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POLICY UNCERTAINTY AND THE MARKET FOR WIND INSURANCE

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1. Introduction

On August 29, 2005, Hurricane Katrina struck the Gulf Coast, resulting in over 1,000 deaths, the most of any hurricane in the United States in over 75 years, and a record $40 billion in insured losses. In addition, Katrina caused $18 billion in losses to the National Flood Insurance Program (NFIP), leaving the program bankrupt. In the aftermath of Katrina, many state residual markets for property insurance have experienced considerable growth. Residual markets are designed to serve as an insurer of last resort to enable homeowners and businesses to secure required insurance even during periodic fluctuations in the market. Seven states have dedicated residual markets for wind insurance, or wind pools, and a number of these state-supported entities have grown past any role as an insurer of last resort and become a means of providing subsidized insurance to coastal residents (Pompe and Rinehart 2009). In addition, all but two Atlantic coast states which do not have wind pools have general residual markets, or Fair Access to Insurance Requirement (FAIR) plans, which provide coverage for coastal properties, among others.

Figures 1 and 2 display the growth experienced by the state wind pools in North Carolina and Texas since Hurricane Katrina. The Texas Windstorm Insurance Association (TWIA) has quadrupled in size since 2001, and the growth has been particularly rapid since 2005, with a 151 percent increase in total liability in force between 2005 and 2007. The North Carolina Insurance Underwriting Association has experience a 157 percent increase in policies in force and a quadrupling of liability in force between 2003 and the end of 2008. Property-casualty insurance is subject to a well-recognized cycle, and catastrophic losses tend to lead insurers to write less new insurance and raise rates for existing policy holders to replenish reserves (Born and Viscusi

2006). But the reduction in insurance availability in the Atlantic and Gulf coast is alleged to go much beyond a cycle, and has been widely described as companies "abandoning" coastal areas (Taylor 2008). Some observers now question if hurricane risk is even insurable. The announced exit of State Farm, the nation's largest insurer, from the Florida homeowner's market in January 2009 symbolizes this abandoning of the coast. The 110th and 111th Congresses considered legislation to extend the NFIP to cover wind insurance as well.

The above discussion suggests that the decrease in wind coverage in coastal areas following Katrina is due to market inefficiency, which some might attribute to excessive concern by insurance companies about ensuring a sufficiently high profit margin. But at least two alternative explanations for the increase in state residual market coverage exist. First, insurers could be writing less insurance in response to new information about expected hurricane losses. Hurricanes occur infrequently and have the potential to result in extremely large, correlated losses, which creates the difficulty of insuring against catastrophes. But the infrequency of major hurricane landfalls also means that actuaries, engineers, and catastrophe-risk modelers rarely get to learn about the determinants of hurricane losses. By contrast, insurers learn about losses in auto accidents or hail storms every year. Insurance companies may have revised upward their expectation of losses in future hurricanes based on storms of 2005, resulting in a desire to charge higher rates. If regulators refuse to permit rates to rise, the reduced availability of insurance is simply a price ceiling induced shortage.

Second, the actions of insurance regulators and other policy makers may be generating policy uncertainty regarding future costs. State insurance commissions regulate rates and contracts and take actions for a variety of political purposes. Many of these actions increase costs directly for insurers, but also generate uncertainty regarding future policy decisions, and

this policy uncertainty, in the spirit of Robert Higgs' (1997) regime uncertainty, increases the potential for even more costly actions in the future. While increase in costs in the first alternative is largely unavoidable, the costs and uncertainty due to bad policy decisions are in theory avoidable, if not politically feasible.

This paper is organized as follows. Section 2 discusses the conventional wisdom regarding the flight of insurance companies from coastal areas and interprets the flight in terms of economic models of herding. Section 3 discusses the first alternative explanation, that the hurricanes of 2004–05 increased expected losses from future hurricanes. Specifically, these seasons highlighted the potential for two major hurricanes to strike population centers along the U. S. coast in the same season, and the need for insurance companies to prepare for such an event. Section 4 discusses the concept of policy uncertainty and discusses specific sources of uncertainty from 2005, including litigation by state regulators against leading insurers. Section 5 examines changes in the premiums written by leading insurance companies in coastal states between 2005 and 2007 for evidence of herding. The analysis undermines both the abandonment of the market of coastal states by leading insurers and herding, as changes in underwriting by insurers across coastal states are basically uncorrelated. By contrast, herding predicts positive correlation in premiums among herders. Section 6 concludes. The logic of concentrated benefits and dispersed costs suggests that state policy makers will respond to the demands of coastal residents following hurricanes, and these time inconsistent actions imply that policy uncertainty will be pervasive. Federal regulation may be one way to tie the hands of state policy makers and create a more market-friendly environment for wind insurance.

