

The Real Estate Risk Fix:

Insurance-Linked Securitization in the Florida Metropolis

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The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

This PhD critically examines the operations, and limits of insurance-linked securitization (ILS) as a 'real estate risk fix' in the Florida urban context. The primary aim is to demonstrate how, why, and where ILS markets are constituted through Florida's real estate sector, and to consider what this close link means for the political economy of Florida cities in the context of mounting climate risks. Using a novel mixed-methods research strategy, the study investigates this real estate risk fix across three main sites of analysis: (i) Florida public policymaking efforts, which play a critical role in connecting ILS risk capital with residential insured risk, (ii) Florida primary insurer underwriting and risk transfer practices, through which real estate risks are sourced and circulated in value form on global risk capital markets, and (iii) Florida cities, within which the flow of risk capital is vital to both private real estate lending and public finance. Through the case of ILS in Florida cities, the project extends David Harvey's seminal theory of the spatial fix, and the related work of Leigh Johnson, to conceptualize and investigate the relationships finance, the built environment, and climate risk in a new and critical light. In doing so, the project generates multiple conceptual and empirical insights relevant to both scholars and policymaker-practitioners.

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Glossary of Terms

Term	Definition	Source
Alternative Risk Transfer	“generic phrase used to denote various non-traditional forms of re/insurance and techniques where risk is transferred to the capital markets. On a broader note it refers to the convergence of (re)insurance, banking and capital markets.” (e.g. ILS)	2
Book of Business	“a database or ‘book’ that lists all of the insurance policies the insurance company has written. As a client relations management tool, it helps insurers keep track of all of their policyholders, their subsequent coverage obligations, and make relevant business decisions.”	1
Captive (Insurer)	(1) “a wholly owned and controlled subsidiary created by another corporation, known as its parent company, to insure itself against certain risks to which the parent company is exposed to. Aside from protecting the insured parent company and the parent company’s clients against certain risks, a captive insurance company also benefits from the profitability of the captive insurer.”	1
	(2) “establishment of trading company in a 'no-tax' haven”	2
Catastrophe Bond	“an example of insurance securitization to create risk-linked securities which transfer a specific set of risks (generally catastrophe and natural disaster risks) from an issuer or sponsor to investors. In this way investors take on the risks of a specified catastrophe or event occurring in return for attractive rates of investment. Should a qualifying catastrophe or event occur the investors will lose the principal they invested and the issuer (often insurance or reinsurance companies) will receive that money to cover their losses.”	2
Cedent	(1) “a party who gives the responsibility for reimbursing certain risks to another party. In the context of insurance, the cedent is the party that pays a premium to an insurance company in exchange for insurance coverage.”	1
	(2) “an insurance company buying reinsurance cover”	2
Collateralized Reinsurance	“a reinsurance contract or program which is fully-collateralized, typically [...] by investors or third-party capital. The collateral is put up by investors or third-party capital providers to cover in full the potential claims that could arise from the reinsurance contract. Normally the collateral posted is equal to the full	2

	reinsurance contract limit, minus the net premiums charged for the protection.”	
Cover	“the amount of risk or liability that is covered for an individual or entity by way of insurance services”	3
Dedicated Vehicle	“company or entity set up for a specific purpose (e.g.. reinsuring catastrophe risk)”	2
Domicile	“place of incorporation” (for a [re]insurer)	2
Exposure	“basic unit that underlies an insurance premium” which denotes a potential for losses.	1
Fronting (Company)	“a business entity that sells an insurance product but transfers the risk to another company. It is able to do so because the company that takes on the risk is not licensed to sell a similar product in that area.”	1
Insured	“the listed owner of a policy and is the only recognized as such by the insurance company. The named insured can be a person or an organization”	1
Insurer	“a party who agrees to compensate people, companies, or other organizations for specific financial losses. This service is typically provided for an exchange of payments called premiums. The exact perils that are covered and the exact cost of the premiums are laid out in the contractual agreement between the insurer and the insured.”	1
Insurance-Linked Security	“financial instruments which are sold to investors whose value is affected by an insured loss event”	2
Loss Event	“the total losses to the ceding company or to the reinsurer resulting from a single cause such as a windstorm.”	5
Portfolio	see Book of Business	-
Premium	“the amount charged by an insurer or reinsurer as the price of granting insurance or reinsurance cover, as stated before or after the subtraction of brokerage and other deductions.”	4
Rate on Line	“A percentage derived by dividing reinsurance premium by reinsurance limit; the inverse is known as the payback or amortization period.”	5
Reinsurance	“a contract under which a reinsurer agrees to pay specified types and amounts of underwriting loss incurred by an insurer or another reinsurer in return for a premium. Reinsurance serves to 'lay-off' risk.”	4

Reinstatement	“the restoration of cover following its exhaustion as a result of a loss by payment of an additional (reinstatement) premium. Many reinsurances provide for one or more automatic reinstatement of covers.”	4
Retention	“the amount of any loss or combination of losses that would otherwise be payable under an insurance/reinsurance contract which the insured/reassured must bear itself before the insurer or reinsurer becomes liable to make any payment under that contract.”	4
Residual Market	“a coverage source of last resort for firms and individuals who have been rejected by voluntary market insurers	5
Retrocession	“a reinsurance of a reinsurer by another reinsurer. It serves to 'lay-off' risk”	4
Risk Management	“Identification, evaluation and control of risk”	2
Risk Transfer	“the transfer of the financial consequences of a risk to another by legal contract and/or insurance” (e.g. reinsurance)	2
Securitization	(1) the process of making a security, the latter which is “a fungible, negotiable financial instrument that holds some type of monetary value. It represents an ownership position in a publicly-traded corporation (via stock), a creditor relationship with a governmental body or a corporation (represented by owning that entity's bond), or rights to ownership as represented by an option.”	3
	(2) in (re)insurance, the “securing the cash flows associated with insurance risk. Securitised insurance risk enables entities which may not be insurance companies to participate in these cash flows”	2
Self-insurance	“funded from organization’s (individual’s) own financial resources”	2
Special Purpose Vehicle (or Entity)	see Dedicated Vehicle	-
Surplus, (Statutory)	“the money that remains after an accounting system by an insurance regulatory board has deducted an insurance company's liabilities from its assets. The remainder is expected to be used to offset possible losses the company might suffer in the future.”	3
Third Party Capital	see Alternative Risk Transfer	-

Tranche	“term to describe a specific class of bonds within an offering, usually each tranche offers varying degrees of risk to the investor.”	2
Underwriting	“may refer to (a) The process of evaluating, defining and pricing insurance and reinsurance risks including where appropriate the rejection of such risks. (b) The acceptance of the obligation to pay or indemnify the insured or reassured under a contract of insurance or reinsurance.”	4
Voluntary Market	“a group of insurers that elect to write insurance in a competitive environment retaining the right to accept and reject business submitted. [...], (also) refers to the insurers that provide coverage to desirable risks while rejecting the less attractive risks, which must then be afforded coverage through assigned risk markets” (i.e. residual market)	5

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1. Introduction

1.1. (Re)insurance and the Real Estate Risk Fix

Climate change poses a global property catastrophe conundrum: Real estate underpins contemporary financialized capitalism, yet several high value property markets are increasingly vulnerable to devaluation by disaster. Real estate is uniquely central to the reproduction of everyday space and place, acting as both a stage and driving force within urban political and economic life (Logan and Molotch, 1987; Fainstein, 2001; Schafran et al, 2018). At the same time, select real estate assets and asset-linked financial products like mortgage-backed securities represent a scarce form of 'high value collateral,' the liquidity and security of which has become vital to the accumulation and circulation of capital (Gotham, 2006; Christophers, 2011; Aalbers, 2016).

Climate risks stand to disrupt this property order in three key ways. First, real estate assets will be increasingly devalued or destroyed outright, as stronger and more frequent hazards like hurricanes or sea level rise-induced flooding place cities and their property markets at growing risk. For example, a joint World Bank and OECD study estimates that up to \$1 trillion per year of flood-related damages could be realized across the world's largest cities by 2050, when adjusting for social and economic trends and city-specific environmental vulnerabilities (Hallegatte et al, 2013). This economic vulnerability is particularly concentrated in a handful of high value, high risk locations: Just five cities -- Guangzhou, Miami, New York, New Orleans, and Mumbai -- account for 43% of this anticipated exposure (ibid).

Second, climate risks are likely to erode the value streams (or rents) which are appropriated through real estate (and real estate-linked assets). This disruption includes both higher

property operational costs, as increasingly seen in the form of growing insurance premiums (Harrington, 2013; Harris, 2018), and lower property returns, including emerging patterns of asset devaluation in high risk contexts (Keenan et al, 2018; Alpine and Porter, 2018), which will in part or together impair the extent to which value can be mobilized from specific assets.

