

September 2010 ■ RFF DP 10-30

Managing the Risk of Natural Catastrophes

*The Role and Functioning of State
Insurance Programs*

Carolyn Kousky

1616 P St. NW
Washington, DC 20036
202-328-5000 www.rff.org

Managing the Risk of Natural Catastrophes: The Role and Functioning of State Insurance Programs

Carolyn Kousky

Abstract

This paper surveys state-mandated programs designed to provide natural catastrophe insurance to property owners and businesses unable to find a policy in the private market. The paper provides an overview of the 10 state programs offering wind or earthquake coverage and outlines the motivation for establishing such programs. The implications of design and operation decisions, such as pricing strategies and contract options, are discussed, as well as how these programs interact with the private property insurance market. Finally, the paper examines whether such programs can handle a truly catastrophic loss year and the merits and drawbacks of federal support for the programs.

Key Words: insurance, catastrophe, hurricane, earthquake, residual market mechanisms

JEL Classification Numbers: G22, H79, Q54

© 2010 Resources for the Future. All rights reserved. No portion of this paper may be reproduced without permission of the authors.

Discussion papers are research materials circulated by their authors for purposes of information and discussion. They have not necessarily undergone formal peer review.

Contents

Introduction..... 1

The Nature of Natural Catastrophe Risk 2

Overview of State Programs 4

 North Carolina 6

 South Carolina 6

 Georgia..... 7

 Florida..... 7

 Alabama 8

 Mississippi 9

 Louisiana..... 9

 Texas 10

 Hawaii..... 11

 California 11

The Need for State Programs: Availability and Affordability 12

Pricing, Subsidies, and Incidence 15

Available Contracts 18

Interaction with the Private Market 19

Can They Handle a Catastrophe? 22

Do They Merit Federal Support? 23

Conclusion 25

References..... 27

Managing the Risk of Natural Catastrophes: The Role and Functioning of State Insurance Programs

Carolyn Kousky*

Introduction

States play a prominent role in the management of natural disaster risk. They manage exposure levels through building codes, land-use regulations, and mitigation programs. States are involved, along with the federal government, in crisis response and in postdisaster rebuilding. State insurance commissioners, working with state legislatures, authorize private companies to sell insurance, oversee and approve insurance premiums, and regulate many other aspects of the private insurance market. In addition, some states that face catastrophic natural disaster risks have established state-mandated catastrophe insurance programs. The specifics of these programs vary, but all have some similar features and face similar challenges.

Most state programs were established following a disaster that raised concerns about the ability of private insurance companies to cover catastrophic risks and the affordability of such policies when they do. Broadly referred to as residual market mechanisms, they were created to provide insurance coverage to property owners and businesses unable to find a policy in the voluntary market. This paper focuses on the Gulf Coast states' and the Carolinas' programs designed to cover wind damage from hurricanes (Hawaii's program is now dormant) and California's program to cover earthquake losses. Though also potentially catastrophic, floods are insured at the federal level through the National Flood Insurance Program and are thus not covered by state programs.

The hurricanes of 2004, 2005, and 2008 focused attention on the management of natural catastrophe risk and raised questions about the design and functioning of state catastrophe insurance programs. This paper begins with a brief discussion of the nature of natural catastrophe risk that makes it difficult to insure. The paper then provides an overview of the residual market mechanisms, offering a brief description of the 10 state programs. The paper then moves on to

* Fellow, Resources for the Future. I would like to thank without implicating the following people for their helpful comments and suggestions: Dennis Burke, Smitty Harrison, Jan Mares, and Paul Raschky. I would also like to thank John Wortman, James Murphy, Mike Valdez, Joe Shumaker, Ron Cassesso, and Robert Groves for providing information on the programs. Remaining errors are, of course, my own.

address a range of issues related to these programs, including the need for them, pricing strategies and subsidies, the types of insurance contracts offered, how such programs interact with the private market, whether they are designed to handle a catastrophic loss year, and the arguments for and against federal support to cover high-loss years.

The Nature of Natural Catastrophe Risk

Catastrophic risks are typically characterized by two features: “fat tails” and correlated losses. Many natural catastrophes, from earthquakes to wildfires, have been shown to be fat-tailed (e.g., Schoenberg et al. 2003; Newman 2005). An imprecise though popular term, this roughly means that the probability of an event declines slowly relative to its severity.¹ Thus, the most extreme event observed to date could be several times greater than the second most extreme event, which could be several times greater than the third, and so on. Take hurricanes. The most costly U.S. hurricane was Katrina (2005), which caused more than \$100 billion in damage, or close to three times the damage caused by the second costliest, Hurricane Andrew (1992), which the National Oceanic and Atmospheric Administration (NOAA) estimates cost “only” \$35.5 billion. The next hurricane larger than Katrina could cause multiple times more damage. Historical averages tend to underestimate potential losses from fat-tailed catastrophes.

Catastrophic risks are also correlated in space; that is, a large number of buildings in close proximity are affected simultaneously. As the size of an event increases, the number of buildings affected in the area increases as well. Unlike, say, theft, where the victimization of one person does not mean that a neighbor is also victimized, with correlated risks, large regions all sustain damage together. Further, building types in close geographic proximity are often similar, further correlating damages.

Both of these features of catastrophic risks—fat tails and correlated losses—make them difficult to insure, since they imply a larger risk of insolvency for the insurer. With noncatastrophic risks, premiums received in a given year can largely cover losses experienced in that year. Not so with catastrophes. For catastrophic risks, insurers must solve an intertemporal smoothing problem—matching regular premium payments, insufficient in any given year to cover a large loss, with the need for enormous sums of capital in a catastrophic year (Jaffee and Russell 1997). Insurance companies generally manage their risk by ensuring enough access to

¹ “Fat-tailed” often refers to data that can be well approximated by a power law or Pareto distribution.

capital so that the probability of going insolvent in a catastrophic year stays below a target level.² When losses are catastrophic, insurance companies must charge more to build up reserves, purchase reinsurance, or use the financial markets to meet their solvency target.

Simply put, premiums for catastrophic risks must be higher than for noncatastrophic risks. In good years, the rates may seem excessive to homeowners and policymakers unfamiliar with the intertemporal smoothing problem. The high rates are needed, though, to make up for the bad years. For instance, from 1993 to 2003, the rate of return on net worth for homeowners insurers was 2.8 percent nationwide but 25 percent for Florida; if 2004 and 2005—two years with powerful storms—are added, the situation reverses dramatically, with the national percentage being -0.7 and in Florida, a devastating -38.1 percent (Insurance Information Institute 2009b).

The required high rates often cause outcry in catastrophe-prone regions, especially in good years. U.S. insurance commissioners tend to weight low prices and availability of policies more heavily than solvency considerations or management of catastrophe risk (Klein and Wang 2007). Restricting rates to appease homeowners, however, can make it impossible for firms to operate profitably. For instance, looking at cumulative insurer profits by year in Florida reveals that insurance companies have been in the red since 1992 (Klein 2008). Although insurance companies made profits in quiet years, the losses from 1992, 2004, and 2005 more than wiped out all those profits. This has led many insurance companies in recent years to scale back operations in Florida and along the Gulf Coast.

Two points are of note here. First, if private insurance companies do not believe they can write catastrophe insurance policies at a price that regulators will allow, it creates a need for and can put a strain on residual market mechanisms. Thus, there is an important interaction between pricing regulation of the voluntary market and the demand for policies in the residual market. Second, state programs will face the same difficulties in smoothing losses over time as a private insurance company. They have a few more policy options to help in this endeavor, but they are not immune to the nature of catastrophic risks.

² Regulations for the banking and insurance industry, such as the Basel II and Solvency 2 Protocols in the European Union, instruct companies to manage their tail risk using a value-at-risk (VAR) framework. Essentially, a firm chooses a target solvency probability (or one is set for them through regulation). The firm must have access to enough capital to keep its probability of insolvency at the defined level.

Overview of State Programs

Residual market mechanisms are designed to offer insurance to homeowners unable to obtain policies in the voluntary market. These programs take a variety of forms, including state FAIR (Fair Access to Insurance Requirements) plans,³ state wind pools or “beach plans” that provide only wind coverage in certain high-risk areas, hybrid programs that may write both hazard-specific policies and complete dwelling coverage, and reinsurance funds.⁴ This paper focuses on the catastrophe insurance programs, namely the wind pools and hybrids in North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, and Hawaii, plus an earthquake program in California.

