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# All-Hazards Homeowners Insurance

*Challenges and Opportunities*

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Howard Kunreuther



# **All-Hazards Homeowners Insurance: Challenges and Opportunities**

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## **Abstract**

In the United States, standard homeowners insurance policies cover damages resulting from fire, wind, and hail, but exclude damages caused by floods and earthquakes. This is not the practice worldwide: several countries include all perils in homeowners insurance. Building on two fundamental insurance principles—that premiums reflect risk and that support for low-income households come from public funding, not insurance premium subsidies—this paper proposes a strategy for developing an all-hazards homeowners insurance policy in the US that should be attractive to both private insurers and property owners. It outlines critical supporting roles for the public sector and proposes modifications to the National Flood Insurance Program that could provide a foundation for all-hazards insurance.

**Key Words:** homeowners insurance, disaster, premiums

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# All-Hazards Homeowners Insurance: Challenges and Opportunities\*

Howard Kunreuther<sup>1</sup>

## 1. Introduction

This paper proposes a strategy for developing an all-hazards homeowners policy in the United States that should be attractive to both private insurers and property owners. A number of countries have insurance policies that cover all hazards, notably Belgium, Bermuda, France, New Zealand, Spain and the United Kingdom. Coverage is often required by the federal government, but in most of these countries, premiums are not risk-based and there are no incentives provided to encourage individuals to adopt mitigation measures—two features of an all-hazards homeowners policy that must be considered if we are going to reduce future losses.<sup>2</sup>

The paper first considers the role the private insurance market can play in providing all-hazards homeowners insurance by investigating how homeowners view such a policy (the demand side) and whether insurers and reinsurers would seriously consider offering such coverage (the supply side). The paper concludes by highlighting the role that the National Flood Insurance Program, which is up for reauthorization in September 2017, can play in developing an all-hazards homeowners insurance policy.

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\* Portions of this paper are taken from Kunreuther (2015).

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<sup>2</sup> For more details on all-hazards insurance in other countries see McAneney et al. (2015).

## 2. Demand for All-Hazards Coverage

If one asks residents in hazard-prone areas if they would like their homeowners insurance policy to cover all natural hazards, one is likely to get two responses:

- I would like to be covered for all the potential disasters that could cause damage to my property.
- I don't want to pay a high premium that reflects damage from hazards faced by homeowners in other parts of the country.

To highlight these points consider the following illustrative example:

The Lowland family has lived in their home in Baton Rouge for 20 years and was not aware of the possibility of flood losses. Their house was not in a Special Flood Hazard Area since the likelihood of suffering flood-related damage was estimated to be less than 1 in 100. Hence they were not required to purchase flood coverage and their insurance agent never recommended that they buy a policy offered by the National Flood Insurance Program. The family was shocked and surprised when the torrential rainstorm of August 14, 2016 caused two feet of flooding in their house and they learned that their homeowners policy did not include water-related damage from hurricanes, flood or storms. When asked whether they would purchase an all-hazards homeowners policy, their response was "Yes" unless we were charged high premiums to cover damage from earthquakes to California residents.

The Lowland family is typical of many households in hazard prone areas who have not undertaken measures to protect themselves against natural hazards and are thus caught off guard when they suffer damage from hurricanes, earthquake, floods or tornados. There are lessons to be learned about their decision making process from the large body of cognitive psychology and behavioral economics research over the past 30 years. Field studies and controlled experiments have revealed that individuals often make decisions under conditions of risk and uncertainty by combining intuitive thinking with deliberative thinking.

In his thought-provoking book, *Thinking, Fast and Slow*,<sup>3</sup> Nobel Laureate Daniel Kahneman has characterized the differences between these two modes of processing information. Intuitive thinking (System 1) operates automatically and quickly with little or no effort and no voluntary control. It is often guided by emotional reactions and simple rules of thumb that have

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<sup>3</sup> Kahneman (2011).

been acquired by personal experience. Deliberative thinking (System 2) allocates attention to effortful and intentional mental activities where individuals undertake trade-offs, recognize relevant interdependencies and the need for coordination.

Choices are normally made by combining these two modes of thinking and generally result in good decisions when individuals have considerable past experience as a basis for their actions. With respect to low-probability high-consequence (LP-HC) events such as natural disasters, however, there is a tendency to either ignore a potential disaster or overreact to a recent one, so that decisions may not accurately reflect expert risk assessments.