Third, climate risks may present a market opportunity for certain real estate and financial institutions. In recent years, a wide array of institutions have sought to marketize real estate climate risks throughout the real estate finance, development, and sales lifecycle, as seen in the creation of climate risk screening techniques for real estate investment portfolios and asset managers (Sjöblom et al, 2018), the development of design and construction standards intended to “future proof” real estate (Jones Long LaSalle, 2010), and the creation of credit score-like ratings of future climate risks for everyday property buyers (Taylor, 2016), respectively.

Against this nascent landscape of intervention, property (re)insurance remains the primary market mechanism for financing real estate climate risks, however. Unlike other real estate interests, (re)insurers possess the profit motive and technical capacities necessary to marketize real estate climate risk at scale (James et al, 2013; Jarzabkowski et al, 2015). This market power is founded upon a long-standing institutional architecture, through which a diversity of risks can be traded and distributed between (re)insurers and their global base of risk capital providers.

Property catastrophe reinsurers mobilized roughly \$600 billion of outstanding protection worldwide by the end of 2017 (Aon Benfield, 2018). The extent to which reinsurers can profitably absorb real estate climate risks is structurally limited by the availability of risk capital, however (Seo, 2015). Like the highrises which form city skylines, real estate risks tend to be highly concentrated in highly specific settings where property is both sufficiently valuable and vulnerable to warrant insurance. A series of high cost urban disasters like

Hurricane Andrew (Miami, 1992) and the Northridge Earthquake (Los Angeles, 1997) exposed limits to the extent to which (re)insurers could disaggregate and distribute real estate risks (McChristian, 2012), and sparked the development of a new form of risk capital: the insurance-linked security (ILS). ILS instruments distill the spatial and temporal contingencies of property climate risk into a singularized revenue stream -- the insurance policyholder premium payment -- which is securitized and sold to capital market investors, such as pension funds. Issuing (re)insurers use the capital raised through the sale of ILS as cover against a predefined insured loss scenarios, like a major Florida hurricane. If disaster strikes, the issuer uses the proceeds to pay policyholder claims. If not, investors walk away with the secured premium, plus invested returns.

By the start of 2018, the fast-growing ILS market provided more than \$82 billion of global property protection (Aon Benfield, 2018). In recent years, ILS has been positioned by capital market investors, multilateral development institutions including the World Bank, and urban resilience advocates like the Rockefeller Foundation as an “untapped source” of risk capital (Rodin, 2015), one with the promise to put hundreds of billions of dollars of institutional investment capital to work to manage property catastrophe risks in the world’s most vulnerable cities.

Despite this global promise, today approximately half of all ILS capital remains invested in a single geography: Florida hurricane risk (Seo, 2015). This risk is largely enmeshed within Florida’s six million ordinary residential insurance policies, which represented a total insured value on the order of approximately \$2.5 trillion by the end of 2017 (Florida Office of Insurance Regulation, 2018). In this dissertation, I examine how and why the market for ILS capital is constituted through Florida’s risky residential real estate sector, which arguably represents the highest value, highest risk property market in the world. Indeed, the state and its largest urban regions -- metro Miami and Tampa Bay -- routinely top indices of both historic property catastrophe losses and future climate vulnerabilities alike. In this context,

the securitization of (re)insurance emerged in close relation to specific modes of production of space in Florida, the crises of the latter which have created and consolidated an important infrastructural role for (re)insurance risk capital within the state's real estate-driven political economy.

Against the significant potential ramifications of climate change for a great number of cities, and for real estate and finance markets more broadly, ILS and property (re)insurance remain opaque and off the map of critical urban studies. At the same time, mainstream insurance studies have largely failed to account for the centrality of the production of urban space -- and specific cities and crises therein in particular -- within their analyses of ILS and risk capital markets. As a consequence of these dual absences, ILS remains conceptually and empirically under-investigated as an *urban* phenomenon, one which emerges from and acts through a dialectic between the production of space and climate risk, and in relation to the people, places, and properties entangled therein.

1.2. Research Aim and Questions

This dissertation explores the origins, operations, and potential limits of ILS in the Florida urban context. Its primary aim is to explain how, why, and where ILS markets have been constituted through Florida's real estate sector, and to consider what this close link means for the political economy of Florida cities in the context of mounting climate risks.

Towards this aim, I approached my analysis of ILS with three research questions in mind:

- 1. What was the historical and geographical juncture at which ILS emerged in the Florida city?** How and why did (re)insurance and real estate markets become conjoined, and what were the specific geographies of crisis -- and opportunity --

which constituted this relationship? How and why did distinct institutions and interests converge to generate ILS markets in Florida in particular?

2. How do risk capital markets mobilize value from real estate risk through ILS?

How much ILS capital is deployed in Florida's residential insurance business, and how does it generate fixes within this market? How and why are Florida properties connected to risk capital markets through these (re)insurance underwriting and risk transfer practices?

3. How do ILS and (re)insurance markets mediate the reproduction of Florida's risky mode of urbanization? Who relies upon (re)insurance in Florida cities, how, and why? How do (re)insurance market dynamics interface with urban geographies of race, class, environmental risk, and community wealth?

I investigated these questions using a two-part research strategy, implemented over the course of one year of fieldwork in Florida cities. First, I conducted 65 expert interviews on (re)insurance and real estate climate risk governance, drawing on perspectives from senior (re)insurers, real estate developers and investors, urban and environmental planners, climate scientists, and elected officials.

Second, I examined Florida's (re)insurance markets. To do so, I reviewed (i) state government public policy documents on (re)insurance regulation, (ii) local government urban and environmental planning reports, (iii) (re)insurance industry reports and grey literature, and (iv) mainstream media reports on (re)insurance and Florida climate risks. I also conducted a forensic financial analysis of the use of ILS by Florida insurers through an examination of the 2015 underwriting practices, risk transfer programs, ownership, and operational strategies of 28 Florida 'specialist' primary insurers. Finally, I investigated Florida's insurance markets at a local level in the Miami Dade area, using a mixture of public actuarial, demographic, and financial data from the Florida Hurricane Catastrophe Fund, the National Flood Insurance Program, the American Community Survey, and Miami Dade local

and county municipal sources. I explain how and why I designed and implemented this research methodology in greater detail in Chapter 3.

1.3. Core Arguments

My core argument is that contemporary ILS and (re)insurance risk capital markets are closely connected with the production of space in the Florida urban context in two main ways. On one hand, risk capital serves a critical infrastructural role within Florida cities, one which enables the reproduction of the state's \$4 trillion real estate market -- at least for now. On the other, Florida real estate constitutes the largest material source of a global ILS trade, which appropriates substantial value from risk through an institutional architecture of (re)insurers and risk capital intermediaries. I demonstrate how this arrangement is functional, yet extractive, in ways which are likely to generate new and deepened patterns of urban crises within the context of Florida's already-unequal real estate markets.

To conceptualize and investigate ILS in the Florida urban context, I expand upon David Harvey's concept of the spatial fix (1981, 2001), and recent efforts to extend it to the domain of climate risk governance (Ekers and Prudham, 2015; Johnson, 2015). Harvey's spatial fix represents an urban-geographical theory of capitalism, one which explains how (over-) accumulation in the 'real' economy is closely linked with the production of the built environment (Jessop, 2006; Bok, 2018). Accordingly, overaccumulation in the economy is offset -- albeit temporarily -- through the "tying up and the pinning down of large amounts of capital in place through the production of fixed and immobile capital in the built environment" (Harvey, 2001: 28). This dynamic generates "symbiotic forms of accumulation (suburbs need cars and vice versa)" (ibid), which displaces the crisis spatially and temporarily. Indeed, one of Harvey's key premises is that the spatial fix yields new and uneven geographical contradictions and crises, of which the home lending-turned-Global Financial Crisis provides a stark contemporary example (Gotham, 2009; Wyly et al, 2009; Aalbers, 2012).

Building on Harvey and Johnson, I argue that insurance-linked securitization acts as a real estate risk fix within the Florida context. Securitization transforms insured real estate risk into a lucrative asset class, through which institutional investment capital extends the capacity of (re)insurers to underwrite Florida's 'peak peril' property catastrophe risk. This first dynamic provides a 'fix', both for outlet-seeking investment capital and for risk capital hungry (re)insurers, and therefore offsets two parallel crises of capital: investment capital is provided with a secure outlet which is not correlated with the ebbs and flows of the economy, while (re)insurers can transfer 'peak' risk beyond the immediate institutional bounds of the market. In dialectical fashion, the first dynamic enables a second: by transferring the prospect of devaluation from Florida (re)insurers to global risk capital markets, securitization enables the reproduction of the state's risky real estate markets -- at least for now. Yet this real estate risk fix also generates new spatial and temporal tensions, which sow the seeds of future political and economic crises and restructuring in Florida cities and beyond.

