to reduce premiums and costs
- Reinsurance policies and other financial products?
 - e.g., reforms to allow cost pass-through
- Risk information communication?
 - e.g., improve price setting models, publicly available risk information

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Natural Disaster Insurance Demand

- Public markets: natural disaster insurance-specific contracts
 - e.g., National Flood Insurance Program contracts for flood risk
- Private markets: natural disaster risk is bundled with other perils
 - e.g., California homeowners insurance covers basic fire
- Key issues: take-up
- Many models from health insurance are applicable here

Natural Disaster Insurance Demand

Stylized Facts

- Take-up rates depend on contract structure
 - Over 95% of homeowners carry general multiperil insurance
 - Only 10% of California homeowners purchase earthquake insurance
 - Only 4% of US homeowners purchase flood insurance
- Take-up rates are low...but expected benefits are high!
 - Average flood insurance subsidy is 30% in high-risk flood zones
- So what is it about natural disaster risk specifically that is different?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost $<$ average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
3. Moral hazard?
4. Hassle costs?
5. Limited liability?
6. Credit constraints?
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost < average cost (i.e., adverse selection)?
 - No evidence of selection on unobservables
 - Marginal and average costs are equal, conditional on adaptation
 - > 40% uninsurance with > 30% subsidy below *own* cost
2. Public post-disaster bail-outs?
3. Moral hazard?
4. Hassle costs?
5. Limited liability?
6. Credit constraints?
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost < average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
 - Average is \$4,500
 - Less than 15% of wedge
 - Homeowners' expectations of assistance are 11% of damages
3. Moral hazard?
4. Hassle costs?
5. Limited liability?
6. Credit constraints?
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost < average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
3. Moral hazard?
 - Estimate cost savings from elevation of \$2.64 per \$1,000 of coverage
 - At most 25% of wedge
4. Hassle costs?
5. Limited liability?
6. Credit constraints?
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost < average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
3. Moral hazard?
4. Hassle costs?
 - Many homeowners buy insurance for one year
5. Limited liability?
6. Credit constraints?
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost $<$ average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
3. Moral hazard?
4. Hassle costs?
5. Limited liability?
 - $>75\%$ of homeowners have home equity \geq avg. flood insurance payout
6. Credit constraints?
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost < average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
3. Moral hazard?
4. Hassle costs?
5. Limited liability?
6. Credit constraints?
 - Average premium is 1% of median income in high-risk flood zones
 - Many homeowners buy insurance the day after a flood
7. Risk misperception?

Interpreting Remarkably Low Willingness to Pay

1. Marginal cost < average cost (i.e., adverse selection)?
2. Public post-disaster bail-outs?
3. Moral hazard?
4. Hassle costs?
5. Limited liability?
6. Credit constraints?
7. Risk misperception?
 - 40% of high-risk homeowners “not at all worried about flooding”
 - 60-70% of homeowners underestimate flood probabilities relative to gov't and storm surge models
 - Flood risk incompletely capitalized into home values
 - **Cautions against using observed WTP to calculate welfare**

Flood Risk Beliefs

Bakkensen and Barrage (WP 2021)

