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Public Private Partnership in Catastrophe Risk Management

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Executive Summary

The goal of this project is to identify how policymakers can reduce the cost of catastrophic risk. To this end, we developed a framework for catastrophe risk management that includes risk mitigation (reducing potential losses), insurance markets (reducing the cost of financing remaining losses), and the role that public (government) entities should play in lowering the cost of catastrophic risk for current and future Floridians.

Catastrophic risk is a complex issue that will require considerable effort and coordination to address effectively. We believe that successfully reducing the cost of catastrophic risk in Florida requires a public-private partnership (PPP) focused on two primary goals:

1. Reducing current and future risk exposure through tougher building codes and risk mitigation for existing properties.
2. Lowering the cost of financing catastrophic risk by reducing the cost of capital. This can be achieved by optimizing government involvement in insurance markets and strengthening the risk-bearing capacity of private insurers.

As governments become more involved in insurance, our research provides a foundation for understanding the public sector's role in both catastrophe risk mitigation and financing. We propose an enhanced public-private partnership that supports both individual property-level and macro-level mitigation strategies, along with a pilot program involving insurers and mortgage lenders. These entities would drive significant changes in how mitigation is financed and how property insurance is structured and sold. This may include separating insured catastrophe (wind) losses from other homeowner losses, implementing multi-period contracts, and providing explicit government guarantees.

Among the many recommendations in this report, two should be prioritized. To reduce future catastrophic losses, the mitigation of existing properties is essential. This begins with the development of a uniform hurricane-resistance grading schedule that can be applied across all residential construction. Prioritizing properties that would benefit most from cost-effective mitigation requires an understanding of which structures are most vulnerable. It's crucial to protect the entire building envelope and avoid ineffective, piecemeal mitigation. Sharing this data with catastrophe modelers and insurers in the Florida property insurance market would help maximize the value of these investments. Creating a property-level mitigation database would be a key step forward.

Once a system is in place to assess mitigation needs for each property and to share that data with relevant stakeholders, we recommend launching a pilot program to involve insurers and mortgage lenders more directly in mitigation planning and financing. Current efforts to encourage homeowner mitigation—such as the My Safe Florida Homes program—have had some success. However, most decisions about mitigation remain with homeowners, many of whom are financially constrained. A pilot program involving capital-rich and mitigation-savvy

institutions like insurers and mortgage lenders could better support homeowners in implementing needed upgrades. This model represents a major shift from current insurance and mortgage contract structures and would require coordination between private entities and state regulators.

The next section outlines our full set of recommendations. The highest-priority items—Mitigation Recommendation M1, Financing Recommendation F1, and Mitigation Recommendation M2—should form the foundation of efforts to lower the cost of catastrophic risk. Many of the recommendations in this report are based directly on our research, while others reflect long-standing policy proposals dating back to Hurricane Andrew in 1992. All remain relevant and merit renewed consideration.

Recommendations

We provide in Appendix A three tables that list specific recommendations: Table 1 provides recommendations specific to mitigating or reducing exposure to loss (recommendations beginning with the letter M); Table 2 provides recommendations specific to more efficiently financing or funding losses that still occur despite mitigation efforts (recommendations beginning with the letter F); and Table 3 provides recommendations that are more general in nature and pertain jointly to financing and mitigation (recommendations starting with the letter B for both). Although some recommendations are the product of previous research or other policy assessments, many stem from the research performed for this project.[1] These recommendations are highlighted in bold in the three tables in Appendix A.

Highest Priority Recommendations

The recommendations that should serve as a starting point to ensure a path to lowering the cost of catastrophic risk (recommendation with the highest priority) include:

> ***RECOMMENDATIONS WITH THE HIGHEST PRIORITY***
>
> ***Mitigation Recommendation (M1): Develop a Hurricane Resistance Grading Schedule that assigns a grade to structures considering all relevant mitigation features, thereby promoting a clear understanding of a building's structural soundness as it relates to catastrophic windstorm risk.***
>
> ***Financing Recommendation (F1): Organize and/or provide data to increase the system's efficiency by establishing, for example, a database that incorporates loss control and mitigation features of building stock in the same way that CARFAX does for used automobiles and by expanding and promoting promote managed repair programs.***
>
> ***Mitigation Recommendation (M2): Initiate a pilot mitigation program supported by mortgage lenders or property insurers (or both) to aid development of an insurance and/or mortgage product that effectively promotes mitigation for the property owner and mitigation financer.***

To most efficiently reduce both current and future potential losses due to storms, a better understanding of the existing mitigation features of properties—and the impact of future mitigation on loss reduction—is necessary, thus the recommendation of the grading schedule. To make the best mitigation decisions, the homeowner needs to understand what features

[1] Namely, recommendations M1*, M2*, M3, M4, M5 and M9 with respect to mitigation, F1*, F2, F5, F6, F7, F10 and F12 with respect to financing, and B1 and B2 with respect to both. *** are the recommendations we would like to see prioritized.

currently exist on the property. Homeowners need to know what those features do about future losses, and what mitigation efforts can be undertaken, along with the benefits of those efforts in terms of loss reduction. A relatively simple grading system that explains to a homeowner how storm-resistant their current home is, and what can be done to make it effectively safer, is necessary to aid in better mitigation decisions.

Once we have a grading system, an efficient system of gathering and sharing that information (along with other relevant data) is necessary to greatly increase the efficiency of incentivizing more mitigation, as well as the accurate pricing of the mitigation features in the risk financing process. Better data for catastrophe modelers, insurers, mortgage lenders, and others involved in the risk financing process will help reduce uncertainty regarding storm losses and aid in lowering the cost of capital necessary to finance the remaining catastrophic risk.

The final highest-priority recommendation is aimed at making mitigation decisions easier for homeowners. Incentivizing individual homeowners to undertake meaningful mitigation has been difficult to implement. Programs such as My Safe Florida Homes are successful but are not scaled to meaningfully reduce the aggregate catastrophic risk in Florida. Currently, there are few immediate and up-front financial benefits to building owners for investing in mitigation beyond small premium discounts. These discounts are so modest that it typically takes property owners several years to recoup the initial mitigation investment (e.g., installing hurricane windows/shutters, hardening the roof, or investing in other loss-reducing features). This does not adequately incentivize homeowners to invest in mitigation. Also, for homeowners, the cost of investing in risk mitigation is certain, whereas the benefits—such as lower premiums and higher resale value—are very much uncertain. Taken individually, these factors represent significant deterrents to investing in mitigation. Together, their effect compounds and often prevents investment in mitigation altogether.

Therefore, we recommend exploring ways to get insurance companies and mortgage companies more involved in the mitigation activities of the properties in which they have a financial interest. To determine whether a statewide program could be successful, a pilot mitigation program is necessary. The goal of this program—driven by either mortgage lenders or property insurers (or both)—is to develop an insurance and/or mortgage product that creates a financial incentive to engage in mitigation for both the property owner and the institution providing the financing. For example, policies could encourage mortgage providers to support mitigation by allowing its cost to be amortized over a longer period through Fannie Mae and Freddie Mac. They could also incentivize private property insurers to participate in risk mitigation through experimental long-term property contracts where the insurer funds the mitigation. Creating incentives for households as well as private-market actors has the potential to reduce the overall cost of catastrophic windstorm risk.

The remaining discussion in this section focuses on the recommendations that resulted from the current research project.

Mitigation Recommendations

Our research finds support for increasing investment in effective mitigation techniques. Broadly speaking, mitigation techniques refer to activities that can reduce losses incurred. Often, mitigation techniques specifically refer to activities that reduce the severity of a loss, though activities that reduce the frequency of a loss are also sometimes categorized as mitigation techniques.

The third mitigation recommendation (M3) focuses on making mitigation more affordable for homeowners. We believe that developing strategies to improve access to affordable mitigation techniques is paramount to reducing the current and future cost of catastrophic risk, particularly in the state of Florida. This is a multi-level recommendation that targets all levels of government (federal, state, and local), as well as insurers, mortgage lenders, and homeowners. The federal government can offer tax credits for cost-effective mitigation; state governments can add funding to state-sponsored mitigation programs (e.g., My Safe Florida Homes); and local governments can offer property tax credits or rebates for undertaking mitigation efforts. Insurers can provide appropriate premium discounts, and mortgage lenders can offer differential mortgage rates for mitigated homes.

One specific mitigation-related recommendation is to strengthen building codes (M4) to reduce the severity of losses suffered by homeowners. Even though Florida has some of the strongest building codes in the nation, consistent updating is required to reduce future exposure. In addition to updating existing codes, it would be economically efficient to encourage building beyond code to the so-called “Code Plus” standards. This would help make structures more resilient to the effects of catastrophic windstorms, thereby reducing potential damage and financial losses.

There are also other ways to encourage and promote the hardening of structures to reduce the effects of windstorms. One idea is to establish a community rating system for wind and flood exposure jointly, as a means of encouraging sound building and zoning codes (M5). This would be similar to developing a uniform Hurricane Resistance Grading Schedule that assigns a grade to structures based on all relevant mitigation features—thereby promoting a better understanding of the structural soundness of a building as it relates to catastrophic windstorm risk (M1).

The final mitigation strategy directly related to this research is the need for additional funding for research into cost-effective mitigation, windstorm prediction, and the interaction between windstorms and storm surge (M6). There is still much to learn about the most cost-effective ways to mitigate, and what new products can be developed to aid in the mitigation process. In addition, improved storm prediction accuracy will help reduce uncertainty in pricing storm-related damages—and reductions in uncertainty help to reduce overall costs.