I examine the constituent elements the real estate risk fix across three main 'sites' of empirical analysis, each of which is structured as a response to the three main research questions introduced in the prior section. These sites include (i) Florida state insurance market regulations and public policies, which have played a critical role in connecting ILS risk capital with residential insured risk, (ii) Florida primary insurer underwriting and risk transfer practices, through which real estate risks are sourced and circulated in value form on global risk capital markets, and (iii) Florida cities, within which the flow of risk capital is vital to both private real estate lending and public finance. Sections 1.3.1, 1.3.2, and 1.3.3 expand upon the main arguments and findings from each of the three sites of analytical engagement.

Insofar as each site of analysis speaks to key aspects of ILS as a 'fix' in the Florida context, they also collectively demonstrate how a wide range of dynamics -- including a long legacy

of public policy choices, firm-level strategies, and structural dynamics within Florida's urban political economy -- inform the origins and operations of ILS as a real estate risk fix. My analysis also illuminates multiple spatial, temporal, political, and economic tensions that are generated or deepened by this fix, which portend potential crises -- but also opportunities -- for ILS and risk capital in the Florida urban context and beyond. As I explore in greater depth in the conclusion, this analysis yields several conceptual and empirical insights with relevance to both academic and practitioner audiences.

1.3.1. The Risk Fix as Public Policy Goal

The presence of ILS capital in Florida is in no small part an artefact of the efforts of Florida public policymakers, who have cultivated the entry of ILS capital into the state as a means to offset long-standing (re)insurance market crisis tendencies that have threatened to destabilize Florida's real estate-driven political economy. In the wake of Hurricane Andrew's unexpectedly catastrophic 1992 landfall and subsequent (re)insurance market disruptions, State of Florida public insurance institutions have played a key role in mediating two tensions within the state's residential market, between consumer affordability and private insurer profitability -- tensions which have at times seemed to be irreconcilable, yet central questions surrounding the long-term viability of the market. My analysis begins with an introduction to these public institutions in the post-Andrew context of debates about the role of public policy in shaping the Florida market. I show how these institutions have reflected -- and transformed -- the market around goals of encouraging consumer affordability and private capital profitability, often to conflictual ends. I demonstrate how, in recent years, these institutions have been leveraged to grow private risk capital, and ILS capital in particular, under the premise of resolving this long-standing tension.

I map how the State of Florida fosters the entry of risk capital into the residential market in three ways. First, the state *stages risk* through various performative exercises and market-making measures which codify the expanded use of reinsurance as good industry practice. Second, the state *sources risk* for reinsurers and ILS, both directly by acting as one of the most prominent users of ILS, and indirectly by moving risk from public institutions to private specialist insurers. Because the specialists have highly concentrated portfolios, they are generally more reliant on external risk capital, and many have thus become pioneering users of ILS. Finally, the state *secures risk* by maintaining a backstop -- a public guarantor -- to socialize any losses which may emerge should these speculative ventures in risk capital innovation falter.

This analysis demonstrates the constitutive role of the state in the making of the Florida market for ILS, while also highlighting the ways in which public policies make certain forms of climate risk more or less marketizable, often in close conjunction with private capital. Indeed, much of the risk which the state has ceded to the specialists was hitherto considered 'residual' or unmarketable. This analysis also points to the selective and at times highly entrepreneurial presence of the State of Florida in engineering fixes for Florida's property catastrophe conundrum, the interventionist stance of which is striking in the context of the limited resources which have been made available for statewide climate risk reduction efforts. The selective presence and absence of the State of Florida provides a context for understanding how and why insurance has become so vital to Florida cities seeking to manage climate risks -- and how Florida residential insurers and their risk capital providers have thus been granted access to a structural market for insurance cover through practices of statecraft.

1.3.2. The Risk Fix as (Re)Insurance Market Logic

ILS provides an underwriting fix for Florida's risk capital-reliant 'specialist' insurers and their risk-seeking reinsurance partners. The former rely upon external risk capital to write high concentrations of real estate exposure for upwards of half of the Florida residential market, while the latter leverage the specialists to source a large share of the risk which underpins a lucrative territorial accumulation strategy built around securitization.

Through a forensic firm-level analysis, I demonstrate how 28 Florida specialists play a decisive role in constituting ILS and risk capital markets through their underwriting and risk transfer programs. I find that the specialists ceded half of every premium dollar they earned in 2015 (or \$2.95 billion) from Florida policyholders to 164 reinsurers and ILS funds operating across 35 geographies, ranging from Bermuda to Qatar. At least 26 ILS funds and special purpose entities assumed \$529.56 million of this premium for securitization or other forms of third party capital collateralization -- sufficient to secure between \$8 billion and 10 billion of property catastrophe cover for the specialists, and alone equal to the nearly one third of global ILS issuance that year.

Beyond demonstrating the material extent of the financial ties between the specialists and risk capital providers, I also show how these firm-to-firm, risk-to-capital relationships are highly contingent on a variety of factors, ranging from firm underwriting and operational choices, to direct risk capital ownership stakes in the specialists and interlocking board membership. I argue that risk capital markets are able to secure market rule by bringing market-making devices to bear on these contingencies. These market-making devices enable risk capital markets to transfigure Florida real estate risk from amorphous fixity into

an idealized state of financial market liquidity, and to thereby appropriate substantial value from risk.

Insofar as this risk fix is functional, it is also extractive: it operates as form of rent capture which does little to fundamentally mitigate the underlying material risk against which it is constituted. In doing so, the fix deepens asymmetrical processes of inter-urban accumulation, by siphoning value from this market hinterland to select (re)insurance command and control nodes, including London, New York, and Zurich. Through this analysis, I thus seek to move critical insurance studies towards a greater empirical understanding of the intra-urban origins and territorial workings of this risk capital market (as seen in specific firm-to-firm relationships), and to bring focus to the inter-urban outcomes of its redistributive logics which follow.

1.3.3. The Risk Fix in the Unequal Metropolis

It is in the city that these first two fixes most clearly come together, in ways which threaten to produce new and deepened forms of urban crisis and restructuring. I show how and why ILS and risk capital have come to underpin two central drivers of the production of space in the Florida urban context -- residential mortgage lending and property-linked public finance -- and how these interdependencies could generate new and deepened patterns of contradiction and crisis within the contemporary Miami context.

Through an analysis of the geographies of Miami housing, I show how (re)insurance costs stand to exacerbate long-standing home affordability issues along existing lines of race and class. In this way, the (re)insurance capital so deeply invested in South Florida could morph from an instrument of housing protection into one of precarity, generating a new wave of

mortgage default, foreclosure, and neighborhood devaluation long before Miami doorsteps are permanently inundated by rising seas.

At the same time, the ongoing influx of (re)insurance capital into Florida property markets indirectly reinforces a highly unequal order of intra-urban municipal fiscal power, within which municipalities with wealthier property tax bases have a greater fiscal capacity to manage the costs of climate risk mitigation. I argue that (re)insurance stands to reproduce this inequality in two key ways, all else being equal: First, cities without large endowments of property-based wealth against which to finance the costs of adaptation could increasingly defer responsibility to individual property owners and their insurers, in ways which solidify the political economic importance of (re)insurance market access and availability. Second, (re)insurers also find new opportunities to deploy risk capital advisory services (including new ILS products called resilience bonds) to Florida cities, many of the latter which lack the internal technical capacity to visualize, price, and finance climate risk mitigation.

This analysis reveals how and why (re)insurance markets became critical to the political economy of Florida cities, and Miami in particular, in ways which bring both the state-level public policy examination and the firm-centric analysis presented in this dissertation into sharper spatial and demographic focus. I demonstrate how (re)insurance can act as a force of 'splintering protectionism' (Johnson, 2015), within which wealthy property owners and cities can afford to protect high value areas from climate risks at the same time that insufficiently valuable properties and places are left to the steady encroachment of market devaluation. Unaddressed, these tensions could directly and indirectly erode the material basis against which (re)insurers capture value from risk, as rising insurance costs and other forms of property-based climate risk finance (e.g. infrastructure fees, bond finance) erode the value of the property against which (re)insurers mobilize value, or political crises prompt market interventions which could once again limit market opportunities for (re)insurers, respectively.