Most of these programs have been expanding. Total exposure in wind pools grew 100 percent between 1990 and 2005, to \$31.7 billion (Hartwig and Wilkinson 2007). For hurricane-prone states, part of the growth could be attributed to population growth. Between 1980 and 2003, NOAA estimates that the population in Gulf Coast coastal areas increased 45 percent, and the population in Southeast coastal areas grew 58 percent (Crossett et al. 2004). Since 2005, when Katrina struck, many wind pools have grown further as private coverage has become less available in some areas (discussed further below). California’s program is the exception, where policies-in-force have declined from higher numbers in the mid-1990s, perhaps because of relatively quiet earthquake years.

Figure 1 shows the percentage change in policies-in-force from the previous year for all the state programs. The increases for the 2005 to 2009 period are apparent in most Gulf Coast programs. Florida and Louisiana lost policies in recent years as a result of efforts to “depopulate” their programs (discussed further below). California showed only modest increases each year. Note, however, that this is not a completely accurate comparison across programs. For instance, the numbers for Georgia are wind-only policies, but for Florida, they include all policies, not just wind-only (the percentage of policies in Florida Citizens labeled as the high-risk account increased in 2006 and 2007). The variations in the size of programs is obscured by looking at percentage changes but is clear in Figure 2. Florida is by the far the largest program, with

³ Thirty-two states and the District of Columbia have FAIR plans that offer homeowners coverage to residents who cannot find policies in the voluntary market. Following riots and civil disorder in many urban areas, federal legislation in 1968 made federal riot insurance available to states that enacted FAIR plans. The plans set up in the following years generally began by writing policies just for fire, but many have expanded, and some even offer wind coverage.

⁴ Florida alone has a reinsurance program at the state level, the Florida Hurricane Catastrophe Fund.

currently more than a million policies-in-force. California follows second. Of the hurricane-prone states, Louisiana, North Carolina, and Texas are the next largest programs after Florida; in 2009, Louisiana had 139,000 policies, North Carolina had more than 175,000, and Texas had more than 215,000. The other programs are smaller, with only tens of thousands of policies-in-force.

Figure 1. Percentage Change in Policies-in-Force for Select State Insurance Programs, by Year

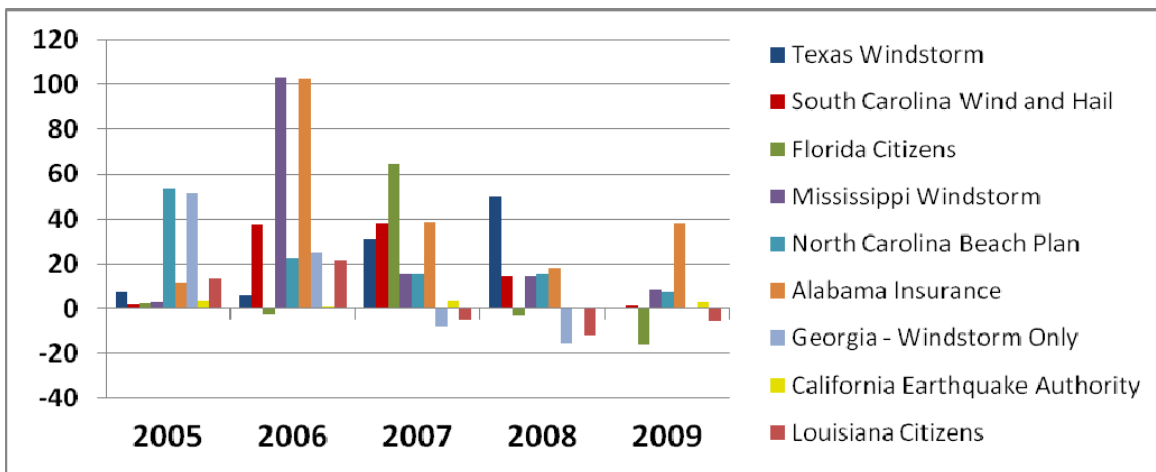
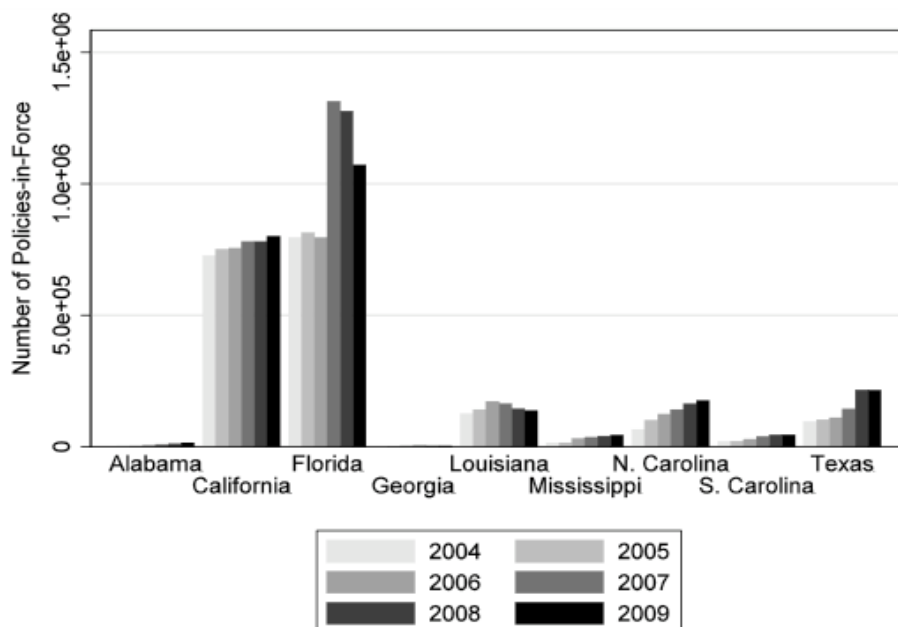


Figure 2. Policies-in-Force for Select State Insurance Programs, by Year



Although their details differ, these programs share some common features. The majority of those offering wind-only coverage do so in defined high-risk areas, such as coastal counties. California offers earthquake coverage everywhere in the state. Many programs have eligibility requirements intended to ensure that policies are purchased only as a last resort. All programs first cover losses out of premium and investment income. To cover higher amounts of claims, programs differ in the extent to which they rely on bonding or reinsurance, but all assess private insurers or their policyholders after an event that exceeds claims-paying capacity. In most cases, the state is not responsible for any losses the program may sustain, although recently several have appropriated general revenues to reduce deficits. The structure, size, and financing mechanisms for each state program are briefly reviewed here, and then the following sections discuss the implications of various design and operation decisions.

North Carolina

North Carolina has a FAIR program and a wind pool, the North Carolina Insurance Underwriting Association (NCIUA), both established in 1969. NCIUA provides wind and hail coverage in coastal areas. In spring 2009, this program had almost 176,000 policies, a roughly 85 percent increase since 2004. In 2009, coverage limits were reduced from \$1.5 million to \$750,000 for dwellings and from \$1.1 million to \$300,000 for contents coverage, a reform that should affect about 2 percent of policyholders (Scism 2009). In 2007 and 2008, the program purchased a small amount of reinsurance (Marlett 2009). NCIUA has a total claims-paying capacity of roughly \$2.4 billion. Should losses exceed this amount, all property insurance premiums in the state can be assessed up to 10 percent per year. Poststorm assessments were recently capped at \$1 billion.

South Carolina

South Carolina has no FAIR plan. Its wind pool, the South Carolina Wind and Hail Underwriting Association (SCWHUA) was established in 1971 to write wind and hail policies in coastal areas. Policies are only for residents unable to find wind coverage in the private market. Policyholders receive premium credits for fortified homes certified by the Institute for Business and Home Safety. To obtain replacement cost coverage on primary dwellings, flood insurance is required. In 2007, the program expanded the areas in which coverage was available in response to growing concern about the cost and availability of private insurance (and also concern about the equity of the 1971 boundaries), but also raised rates 35 percent (Klein 2009). The SCWHUA can issue bonds and assess all property insurers in the state, based on their market share, to cover

high loss years. Insurers may pass these assessments on to their policyholders. They may also reduce their assessment—even to zero—by voluntarily writing more wind coverage in the state’s high-risk wind territory. The SCWHUA currently has reinsurance with a \$10 million retention and coverage for losses greater than those estimated for a 1-in-150-year loss.