Financing Recommendations

Our research also resulted in recommendations related to financing. More precisely, on ways to reduce the cost of capital and make financing techniques more efficient (see Table 2 in Appendix A). Loss financing refers to activities that allow property owners to be paid for losses after they occur. The most common method of loss financing is insurance, though there are other risk financing methods that can be used. Some of the recommendations in this section have been proposed in the past but remain equally relevant today. The focus of our research in this project, and of our recommendations regarding the role of government entities in financing, is how those entities choose to finance their activities: through pre-loss or post-loss financing.

Specific to Florida, we recommend adjusting the Cat Fund operations (F2) and Citizens' operations (F3). Specifically, we recommend adjusting the layer in which the Cat Fund operates upward—meaning the Cat Fund should cover losses that are higher on the distribution. We also recommend "right-sizing" the Cat Fund to balance the competing goals of reducing the cost of capital for catastrophic risk financing while ensuring that excessive post-loss financing does not occur.

As it relates to Citizens' operations, many of our recommendations are not new. We recommend:

- Minimizing Citizens' role in providing the primary layer of property insurance
- Altering commission structures to incentivize insurance agents to place business outside of Citizens, removing the glidepath from Citizens' rate structure
- Tying Citizens policies to the My Safe Florida Homes program (a new recommendation) to mandate cost-effective mitigation.

As part of these recommendations, we also propose that state insurance entities be used to address the availability of necessary coverage—not affordability. Affordability of premiums should be addressed outside of the insurance mechanism (F4), using a different program (e.g., means testing) to ensure that wealth-constrained citizens can afford property insurance.

New ways are needed to incentivize insurance companies to retain capital and grow their balance sheets (F5). The Florida insurance market must reduce its reliance on small and/or undercapitalized insurers. One recommendation we highlight relates to insurance companies' regulatorily constrained accounting practices. Currently, insurance companies can only set rates and collect premiums for losses expected to occur during the policy period (typically one year). They are financially disincentivized from building surplus to pay for property damage losses occurring beyond a one- or two-year horizon. We therefore recommend that federal tax laws be changed to allow at least a portion of surplus reserves of private insurance companies to be accumulated and invested on a tax-free basis (F5a), if those funds are used to indemnify insured homeowners in major catastrophes. This change would give insurance companies more flexibility to smooth losses over time and decrease premiums.

Directly related to tax law changes on insurer reserves is the idea of allowing similar reserving mechanisms on the consumer side of the insurance market. For example, we recommend allowing the establishment of individual disaster preparation accounts, which would permit homeowners to save for future mitigation or disaster recovery on a pre-tax basis (F5b). This could be paired with insurance policies that include very large deductibles for wealthier customers or those who have accumulated significant value in their individual accounts—thereby reducing their premium outlays.

We also recommend removing homeowners from the wind vs. rain cause-of-loss issue in the standard homeowner's insurance contract (F6). Most private policies cover wind losses but exclude flood losses (which are covered by the National Flood Insurance Program, or NFIP). When catastrophic storms occur, they often cause both wind and flood damage, leaving the source of indemnity payments in question for many homeowners. We therefore recommend repositioning the NFIP as a reinsurance program—having flood covered by the standard homeowner's policy, with the flood component reinsured through the NFIP or private flood coverage.

The remaining financing recommendations have been made in a variety of other venues and are aimed at making the risk financing mechanisms in Florida more effective and efficient.

Joint Mitigation & Loss Financing Recommendations

We also propose other recommendations that can jointly address mitigation and loss financing and are more general in nature (see Table 3 in Appendix A). The first is promoting risk-wise behavior among consumers, businesses, and all levels of government (B1). This recommendation means that all parties involved in bearing the cost of catastrophic windstorm risk should ensure that the decisions they make are fully informed and optimal. This would involve widespread education on catastrophic risk and its costs.

For example, government insurance programs should avoid incentivizing suboptimal insurance plans through over-subsidized rates. Businesses should explicitly weigh the costs of undertaking new developments in catastrophe-prone areas. Consumers should efficiently allocate resources toward mitigation and insurance financing techniques.

Another recommendation relates to Citizens' ability to facilitate mitigation. While Citizens finances risk, it can simultaneously encourage policyholder mitigation. This could be achieved by linking the My Safe Florida Homes program with Citizens policyholders — requiring that Citizen*s* policyholders take advantage of all the benefits available through the program. This would have the net effect of reducing the state's overall exposure to catastrophic windstorm risk (B2).

The remainder of this report outlines our research efforts to address the overall cost of catastrophic risk in Florida. We provide a discussion of our goals, the drivers of current

challenges in the Florida market, why we believe a public-private partnership is necessary, and an explanation of our research into the two areas that are vital to reducing the cost of catastrophic risk: mitigation to reduce potential future losses and optimizing financing to reduce the cost of capital.

The body of this report contains our discussions of these efforts; the appendices include the relevant research papers and projects developed to support the above recommendations.

Public Private Partnership in Catastrophe Risk Management

Introduction

Does the government act as the "ultimate risk manager"? In *When All Else Fails: Government as the Ultimate Risk Manager*, David Moss outlines how the government manages a wide variety of private-sector risks, including natural and man-made catastrophe risk. The federal government provides primary insurance coverage for natural disasters (e.g., the National Flood Insurance Program) and disaster recovery funds following natural disasters (e.g., Federal Emergency Management Agency assistance programs). The federal government also provides reinsurance coverage for terrorism, crop insurance for farmers, insurance coverage for banks, and political risk insurance for U.S. companies with international operations.

The United States government is not alone in managing natural catastrophe risk exposure and/or funding the impact of catastrophes. The State of Florida currently provides homeowners insurance coverage to nearly one-quarter of homeowners in the state through Citizen*s Property Insurance Corporation*.[2] What was initially set up as the insurer of last resort (residual market) in 2002 has since become the largest single provider of homeowners insurance in the state. The State of Florida also provides a mandatory layer of reinsurance coverage to all insurers in the state through the Florida "Cat Fund." Florida is not the only state with a large residual market in property insurance. Louisiana's residual market insurer, Louisiana Citizens, experienced higher growth than Florida's Citizens in 2022. Both Florida and Louisiana have faced a property insurance crisis in the private insurance market over the past 3–5 years. While recent legislative activity aimed at reducing fraud and litigation (discussed below) appears to have stabilized the Florida insurance market, it is still far from a stable, well-functioning system.

Government intervention in catastrophe insurance markets is diverse and lacks consistency. Some exposures, such as wind coverage, are left to private insurers, supplemented by state entities in states with significant exposure. Wildfire exposures are also insured by private

[2] As of June 2024.

insurers (wind and fire are covered by standard homeowners' policies), without any specific state programs designed to provide supplementary coverage—at least as of 2024. Other exposures are insured by the federal government at the primary level, such as flood (excluded from standard homeowners' policies but required by mortgage lenders in flood zones), with some supplementary coverage available in the private insurance market (excess flood). Finally, some exposures—such as earth movement (excluded from standard homeowners' policies and not required by mortgage lenders)—are left to limited supplementary coverage from government entities or the private market, with only minimal participation by residents.

As public policymakers have become increasingly aware of the impact of private market insurance availability and affordability on their constituents, government intervention in insurance markets has grown in hazard-prone areas. Despite the policy count in state-run property insurance entities increasing only three- to four-fold since 1990 (e.g., beach plans, Citizens), total exposure has grown fifteen- to twenty-fold. This does not include other state and federal property insurance programs in the U.S., such as the California Earthquake Authority, the National Flood Insurance Program, or the Federal Terrorism Insurance Program.

While such government interventions can be welfare-enhancing for citizens, they should be designed to operate as efficiently as possible. The question of how to optimally structure a public-private partnership (PPP) to reduce the cost of catastrophic risk is the focus of this project. When and how should government entities become involved in both mitigation and catastrophe insurance—a product that has traditionally been provided by private market entities?

Statement of Problem & Goals of Project

It is important to define what the goal of this project is and what some of the forces are that may prevent us from reaching this goal.

GOAL: Reduce cost of catastrophic risk to current and future Floridians

Florida currently has the highest homeowners' insurance premiums in the nation. Since it also has the highest hurricane risk of any state, we should expect insurance premiums to be higher than in most areas of the U.S. However, premiums are not the only cost of catastrophic risk. Many Floridians are choosing to forego insurance protection, and those who do purchase coverage face significant out-of-pocket costs when an event occurs. Most insurance policies have large deductibles for windstorm damage, and there can be substantial uninsured costs associated with catastrophes (e.g., lost work, evacuation costs). This is indicative of an increasing protection gap for Floridians. One of the most pressing issues for policymakers is that the costs associated with catastrophe risk have increased significantly.

Factors driving the rising cost of catastrophic risk

A variety of factors make a public private partnership necessary to properly address the cost of catastrophic risk in not only Florida, but the U.S. Before diving into these factors, it is important to understand some of the major drivers increasing the cost of catastrophic risk. These drivers are:

1. Exposure growth
2. Inflation
3. Climate change
4. Cost of capital

Exposure Growth

Exposure refers to the structures at risk of being damaged by natural catastrophes. Exposure growth is one of the major causes of the increase in catastrophic losses. The US population has grown by more than 50 million people since 2000.[3] According to Statista, that has led to an increase of more than 30 million housing units in the US since 2000.[4] According to the Congressional Budget Office, housing starts are expected to average close to 1.6 million per year through 2033, meaning another 16 million housing units in the next 10 years. Consequently, there are more people and more built environments in catastrophe-prone areas than ever before, and it is likely that the exposure will continue to grow.