1.4. Structure of Dissertation

The remainder of this dissertation is divided into two parts, the first of which sets the intellectual and methodological groundwork for the empirical analysis presented in the second. In Chapter 2, I review the existing scholarship on ILS, within which I identify a conceptual and empirical blindness to the role of the production of space in constituting risk capital markets. I build on the work of Harvey (1981, 2001) and Johnson (2015) to show how the concept of the spatial fix can be used to both conceptualize and investigate the relationships between ILS and its urban-geographical basis.

In Chapter 3, I review the research methods employed to derive the findings of this study. Unlike other chapters, Chapter 3 is presented from a reflective and first-personal account, through which I reflect on the origins and evolution of the research process. I also review the two core parts of this methodology, including the tactics and sources I used within each, and I reflect on some of the key challenges, limitations, and opportunities which emerged therein.

Chapters 4, 5, and 6 correspond with each of the core empirical arguments at the heart of this dissertation. Chapter 4 examines how and why the State of Florida has played a key role in the making of ILS markets. Chapter 5 demonstrates how and why Florida specialist insurers and their risk capital providers mobilize value from Florida real estate risks. Chapter 6 brings these dynamics together in the contemporary Miami context through a neighborhood-level analysis of the relationships between (re)insurance and residential mortgage lending and public finance. Finally, Chapter 7 concludes the dissertation with a review of its core arguments, discussion of the implications of these findings for both scholarly and policy-practitioner audiences, and a consideration of various opportunities (and limits) for future inquiry into the relationships between real estate, climate risk, and (re)insurance.

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2. Locating ILS in the City: A Review of Key Literatures

2.1. Introduction

New and deepened climate risks pose a great threat to cities and their property markets, and to the financial markets and patterns of accumulation constituted therein. Yet the ILS and property (re)insurance risk capital remain opaque and off the map of critical urban studies, at the same time that mainstream insurance studies have largely failed to account for urban space -- and its production and consumption -- within their analyses of ILS. As such, ILS is conceptually and empirically under-investigated as an urban phenomenon, one which emerges from and acts through a dialectic between the production of space and climate risk in highly particular geographies, including Florida's risky real estate trade.

This chapter charts a course through these absences to arrive at a series of conceptual tools and empirical lines of inquiry which can bring the study of ILS and the urban into critical dialogue. I structure the chapter in three parts. First, I review the existing literature on ILS, which is largely technical and capital market-centric in orientation and outlook (Section 2.2.2). I organize this review around three interrelated crises of risk capital, which frame the origins and evolution of ILS in the post-Hurricane Andrew (1992) context. I find cities and the built environment appear only obliquely within this literature, as problem sites to be resolved by more sophisticated forms of marketization, be it a more robust actuarial calculus or access to greater reserves of risk capital. Not only does this urban absence leave the story of ILS and property (re)insurance market restructuring conceptually and empirically incomplete, it means that a potentially much larger and arguably more important set of relationships between climate risk, finance, and the built environment are left off the map of both insurance studies and urban and economic geography.

Second, I review scholarship on the real estate-finance link, largely focusing on the application of mortgage-backed securitization (MBS) in the US post-war urban context (Section 2.3). I use this review to contextualize how and why this nexus forms a central basis of contemporary capitalist accumulation, crisis, and restructuring. This literature demonstrates how and why processes of capital market restructuring and urban restructuring are closely, and often mutually, constituted through the structure and application of specific instruments like MBS (or ILS). To this end, I bring this literature into conversation with the 'urban limits' identified in Section 2.2 to identify three lines of inquiry around which ILS might be examined 'from the city', rather than solely from a capital market perspective. These lines of inquiry relate to (i) how practices of statecraft connect risk capital with specific at-risk places and property, (ii) how (re)insurers and risk capital investors use territorialized accumulation strategies to mobilize financial value from real estate climate risks, and (iii) how (re)insurance market dynamics mediate geographies of race, class, and power within the particular urban contexts which are most closely connected to specific risk capital markets.

Third, I reflect on how Harvey's seminal idea of the 'spatial fix' can be used to conceptually bridge these as-yet disparate analyses of risk capital market restructuring and the real estate-finance link, as through the case of ILS in Florida (Section 2.4). Not only is the spatial fix a foundational theory within geographical political economy (Bok, 2018), it also formed the basis for Johnson's (2015) conceptualization of ILS as a catastrophic fix. I situate the origins and evolution of the spatial fix, up to and including a recent wave of 'fix thinking' related to questions of climate risk, of which Johnson's work is a crucial part. I propose that Harvey and Johnson's thinking can be combined and extended to examine ILS as a 'real estate risk fix', one which operates as an internal capital market fix in its own right, but also acts as a 'fix for the fix' - a fix which enables other practices of real estate-linked investment, against growing capital market odds. This amended view of the fix, I argue, can be used to

extend and cross-pollinate existing accounts of ILS and the real estate-finance link across the lines of inquiry I identified at the end of Section 2.3.

2.2. The Origins and Evolution of Insurance-Linked Securitization

In this section, I review the literature on the origins and evolutions of insurance-linked securitization (ILS). This literature emerged through a close-knit relationship between insurance scholars working in a tradition descendent from neoclassical economics, and (re)insurance practitioners comprised underwriters and actuaries, market investors, and market regulators. As a result of these close scholar-practitioner ties, the literature on ILS is largely capital market-centric in orientation: It focuses on the technical, calculative, and organizational needs and opportunities which have shaped the creation and evolution of ILS. This has produced a literature with a substantive focus on capital market institutions (e.g. reinsurers, their investors, and their regulators) and on risk capital instruments and technologies (like catastrophe bonds and risk models) and their applications (Chichilnisky, 1996; Doherty, 1997; Cummins, 2008a; Cummins, 2012).

I organize this review of the ILS literature as an overarching story of (re)insurance market crisis-driven restructuring and subsequent restructuring-driven crisis, across which ILS is engineered as a solution, only to become a driving force of disruption and further crisis. This story unfolded in the quarter-century since Hurricane Andrew (South Florida, 1992) and the Northridge Earthquake (Los Angeles, 1994) together “changed the worldwide reinsurance market” (Greenwald, 2012). I reflect on key inflection points of crisis across this literature, which include (i) a crisis of calculation related to pricing catastrophe ‘tail’ risks (Section 2.2.1), (ii) a crisis of capital, related to the challenges associated with attracting sufficient scales and diversity of risk capital to property catastrophe underwriters (Section 2.2.2), and (iii) a crisis of declining rates of return, related to eroding margins within the (re)insurance sector generated after the large-scale entry of alternative risk capital (Section 2.2.3).

In Section 2.2.4, I argue that cities and the built environment appear only obliquely within this literature, as problem sites to be resolved by more sophisticated forms of marketization, be it a more robust actuarial calculus or access to greater reserves of risk capital. I reflect on the limits of this absence, and how it might be rectified by connecting ILS to an as-yet disparate scholarship on the real estate-finance nexus (Section 2.3) using Harvey's concept of the spatial fix (Section 2.4).

2.2.1. The Crisis of Calculation

The first and foundational crisis which defines the literature on ILS is one of calculation, which related to how questions about how to accurately price and marketize catastrophe 'tail' risks within (re)insurance actuarial practice. Historically, (re)insurers relied on records of past losses to write property catastrophe risk (Clark, 1986). Before Hurricane Andrew's metro Miami landfall in 1992, for example, "few anticipated the true extent of damage a major storm could cause in the modern age of large coastal populations and high value properties" (McChristian, 2012). For (re)insurers writing business in Miami, relevant loss data was simply non-existent: there had never been a major hurricane landfall subsequent to region's post-war urban growth boom.

Andrew revealed that (re)insurers had significantly undervalued their exposure to 'peak peril' South Florida hurricane losses. These 'tail risks' -- the high value, low probability scenarios at the far end of a standard distribution of anticipated losses -- had not been adequately accounted for within the underwriting, retention, and risk transfer strategies of Florida insurers (Lecomte and Gahagan, 1998). This resulted in a wave of insolvencies, left hundreds of millions of dollars in unpaid policyholder claims, prompted the retreat of many insurers from the market, and generated a large spike in catastrophe reinsurance rates --

and therefore consumer prices (Lecomte and Gahagan, 1998; McChristian, 2012). In the year after Andrew, the remaining Florida insurers increased consumer rates in coastal communities by upwards of 200%, and deductibles by 500%, for example (US House, Committee on Banking, Finance and Urban Affairs, 1993).

In this context, catastrophe risk models ('cat models') offered an attractive and forward-looking way to marketize infrequent yet high loss disasters (Clark, 1986; Grossi and Kunreuther, 2005). Cat models enabled reinsurers to simulate thousands of hypothetical loss events against their portfolios, bringing together geospatial particularities like land elevation and storm intensity, engineering considerations like construction standards, and financial variables into a new actuarial synthesis: the loss exceedance probability curve (Grossi and Kunreuther, 2005: 31; see Figure 2.1).

