

Do homebuyers value stricter construction requirements in disaster-prone areas?

The Value of Building Codes

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The record-setting 2004 and 2005 hurricane seasons have highlighted the U.S. coastal regions' susceptibility to unpredictable, natural perils. Preliminary estimates of insured losses are \$4 billion from Hurricane Rita, \$5 billion from Hurricane Wilma, and \$35 billion from Hurricane Katrina. Aggregate economic losses from Katrina are estimated to exceed \$100 billion.

As more people continue to move to coastal areas, losses resulting from future hurricanes can only be expected to increase. One recent study puts the current value of insured coastal property in hurricane-prone states—those bordering the Atlantic Ocean and the Gulf of Mexico—at \$6.76 trillion.

Among the many policy responses to recent natural disasters and their costs have been proposals to tighten land use restrictions and building codes in disaster-prone areas. There is little modern economic research on either the costs of codes or their effectiveness in producing the desired level of safety within high hazard areas. In this article, I examine code changes during the 1980s on Florida's Gulf Coast to determine how land market participants value building codes in high hazard areas, including those associated with the provision of federal flood insurance.

THE VALUE OF BUILDING CODES

Residential building codes have been in use in the United States for over 100 years, with the first model code published by the National Board of Fire Underwriters in 1905. Local governments regulate construction through building codes as an exer-

cise of police power, although the codes themselves may be based on a regional or national model.

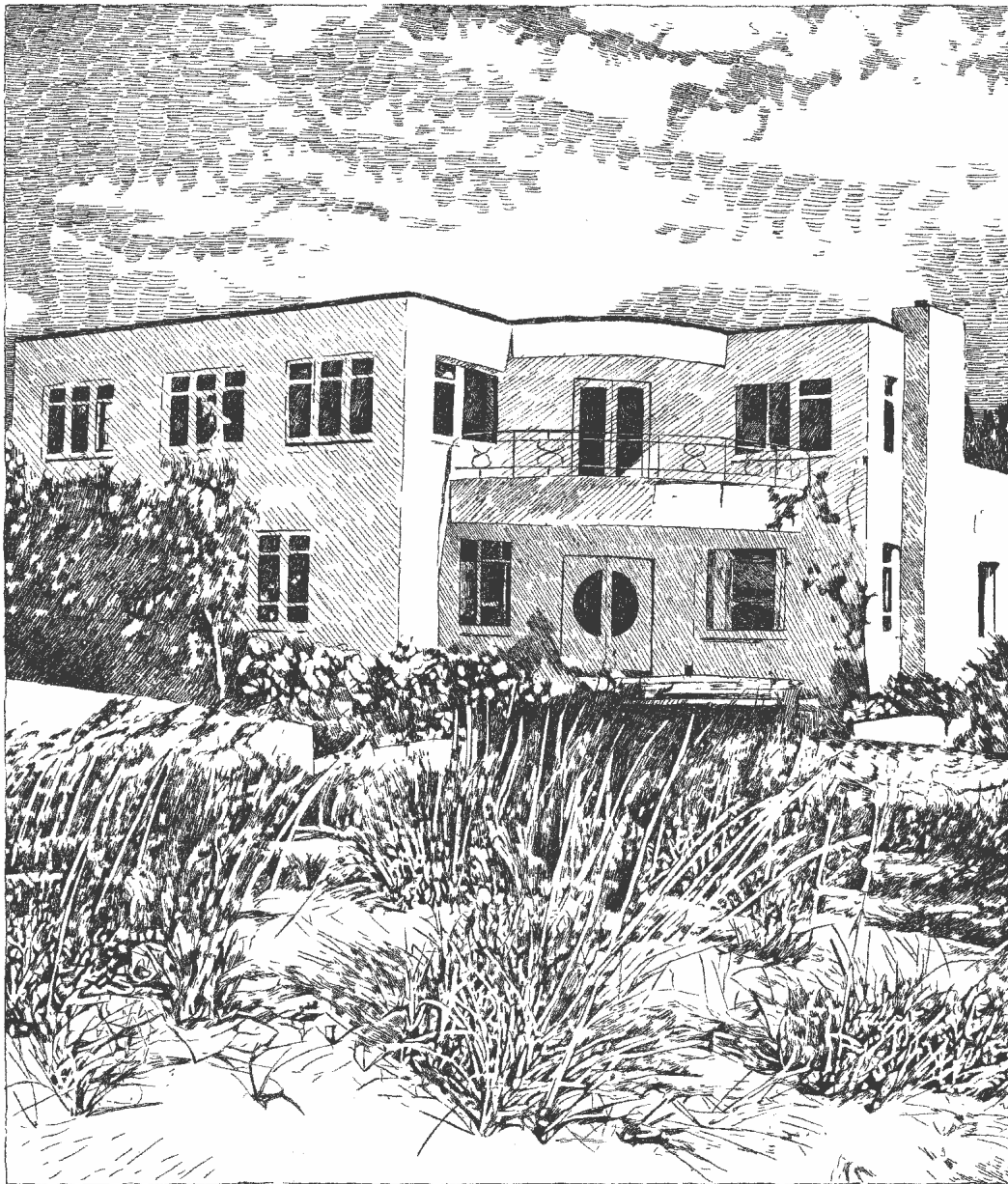
Codes can be classified as either prescriptive or performance in nature. Performance codes state a technical objective while prescriptive codes specify a method for achieving an objective. Prescriptive standards offer the advantages of lower enforcement costs and reduced liability for code officials, while performance standards may more readily accommodate technological innovation. Unfortunately, neither type of standard necessarily allows the least-cost method of producing the desired level of safety.

