Prospects and Challenges of Risk-Based Insurance Pricing for Disaster Adaptation

Authors: Joakim A. Weill[1*], Jesse D. Gourevitch[2]
Affiliations:
[1]Federal Reserve Board, Washington, DC 20551, USA
[2]Environmental Defense Fund, New York, NY 10010, USA
Corresponding Author: [*]joakim.a.weill@frb.gov

Regulation of property insurance pricing involves trade-offs that will determine how disaster risks impact households' budgets. Allowing prices to reflect property-specific risks offers several benefits, but may cause a range of negative unintended consequences associated with declines in coverage.

Rising losses from climate-related disasters are generating turmoil in property insurance markets. In the United States, these developments are exposing the limits of pricing regulations that suppressed premiums in many high-risk areas. State-level pricing constraints for homeowners insurance are increasingly met through insurer retreat from higher-risk markets. Meanwhile in the National Flood Insurance Program (NFIP), which is the primary provider of flood coverage, years of premiums below expected losses have required repeated borrowing, leaving roughly $22 billion in outstanding debt by 2025. In response, premiums in both systems are being allowed to rise and better reflect property-specific disaster risk; we refer to this shift as "risk-based pricing."

The shift towards risk-based pricing by the NFIP and state regulators aims to serve two distinct goals: preserving insurer solvency and insurance availability in private markets and promoting climate adaptation in the housing sector. By aligning prices with underlying hazards, risk-based pricing can reward investments in risk reduction and discourage development in high-exposure areas. It also acts as a risk signal by making the cost of climate risk more visible to homeowners, thus encouraging more informed decisions about where to live and how much to invest in adaptation.[1,2]

However, risk-based pricing cannot meet these goals when implemented as an isolated policy. When rates increase, low-income households are more likely to drop or reduce their coverage rather than invest in risk reduction, which leaves them financially vulnerable in the wake of disasters. The effectiveness of risk-based pricing in promoting adaptation depends on targeted measures that help low-income households respond to rising premiums, as well as complementary housing policies that address the structural limits of insurance contracts in promoting adaptation.

This Comment discusses the policies that can support risk-based pricing and promote adaptation in the housing sector. Although climate-related insurance challenges are global, we focus here on the United States, where detailed evidence provides insights into broader emerging tensions between insurance, affordability, and adaptation.

Risk signals only work if households can act on them

Insurance premiums convey information about expected disaster losses and can incentivize households to reduce exposure through home retrofits or relocation. Yet even when premiums accurately reflect disaster risk, many households face financial barriers that limit their ability to invest in costly risk-reduction measures such as replacing roofs to withstand wind, elevating foundations to reduce flood risk, or creating defensible space to lower wildfire exposure. Nearly half of U.S. households in the lowest income quintile are homeowners, who may not be able to afford the upfront costs associated with risk-reduction measures. Consistent with this constraint, the limited evidence to date suggests that demand for adaptation is more responsive to prices among the wealthy.[3,4]

Similarly, price signals may have limited effects on households' location decisions. While higher premiums may discourage development in high-risk areas, new construction is a small fraction of the housing stock. For most homeowners, relocation as a strategy to lower premiums is rarely a feasible or attractive option. Employment constraints, limited housing availability, and the value of local social networks all reduce household mobility. The literature points to existing but limited migration in response to rising premiums,[5] underscoring the high costs of relocation.

Targeted subsidies can soften risk-based pricing impacts

Instead of encouraging risk-reduction, risk-based pricing may lead to a decline in coverage,[6,7] particularly among lower-income households. Underinsurance increases disaster vulnerability through slower recovery, falling property values, and negative spillovers in the local economy.[8] For mortgaged households who cannot reduce their coverage, higher premiums may raise the risk of mortgage default and prepayment, echoing dynamics seen with adjustable-rate mortgages in the lead up to the 2008 financial crisis.[5]

Targeted, publicly-provided subsidies for lower-income households (for insurance premiums, home retrofits, or relocation) can help address the negative consequences of underinsurance by improving coverage and reducing exposure. They can also support market stability by maintaining a more diverse and solvent risk pool, especially if these subsidies lead to meaningful investments in risk reduction. These subsidies could partly pay for themselves by reducing reliance on other safety net programs, which often exceeds the direct cost of federal disaster aid.[9]

However, the optimal design and fiscal implications of such subsidies remain uncertain. To date, there is limited research comparing the long-run costs and benefits of ex ante subsidies with those of post-disaster assistance. There is also limited research on the effects of means-tested insurance subsidies on induced risk-taking behavior (``moral hazard''): while low-income households often locate in hazardous areas due to affordability constraints rather than due to positive amenities[10,11], insurance subsidies could, in principle, induce some households to locate in higher risk areas. Quantifying these tradeoffs between affordability and moral hazard should be a priority for future work.