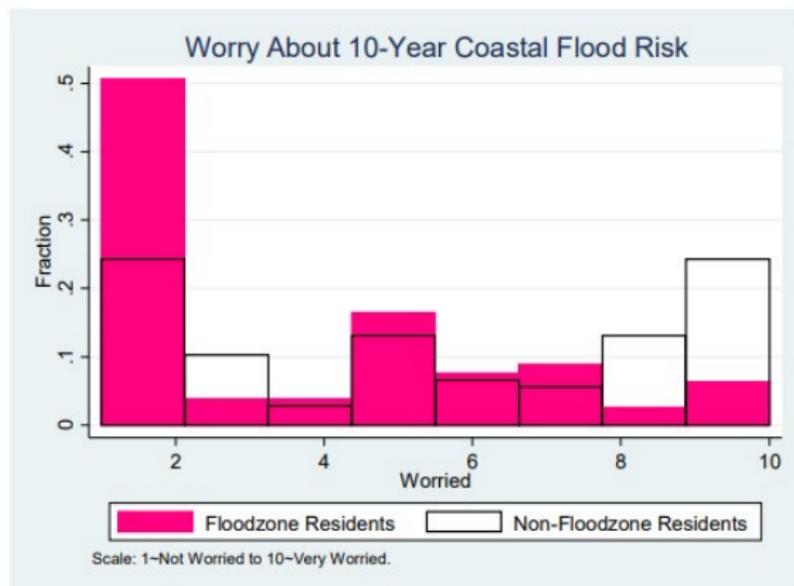


Figure 1: Flood Worry Distribution

Policy Implications

- Distinction between economic and behavioral explanations matters!
- In the presence of behavioral mistakes, homeowners' full benefit from insurance isn't reflected in willingness to pay
- In the presence of behavioral mistakes, willingness to pay isn't "welfare-relevant"
- Current phase-out of NFIP subsidies and wildfire insurers' regulatory filing requests seem likely to lead to even lower levels of demand for insurance
 - Even if premiums remain actuarially fair or better

Policy Solutions

- Allocation policies: assign consumers to specific options
 - e.g., mandating purchase of natural disaster insurance
 - NFIP mandates insurance purchase if living in a high-risk flood zone with a federally-backed mortgage
 - Don't require information on source of behavioral mistake
- Mechanism policies: target specific distortions
 - e.g., provide accurate information about flood zones
 - Some states have housing disclosure laws mandating the publishing of flood zone status
 - Require more information about source of “mistake”
 - But potentially more politically feasible?

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Complementary Markets

- Reforms in natural disaster insurance markets have spillover effects in complementary markets
- Housing markets, financial markets, construction markets, public programs
- Others?

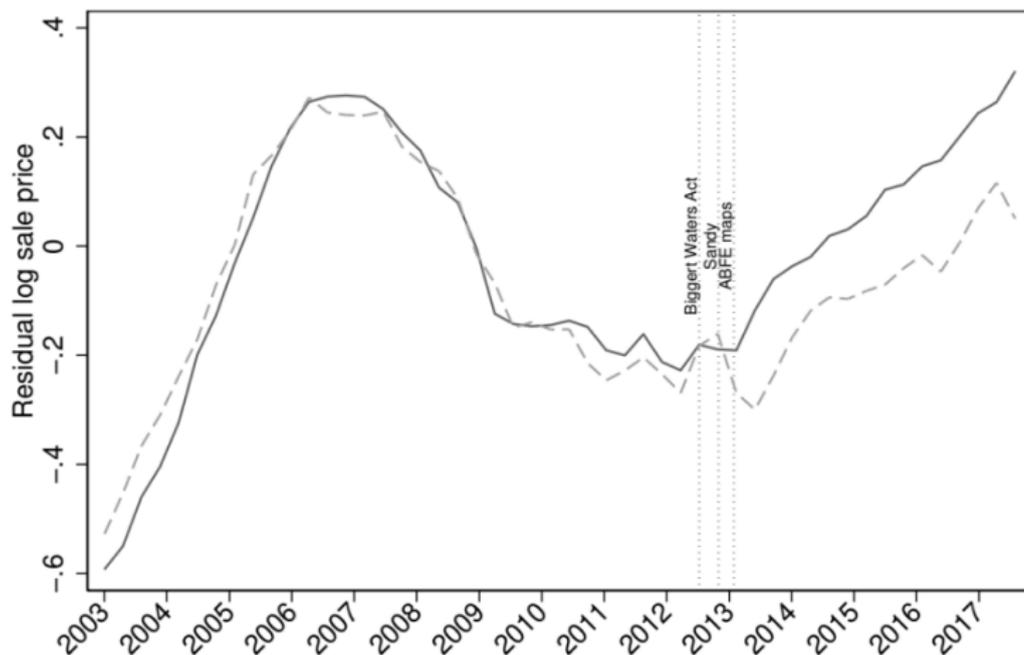
Real Estate Markets

- Intuition: natural disaster contracts are house-specific amenities of a home
- Result: natural disaster insurance premiums and risk information are tightly linked to house prices and property taxes
- Number of Americans living in high-risk flood zones exceeds 40 million
 - NFIP maps only correctly zone 1/3 of these
- Potentially large effects!