Empirical studies have revealed that many individuals engage in intuitive thinking and focus on short-run goals when dealing with unfamiliar risks.<sup>4</sup> More specifically, individuals often exhibit systematic biases such as the availability heuristic, where the judged likelihood of an event depends on its salience and memorability.<sup>5</sup> There is thus a tendency to ignore rare risks until after a catastrophic event occurs. This is a principal reason why it is common for individuals to purchase insurance only after a large-scale disaster and then cancel their policy several years later if they have not made a claim during this period.

One reason that individuals do not buy insurance is that they perceive the probability of a loss to be below their threshold level of concern so that the benefits of insurance exceed the associated premium and search costs.<sup>6</sup> By bundling hazards in a single policy, property owners are likely to perceive the risk to be sufficiently high that they will want to purchase coverage prior to experiencing a disaster. Data from two controlled experiments provides confirming evidence supporting this conjecture.<sup>7</sup>

There is also a tendency to view insurance as an investment rather than a protective activity. Individuals feel they have wasted their money on premiums if they don't have an insured loss in the next few years and may decide not to renew their insurance. An all-hazards policy increases the likelihood of insured individuals making a claim in the next few years so that they feel their investment paid off and decide not to cancel their policy.

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<sup>4</sup> Cutler and Zeckhauser (2004); Krantz and Kunreuther (2007); Kunreuther, Pauly and McMorro (2013).

<sup>5</sup> Tversky and Kahneman (1973).

<sup>6</sup> Kunreuther and Pauly (2004).

<sup>7</sup> Slovic et al (1977); Schade, Kunreuther and Koellinger, P.(2012)

A deliberative model of choice, such as expected utility theory, implies that risk averse consumers normally value insurance as it protects them against losses at a low premium relative to their potential damage. Individuals should celebrate not having suffered a loss over a period of time rather than canceling their policy. A challenge facing insurers is how to convince their policyholders that the best return on an insurance policy is no return at all.

### 3. Supply of All-Hazards Coverage

There are good reasons why insurers should want to consider all-hazards insurance as illustrated by the following example:

The Pathbreaking Insurance Company is considering offering an all-hazards homeowners policy that includes damage from flood and earthquake along with the standard insurance that covers fire, wind, and hail. They are several reasons why they feel this would be an attractive policy for them as well as their potential clients. Following Hurricane Katrina in 2005 they spent a large amount of time and money fighting lawsuits which claimed that the damage to homes insured by their company was caused by wind from the hurricane, while they were certain they could demonstrate that the losses were due to inundation. An all-hazards policy would avoid this problem. Similarly the company feels that damage to a home from fire following an earthquake should be reimbursed only if the property owner had earthquake coverage as in Japan. In the United States, fire from any cause is covered in the standard homeowners policy. Pathbreaking also feels that an all-hazards policy would be attractive to homeowners like the Lowland family if they could demonstrate that they were charged a premium that reflects only the risks faced by the household.

There is an additional reason why private insurers should have an interest in promoting an all-hazards policy that incorporates losses from earthquakes, flood, hurricanes and windstorms. Their risk is diversified across hazards and thus reduces the variance of losses via the law of large numbers. In other words, the insurer will have a more certain estimate of the expected claims payments with an all-hazards policy than if than if flood and earthquake were offered and priced as separate policies.<sup>8</sup> Should an all-hazards policy increase the total demand for coverage from marketing policies against individual hazards then this will reduce the

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<sup>8</sup> For an illustrative example of how the law large numbers works with respect to insurance see Kunreuther, Pauly and McMorrow (2013), Chap. 1 pp. 20-23.

variance of losses even further. The marketing and administrative cost of a single policy will also be lower if homeowners were offered a single all-hazards policy.

There are two principal concerns that insurers like Pathbreaking Insurance will have when they consider offering this policy: state regulation and concern with catastrophic losses.

### ***State Regulation***

Insurance is regulated by the states; insurance commissioners can specify premiums that insurers may charge and are concerned with the solvency of insurers. If insurers proposed offering an all-hazards insurance policy, the rates and the forms would have to be filed, reviewed and, in many states, formally approved by the state insurance commissioners before used.