Inflation

A second driver of increasing catastrophic risk costs is inflation. For several years, inflation in the US remained relatively low, including inflation related to building costs. The cost of construction and repair to bring a building back from damage is the major cost affiliated with insured property losses following a catastrophic event. According to an article by Ed Zarinski, the 30-year average inflation rate for residential and non-residential construction was 3.7% (not including 2021 & 2022). It was higher between 2013 and 2020 (closer to 5% and significantly higher than general inflation in this period) then spiked in 2021 and 2022 (8% then 12% for non-residential, 14% then 15.7% for residential). While inflation in this area has abated in 2023 and 2024, costs have not come back down but remained flat.[5] This construction inflation added significant costs to repairs and significant increases in insurance costs during that timeframe.

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[3] USAFacts.org accessed 11/06/24

[4] US Census Bureau, Statista, accessed 11/06/24, https://www.statista.com/statistics/240267/number-of-housing-units-in-the-united-states/#:~:text=Number%20of%20U.S.%20housing%20units%20and%20annual%20increase%201975%2D2023&text=The%20number%20of%20housing%20units,in%20the%20past%2015%20years

[5] https://edzarenski.com/2024/01/17/construction-inflation-2024/#:~:text=In%20times%20of%20rapid%20construction,the%20recession%20bottom%20in%202011, accessed 06/04/25.

Climate Change

While none of the authors on this project are climate change scientists, there does appear to be an increasing frequency of more severe hurricanes forming in the Gulf of Mexico (8 in the last 7 years) and an increase in the number of days in the US with multiple tornadoes touching down.[6] The World Resources Institute states that the frequency of wild/forest fires are increasing globally.[7] This could be a short-term pattern, a set of random events, or an indicator of future event frequency due to climate change. Time will tell, but warming sea surface temperatures and rising sea levels will present significant risk to Florida for the remainder of the century. The significant increases in sea levels predicted through 2100 (2-3 feet) pose a formidable risk to a state like Florida with such significant coastline exposure and the nature of the built environment in many of these coastal areas.

Cost of Capital

Recovering from catastrophic loss requires access to capital to rebuilding and repair. Who provides that capital and how much it costs to access that capital (cost of capital) has varied widely in Florida. As discussed in the section on the history of the Florida insurance market, the market switched from a market dominated by large national insurers (with potentially lower cost of capital) to a market with smaller, less diversified insurers relying heavily on reinsurance (potentially higher cost of capital) and an increasing reliance of state entities on Florida's credit rating have defined the sources of capital. As discussed below, convincing investors to put their capital at risk in the Florida market will require paying investors an adequate return on their investment. The larger the uncertainty of potential losses, the larger the **need** for capital and the higher the **cost** of that capital will be. The cost of capital argument is one of the major drivers in our recommendations on how government entities should be involved in the insurance market.

Why do we need a public private partnership?

We believe that long-term solutions to reducing the cost of catastrophic risk must recognize that potential losses may be beyond the capacity of the private insurance sector and current state-level public mechanisms. While Florida and other states have taken steps to manage the cost of catastrophic risk, events causing catastrophic losses do not abide by state lines. The solution requires a stronger and more coordinated public private partnership (PPP) to ensure success.

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[6] https://www.c2es.org/content/tornadoes-and-climate-change/#:~:text=Although%20the%20number%20of%20days,and%20the%20strength%20of%20tornadoes., accessed 11/06/24.

[7] https://www.wri.org/insights/global-trends-forest-fires#:~:text=Climate%20change%20is%20one%20of,larger%2C%20more%20frequent%20forest%20fires – last accessed in May 2025.

Today's catastrophic risk financing solutions are marked by many public private partnerships between:

- Private industry and state-level financing mechanisms in some cases (e.g. CEA, Citizens, Florida Cat Fund, NC JUA)
- Federal intervention in others (e.g. crop, FEMA/NFIP), and
- Private market only (e.g. wildfire, tornado).

Our proposed PPP is broader than what we have seen in practice to date. Involving all stakeholders when developing solutions (e.g. Federal government, mortgage lenders, state government, private insurers, reinsurers, alternative risk financing entities, private property owners-commercial and residential- and other third parties that suffer negative externalities) will ensure that solutions will minimize market disruptions.[8] We acknowledge that having more seats at the table may lead to cumbersome administration and a prolonged decision making process. However, we believe that a more systematic approach is required regarding catastrophic risk as the ad hoc approach to date has proven to be less effective than desired.

Given the complexity of the challenges and the scale of hurricane disaster risk, it seems logical to expect public and private organizations to work together to manage such natural disasters. Given that hurricanes have the potential to inflict severe damage on public infrastructure and residential areas, and to affect the economic system itself, public private partnerships can provide a coordinated and well-resourced approach to resiliency (e.g. preparedness, response and recovery).

Integrating public and private sector capabilities through PPPs harnesses the regulatory authority, coordination capacity and considerable resources of government (through its ability to raise taxes), as well as the financial resources, innovation, and efficiency of the private sector. PPPs have the potential to improve the overall effectiveness of hurricane risk management strategies, leading to more comprehensive and resilient outcomes. Public sector contributions to PPPs include regulatory enforcement, resource mobilization and large-scale financing capabilities. Governments can implement and enforce building codes, land use planning and other regulatory measures designed to mitigate hurricane impacts. In addition, they can rapidly mobilize national resources and personnel in response to disasters, providing essential emergency services and restoring infrastructure. The government's implication ensures a coordinated response between different agencies and stakeholders. However, public sector entities often face bureaucratic challenges, limited agility and slower adoption of innovative technologies and methodologies. Governments are also better placed to internalize the externalities created by investment in public infrastructure.

By contrast, the private sector offers expertise in risk assessment and insurance underwriting, financial management and technological innovation. For example, insurance companies use

[8] Markets include insurance markets, real estate markets, and labor markets.

sophisticated risk models to assess hurricane threats and provide essential financial incentives through insurance pricing mechanisms.[9] They can encourage construction companies to use more advanced building techniques that improve structural resilience. Insurance companies are also working closely with technology companies to develop advanced early warning systems and more sophisticated and accurate data analytics tools. Despite these strengths, the profit-driven nature of the private sector can lead to under-investment in mitigation technologies. Each private sector participant is also exposed to the risk of insolvency and bankruptcy. This increased risk of insolvency leads to a tendency to prioritize safer short-term investment projects over long-term resilience and public welfare.

By combining the strengths of both sectors, PPPs address the weaknesses inherent in each. Public sector limitations, such as budget constraints, political pressures and slow decision-making processes, can hamper disaster response and recovery efforts. At the same time, the private sector's focus on profitability can lead to inefficient investment and risk management practices. Through collaboration, PPPs could ensure a balanced approach in which the government provides regulatory oversight and disaster management frameworks, while the private sector introduces efficiency, innovation and effective use of financial resources. Public private partnerships can create a robust and resilient disaster risk management effort, ensuring a more effective and equitable response to these devastating events.

The goal of PPPs, as we see it in the context of Florida, is to reduce the cost of hurricane catastrophic risk (and address the Florida private insurance market crisis). Our research efforts in this project are focused on shedding light on how a successful PPP could be implemented. Although slightly outside the scope of what we propose in this research note, public private partnerships can also reduce the negative impact of hurricane disaster externalities by providing incentives and resources to address broader societal costs that neither sector can effectively manage alone. These include environmental degradation, public health crises and economic disruption. These damages often follow hurricanes and can extend beyond the immediate disaster zone. Through PPPs, the public sector can apply regulations and policies that ensure private companies integrate societal costs into their decision-making processes. Private sector expertise in innovation and efficiency can lead to the development of cutting-edge technologies and practices that mitigate these externalities. PPPs have the potential of minimizing the negative impact of hurricane catastrophes on the environment, public health, and the economy.

In Florida, the factors that lead to the need for a public private partnership include:

1. Pervasive catastrophic risk exposure
2. Lack of information and understanding
3. Need for adequate returns for investors
4. Insurance rate inaccuracy/inadequacy

[9] Risk based insurance premiums internalize the costs of the location decision to the homeowner. Riskier locations result in higher premiums.

5. Consumer protection gaps
6. Affordability

Pervasive Catastrophic Risk Exposure

While the State of Florida has the highest concentration of property exposed to hurricane risk in the United States, it is far from the only area with catastrophic risk exposure. As we have learned in the 30+ years since Hurricane Andrew, hurricanes cause catastrophic losses from the Northeast (Hurricane Sandy) to Ohio (Helene 2024, Ike 2008), and all along the Southeast from North Carolina all the way to the Texas Gulf coastline. When expanding catastrophe events to include flood, wildfire, tornado, severe convective storms, drought, heat or freezing, the exposure area covers most of the U.S. According to the National Centers for Environmental Information (part of NOAA) there have been more than 400 weather and climate disasters in the US since 1980, and 24 (through November 1st) in 2024 that have caused more than $1 billion in damage.[10] Long-term solutions to controlling the cost of catastrophic risk exposure is a national problem in the U.S.

Lack of Information and Understanding

The private insurance industry in the U.S., in conjunction with third party catastrophe model providers, are excellent at pricing catastrophic risk. Unfortunately, even with advances in technology and the science behind the models, there is large uncertainty in current and future catastrophic loss prediction. Uncertainty in prediction leads to large risk charges and capital requirements for insurers with significant catastrophe exposure. The volatility in catastrophic events adds to model uncertainty in driving up costs. With better information and scientific understanding of the systems involved, the build exposures can reduce uncertainty, but large uncertainty in predictions will persist.

