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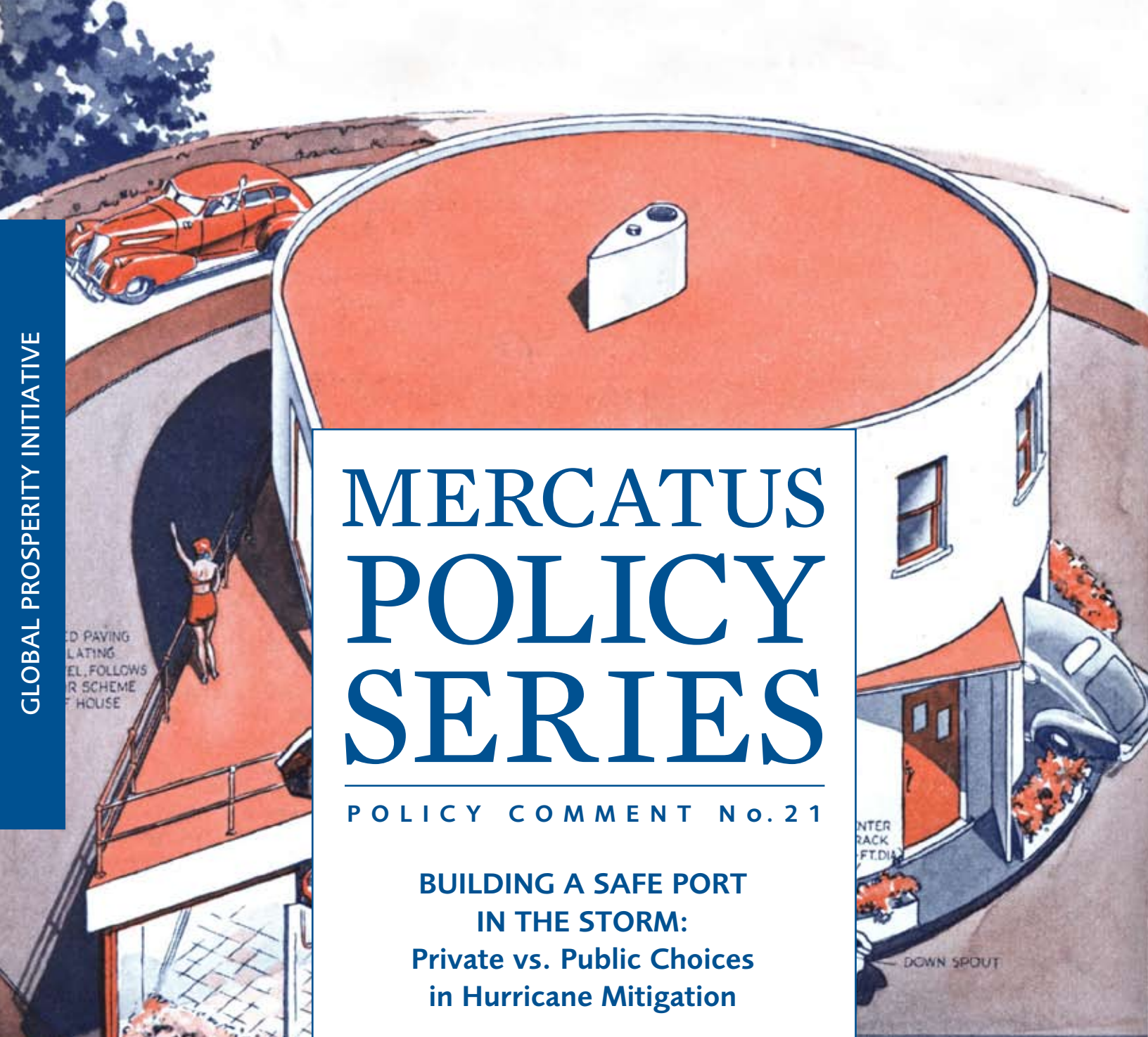
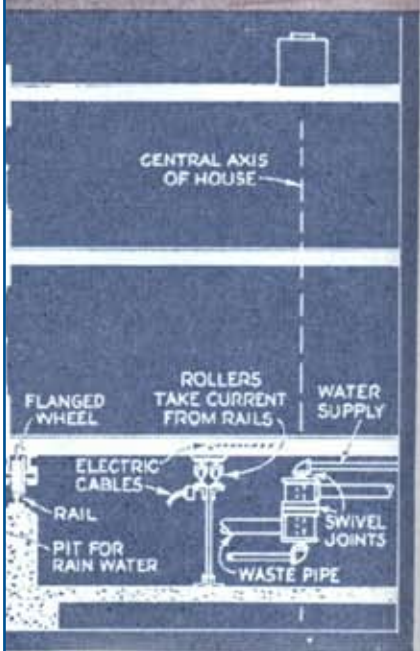


MERCATUS POLICY SERIES

POLICY COMMENT No. 21

BUILDING A SAFE PORT IN THE STORM: Private vs. Public Choices in Hurricane Mitigation

DANIEL SUTTER
Associate Professor of Economics,
University of Texas-Pan American



JULY 2008

MERCATUS CENTER
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Daniel Sutter, Author

Daniel Sutter is an affiliated senior scholar at the Mercatus Center and an associate professor of economics at the University of Texas—Pan American. His research interests include the impact of weather hazards, the value of weather forecasts, the economics of the news media and news bias, and constitutional economics.

Dr. Sutter has published over sixty articles in journals including *Economic Inquiry*, *The Southern Economic Journal*, *Public Choice*, *Weather and Forecasting*, *Natural Hazards Review*, and *Risk Analysis*. Prior to his position at the University of Texas, he taught at the University of Oklahoma for eleven years. He graduated with a degree in economics from Rensselaer Polytechnic Institute and earned Masters and PhD degrees in economics from George Mason University.

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Cover picture: Popular Science 1939. http://blog.modernmechanix.com/2008/04/17/hurricane-house-turns-with-wind/

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Private vs. Public Choices in Hurricane Mitigation

Daniel Sutter

EXECUTIVE SUMMARY

Seven of the nine costliest hurricanes in U.S. history occurred in 2004 and 2005. Some experts portray rising hurricane losses as the consequence of increased coastal development and suggest that development must be curbed to contain hurricane losses. However, hurricane losses depend not only on the concentration of coastal development, but also on the quality of that construction. Many construction designs and materials that can reduce losses exist. Using such designs and materials in construction could mitigate structural damage and help resolve the apparent dilemma of increased coastal development accompanied by rising hurricane losses.

This Policy Comment analyzes the connection between hurricane mitigation and insurance. As many people fail to purchase government-subsidized flood and earthquake insurance, some researchers argue that market failure explains the lack of mitigation. But empirical evidence shows that markets do value natural hazards risks, including hurricane mitigation, and thus the case for market failure has been overstated.

This Comment then examines how government policies like insurance subsidies undermine incentives for mitigation. It concludes policy makers can take several steps to encourage a more effective hurricane mitigation system. They should:

1. Allow insurers broad freedom to craft contractual incentives for mitigation. Low probability event bias, myopia, and status-quo bias will make it difficult, but not impossible, for insurance companies to alert homeowners to valuable mitigation opportunities, but successful incentives could avoid billions of dollars of unnecessary losses in a major hurricane.

2. Resist mandating politically determined discounts for mitigation. Competition will lead to reduced premiums for well constructed homes.

3. Shift to a market-based system for quality assurance in place of government-enforced building codes.

4. Eliminate below-market insurance premiums for high-risk coastal properties, particularly for new construction.

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BUILDING A SAFE PORT IN THE STORM:
Private vs. Public Choices in Hurricane Mitigation

INTRODUCTION

Hurricanes have taken a heavy toll on the United States this decade. The loss of life and devastation from Hurricane Katrina have attracted the most attention, but Katrina was not the only disaster: seven of the nine costliest hurricanes in U.S. history occurred in 2004 and 2005.[1] But increased vulnerability to hurricanes, both because of the greater numbers of people and higher value of property in coastal areas, not increased frequency of hurricanes or stronger storms, explains the growth of hurricane damage in the United States.[2] Coastal growth in the United States has been substantial: for example, the population of counties on the Atlantic and Gulf coasts increased from less than 6 million in 1900 and 13 million in 1950 to over 35 million in 2000. Today, almost $7 trillion in insured property is vulnerable to hurricane losses. While coastal growth drives much of the vulnerability to hurricanes, a variety of loss-mitigation measures—methods of securing buildings to make them able to withstand hurricane conditions—can protect buildings and infrastructure from hurricane winds and flooding and significantly reduce hurricane losses. Studies show that construction to the best available standards can cut hurricane damage by about 50 percent.[3] The Federal Emergency Management Agency (FEMA) attempted to highlight the importance of mitigation with its National Mitigation Strategy in the 1990s.[4] Mitigation allows society to enjoy the benefits of living, vacationing, and working along the coast while still containing losses when a hurricane eventually strikes.