Natural Disaster Insurance Premiums Affect House Prices

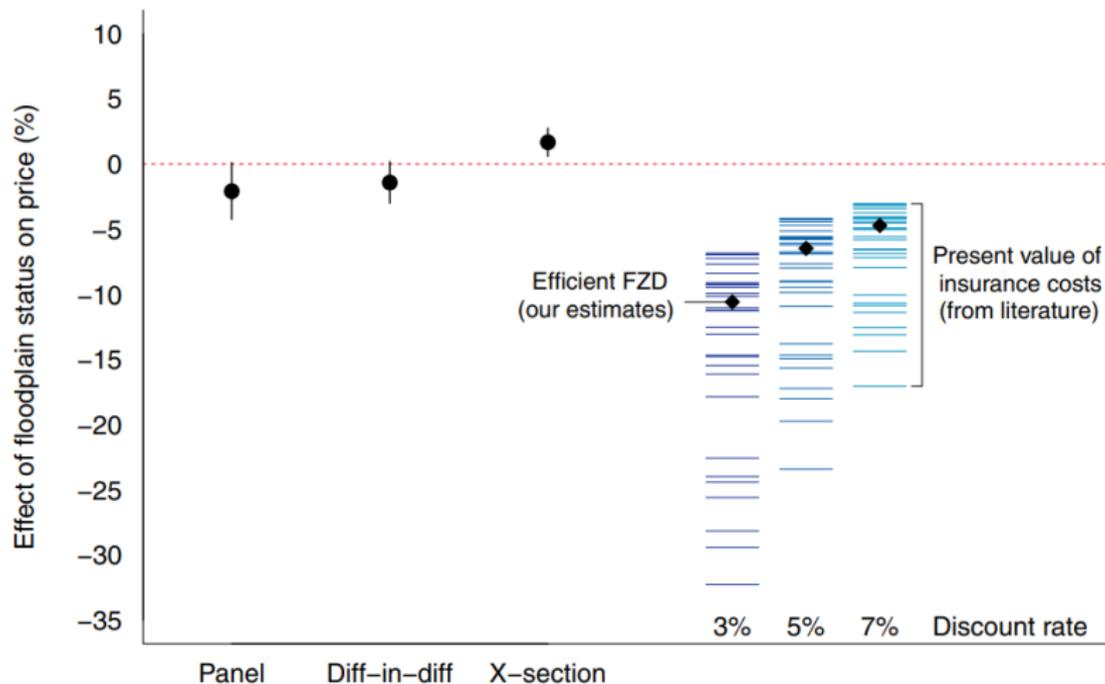
- Phasing out flood insurance premium subsidies decreased prices of risky houses (Gibson and Mullins 2020)

Figure 2: Effect of Biggert-Waters



Natural Disaster Risk Information Affects House Prices

- Updating flood risk maps reduces prices for houses newly mapped into high-risk zones (Hino and Burke 2021)



Policy Implications

- Homeowners have an incomplete understanding of their risk
- Natural disaster risks are incompletely capitalized into house prices
 - High-risk properties are over-valued
 - Over-valuation is at least 13% (Bakkensen and Barrage 2021)
 - Over-valuation exceeds \$200 billion (Gourevitch et al 2023)
- Resulting misallocation of people
- Over-valuation could increase as exposure to climate change risk increases

Policy Solutions

- Provide accurate risk signals through actuarially fair natural disaster insurance premiums?
- Implement a mandate requiring insurance?
- Zoning or other information-based policies?
- Other ideas?

Financial Markets

- Intuition: financial markets allow transfer of risk between economic agents
- Result: incidence of natural disaster risk changes
- Difficulties pricing natural disaster insurance are similar to difficulties pricing 30-year mortgages in flood zones
 - Uncertainty creates incentives to transfer risk
- Linkages between natural disaster insurance markets and financial markets complicate the functioning of financial markets
- Linkages also create possible solutions to supply-side challenges

Construction

aka In-Place Adaptation

- Intuition: adaptation reduces natural disaster damages
- Result: actuarially fair insurance premiums are lower, but insurance and adaptation may be substitutes
- Moral hazard: natural disaster insurance coverage changes behavior
 - Large literature in other settings (e.g., health)

Other Public Programs

- Intuition: natural disaster insurance payouts are one of a suite of post-disaster funding sources
- Result: other funding sources may depress insurance demand
 - “Implicit insurance”
- Main federal programs are Individuals and Households Program and Small Business Administration Loan Program
 - Payouts are a few thousand dollars
- State programs are more generous

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Conclusion

Key Take-Aways

- Natural disaster insurance and climate change risk literature is growing
- Historical market structure locked in
 - Arguably not appropriate for today's distribution of climate risk
- Policy solutions from other insurance markets may not generalize
- Natural disaster insurance policy changes will have important implications for other markets