From the consumer's perspective, a general lack of understanding of not only catastrophic exposure but also how private insurance works and is priced leads to frustration with both costs and interactions with the insurance providers. Disputes occur over what is a covered event versus a non-insured loss. For example, wind versus water loss in a standard homeowner's policy following recent hurricanes (Helene and Milton) can lead to anger and frustration from the consumer standpoint. Further demonization of the insurance industry in political ads and personal injury attorneys also feeds a negative public image of the industry that causes many consumers to lack faith in the insurance industry. A lack of understanding of the catastrophic risk and the costs associated with financing that risk may lead people to make poor location choices that lead to affordability issues.

[10] Ncei.noaa.gov/access/billions, accessed 11/6/24.

Need for adequate returns for investors

While insurance is a social good, property insurance is generally provided by private insurers that supply capital for the policies they sell. That capital is supplied by investors that require an adequate return on their investment. As we have seen with the homeowners' line of insurance, the volatility of losses has increased in recent years leading to more risk for investors. As the risk increases, so does the required rate of return for those investors. This is especially true in more hazard-prone areas. This applies to both primary insurers providing property coverage but also reinsurers that provide coverage for those primary insurers. This is commonly referred to as the cost of capital. As the cost of capital increases, it is reflected in insurance rates, making insurance premiums increase.

Insurance rate inaccuracy/inadequacy

The increase in volatility of losses also makes predicting future losses more difficult. This increased uncertainty will result in higher rates for consumers but may also lead to more inaccuracy in rate setting. This can lead to short-term disruptions in insurance markets. When there are fewer natural events that lead to losses, consumers feel that rates are too high, and political pressure may lead public entities that provide insurance to reduce rates. This can lead to private market frictions that cause private insurers to leave the market or restrict providing coverage since others in the market are underpricing risk. We have seen this in Florida with Citizens on the glidepath which has led to Citizens being the insurer of first resort in some areas of Florida because their rates are below what is actuarially fair in those areas.

Consumer protection gaps

One of the main reasons behind the need for a more comprehensive public private partnership regarding property insurance is the ever-increasing consumer protection gaps. As losses and premiums have risen, so has the frequency of consumer protection gaps. Large deductibles place more of the financial burden of losses on households (e.g. percentage wind deductibles). Increasing premiums have led more households to forgo insurance purchases (e.g. flood insurance), even when they may not be considered optional purchases (mortgaged homes in a flood zone are required by mortgage lenders to carry flood insurance). Larger shares of potential losses via deductibles and retention of potential losses through lack of insurance purchases lead to substantial protection gaps. When the losses do occur, many households then need to rely on savings or credit to repair damage.

Affordability

Private market insurers are very good at pricing risk. Insurance products share information with consumers about the costs of their decisions. For property, location decisions incur costs and benefits. Most consumers consider school zones, tax rates, and local amenities when making

housing location decisions. In more hazardous areas, insurance premiums should now be part of the decision-making process. By accurately pricing risk, private market insurers can inform consumers about the risk of their location decisions. This accurate pricing can lead to better location decisions. The more hazardous the location, the higher the premium, the less incentive to locate there. This should lead to less development in hazardous areas and reduce future losses. Location decisions are not made frequently and for many Americans, the recognition of current and future disaster risk is after location decisions have been made. Recent price increases due to predicted future losses may make insurance unaffordable to wealth-constrained households. The regulation of insurance products provided by the private insurance market is designed to ensure that rates are adequate, not excessive, and not unfairly discriminatory. Regulation has not traditionally focused on affordability of accurate rates. Addressing affordability should be done outside the insurance mechanism to not dilute the information conveyed by risk-adjusted premiums. Insurers should charge accurate, actuarially fair rates. If public policy determines that insurance needs to be more affordable, this should be addressed through a program that involves means-testing to ensure that only the portion of the population deemed in need of a subsidy receives discounted insurance, not all insurance buyers.

Barriers to Success

While we believe that a strong public private partnership is necessary to effectively manage the cost of catastrophic risk moving forward, we recognize that there are barriers to developing this solution. Many institutions and public policy makers outside of Florida view this as a Florida problem. “If you want to live on the beach in Florida, you need to pay for it. Why should we subsidize your beachfront living?” While Florida is an outlier regarding hurricane risk, it is far from the only catastrophic risk facing the U.S. today. Wildfires, earthquakes, tornados, severe cold, extreme heat and drought, and severe convective storms render most of the U.S. potential disaster areas. Changing the narrative regarding the “Florida Problem” is necessary to ensure success.

Political tensions have restricted the ability of the Federal government to pass significant legislation for the past few years. A viable long-term solution will require local, state and federal government cooperation with private industry. The ability to gain bipartisan support will be necessary to overcome resistance to change and political discourse that may derail the success of a full public private partnership.

A Preview of the Solutions

There are mechanisms that can be utilized to reduce the current and future potential losses and reduce the cost of catastrophic risk. To achieve the goal of reducing the cost of catastrophic risk in Florida, the public private partnership will need to focus on two main efforts: mitigation and financing. First, we need to alter the cumulative catastrophic risk profile in Florida and the U.S.

In other words, we need to reduce potential future losses through mitigation. Second, we need to optimize the risk financing of the future catastrophic losses that remain after mitigation. This includes determining the optimal role of governmental financing of catastrophic risk and the optimal structure of the government funding of that role.

Mitigation Solutions

To reduce the cost of catastrophic risk, the first step is to reduce future losses. Traditional risk management outlines a variety of ways in which we can reduce risk:

1. Avoidance
2. Stop Risk Expansion
3. Slow Risk Growth
4. Risk Reduction through Mitigation

Avoidance

Principles of risk management indicate that if the risk of any activity is too great, then one should forgo that risky activity. Avoidance in the case of Florida hurricane risk would be to start moving people out of Florida or start retreating from the coastlines. If we expand to avoid sea level rise, that will lead to broader retreat from many coastal areas including areas like lower Manhattan. Realistically, this is not something we have done or are considered doing on a large scale in the US. The cost of such an undertaking likely removes it from consideration.

- How do you compensate (if at all) current high-risk property owners?
- How will it affect economic growth?
- How do you build infrastructure in new locations with such large-scale population movements?

These are just a few questions that need to be addressed to consider such a drastic course of action.

Stop Risk Expansion

Another method of reducing the cost of catastrophic risk would be to stop population growth in hazardous areas. For Florida, this means implementing a ban on all new constructions in hazard-prone areas, if not in the entire state. As the older housing stock ages out or expires, allowing it to phase out without replacement would naturally reduce the current exposure over time. Additionally, halting further expansion of the built environment in Florida will reduce future losses. This, again, is a drastic course of action. The economic ramifications for Florida, the 14th largest economy in the world, banning all new construction would likely be catastrophic and

would significantly impact the national and global economy. It may also significantly increase development in other hazard-prone areas as the U.S. population migration movements would shift away from Florida.

Slow Risk Growth

Florida has some of the more stringent building codes in the U.S. Still, the codes need consistent updating to reflect what we have learned over the last thirty years regarding building techniques and the performance of certain materials and physical structures to reduce storm-related losses. For example, asphalt roof shingles have typically performed poorly during storm activity and the older the shingle, the worse the performance. One update would be to require roof coverings that perform better (including putting an end to the use of asphalt shingles in Florida) as part of the building code. There are many other considerations, of course. For instance, roof shape, minimum flood base level elevations, and masonry vs. wood frame construction are all factors that should be re-evaluated as part of a continuing process to increase building code stringency.

In addition to revising building codes, incentivizing building structures that exceed the current building codes, also known as code plus construction, are a way to significantly reduce costs and losses going forward. This approach will lead to long-term reduction in future losses and is a long-term solution given the amount of time constructed buildings are inhabitable. This is a step that we should be taking today, but in conjunction with the next step, risk reduction through mitigation.

Risk Reduction Through Mitigation

While tougher building codes will take time to change the long-term risk profile, hardening the current housing and building stock is the primary method of reducing the current and short-term risk profile. To reach our conclusions, we investigated how one can improve the equilibrium in the catastrophe risk mitigation and insurance markets through a government mandate. The approach we utilize in this research project complements that of Boyer and Nyce (2013a, 2013b) to characterize the catastrophe market equilibrium involving three or more decision-makers in the primary insurance and reinsurance markets, and the role of governments. This paper examines catastrophe and natural hazard insurance contracts and programs from the point of view of a public policymaker who seeks to structure the PPP to minimize the total cost of catastrophic losses. These costs include expenditures to mitigate against future losses and the purchasing of insurance against those losses that might still occur.

Effectively managing natural disaster risks requires an integrated approach that addresses limiting exposure to natural hazards through comprehensive mitigation strategies that include:

- Individual property level mitigation

- Neighborhood mitigation efforts, and
- More global and government financed mitigation efforts.

Some of these mitigation efforts are easily incorporated while others may require a more sophisticated understanding of the risk and significant upfront capital expenditures. Kleindorfer and Kunreuther (1999) write *"Few insurers provide incentives in the form of premium reductions to encourage individuals to take this step. Developers and contractors have no economic incentive to build safer structures since it means incurring costs that they feel will hurt them competitively because the risk mitigation measures are undervalued by the potential buyers. Hence the public sector has to bear a larger portion of the disaster losses than if these measures had been adopted."* A similar idea is found in Boyer (2024) in another context. While insurers in Florida have provided premium reductions for mitigation efforts, and the state has funded the My Safe Florida Homes program, efforts have not been on a large enough scale to "move the risk needle".

Kleindorfer and Kunreuther (1999) write *"For risk mitigation measures to be cost-effective, the discounted expected benefits over the life of the property must exceed the upfront investment expenses and other costs associated with the measure. In theory all of the interested parties concerned with natural disaster losses should view such a measure favorably."* Interested parties include the

- Property owner, who must see the investment in risk mitigation as an attractive investment that will increase the value of his property;
- Insurer that knows that its claims payments and claims-handling expenses will be reduced should a disaster strike in a region where it has insured many properties;
- Property developer who should find it easier to sell her well-designed properties even if they were more costly to build; and
- Non-affected taxpayers who will see local, state and federal agencies devote tax revenues to other (and perhaps better) projects because the need to account for future disaster assistance is reduced due to the lower expected damages in the future.