2. Herding and Inefficient Exit of Insurers

Insurance companies from Texas to Cape Cod reduced their exposure in high-risk coastal areas after Katrina. Insurance companies may want to revise their book of business in the aftermath of a major hurricane for numerous reasons; an insurer might suffer heavy losses and temporarily experience loss of capacity or ability to pay claims, or realize they have more exposure than desired in high-risk coastal areas. The reduction in capacity following a catastrophe is part of the well-recognized cycle (Born and Viscusi 2006). The market response following Katrina has been attributed to much more than an adjustment process in which some companies reduce their exposure while others take advantage of this opportunity to expand their business. U. S. Representative Gene Taylor (D, Mississippi) describes the situation as follows:

> In the aftermath of Hurricane Katrina, the insurance industry has proven beyond all doubt that the private insurance market is not capable of offering adequate coverage in coastal communities. The insurance and reinsurance industries have a well-developed pattern of exploiting the market conditions after a major catastrophe to simultaneously reduce the risk while hiking up their premiums . . . . Insurance companies have blamed Katrina as they have stopped writing new policies and doubled, tripled, or quadrupled premiums on existing policies. They have not confined this price gouging to Mississippi and Louisiana, but have jacked up premiums and reduced coastal risk from the Texas Coast to Long Island and Cape Cod (Taylor 2008, p.788).

The alleged mass exodus of leading insurers from coastal markets has been attributed to greed, and has led some observers to question if hurricanes may now be uninsurable.[1]

Inefficient abandonment of coastal markets would be easier to explain if homeowners insurance markets were highly concentrated. If a handful of companies wrote all of the insurance, perhaps an insurance cartel could be manipulating the market. But considerable competition or potential competition exists in homeowners insurance markets of all coastal

[1] Insurability refers to the potential for insurers to pool risk and sell coverage at a premium which people would purchase (Kunreuther 1998).

states. If companies with a one percent share of premiums in the market are considered competitors, then the number of competitors in the 18 Atlantic and Gulf Coast states ranged from 13 to 28, with an average of 18.4.[2] And other companies write insurance in these states and could take advantage if leading insurers abandoned a profitable market. The number of potential competitors, companies with one-tenth of 1 percent of homeowners premiums in 2007, ranged from 31 to more than 50 with an average of 43.1. In addition, other companies write insurance for commercial property in these states. Even though commercial property specialists may have greater expertise in underwriting commercial risks, they possess knowledge of risks in the state and have agents and adjusters who could facilitate an entry into the residential market if the exit of other insurers opens up a profitable opportunity.

With so many actual and potential participants, it is unlikely that all insurers would simply miscalculate the cost of underwriting in the aftermath of the 2005 hurricane season. To provide a perspective on this, consider the following model. Assume that each insurance company received private information after Katrina regarding the change in the cost of writing coastal insurance; let c_i be the signal received by firm i, which can be interpreted as the percentage increase in premiums required (a decrease if negative). The signal reflects the analysis provided by the firm's actuaries, underwriters, engineers, and risk modelers. Experts are not omniscient, and thus the information a firm receives regarding the cost change is noisy, and can be modeled as probabilistically distributed. Thus if c is the true cost increase, firm i's signal would be $c_i = c + ,_i$, where $,_i$ is the error in firm's i's estimate of the cost change. Although each firm can make a mistake, convention in economic modeling suggests that on

[2] The premium data analyzed in this paper was assembled by the Insurance Information

average experts are correct, or that the mean of ε_i is zero for each firm. The aggregation of the signals provide society's best-available estimate of the cost of insurance (the Wisdom of Crowds argument) and the power of the crowd depends on the independence of each firm's cost estimate. If only three of four companies wrote insurance, the probability that each might independently receive an incorrect signal that the cost of future hurricanes had risen, while not large, certainly would not be zero. But as established above, at least 18 companies have a 1 percent or greater share of the market in each state, so the probability that all these insurers receive the same mistaken information signal that costs had risen dramatically is very small.[3]

Nonetheless, firms may not act on their private information regarding costs in setting rates or reducing insurance written in coastal states. Each firm takes a publicly observed action (requesting a rate increase, not writing new policies) based on its private information and the observed actions of other firms, which presumably reflects their private information. The potential exists in models with private information and public actions for asymmetric information, information cascades, or herding. These possibilities arise because managers know that their information could be wrong and try to update their assessment based on the information of others, as revealed through actions. In an information cascade, firms use the actions of other firms to update their own information (Bikhchandi, Hirshleifer, and Welch 1992, Banerjee 1992). Actions by others at odds with the firm's own signal can indicate to managers

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Institute and is available at www.iii.org/.

[3] The signals received by each insurance company could be correlated, as actuaries at different firms will have received much of the same formal training, will receive some of the same information (building performance assessments), and communicate with each other. If the signals are perfectly correlated, then the independence of the individual assessments required for information aggregation fails to hold. Partial correlation can be introduced by decomposing the information signal of each firm into a common signal received by all and a firm specific

that their own signal is erroneous. But when firms discount their own information, early signals are propagated, and subsequent firms become even less likely to follow their own information when it differs from the observed actions of others. If the early choosers happen to be wrong, an inefficient decision by the group results. One possibility is asymmetric information, that some firms might be recognized to have higher quality information than others, or noise in their signal ε_i would have a smaller variance. In models of asymmetric information, the actions (and information) of the best-informed firms will carry disproportionate weight, potentially canceling out contradictory information received by other firms. In the instances when the most-informed firm happens to be wrong, others follow along, although if anyone knew the private information of all firms, the error would become apparent. Herding can also arise due to managers' incentives (Scharfsetin and Stein 1990). Mistakes hurt a manager's reputation, but not all mistakes are equally costly. When a manager takes an action at odds with other firms which turns out to be wrong, this will hurt a manager's reputation. On the other hand, a mistake in common with others (when following the herd) does much less damage to one's reputation. Thus once firms start herding, managers might become very reluctant to follow their private information even when this differs from the actions of others.