Targeted subsidies also have limits. They can be expensive to sustain at scale, especially as climate risk grows, which might require stringent eligibility rules. In addition, means-tested subsidies are an imperfect approach for increasing insurance coverage. Even when costs are lowered, several frictions limit demand, such as administrative hurdles, informational deficiencies, and cognitive biases. Finally, while public programs such as the NFIP can ensure subsidies reach households, the incidence is less predictable in private markets. Where competition is limited, insurers may offset subsidies via premium increases, requiring oversight to ensure consumer benefit.

Premiums have limited power to drive adaptation in housing

Risk-based pricing can support climate adaptation, especially when combined with targeted subsidies. But its effectiveness is constrained by structural features of insurance contracts, warranting realistic expectations about what insurance pricing alone can achieve.

First, insurance contracts are typically renewed annually, while disaster risks evolve over decades. This temporal mismatch limits the ability of insurance prices to influence long-term decisions about where to build and how to retrofit structures expected to last a century or more.

Second, adaptation often requires collective action and large upfront investment. For example, wildfire risk depends not only on individual defensible space but also on neighborhood-wide fuel management, while managing flood risk may require levees or public drainage infrastructure. NFIP's Community Rating System links community actions to premium discounts, illustrating how pricing can support shared investments. Private markets are unlikely to coordinate these efforts, but state insurance regulators can support collective action by requiring transparent, consistent discounts for verified interventions.

Third, pricing disaster risk is complex. Insurers use different catastrophe models, which vary across vendors and are often opaque to consumers and regulators. As a result, premiums may reflect model artifacts and uncertainty as much as underlying risk, undermining alignment with actual exposure.[12-14] Florida's Commission on Hurricane Loss Projection Methodology has a formal review process, and California recently completed its first wildfire model review. Elsewhere, models often inform rates with limited oversight.

While aligning insurance premiums with risk is important for market stability, it cannot substitute for other policy tools needed to address the multiple market failures and budget constraints that limit widespread adaptation. These include long-term planning incentives through zoning and building codes, public efforts to improve the accuracy and transparency of disaster risk information, and investments in protective infrastructure to reduce physical exposure.

Conclusion

The U.S. housing system redistributes the costs of disaster risks implicitly and often inefficiently through programs not designed for climate shocks. Public insurance programs and state-level pricing regulations shift risk across households without regard to income or vulnerability, distorting economic incentives without improving outcomes for lower-income households or strengthening insurer solvency.

Ensuring both affordability and stability requires approaches that continue the expansion of risk-based pricing while supporting coverage and adaptation among those with limited capacity to respond to rising premiums. A key challenge for future research is identifying the income thresholds where risk-based pricing no longer incentivizes adaptation but instead creates financial distress and coverage gaps.

Broader insurance pricing reforms may also be considered. While investments in home hardening can reduce future damage, they do not always translate into meaningful insurance savings. Only 14 states mandate that insurers offer discounts for properties with specific disaster protections. Yet in many cases, the precise discount amount is left to the insurer, and the discounts are also often too small to offset retrofits and verification costs.[15] Broadening the requirements for explicit and actuarially-based discounts for home hardening could improve the effectiveness of risk-based pricing.

At a systemic level, a national reinsurance program could lower costs for primary insurers by covering extreme losses, reducing solvency risk, and reducing pressures on premiums in high-risk areas. International models offer proven examples: France, Spain, and Japan's Reinsurance scheme all demonstrate how public reinsurance can enhance market stability under rising disaster risk. Getting insurance prices right is an important step towards a resilient housing sector, but even accurate pricing must be complemented by long-term policy tools.

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