These interested parties all need to be represented in the public private partnership.

Governments usually address catastrophe risks through two types of programs: (i) insurance (or reinsurance) programs before the catastrophe materializes and (ii) relief programs after the occurrence of a catastrophe. With the former, so-called *ex-ante government programs* prepare for catastrophic events by creating reserves to prevent insurers from defaulting or offer government-provided catastrophe insurance. With the latter, *ex-post government relief programs* help catastrophe victims or private insurers after a catastrophic event has occurred, particularly when insurers default or are on the verge of default. Both types of programs are commonly implemented (see Charpentier and Le Maux 2014, Zanjani 2008, Bruggeman et al. 2010, and Klein and Weston 2010 for specific government insurance programs in various countries).

What we propose in this project is that government involvement can go beyond a simple financial contribution to reducing the negative impact of hurricanes, whether it is before or after the occurrence of the catastrophe. Governments can also change the rules of the game to nudge insurance, building contractors, and individual property owners to invest an appropriate amount in risk mitigation techniques. In Boyer and Nyce (2025), we propose that this could be achieved through two changes in legislation. The first would be to separate hurricane risk insurance from other types of homeowner insurance protection. The second change would be to have high hurricane insurance contract switching costs, so that homeowners will choose to invest greater sums in hurricane risk mitigation technology. The increase in risk mitigation investments would benefit society since every individual property in a neighborhood would benefit from risk mitigation investments done by all neighborhood residents.

In Boyer and Nyce (2025), the original research included in this project, we start from the premise that households face risks they would like to manage but may not be fully educated on what are the proper ways to do so. By contrast, and through their experience in assessing and managing such risk exposure over many properties, insurers have developed an expertise that makes them better informed about the tools, techniques, and technologies available to reduce exposure to many risks, including natural catastrophes. Owners of properties at risk can therefore contract insurers for both the hurricane risk mitigation technology AND to be insured against direct losses that may arise. Because many features of hurricane risk mitigation are often hidden, we can see the mitigation technology as a proprietary service whose quantity and quality cannot be observed freely by any outside party. As a result, only the insurer that implemented the technology knows the property's true vulnerability.

There are, of course, ways that a homeowner could make his property's risk mitigation factor known. One could hire some sort of “hurricane risk certification agent” who would inspect and vouch for the property’s hurricane risk resiliency level. Such a certification would be costly, however.[11]

We show in our study that investment in hurricane risk mitigation technology reduces the probability of loss irrespective of whether insurance contracts are signed for many years, as in Kleindorfer and Kunreuther (1999) and Kunreuther and Heal (1999), or whether short-term contracts are used with an exit cost as described above. We also show that when the cost of changing insurers is high, then investment in hurricane risk mitigation technology could be greater in the case of short-term contracts than in the case of a long-term contract. Competition between insurers is therefore compatible with investment in hurricane mitigation, and the more

[11] If left to their own devices (i.e., insurers are not involved with any investment in mitigation), homeowners could tell their insurer that they invested an appropriate amount in mitigation but shirked on the quality or completely forewent such investment altogether. Underinvestment in mitigation can therefore result in a bad market equilibrium, especially if insurers cannot tell after the fact whether the proper risk mitigation technique was used. Boyer and Stöckl (2024) present such an approach when insurers can tell after the fact whether proper technology and techniques were used to prevent a loss.

so that short-term (i.e., annual) contracts become the way to induce the most investment in mitigation.

Our analysis also highlights the fact that short-term contracts could make neighborhoods better off if properties benefit from every other neighborhood property's investment in hurricane risk mitigation. Since more investment may be achieved through short-term contracts when homeowners face a cost of exiting their contract, it may be socially optimal for governments to mandate that hurricane risk insurance be short-term but penalize homeowners who want to change insurers.

Mitigation and the Role of Intermediaries

Investing in mitigation reduces risk and claims cost, which stabilizes premiums. Structural improvements such as reinforcing roofs, installing storm shutters, or upgrading building materials are particularly effective. Community-level measures (improved coastal defenses or stricter zoning laws) also play a critical role. Land-use strategies and zoning laws ensure that developments are built in low-risk areas and away from floodplains or fire-prone zones. Investment in loss mitigation lowers the incidence losses, which can lead to reduced premiums. For example, homeowners who invest in hurricane-resistant materials should qualify for discounts on their insurance policies if insurers can observe such investment. These calculations depend on insurers accurately evaluating the effectiveness of mitigation measures and reflecting them in their underwriting standards.

Intermediaries such as insurers and mortgage lenders play a pivotal role in implementing mitigation measures. The case for insurers is clear as insurance premiums will be reduced for policyholders who undertake approved risk-reduction activities. Mortgage lenders have a vested interest in protecting their collateral. As such, they may require specific mitigation measures as a condition for approving loans in high-risk areas. These institutions, together, can help incentivize investment in mitigation, reducing overall risk for property owners and society.

Financing Solutions

Public vs Private Financing

Boyer and Nyce (2013a, 2013b) wrote two papers that explain much of the structure we see in insurance markets as a two-factor model, labor and capital. In the first paper titled "An Industrial Organization Theory of Risk Sharing", they show that insurers with varying access to labor (underwriting, claims) and capital self-select into layers of insurance coverage where labor (primary) or capital (reinsurance) are more important to minimizing the cost of providing insurance. Using this model in a second paper titled "Insuring catastrophes and the role of governments", Boyer and Nyce (2013b) show that if governments (state or federal) can become

insurance entities, then it should enter the insurance market as the reinsurer of last resort at the high end of the loss. The reason is that through their ability to tax, government entities have the lowest cost of raising capital, which means that they also have the lowest marginal cost of bearing risk. At the same time, governments have the highest underwriting cost since they lack the underwriting expertise, and the economic incentives and political will to seek the most accurate pricing. When the government has the lowest cost of capital, access to capital is more important than the ability to underwrite. This is especially true in situations where losses are important (see Kessler, 2008, for other reasons). When we include governments in a model where we seek to minimize the cost of providing insurance coverage against catastrophic events through insurance, then market structure will include primary insurers and reinsurers, as well as the implicit (or explicit) presence of governments as reinsurers of last resort.

We know the conditions for the reinsurance market to exist and the conditions for the net benefits of government-provided insurance. These depend on the diversity of the private market insurance (reinsurance) providers and the underlying loss distribution (the losses that remain after mitigation efforts). Even though attachment and detachment points are determined to minimize the cost of insurance protection, the cost of catastrophic insurance cannot be so extraordinarily high that making the implicit government's guarantee explicit can reduce this cost. Such a reduction in the cost of bearing risk surely increases the policyholders' welfare. We are not suggesting that the government should necessarily intervene in all insurance markets, quite the contrary. In most instances, government involvement in insurance is unnecessary and may distort private market success. However, in some cases, such as significant catastrophic risk, government involvement may improve the overall welfare of consumers.

In the separate paper, Jia et al. (2022), the authors develop a model that shows government reinsurance can increase the default probability of insurers in a perfectly competitive market. As the insurer's default probability varies with the level of government involvement, the authors show that individuals with different levels of risk aversion have varying preferences for the extent of government involvement. The approach is interesting in that their proposed government-reinsurance solution contributes to the ongoing discussion on the efficient public private partnerships that optimize risk-sharing amongst different market participants.

One aspect of financing that was not discussed in these models is how the governments may choose to fund their participation. For private market insurers, solvency regulation is tasked with ensuring that the insurer has sufficient capital to pay for potential losses in "most" cases. Many solvency tests are designed to ensure that the insurer is solvent 99% or 99.5% of the time. This results in the private insurer pre-funding potential losses (holding sufficient capital) at or above the requirements set by the regulators. For government entities, they often have an additional option, post-loss funding. They may not have to have all the capital available to pay losses prior to the loss occurring, the entity may utilize an ability to issue debt (borrow) funds to pay for current losses and repay that debt into the future. This ability to conduct post-loss financing raises an interesting research question, "Are consumers ever better off utilizing some type of

post-loss financing of catastrophic risk"? That is the question currently being addressed in this research project.

Pre vs Post loss Financing

To begin the research on pre-vs post-loss financing, we examined existing examples of government intervention in insurance markets. We focus mainly on property insurance markets but do expand into other types of insurance. The goal is to better understand when governments have decided to get involved in providing insurance coverage and how they have chosen to finance these endeavors. We pay special attention to examples where governments have utilized post-loss financing. We provide a review of different government provisions of insurance in Appendix B. The review discusses insurance examples at both the national and state levels with an emphasis on exposures that carry catastrophic risk. Table 4 contains a summary of the discussion. Floridians have access to three programs that can utilize post-loss financing, namely: 1) the National Flood Insurance Program (Federal Government); 2) Citizens Property Casualty Insurance Corporation (State of Florida); and 3) the Florida Hurricane Catastrophe Fund (State of Florida).[12]

[12] Florida, like many states also has a guarantee fund for insurers that are insolvent. The Florida Insurance Guarantee Association (FIGA) can also utilize post-loss assessments to help pay the claims for insolvent insurers.