Georgia

Georgia has a FAIR plan, the Georgia Underwriting Association (GUA), but no state wind pool. The GUA, however, writes hail- and wind-only policies for homeowners and businesses in coastal counties and islands unable to find such coverage in the voluntary market, and as such, it is included here. New hurricane policies or increases in coverage are not allowed during a hurricane warning. To be eligible for coverage, buildings must comply with hurricane building codes. The GUA has purchased \$150 million of reinsurance for losses over \$50 million. Should losses exceed available capital, it can assess all licensed insurance companies in the state in proportion to written premiums, but the companies are not allowed to pass the assessments on to policyholders. Should there be excess profits, member insurance companies receive a fraction.

Florida

Citizens Property Insurance Corporation was created in 2002 through the combination of a wind pool and another state program that wrote full homeowners coverage. Citizens is a tax-exempt, nonprofit state corporation that offers full-coverage policies and wind-only policies to both residents and businesses. The earlier state insurance program, established in 1992, required average rates by county to be at least as high as the highest rate charged by the top 20 writers of property insurance in the state (Florida TaxWatch 2010). Policies were issued only to those who had been denied coverage in the voluntary market. The original intention of being an insurer of last resort has been eliminated in recent years, and Citizens is now the state’s largest property insurer, with more than a million policies and \$400 billion in exposure (Florida TaxWatch 2010). In part, this exposure level is due to legislative action in 2007 that decreased and froze rates as well as loosened the eligibility requirements. In 2009, the pattern was reversed, and rates have been increased slightly.

A 1-in-100-year hurricane is expected to generate \$24.4 billion in claims, and Citizens only has \$4.3 billion in surplus (Florida TaxWatch 2010). The economic downturn of 2008

raised concerns that Citizens would have limited bonding ability to cover this roughly \$20 billion shortfall (although \$10 billion of payments will come from Florida's state reinsurance program,⁵ it too may have difficulty issuing bonds and thus paying claims). Should Citizens not have enough funds to pay claims, it has three assessment options. First, a surcharge is levied on Citizens policyholders, up to 15 percent of the premium for each of the three Citizens accounts (personal lines account, commercial lines account, and high-risk account) that are in deficit. Should this fail to generate enough revenue, then all insurance in the state (excluding workers compensation, medical malpractice, and accident and health), apart from Citizens, can be assessed up to 6 percent per account in deficit. The companies can pass this assessment on to their policyholders. Finally, as a last resort, an emergency assessment can be levied on all property and casualty policies, including Citizens policies, capped at 10 percent of the premium or the remaining deficit; this assessment can be spread over multiple years. The 2004 and 2005 hurricanes led the state legislature to appropriate \$715 million to lower the necessary assessments, and the rest of the deficit will be paid off over 10 years using emergency assessments (which were 2.5 percent in 2007 and around 1.5 percent in following years) (Klein 2008).

Alabama

Alabama has a wind pool but no FAIR plan. The Alabama Insurance Underwriting Association (AIUA) was established in 1971 to offer fire and extended coverage and to write policies in the beach areas of Mobile and Baldwin counties, but was altered in 2001 to offer wind-hail policies for seacoast areas (Klein 2009). If a property is in a high flood risk zone, flood insurance is required as a condition for an AIUA policy. As of 2008, fortified homes certified by the Institute for Business and Home Safety can receive a premium discount. The AIUA is a small program, with 12,500 policies-in-force as of June 2009, likely because Alabama has less coastal exposure. Still, the program has been growing in the past few years, and the rising exposure, perceived increases in risk, and higher costs of reinsurance have led to rate increases. AIUA raised rates 15 percent in 2007, 10 percent in 2008, and 5.5 percent in 2009.

⁵ The Florida Hurricane Catastrophe Fund (FHCF) is a tax-exempt state trust fund, established in 1993 following Hurricane Andrew, to provide mandatory reinsurance to property insurers in the state. It covers a fixed percentage (chosen by the insurer) of each participating insurer's losses that exceed a given retention level. Coverage is also subject to a maximum aggregate limit. The FHCF offers reinsurance at below-market rates based on the theory that it can build reserves tax free, does not have a risk load, has low administrative costs, and is a nonprofit. It is financed by premiums received, investment earnings, borrowing authority, and emergency assessments.

Every insurance company that writes property insurance in the state is a mandatory member of AIUA and thus eligible for assessments. Participation is determined by the percentage of business the insurer writes in coastal areas compared with its market share in the rest of the state. If an insurance company writes more policies in coastal areas than its share, it can bring its participation down to zero. The AIUA does not hold large reserves and purchases reinsurance with a significant portion of its revenues—60 percent in 2010 (Amy 2010a). Assessments would cover the first \$100 million in losses with the next \$335 million covered by reinsurance. Losses in excess of reinsurance are also covered by assessments. As of 2008, the AIUA can also issue bonds to cover losses.

Mississippi

Mississippi has both a wind pool, the Mississippi Windstorm Underwriting Association (MWUA), established in 1987, and a FAIR plan, established in 2003 (the FAIR plan expanded the Mississippi Rural Risk Underwriting Association to offer coverage throughout the state). The MWUA provides wind and hail coverage in coastal counties for residential and commercial properties. Beginning in 2009, policyholders who hardened their homes against wind damage could receive premium discounts. As of July 2009, policies in 100-year floodplains (as designated by the Federal Emergency Management Agency) must purchase flood insurance. Following losses in 2005, the MWUA had to impose assessments on insurance carriers. To help stabilize the program, the Mississippi legislature appropriated \$20 million for four years from an insurance premiums tax collected statewide. In 2006, policyholders saw an average rate increase on residential properties of 90 percent; this was followed by a rate reduction of around 11 percent in 2008. In 2009, the state legislature appropriated an additional \$20 million more for the purchase of reinsurance.

Louisiana

In 2004, Louisiana combined its wind pool and its FAIR plan to create the tax-exempt Louisiana Citizens Property Insurance Corporation, offering the Citizens FAIR Plan and the Citizens Coastal Plan. Coverage under the former is available anywhere in the state, whereas the latter policies are available only in designated coastal areas. Property owners are eligible for coverage only if they have been denied a policy in the voluntary market. Louisiana Citizens is roughly 8 percent to 9 percent of the total homeowners market (Klein 2008). As of February 2010, there were 129,000 policies-in-force representing \$27 billion in total insured value. It had been required to charge 10 percent more than the rates charged by the 10 insurers with largest

written premiums to ensure that it did not undermine the private market. This requirement was revised over the years, and now Citizens takes the higher of an actuarial analysis of its risk plus 10 percent or 10 percent more than the highest private premiums from a company with at least 2 percent of the market (the 10 percent is not added to 12 coastal parishes).

Louisiana Citizens builds reserves tax-free and issues tax-exempt bonds. For any yearly deficit, Citizens can issue a regular assessment on companies of up to 10 percent of property insurance premiums. If this is insufficient, an emergency assessment can be issued up to 10 percent per year on all property owners, who can then receive tax credits. Losses from Hurricane Katrina led to a \$1 billion deficit. The program issued bonds and is repaying the debt through assessments that began at 15 percent in 2006 and declined to 4.3 percent in 2010. The program also purchases reinsurance; in 2009, Citizens purchased 95 percent of \$400 million in excess of \$100 million.

Texas

Texas has a wind pool, the Texas Windstorm Insurance Association (TWIA), founded in 1971. In 2003, Texas also created a FAIR plan in response to complaints about high insurance costs in the unregulated market. TWIA offers wind and hail coverage to residential and commercial properties in certain coastal areas. An applicant must have had the wind coverage or the entire policy for a property declined or dropped by a private insurer. The property to be insured must also be certified as meeting the appropriate building code. Applicants not meeting this requirement can apply for a waiver but must pay a 15 percent surcharge and are not eligible for discounts based on compliance with building standards. As of 2009, to reduce concerns about whether a home was damaged by wind or water, TWIA policyholders must also maintain flood insurance if they are in a designated flood zone and their property was built or remodeled after September 1, 2009. TWIA has been growing dramatically. Between 2000 and 2007, TWIA exposure grew 326 percent.