Using cat models, (re)insurers reevaluated their underwriting standards, market exposure, and risk transfer strategies. Models also bridged the actuarial calculus of (re)insurers with the concerns of non-expert market stakeholders, including investors in (re)insurance and state regulators concerned with (re)insurer solvency, through a new language of risk (Doherty, 1997; Grossi and Kunreuther, 2005). Cat models facilitated the entry of new forms of 'third party' investor capital into the peak peril catastrophe (re)insurance market by supporting the formation of a market consensus on the value of highly specific modeled catastrophe risks, like hurricane wind exposure (Lewis and Davis, 1998; Niehaus, 2002; Cummins and Trainer, 2009). In this way, cat models served as a 'collective device of calculation' (Callon and Muniesa, 2005), one which enabled specific types of 'agencies' to form. Through this "more or less systematically organized guesswork" (Mennicken and Sjögren, 2015: 4), assemblages of institutions could objectify, singularize, and marketize risk across pre-existing territorial, institutional, and epistemological barriers (Callon and Muniesa, 2005).

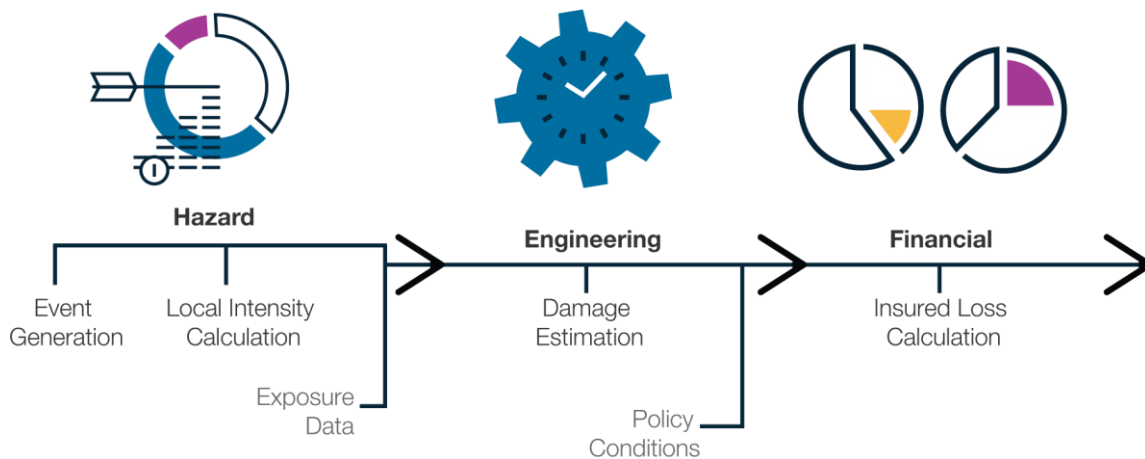


Figure 2.1. Typical catastrophe risk model components. Source: AIR Worldwide (2018)

2.2.2. The Crisis of Risk Capital

Closely related to the first crisis is a second, which might be characterized as a crisis of risk capital. Events like Hurricane Andrew raised questions about the extent to which the traditional (re)insurance sector could adequately provide risk capital for the market. Testimony by John Cosgrove (who represented the Miami area in the US Congress at the time of Hurricane Andrew) before a special hearing of the House Committee on Banking, Finance, and Urban Affairs on catastrophe insurance in 1993 clearly illuminated this dilemma:

“It took awhile for the insurance companies to count their losses, but by early 1993 they were scared. They realized that Hurricane Andrew wasn't the big one. Computer models project \$53 billion in insured losses-Andrew times three--if a category 5 hurricane were to hit Miami or Ft. Lauderdale. When you consider that this amount-\$53 billion-is about one-third of the combined net worth of all the property and casualty insurance companies in America, when you consider that Florida is not the only state likely to get hit by multi-billion-dollar hurricanes, and when you consider that hurricanes are not the only natural disasters with the potential for \$50 billion or more in insured losses—when you consider all of these things, you begin to understand why insurance companies are so worried.

Changes in the reinsurance marketplace also worry insurance companies. Historically, there was always enough reinsurance money around that

insurance companies were not inordinately worried about natural disasters. Today, worldwide reinsurance capacity has contracted to the point where no insurance company can obtain, at any price, more than about \$250 million in catastrophe reinsurance. This is small comfort for a company that lost several billion dollars in Hurricane Andrew” (Committee on Banking, Finance and Urban Affairs, 1993).

In this context, (re)insurers and related financial market institutions invested heavily in the development of weather-based financial instruments to raise ‘third party’ investor risk capital, which could in theory diversify and extend the underwriting capacity of global reinsurance markets (Loubergé et al, 1999; Seo, 2015). In other words, this new risk capital could absorb the high loss, low probability ‘tail risks’ like those which triggered the market crisis after Hurricane Andrew’s landfall.

Of many experiments in pricing and trading weather-linked derivatives in the 1990s, including catastrophe options offered by the Chicago Board of Trade and on the Bermuda Commodities Exchange, catastrophe bonds found footing after major issuances covering US hurricane exposure (Bouriaux and MacMinn, 2009; Cummins, 2012). Figure 2.2 shows the typical structure of a catastrophe bond, the original -- and today, the largest -- instrument within the insurance-linked securities market.

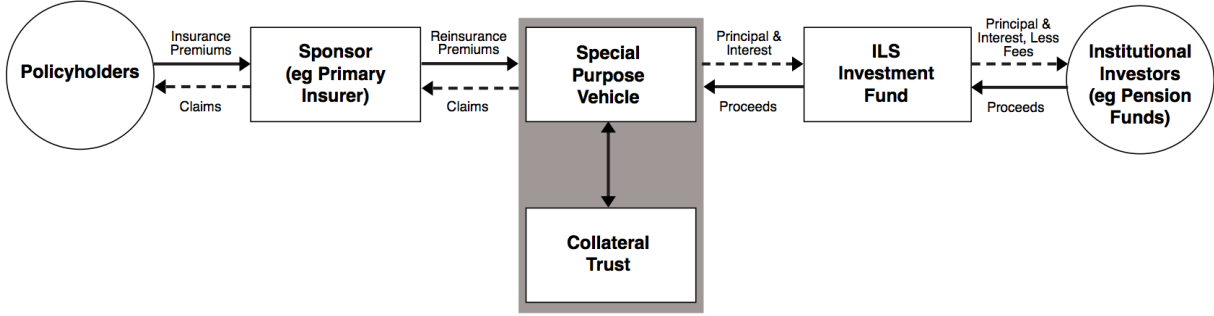


Figure 2.2. Typical catastrophe bond structure. Source: Author

Like other forms of “coupon-pool capitalism” (Froud et al, 2001) which have emerged in the context of a financialized economy (see van der Zwan, 2014; Christophers, 2015a), including

more well-known instruments like the mortgage-backed securities, catastrophe bonds were designed as capital transforms. Cat bonds turn investment capital (e.g. pension fund investment) into (re)insurance risk capital for both primary insurers and their reinsurers. Policyholder payments to their insurer, in the form of premiums, are passed through to a special purpose vehicle, where they are held in a trust. The special purpose vehicle in turn issues bonds to investors, the proceeds of which are also held in the trust. If a pre-defined loss event occurs, the proceeds of the bond sale are paid to the primary insurer, which in turn can pay policyholder claims. If the loss event does not occur, bond buyers receive their principal, plus the original policyholder premiums and any invested returns.

Cat models (and the pricing consensus they afforded) were only one of the technologies needed to mainstream the catastrophe bond market. New geographies of offshore reinsurance centers like Bermuda emerged, where favorable tax and regulatory conditions made it legal, relatively cost effective, and lucrative to invest in catastrophe bonds (Appleby, 2007; Cummins, 2008b; Seessell, 2011). Over time, innovations in the structuring of special purpose vehicles, contractual mechanisms and loss 'triggers', and alternative risk capital product types also emerged, all of which facilitate risk capital intermediaries to match investor expectations around rates of return and investment horizon with insured risks (Cummins, 2012). Within this context, a large segment of the academic scholarship on ILS thus focused on how to resolve specific calculative challenges associated with pricing catastrophe risks for market trade trading of catastrophe risk, and on evaluating the performance of different risk instrument structures according to the criteria of (re)insurers, risk capital investors, and market regulators (Bouriaux, 2001; Vaugirard, 2003; Cummins et al, 2004).