Table 4: Prominent Government Insurance Programs				
	Peril	**Tail Risk**	**Attachment Point**	**Post-Loss Financing**
WC Funds	Worker Injuries	Negligible	Primary Insurer	None
NFIP	Flood	Substantial	Primary Insurer	Borrow from US Treasury
CEA	Earthquake	Substantial	Primary Insurer	Issue bonds
Fair/Beach	Windstorm	Substantial	Primary Insurer	Assessment on insurers
Citizens	Windstorm	Substantial	Primary Insurer	Assessment on policyholders
Cat Fund	Windstorm	Substantial	Reinsurer	Assessments on policyholders

Economists would recommend against the use of post-loss financing, arguing for the value of pre-loss financing schemes. Pre-loss financing through a well-functioning insurance mechanism that can accurately price the risk internalizes the cost of the location decision to those who bear the risk. Put differently, those who bear the risk would be the ones paying the price for their decisions. It would minimize the need for any type of subsidy that may exist in a post-loss financing mechanism (e.g. a broad tax). This would incentivize better decision-making. It would ensure that those living in risky areas were more incentivized to invest in mitigation and would help optimize individual location decisions, while also avoiding residents of less risky areas subsidizing the risk exposure of others.

But pre-loss financing methods can be costly. Upfront premiums may be substantial, and, for lower-income individuals, unaffordable. For private insurers that bear a substantial portion of the catastrophic risk transferred through the insurance mechanism, the amount of capital necessary to ensure solvency will be high. As documented in the Boyer and Nyce papers (2013), the marginal cost of capital is increasing, which means each additional dollar required to be held by the insurer costs more to hold than the previous dollar. Depending on the risk profile, the cost of capital for holding the additional dollar may be too high. Ensuring solvency in the 1-in-200 year or 1-in-500-year event that may never occur could lead to a suboptimal allocation of capital. Therefore, a real tradeoff exists between utilizing post-loss funding to lower the upfront costs of catastrophes and the potential distortion of incentives to decision-making that could occur with cross-subsidies, intertemporal subsidies, distorted mitigation and location incentives and potential political risks that may arise. Table 5 contains a comparison of the potential issues with post-loss financing.

Table 5: Pre-loss vs Post-loss Financing		
	Pre-loss	Post-loss
Upfront Premiums	Higher	Lower
Risk/Cost allocation (underwriting)	Fairer	Less Fair
Cross Subsidies	Less	More
Intertemporal Subsidies	None	Yes
Solvency capital requirements	Higher	Lower
Mitigation incentives	Higher	Lower
Location incentives	Optimal	May distort
Political Risk	Less likely	More likely

Upfront Premiums

As noted in the table, financing all catastrophic risks on a pre-loss basis requires funding every possible outcome, or at least those up to some specific solvency level. Utilizing a government entity that explicitly declares its attachment points and its pre-loss funding level, leaving the remaining risk to be funded post-loss will result in lower upfront premiums. Note that we are referring to them as upfront premiums. If a post-loss funding mechanism has an assessment, like in the case of Citizens for example, they can still be considered premiums, just not upfront premiums.

Solvency

By having a government entity declare an attachment point and its pre-loss funding level it will set a maximum loss for each insurer. This lowers the capital requirements for each insurer to ensure solvency, since when losses exceed a certain point, the insurer is no longer liable. By lowering the solvency requirements for each insurer, it lowers the amount of capital that needs

to be held and thus the cost of capital for the insurers. These lower costs can be passed on to the end consumer through lower private insurance premiums. One of the effects of lower solvency standards – accompanied by higher post-loss financing - can be a decreased incentive to mitigate risk since insurance premiums, which decrease with mitigation measures, are lower.

Risk/Cost Allocation

One of the insurers' core functions is underwriting, which involves determining the potential future losses and the appropriate premium for the exposure being insured. Exposures that present a higher expected loss are charged higher premiums. In other words, the cost is allocated according to the risk presented. This is one of the strengths of the private insurance industry. Insurers have developed expertise at evaluating exposures and determining an appropriate premium. As data sources and technology have evolved, this process has become more and more granular. This alignment of premiums with the underlying risk gets distorted with most post-loss financing schemes, which proportionally allocate the shortfall after a catastrophe across individuals. As they exist today, all post-loss financing structures allow for collecting funds from a large pool (e.g. all U.S. Federal taxpayers, all property casualty policy holders in Florida, etc.) which is somewhat or completely independent of the pool members' risk. In fact, many individuals shouldering the cost for ex-post financing of catastrophes were not at risk of suffering a loss. This allocation of the post-loss cost can create two types of subsidies, across current exposures (cross subsidies) and onto future exposures (intertemporal subsidies).

Cross & Intertemporal Subsidies

In many post-loss financing structures, the ability of the entity to conduct post-loss financing relies on their ability to "tax" a broad base of exposures. If the post-loss charges are not directly tied to the risk posed by the exposure, the result is a cross-subsidy from lower risk (or no risk) to higher risk exposures. Both Citizens and the Cat Fund can assess all property-casualty insurance policies sold in Florida except for medical malpractice and workers' compensation. This leads to a variety of insurance policies being assessed based on a percentage of premium paid, including liability policies such as personal umbrella policies. Therefore, these entities are post-loss financing potential property losses across insureds who may have little to no exposure to property losses. Individuals paying ex post for a loss that is not perfectly correlated with their risk of suffering the loss is known as a cross subsidy.

Most post-loss financing mechanisms allow the entity to issue debt and pay that debt off using future assessments (taxes). This in turn can lead to future generations paying for the losses of current or past generations. These are known as intertemporal subsidies. If assessments are significant enough, it may deter future generations from moving to areas subject to assessments. Furthermore, the funds the government must commit to financing uninsured losses from natural catastrophes cannot be used for other public investments such as infrastructure and education, which is another way that too much post-loss financing in Florida

may deter future growth. Finally, post-loss financing could have a negative impact on a government's credit rating if too much credit is needed to fund losses that have occurred.

Mitigation and Location Incentives

People respond to incentives. The most common incentives utilized are financial. Charging premiums that are accurately risk-based provides significant financial incentives to reduce the risk associated with the insured exposure. That is, property owners that are being charged high premiums have a real incentive to undertake mitigation activities that reduce their potential losses and will therefore result in lower premiums. This will work if premiums are accurate, and risk based. Any subsidies built into the premiums distort this mitigation incentive. A common method of incentivizing mitigation is to specify mitigation steps that can be undertaken and the resulting reduction in premium associated with the steps taken. This leads to proper cost benefit analysis at the exposure level and mitigation being done if it is cost-effective (the benefits of the reduction in premium outweigh the costs of the mitigation steps). This also assumes full information (people knowing the costs and benefits) and it assumes rational decision making (people make the most cost-effective decisions). Post-loss funding with subsidies reduces upfront mitigation incentives, thus resulting in a riskier society.

Similarly, post-loss financing can distort location decisions. Individuals (and businesses) making location decisions factor both amenities and costs into their location decision. Lowering upfront costs (for example, by lowering insurance premiums through increased government funding) may entice more individuals to choose risky locations since they benefit from the amenities but do not bear the full cost of the accrued risk from natural catastrophes from those places. The result is population growth in more hazardous areas than would be optimal if the cost was borne upfront. Reducing and/or distorting mitigation and location incentives may lead to higher future risk than pre-loss financing.

Political Risk

Political risk includes the risk that laws democratically change. These risks, while subtler in the U.S. than in less stable systems, stem from the dynamics of democratic governance, policy shifts, and geopolitical factors. The source of political risk in developed democracies stems from policy uncertainty and political polarization. While we enjoy regularly occurring elections in democracies as they promote accountability, leadership changes also introduce uncertainty regarding policy continuity. Another dimension of political risk involves populism and polarization. Such shifts can disrupt global supply chains, impede international collaboration, and erode investor confidence.

Insurers are not insulated from the political risks that arise in these otherwise stable environments as they face challenges stemming from policy uncertainty, political polarization, and shifting socio-economic priorities. This is even more challenging in industries that are

heavily regulated, such as insurance. Political polarization also poses risks as regulatory frameworks may shift as different political parties advocate divergent approaches to issues such as climate change and disaster recovery. Political risk makes insurers uncertain about their liability and operational scope, which can result in market distortions or uneven coverage availability for consumers. For instance, governments may impose mandates requiring insurers to expand coverage for politically sensitive issues, such as mental health, pandemics, or cyber risks. Populist movements may push for caps on premium increases or coverage reductions that can affect profitability and market dynamics. The growing focus on climate change introduces long-term risks for insurers. Governments may implement new environmental regulations or set ambitious carbon-reduction goals that influence how insurers assess and price risk. Political risk significantly influences how insurers manage and price certain risks.

With respect to hurricane and wildfire coverage, policy debates around government-backed reinsurance programs, disaster relief funding, and climate change mitigation create an uncertain environment. Shifting policies can affect the insurers' exposure and pricing strategies, which can compound due to the growing political focus on stricter building codes, land-use restrictions, or mandated climate risk disclosures. These factors make catastrophe insurance a focal point of political risk, and the more so in the United States, where the presence of multiple layers of government increases the complexity of catastrophe insurance because of the overlapping and sometimes conflicting regulations at federal, state, and local levels. Insurers in developed democracies like the United States must navigate a complex landscape shaped by political risk, as much as in developing autocratic countries. Policy changes, polarization, and shifting regulatory priorities create an environment where adaptability and proactive risk management are crucial to maintaining stability and profitability.