In 1993, the Catastrophe Reserve Trust Fund (CRTF) was established, into which TWIA deposits excess revenue. Hurricanes Dolly and Ike, both in 2008, ran the CRTF down to zero. The perilous financial state of TWIA in 2009 led to legislative reform. Surplus revenue is still to be deposited into the CRTF. Losses are first paid from premiums and then from any funds in the CRTF. Following that, public securities of up to \$1 billion can be issued. A second layer of securities can next be issued, again up to \$1 billion, with 30 percent to be repaid from insurer assessments and 70 percent from surcharges (estimated up to 2.8 percent) on coastal property and casualty insurance policies. Finally, there is a third class of securities that can be issued up to

\$500 million, to be paid by insurer assessments. Assessments had previously been unlimited but were capped in 2009 at \$800 million per year to be paid over the duration of the bond. If losses exceed \$2.5 billion, a special legislative session would need to be called. TWIA had previously purchased reinsurance to cover claims. In spring 2009, Texas let its reinsurance policy lapse, even though reinsurers paid \$1.2 billion in claims from Hurricane Ike. They may repurchase in the future. Annual rate increases over 5 percent are subject to approval and cannot exceed 10 percent unless needed following catastrophic losses. Rates were increased in the years 2006 to 2009, and legislation in 2009 affirmed that TWIA should be an insurer of last resort, but some contest whether the program is truly pricing to meet this goal.

After Hurricane Ike, hundreds of homeowners filed lawsuits accusing TWIA of systematically underpaying claims and delaying or denying claims payments. The Texas Department of Insurance also charged that TWIA had been deceptive about claims practices, particularly how it handled loose shingles, and called for more oversight. TWIA has begun settling the cases, picking up the pace of such settlements in early 2010.

Hawaii

The Hurricane Relief Fund (HRF) was created in 1992 after Hurricane Iniki in reaction to a withdrawal of insurance companies from the islands. Insurance companies could choose to keep wind risk or write policies that excluded wind coverage and then service an additional, wind-only policy for the insured from the HRF. It was partially funded by mortgage recording fees. The fund purchased reinsurance and could assess insurers after a storm should claims exceed its paying ability. By 2000, insurance companies were largely choosing to write their own policies, and payments into the HRF were discontinued in 2001. No new policies have been written. Currently the fund has about \$180 million. Raiding the HRF for other purposes has been discussed several times. In winter 2010, over the objections of the insurance commissioner, the Hawaii legislature approved using HRF funds to end school furlough days (Tom 2010).

California

The withdrawal of private companies from the property insurance market after the 1994 Northridge earthquake was extreme, and became a crisis California addressed by creating the California Earthquake Authority (CEA) in 1996. Insurance companies are mandated to offer

minimum levels of earthquake coverage, which they can do on their own or through the CEA (for residential policies only; the CEA does not offer commercial coverage).⁶ Upon joining CEA, insurers make a capital contribution and are able to be assessed after an event. Three requirements were imposed on the CEA: 70 percent of insurers in the state had to participate, it must be exempt from federal income taxes, and reinsurance be purchased at twice the level of contributions from insurance companies.

Participating insurers offer and service CEA policies, keeping a portion of premiums to cover their costs. Premiums vary by location and structural characteristics of the house and are required by law to be actuarially sound. They are set using sophisticated models of projected losses. A third of the state's homeowners purchased earthquake insurance in 1996, but by 2008, the percentage with coverage had dropped to only 12 percent (Insurance Information Institute 2009a). Low take-up rates are often blamed on the perception of high premiums and deductibles. CEA reduced rates 22 percent in 2006 to attract more policyholders (the first rate change since 1998) (Insurance Information Institute 2009a). At the end of 2009, the CEA had 800,930 policies-in-force representing \$280.7 billion in exposure. By law, state general funds are not allowed to pay for CEA claims. The first line of payments is from CEA capital, today at around \$3.6 billion. Next is reinsurance of \$3.1 billion. Should both these be exceeded, the CEA can issue \$0.3 billion in bonds. Should claims still not be paid, insurers can be assessed up to \$2.8 billion.

The Need for State Programs: Availability and Affordability

The majority of state catastrophe insurance programs were established following an extreme event that severely taxed the private insurance market. Faced with the withdrawal of private insurance companies or increases in premiums that led to political upset, many states felt it necessary to step in and offer coverage. For instance, Louisiana Citizens and the Alabama Beach Pool were created in response to Hurricane Camille, Hawaii's fund was created after Hurricane Iniki, the TWIA was created following Hurricane Celia, and the precursor to Florida

⁶ The CEA does not cover fire, explosion, or water damage following an earthquake. The policy also does not cover other structures, such as pools or garages.

Citizens was created following Hurricane Andrew. Similarly, the CEA was created in response to the decline in availability of private earthquake insurance following the Northridge earthquake. After Northridge, insurance companies paid out \$15 billion in claims but had collected only \$3.4 billion in earthquake premiums in the preceding 25 years (GAO 2007). Their refusal to write more policies and filing for rate and deductible increases triggered a housing crisis that led the state to intervene.

Hurricane Katrina triggered another crisis in the voluntary market. After the storm, catastrophe-modeling companies revised upward the estimation of losses, and rating agencies increased their stress tests (Guy Carpenter 2005). This further exacerbated a hardening in the reinsurance market. When state regulators began capping rate increases, many insurers sought to reduce their exposure along the coast. In 2007, State Farm began a process of not renewing coastal policies in Texas; they suspended the non-renewals for over year but began again in 2010 (Patel 2010). In 2009, Nationwide announced plans to drop 60,000 homeowners policies in Florida. When the largest property insurer in Florida, State Farm, announced it was withdrawing because of rising potential hurricane losses,⁷ protracted negotiations with the state ensued. In December 2009, State Farm agreed to drop 125,000 high-risk policies instead of exiting the state entirely, and Florida allowed it to raise rates 14.8 percent (Fineout 2010). State Farm also eliminated certain voluntary discounts, which had the effect of further raising rates. Farmer's announced in February 2010 that it would drop more than 10,000 policyholders in the coastal counties of Alabama, joining Allstate, Alfa Mutual, and State Farm in shedding policies in Baldwin and Mobile counties (Amy 2010b).

Decisions by private insurance companies to limit the number of policies they write for catastrophic lines stress residual market mechanisms as the population unable to find policies in the voluntary market grows. If the decrease in supply is temporary, state programs can be a useful stopgap. The insurance industry has been observed to cycle through "hard" and "soft" markets, periods when supply is low and expensive and then when it is readily available and cheaper. Major events, such as Andrew or Northridge, deplete capital, leading to a hard market (Cummins 2006). Hawaii's program exemplifies how the state can ensure availability in a hard market and then let the private sector step back in as the market softens. States can help

⁷ Part of State Farm's decision to withdraw was due to state-mandated mitigation credits that the company believed were not actuarially sound. Florida's mitigation credits have been a source of controversy, especially when fraud was uncovered in the program. For more information, see a report by the Florida Association of Insurance Agents (2009).

encourage the return of the private market after hard periods by allowing insurers to charge rates that are risk-based and keeping residual market mechanisms as a place of last resort for property owners and businesses through higher prices and strict eligibility requirements (discussed below). South Carolina may be a case in point: rates in the state program were recently raised and private insurers seem to be returning or dropping plans to withdraw (Lehrer 2007).

This suggests that the role of state programs is to ensure the availability of coverage. Proponents of state programs, however, contend they are needed to make insurance not just available but also “affordable.” Although state programs may be able to offer slightly cheaper policies, especially since they do not attempt to charge all costs *ex ante*, ultimately, there is no free lunch. The costs must be paid by someone, and as discussed below, state programs make insurance “affordable” by passing some costs off on private insurance companies and other policyholders in the state. Economic theory suggests that the price of property insurance sends a signal to homeowners about the riskiness of a given location. When prices are too low because some of the costs are borne by others, homeowners will not fully internalize the costs of their decisions, theoretically leading to too much development in high-risk areas and too little mitigation. So the question is really whether and to what extent catastrophe insurance should be subsidized by others through a residual market mechanism, the cost of which may be inefficient development. Excess development, of course, only exacerbates the problem the program was trying to solve. Limiting exposure is a more permanent solution but may be more costly and is certainly politically untenable in many places.