State insurance regulators sometimes have restricted insurers from setting premiums that reflect risk, in part to address equity and fairness issues. To illustrate, following Hurricane Andrew in August 1992, Florida regulators imposed a moratorium on the cancellation and nonrenewal of homeowners insurance policies during the upcoming hurricane season for insurers that wanted to continue to do any business in Florida. In November of 1993, the state legislature enacted a bill that these insurers could not cancel more than 10 percent of their homeowners policies in any county in Florida in one year and not cancel more than 5 percent of their property owners' policies statewide for each of the next three years. During the 1996 legislative session, this phase-out provision was extended until June 1, 1999.<sup>9</sup>

Early in 2007, Florida enacted legislation that sought to increase regulatory control over rates and roll them back based on new legislation that expanded the reinsurance coverage provided by the Florida Hurricane Catastrophe Fund (FHCF) that was established in 1993 following Hurricane Andrew to reimburse all insurers for a portion of their losses from catastrophic hurricanes. Insurers were required to reduce their rates to reflect this expansion of coverage, which was priced below private reinsurance market rates. After the severe hurricanes of 2004 and 2005 in Florida, the state-funded company, Citizens Property Insurance Corporation that had been the insurer of last resort, offered premiums in high-risk areas at subsidized rates, thus undercutting the private market.<sup>10</sup> Today, Citizens is the largest provider of residential wind coverage in Florida.

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<sup>9</sup> Lecomte and Gahagan (1998).

<sup>10</sup> Kunreuther and Michel-Kerjan (2011).



### ***Concern with Catastrophic Losses***

Even if the variance from an all-hazards policy is decreased relative to separate policies, there may be a greater chance of suffering a catastrophic loss by combining the risks from several hazards when the losses from a particular hazard are highly correlated. Specifically, if wind and water damage coverage were included in the policy, the insurers' claim payments is likely to be larger following a hurricane than if only wind damage was covered.

To illustrate this point, suppose there is a 1-in-50 chance of suffering wind damage from a hurricane, and 1-in-100 chance of suffering water damage from a hurricane, and some chance of suffering both wind and water damage from the hurricane. With two separate policies for wind and water, the variance of claims from each policy would be larger than with a joint policy; however, there would be a smaller chance of a very large claim than if only wind were covered in the homeowners policy.

### **Flood Insurance<sup>11</sup>**

The history of flood insurance highlights the concern that insurers had with respect to suffering catastrophic losses. Following the severe flooding in 1927 and 1928 one of the insurance magazines summed up the situation graphically:

Losses piled up to a staggering total which was aggravated by the fact that this insurance was largely commonly treated in localities most exposed to the flood hazard...By the end of 1928 every responsible company had discontinued this coverage.<sup>12</sup>

Continuing through the 1960s there was a widespread belief among private insurance companies that the flood peril was uninsurable by the private sector for several reasons: adverse selection would be a problem because only particular areas are subject to the risk, risk-based premiums would be so high that no one would be willing to pay them, and flood losses could be so catastrophic as to cause insolvencies or have a significant impact on surplus.<sup>13</sup> This lack of coverage by the private sector triggered significant federal disaster relief to victims of Hurricane Betsy in 1965 and led to the creation of the National Flood Insurance Program (NFIP) in 1968.

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<sup>11</sup> For more details on the history of flood insurance and recent developments see Michel-Kerjan (2010), and Knowles and Kunreuther (2014).

<sup>12</sup> Manes (1938).

<sup>13</sup> Overman (1957); Gerdes (1963); Anderson (1974).

## Earthquake Insurance<sup>14</sup>

Until the San Fernando earthquake of 1971, few homeowners and businesses in California had purchased earthquake insurance even though coverage had been available since 1916. In 1985, the California legislature passed a law requiring insurers writing homeowners policies on one- to-four family units to offer earthquake insurance to these residents. The owners did not have to buy this coverage; the insurers only had to offer it to them. At the time and still today, banks and financial institutions do not require earthquake insurance as a condition for a mortgage.

The Northridge earthquake of January 1994 caused insured losses of \$20.6 billion primarily to commercial structures. In the three years following Northridge, demand for earthquake insurance by homeowners increased 19 percent in 1994, 20 percent in 1995 and 27 percent in 1996 leading private insurance companies in California to re-evaluate their seismic risk exposures.<sup>15</sup> Insurers concluded that they would not sell any more policies on residential property, as they were concerned about the impact of another catastrophic earthquake on their balance sheets. The California Insurance Department surveyed insurers and found that up to 90 percent of them had either stopped or had placed restrictions on the selling of new homeowners policies. This led to the formation of a state-run earthquake insurance company—the California Earthquake Authority (CEA) in 1996.