Economic models of asymmetric information, cascades, and herding provide a framework for inefficient exit of insurers from coastal markets. For one reason or another, a large insurer chooses to reduce their book of business in coastal states. Even if this decision is optimal for this firm (if firms are heterogeneous and the same information about costs or risks could lead firms to respond differently), other insurers interpret this as evidence that coastal insurance is now too costly or risky to write. Other insurers will ignore their private information

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component.

and join the exodus. The failure of the private market drives coastal property owners into the state residual market. State policy counters market inefficiency in two ways: by providing a much needed insurer of last resort and by stemming inefficient herding by insurers.

3. Changing Circumstances and Regulation

Inefficient herding is not the only possible explanation for a decline in the availability of insurance after Katrina. Catastrophe insurance differs from ordinary types of insurance in two ways. First, in contrast with normal types of risks where the probability of loss across policy holders is independent, hurricane risk is correlated, making wind insurance in coastal areas much more costly. But the infrequency of major hurricanes or earthquakes also means that insurance companies only get to learn about these losses infrequently. Major hurricanes can stress the global insurance market, but also allow engineers and actuaries to learn valuable new information about losses. Hurricane Andrew in 1992 was the first major hurricane to significantly impact the United States in about two decades. And the 2004–05 hurricane seasons were the next major hurricane events for the United States. Major hurricanes provide a learning experience, and insurers often learn that they have not been properly estimating losses and have to adjust rates accordingly. That is, firms could all receive signals c_i that costs have gone up, and the signals could be correct.

Hurricane Andrew provides an important example of learning from a hurricane. South Florida had one of the strictest building codes in the nation in the 1970s and 1980s. This should not surprise given Florida's hurricane risk and the historical examples of the Great Miami Hurricane of 1926 and the Lake Okeechobee hurricane of 1928, the second-deadliest hurricane in U. S. history. Investigation of damage after Andrew revealed a surprising fact: Newer homes and subdivisions suffered more damage than older subdivisions, everything else equal (Fronstin

and Holtman 1994). Further investigation revealed that communities had been poorly enforcing the South Florida Building Code, for instance by certifying building materials and techniques as meeting the code despite their inadequacy, and hiring too few building inspectors. Eventually 25 percent of damage in Andrew was attributed to poor code enforcement (Mileti 1999, pp.).[4] Insurers who had been charging rates based on the presumption that construction was to code learned that their rates were inadequate. If regulators restrict premiums from rising, the normal effect of a price ceiling will produce a crisis of availability. Thus, new information leading insurers to want to raise rates combined with rate regulation can result in the reduction in the availability of insurance as herding.

Katrina provided several lessons which might lead insurers to want to raise rates. The 2004–05 hurricane seasons each involved landfalls of three major hurricanes in the continental United States.[5] As a consequence of this, rating companies determined that insurers needed to be prepared to meet a higher level of claims than previously anticipated, with the potential for a hurricane season with $100 billion in insured losses looming on the horizon. This change in required preparations meant that companies needed to build up additional reserves and purchase more reinsurance, which created pressure to raise rates or alternatively reduce exposure in coastal areas (Grace, Klein, and Lin 2006). The requirement certainly seems prudent in the aftermath of the 2005 hurricane season, when New Orleans and the Mississippi coast were struck

[4] Studies after the Northridge Earthquke in 1994 also revealed that a substantial portion of the damage was due to poor building code enforcement (Mileti 1999), demonstrating that insurers could not dismiss the issue of enforcement as isolated.

[5] A major hurricane has a rating of 3, 4 or 5 on the Safir-Simpson scale of hurricane intensity. The scale rates hurricanes from 1 to 5. The winds of a category 3 hurricane are 111 mph or greater. For more on the Safir-Simpson scale see

by Katrina, Rita approached the Houston-Galveston area as a Category 5 storm, and Wilma struck South Florida after attaining the lowest barometric pressure ever for a hurricane in the Western Carribean. While rating agencies are often reviled as the bearers of bad news, they play an indispensable role in disciplining financial markets and hopefully providing sober analysis unaffected by the wishful political thinking.

Demand for repair services and building material naturally rises after a major hurricane, and this increases prices for building supplies and contractors, increasing the cost of repairs relative to a more even spacing of demand over time. A major hurricane will tax capacity in the construction industry, so some escalation in cost is inevitable. The cost of repairs can be greater if not completed quickly, that is, damage from wind, rain and heat continues to mount until repairs are completed. The cost of claims will rise if a home is uninhabitable and the policyholder has coverage for alternative living expenses. For reasons which are not yet clear, demand surge appears to be worsening (Pielke et al. 2008), increasing expected costs in future hurricanes. Government policy may play a role. States license contractors and this can limit the flow of out-of-state contractors after a hurricane affected zone.[6]

The potential for increased hurricane activity in the future is increasing expected costs for insurers, or at least contributed to growing loss ambiguity. Some leading atmospheric scientists argued for a possible link between climate change and global warming and increased hurricane activity and intensity during the 2005 hurricane season, and although the claim is controversial; at a minimum Atlantic hurricane activity is in the active phase of a decades-long natural

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http://www.nhc.noaa.gov/aboutsshs.html.