Although “affordability” may explain political decisions to subsidize vocal, high-risk residents, there are two arguments for offering subsidized catastrophe insurance. The first is an equity argument: some low-income homeowners reside in high-hazard areas, and it is a government role to help these homeowners afford insurance, just as society subsidizes their food and health care. None of the state insurance programs, however, target low-income households or offer differentiated pricing based on income, suggesting this is not their *raison-d’être*. If this were the justification for state programs, a transparent, needs-based subsidy for private coverage could be designed and implemented instead. The difficulty is that while this will help low-income residents, as said above, it could also encourage excess development.

The second argument is an economic one: insurance (particularly wind insurance, which banks usually require as a condition for a loan) is necessary for development, and some types of development must be in high-risk areas but provide economic spillovers that justify insurance subsidies. The extent to which this is the case is a difficult empirical question that to my knowledge has not been thoroughly addressed but would likely justify only very small and

targeted subsidies in any event. States insurance programs do not seem to be motivated by this rationale, either, however, since they do not target specific development types and some exclude commercial development, which would be more likely to generate spillovers.

There may also be market imperfections that reduce the availability and raise the cost of catastrophe insurance, but other mechanisms besides state programs could be adopted to overcome these barriers. One market barrier is imperfect access to capital by insurance companies. Some authors have promoted the use of catastrophe bonds and other securities to help insurance companies access capital in the financial markets (e.g., Michel-Kerjan and Morlaye 2008). Another suggestion has been the creation of tax-deferred catastrophe reserves (Harrington and Niehaus 2001; Milidonis and Grace 2007). Currently, insurance companies must keep catastrophe funds in general surplus accounts where they are taxed and may be depleted, and regulators may treat the extra funds as reason for more stringent price regulations (Klein and Wang 2007).⁸ If an insurer could allocate funds to a trust or separate account where they could accumulate tax free and be withdrawn only for payment of claims following predefined triggers, it could lower the cost of catastrophe insurance (Davidson 1998). If either suggestion improved the functioning of the voluntary market significantly, it could reduce or eliminate the need for state programs. It appears unlikely, however, that such approaches would significantly increase supply, although they may still be desirable.

Pricing, Subsidies, and Incidence

Programs differ in their pricing goals. Some programs are designed to be true insurers of last resort, and as such, their prices are set higher than those in the voluntary market. For instance, Louisiana Citizens' prices must be greater than private rates. To further ensure they are markets of last resort, some state programs, such as in South Carolina, Louisiana, and Texas, require homeowners to demonstrate that they have been unable to find coverage in the private market (in Texas this requirement can be waived, but homeowners pay a surcharge). Of course,

⁸ Davidson (1998) uses a simple example to explain the problem with taxing capital used to pay catastrophe losses as income. He assumes, for simplicity, that an insurer charges \$1,000 (the expected loss) of a 1/10 possibility of a \$10,000 loss. If the \$1,000 is taxed in year 1—assuming no losses—then, at a 35 percent rate, only \$650 remains. This continues through year 9. Then in year 10, assume the loss occurs. The insurer does not have enough to cover the loss. Some can be recouped through carry-back provisions, and in reality, premiums would increase to account for the taxation, but this just drives up the cost of catastrophe insurance. Equity capital can be raised, but this can be so costly that it could raise rates to a point where insurance demand falls substantially, leading to a shortage of coverage (Milidonis and Grace 2007).

the requirements must be enforced. A recent audit of Louisiana Citizens found that 34 of 35 applications did not even disclose whether the eligibility requirement had been met (Associated Press 2010).

Other programs require that rates be actuarial. The Casualty Actuarial Society defines an actuarially sound rate as “reasonable, not excessive, not inadequate, and not unfairly discriminatory.” This is the case when the rate is an estimate of the expected value of all future costs and when it accounts for all the costs associated with transferring the individual risk (Actuarial Standards Board 1999). For instance, TWIA adopts the language that rates must be reasonable, adequate, and not unfairly discriminatory. When setting rates, then, it must consider potential losses, operating expenses, and profit and contingency margins. Of course, many state programs can have “actuarial” rates that are lower than in the private sector because they are not seeking a profit, have lower expenses, and importantly, do not charge all costs in advance, instead relying on debt issuances that can be repaid through industry assessments. This may explain why TWIA, among others, couples actuarial requirements for rates with eligibility requirements.

Florida is one program that has more actively competed with the private market. Originally, the program required rates to be high enough to not compete with the voluntary market. In 2007, this requirement was abandoned and Citizens’ rates just had to be actuarially sound (GAO 2007). Rates were also decreased and frozen until 2009. In 2007, the legislature also allowed homeowners to purchase a policy from Citizens, even if they were not denied coverage in the voluntary market, if a comparable policy cost more than 15 percent more than a Citizens policy.⁹ Recently, concern has been building about Citizens’ financial stability, and a task force on returning Citizens to being an insurer of last resort recommended, among other things, a “glide path” to increased rates (Citizens Property Insurance Corporation Mission Task Force 2008). This began in 2009, but annual rate increases were limited to 10 percent per year. In late 2009, an average rate increase statewide of 5.4 percent was approved for noncoastal Citizens policies, and average rates in coastal areas went up 4–5 percent as well, although Citizens had asked for higher rate increases (Patel 2009).¹⁰ A 2008 study estimated that Citizens’ premiums

⁹ In 2008, available coverage limits were increased to \$2 million from \$1 million, properties within 2,500 feet of the coast were exempted from complying with building codes, and further rate adjustments were postponed until 2010. These actions all had the effect of increasing Citizens’ exposure.

¹⁰ As in many other states, such as Louisiana, the insurance commissioner approves rates in the residual market mechanism.

would need to increase almost 47 percent to be actuarially sound (Florida Catastrophic Storm Risk Management Center 2009). The authors found that at the 10 percent rate increase limit, and assuming a 3 percent inflation rate, some of the highest-subsided areas would not reach sound rates for years. For example, Hernando County rates would not be sound until 2034, and Miami-Dade's would not be sound until 2019.

Depending on how geographically differentiated rates are in a program, cross-subsidies from lower-risk to higher-risk homeowners could be built into the pricing. For instance, the CEA decided to average rates over only 19 rating zones, even though it could have had finer pricing differences, leading to compression in the rates homeowners face. This, however, opens the possibility that private insurance companies could undermine the program and “cherry-pick” lower-risk customers facing higher average rates (Jaffee and Russell 2000). Louisiana Citizens recently shifted to charging rates by zip code instead of parish, leading to finer-grained, and thus more risk-based, pricing. Many programs, such as Florida Citizens and the MWUA, also differentiate rates based on the property's structural characteristics, ensuring that pricing is closer to the actual risk.

Some of the largest cross-subsidies to policyholders in residual market mechanisms, however, arise from postevent assessments. Most states allow for assessments on all property companies or property insurance policies in a state, creating a cross-subsidy from policyholders outside the program to those within it. Lower-risk policyholders are thus underwriting some of the costs of higher-risk policyholders in the state program. A cross-subsidy from all general taxpayers in the state to policyholders in the residual market mechanisms can also occur when states give tax credits to companies to cover their assessments, as in Florida and Louisiana, or when states appropriate general funds to the insurance program, as has been done by Mississippi and Florida. Again, simple economic theory suggests that this will lead to inefficiently high levels of development in high-risk areas and inefficiently low levels of mitigation, since policyholders in the state pool are not paying the full cost of their risk.

Florida provides an example of the cross-subsidy created by assessments. Should a deficit occur, first, only Citizens policyholders are assessed. In this sense, those at risk are paying for it, only this is partially funded in up-front premiums and partially funded through an ex post assessment. Of course, a homeowner who drops the policy immediately after a hurricane will not have paid the full cost of coverage. If this first assessment is insufficient, Citizens assesses policyholders outside the program and in all other lines of coverage—excluding only medical malpractice, workers compensation, and accident and health. Citizens thus shifts the cost of catastrophe insurance from homeowners in high-risk areas to all policyholders—not just

homeowners policyholders—throughout the state. In this way, residents, businesses, and nonprofits throughout Florida are subsidizing those in the highest-risk areas. In other states, assessments may be more limited. In Mississippi, for example, they are limited to property insurance premiums¹¹ but still introduce a cross-subsidy among policyholders in the state.