## 4. Guiding Principles for Insurance<sup>16</sup>

The following two principles are relevant for utilizing insurance as a risk-bearing tool that communicates risk accurately, encourages policyholders to invest in cost-effective loss reduction measures while at the same time recognizing issues of affordability.

### ***Principle 1. Premiums Should Reflect Risk***

Insurance premiums should be based on risk to provide individuals with accurate signals as to the degree of the hazards they face and to encourage them to engage in cost-effective mitigation measures to reduce their vulnerability. Risk-based premiums should also reflect the

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<sup>14</sup> For information on earthquake insurance in the United States, see Roth, Jr. (1998).

<sup>15</sup> California Department of Insurance (1997-1998).

<sup>16</sup> These principles are discussed in more detail in Kunreuther and Michel-Kerjan (2011), and Kunreuther, Pauly and McMorro (2013).

cost of capital that insurers need to integrate into their pricing to assure an adequate return to their investors.

Catastrophe models have been developed and improved over the past 25 years to more accurately assess the likelihood and damages resulting from disasters of different magnitudes and intensities. Today, insurers and reinsurers can utilize the estimates from these models to determine risk-based premiums and how much coverage to offer in hazard-prone areas. The earthquake risk has been incorporated in cat models from their inception and is the basis for risk-based premiums currently charged by the California Earthquake Authority. New technology, such as Lidar (Light Detection and Ranging), enables the development of more accurate flood maps and structured-based risk assessments for determining risk-based insurance premiums for properties in flood-prone areas.<sup>17</sup>

If Principle 1 is applied to risks where premiums are currently subsidized, some residents will be faced with large price increases. This concern leads to the second guiding principle.

### ***Principle 2. Dealing with Equity and Affordability Issues***

Any special treatment given to low-income individuals currently residing in hazard-prone areas should come from general public funding and **not** through insurance premium subsidies. Funding could be obtained from several different sources such as general taxpayer revenue, state government or taxing insurance policyholders depending on the response to the question “Who should pay?” It is important to note that Principle 2 applies only to those individuals who currently reside in hazard-prone areas. Those who decide to locate in these regions in the future would be charged premiums that reflect the risk.

## **5. Role of the Public Sector**

The above two principles are designed to address homeowners need to know their risks so they have economic incentives to undertake steps to reduce the likelihood of suffering severe losses from a future disaster. At the same time steps need to be taken by the public sector to enable those currently residing in hazard-prone areas requiring assistance to purchase insurance if premiums are risk-based.

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<sup>17</sup> For more details see the 2015 Annual Report to FEMA of the Technical Advisory Mapping Council (TMAC) (2015).

These principles are also central to the private insurers' willingness to consider supplying an all-hazards homeowners policy. Unless state regulators allow insurers to charge a risk-based rate, no insurer will have an interest in marketing an all-hazards insurance policy. Regulators should still specify a level of surplus or reserves for insurers to pay claims from a catastrophic loss. Insurers will then have to consider ways that they can protect themselves against unusually large losses to reduce the chance of insolvency. Here, the public sector may also have to play a role by providing protection against catastrophic losses that cannot be covered by the private sector.

### ***Dealing with Affordability Issues***

One way to maintain risk-based premiums while at the same time addressing issues of affordability is to offer means-tested vouchers that cover part of the cost of insurance. Several existing programs could serve as models for developing such a voucher system: the Food Stamp Program, the Low Income Home Energy Assistance Program (LIHEAP) and Universal Service Fund (USF).<sup>18</sup> The amount of the voucher would be based on current income and determined by a specific set of criteria as outlined in National Research Council (2015) report on the affordability of flood insurance.<sup>19</sup>

As a condition for the voucher, the property owner could be required to invest in cost-effective mitigation measures. Due to budget constraints property owners are often reluctant to invest in these measures because of their high upfront costs. To address this problem FEMA created the Flood Mitigation Assistance (FMA) program to support loss reduction measures, such as elevation or acquisition/demolition of repetitively flooded structures, or demolition and rebuilding of property that has received significant damage from a severe flood.

In July 2014, Connecticut initiated its *Shore Up CT* program designed to help residential or business property-owners elevate buildings, retrofit properties with additional flood protection, or assist with wind-proofing structures on property that is prone to coastal flooding. This state program, the first in the United States, enables homeowners to obtain a 15-year loan ranging from \$10,000 to \$300,000 at an annual interest rate of 2¾ percent.<sup>20</sup> If the property

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<sup>18</sup> For more details on these programs see Kunreuther and Michel-Kerjan (2011).