[6] Florida relaxed its restrictions on out-of-state contractors after the 2004 and 2005 hurricanes, without any adverse consequences, as examined by Skarbek (2008).

oscillation.[7] And even if the global warming turns out unfounded, disagreement among experts creates ambiguity which increases the rates underwriters charge (Kunreuther et al. 1995). Some increase in rates today is prudent since insurers would be irresponsible to ignore totally experts predicting more destructive from hurricanes in the future. The insurance premiums established during the period of low tropical activity in the Atlantic in the 1970s, 1980s, and 1990s are inadequate given the recent upswing in hurricane activity.

4. State Actions and Policy Uncertainty

Politicians cannot lower the real resource cost of economic activity. If the expected damage from hurricanes has increased, insurance rates will have to rise in the absence of subsidies, a simple point which many observers none the less try to ignore, as Grace et al. (2006) note. State insurance departments and other state officials, however, took actions in the aftermath of Katrina and other hurricanes which have unnecessarily increased costs. And perhaps more significantly, these actions have contributed to policy uncertainty in state property-casualty insurance markets. Policy uncertainty increases ambiguity and the cost of writing wind insurance in hurricane-prone states. I use the term policy uncertainty to draw on Higgs' (1997) concept of regime uncertainty. Higgs introduced regime uncertainty to explain the failure of private investment to recover during the New Deal and thus the persistence of The Great Depression. New Deal policies created "uncertainty among investors about the security of their property rights in their capital and its prospective returns. This uncertainty arose, especially

[7] For scientific papers on the link between recent hurricane activity and global warming see Emanuel (2005, 2008) and Webster et al. (2005). For dissenting views see Pielke et al. (2005), Klotzbach (2006), and Klotzbach and Gray (2006).

though not exclusively, from the character of federal government actions . . ." (1997, pp.563–4). The crucial element of regime uncertainty is the potential for actions which may never occur to disrupt markets. As Higgs describes,

> In retrospect it seems hyperbolic to put much weight on the fears of investors in the latter half of the 1930s that the regime might soon undergo changes that would seriously jeopardize their private property rights—after all, we know quite well that the U. S. economy did not fall into outright fascism, socialism, or some other variant of government takeover . . . . But what seems so obvious to us in retrospect had a quite different appearance to many contemporaries . . . the possibility that the United States might undergo an extreme regime shift seemed to many investors in the late 1930s and early 1940s not only possible but likely (569).

The policy measures discussed below affect the insurance market directly by raising costs and indirectly by creating the specter of more cost increasing actions in the future. I do not mean to imply that insurers fear the attenuation of property rights which Higgs considered possible in the New Deal, and thus I use the more modest term policy uncertainty, but I still wish to emphasize the prospect of future actions to affect insurer behavior today. Carden (2009) has applied regime uncertainty to explain the impact of price gouging laws and rhetoric in the aftermath of Katrina.

Perhaps the most-noted insurance policy action after Katrina was the state of Mississippi's litigation to force insurance companies to pay for storm surge damage from Katrina. Storm surge has been an excluded peril under homeowners insurance since before the advent of the National Flood Insurance Program (NFIP) in 1968. The state's action was undoubtedly spurred by the low rate of purchase of flood insurance along the Mississippi coast, and thus thousands of constituents with wrecked homes and no insurance. The low coverage limit under the NFIP of $250,000 also contributed to the dilemma as many other coastal homes were not be fully insured. Mississippi tried to force insurance companies to pay for losses they had not expected to pay. The attorney general's argument was more sophisticated and involved

wind damage a property might have suffered before the storm surge arrived. Thousands of homes were completely washed away by the storm surge, making a definite determination of how much wind damage might have occurred prior to the storm surge impossible. The inability to prove whether homes were damaged by wind prior to the storm surge provided an opportunity for politicians to try to provide relief for uninsured or underinsured constituents by shifting costs to insurers (Binderup 2006).

Mississippi was not the only state to litigate after the 2005 hurricane season. Hurricane Rita prompted the evacuation of an estimated 1.5 million persons from the Houston area before striking along the Texas-Louisiana border as a Category 3 storm. The evacuation for Rita was possibly more costly than the storm itself, given the time of people spent in the massive traffic jams, the disruption of economic activity during the evacuation, and a bus accident which killed 20 evacuating nursing home patients. Many homeowners' insurance policies include coverage for alternative living expenses when storm damage forces residents out of their homes, but this coverage applies only when the property is damaged. Policyholders who either could not return to their undamaged homes quickly after Rita or who elected to stay out of their homes due to power outages filed claims for their living expenses. The Texas Department of Insurance intervened on behalf of the policyholders, first issuing an injunction to force Allstate to pay the claims and then suing to force payment of these claims. A state court ruled in Allstate's favor in January 2006 (*Insurance Journal*, 1/26/2006).

Other insurance policy decisions contribute to market uncertainty. State regulators often limit the ability of insurers to reduce the amount of insurance they write or exit the state market after a hurricane. The Florida Department of Insurance imposed a moratorium on cancellation, nonrenewal, and withdrawal from the state for more than a year after Hurricane Andrew and the

state legislature extended the restriction through November 1996 (Lecomte and Gahagan 1998). Both Louisiana and Mississippi restricted the nonrenewal of policies following Katrina. In Louisiana, Rule #23 enacted restricted cancellation or nonrenewal of policies, and remained in effect until December 31, 2006. In Mississippi, Commissioner George Dale issued Bulletin 2005-13 restricting cancellation or nonrenewal of policies, which was extended in January 2006. Restrictions on reducing a company's book of business contribute to policy uncertainty, because in the wake of new information demonstrating the need for higher rates and in the face of regulator opposition to rate increases, writing less insurance becomes the only option available to insurers. Yet, regulators often foreclose the exit option when needed by companies. An inability to reduce a company's book of business makes the initial writing of insurance less attractive (Lecomte and Gahagan 1998).