Mitigation is not an end unto itself. Rather, it is important that coastal development be efficient—only development that generates benefits in excess of the full costs should occur. When development is efficient, the homes or businesses built represent the highest-valued use of scarce resources. By reducing the cost of hurricanes, efficient mitigation increases the net benefits of coastal development. Unlike other measures to protect property, which remain private choices, mitigation decisions assume a policy dimension because hurricanes can threaten the vitality of entire communities and losses can be shifted to third parties through regulated insurance markets and disaster relief. Many researchers suggest that homeowners and businesses systematically neglect hurricane (and other natural hazard) risks.[5] But poor public policies like subsidized insurance and generous post-disaster

1. Insurance Information Institute, "Top 15 Most Costly Hurricanes in the United States," http://www.iii.org/media/facts/statsbyissue/hurricanes.
2. Roger A. Pielke, Jr., and others, "Normalized Hurricane Damage in the United States: 1900–2005," *Natural Hazards Review* 9, no. 1 (2008): 29–42.
3. Applied Research Associates, *Analysis of Cost and Loss Reduction Benefits for Windborne Debris Protection—North Carolina Coast Exposure C Locations*, ARA Report no. 792 (Raleigh, NC: Applied Research Associates, 2002); Applied Research Associates, *Analysis of Cost and Loss Reduction Benefits for Windborne Debris Protection—South Carolina Coast Exposure C Residential Buildings*, ARA Report no. 792 (Raleigh, NC: Applied Research Associates, 2002); Shimberg Center for Affordable Housing and Applied Research Associates, *Florida Building Code Cost and Loss Reduction Benefit Comparison Study* (Tallahassee, FL: Florida Department of Community Affairs, 2002); Marc C. Levitan, Carol Hill Friedland, and T. Eric Stafford, *Residential Wind Damage in Mississippi: Potential Hurricane Damage Reduction Through Improved Building Codes and Building Practices* (Baton Rouge, LA: LSU Hurricane Center and T. Eric Stafford & Associates, 2006).
4. The current incarnation of FEMA's Mitigation Directorate is its "Mitigation Best Practices Portfolio" at www.fema.gov/plan/prevent/bestpractices/index.shtm.
5. Robert J. Meyer, "Why We Underprepare for Hazards," in *On Risk and Disaster: Lessons from Hurricane Katrina*, ed. Ronald J. Daniels, Donald F. Kettl, and Howard Kunreuther (Philadelphia: University of Pennsylvania Press, 2006); Howard Kunreuther and Mark Pauly, "Rules Rather Than Discretion: Lessons from Hurricane Katrina," *Journal of Risk and Uncertainty* 33 (2006): 101–116.

relief can reduce the incentive for coastal residents and businesses to invest in mitigation. This Policy Comment explores whether individuals are likely to make efficient decisions regarding mitigation, or whether government should be relied upon to invest in mitigation or force individuals through regulation to invest in mitigation.[6]

The first section of this Policy Comment focuses on a number of reasons, proposed by researchers, why people might make poor decisions regarding mitigation. Section two reviews these decision-making maladies and their potential, if widespread, to disrupt a market-based approach to mitigation. Insurance provides an important incentive for homeowners and businesses to invest in mitigation, yet as section three reviews, state regulation currently limits the incentives insurers can offer for mitigation. Government mandates and provision of mitigation are offered as solutions to homeowners' poor decisions with respect to mitigation, but the same maladies that lead people to ignore or put off mitigation affect politicians as well. Section three examines the poor performance of local governments on two important elements of hurricane mitigation: the enforcement of building codes and flood plain regulations. Section four discusses the potential to move toward a more market-based system of mitigation. In contrast to the allegations of market failure, market forces already provide incentives in the housing market for mitigation. The section further discusses how these successes might be transferred into market-based quality assurance in place of government building codes and regulatory reform to allow insurance companies greater latitude to devise incentives for mitigation. The last section offers four concrete recommendations for policy makers.

I Will Homeowners Choose Efficient Mitigation?

Individuals take many actions—most of which are private choices—to protect their properties. Each of these actions involves trade-offs; when it comes to mitigation, homeowners and businesses must compare the value of the loss prevented when a hurricane occurs against the cost of mitigation. A number of theories indicate that people face obstacles in adopting efficient mitigation measures.[7] So why might residents fail to adopt efficient mitigation measures, and why might this failure become a public policy issue? The following are some of the biases that may affect individuals' mitigation decisions.

Interpreting Low Probabilities. A major hurricane is likely to strike a given part of the coast every twenty to thirty years or less.[8] This means that the annual probability of being hit by a hurricane is 5 percent or less. Even when a hurricane eventually strikes, not all homes in an area will sustain extensive damage. Risk researchers have accumulated evidence that people have difficulty making decisions for such events, a phenomenon called "low-probability event bias." In fact, in low-probability decision experiments, people often make choices at odds with what is objectively rational.[9] For hurricanes, low-probability event bias suggests that residents might underestimate the underlying probability of a hurricane, perhaps ignoring the risk altogether, and treat the probability as if it were zero.[10] If residents perceive that the probability of a hurricane is zero, they will see no value in mitigation.

6. This Comment focuses on mitigation of personal property loss, not hurricane losses to government property (e.g., roads, government buildings, and vehicles), which is an important but separate question. Mitigation for government property does not involve the possibility of public-sector decisions supplanting market decisions, because government officials should be expected to take prudent action to protect property entrusted to their care. The question here is whether government should make citizens protect their own property.

7. The efficient level of mitigation minimizes the sum of hazard losses plus mitigation costs, each adjusted for timing and risk (that is, efficient mitigation minimizes the expected present value of the sum of hazard losses and mitigation costs). In practice, researchers have difficulty conclusively identifying efficient mitigation measures despite evidence of their effectiveness in reducing losses because losses and costs are subjective. For example, gabled roofs on homes have been shown to modestly increase damage in hurricanes relative to hip roofs. This does not demonstrate that hip roofs are efficient, because the aesthetic value to some homeowners of gabled roofs might offset the added hurricane losses. Almost all mitigation decisions include such tradeoffs.

8. This information is based on the return periods reported by the National Hurricane Center, at www.nhc.noaa.gov/HAW2/english/basics/return.shtml.

9. Howard Kunreuther, Nathan Novemsky, and Daniel Kahneman, "Making Low Probabilities Useful," *Journal of Risk and Uncertainty* 23, no. 2 (2001): 103–120.

10. Colin Camerer and Howard Kunreuther, "Decision Processes for Low Probability Events: Policy Implications," *Journal of Policy Analysis and Management* 8 (1989): 565–592; Howard Kunreuther and Mark Pauly, "Neglecting Disaster: Why Don't People Insure Against Large Losses?" *Journal of Risk and Uncertainty* 28, no. 1 (1989): 5–21.

Shortsightedness. A second challenge for efficient mitigation is excessive discounting of the future, often referred to as a "time horizon problem."[11] This occurs when people do not properly value the future benefits of a mitigation measure—such as lower expected damage, longer life span, or lower insurance premiums over time—but instead focus on the immediate cost. Shortsightedness can also result if a homeowner considering a mitigation investment today does not plan to live in the house for the entire useful life of the mitigation measure and does not expect to be able to capture the value of future benefits in the sale price of the house. If the benefits of a mitigation measure such as hurricane shutters can be captured in a higher sales price, the current owner will include these benefits in their mitigation decisions; if not, the unused benefits will be discounted or ignored.[12]

Procrastination and Status-Quo Bias. People have a tendency to put things off, sometimes until it is too late. Economists call this "status-quo bias," and a wide range of real-world and experimental evidence (and also introspection) suggest that people disproportionately choose to maintain the status quo.[13] Residents might recognize the value of hurricane shutters or a new roof with secondary water resistance, but simply put off calling a contractor to get the work started until it is too late.