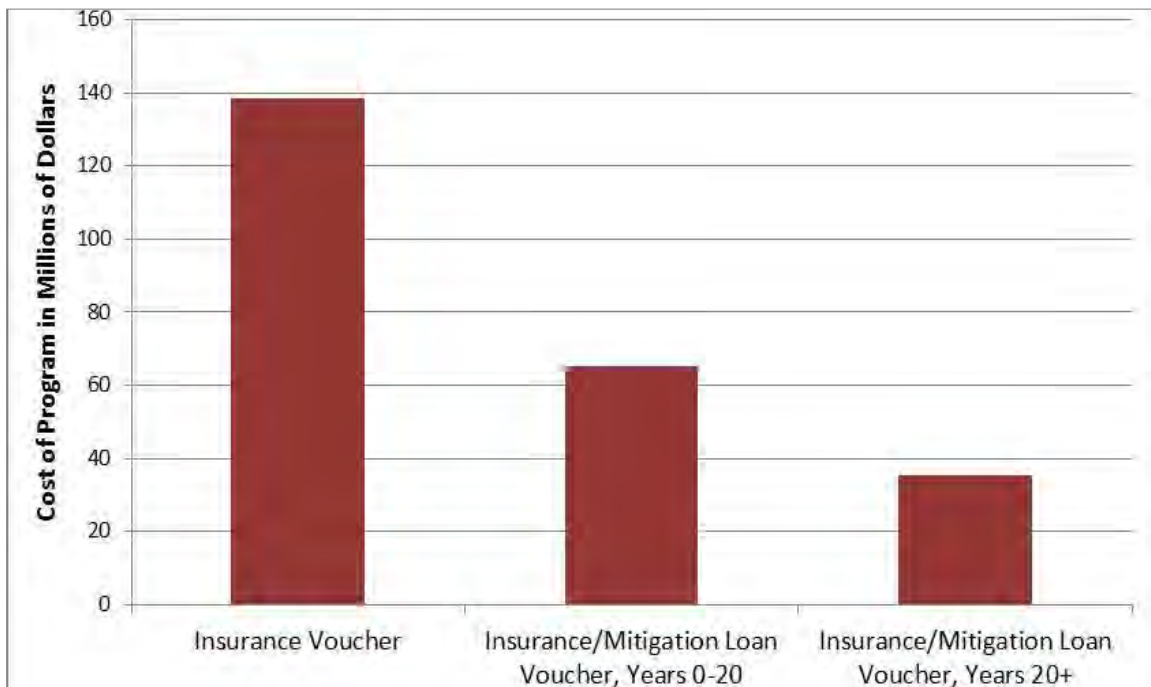
<sup>19</sup> National Research Council (2015).

<sup>20</sup> For more information, see <http://shoreupct.org/>

owners were offered such a multi-year loan from to invest in mitigation measure(s), the voucher could cover not only a portion of the resulting risk-based insurance premium, but also the annual loan cost to make the package affordable.

An empirical study reveals that the amount of the voucher is likely to be reduced significantly from what it would have been had the structure not been mitigated, as shown in Figure 1 for property in Ocean County New Jersey, an area subject to hurricane related damage.<sup>21</sup> A related study of a voucher/mitigation program applied to homes in flood-prone areas of Charleston, SC<sup>22</sup> revealed that elevating a house a few feet can decrease the homeowner's risk-based premium by 70 to 80 percent, saving thousands of dollars annually and could cut the government's voucher cost by more than 60 percent when elevation costs are low (\$25,000). Even when elevation costs are high (\$75,000), as they are likely to be in the V zone, coupling vouchers with mitigation loans still leads to cost savings for the government.

**Figure 1. Cost of Program to the Federal Government of an Insurance Voucher or Insurance/Mitigation Loan Voucher for Ocean County, New Jersey**



Source: Kousky and Kunreuther (2014)

<sup>21</sup> Kousky and Kunreuther (2014).

<sup>22</sup> Zhao, Kunreuther and Czajkowski (2015).