Available Contracts

The coverage limits and deductibles offered by residual market mechanisms vary widely among states (see Table 1). California will offer coverage up to the amount on the policyholder's homeowners policy. Among those with specific limits, Florida and Georgia offer the highest residential coverage, at \$2 million. Others have tighter limits, such as Alabama, at \$500,000. Most programs have a mandatory catastrophe deductible but also offer higher deductible options for lower prices, the highest of which is a 20 percent deductible, offered in Mississippi.

The higher the coverage and the lower the deductible, the greater the exposure the program faces. Florida Citizens is the state program most often discussed as being financially unsound. It may not be surprising, then, that it offers a high coverage level and a fairly low deductible. Note that Georgia has a high coverage level as well, however, highlighting that financial soundness is about not just the contracts offered but also how they are priced, and as discussed earlier, Florida had been underpricing its policies. High levels of coverage and low deductibles can also discourage policyholders from returning to the voluntary market. In addition, the coverage limits offered by a program can have distributional implications. Higher-income homeowners may be able to afford private insurance, and private companies often offer coverage in excess of the state cap that high-income households could afford. High coverage levels, then, may be providing lower-cost insurance to those who could afford private policies.

¹¹ State insurance programs are not the only state policies that shift costs of catastrophe risk among residents. All states have guarantee associations—state programs that pay the claims of insolvent insurers. These funds provide protection for consumers but eliminate market pressure from a homeowner choosing to place her policy with a well-capitalized company. This can create perverse incentives. Hard hit by the 2004 storms, Poe insurance companies in Florida increased their exposure, betting that there would not be more losses in 2005, which of course turned out to be a bad bet, and Poe companies became insolvent. Grace and Klein (2009) note that solvency funds create the incentive to be overly risky in this manner, since the firm wins if the bet pays off but the state bears the cost if they are wrong. When companies do go bankrupt, all taxpayers bear that burden.

Table 1. Coverage (Combined Building and Contents) and Deductibles, by State Program

<i>State</i>	<i>Residential Limit*</i>	<i>Commercial Limit</i>	<i>Residential Deductibles**</i>	<i>Commercial Deductibles</i>
North Carolina (NCIUA)	\$750,000 for building; contents at 40% of home's value	\$3 million	1%, 2%, 5%	1%, 2%, 5%
South Carolina (SCWHUA)	\$1.3 million	\$2.5 million	3% close to shore; 2% further inland (can also choose higher deductibles of 3–5% or 10%)	3% close to shore; 2% further inland (can also choose higher deductibles of 3–5% or 10%)
Georgia (GUA wind-only)	\$2 million	\$2 million	1%, \$250 minimum (applied separately to building and contents)	1%, 2%, 5%
Florida (Citizens)	\$2 million	\$1 million	2%, 5%, 10%	3%, 5%, 10%
Alabama (AIUA)	\$500,000	\$1 million	5% with \$1,000 minimum (2% available in certain locations)	2%; 5%; 10%
Mississippi (MWUA)	\$1 million for 1 to 4 family dwellings; \$250,000 for contents	\$1 million	2% (\$500 minimum), 5%, 10%, 15%, 20%	2% (\$750 minimum)
Louisiana (Citizens)	\$750,000 for buildings; \$375,000 for personal property	\$5 million building and \$2 million contents	2%, 5%	2%, 5%
Texas (TWIA)	\$1.8 million	\$4.4 million	\$100; \$250; 1%; optional large deductibles up to 5%	1%; 2%; 5%
California (CEA)	Homeowners policy limit for building; \$100,000 for contents	NA	10%; 15%	NA
Hawaii (HRF)	\$750,000	\$500,000	Greater of \$1,000 or 1%; greater of \$2,000 or 2%	Greater of \$5,000 or 5%

* Reported numbers are for single-family dwellings. Mobile homes, condos, etc. may have different limits.

** These are hurricane deductibles (CEA excluded); other deductibles could apply to other perils. Most programs have a minimal deductible with higher ones available.

Interaction with the Private Market

A residual market mechanism can involve private insurers in two ways, which Klein (2009) refers to as the full participation model and the assessment model. In the former, companies (either forced or by choice) share in the profits and losses of the mechanism; in the

latter, companies can be assessed ex post to cover losses. The latter approach is becoming much more common, although the GUA, for example, uses a full participation model, and North Carolina did until 2008. Under either approach, a state may have private companies write and service the policy in exchange for a fee, such as is done by the CEA or the HRF, while in other states, policies are written by the program.

Some state programs using the assessment model structure their assessments to incentivize insurance companies to increase their exposure in high-risk areas. For instance, in North Carolina, Alabama, and Mississippi, companies can lower their assessments by writing more policies in coastal counties. In North Carolina, however, there is some concern that larger companies have expanded their coastal coverage and limited their assessments, which will put more assessment burden on smaller insurers that might not be able to handle them in the case of a large storm (Marlett 2009). In Texas, companies can reduce their share of assessments by only 80 percent, so some amount of the assessments will always be spread over all companies (Insurance Information Institute 2006).

Heavy reliance on high assessments can discourage companies from writing policies in a state. In 2009, North Carolina passed an industry-wide cap on assessments after some insurers withdrew from the state and others threatened to do so because of their unlimited exposure to postevent assessments (Insurance Journal 2009). A group of private insurers sued the MWUA after Katrina, alleging it had not purchased enough reinsurance and therefore had to impose excessive assessments. The program had purchased \$175 million in reinsurance, but Katrina caused a \$700 million shortfall; it filed for a summary judgment, which was denied in February 2009.¹²

State programs and the private market also interact through depopulation programs, which offer incentives to insurance companies to take over residual market policies. The justification for encouraging private companies to assume policies from the residual market mechanism, as opposed to making the state environment more favorable for the private writing of catastrophe coverage in general, is unclear. Depopulation programs do not improve the voluntary market and often leave the riskiest policies in the state pool, since companies assume

¹² The Memorandum Opinion and Order are available online at <http://www.reinsurancefocus.com/uploads/AssociationCasualtysjorder.pdf>.

the least risky ones first. The programs also use general tax revenue to provide incentives, creating another cross-subsidy between low- and high-risk residents.

In the mid-1990s, Florida initiated a depopulation program, awarding bonuses of \$100 per policy to new companies that removed policies from the state program, allowing them to use the bonuses as start-up capital. The companies were required to hold the policies for three years. Many took on enormous exposure in high-risk areas, but no major hurricanes struck the state in that timeframe. Some of the new firms left the market after the three years, others dropped their coastal policies and tried to write new policies farther inland, and a third group expanded their coastal exposure (Klein 2009). It's unclear whether the program helped the state. Many of the policies that the state paid to have removed were back with the state at the end of three years, and new companies that did a poor job of diversifying or capitalizing themselves went bankrupt with the storms of 2004 and 2005, requiring the state to cover their losses through the guarantee association.

Depopulation has continued, however, picking up pace in 2007 and 2008. Prior to 2002, policyholders in the state insurance program who received offers from a private insurance company were compelled to accept. This changed in 2002, and consumers could turn down take-out offers. This may not have had a significant impact on the number of policies removed. In 2008, for example, fewer than 8 percent of those given take-out offers chose to reject them (Citizens Property Insurance Corporation Mission Task Force 2008). That year, 14 companies took out 385,084 policies representing over \$1 billion in exposure, more than in the previous four years. As already stated, a general problem with depopulation programs is that insurers tend to choose the lowest risks from the state program. Although Citizens' exposure declined, most of this was due to reduction in personal lines policies, while no wind-only policies were removed in 2007, 2008, or 2009.

Since 2007, Louisiana has also aggressively moved to depopulate its state program, through the Insure Louisiana Incentive Program. The state allocated \$100 million to provide grants of \$2 million to \$10 million to private insurance companies that assume more policies in Louisiana, with at least half being in coastal areas and at least a quarter being policies from Louisiana Citizens. The company has to keep policies for five years. Policyholders have 30 days to decide whether to stay with Citizens. As of February 2010, around 40,000 policies had been removed.

Can They Handle a Catastrophe?

All of the state programs cover losses through some combination of premium revenue, surplus and investment income, reinsurance purchased, the issuance of bonds, and ex post assessments. Despite similar sources of revenue, the programs have made differing choices regarding their exposure and the level of catastrophe they aim to cover.