At the same time, ILS products proliferated to pair risk with capital through increasingly innovative and nimble instruments and institutional formations. Sidecars were popularized after the highly destructive 2004 and 2005 Atlantic Hurricane Seasons as as a way to bring

short-term risk capital to reinsurers in the immediate wake of a catastrophic loss, for example (Cummins, 2012: 46). Over the same time, ILS specialty investment funds emerged to manage risk capital investments on behalf of pension funds and hedge funds (Montross, 2014; Seo, 2015), building on scholarly arguments that risk capital markets represented an 'alternative beta' - that is, an investment outlet uncorrelated with the ebbs and flows of the stock market (Jaeger et al, 2010). By mid-2017, 58% of ILS capacity was provided by dedicated catastrophe funds, which managed placements on behalf of institutional clients (Aon Benfield, 2017: 9).

Between the first catastrophe bond issuances in 1997 and 2004, roughly \$5.20 billion of catastrophe bonds and ILS risk capital had been issued, according to the Artemis ILS directory, representing a relatively modest share of the total capacity of the global reinsurance market. Aon Benfield (2018: 5) estimated that alternative risk capital comprised 4.4% of the \$385 billion total reinsurance market capacity. The ILS market grew substantially after Hurricane Katrina's landfalls over Miami and the New Orleans region in 2005, however. According to one Moody's executive, "reinsurance capacity poured into the industry right after Katrina to take advantage of the spike in price" (Artemis, 2015). In 2012, insured losses from Hurricane Sandy once again triggered an influx of alternative risk capital into the market (Seo, 2015). Between 2006 and 2018, the sum of outstanding ILS therefore grew from \$9.2 billion to \$36.82 billion, according to the Artemis ILS directory (Figure 2.3). "(I)nvestors stumbled upon cat risk while searching for better returns in a low interest rate, post-financial crisis environment" (Artemis, 2015) -- and that capital stuck around.

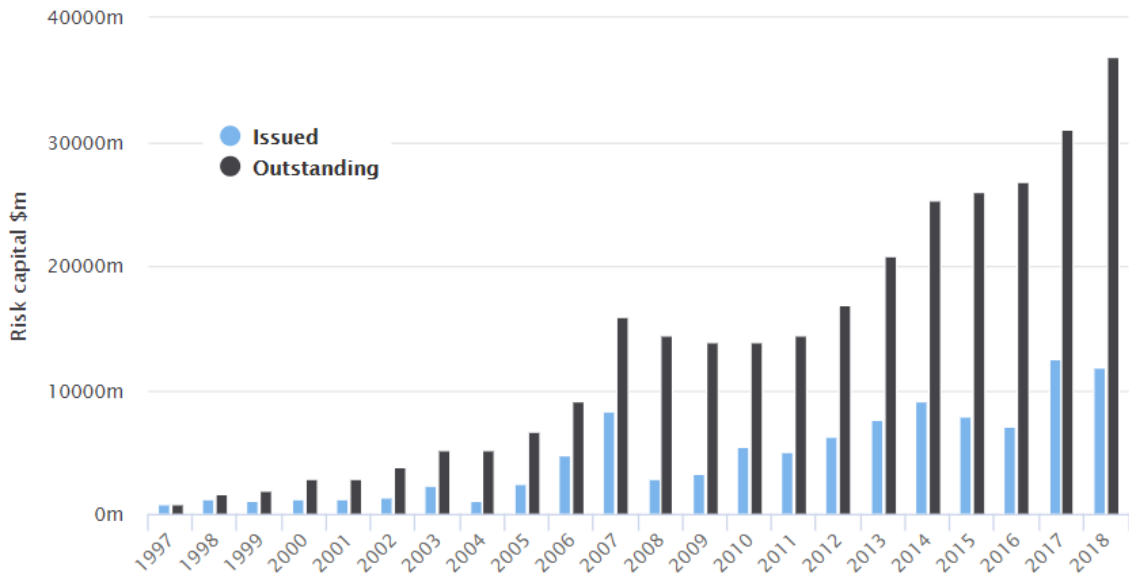


Figure 2.3. ILS Capital Issued and Outstanding, 1997-2018. Source: Artemis ILS directory

2.2.3. The Crisis of Declining Rates of Return

The proliferation of ILS markets signaled -- or perhaps generated -- the emergence of a third crisis of declining rates of return within (re)insurance markets (Johnson, 2015). This was a function of two interrelated forces: the growth of risk capital, and a related decline in catastrophe reinsurance rates. Between 2006 and 2016, the sum capacity of both the traditional and alternative reinsurance market grew by 54.55% (Aon Benfield, 2018: 5). Over the same horizon, the share of alternative risk capital grew by a far greater rate of 382.35%, however (ibid). At the same time, global property catastrophe reinsurance rates declined by 39.63%, while US rates declined by 49.80%, as expressed by Guy Carpenter Rate on Line Indices.¹

¹ The Guy Carpenter Rate on Line Index is accessible through the Artemis ILS directory. Accessed 1 August 2018.

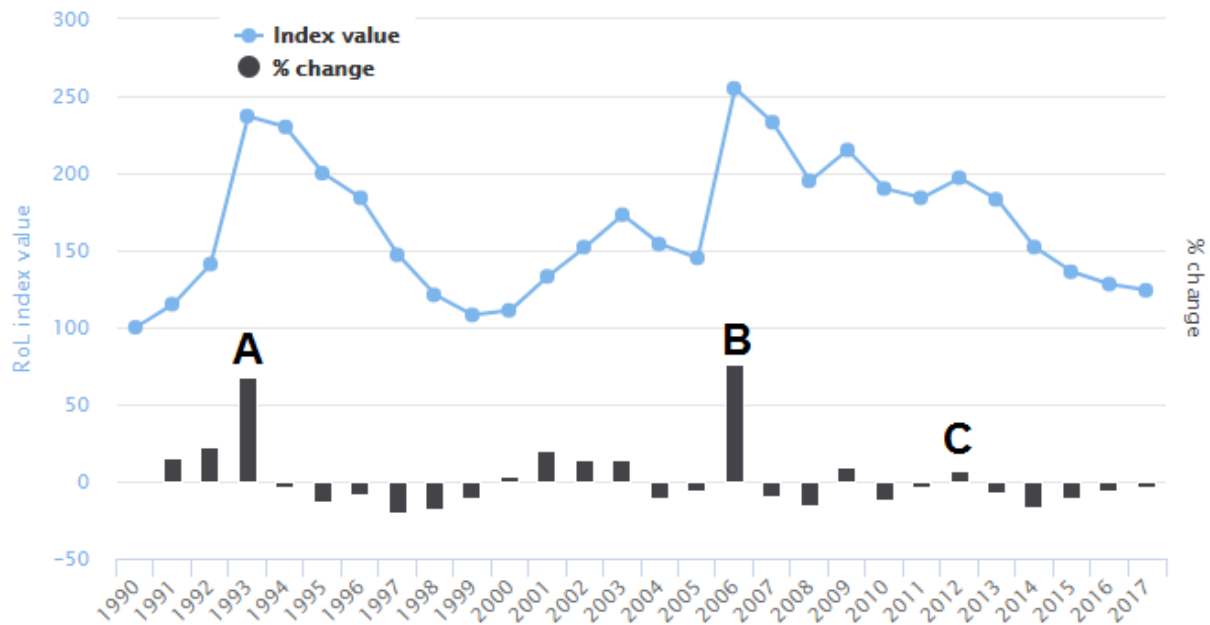


Figure 2.4. US Property Catastrophe Reinsurance Rate-on-Line Index, 1990-2017. Source: Guy Carpenter, Presented by Artemis. Notes of emphasis added by author.

Johnson (2015) argues that ILS capital which arrived to take advantage of post-disaster increases in catastrophe reinsurance rates eroded the hard/soft market cycle which drove the traditional reinsurance business, where years of high losses were offset by price increases in subsequent years. Note how, in Figure 2.4, the ‘hard’ market rate spikes which appeared after (A) Hurricane Andrew (1992) and (B) the disastrous 2004 and 2005 North Atlantic Hurricane Seasons (which included Katrina), did not follow after (C) Hurricane Sandy (2012). Moreover, initial market signals after Hurricanes Harvey, Irma, and Maria -- together representing the most loss-intensive Atlantic Hurricane Season on record -- do not suggest the return of a ‘hard’ cycle dynamic: “Record losses from the 2017 hurricane season have failed to trigger the rate increases the industry had hoped, with many experts and reports based on analysis of the recent renewals now suggesting that low rates may be here to stay” (Wuestner, 2018).