A related study proposed that vouchers be used as a way to deal with affordability and ease the transition to flood insurance premiums that reflected risk. Based on an integrated model coupling risk-based premiums with cost-effective would reduce flood losses by 12 percent in Germany and 24 percent in France by 2040.<sup>23</sup>

### ***Catastrophe Coverage***

As indicated above, insurers' withdrawal from certain markets due to lack of sufficient reinsurance capacity and other risk transfer instruments (for example, catastrophe bonds) led to the establishment of government-backed programs such as the California Earthquake Authority, the National Flood Insurance Program (NFIP) and the Terrorism Risk Insurance Act (TRIA).

If insurers were permitted to charge risk-based premiums they would very likely want to market coverage against earthquakes and floods as long as they were protected against catastrophic losses. State reinsurance facilities could play an important role in this regard if premiums were risk-based based using data provided by catastrophe models. The California Earthquake Authority could play a similar role by providing protection against catastrophic losses that was not available from private reinsurance and other risk transfer instruments. It could also offer low interest loans for mitigation if private insurers were to incorporate the earthquake risk in an all-hazards policy.

Lewis and Murdock<sup>24</sup> proposed that the federal government could auction a limited number of catastrophe reinsurance contracts annually to private insurers in order to provide them with more capacity to handle truly extreme events. The design of such contracts would have to be specified, and a more detailed analysis would have to be undertaken to determine the potential impact of such an auction mechanism on the relevant stakeholders.

### ***Well-Enforced Regulations and Standards***

Given the reluctance of individuals to voluntarily purchase insurance against losses, policymakers should consider requiring catastrophic coverage for all individuals who face risk. Social welfare is likely to be improved under the assumption that individuals would have wanted insurance protection had they perceived the risk correctly, not exhibited systematic biases and

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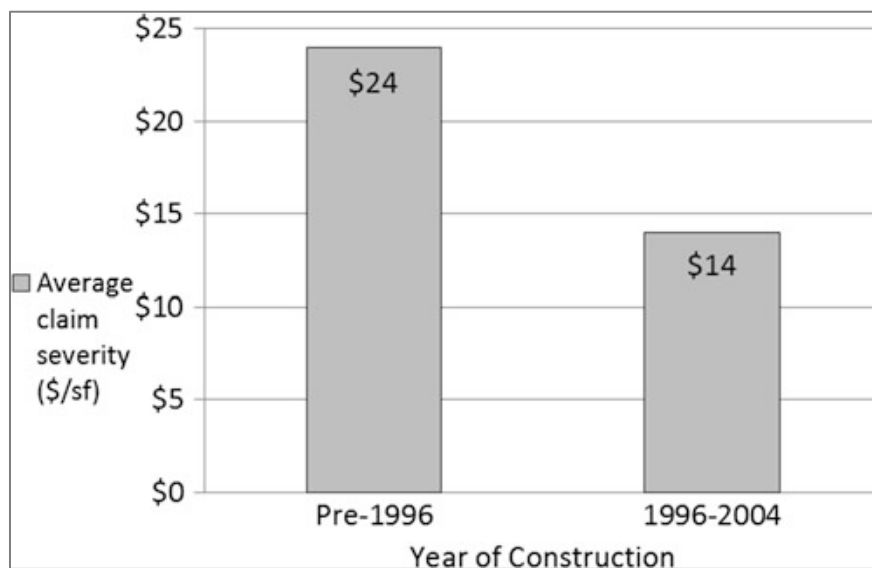
<sup>23</sup> Hudson et al. (2016)

<sup>24</sup> Lewis and Murdock (1996).

utilized simplified decision rules that characterize intuitive thinking. If the public sector were providing protection against catastrophic losses from these extreme events they could pass a regulation requiring insurance coverage for individuals at risk.

Risk-based insurance premiums could be coupled with building codes so that those residing in hazard-prone areas adopt cost-effective loss-reduction measures. Following Hurricane Andrew in 1992, Florida reevaluated its building code standards, and coastal areas of the state began to enforce high-wind design provisions for residential housing. As depicted in Figure 2, homes that met the wind-resistant standards enforced in 1996 had a claim frequency that was 60 percent *less* than homes that were built prior to that year. The average reduction in claims from Hurricane Charley (2004) to *each* damaged home in Charlotte County built according to the newer code was approximately \$20,000.<sup>25</sup>

**Figure 2. Average Claim Severity by Building Code Category from Hurricane Charley**



Source: Institute for Business & Home Safety (IBHS)