Quality Assurance. Verifying the presence of mitigation in a home or building can be difficult, and this asymmetry of information between buyers and sellers has been offered as an economic rationale for building codes.[14] Such quality assurance issues apply only to some types of mitigation or strengthened construction. For example, once construction is completed, it is basically impossible to verify the direction and spacing of nails, the proper installation of hurricane straps or clips, or the anchoring of walls to the foundation; yet, these factors affect the structural integrity of a building. On the other hand, verifying the installation of permanent hurricane shutters is relatively easy. The quality assurance problem might prevent insurance companies from offering premium discounts for some types of mitigation,[15] which, in turn, may make homeowners unwilling to invest in these measures, or pay extra for homes with mitigation features in the market for existing homes.

Neighborhood Protection. Some of the costs of poor construction spill over to neighboring properties, another rationale put forth for building codes.[16] If a hurricane blows apart a poorly built house, the debris can damage neighboring houses. Sufficient debris can even damage the windows and doors of a well-constructed home, allowing wind and rain to enter the home and often leading to extensive damage. A well-built home provides external benefits to the neighboring homes by not becoming the source of damaging debris. [17]

These decision-making biases provide reasons why homeowners and businesses may fail to invest in efficient mitigation measures, but they are not the only reasons why people may fail to invest. Government policies like insurance regulation and disaster relief can also reduce the incentive to take preventive measures. Many instances of alleged inaction due to decision-making biases, like the failure to purchase subsidized flood or earthquake insurance, can also be explained by a rational reaction to government policy. As will be discussed in section five, markets do respond to some natural hazard risks and do value mitigation. It is important to understand all the reasons people may fail to act, or act improperly, when faced with these decisions—only then can decisions be made regarding the appropriate policy response. Consequently, this Policy Comment will next consider how insurance regulation affects incentives for homeowners to invest in mitigation.

11. Howard Kunreuther and Anne Kleffner, "Should Earthquake Mitigation Measures be Voluntary or Required?" *Journal of Regulatory Economics* 4 (1992): 321–335; Camerer and Kunreuther, "Decision Processes."
12. Kunreuther and Kleffner, "Should Earthquake Mitigation Measures be Voluntary or Required?"
13. William Samuelson and Richard Zeckhauser, "Status Quo Bias in Decision Making," *Journal of Risk and Uncertainty* 1 (1988): 7–59.
14. Sharon M. Oster and John M. Quigley, "Regulatory Barriers to the Diffusion of Innovation: Some Evidence from Building Codes," *Bell Journal of Economics* 8, no. 2 (1977): 361–377.
15. Howard Kunreuther, "Mitigating Disaster Losses through Insurance," *Journal of Risk and Uncertainty* 12 (1996): 171–187.
16. Linda Cohen and Roger G. Noll, "The Economics of Building Codes to Resist Seismic Structures," *Public Policy* 29 (1981): 1–29.
17. Government policies like providing insurance at below-market rates or providing disaster assistance can spread the costs of hurricanes to policyholders or taxpayers outside of the hurricane-affected area. This is distinct from the neighborhood effect, and as discussed in the next section, can also undermine incentives for mitigation. Even if insurance regulation and disaster relief did not spread hurricane costs outside of the affected area, the neighboring home externality would still exist, and might lead to too little investment in mitigation.

2 Insurance Regulation and Mitigation

Insurance remains one of the most regulated industries in the United States, with state insurance commissions having the power to review rates, terms of coverage, and other contractual provisions. Decision-making biases and quality-assurance problems can explain why residents might fail to invest in mitigation, but insurance regulation also affects the benefits from mitigation. This section reviews some of the policies state regulators and legislators have enacted to encourage—but which actually may discourage—mitigation. This discussion centers around hurricane deductibles, the treatment of premium discounts insurance companies might want to offer for mitigation, and politically mandated discounts for mitigation. There are other ways insurance regulation affects incentives for mitigation; for example, the text box describes how Connecticut legislators prohibited insurers from making mitigation a condition for coverage or policy renewal.

CONNECTICUT AND HURRICANE SHUTTERS

In the aftermath of Katrina, insurers and policy makers have become aware of the losses possible if a major hurricane were to strike the tristate New York City area. In 1938, the Long Island Express, a Category 3 storm, killed over 550 people and caused nearly $5 billion in inflation-adjusted damage, even though Long Island at the time was largely rural. The current risk to property is substantial: New York, New Jersey, and Connecticut rank 2nd, 5th, and 6th nationally in hurricane-exposed property, at $1.9 trillion, $506 billion, and $405 billion respectively.

Insurance companies in the Northeast have taken steps to reduce their hurricane exposure and encourage mitigation. In Connecticut, some insurers warned their customers that their policies would not be renewed unless they installed hurricane shutters. Hurricane shutters provide important protection to a building from wind-blown debris. Nonetheless, the Connecticut Department of Insurance halted these actions and the state legislature passed a law to prevent insurers from making installation of shutters a condition for coverage.

An insurance company might want to require hurricane shutters or other mitigation as a condition of coverage for at least two reasons. First, the reduced potential loss might make underwriting much more attractive to insurers. Second, insurers might be able to better estimate expected losses for a property with hurricane shutters. That is, shutters might reduce the variance of loss in addition to the expected loss. Ambiguity is an important factor in the pricing of insurance, and underwriters typically set significantly higher premiums for ambiguous or uncertain risks.[1] The reduced variance of loss with mitigation could induce some insurance companies to write policies in high-risk coastal areas.

Second, the threat of cancellation or nonrenewal might provide a valuable antidote to inertia or status-quo bias. A threat of cancellation might be required to make homeowners seriously consider installing shutters; an information sheet included with annual renewal declarations might not be sufficient. Cancellation would necessarily force a policyholder to take action, even if only to find a new insurer. In a market where policyholders have heard stories about the difficulties of finding insurers willing to write new coverage, the threat of cancellation might be the necessary incentive to induce a policyholder to install shutters, or to at least carefully weigh the cost and savings of shutters.

1. Howard Kunreuther and others, "Ambiguity and Underwriter Decision Processes," *Journal of Economic Behavior and Organization* 26 (1995): 337–352.

2.A: Hurricane Deductibles

A deductible, the out-of-pocket amount a policyholder must pay before insurance covers a loss, is designed to reduce small claims that would be costly to process relative to the payment distributed and to combat the problem of moral hazard.[18] In recent years, hurricane deductibles have become increasingly common and can be as large as 5 percent of the property's value.[19] The larger deductible reduces insurance companies' potential losses in the event of a hurricane and can reduce the premium for the policyholder. However, state regulators must approve the deductibles insurance companies offer to policyholders and can prevent insurers from offering as high a deductible as they might wish.

Deductibles generally encourage mitigation, but the degree of their incentive effect is questionable. How much of an incentive a deductible provides depends on whether the reduction in damage occurs beyond the margin of the deductible. Suppose that a $200,000 home (without mitigation) with a 5 percent deductible suffered $40,000 of damage in a hurricane. The deductible would be $10,000, resulting in the remaining $30,000 being paid by the insurer. Assume that mitigation would reduce the amount of hurricane damage on this home by 25 percent, from $40,000 to $30,000. This still exceeds the deduct-

18. Moral hazard refers to the probability that a policyholder may behave less cautiously day-to-day if someone else is paying for the consequences of his actions. If the policyholder has to pay some of the loss (or all of a small loss), he has an incentive to take action to avoid losses, say, by double checking that the stove is off before leaving the house.

19. Hurricane deductibles are so named because they only apply when a named tropical storm or hurricane (depending on the state) makes landfall.

ible, so the homeowner does not have an incentive for mitigation. A second drawback of large deductibles is that they offset the very benefit of insurance by leaving the policyholder with a sizable reduction in wealth following a hurricane. To offset this, South Carolina's Omnibus Coastal Property Reform Act of 2007 allows individuals to create Catastrophe Savings Accounts, setting aside pretax dollars to cover hurricane deductibles.