Two theoretical justifications exist for residential construction codes: information asymmetries and externalities. The information asymmetries argument is that homebuyers are unlikely to possess the technical expertise to be able to assess the structural integrity of a housing unit. The externality argument is that codes are required to prevent market participants from developing land in a manner that endangers adjacent property. However, private market mechanisms such as inspection services, home warranties, and liability can address those problems. Citing those mechanisms, opponents of government-administrated building codes assert that under the current system, "innovation is stymied and codes are increasingly rigorous and costly."

PROPERTY VALUES Building codes may impose both technological costs and enforcement costs, yet may provide benefits such as reduced expected mortality and property damage. The value of building codes to land market participants is revealed through land prices as net of the perceived costs and benefits brought about by codes.

Most empirical evidence on building codes and property values finds that codes increase housing costs by not more than 5 percent. With regard to benefits, less is known. One recent study

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observed that newer properties developed under less stringent building codes sustained greater damage from Hurricane Andrew than pre-1960 structures. On the other hand, in many cases, casual observation following hurricane activity will reveal that elevated houses fair better, holding location constant.

How much do land market participants value safety? The private market's valuation of building codes can be assessed through an examination of vacant land price changes following construction code changes in a high hazard area. Additional compliance costs and safety benefits brought about by a code change will be related to the geographic placement of property. For example, consider the safety benefits associated with residential coastal construction codes in a coastal community. Risk exposure will typically be highest for those parcels fronting the ocean. Relative to parcels one or two blocks inland, the most seaward properties bear the full force of wind and wave actions during a major storm. An inland parcel, on the other hand, may benefit from the protection afforded by more seaward structures that impede wind and water forces. Con-

versely, a portion (or the entirety) of a seaward structure may become dislodged in a major storm, making physical impact with inland parcels. Further, there may be costs to landward properties if the code change involves increased elevation, which may detract from water views. Thus, for inland properties, the benefits from increased safety resulting from stricter structural standards include both direct safety effects and an ambiguous externality effect.

REGULATION IN FLORIDA

Along Florida's coast, regulatory efforts to protect life and control development through structural building requirements involve both federal and state initiatives. At the federal level, the Federal Emergency Management Agency began the National Flood Insurance Program in 1968, in which participating counties adopt minimum elevation standards designed to

reduce damage from storms in flood-prone areas. The program also requires participating communities to review all building permits for new construction. Residents in participating counties can then obtain flood insurance that the federal government guarantees. Flood insurance rate maps depict base flood elevations throughout the county, above which new structures and substantial improvements to old structures must be raised.

The first effort initiated at the state level to protect Florida beaches was in 1961 with the passage of the Shore and Beach Preservation Act. The legislation's purpose was to provide for shore and beach restoration and preservation programs for each coastal county. Included under the umbrella of "shore and beach restoration and preservation" were erosion control, coastal flood control, shoreline and offshore rehabilitation, land use regulation, and regulation of work and activities likely to adversely affect the physical condition of the shore or beach. The act also gave counties the power to establish shore and beach preservation districts.

In 1969, the Shore and Beach Preservation Act was replaced with the Beach and Shore Preservation Act. The new legislation required that landowners obtain a permit from Florida's Department of Natural Resources before undertaking any construction or reconstruction below the mean high water line.