As a result, reinsurance renewals for major property catastrophe markets -- like Florida hurricane risk -- became a highly competitive “knife fight” between traditional reinsurers and ILS providers in recent years, as characterized by one reinsurance industry senior executive

(Montross, 2014). To offset declining rates of return, the industry focused on mergers and acquisitions to grow the scale of their operation and to diversify their underwriting portfolios and product offerings (Johnson, 2015; Lerner, 2015; Kent, 2016; Jardine Lloyd Thompson Capital Markets, 2017; Meckbach, 2018). In 2015, the aggregate deal value of US (re)insurance mergers and acquisitions reached a record high of nearly \$150 billion, for example (Jardine Lloyd Thompson Capital Markets, 2017: 11, quoting SNL Financial). Speaking of ILS investors in 2018, the CEO of Swiss Re raised “doubts if they really operate in sustainable territory right now” (Artemis, 2018).

Johnson (2015: 2517) argues this “glut of capital” has resulted in a “transformation of capacity” within reinsurance markets, as the institutional investors’ hunt for non-correlated investment consumables like ILS erodes the pricing power of traditional (re)insurers. Johnson argues that (re)insurers may be underwriting policies “with the express intent of passing them on to catastrophe bond markets” (ibid). Elsewhere, Johnson (2014: 179) argues that this pattern of “writing to securitize” is reminiscent of the ‘originate to securitize’ mortgage-lending model that ultimately produced the Global Financial Crisis. They speculate that this may have consequences for the ‘resilience’ of the property markets which rely on risk capital market access.

2.2.4. The Urban Limits of Existing ILS Scholarship

Although property (re)insurance markets ultimately provide cover for assets in specific places with specific exposures to specific risks, the built environment and the production of space -- henceforth, the urban -- are conceptually and empirically flattened within mainstream accounts of ILS. This is a striking absence, insofar as the challenges associating with marketizing Florida hurricane risk in large part inspired the creation of the market in the first instance, and because upwards of half of all ILS capital remains invested in the Florida market (Seo, 2015).

When the urban does appear, it is typically in two ways. According to both understandings, the urban is reduced to an object of crisis, to be fixed through market innovation. First, the urban represents a calculative problem: an opaque yet reducible set of risk elements which can be calculated and priced with the right model and with sufficient data. This first understanding of the urban underpins the first crisis discussed in this section.

Second, and related, the urban represents oversupply of risk relative to capital. When explaining ILS markets to US federal insurance regulators, a major catastrophe bond market architect and investment manager rendered the urban as such: "As the coastal concentration of risk grows to the sky, literally, what we're finding is that we're getting a lot of economic losses that are not covered by insurance" (Seo, 2015). This is a function of the shape of global real estate markets: "80% of the property is in 20% of all the locations." Reinsurance markets are shaped differently, however, he argued: "(I)f you look at how insurance and reinsurance fundamentally approaches any market, and it's a good thing, it's very disciplined, it constantly seeks disciplined diversification. It uses strict risk bucketing." Like a casino, "there's table limits in the industry" (ibid). While urban risk grows 'vertically', the

reinsurance market is fundamentally horizontal. This urban risk-capital market imbalance drives the demand for risk capital innovation, accordingly.

Both treatments flatten and instrumentalize urbanization (and urban crisis) in order to make a claim for marketization. Missing from this formulation is an explanation of how, where, why, and to what ends ILS capital has come to be constituted by markets like that for Florida hurricane insurance, the latter which ultimately underwrites specific properties in specific places.

Johnson is the only scholar which has attempted to situate the rise and machinations of ILS in a critical urban geographical context. Should financial market disruptions cause this capital to flee, Johnson speculates that patterns of “splintering protectionism” could emerge within risky geographies:

“As wealthy individuals, firms, and even some states are able to access such financial and/or physical protection, this may allow certain spaces to be secured against loss, while the lion’s share of devaluation falls to states and those inhabitants of vulnerable areas who cannot afford to bear the full financial burden of risk management.” (Johnson 2015: 2516)

However compelling, Johnson’s speculative conclusion is not substantiated. Johnson alludes to, but does not fully explain, a striking parallel between mortgage securitization and insurance-linked securitization, both in terms of the structure and application of the instrument for problematic forms of accumulations (i.e. ‘originate to securitize’), and in terms of the potentially severe consequences of this speculative financial market activity for the urban geographies which rely upon risk capital market stability. Johnson leaves us to wonder if and to what extent ILS enables risky real estate development practices to continue in particular places, and if this could deepen the long-term vulnerabilities of those places to climate risk, yet does not provide clear insight into how or where this dynamic could play out.

This open-endedness is in part a result of a straightforward empirical absence. Johnson (2014: 179) notes that “investors’ ongoing interest in high-paying peak perils could ironically make more capital available for paying claims, rebuilding, and new underwriting in places like Miami, Florida, where the highest concentrations of value are being made even more vulnerable by climate change,” but the unique investment of ILS in Florida is not investigated in further detail.

This empirical absence relates to a larger conceptual limit within Johnson’s formulation: By arguing that this “crisis of overaccumulation within the (re)insurance industry” may be “displaced to the built environment” (ibid: 2517), Johnson also risks flattening the relationships between risk capital and its constitutive geographies to one which in which capital acts upon place. Answers to questions of particularism, power, and place are missing from this formulation.

Not only does this recurring urban absence leave the story of ILS and property (re)insurance market restructuring incomplete, it means that a potentially much larger and arguably more important set of relationships between climate risk, finance, and the built environment have been under-investigated by ILS scholars and urban and economic geographers alike. As Schafran et al (2018) argue, the urban is increasingly not only the site and stage of economic activities, but an economic sector in its own right: the production and consumption of cities, and real estate in particular, is central to contemporary capitalism and its crises. In the section which follows, I therefore review key elements within the scholarship on the real estate-finance link, in order to contextualize and conceptualize how the literature on ILS can be extended to the urban.

2.3. The Real Estate-Finance Link

The intersection between real estate and finance forms a central site of accumulation, crisis, and restructuring within the geographies of contemporary capitalism. This is in part because real estate assets (and asset-linked financial products, like mortgage securities) have come to be seen as safe and secure investment outlets in the context of turbulent capital markets, where capital continually seeks refuge and returns. It is also partly due to the central role of real estate within the wealth creation and economic development strategies of cities and nations, particularly in the US post-war context.

In this section, I review the literature on the real estate-finance link across three registers. First, I situate the real estate-finance link in relation to broader processes of financialization, which have emerged in the post-World War II context in the US and Global North (Section 2.3.1). In the second and third parts, I review the literature on mortgage-backed securitization (MBS) from a capital market perspective (Section 2.3.2) and from an urban political economy perspective (Section 2.3.3).

I see the MBS case in particular as particularly relevant to that of ILS for three reasons.² First, I seek to simplify the broader literature on real estate and finance to a representative example, by focusing on a single capital market instrument. Second, and related, the structure and rationale for mortgage securitization is very similar to insurance-linked securitization, in that both are instruments which act as property-linked capital ‘transformers’. Third, MBS is central to the story of post-war urban restructuring in the US context, and provides an essential context for understanding the real estate-finance link in relation to

² It is important to note that MBS is one of the largest but not the only form of real estate financialization. It is beyond the scope of this review to discuss the full breadth of real estate-linked financial instruments, structures, and practices. Such an overview and genealogy would doubtless be a fruitful endeavour for a future project on climate risk and the real estate-finance link, however.

contemporary urban political economy. Together, the capital market and urban political economy perspectives on mortgage securitization provide a vital framing for the empirical analysis which follows in this study. They show how the analysis of a single capital market instrument (like ILS) can be used as a basis for relating seemingly-disparate forces like financial market restructuring to questions of urban political economy and the production of space. Crucially, this literature shows how important processes of capital market restructuring and urban restructuring are closely and mutually constituted through highly specific instruments like MBS (or ILS).

In Section 2.3.4, I therefore summarize key insights from this literature which can be imported to the study of ILS and real estate climate risk. I draw three vital yet unexamined lines of inquiry about ILS, which relate to (i) how practices of statecraft in connecting risk capital with specific at-risk places and property, (ii) how (re)insurers and risk capital investors use territorialized accumulation strategies to mobilize financial value from real estate climate risks, and (iii) how (re)insurance market dynamics mediate geographies of race, class, and power within the urban contexts which are most closely connected to risk capital markets.