To create an incentive for mitigation, some states regulate reductions in hurricane deductibles if homeowners invest in mitigation. In New Jersey, five mitigation elements are defined, including construction to current state building codes, hurricane shutters, impact-resistant windows, exterior doors, and garage doors. Homes in the state's most exposed coastal zip codes have a $1,500 all-peril deductible and a five percent hurricane deductible. But if a property in this zone meets all 5 mitigation goals, the 5 percent hurricane deductible is waived and the $1,500 all-peril deductible applies to hurricanes. The question remains as to whether such politically negotiated deductibles provide homeowners with sufficient incentive to invest in mitigation.

2.B: Premium Discounts

If a homeowner invests in protective measures expected to reduce hurricane damage in the future, the homeowner should expect to share in this damage reduction. And in contrast with hurricane deductibles, premium discounts for mitigation benefit the homeowner immediately in the form of a lower bill for insurance coverage. Premium reductions are one way the insurance industry encourages mitigation. For instance, discounts can be given for specific mitigation measures like hurricane shutters, wind-resistant windows and doors, and secondary water resistance. Premium reductions are also often given for homes built to the existing state building code.[20] The Texas Windstorm Insurance Association, the state hurricane insurance pool, offers premium discounts of 19 to 33 percent for building code compliance. Premium discounts can become complicated, since the marginal value of a mitigation feature might depend on the other types of mitigation a property has, as well as the exact location, elevation, and surroundings of a home. Florida has the most extensive set of premium discounts, which depend on location and terrain. The main mitigation or home characteristic features for discounts include roof shape, roof deck material, roof cover, secondary water resistance, roof-to-wall connections, and protection for openings.[21]

Insurance commissions must approve discounts for mitigation as part of their general power to regulate insurance rates, and this limits the ability of insurance companies to offer discounts. States regulate insurance rates in two different manners, either as a "prior-approval" state where the commission reviews rates before a company is allowed to use the rate, or as a "file-and-use" state in which companies can begin to use a new rate but the commission can review and possibly disallow the rate change. In a state where the insurance commission actively reviews new rates, a file-and-use system ends up being the functional equivalent to a prior-approval state. Premium regulation typically requires insurers to justify their proposed discounts to state regulators. For instance, in South Carolina,

> when calculating the discount or credit the *insurer must be able to demonstrate* a correlation between the reduction in premium and the reduction in risk associated with the mitigation measures. The insurer may include the structure's age, location, construction method and materials used in calculating the discount. . . . The Department will use available studies providing data and information on estimated loss reduction for wind resistant building features to evaluate the discounts offered by insurers.[22]

In essence, regulators get to second-guess insurers. An insurance company must be able to convince both itself *and* regulators of the value of mitigation. Reliance

20. One proviso about discounts based on building codes must be noted. Typically, for discounts or deductible waivers to be approved, homes built after a code went into effect are assumed to be built to code and are eligible for the discounts. Building code enforcement is not automatic, and enforcement efforts vary across communities, as discussed in the next section. Consequently, building code-related discounts may be overly generous. Note that South Carolina's Omnibus Coastal Property Insurance Reform Act of 2007 allows insurers to take a community's building code enforcement score into account in determining premium discounts.
21. The Florida wind incentives can be accessed at http://www.floridadisaster.org/mitdb/.
22. South Carolina Department of Insurance Bulletin 2007-15, Section 3, available at http://www.doi.sc.gov/bulletinsandorders/2007bulletins.htm emphasis added.

on existing studies of loss injects conservatism into the discount-approval process—insurers may not be able to demonstrate all that they know about losses.[23] Also, if insurers differ in their assessments of the value of specific elements of construction—such as reinforced garage doors or strengthened soffits—the largest discounts proposed will appear excessive compared to those proposed by other insurers and might be viewed as competitive price cutting. Insurance commissions are politicized bodies, and insurance companies (in addition to consumers or lawmakers) can suggest that rates be disallowed. Insurance companies in a regulated market consequently can interfere with price setting by rivals in a way not possible in a competitive market.

Furthermore, the process presumes that regulators are as knowledgeable about construction engineering and wind damage as the insurance companies. However, many state insurance commissions have modest staffs, and state insurance commissions differ in their willingness to accept risk models developed by the industry to project expected hurricane losses. Insurance companies use these models to calculate appropriate rates to charge, and risk models provide one way to estimate the appropriate discount for mitigation. Policy makers should recognize that insurers already have a profit incentive not to provide excessive discounts; if an insurer makes an error and offers too great a discount, that company will bear the loss.

Premium discount regulation at the state level implies that justifications for mitigation discounts would have to be successfully made to regulators in each hurricane-exposed coastal state. The time and resources needed to secure approval in each state could interfere with insurers' efforts to advertise or market mitigation incentives nationwide. As noted previously, regulatory burden can discourage insurer interest in mitigation:

> Insurance is a highly regulated industry, with rate changes and new policies generally requiring the approval of state insurance commissioners. The development of premium schedules which provide rate reductions for adoption of certain mitigation measures requires administrative time and energy, both to develop and make a case to the state insurance commissioners. [24]

2.C: Mandated Discounts for Mitigation

Regulators and state lawmakers sometimes go beyond merely second guessing insurers and require or mandate discounts for mitigation. Florida adopted such an approach after implementation of the statewide Florida Building Code in 2001, and Louisiana and South Carolina passed similar legislative mandates in 2007. Florida commissioned an engineering study to document the expected benefit of mitigation measures included in the building code.[25] Insurance companies then had to submit discounts for mitigation, and state regulators could require companies to offer more generous discounts than proposed.

Politically mandated discounts for mitigation differ from discounts voluntarily offered by insurers. Insurance companies will only offer discounts for various mitigation features if they believe that expected cost savings justify the discount. While insurers might overestimate the expected cost savings resulting from a particular mitigation measure, insurer-initiated discounts will be based on expected damage reductions. Politically mandated discounts, however, need not be proportional to expected loss reductions and could serve as a means of disguising below-market premiums. Even if not intended as a disguised subsidy, politically set premium reductions will be difficult to tailor to individual circumstances. Insurance companies have an incentive to take into account all of the relevant information regarding the value of mitigation for an individual property. If the politically brokered premium reductions fail to incorporate all of the relevant, localized information, mitigation incentives will not be properly tailored, resulting in some homeowners not receiving a sufficient discount to mitigate, while others might receive an excessive discount and mitigate unnecessarily.

23. Insurers may have decentralized knowledge about losses that is difficult to express in a formula or back up with statistical evidence. In addition, some insurers might be wary of revealing patterns in losses which they have uncovered to other insurers.
24. Howard Kunreuther, "Mitigating Disaster Losses." Optional federal chartering for insurance companies would have minimal impact overall on hurricane insurance or state-run wind pools. Federal chartering could, however, reduce the regulatory burden on insurers in obtaining approval in each state for discounts for mitigation, which could allow the coordination of incentives with a national advertising campaign to raise awareness.
25. Shimberg Center, *Florida Building Code Cost*.

Clearly, policyholders must share the expected loss reduction to have an incentive to invest in mitigation. In the absence of some sharing mechanism—a deductible, co-pay or premium discount—mitigation by homeowners amounts to altruism on behalf of insurance companies. The driving force behind mandated discounts is likely skepticism about whether insurers would actually lower premiums once homeowners invested in mitigation; the "greedy" insurance companies might be expected to keep all the gains for themselves. Yet the evidence shows that competitive pressures work to contain premium growth and lead to rate reductions in spite of regulation of the industry. Overall, premiums written by the U.S. insurance industry are forecast to decline slightly in 2008, after remaining unchanged in 2007.[26] The average cost of auto insurance nationally fell in 3 years out of 10 between 1996 and 2005. Competition, if permitted by regulators, can be expected to force the savings from mitigation to be passed on to consumers.[27]

3 The Public Sector's Performance on Mitigation

People may indeed make questionable decisions regarding hurricane mitigation, ignoring the risk of a hurricane, acting myopically, and procrastinating. People might also seek to shift the costs of their actions to others. In addition, they may be uncertain about the value (quality) of their property's mitigation measures. But the factors that might lead homeowners to put off or ignore mitigation will similarly affect voters, politicians, and bureaucrats.[28] The fundamental tenet of public choice economics is that people who are assumed to maximize their own well-being in market decisions will behave similarly in political decisions.[29]

Indeed, government's record on mitigation is not distinguished, as Hurricane Katrina illustrated. The deficiencies of the levee system around New Orleans had been identified, but repairs were not undertaken in time. FEMA and the City of New Orleans were unprepared for the crisis, despite the hypothetical Hurricane Pam exercise having laid out the main elements of the disaster.[30] By contrast, retailers like Wal-Mart and Home Depot found the time and resources to prepare a timely and effective response to the disaster.[31] The discussion of possible market failures in mitigation implicitly assumes that public sector intervention could better exploit opportunities for mitigation. The public sector's poor preparation for Katrina suggests otherwise. This section offers a systematic evaluation of the public sector's performance in two important areas of mitigation: the enforcement of building codes and the management of flood zones.