In this regard, Chile serves an example for the United States to emulate. The country passed a law that requires the original construction company to compensate those who suffer any structural damage from earthquakes and other disasters if the building codes were not followed. Furthermore, the original owner of a building is held responsible for damage to the structure for a decade, and a court can sentence the owner to prison. Well-enforced building codes in Chile

<sup>25</sup> IBHS (2007).

account for the relatively low death toll from the powerful earthquake (8.8 on moment magnitude scale) that rocked the country on February 27, 2010.<sup>26</sup>

Homeowners who adopt cost-effective mitigation measures could receive a seal of approval from a certified inspector that the structure meets or exceeds building code standards. A seal of approval could increase the property value of the home by informing potential buyers that damage from future disasters is likely to be reduced because the mitigation measure is in place. Evidence from a July 1994 telephone survey of 1,241 residents in six hurricane-prone areas on the Atlantic and Gulf Coasts provides supporting evidence for some type of seal of approval. Over 90 percent of the respondents felt that local home builders should be required to adhere to building codes, and 85 percent considered it very important that local building departments conduct inspections of new residential construction.<sup>27</sup>

### ***Multi-Year Insurance***

As a complement to property improvement loans, insurers could consider designing multi-year insurance (MYI) contracts of three to five years with a back-up from the public sector on catastrophic losses. The insurance policy would be tied to the structure rather than the property owner, and carry an annual premium reflecting risk that would remain stable over the length of the contract. Property owners who cancel their insurance policy early would incur a penalty cost in the same way that those who refinance a mortgage have to pay a cancellation cost to the bank issuing the mortgage. With an MYI contract, insurers would have an incentive to inspect the property over time to make sure that building codes are enforced, something they would be less likely to do with annual contracts.

Several factors have contributed to the non-marketability of MYI for protecting homeowners properties against losses from fire, theft and large-scale natural disasters. Without the freedom to charge risk-based premiums in hazard-prone areas, no insurance company would even entertain the possibility of marketing a homeowner's policy that was longer than one year. Insurers would be concerned about the regulator clamping down on them now or in the future

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<sup>26</sup> Useem, Kunreuther and Michel-Kerjan (2015)

<sup>27</sup> Insurance Institute for Property Loss Reduction (1995).



regarding what price they could charge.<sup>28</sup> Uncertainty regarding costs of capital and changes in risk over time may also deter insurers from providing multi-year insurance.

For the private sector to want to market coverage if the above issues are addressed, there needs to be a sufficient demand to cover the fixed and administrative costs of developing and marketing the product. To empirically test the demand for multi-year insurance, a web-based experiment was undertaken with adults in the United States; most were older than 30 so they were likely to have experience purchasing insurance. The individuals participating in the experiment were offered a choice between 1-year and 2-year contracts against losses from hurricane-related damage. A large majority of the responders preferred the 2-year contract over the 1-year contract, even when it was priced at a higher level than the actuarially fair price. Introducing a 2-year insurance policy into the menu of contracts also increased the aggregate demand for disaster insurance.<sup>29</sup>

A choice experiment of a representative sample of 1250 households in the Netherlands revealed that demand for flood insurance is likely to increase by introducing 5 and 10 year policies with constant annual premiums in addition to the standard one year contract.<sup>30</sup> The annual premium that individuals were willing to pay for a 5-year policy was higher than for a 1-year policy and was even higher for a 10-year policy but decreased when the policy was for 15 years. This implies that homeowners would not want to be locked into a very long-term insurance policy if they felt they would be moving. Insurers would also be unlikely to market that are longer than 3 to 5 years given the uncertainties associated with the long-term risks of hazards that would be covered in the policy.

## 6. Next Step: Modifying the National Flood Insurance Program

The National Flood Insurance Program (NFIP) provides a target of opportunity to implement a long-term strategy for reducing risk that could eventually be extended to other extreme events.<sup>31</sup> The proposed changes discussed below, with specific details in the context of

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<sup>28</sup> Regulators would still monitor insurers to make sure that they have sufficient surplus on hand and are charging a sufficiently high premium to reduce the chance of insolvency to an acceptably low level.

<sup>29</sup> Kunreuther and Michel-Kerjan (2015).