Assessments imposed as a consequence of government intervention into the insurance market contribute to uncertainty as well. State-sponsored residual markets for wind coverage are the primary form of assessment in costal states. The wind pools offer subsidized coverage for high-risk properties in coastal areas, and seven states from Texas to North Carolina have dedicated residual market mechanisms for wind insurance. The inadequacy of rates ensures that the state wind pools will run deficits when major hurricanes strike. The pools assess member companies to cover the deficits, and all membership in the pool is a condition of writing insurance in the state. The assessments function as the economic equivalent of an excise tax on insurance premiums, except that the tax is only imposed after a hurricane, and for an amount unspecified in advance. Florida, Louisiana, Mississippi, and Texas all assessed their state insurers due to the 2005 hurricanes. Wind pools are not the only source of hurricane-related assessments. All states have guaranty funds for state insurance companies to ensure payment of

claims against insolvent insurers. Guaranty funds have a similar ability to assess state insurers in case of a deficit. The correlated risk of a hurricane creates a danger of failure for insurers and the potential for guaranty fund assessments. Nine insurers failed in Florida after Andrew (Lecomte and Gahagan 1998), and the Poe Insurance Group companies failed following the 2004–05 hurricanes. The Florida Guaranty Fund imposed assessments of $225 million due to the failure of the Poe Group. And the state of Florida has entered the reinsurance business through the Florida Hurricane Catastrophe Fund, or the Cat Fund, which provides reinsurance to insurance companies in the state, including Florida Citizens (the state wind pool), at below market rates. Providing reinsurance at subsidized rates ensures the availability of deficits when a major hurricane strikes, again covered by assessments on state insurers. The Cat Fund imposed a 1 percent assessment to remedy its shortfall after the 2004–05 hurricanes. Assessments contribute to policy uncertainty, since they are unspecified in advance and can be potentially quite large. The Texas Windstorm Insurance Association (TWIA) literally relies on unlimited assessments after a modes amount of reinsurance coverage; TWIA had already reached its layer of unlimited assessments after Hurricane Ike.[8] States typically allow insurers to recoup assessments by surcharges on policy holders or by crediting assessments against state insurance taxes, but neither mechanism offers particularly effective relief. In states like Texas which allow tax offsets, companies can only get relief up to the maximum taxes paid in a given year, so assessments from a major hurricane would take years to recoup in tax offsets. And the incidence of a surcharge on policyholders to pass on assessments depends on the elasticities of supply and demand, as with any commodity tax. Assessments comprise a threat to the viability of insurers;

[8] "Hurricane Ike Fact Sheet" from the Texas Windstorm Insurance Association, available

one company in Florida failed due to the assessments from Hurricane Andrew, while insurers in Texas purchase reinsurance to cover their potentially unlimited assessments from the state wind pool.

The exclusion of flood losses from homeowners insurance and coverage through the NFIP is another source of uncertainty. The separation of flood and wind coverage and the ensuing flood—no flood tango creates considerable uncertainty for policy holders who may have to wait for coverage or may find out that losses will not be covered if this property is under-insured for floods (Chamlee-Wright 2007). But the tango also contributes to uncertainty for companies. Attributing damage to wind or water is at a minimum very costly and is simply impossible when storm surge totally washes a structure away. Because engineering studies will prove inconclusive, politics can affect the allocation of losses to flood and wind policies, leaving insurers unsure what portion of losses they may have to pay in the next hurricane. After Katrina, the federal government encouraged a speedy payment of claims, and thus the NFIP was instructed to pay claims without a firm determination that losses were caused by flooding or storm surge. But after allegations that insurers shifted wind losses to federal taxpayers, insurers might face a different attitude on the part of federal officials next time. Also, state politicians have an incentive to help out flood under-insured constituents by forcing insurers to cover these losses, as Mississippi officials attempted through their litigation after Katrina. State-sponsored wind pools can also be forced to take on these losses, with the costs passed on to insurers through larger assessments.

State regulators also take actions which while not directly related to hurricane losses and wind coverage contribute to policy uncertainty. For example, Connecticut regulators in 2006

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at www.tdi.state.tx.us/consumer/storms/documents/windfactsheet.pdf.

prevented companies from making the installation of hurricane shutters—metal coverings for doors and windows to prevent damage from wind-blown debris—a requirement for coverage. Hurricane shutters reduce wind damage, and insurers may seek to reduce their potential for large losses by insuring only well-built homes. The mold crisis in Texas also illustrates the potential for contractual uncertainty. Claims for mold damage to homes skyrocketed after a state court held in 1999 that mold was a covered peril under the standard Texas homeowners' policy. Insurers attempted to substitute language used in other states to exclude mold coverage, but the Texas Department of Insurance refused for several years to approve the new contract. In the interim, insurance companies paid out $900 million in mold claims, and the number of companies writing home owners insurance in the state fell from 137 to 101. The state faced a crisis of availability of insurance similar to that in coastal areas following Katrina. The mold crisis ended quickly in 2002, after the state finally approved the new form excluding mold coverage (Peacock 2008). While not directly on point for hurricanes, actions such as this must suggest to insurers that policy makers might similarly accommodate an expansion of coverage after a hurricane. And as mentioned, the Texas Department of Insurance did try to force Allstate to cover alternative living expenses for policy holders whose homes were not damaged in Hurricane Rita.