Indeed, government's record on mitigation is not distinguished, as Hurricane Katrina illustrated.

Local governments hire building inspectors and enforce building codes. The Building Code Effectiveness Grading Schedule (BCEGS) is a rating system developed by the Insurance Services Office (ISO) in the 1990s in response to the deficiencies in building code enforcement revealed after Hurricane Andrew (see text box on next page).

26. Insurance Information Institute, "Special Report: Early Bird Forecast 2008," available at http://www.iii.org/media/industry/.
27. Premium discounts for mitigation become quite complicated if regulated premiums are below the rates at which insurance companies would voluntarily write policies in high-risk coastal areas. Since insurers lose money writing these price-controlled, high-risk policies, insurers will not want to offer discounts for mitigation because this could attract additional customers. Addressing the underlying problem of subsidized insurance rates would be superior to regulators mandating further discounts for mitigation.
28. Roger G. Noll, "The Complex Politics of Catastrophe Economics," *Journal of Risk and Uncertainty* 12 (1996): 141–146.
29. James M. Buchanan and Gordon Tullock, *The Calculus of Consent* (Ann Arbor: University of Michigan Press, 1962).
30. In 2004 FEMA sponsored a week long planning exercise about a hypothetical category 3 hurricane "Pam" striking New Orleans, prepared by hazards researchers at LSU. The exercise forecast the deluge from Katrina quite well. Douglas Brinkley, *The Great Deluge* (New York: William Morrow), 18–19.
31. Steven Horwitz, *Making Hurricane Response More Effective: Lessons from the Private Sector and the Coast Guard During Katrina* (Arlington, VA: The Mercatus Center, 2008), http://www.mercatus.org/repository/docLib/20080319_MakingHurricaneReponseEffective_19Mar08.pdf.

BUILDING CODES AND HURRICANE ANDREW

Hurricane Andrew struck Miami in August 1992 and caused a then-record $16 billion in insured losses. Andrew was a powerful storm, one of only three hurricanes to make landfall in the United States as a Category 5 storm. Investigation after Andrew revealed that poor building practices and poor enforcement of the existing South Florida Building Code, which was considered by experts to be one of the nation's best building codes, increased the damages. Homes built after 1980 suffered significantly greater damage than older homes, despite being built under the strong code and with new and supposedly better materials.[1] Analysis eventually reached a consensus that 25 percent of the damage in Andrew was due to poor construction, which ultimately meant deficient building code enforcement.

What went wrong? A part of the answer was a series of questionable decisions by Dade County's Board of Rules and Appeals regarding building techniques and materials.[2] These included allowing builders to use asphalt shingles for roofs even though no shingle on the market could meet the code's 120 mph wind standard; allowing builders to use staples instead of nails in roof installation; substituting nail guns for nails driven by hand; and approving the use of wafer board in place of plywood on roofs.

Another factor was an insufficient number of building inspectors. When Andrew struck, Dade County had 60 building inspectors even though about 20,000 new buildings were being built each year. Given the multiple inspections required, each inspector would have had to conduct 35 inspections per day for proper enforcement of the code. Understaffing can lead to delays in plan approval and inspections that are costly to builders. Residents can end up with a higher cost of housing due to delays and poorly constructed buildings and homes.

When government takes on a task that could be accomplished through the market, people will often believe, until evidence shows otherwise, that government is actually performing the task. With government building codes in place, home buyers and insurers might assume that all new homes are being built to withstand the winds specified in the code. Government quality assurance will crowd out market forces that otherwise would alert home buyers to pay attention to the reputation and record of the builder. When government fails to deliver on building code enforcement, the results can be devastating due to the correlated nature of hurricane losses. Thousands of homes are exposed at the same time, and damage for all of them could be higher than expected if codes are not enforced. Nine insurance companies failed after Andrew, and some of these failures could have been a result of unexpected costs due to poor building code enforcement.

1. Paul Fronstin and Alphonse Holtman, "The Determinants of Residential Property Damage Caused by Hurricane Andrew," *Southern Economic Journal* 61 (1994): 387–397.
2. Dennis Mileti, *Disasters by Design*, 128–132.

The program, modeled on the Public Protection Classification Program rating system for the fire-fighting capabilities of communities, follows a 10-point scale, with 1 being "exemplary enforcement of a model building code."[32] Not all communities participate in the program, so it is possible to have no rating. The score is based on 21 different factors, including the administration of codes, the review of plans, field inspections, staffing levels and qualifications, the building code in effect, local modification of codes, contractor and builder licensing and bonding requirements, and public awareness programs. Personal and commercial construction code enforcement are independently evaluated, and the score assigned may differ (this paper's analysis uses the personal construction ratings). Insurers generally offer discounts for a better score, with no discount offered for a score of 10; the program is intended to reward enforcement, not penalize failure to enforce codes. The ISO periodically reviews ratings, though a community can request a new review if they have undertaken steps to strengthen enforcement since its last evaluation. Ratings only apply to new construction, not construction that predates the current rating for enforcement in the community.

Local communities also manage flood hazard areas eligible for insurance through the National Flood Insurance Program (NFIP). The Community Rating System (CRS), has been developed to provide a financial incentive to take further steps than those required by the NFIP to reduce the flood vulnerability of communities with a Special Flood Hazard Area. The NFIP rate structure subsidizes the highest-risk properties, and so management of areas subject to storm surge flooding by communities (by limiting new construction or requiring adequate flood proofing) importantly affects the nation's vulnerability to hurricanes. Communities earn points based on 18 activities in the areas of public information, flood plain mapping, damage reduction measures, and flood preparedness. The program rates communities from 1 (best) to 10 (worst). Flood insurance policyholders in CRS communities then receive premium discounts based on the community's rating. There is no discount for a rating of 10 and a 5 percent discount for each point of improvement, up to a maximum of 45 percent for a community rated 1.

Both CRS and BCEGS measure local government activities that affect the vulnerability of communities to hurricanes. In each case, a rating of 1 represents the best practices in flood protection and building code enforcement. Table 1 summarizes the distribution of CRS and BCEGS ratings for the Atlantic and Gulf coast regions to show how local government performs on mitigation.

32. This description of the program is based on information available on the ISO website at http://www.isomitigation.com/bcegs.

TABLE 1: COMMUNITY RATING SYSTEM AND BUILDING CODE EFFECTIVENESS GRADING SCHEDULE RATINGS OF ATLANTIC AND GULF COASTAL COUNTIES AND COMMUNITIES

	CRS			BCEGS	
Rating	Counties (Delaware to Texas)	Communities in All States	Communities in High-Risk States	Communities in All States	Communities in High-Risk States
1	0	0	0	2	2
2	0	0	0	50	25
3	0	0	0	576	196
4	0	0	0	1,370	399
5	5	8	8	760	308
6	5	24	22	354	201
7	17	84	69	370	94
8	14	138	103	236	77
9	9	57	28	137	57
10	3	24	8	26	17
Counties or Communities Rated 9 or Better	50	311	230	3,855	1,359
Total Counties or Communities	92	1,274	513	8,164	5,241
Percent Rated	54.3	24.4	44.8	47.2	25.9
Average Rating	8.55	9.43	8.89	7.60	8.70