<sup>30</sup> Botzen et al (2013)

<sup>31</sup> See, Kousky (2016) and Kousky and Kunreuther (2016) for a more detailed analysis of the National Flood Insurance Program.

the flood hazard, would provide a foundation for all-hazards homeowners insurance in light of the interest that the private sector has in providing flood insurance to homeowners.<sup>32</sup>

- **Specify likelihood of hazards of different magnitudes or intensity and the resulting damage to property at risk.** Accurate flood maps are needed, not only for the highest-risk areas, but also for areas outside those normally considered flood-prone. Such maps, coupled with elevation data on individual structures, would provide information on the likelihood of floods of different depths that could cause damage to the structure, its contents and critical systems like the air conditioning and heating units.
- **Determine risk-rated premiums based on the likelihood of specific hazards occurring and the resulting damage.** With respect to the NFIP, risk-based premiums would be based on updated flood maps, elevation data and damage estimates.
- **Provide means-tested vouchers or tax credits via the public sector to those who undertook cost-effective mitigation measures.** This proposal would address the question of making flood insurance affordable as authorized by HFIAA if risk-based premiums were charged.<sup>33</sup> Homeowners who invested in loss-reduction measures would be given a premium discount to reflect the reduction in expected losses from floods. Long-term loans for mitigation would encourage investments in cost-effective mitigation measures.
- **Offer multi-year insurance policies.** The NFIP could offer a multi-year insurance (MYI) policy tied to the property in addition to the standard annual policy. Based on the studies reported above demand for flood insurance would likely increase. It would have the added benefit of deterring MYI policyholders from canceling their insurance if they did not suffer flood losses for several years.

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<sup>32</sup> In this regard the US House of Representatives recently passed a bill enable the private sector to provide flood insurance to complement insurance provided by the NFIP.

<sup>33</sup> This proposal for risk-based premiums and means-tested vouchers are part of BW12 that was modified in March 2014. The new legislation (HFIAA14) delayed the implementation of risk-based premiums until issues of affordability of the NFIP were addressed. The National Research Council is currently undertaking this study and issued its first report in March 2015 (National Research Council 2015) where the methods for an affordability framework and program policy options were proposed. The second report, due in the fall of 2015, examines the features of alternative approaches for undertaking a national evaluation of affordability program policy options.

- **Market reinsurance and risk-transfer instruments via the private sector.** The private sector could cover a significant portion of the catastrophic losses from future floods. Some type of federal reinsurance would provide insurers with protection against extreme losses that could not be covered by the private sector.

The social welfare benefits of this proposed program would be significant: less damage to property, lower costs to insurers for protecting against catastrophic losses, more secure mortgages, and lower costs to the government for disaster assistance.

## 7. Direction for Future Research

The impact of changing climate patterns on future damage from flooding due to potential sea level rise and more intense hurricanes also needs to be taken into account. There is evidence that federal agencies and other bodies have underestimated the risks of damage from extreme weather events due to climate change.<sup>34</sup> Hurricane Sandy has stimulated studies on ways that communities can be more prepared for future disaster damage as well as highlighting the need for a suite of policy tools including insurance to address the climate change problem.<sup>35</sup>

Studies are also needed as to ways that other policy tools, such as well-enforced building codes to encourage good construction practices, can complement insurance. Enforcing building codes for all residences in Florida could reduce by nearly half the risk-based prices of insurance under climate change projections with respect to hurricane damage in 2020 and 2040.<sup>36</sup>

The challenge facing the United States today is how to capitalize on the concerns raised by Hurricanes Katrina and Sandy and discussions on the renewal of the NFIP in 2017. The case for making communities more resilient to natural disasters by investing in loss reduction measures is critical today given economic development in hazard-prone areas.<sup>37</sup> For all-hazards homeowners insurance to be part of such a strategy, there is a need for support from key interested parties, including real estate agents, developers, banks and financial institution, residents in hazard-prone areas as well as public sector organizations at the local, state and federal levels.

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<sup>34</sup> Repetto and Easton (2012).

<sup>35</sup> See New York City Panel on Climate Change (2015); NYC (2013); and Hurricane Sandy Rebuilding Task Force (2013).

<sup>36</sup> Kunreuther, Michel-Kerjan and Ranger (2013).

<sup>37</sup> See, National Research Council (2012).

The principle of risk-based premiums coupled with concerns regarding affordability and catastrophic losses apply to all countries that utilize insurance as a policy tool for dealing with risk. OECD (2012) presents a framework for assessing disaster risk and financial strategies for disaster risk management that serves as a reference point for comparing specific country approaches and methodologies. The US would also do well to examine how other countries address the issue of insuring against all-hazards in their homeowners policies and design long-term strategies that have a chance of being implemented because they address short-term concerns.

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