Finally, the role of post-hurricane litigation must be mentioned. Insurance is a complicated contract, and disputes will inevitably result following a major hurricane, and thus some litigation is inevitable. But suing insurance companies has become growth area for trial lawyers, especially in cases where homes have suffered storm-surge damage, creating ambiguity regarding the source of losses. Hundreds of suits were filed in state and federal courts following

Hurricane Katrina.[9] If anything, lawyers are becoming more aggressive in recruiting policy holders, based on comparisons in the aftermath of Hurricanes Rita and Ike on the Texas coast. Litigation plays an indispensable role in the market process, but hurricane claims appear to be one area where excessive litigation is negatively affecting society. The costs of litigation and potentially erroneous jury awards contribute to the uncertainty of insurance against homeowners.

5. Herding or Calculated Exit? Evidence from Coastal Homeowners Insurance Markets

Does inefficient herding by private insurers explain the growth of wind coverage in residual markets since 2005? To provide evidence on this, I now examine the change in premiums written by the top 50 insurance companies in the 18 Atlantic and Gulf Coast states between 2005 and 2007. Premiums written by a company in a year in a state is a measure of revenue and not the quantity of insurance. Higher rates could increase premiums written even if fewer policies being written. Premiums could also go up if coverage limits increased or deductibles decreased on existing policies. To closer approximate a change in quantity between 2005 and 2007, I adjust the company's 2005 premiums written by the percentage change in total state homeowners premiums between 2005 and 2007. For example, total premiums written in Alabama increased by 14.1 percent between 2005 and 2007, from $1.006 billion to $1.147 billion. If the total premiums written by a company in Alabama increase by less than 14.1 percent, the company has reduced its coverage in the state, at least relative to the average increase in the state. For each company, 2005 premiums were multiplied by this change in state premiums to create a projected premium written in 2007; Change in Premiums is the percentage

[9] For an overview of the highlights of these cases see Binderup (2006).

difference between actual 2007 premiums and projected 2007 premiums. A negative value of Change in Premiums indicates that a company has reduced coverage in a state since Katrina. Overall premiums written by private insurers in the 18 coastal states increased by 15.8 percent between 2005 and 2007, with the percentage increases by state ranging from 6.5 percent in Maryland to 26.6 percent in Florida. Table 1 includes detailed definitions and sources for the variables employed here.

I will focus on the behavior of large insurers. I include the eight of the ten largest property and casualty insurers who extensively write homeowners insurance (GEICO and Progressive are excluded), plus two companies (USAA and Chubb & Son) which write insurance in all of these coastal states and have a good sized share of the market in at least several (USAA and Chubb & Son). Figure 1 reports for each of the ten companies how many of the 18 coastal states in which they have increased their coverage, based on a positive value of Change in Premiums for the company in a state. As a group the leading insurers have not abandoned the markets in the Atlantic and Gulf Coast states, as each insurer has increased their premiums in at least 5 of the 18 states. State Farm and Allstate reduced their market share in more than half of the states, so these two companies at least partially fit the popular description. Of course, these totals are based on premiums written throughout a state, not just the coastal counties of these states.

Table 2 describes some elements of the insurance market in these states. The table reports the number of companies with a market share of at least 1 percent of premiums in 2007, the Herfindahl-Hirschman Index (HHI), the number of new entrants in the state homeowners market since 2005, and the number of companies (out of the ten examined) with a positive Change in Premiums. The first two columns reveal that the more hurricane exposed coastal

states have less competitive homeowners insurance markets, with the exception of Florida, which has the largest number of companies with at least a 1 percent market share and a low HHI of 699. The HHI in other Gulf Coast states range from 1410 to 1553. Yet even these states are in the moderately concentrated range as characterized by the federal merger guidelines (Department of Justice and Federal Trade Commission 1997). So competition exists in all of the coastal states. A total of 45 new entries have occurred in these states (some of which are the same company in more than one state), with a total of 9 in Florida and Texas. And no state has been abandoned by the leading insurers, as at least five companies have increased their premiums written relative to growth in state premiums in each of the 18 coastal states.

Herding in the extreme, as come commentators have described the post-Katrina coastal insurance market, implies that all top insurers would be seeking to leave the homeowners' markets in these states, and if not all coastal states, at least the Gulf Coast states affected by the hurricanes of 2005. Table 2 clearly rejects this strong form of herding, as at least five of the ten companies have expanded coverage in each of the 18 states. Herding also implies that the market actions of firms should be positively correlated, so when for example State Farm decides to reduce exposure in a state, Allstate and others will as well. Herding does not necessarily imply that insurers leave all coastal states, but we should see a large positive correlation between members of the herd. Table 3 presents the correlation coefficients for Change in Premiums across the 18 states for all of the pairs of insurers. Little evidence of herding emerges. The change in premiums written for State Farm and Allstate are negatively correlated, at -.23, so these two leading insurers tend to adjust market share in opposite directions. Four correlations exceed a threshold of +.50, between State Farm and AIG at +.69 (admittedly the nation's two largest insurers) and each of the correlations between Allstate, Traveller's, and Nationwide. But

this appears to be the extent of the herd. State Farm and AIG are negatively correlated with each of the latter three companies. Overall, only 20 and 44 correlations between pairs of companies are positive. No clear leader of a herd is apparent, and thus market reactions seem to be largely based on independent private information regarding firm specific effects of a changing environment.