Having government entities providing insurance products may make political interference into insurance markets easier or more frequent. As we have seen in Florida, the legislative changes brought about by HB 1A in 2007 have had long-term ramifications. Proposed solutions to the insurance issues in Florida have included having Citizens underwrite all the wind risk in the state. If this had been the case when Citizens was formed in 2002, Floridians would have had to post-loss finance nearly $35 billion dollars following the 2004-2005 storms. Having government entities established in the market simplifies the implementation of these types of “solutions” and adds to the political risk of charging less pre-loss and relying more heavily on post-loss financing to “save” money.[13]

Our Suggestions

With respect to post-loss financing, we developed an approach that illustrates the trade-off between pre- and post-loss financing in this project. Neither extreme – financing the entire cost

[13] Similarly, imagine a scenario where Citizens underwrites all the wind risk and Florida goes 10 years without a storm making landfall again. What happens when Citizens is sitting on $50 billion in assets and the state faces a budget shortfall?

of natural disasters up-front through pre-loss financing or funding all catastrophic risk post-loss – is desirable. Depending on the assumptions of the model, there are internal solutions that utilize both pre-loss and post-loss financing that make consumers better off in the long run. In our model, policyholders have an income that they allocate between investment in loss prevention and a savings account. They also purchase insurance for their house which is at risk of being destroyed. If a catastrophe such as a hurricane hits, losses of all policyholders are correlated. Since everyone buys insurance (for example, mortgage lenders require full insurance lest they don't finance a house purchase), the question is not how much insurance individuals will buy but rather at which price. The insurance premium increases in regulatory stringency (i.e. what is the worst outcome insurance companies must be able to finance out of their own assets) and decreases in policyholders' loss prevention effort (since it reduces the expected damages).

Whenever regulatory stringency is low, ex-post government bailouts become more likely. These bailouts are financed through a tax on all policyholders. Loss prevention reduces policyholders' insurance premiums because it lowers expected losses, and it decreases expected taxes for government bailouts. However, it also comes at a cost. The additional loss reduction achieved with more investments decreases, meaning that while the first dollar invested in mitigation has a large risk-reduction effect, this effect decreases with each dollar invested. There is only so much damage from catastrophes that can be prevented. At some point, investing in more prevention does not make individuals better off and they prefer to finance the remainder of the losses through ex-post bailouts. When regulatory stringency is low, the incentive to mitigate losses is low as the ex-ante risk-adjusted premiums are low compared to overall wealth, and lowering those already-low premiums have little value for individuals. Since all property damage is a deadweight-loss for the economy, and little regulatory stringency entails no risk prevention, this is not an optimal outcome. On the other hand, when regulatory stringency is high, insurance premiums are higher because insurance companies must provide for even the worst-case scenarios and therefore charge policyholders large premiums. Lowering these large premiums through prevention has more value and, as such, encourages risk mitigation.

The more stringent regulation is, the more expensive it becomes for insurance companies to offer insurance, and policyholders will not be able to afford premiums anymore. Therefore, very high stringency is not optimal either. The result is that there is some balance between pre-loss and post-loss financing that in the long run makes people better off. As with many of these theoretical models, the devil is in the details. For example, how big the potential losses are compared to the wealth levels matter when it comes to the results. We continue to develop the model. The current model shows the trade-off between pre-loss financing and just one of the potential post-loss financing issues, incentives to invest in mitigation. The model will be expanded to address the broader set of tradeoffs as well. As it evolves to address more of the issues we see in the market for catastrophe insurance, the model will help inform public policy makers as to the proper balance of pre-loss and post-loss financing. Balancing the larger upfront costs of pre-loss financing that will incentivize more loss prevention (mitigation) with the

issues that develop with the wider use of post-loss financing like cross and intertemporal subsidies and the reduction in mitigation and location incentives.

Conclusions and Directions for Future Research

The goal of this project is to outline recommendations that will lead to reducing the cost of current and future catastrophic risk to Floridians. The two main themes of our recommendations involve

- Motivating more mitigation efforts to reduce the risk of catastrophic damage
- Reducing the cost of capital associated with financing the remaining catastrophic risk that is not mitigated.

Many recommendations are generated directly by the research projects included within this project, but other recommendations have been made in previous efforts related to managing catastrophic risk in Florida. Further, while many of the recommendations included in this project are not simple or low-cost, we believe that the long-term value of investing now will be far greater than current costs.

The primary conclusions of this project are as follows:

1. The ultimate goal is to reduce the cost of catastrophic risk to both current and future Floridians
2. To achieve this goal, we recommend a better developed public private partnership that focuses on two main functions:
    a. Motivating more mitigation efforts to reduce the current and future potential losses
    b. Optimizing government involvement in insurance (with some post-loss financing) to reduce the overall cost of capital associated with financing catastrophic loss while still balancing the negative aspects of post-loss funding.
3. A variety of recommendations are made along these lines with the highest priority recommendations being:
    a. Develop a hurricane resistance grading schedule that incorporates all relevant mitigation features of a property;
    b. Organize and share the above information with relevant parties in the mitigation and insurance system; and
    c. Initiate a pilot program supported by mortgage lenders and property insurers to aid in the development of an insurance and/or mortgage product that effectively promotes the planning and financing of mitigation.

Substantial work remains to be done to fully vet all recommendations.

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Appendix A: Recommendation Tables

Recommendation Table 1: Mitigation – Reduce Exposure

Reduce Exposure		Target Level		
Rec. No.	Recommendation	Federal Govt.	State & Local Govt.	Private Insurers & Mortgage Lenders
M1*	**Develop a uniform Hurricane Resistance Grading Schedule that assigns a grade to structures considering ALL relevant mitigation features to aid in optimizing discount and tax mitigation incentives.**	Yes	Yes	Yes
M2*	**Develop a pilot mitigation program driven by either mortgage lenders or property insurers (or both) to aid develop an insurance and/or mortgage product that effectively promotes mitigation for the property owner and mitigation financer.**	Yes	Yes	Yes
M2a	**Incentivize mortgage market participation in mitigation. Through Fannie Mae and Freddie Mac enable mitigation costs to be amortized over a longer time.**	Yes		
M2b	**Incentivize private property insurers to participate in property mitigation through an experimental program of long-term property contracts with mitigation funding provided by the insurer.**		Yes	Yes
M3	**Develop strategies to improve the affordability of mitigation**	Yes	Yes	Yes
M3a	Federal level – federal tax credits for cost-effective mitigation, mortgage rate reductions, incentives to state and local governments to undertake aggregate mitigation efforts	Yes		
M3b	State level - Additional funding to state sponsored mitigation programs, sales tax holidays for mitigation projects, sales tax holidays on post loss rebuilding (or additional sales tax earned post-storm is earmarked for mitigation), incentives to local governments for aggregate mitigation		Yes	

M3c	Local level – property tax credits or rebates for individual mitigation (commercial and residential property)		Yes	
M3d	Insurer level – appropriate premium discounts			Yes
M3e	Leverage all resources to lower the overall cost of mitigation to the property owner, especially for more capital constrained property owners.			Yes
M4	**Expand and improve the Florida Building Code, incorporate "Code plus" standards, raise future building standards to limit future exposure growth.**		Yes	
M5	**Establish a community rating system (bring local government to the table) for wind (BCEGS) AND flood exposure as means of encouraging sound building and zoning codes, adequate enforcement of codes, in-depth inspections of individual homes to assess risks, private insurers and state agencies should encourage and support such programs and require them as part of underwriting procedures and rate setting. The rating system considers both aggregate and individual property mitigation efforts.**	Yes	Yes	
M6	**Expand research funding in cost-effective mitigation, windstorm prediction, and interaction between windstorm and storm surge.**	Yes	Yes	Yes
M7	Encourage not-for-profit organizations aimed at mitigation.		Yes	Yes
M8	Educate all stakeholders in catastrophe prone areas on the risks and costs of location, focus on vulnerable populations (age, income, etc....)	Yes	Yes	Yes
M9	Establish requirements that building permits on new residential construction include proof of private market insurance coverage.		Yes	Yes

Recommendation Table 2: Efficient Financing – Reduce Cost

Reduce Cost		Target Level		
Rec. No.	**Recommendation**	**Federal Govt.**	**State & Local Govt.**	**Private Insurers & Mortgage Lenders**
F1*	**Address insurance financing system inefficiencies:**		Yes	
F1a	Organize and/or provide data to increase efficiencies (e.g. database that incorporates loss control and mitigation features of housing stock similar to CARFAX).		Yes	
F1b	Expand and promote managed repair programs		Yes	
F2	**Address Cat Fund Operations**			
F2a	***Adjust the layer in which Cat Fund operates (move up the loss distribution)***		Yes	
F2b	***"Right-size" the Cat Fund to balance competing goals of reducing the cost of capital of financing catastrophic risk while ensuring that "too much" post loss financing does not occur.***		Yes	
F3	**Adjust Citizen's Operations**		Yes	
F3a	***Minimize the role of Citizens in the provision of the primary layer of property insurance.***		Yes	
F3b	Review insurance commission structure to incentivize insurance agents to place business outside of Citizens		Yes	
F3c	Remove glidepath from Citizens rate structure (address affordability elsewhere)		Yes	
F3d	**Tie Citizens policies to My Safe Florida Homes program, mandated cost-effective mitigation (utilize state funds to reduce state's exposure).**		Yes	
F4	**Address insurance affordability outside of the insurance mechanism (for example a means tested program).**		Yes	
F5	**Incentivize companies to retain capital and balance sheet growth to reduce reliance on small and/or undercapitalized insurers.**		Yes	Yes