A second source of regulation, coastal setback lines, was first introduced with a 1971 revision to the 1969 act. The new law directed the Department of Natural Resources to "establish coastal construction setback lines on a county basis along the sand beaches of the state fronting on the Atlantic Ocean and the Gulf of Mexico." These coastal construction setback lines, now referred to as coastal construction control lines (CCCL), establish an area of jurisdiction in which special siting and design criteria are applied to beach-dune areas having the potential for extreme fluctuation in the event of a 100-year storm. Structures must be able to withstand physical forces and waves from storms, water pressure from flooding, and the effect of soil loss from storm-induced erosion. While not prohibited outright, improvements constructed partially or totally seaward of a CCCL must have the lowest horizontal structural member placed at an elevation above the predicted breaking wave crest. A CCCL elevation certificate depicting the elevation of the lowest horizontal structural member must be prepared by or under the direct supervision of a registered land surveyor, professional engineer, or architect licensed by the State of Florida. Once a structure exists seaward of a CCCL, a permit is required to modify, repair, or rebuild when the proposed changes involve changes to the structure's foundation.

The Florida Department of Environmental Protection conducts ongoing reestablishments of existing CCCLs. These reestablishments are deemed necessary both because of shoreline changes and erosion, and also because of the improved technology and methodology used in placement since initial determination of many of the lines. According to the agency, a redrawing of a CCCL is generally expected to be landward of the previous line.

A third regulatory jurisdiction was established by the State of Florida with passage of the Coastal Zone Protection Act of 1985, an amendment to the 1969 law. The intent of the 1985 act is to manage the most sensitive portion of the coastal area "through the imposition of strict construction standards in order to minimize damage to the natural environment, private property, and life." The new law establishes the Coastal Building Zone (CBZ) as the area extending from the seasonal high-water line to a line some distance landward of the control line. The design and construction of the building, building foundation, and the building support structure for major structures in the CBZ must be able to resist the wind and wave loads associated with a 100-year storm event, and are required to be elevated above the base flood elevation.

AN EMPIRICAL STUDY OF COASTAL BUILDING CODES

To test how market participants in Florida value construction code changes in high hazard areas, I examined vacant land price changes following changes in coastal building regulations on five barrier islands in Lee County, Florida. Southwest

Florida's barrier islands front the Gulf of Mexico and are susceptible to extreme weather events such as hurricanes and floods. Lee County was selected for the study because of the availability of vacant residential land sales data through various coastal construction regulatory regimes. From 1980 to 1993, there were two changes in coastal construction regulatory regimes and one change to an existing regulatory zone. In 1984, the county began participation in the National Flood Insurance Program. In 1986, the county established a CBZ. In 1991, the county reestablished its CCCL.

The effect of building codes on land values is revealed though land price changes following construction code modifications related to the regulatory measures. A hedonic regression model is used to ascertain how changes in coastal codes affect land prices. Within the hedonic framework, a land parcel is a bundle of characteristics, each of which contributes to its sales price. In general, we expect that vacant land prices are related to lot size, distance from an employment center or recreational amenity, and various other physical or legal attributes. In this case, two of those latter characteristics are the building code regime in which the property is sold and the regulatory zone in which the land is located.

In the empirical model, sales price is explained by lot size, distance from the Gulf of Mexico, and whether the property has water frontage, among other things. Sales price may differ across the barrier island cities studied: Boca Grande on Gasparilla Island, Bonita Springs on Little Hickory Island, Ft. Myers Beach on Estero Island, Captiva Island, and Sanibel Island. Parcel information and sales information for the study were obtained from the Lee County Property Appraiser. The final working dataset includes 1,745 qualified vacant residential sales behind the 1978 CCCL.

The hedonic analysis reveals any percentage change in price for land parcels following the announcement of the National Flood Insurance Program. When Lee County joined the program, all land in the CBZ received either an "A-Zone" or "V-Zone" designation, which are both coastal high hazard areas inundated by the base flood. A-Zone land is subject to rising water from coastal flooding, while V-Zone land is subject to wave action in addition to the rising water from coastal flooding. The direction of the price change reveals whether any marginal benefit from the flood insurance program is outweighed by an increase in the costs of compliance. We also explore whether any additional change in price occurs as a result of change in additional required base flood elevation level. The model allows price effects for A-Zone and V-Zone parcels, respectively, to differ across zones following the CBZ announcement, but holds them constant within zones. Finally, the price effect of the CCCL regulation is expected to differ, depending on whether the property is designated as seaward of the line. Because of higher costs of compliance under CCCL regulation, we expect prices to be lower for designated property. For those properties behind the CCCL, price effects will be the net effect of any substitution and amenity effects from the reduced risk of damage created by property which is closer to the coast, while negative amenity effects might include loss in

view from the increased elevation of structures. Because the construction regulations do not restrict the density of developable land, there is no scarcity effect for properties, regardless of designation.