It appears that the Gulf Coast states with a greater degree of coastal exposure relative to the rest of the state face greater financial difficulties. For example, a majority of insured property in Florida is located in coastal counties, and in 2005, Citizens had 17 percent of the state's property insurance market; contrast this with Louisiana, whose program is 8.6 percent of the market, or Texas, at 1.6 percent (Hartwig and Wilkinson 2007). Although Texas has significant coastal exposure to hurricanes, the state is so large that the policies for coastal residents are only a small fraction of the total market. This is not the entire story, however, as Florida Citizens' share of the state market was only 2 percent in 2001 (Hartwig and Wilkinson 2007). Aggressively lowering prices, expanding coverage, and loosening eligibility standards led to growth in its market share. A large coastal population could partially explain these actions, at least indirectly. The high cost of insurance is a hot political issue in Florida and with a greater percentage of residents on the coast, elected officials may see benefits to offering subsidized policies. In states where the coastal population is a small share of the state, such redistribution may be less politically appealing.

Most of the wind pools ensure financial stability through the cross-subsidization inherent in the assessment structure. For states with larger lower-risk areas, insurance companies might be in a better position to handle assessments. For instance, in Texas, Hurricane Ike wiped out all of TWIA's reserves and required industry assessments that exceeded \$500 million. Assessments in Texas, though, can be spread over a wider base of unaffected policyholders, and insurance companies have a smaller percentage of their total state portfolio exposed, suggesting they may be in a better position to handle them.

Regardless, some state programs are in a much better position to weather a severe storm than others. Florida has been in particularly bad shape. Not only is Citizens the largest insurer in the state, but most of its exposure is in high-risk coastal areas. In 2010, 56 percent of wind-only policies-in-force were in Dade, Broward, Palm Beach, and Monroe counties—all southern, coastal counties most exposed to hurricane risk. Citizens, by statute, is supposed to make its

“best efforts” to procure reinsurance at “reasonable rates” to cover a 1-in-100-year loss.¹³ But it has been analyzed as being able to handle only a 1-in-25-year event (Frank 2010). This is the lowest claims-paying ability of all the states, but Citizens appears to be slowly reversing course by starting to raise rates.

California is the state that is most prepared to cover truly catastrophic loss years. This is because of its higher prices, higher deductibles, greater purchases of reinsurance, and limited geographic coverage. In 2010, it was estimated that the CEA would have claims exceeding its ability to pay only once in 545 years (Pomeroy 2010). This is a dramatic contrast to Florida, which has chosen to offer cheaper insurance and more expansive coverage and is thus gambling with its ability to offer full and timely payments when the next large storm hits. Indeed, to cover losses from 2005, the Florida legislature appropriated \$715 million, but Citizens still had to issue assessments. A state that cross-subsidizes catastrophe insurance, like Florida, can provide wider and larger coverage than California, which has much more limited cross-subsidization.

Florida is not the only program that has required state help. The U.S. Department of Housing and Urban Development permitted Mississippi to use \$30 million in 2006 and \$20 million in 2007 of Community Development Block Grant funds to help the MWUA (GAO 2007). In 2007, the state created a fund to use state tax dollars to help with reinsurance costs. In Louisiana in 2006, the state allowed policyholders facing assessments to deduct them from their income taxes, another form of state subsidy. Although states could improve the ability to cover claims in high-loss years in many ways, most apparently prefer to subsidize high-risk homeowners through assessments and state aid than charge policyholders more.

Do They Merit Federal Support?

Like many other programs, Florida Citizens relies on postevent bonding to pay claims from large events. The 2008 economic downturn, however, raised concerns that Florida would not be able to issue enough bonds to cover losses after a large hurricane. This led Florida Sen. Nelson to introduce the Homeowners’ Defense Act of 2009 and Florida Rep. Klein to introduce a similar bill in the House. The bill would guarantee loans to state catastrophe insurance programs, allow state programs to group together to issue bonds, and create a program of federal reinsurance for state programs.

¹³ Florida Statute 627.351.

The bill has attracted the attention of catastrophe-prone states beyond Florida. The CEO of the CEA testified in support of the House bill, arguing that it would allow the CEA to lower rates and deductibles and thereby increase take-up rates (Pomeroy 2010). The CEA has historically spent 40 percent on average of its revenue on reinsurance, and the CEO believes this was highly profitable for the reinsurance companies while imposing costs on policyholders (Pomeroy 2010). The CEA contends that a federal guarantee for loans would be a cheaper way to finance claims payments. Of course, it might be cheaper for the state, but federal assistance is not free, although a Congressional Budget Office analysis of a similar bill introduced in 2007 estimated that the cost to the federal government associated with loan guarantees and postdisaster loans would be negligible.

Supporters of the bill argue that property insurance prices in places like Florida and California are exorbitant and homeowners need relief. Critics warn of moral hazard problems, if it encourages states to be reckless in their risk taking as well as in their regulation of exposure, such as by underpricing state insurance or allowing lax building codes. Critics also point out that large loans could set the stage for federal bailouts, as with the National Flood Insurance Program. This would ultimately push more of the costs of natural disasters onto the general taxpayer.

An alternative proposal that has been suggested many times is federal reinsurance for either private insurers or state programs. Lewis and Murdoch suggest federal excess-of-loss contracts to insurers (or state programs) to cover the catastrophic layers where there is currently little reinsurance (Lewis and Murdock 1996). Similarly, Litan (2006) proposes a prefunded reinsurance program administered by a quasi-independent group in the Treasury Department. Premiums would be risk based and could be reduced if the entity adopted risk reduction measures. Such programs would take advantage of the government's ability to diversify intertemporally and across the United States (private reinsurance, it should be noted, diversifies internationally) and could have industry-wide triggers (and some equivalent for state programs) to minimize moral hazard. Cutler and Zeckhauser note that federal reinsurance could allow private market functioning for smaller losses, internalize some loss costs that the government has control over, and raise revenues for a service the government may provide anyway (Cutler and Zeckhauser 1999). Critics, however, note that governments face enormous political pressure to lower rates, as can be seen in the flood program, raising concerns that such a program would

crowd out private insurance and lead to inefficient levels of mitigation (Harrington and Niehaus 2001).¹⁴

There seems to be little economic justification for federal intervention in the catastrophe insurance market, and moral hazard is a nontrivial concern. Losses from natural disasters are a function of where and how we build, and when such losses are passed on to others, inefficient decisions will be made. Some federal proposals have tried to address this by coupling federal aid with mitigation requirements. Ultimately, political pressure for lower catastrophe insurance premiums will demand that some costs be borne by those in low-risk areas. That is a tradeoff that will be made in the political arena. If federal intervention can put minimal burdens on the general taxpayer, or could be seen to generate revenue for aid that would have been provided anyway, those in catastrophe-prone states will presumably have an easier time garnering support for a federal program.

Conclusion

This paper has focused on one of the panoply of catastrophic risk management programs in the private and public sector—state programs that write natural catastrophe insurance. These programs were established in response to catastrophes that led private insurance companies to reduce their exposure and raise their rates. Such programs can ensure availability of catastrophe insurance and provide it more cheaply, but to do so, they pass some costs off on other policyholders or taxpayers in the state. It is inescapable that insuring catastrophic risks is expensive.

This raises the question of whether cheaper, more available catastrophe insurance for low-income, high-risk areas provides a public good or is something every homeowner should have access to, no matter where he locates or how she builds. If we, as society, support either proposition, then state programs that offer broad coverage and spread the costs are one mechanism to achieve our goals. If, however, we believe that those who assume higher risks should bear the costs, either for equity or economic efficiency, the design of many state

¹⁴ Jaffee and Russell (2006) argue that federal intervention may be needed to provide temporary liquidity to the insurance industry after major catastrophes, but that a government insurance program could crowd out private firms, and if used at all should have actuarial prices and adequate capital reserves. Cummins (2006) makes similar arguments.

programs falls short. This is not an either-or question; programs must locate themselves on a spectrum balancing affordability, cross-subsidies, and claims-paying ability.

An interesting proposition that has been suggested but is not explored here is that the composition of the boards of directors and other organizational structures of residual market mechanisms influence whether they adopt design choices that truly make the program an insurer of last resort. Boards composed largely of national insurance company representatives may push harder to make the residual market coverage unattractive, whereas when coastal residents make up the board, they will push to have lower rates, expanded coverage, and cross-subsidies to coastal areas. This is a topic worthy of further research.