To search further for patterns in the market responses of insurers to Hurricane Katrina, table 4 presents regression analysis of Change in Premiums for the ten leading insurers across the 18 coastal states. The base regressions estimate Change in Premiums on a constant, hurricane exposure in a state, and the company's share of homeowner's premiums in 2005, with company dummy variables included but not reported in the second specification. The exposure variable combines the proportion of coastal property in a state multiplied by the probability of a major hurricane, constructed from return periods estimated by the National Hurricane Center. Overall the models explain little of the variation in Change in Premiums, with adjusted R^{2}'s less than 0.06, and the entire regression significant at only the 5 percent level. The only variable which attains significance in these regressions is the firm's share of homeowners' premiums in 2005, with a negative sign (which is consistent across specifications when not significant). Firms which had a larger market share in 2005 tended to reduce their coverage written, which could be due to over exposure given the recognition of the potential for multiple major hurricane strikes in the same season in the aftermath of the 2004–05 seasons. Greater hurricane exposure reduces coverage in each specification but fails to attain significance at the 0.10 level; this variable would be significant in each case at the 0.10 level in a one-tailed test. The negative sign suggests that companies reduced insurance in states with more vulnerability to a major hurricane, but this is only a suggestion given the lack of significance. The final two specifications add three variables

controlling for characteristics of state insurance markets which might affect large insurers' willingness to write coverage. The variables are the grade assigned to the state's property-casualty market regulatory structure by the Competitive Enterprise Institute and Heartland Foundation (converted to a 4.0 scale with A = 4, B = 3, C = 2, D = 1, and F = 0), a dummy variable which indicates if a state has an elected insurance commissioner in 2007, and a dummy variable which equals one if the state has a wind pool or not.[10] None of these variables approach significance and are jointly insignificant as well.

6. Conclusion

Critics have alleged that the nation's leading insurers are turning their backs on hurricane-exposed coastal states, unwilling to risk high profit margins to provide coverage needed by millions of Americans. While some of this criticism can be dismissed as populist rhetoric, the charge can be given a basis in economic models of herding. The models show that in some circumstances, parties will ignore their private information and follow the herd, for several different reasons. Although crowds are generally wise, herding can inefficiently block the revelation of information insurance companies might possess regarding the costs of writing coverage in high-risk coastal areas. If insurance markets are prone to frequent, inefficient herding, policy makers are wise to provide a public insurer of last resort and regulators might be able to prevent panicked exit by insurers after a hurricane. But inefficient herding is not the only possible explanation for a shortage of coverage in the private market in the aftermath of

[10] The coastal states with elected commissioners are Delaware, Georgia, Louisiana, Mississippi, and North Carolina. Alabama, Florida, Louisiana, Mississippi, North Carolina, South Carolina, and Texas have dedicated wind pools.

Hurricane Katrina. Enforcing below-market premiums through regulation can easily result in a shortage as would any price ceiling. And regulators could contribute to exit from the market through adverse actions and the resulting policy uncertainty.

Does inefficient herding explain developments in coastal state insurance markets since Katrina? Although a definitive test is not possible (almost any observed pattern could also coincide with efficient exit due to higher risk or cost), major insurers have not abandoned the homeowners' insurance markets of coastal states. At least five out of ten leading insurers have increased their premiums in each coastal state. Herding would imply a high positive correlation between the change in premiums of herding insurers, yet changes in premiums between insurers across states are basically uncorrelated. I find some evidence that insurers with especially large market shares have tended to reduce insurance written, but a scaling back by a few over-exposed companies does not constitute a stampede out of these markets. I have documented a number of questionable actions by state policy makers which have either unnecessarily increased insurers' costs and contributed to policy uncertainty, which should reduce the willingness of insurers to write coverage for fear of regulators' future blunders.

Many of the policy actions which undermine genuine markets for hurricane insurance seem almost inevitable politically. The law of concentrated benefits and diffuse costs is one of the fundamental propositions of public choice. Coastal residents benefit handsomely from subsidized insurance and other regulatory measures, while the costs are spread out over the much more numerous insurance policy holders or taxpayers in a state. State politicians seem inevitably destined to use whatever discretion they possess to benefit coastal constituents, even if these actions in the long run undermine a tenable market for hurricane insurance. Policy uncertainty

seems to be an inevitable consequence of time inconsistent state insurance regulation.[11] If this is so, a solution to the dilemma will be difficult. Shifting regulation to the federal government may address the problem. One the one hand, the costs of coastal insurance subsidies and other poor policies will be even more widely dispersed, which might worsen the problem. But federal regulation might restrict the local discretion; members of Congress from coastal states will try to shape regulation, but may lack discretionary control over regulatory decisions. It may be easier to tie the hands of a federal regulator than state regulators.

[11] On the political economy of insurance regulation, see Meier (1991).