The first four columns look at CRS ratings. The first column reports the distribution of CRS ratings for coastal counties in states from Delaware south along the Atlantic and Gulf coasts.[33] All of the 92 coastal counties participate in the NFIP, and just over half (57.6 percent) are rated in the CRS. But the best rating of any coastal county is a 5, and the average rating (including nonparticipating counties) is 8.5.[34] The second column reports the distribution of ratings of communities in coastal counties in all states along the Atlantic and Gulf coasts.[35] A total of 1,274 communities in these coastal counties participate in the NFIP, and only 26 percent of these communities are in the CRS, with an average rating of 9.4—barely different from the "no discount" rating of 10. Again, the best rating for any coastal community is 5. Hurricane risk differs greatly along the coast, and thus column three reports the ratings only for coastal communities in the states from Texas to North Carolina, the portion of the coast more at risk of hurricanes. Overall participation is better in the high hurricane-risk states, at 46 percent of the 513 communities, but the average rating is only 8.9. The final two columns report the distribution of BCEGS ratings of communities in coastal states. Because only the state summaries of ratings are available for use, the distributions include ratings for communities in coastal states that have no hurricane risk (e.g., towns in the Texas Panhandle). Column 5 shows that about 48 percent of communities in coastal states are rated, with an average rating of 7.6, and two communities have the best rating of 1. For building codes, enforcement performance is poorer in the high hurricane risk states, as column six reports. Only 26 percent of the 5,241 communities in these states are rated, with an average rating of 8.7. The two communities with ratings of 1 are in the high hurricane risk states. The difference in BCEGS ratings between the high hurricane risk states and all coastal states reflects the much higher level of code enforcement generally in northeastern states.

Overall, the mitigation performance of local governments for hurricanes cannot be described as good. Only about a quarter of communities in coastal counties and high-risk states are rated for flood plain management or building code enforcement. And as a rating of 1 represents the best practice in both systems, no communities or coun-

33. Participation in the NFIP in northeastern states is exclusively at the town and township level, and thus there is no county-level designation in these states. Consequently, only counties in states from Delaware south are reported in column 1.

34. To construct the averages, all unrated jurisdictions and jurisdictions with a rating of 10 are assigned 0 points, and then 1 point for a rating of 9, 2 points for a rating of 8, and so forth up to 9 points for a rating of 1. The average point total was then converted back into a rating on the original 1 to 10 point scales.

35. For northeastern states, all NFIP participation is based on communities; for other states, the county status applies to unincorporated territory within the county and community status applies for towns within the county. Only communities in these counties participating in the NFIP are considered here, since this should include all communities subject to hurricane storm surge or tidal flooding.

ties exemplify best practices for floods, and only 0.02 percent of communities in all Atlantic and Gulf Coast states represent the best practices for building codes. Reliance on the public sector for hurricane mitigation is very imperfect.

4 Toward More Market-Based Mitigation

The public sector's poor performance on enforcement of building codes and flood zone regulations shows that the same factors that might lead homeowners to make poor mitigation decisions operate in the political sector as well. Furthermore, the public sector's performance is unlikely to improve substantially as political incentives favor relief over mitigation; the marginal political benefit of providing assistance to disaster victims is high, while a disaster that does not occur does not readily generate photo ops.[36] Insurance regulation may also inhibit mitigation.

What are the prospects for more reliance on a market for mitigation? A market-based approach to mitigation would be desirable as localized information affects the value of mitigation and the costs of mitigation are subjective. Decentralized decision-making provides the best system for exploiting local information and differences in benefits and costs. But the prospects depend on the prevalence of low-probability event bias. This section considers evidence of market responses to hurricanes and natural hazards, which demonstrates that, at least in some instances, people do perceive and respond to hazards. Reputation and private certification of construction is a potential alternative to government building codes, and this section considers some examples of mitigation for natural hazards. Finally, it considers some additional incentives insurance companies might use to encourage mitigation.

4.A: Mitigation, Hazard Risk, and Property Values

As this paper has pointed out, a number of factors explain why households might be reluctant to invest in mitigation. Consequently, we cannot infer from a low level of mitigation whether people misperceive hazard risk or if poor policies (including the potential for generous disaster relief) reduce the incentive to mitigate. Evidence on whether market participants respond to hurricane or natural hazards risks is critical to evaluating the potential to rely on a market for mitigation.

A first question involves whether people ever perceive and respond to the risk of hurricanes or other natural hazards. One place to look for a market response to natural hazards is the real estate market, because everything else being equal, if people do recognize hazard vulnerability as a bad thing, homes more exposed to hazard risk should sell for less. On the other hand, if people ignore hazard risk, as low-probability event bias suggests, hazard risk should be unrelated to real estate values.
A number of studies have indeed found that properties most at risk to hazards sell for less:

- Homes in storm-surge vulnerable portions of Miami-Dade and Lee Counties in Florida increased in price at a slower rate than homes further inland following Hurricane Andrew.[37]
- Homes in seismic zones as designated by the state of California sold at a discount, and the size of the discount declined after the 1989 Loma Prieta earthquake, when damages were less than had been predicted for a quake of this magnitude.[38]
- Homes located in flood plains in three different Louisiana cities sold at approximately a six percent discount relative to homes out of the flood plain.[39]
- Tornado risk negatively affects the proportion of manufactured housing in a community.[40]

36. Noll, "The Complex Politics of Catastrophe Economics."
37. Jared C. Carbone, Daniel G. Hallstrom, and V. K. Smith, "Can Natural Experiments Measure Behavioral Responses to Environmental Risks?" *Environmental and Resource Economics* 33, no. 3 (2006): 273–292; Daniel G. Hallstrom and V. Kerry Smith, "Market Responses to Hurricanes," *Journal of Environmental Economics and Management* 50, no. 3 (2005): 541–561.
38. J. D. Shilling, John D. Benjamin, and C. F. Sirmans, "Adjusting Comparable Sales for Floodplain Location," *Appraisal Journal* 53 (1985): 429–436; Don N. MacDonald, James C. Murdock, and Harry L. White, "Uncertain Hazards, Insurance, and Consumer Choice: Evidence from Housing Markets," *Land Economics* 63 (1987): 361–371; Janet Furman Speyrer and Wade R. Ragas, "Housing Prices and Flood Risk: An Examination Using Spline Regression," *Journal of Real Estate Finance and Economics* 4 (1991): 395–407.
39. David S. Brookshire and others, "A Test of the Expected Utility Model: Evidence from Earthquake Risks," *Journal of Political Economy* 93 (1985): 369–389; Kurt J. Beron and others, "An Analysis of the Housing Market Before and After the 1989 Loma Prieta Earthquake," *Land Economics* 73 (1997): 101–113.
40. Daniel Sutter and Marc Poitras, "Do People Perceive and Respond to Low Probability Natural Hazard Risks? Manufactured Homes and Tornado Risk" (working paper, University of Texas-Pan American, 2008).

A growing body of evidence specifically demonstrates the existence of market premiums for mitigation. Real estate prices indicate that people perceive low-probability natural hazards and thus a value for mitigation. The prospect of a higher sales price alleviates the potential time horizon problem since residents who invest in long-lasting mitigation can cash out the remaining value when they sell their properties. The evidence most directly relevant for hurricane mitigation comes from a test for a market price premium on homes with hurricane shutters in a Texas Gulf Coast city.[41] The research found that homes with shutters in high wind-risk areas sold for 5 percent more than other homes, which would cover the cost of shutters for the median-priced home. The same is true for tornado shelters and safe rooms. In Oklahoma City, homes with a shelter sold for 3 to 4 percent more, which, again, would be sufficient to cover the cost of adding an underground shelter to a median-priced home.[42] Contingent valuation studies have also found a willingness to pay for tornado shelters in single-family homes of approximately $2,500, consistent with observed house premiums.[43] Indeed, two researchers working on this issue found that residents' willingness to pay for a shelter increased by $600, or 25 percent of shelter value, if the shelter had been certified by the National Storm Shelter Association, indicating that in addition to perceiving value in mitigation, residents value quality assurance.[44]

More than half (59 percent) of manufactured home parks in Oklahoma offered community shelters in 2005; lots in these parks rented at a 5 percent premium. The premium would approximately cover the cost per resident of a community shelter. The finding for manufactured homes is particularly significant because researchers contend that market failure is worse for mitigation in rental housing markets. For example, Kathleen Tierney, Director of the Natural Hazards Research Center at the University of Colorado, states, "In contrast with homeowners, renters are dependent on their landlords to carry out activities that can reduce disaster vulnerability, such as making routine repairs and improvements, complying with building and safety codes, and carrying out specific disaster loss reduction measures. Since undertaking such actions costs money, landlords will generally not do so voluntarily."[45] This Comment focuses on mitigation by homeowners, but rental properties comprise a significant proportion of property at risk for hurricanes and protection of this property is also important.