MAJOR FINDINGS

The results of the study suggest that the National Flood Insurance Program had a negative effect on vacant land prices in the A-Zone but not the V-Zone. Land prices decrease 10 percent in the A-Zone following implementation of the program. When the price effect is modeled as a function of elevation, we find an additional 14 percent decrease in A-Zone land prices for every one-percentage-point change in additional base flood elevation required by the flood insurance program.

The different result for A-Zone land compared to V-Zone land is not surprising. V-Zone land is closer, on average, to the Gulf than A-Zone land, and accordingly would have had, on average, stricter codes prior to the launching of the federal insurance program. Thus, the marginal costs of compliance for V-Zone land would be less, on average, than for A-Zone land. Similarly, any marginal benefits from increased safety would be greater for V-Zone land than A-Zone land if a given change in elevation is more effective in reducing hazard risk in the zone.

We also find that land prices decline in response to the establishment of the CBZ. Specifically, results suggest that vacant land prices decrease between 25 percent and 30 percent in the V-Zone following the CBZ announcement, but that there is no significant change in price for A-Zone land following this announcement. These findings indicate that any marginal benefits from the CBZ are outweighed by marginal costs of compliance in the V-Zone, yet are not significantly different for A-Zone land. Likely, this results from the requirement of costlier pile foundations in the V-Zone. Also, design requirements concerning wind velocity pressure are a function of building height, which is greater for V-Zone land on average.

Finally, the study results reveal a drop in price of 30 percent for CCCL-designated land following the 1991 CCCL reestablishment relative to similarly located land prior to the announcement. This suggests that any benefits from increased safety, as perceived by market participants, are less than the expected increase in the cost of regulatory compliance. Further, results reveal no measurable benefit from CCCL regulation for those properties landward of the CCCL zone.

CONCLUSION

The findings suggest either that market participants in high hazard areas want lower levels of building safety than government regulators, or that they do not fully understand the nature of hazard risk. An investigation of whether market participants reassess hazard risk after receiving new information would help to support the latter claim. One could test whether differences in pre- and post-hurricane sales prices are more positive (less negative) for properties built under stricter code regimes, controlling for supply effects.

Are increases in construction standards producing measurable safety benefits? We would expect that safety benefits

from flooding standards accrue to those properties directly affected by the raised standards. On the other hand, elevation may make structures more vulnerable to other types of hurricane damage. It may also be the case that market participants substitute cheaper construction because of costlier elevation requirements, or use cheaper construction to meet the FEMA insurable limits. One could test the extent to which hurricane damage decreases for properties located inland of those built under stricter codes. A test for the externality argument would require controlling for the code regime under which the nearest seaward parcel was built, among other factors.

Many proponents of federal flood insurance justify the program by claiming that there is a market failure in the private insurance market. But those proponents use the term “market failure” loosely to refer to the catastrophic nature of losses, the fact that consumers are unwilling to pay premiums that cover loss exposure, and the difficulty in spreading risk over both high and low risk consumers because lower risk consumers will not purchase at the pooled rate. Some also argue that subsidized flood insurance exists because it is less costly for taxpayers than after-the-fact congressionally appropriated disaster assistance. However, arguments that ex-ante subsidies are less costly than ex-post disaster aid fail to account for how the implicit promise of assistance from the U.S. government affects consumer decisions to insure. The suggestion by policymakers to increase risk-awareness among homeowners will do little to increase coverage as long as such reliance can be expected.

On the other hand, if market participants understand hazard risk but research fails to produce evidence of the externality justification for codes, then the insurance industry’s assumption of responsibility over building safety regulation may be the most efficient solution.

What is clear is that such regulatory issues are not subtle. More work is urgently needed to quantify both the costs and benefits of building codes in high hazard areas so that sound policy decisions can be made regarding development in disaster-prone areas. **R**

READINGS

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