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Table 1: Variable Definitions and Sources

Variable	*Definition and Source*
Change in Premiums	Percentage difference between actual premiums and projected premiums for the company in 2007 based on 2005 premiums and percentage change in total state homeowners premiums between 2005 and 2007; source is the Insurance Information Institute.
Exposure	Proportion of property in state which has coastal exposure multiplied by the probability of a landfall of a major hurricane; sources Insurance Information Institute and National Hurricane Center.
Market Share	Proportion of homeowners insurance premiums in state in 2005.
CEI Grade	Letter grade for state's property-casualty insurance market assigned by the Competitive Enterprise Institute and the Heartland Institute, letter grades converted to a 4.0 scale, with 4 for A, 3 for B, 2 for C, 1 for D, and 0 for F.

Table 2: State Homeowners Markets, 2005-2007

State	Number of Companies with 1% Share	Herfindahl-Hircschmann Index, 2007	New Entrants in State Market, 2005-2007	Number of Companies with Increase in Premiums
Alabama	16	1485	3	6
Connecticut	22	647	2	8
Delaware	17	1240	1	7
Florida	28	699	9	6
Georgia	14	1349	1	6
Louisiana	18	1553	1	5
Maine	23	554	1	5
Maryland	13	1152	0	6
Massachusetts	27	508	4	7
Mississippi	13	1458	1	7
New Hampshire	24	590	2	5
New Jersey	22	644	1	6
New York	17	895	1	7
North Carolina	14	1011	1	7
Rhode Island	21	671	4	8
South Carolina	16	1124	4	6
Texas	14	1410	9	8
Virginia	12	1110	0	7

Table 3: Correlations Between Premium Changes Across States

	All State	AIG	Chubb	Liberty Mutual	USAA	Zurich	Traveller's	Nationwide	Hartford
State Farm	-.230	+.641	+.041	+.018	+.159	-.058	-.038	-.192	-.209
All State		-.214	-.080	+.018	-.348	+.002	+.693	+.616	+.128
AIG			+.206	+.139	-.177	-.427	-.262	-.123	-.079
Chubb & Son				.495	+.139	-.019	-.163	-.297	+.376
Liberty Mutual					-.438	-.147	+.103	+.017	-.247
USAA						+.370	-.381	-.101	-.026
Zurich							-.013	+.094	-.259
Travel'rs								+.628	+.037
Nation-Wide									-.424

Table 4: Regression Analysis of Change in Premiums

Constant	.0675** (2.22)	.0543 (1.23)	.0698 (1.39)	.0619 (1.07)
Exposure	-2.61 (1.35)	-2.58 (1.41)	-3.19 (1.53)	-3.15 (1.59)
Market Share 2005	-329* (1.93)	-.180 (0.96)	-342** (2.02)	-.207 (1.08)
CEI Grade			-.00174 (0.14)	-.00176 (0.13)
Elected Commissioner			-.0185 (0.54)	-.0198 (0.63)
Wind Pool			.0335 (0.90)	.0319 (0.89)
Adjusted R^2	.0302	.0598	.0184	.0475
Company Fixed Effects	No	No	Yes	Yes

Absolute t-statistics based on robust standard errors in parentheses. ** and * indicate significance at the .05 and .10 levels respectively on two-tailed tests.

Figure 1: Wind Pool Exposure Growth in Texas

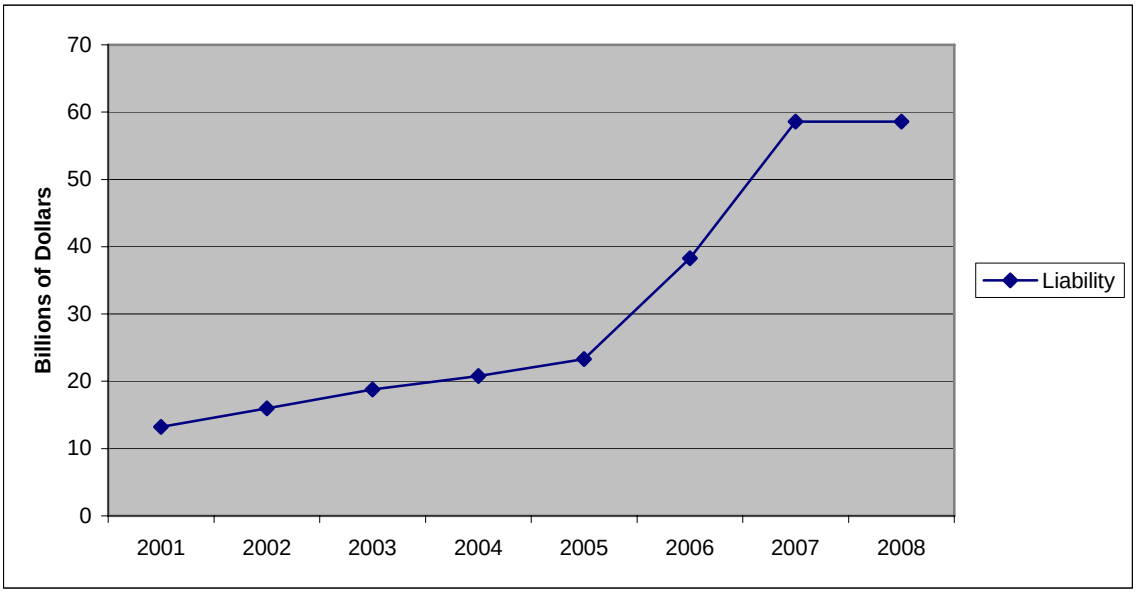

Figure 2: Wind Pool Exposure Growth in North Carolina