F5a	Federal tax laws should be changed to permit at least a portion of the surplus reserves of private insurance companies to be accumulated and invested on a tax-free basis, as long as they are used to pay for damages to insured homeowners in major catastrophes.	Yes		
F5b	Allow establishment of individual disaster preparation accounts which would permit a homeowner to save for future mitigation or disaster recovery on a pre-tax basis (tax credits?) (e.g. pre-catastrophe mitigation and/or post-catastrophe repair or deductibles).	Yes		
F6	**Remove the homeowner from the wind vs. water cause of loss issue. Reposition the National Flood Insurance Program as a reinsurance program, have flood covered by the standard homeowner's policy with the flood component reinsured with NFIP or private flood coverage.**	Yes	Yes	
F7	Proactively explore alternative risk financing solutions		Yes	
F7a	Capital market solutions for risk transfer (cat bonds, industry loss warranties)		Yes	
F7b	Parametric products		Yes	
F7c	Other solutions that may lower the cost of capital in risk transfer.		Yes	
F8	Adjust insurance regulation to allow more insurer flexibility in providing basic insurance coverage/options (e.g. ACV vs. Replacement Cost)		Yes	Yes
F9	Enact proactive programs to attract investors to the Florida property insurance market, including:		Yes	Yes
F9a	Primary insurers		Yes	Yes
F9b	Reinsurers		Yes	Yes
F9c	Alternative risk financing		Yes	Yes
F9d	Captives		Yes	Yes
F9e	Pooling (e.g. similar exposure risk retention groups, hospitals, commercial residential)		Yes	Yes

F10	Incentivize those profiting from the Florida insurance market to have operations in Florida. Florida has done very well in getting primary insurer operations in Florida to benefit economically from the insurance market created here (9th largest in the world), they have not done as much to get reinsurers and alternative financing providers to have operations in the state.		Yes	Yes
F11	Explore the possibility of developing reinsurers and other financing entities in free trade zones or Native American lands.		Yes	Yes
F12	Incentivize improvements in rating methodologies and solvency testing.		Yes	Yes
F13	Ensure that premium discount structures reflect true risk reduction and incentivize cost-effective mitigation.		Yes	Yes

Recommendation Table 3: Both Mitigation & Efficient Financing

Reduce Exposure & Cost		**Target Level**		
Rec. No.	**Recommendation**	**Federal Govt.**	**State & Local Govt.**	**Private Insurers**
B1	***Promote risk-wise behavior for:***	Yes	Yes	Yes
B1a	*Consumers*		Yes	Yes
B1b	*Businesses*	Yes	Yes	Yes
B1c	*Local, state, & national governments*	Yes	Yes	Yes
B2	***Address Citizen's Operations***			
B2a	***Tie Citizens policies to My Safe Florida Homes program, mandated cost-effective mitigation (utilize state funds to reduce state's exposure).***		Yes	

Appendix B: Government Provision of Insurance

Government involvement in insurance markets is not unique to the U.S. Many countries' governments are heavily involved in their insurance markets. In the U.S. we have state and federal involvement in insurance. In some cases, they are the sole provider of insurance, in other cases, they compete directly with private insurers. How the government entities are financed also varies widely. Some are designed to charge actuarially fair rates, compete in the private market and while remaining not-for-profit, be self-sustaining without any implicit or explicit governmental backstop. What makes the State of Florida entities involved in property insurance unique is the extent of their involvement (market share), the attachment points of their involvement (involved in both the primary layer and in lower level reinsurance layers), the catastrophic nature of the protection they are providing (high levels of loss uncertainty and higher likelihood of losses exceeding claims paying ability), and the unique post-loss financing structure of the entities: the ability to issue bonds on the municipal bond market at the State of Florida's credit rating and utilize post-loss assessments on most property-liability insurance contracts to pay back those bonds over a time period up to 30 years.

This section documents the insurance markets where government intervention is prominent. This is not an exhaustive list of government involvement in insurance, it is designed to provide an understanding of the many ways in which government entities have interacted with insurance markets. In the U.S. both state governments and the Federal government have been involved in a variety of insurance markets, including property insurance, liability insurance, life insurance and health insurance. In some cases, the government has acted as the sole provider of an insurance product, they have been in direct competition with private insurers, they have provided mandatory insurance to those that cannot purchase insurance in the private market, and they have acted as a reinsurer and served as a backstop to significant losses.

Florida Property Insurance – State Government Involvement

Two state entities are heavily involved in providing insurance in the Florida property insurance market. Citizens Property Insurance Corporation (Citizens) and the Florida Hurricane Catastrophe Fund (FHCF or "Cat Fund"). A third entity, the Florida Insurance Guaranty Association (FIGA) does not provide insurance directly but pays the covered claims of Floridians if their insurer becomes insolvent and is unable to pay the claim. All three entities can assess property casualty insurance policies and thus provide post-loss financing of catastrophic risk.

Citizens is the state run "insurer of last resort". "Citizens was created by the Florida Legislature in August 2002 as a not-for-profit, tax-exempt, government entity to provide property insurance to eligible Florida property owners unable to find insurance coverage in the private market. Citizens is funded by policyholder premiums. However, Florida law also requires that Citizens levy assessments on most Florida policyholders if it experiences a deficit in the wake of a particularly devastating storm or series of storms" (https://www.citizensfla.com/who-we-are, accessed 8/14/2024). Citizens was formed by the merger of the Florida Windstorm Underwriting Association (FWUA) and the Florida Residential Property and Casualty Joint Underwriting

Association (JUA). In other states these two types of state-run insurers are known as beach plans (like the FWUA) and residual markets (like Florida's JUA). Every state has some type of residual market since property insurance is typically required for a mortgage and if a requirement exists, the state provides a mechanism for those who cannot purchase in the private market. States with large windstorm exposure typically also have beach plans. Florida and Louisiana are somewhat unique in the formation of a Citizens insurer to fulfill both purposes.

Citizens sells both personal lines and commercial lines property coverage throughout Florida and has the ability to conduct post-loss assessments to fund losses if necessary. In the past, they have done this by issuing bonds in the municipal bond market (at the State of Florida's credit rating) and paying the financial requirements of those bonds off through multiyear assessments.

The Cat Fund acts like a reinsurer (insurance for insurance companies) offering a layer of protection to private insurance companies (and Citizens) if storm losses reach a certain level. The Florida Hurricane Catastrophe Fund (FHCF) was created by the Florida Legislature in 1993 to provide additional insurance capacity and help stabilize the property insurance market in Florida (Fla. Stat. s. 215.555(1)). The FHCF provides reimbursement for a portion of a property insurer's hurricane losses above the amount retained by the insurers. Insurers enter contracts with the FHCF and pay a premium. The FHCF can accumulate premium payments on a tax-free basis as it is exempt from federal income taxation. The Cat Fund has a mandatory layer that insurers must purchase, and they offer an optional layer of coverage. For the 2024 storm season the Cat Fund maximum exposure is $17 billion in excess of $9.9 billion in insured losses. Like Citizens, the Cat Fund can assess property casualty insurance policies sold in Florida if they incur a deficit and issue bonds in the municipal bond market.

As we entered the 2025 hurricane season, given the financial situations of both Citizens and the Cat Fund in June 2025, it is far more likely that the Cat Fund would have had to do an assessment if a major storm made landfall in Florida. The Cat Fund's maximum obligation is $17 billion with an estimated claim paying ability of $5.78 billion. The Cat Fund's projected shortfall in a 1 in 50-year event was over $10 billion while Citizens' projected shortfall in a 1 in 100 year event was $1.3 billion. The 2024 storm season saw two landfalling hurricanes in Florida, Helen and Milton. While both were destructive storms, they could have been much worse from a property insurance perspective. Both storms carried substantial flood damage (not insured by the homeowners policy) and both storms avoided hitting the most heavily populated areas that were originally forecast. The result is that assessments for the 2024 storm season are extremely unlikely.

The Florida Insurance Guaranty Association (FIGA) was created by the Florida Legislature in 1970 to address concerns about the adverse effects of insolvent insurers. Its specific purpose is to "provide a mechanism for the payment of covered claims under certain insurance policies to avoid excessive delay in payment and to avoid financial loss to claimants or policyholders

because of the insolvency of an insurer." (Section 631.51(1), F.S.) FIGA assesses property casualty insurance policies to fund paying the claims of insolvent insurers.

One state entity that warrants more detail is the California Earthquake Authority (CEA). Like Citizens, the CEA is a publicly run entity that has been in direct competition with private market suppliers. There are major differences between the CEA and the Florida state run entities. First, the CEA is selling an insurance product, earthquake coverage, that is optional coverage in California. Earth movement is not covered by your standard homeowner's policy. Insurers selling homeowners insurance in California are required to offer earthquake coverage via an endorsement to their policy, but those endorsements are not required to be purchased and are very expensive. The CEA is a viable alternative to purchase earthquake coverage and is the largest provider of coverage in California (approximately 2/3 of all policies issued). Take-up rates (percentage of homeowners purchasing earthquake coverage) hovers below 15%. According to FEMA, in 2022 only 10% of California residents had earthquake coverage (https://www.fema.gov/emergency-managers/risk-management/earthquake/insurance, accessed August 25, 2024). While the CEA currently has approximately $20 billion in claims paying ability, it does not have the ability to do post-loss funding, nor is the State of California liable for any shortfalls. Any shortfall would result in policyholders receiving a pro-rata share of their claim (https://www.earthquakeauthority.com/about-cea/financials/cea-financial-strength, accessed August 25, 2024).

Another insurance marketplace where state run entities have directly competed with private insurers is workers' compensation. While more than 15 states have publicly run WC insurers, only one, New York, specifically states that the state is liable for any shortfall suffered by the WC insurers. No indication in the NY statutes indicates how the shortfall will be paid. Most states fund the insurer then allow them to operate as a separate entity. These state-run WC insurers are an interesting comparable, a state-run insurer competing directly with private insurers in an insurance marketplace that offers compulsory insurance. Many of these state-run entities have existed for more than 75 years, are well funded, and run a very small likelihood of bankruptcy. Further, WC does not have the same catastrophic exposure as property insurance in Florida.

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