Many extreme weather events are predicted to increase in frequency and/or severity in certain locations as the climate changes (e.g., Allen and Soden 2008; U.S. Climate Change Science Program 2008). There is growing concern about how climate-induced changes in the loss distributions associated with natural disasters will affect the management—particularly the insurability—of these risks (e.g., Mills 2005; Kunreuther and Michel-Kerjan 2007; Charpentier 2008). Even apart from climate change, increases in population density in coastal areas are driving up exposure to hurricane risks. Both of these trends have made (re)insurers wary and stressed state programs, leading many to agitate for federal intervention. Designing a federal program to support state programs and/or the private market is going to require candidly and carefully asking ourselves who should pay for catastrophe risks, how we believe exposure should change in the coming decades, and how government and institutional structures can help us achieve our risk management goals without introducing perverse incentives and unintended side-effects.

References

- Actuarial Standards Board. 1999. Actuarial Standard of Practice No. 9: Documentation and Disclosure in Property and Casualty Insurance Ratemaking, Loss Reserving, and Valuations. Washington, D.C.: Casualty Committee of the Actuarial Standards Board.
- Allen, R. P., and B. J. Soden. 2008. Atmospheric warming and the amplification of precipitation extremes. *Science* 321(September 12): 1481–84.
- Amy, J. 2010a. Alabama's beach pool likely to seek rate increase as risks, reinsurance costs grow. Al.com. Birmingham, AL.
- Amy, J. 2010b. Farmers insurance to drop wind coverage from 10,000 coastal policyholders. Al.com. Birmingham, AL.
- Associated Press. 2010. Audit questions Louisiana Citizens' Security. *New Orleans City Business*, January 25.
- Carpenter, Guy. 2005. Shifting winds: A review of recent changes in the direction of modelers and rating agencies. Specialty practice briefing. New York, December.
- Charpentier, A. 2008. Insurability of climate risks. *Geneva Papers* 33: 91-109.
- Citizens Property Insurance Corporation Mission Task Force. 2008. Citizens Property Insurance Corporation Mission Task Force final report. Tallahassee.
- Crossett, K. M., T. J. Culliton, et al. 2004. Population trends along the coastal United States: 1980–2008. Washington, D.C.: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service.
- Cummins, J. D. 2006. Should the government provide insurance for catastrophes? *Federal Reserve Bank of St. Louis Review* July/August: 337–56.
- Cutler, D. M., and R. J. Zeckhauser. 1999. Reinsurance for catastrophes and cataclysms. In *The financing of catastrophe risk*, ed. K. A. Froot. Chicago: University of Chicago Press, 233–69.
- Davidson, R. J. J. 1998. Working toward a comprehensive national strategy for funding catastrophe exposure. *Journal of Insurance Regulation* 17(2): 134–70.
- Fineout, G. 2010. Truce reached with State Farm Florida; Citizens Property Insurance Corp. could grow due to deal. *Florida Underwriter*, January.

- Florida Association of Insurance Agents. 2009. Mitigation: A report card on Florida's quest to harden homes. Tallahassee.
- Florida Catastrophic Storm Risk Management Center. 2009. Pre-loss subsidies in the Florida insurance market. Tallahassee: College of Business, Florida State University.
- Florida TaxWatch. 2010. Florida's financial exposure from its "self-insurance" programs: The Citizens Property Insurance Corporation and the Florida Hurricane Catastrophe Fund. Tallahassee: Florida Council of Economic Advisors.
- Frank, J. 2010. Property insurance revamp could favor insurers, lawmaker says. *Miami Herald*, April 18.
- GAO. 2007. Public policy options for changing the federal role in natural catastrophe insurance. Washington, D.C.: U.S. Government Accountability Office.
- Grace, M. F., and R. W. Klein. 2009. The perfect storm: hurricanes, insurance, and regulation. *Risk Management and Insurance Review* 12(1): 81–124.
- Harrington, S. E., and G. Niehaus. 2001. Government insurance, tax policy, and the affordability of catastrophe insurance. *Journal of Insurance Regulation* 19(4): 591–612.
- Hartwig, R. P., and C. Wilkinson. 2007. Residual market property plans: From markets of last resort to markets of first choice. New York: Insurance Information Institute.
- Insurance Information Institute. 2006. Residual markets. New York.
- Insurance Information Institute. 2009a. The California Earthquake Authority. New York.
- Insurance Information Institute. 2009b. Catastrophes: Insurance issues. Issues updates. New York.
- Insurance Journal. 2009. North Carolina House passes beach plan insurance reform measure. July 15. <http://www.insurancejournal.com/news/southeast/2009/07/15/102231.htm>.
- Jaffee, D. M., and T. Russell. 1997. Catastrophe insurance, capital markets, and uninsurable risks. *Journal of Risk and Insurance* 64(2): 205–30.
- Jaffee, D. M., and T. Russell. 2000. Behavioral models of insurance: The case of the California Earthquake Authority. Paper prepared for NBER Insurance Conference.
- Jaffee, D. M., and T. Russell. 2006. Should governments provide catastrophe insurance? *Economists Voice* 3(5).

- Klein, R. 2008. Catastrophe risk and the regulation of property insurance. Atlanta: Center for RMI Research, Georgia State University.
- Klein, R. 2009. Hurricanes and residual market mechanisms. Atlanta: Center for RMI Research, Georgia State University.
- Klein, R. W., and S. Wang. 2007. Catastrophe risk financing in the US and EU: A comparative analysis of alternative regulatory approaches. SCOR-JRI Conference on Insurance, Reinsurance and Capital Market Transformations, Paris.
- Kunreuther, H. C., and E. Michel-Kerjan. 2007. Climate change, insurability of large-scale risks and the emerging liability challenge. *Penn Law Review* 155(6): 1795–842.
- Lehmann, E. 2009. States shed reinsurance and “run naked” through storm risks. ClimateWire.
- Lehrer, E. 2007. South Carolina’s omnibus coastal insurance reform legislation: Baby steps in the right direction. Washington, D.C.: Competitive Enterprise Institute.
- Lewis, C. M., and K. C. Murdock. 1996. The role of government contracts in discretionary reinsurance markets for natural disasters. *Journal of Risk and Insurance* 63(4): 567–97.
- Litan, R. E. 2006. Sharing and reducing the financial risks of future “mega-catastrophes.” In *Issues in Economic Policy*. Washington, D.C.: Brookings Institution.
- Marlett, D. C. 2009. Insuring coastal properties in the mid-Atlantic region. *Journal of Insurance Regulation* 27(3): 91–122.
- Michel-Kerjan, E., and F. Morlaye. 2008. Extreme events, global warming, and insurance-linked securities: How to trigger the “tipping point.” *Geneva Papers* 33: 153–76.
- Milidonis, A., and M. F. Grace. 2007. Tax-deductible pre-event catastrophe loss reserves: The case of Florida. Working paper. Manchester, UK: University of Manchester.
- Mills, E. 2005. Insurance in a climate of change. *Science* 309(August 12): 1040–44.
- Newman, M. E. J. 2005. Power laws, Pareto distributions and Zipf’s law. *Contemporary Physics* 46(5): 323–51.
- Patel, J. 2009. Citizens insurance rates will rise in South Florida by up to 12 percent. *Sun Sentinel*, November 20.
- Patel, P. 2010. Hundreds near water losing coverage. *Houston Chronicle*, Houston, April 13.

- Pomeroy, G. 2010. Testimony before the House Committee on Financial Services. Hearing on Approaches to Mitigating and Managing Natural Catastrophe Risk: H.R.2555, the Homeowners' Defense Act. 111th Congress, 2nd Session, March 10.
- Schoenberg, F. P., R. Peng, et al. 2003. On the distribution of wildfire sizes. *Environmetrics* 14(6): 583–92.
- Scism, L. 2009. Insurance pool's coverage to coastal Carolina ebbs. *Wall Street Journal*, September 14.
- State Board of Administration of Florida. 2008. Florida hurricane catastrophe fund fiscal year 2007-2008 annual report. Tallahassee: Florida Hurricane Catastrophe Fund.
- Tom, P.-A. 2010. Hawaii Senate committee OKs using hurricane relief fund to end furloughs. *Insurance Journal*.
- U.S. Climate Change Science Program. 2008. Weather and climate extremes in a changing climate. Washington, D.C.: U.S. Climate Change Science Program.