4.B: Market Forces and Construction Quality

Market forces provide an alternative to government building codes to ensure the quality of construction. Ultimately, quality assurance relies on some individual or organization giving consumers (and insurers) their word that a home is built to certain standards. The essence of market-based quality assurance is to attach a monetary incentive to quality, or a monetary penalty to evidence of deterioration in quality. Government lacks a similar financial stake in quality assurance, which is why the quality of so many government-supplied goods and services is low. Florida State University economist Randall Holcombe sums up the institutional comparison as follows:

> The government will never lose profits from being a poor regulator; in fact, the opposite is likely to be true. If information that the government is doing a poor job of regulating an industry begins to circulate, typically there is a call for the government to do more regulation, which probably means bigger budgets for the regulatory agency. . . .Lapses in regulation can actually benefit a government regulatory agency because of the knee-jerk reaction to ask the government to do more to take care of us when a government failure becomes apparent. In contrast, if a private sector regulatory agency had the same lapse, its reputation would be damaged, its profits would decline, and it might be forced out of business.[46]

41. Kevin M. Simmons, Jamie Brown Kruse, and Douglas A. Smith, "Valuing Mitigation: Real Estate Market Response to Hurricane Loss Reduction Measures," *Southern Economic Journal* 68, no. 3 (2002): 660–671.
42. Kevin M. Simmons and Daniel Sutter, "Tornado Shelters and the Housing Market," *Construction Management and Economics* 25, no. 11 (2007): 1119–1126.
43. Bradley T. Ewing and Jamie B. Kruse, "Valuing Self Protection: Income and Certification Effects for Safe Rooms," *Construction Management and Economics* 24, no. 10 (2006): 1057–1068; Ozlem Ozdemir, "Risk Perception and the Value of Safe Rooms as a Protective Measure from Tornadoes: A Survey Method," in *Economics and Wind*, ed. Bradley T. Ewing and Jamie B. Kruse (Hauppauge, NY: Nova Science Publishing, 2006), 89–104.
44. Ewing and Kruse, "Valuing Self Protection."
45. Kathleen Tierney, "Social Inequality, Hazards and Disasters," in *On Risk and Disaster: Lessons from Hurricane Katrina*, ed. Ronald J. Daniels, Donald F. Kettl, and Howard Kunreuther (Philadelphia: University of Pennsylvania Press, 2006), 113.
46. Randall G. Holcombe, *Public Policy and the Quality of Life* (Westport, CT: Greenwood Press, 1995), 103.

Reputation is never a perfect solution to quality assurance problems, particularly for housing. Consumers buy new houses infrequently, the potential return from low-quality construction can be high, and hurricanes (and other hazards) are infrequent, so wind-load construction deficiencies may not be recognized for years. But there are an increasing number of regional or national home builders who seek to maintain a reputation for quality. Some builders have successfully designed for natural hazards. Habitat for Humanity—the nation's 16th largest home builder in 2006—is a prime example. All twenty-seven homes built by Habitat in Dade County at the time of Hurricane Andrew were habitable after the storm. Munne Estates, a seventy-one-home subdivision in southern Dade County built from 1989 to 1990, also survived Andrew. The builder in this case used home designs, materials, and construction techniques that differed from most builders' standards in the county at the time.[47] One Oklahoma home builder, Home Creations, determined to build more wind-resistant homes in the aftermath of the deadly May 3, 1999, tornado outbreak. After consulting with engineers at the University of Oklahoma, Home Creations began building all of its homes with anchor bolts, tornado straps, and oriented strand board. Its wind-resistant construction proved popular with home buyers. The company later included free tornado shelters with some of its new homes to further signal its concern for hazard-resistant construction. Home Creations has been one of the fastest-growing builders in Oklahoma since 1999, and attributes half of its annual growth to its wind-resistant designs.[48]

In addition to home builders establishing a reputation for quality, market-based organizations can also certify the quality of construction and mitigation against hurricanes. Private certification could serve an alternative to government building codes, or as a way to certify construction beyond code requirements. One such certification program is the *Fortified...for safer living*® program of the Institute for Business & Home Safety (IBHS). The program includes design standards for construction and mitigation to reduce losses from a variety of natural hazards, including hurricanes.[49] For hurricanes, the program requires construction to wind loads 20 mph in excess of those typically incorporated into building codes. A home buyer or builder looking to build a *Fortified* home submits the design to IBHS, which assigns an approved inspector to ensure that the builder builds to the standards and conducts at least four inspections during construction. Upon completion, IBHS awards a certificate to the homeowner if the home is accepted into the program; builders are allowed to advertise that they build homes to the *Fortified* program requirements. The *Fortified* homes program is relatively new, and thus its value in the market is still being established. To date, more than twenty builders, including Habitat for Humanity, have built around one hundred homes to *Fortified* standards in fourteen states, including all of the coastal states from Texas to North Carolina. Premium discounts of up to 25 percent from the Mississippi Windstorm Underwriting Association, 10 percent from the South Carolina Wind and Hail Underwriting Association, and 25 percent from American National Property and Casualty in Louisiana are available for *Fortified* homes.[50]

4.C: Insurance Regulation and Mitigation Incentives

Market responses to hazard risk and market-based mitigation refute many of the claims from the decision-making biases argument. Clearly, homeowners perceive and respond to risk at least some of the time. But some homeowners may sometimes suffer from the decision-making maladies described in section two. Homeowners' disinterest in mitigation creates a potential profit opportunity for someone, perhaps insurance companies or the manufacturers of mitigation measures, to alert homeowners to the value of mitigation. This may seem a difficult undertaking, but convincing others of the value of an offer is part and parcel of the task of entrepreneurship. Economist Israel Kirzner writes that

> the function of the producer-entrepreneur is not merely to present the consumer with a particular buying opportunity, but to present it to him so he cannot fail to "notice" its availability. . . . The product itself simply *does not exist* for the consumer

47. Dennis Mileti, *Disasters by Design* (Washington, DC: Joseph Henry Press, 1999), 130.
48. William L. Ridley, Kevin M. Simmons, and Daniel Sutter, "The Market for Tornado Protection: Market and Policy Responses Following the May 1999 Oklahoma Tornadoes," in *Economics and Wind*, ed. Bradley T. Ewing and Jamie B. Kruse (Hauppauge, NY: Nova Science Publishing, 2006), 105-113.
49. Institute for Business and Home Safety, *Fortified...for Safer Living® Builder's Guide*, Version 2.2, December 10, 2007, http://www.disastersafety.org/resource/resmgr/PDFs/builders_guide.pdf.
50. Peter Hamer (Institute for Business and Home Safety), personal communication with the author, February 29, 2008.

> until its existence and usefulness have been brought to his attention. It follows that the entrepreneur's task is not completed when he makes information available to the consumer. He must also get the consumer to notice and absorb that information. It is therefore not surprising at all to discover that information that might be provided in a modest two-line newspaper announcement (that might be read by millions) is instead emblazoned in color on giant billboards, embellished by all kinds of vivid, but superficially irrelevant illustrations.[51]

Most potential consumers of new products in the market economy are skeptical initially. This is particularly understandable when it comes to hurricane mitigation, given that homeowners are constantly warned of myriad threats, from termites and buried pipelines to home invasions, rising sea levels, and terrorist attacks. The job of insurers is to make homeowners aware of the existence and usefulness of mitigation in clever and innovative ways. It is difficult to say beforehand what types of contractual devices or incentives might succeed in convincing homeowners of the value of mitigation. The market is a discovery process, meaning that it provides a means for generating knowledge that does not currently exist.[52] As a consequence, it is highly problematic for regulators to restrict contracts and incentives that insurance companies might find succeed in encouraging mitigation. As discussed above, premium discounts are one mechanism to alert homeowners. But if discounts proved insufficient, insurers might need to be more creative in devising contract provisions to overcome inertia, myopia, and low-probability event bias.

To offset myopia, Kunreuther has suggested allowing homeowners to fund mitigation using long-term loans.[53] One possibility would be to add the cost of mitigation to the purchase price of a home so it can be included in the mortgage. If financed over an extended period of time, homeowners could compare the annualized cost of mitigation with the reduction in annual insurance premiums. For example, instead of comparing a $2,500 upfront cost with $300-lower annual homeowners insurance premiums, residents would compare a $15 increase in monthly mortgage payment with a $300 reduction in annual premium. If the decision is framed in this fashion, homeowners might decide that mitigation is a worthwhile investment.

Interest in mitigation is often great in the immediate aftermath of a hurricane. In addition to the dollar loss, damage often involves additional inconveniences for households, such as the difficulty of finding a contractor and the hassle and cost of making alternative living arrangements. Homeowners at this time might keenly appreciate the potential value of mitigation and want to strengthen their homes during rebuilding to avoid a repeat of their losses in the future. However, because of the expenses involved with a hurricane, including evacuation, a deductible, and uninsured losses (e.g., replacing spoiled food or dining out during a power outage), households may be short on discretionary funds and unable to take on additional costs to upgrade. Moreover, insurance policies typically only pay to repair a home to its pre-loss status. Insurance companies, however, may wish to experiment with contractual arrangements to help cover some of the cost of mitigation. This might mean allowing policyholders to apply some or all of their deductibles toward mitigation. For example, suppose that a home has a $5,000 deductible and has suffered $20,000 in damage. Repairs made with superior materials would reduce losses in a future hurricane, but may cost an additional $3,000. In this case, an insurer might wish to let the household apply the deductible (or part of it) to cover the extra costs, and then the rest of the deductible to the original damage.

The job of insurers is to make homeowners aware of the existence and usefulness of mitigation in clever and innovative ways.

Insurers might also be willing to incur part of the cost of mitigation in exchange for a multi-year contract with

51. Israel Kirzner, *Competition and Entrepreneurship* (Chicago: University of Chicago Press, 1973), 162–3.
52. Friedrich A. Hayek, "Competition as a Discovery Procedure," in *New Studies in Philosophy, Politics, Economics and the History of Ideas*, ed. Friedrich A. Hayek (Chicago: University of Chicago Press, 1978).
53. Howard Kunreuther, "Mitigating Disaster Losses."

a homeowner. Homeowners already enter into multi-year agreements for cell phones, car leases and loans, and mortgages, so they might also be willing to make a multi-year commitment on insurance.[54] In this case, the homeowner would forego part of a premium discount after mitigating the property in exchange for help with the upfront cost. Such an arrangement could represent a profit opportunity for the insurance company, particularly when mitigation could pay for itself (in expected value terms) in just a few years. Insurers may wish to cooperate on mitigation demonstration projects, such as a new community where all the homes are built to high standards. A demonstration neighborhood could be significant in showing the full benefits of building stronger homes and taking advantage of neighborhood effects resulting from a lack of wind-blown debris damage. Demonstration projects can serve as a form of advertising to make homeowners aware of building options, and could ultimately benefit all insurers in the market. Regulators should be receptive to cooperative efforts among insurance companies to increase general interest and awareness in mitigation among homeowners.

The success of insurance companies in marketing mitigation can affect an insurer's willingness to write insurance in high-risk coastal areas. A poorly built home or business might be too ambiguous of a risk for insurers to underwrite. An insurer might only want to underwrite manageable risks, such as buildings protected by shutters or secondary water resistance. If regulators prevent the insurer from selecting types of risks they feel comfortable underwriting, the insurer may choose to exit the market altogether. State-run residual markets for wind coverage (known as hurricane or wind pools) have expanded enormously in the last several years, and policy makers in coastal states have voiced concern over the availability of insurance. Restrictions on mitigation incentives in insurance contracts might contribute to a supply shortage in the property and casualty market and thus increase reliance on state residual market mechanisms.

5 Policy Recommendations

Mitigation is not a panacea; hurricanes are powerful storms and it would be folly to think it possible to build structures that are immune to all damage. But mitigation plays an important role in keeping hurricane costs to a reasonable level and allowing people to capture the benefits of living and working near the ocean. Challenges certainly exist in the marketing of mitigation, but overall, current insurance regulation is probably reducing homeowners' incentives for mitigation. Also, local governments' performance on hurricane mitigation, reflected in National Flood Insurance Program, Community Rating System, and Building Code Effectiveness Grading Schedule scores, has been poor. Policy makers can take several steps to encourage a more market-based system of hurricane mitigation.

1. Regulators should allow insurers broad freedom to craft contractual incentives for mitigation. Low-probability event bias, myopia, and status-quo bias will make it difficult, but not impossible, for insurance companies to alert homeowners to valuable mitigation opportunities. Regulators cannot know ahead of time what incentives might succeed in prompting consumers to action, and the cost to the industry of extra, unnecessary losses in a major hurricane will outweigh any conceivable anti-competitive advantage one company might attempt to gain.

2. Lawmakers and regulators should resist mandating politically determined discounts for mitigation. Insurance companies have greater expertise available to estimate appropriate reductions for mitigation, and politically determined rates could easily become insurance subsidies in disguise. Competition will lead to reduced premiums for well-constructed homes.

3. Shift to a market-based system for quality assurance in place of government-enforced building codes. Government enforcement is not terribly effective, as only two communities in coastal states have the highest rating in the Building Code Effectiveness Grading Schedule. Also, government building codes can lull the public and insurers into a false sense of security that is shattered when poor code enforcement results in higher-than-expected losses from a major hurricane. FEMA and the states can encourage this transition by developing and publicizing assessments of the performance of various builders' homes after hurricanes and other natural disasters. Insurance commissions should follow the leads of Mississippi and South Carolina and approve premium discounts for homes built to the Institute for

54. Another possibility is the bundling of insurance, the structure, and mitigation by the builder. If homeowners simply cannot be alerted to efficient mitigation opportunities, a builder could include mitigation and insurance purchase. This approach could easily be applied to condominiums and shopping centers but could also be extended to homes in a planned development.

Business and Home Safety's *Fortified...for safer living*® program and for other market-based, quality-assurance programs that might develop.

4. Below-market insurance premiums offered by state regulators and state wind pools reduce the incentives for mitigation. Improving incentives for mitigation will require high-risk coastal properties to pay actuarially fair insurance premiums. Mitigation is less costly to design into the construction of new buildings than to retrofit the existing building stock. Consequently, policy makers should focus on ensuring that new construction in high-risk areas pays market insurance rates, with the long-term goal of eliminating insurance subsidies entirely.

6 Conclusion

Although hurricanes cannot be prevented, the built environment can be strengthened to reduce hurricane damage. Mitigation helps resolve the false dilemma of either abandoning coastal areas to avoid the devastation of hurricanes or exposing taxpayers to potentially staggering burdens in the future. Not all building designs will prove efficient, and a particular mitigation measure might be efficient given the probability of a hurricane in Louisiana or Florida, but not in Rhode Island. The cost to society of inefficiency in mitigation looms large, particularly given the potential for catastrophic hurricane losses. Meanwhile, efficient mitigation faces a number of challenges, including low-probability event bias, myopia, and status-quo bias, but evidence suggests that these factors can be at least partially overcome and that markets do value mitigation. Conversely, the public sector has done a relatively poor job with hurricane mitigation, as illustrated by flood plain management and building code enforcement.

The difficulty in alerting policyholders to beneficial mitigation opportunities suggests the value of affording insurers considerable discretion to craft contractual arrangements to induce policyholders to undertake mitigation. Restrictions on the contractual mechanisms insurers can employ, as highlighted by Connecticut's prohibition on making mitigation mandatory for policy renewal, can be quite counterproductive. It is not possible to know what mechanisms might prove successful in overcoming inertia and bias, and regulation might end up prohibiting the use of incentives that work. Insurance markets are quite competitive in spite of state regulation, so eliminating premium subsidies for high-risk properties and allowing insurance companies to encourage homeowners and home builders to invest in mitigation provides a robust, long-term strategy for reducing hurricane losses.

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MERCATUS CENTER
GEORGE MASON UNIVERSITY

3301 North Fairfax Drive, Suite 450
Arlington, Virginia 22201
Tel: (703) 993-4930
Fax: (703) 993-4935