2.3.1. Context: Financialization and the Search for High Value Collateral

Financialization is an important logic of the post-World War II economic restructuring of the US and other 'advanced' economies (Aalbers, 2016; Christophers, 2015a). Krippner (2005: 174) defines financialization as a new regime of accumulation through which "profits accrue primarily through financial channels rather than through trade and commodity production." While Christophers (2015a) identifies up to 17 working definitions of financialization in the literature, Van der Zwan (2014) distills financialization to three overarching strands of scholarly investigation, which focus on (i) changes in the investment activities and operational behavior of US (and, increasingly, non-US) non-financial corporations, which have derived an increasing share of their profits through financial market activities (Krippner,

2005; Lapavitsas, 2013; Karwowski and Stockhammer, 2017), (ii) the restructuring power of the shareholder value orientation of corporations, through which financial market logics and interests have been transmitted into the governance of non-financial corporations and other non-market institutions (Froud et al, 2000), and (iii) the proliferation of financial services and conventions within everyday life, as in the growth of consumer credit markets or the production of subjects of debt (Langley, 2007).

For historical political economists like Arrighi (1994), financialization is not a new process, nor is it isolated from other processes of macro-level political economic transformation. Along with Arrighi, Gowan (1999) relates the current round of financialization to a crisis of American hegemony, which coalesced around the disintegration of the Bretton Woods monetary system and the 1973 oil crisis in the later decades of post-war era. In the Global North, this crisis prompted a shift from the Keynesian welfare state organized around Fordist mass production and consumption, to a neoliberal regime marked by multinational corporate power, flexible 'just in time' production and consumptions systems (i.e. post-industrialism), a new international division of labor, (re)regulated markets favoring cross-border trade and private capital mobilities, and the privatization of state assets and service provision (Harvey, 1990; Brenner and Theodore, 2002). This restructuring was also marked by a shift in the investment of corporate profits away from productive investment in the economy (e.g. new factories or improved labor power), and toward financial market activities (Krippner, 2005; Van der Zwan, 2014). The emergence of a new international 'Dollar-Wall Street regime' facilitated this transformation through global capital market institutions and regulatory frameworks, which "gave leverage to the US government and to Anglo-American financial networks and operators" over distinct international financial linkages and flows (Gowan, 1999: 5), and helped to center financial market power in particular urban command and control centers like London and New York (Sassen, 1992).

Within this context, a great “wall of money”, a global pool of liquid assets” formed in search of high quality investment collateral³ that “act as a safe haven” for growing reserves of capital “in a complex world of risk” (Fernandez and Aalbers, 2016: 74). In the context of a financializing economy, at least four dynamics produced this oversupply of capital relative to the availability of high quality collateral (Fernandez and Aalbers, 2016: 74). First, following Krippner (2005), corporate savings grew, and this wealth needed to be invested (Fernandez and Aalbers, 2016: 74). Second, the assets of pension funds and other institutional investment vehicles grew at a rate that outstripped GDP growth in advanced economies, generating an additional source of demand for investment products (ibid: 74). Third, a sustained US trade imbalance saw a significant increase of inward foreign direct investment focused on specific US asset classes, including real estate (ibid: 74-75). Fourth, central banking policies (including interest rates and quantitative easing) incentivized capital to seek new investment classes, while also reducing the availability of public debt as an investment outlet (ibid: 75).

In this context, both direct and more passive forms of real estate investment have become increasingly important outlets for institutional capital investment in recent decades. These activities can be broken down into four quadrants: public, private, equity, and debt investment (Mansley and Lizieri, 2015). Real estate investment capital is drawn from a range of sources, the largest of which include life insurance companies, pension funds, other private financial institutions, and individual investors (ibid). Several types of instruments and institutions -- ranging from mortgage securities to real estate investment trusts (REITs) enable investment capital to be translated into equity and debt stakes in real estate projects.

³ Fernandez and Aalbers (2016: 74) identify (i) public debt from “core” economies (e.g. US Treasury Bills), (ii) corporate debt from “blue-chip” companies, and (iii) fixed income mortgages and real estate-linked assets as the three forms of high quality collateral.

Mortgage securitization arguably represents the single most important instrument within the real estate-finance link, both in terms of monetary value and relevance to everyday material life. The home mortgage became the quintessential “post-industrial widget”, with borrower repayments providing the “raw products necessary for the production of securities, derivatives, and the related products of a financialized economy” (Newman, 2009: 316). By 2017, US home mortgage securities accounted for \$9.30 trillion of the roughly \$100 trillion outstanding global capital investment (SIFMA, 2018; Hewitt EnnisKnupp, 2014: 4). In addition to being important by virtue of its scale, mortgage securitization also became a central driver of the spatial and economic restructuring of the post-war American metropolis, including the boom and bust which ultimately yielded a Global Financial Crisis. In the two sections which follow, I expand on the mortgage securitization example by reviewing the MBS literature from capital market and urban political economy perspectives.

2.3.2. Mortgage Securitization, Part 1: The Financial Geography Perspective

From the mid-1980s, mortgage securitization emerged as an attractive safe harbor for global capital because of its unique security (premised on the underlying stability of US property values), the portfolio diversification benefits associated with its lower correlation with stock market ebbs and flows, and the growing market acceptance of the design and structure of the instrument itself. This represented a significant transformation of how real estate-linked wealth was generated and organized:

Mortgage debt, as any other type of debt, serves as an investment outlet. However, unlike other forms of debt, mortgages rely on land, bricks and mortar as collateral – a familiar store-of-value – well-established calculative practices, and a highly standardized institutional framework to collect future income streams. Compared to alternatives, such as unsecured loans, the size of real estate markets, even if they are largely *nationally*-bound, enabled investors to create a liquid marketplace that serves to diversify portfolios *globally* (Fernandez and Aalbers, 2016: 74).

While mortgage-linked securities, derivatives, and similar products provided a source of high quality collateral for capital market investors, financial institutions also developed multiple strategies for generating value through mortgage securitization.

Christophers (2015b) identifies four value models for finance, which provide a framework for understanding how mortgage securitization generates opportunities for the accumulation which underpins the financial sector. First, finance appropriates value by charging (1) *fees* for services, through lending, broking, advisory services, management of wealth, and other services. In recent years, fees provided perhaps the largest single source of income for financial institutions, comprising up to half the revenue of several major US commercial banking firms (Christophers, 2015b: 9). Financial firms also derive value through (2) *gains*, by “advancing a certain amount of capital in the hope that doing so will result in a great amount of capital,” as in shorter-term trading or longer-term investment represented by residential mortgage security trades or real estate ownership, respectively (Christophers, 2015b: 9). In addition, (3) *premia* paid into insurance and other risk transfer mechanisms, constitute a third value model, where capital promises to pay against losses against a given scenario (ibid, 12). Finally, (4) *spreads* – the ability to exploit the interest rate costs of capital – form of a fourth model, as in how banks profit from consumer lending by charging borrowers a higher interest rate than that which is paid to depositors for their capital, or which is charged to commercial banks by the central bank (ibid, 15).

The mortgage securities trade both relied upon and directly generated patterns of accumulation through all four value models. First, *fees* from mortgage securitization-related activities constituted a growing and central part of profitability for financial institutions.

DeYoung and Rice (2003: 42; cited by Fligstein and Goldstein, 2012: 19) find that total commercial bank income from fee-related activities grew from 24% in 1980 to 48% by 2003, with securitization and servicing mortgage and other credit loans as the top two contributors to this revenue source. Banks restructured their participation in the market and lobbied for

regulatory reforms so that they could engage in the full spectrum of mortgage-linked transactions, from loan origination to securitization, in order to maximize their capture of fees from mortgage-related income (Wyly et al, 2009; Fligstein and Goldstein, 2010).

Second, financial institutions exploited *spreads* between low Federal Reserve Bank interest rates and the relatively high returns of MBS investments (Fligstein and Goldstein, 2010: 21). Spreads gave financial institutions an extraordinary capacity to grow the MBS market: each dollar they borrowed was leveraged an average of 14 times (with ratios of 1:20 not being uncommon), enabling institutions to buy mortgages and sell securities at profound scale (Aalbers, 2009: 35). Closely related, mortgage securities provided an ostensibly secure basis for realizing *gains* for a wide range of financial investors. The years between 2002 and 2007 saw unprecedented global demand for US MBS.⁴ Moreover, while commercial lenders and conduits profited significantly from fees and spreads, they also became major holders of MBS, growing their respective shares from \$650 billion to \$1.1 trillion, and \$35 billion to \$175 billion, over the same horizon (ibid: 21).

Premia are also an important part of this story. Lenders require mortgagors to purchase a range of insurance products, including mortgage, title and property insurance policies, all of which secure elements of the lending transaction. While homeowners and mortgage insurance are examples of *premia* which are mobilized from to the primary mortgage market, insurance also provided a lucrative domain for securing mortgage-based financial products on the secondary market. In 2008, \$60 trillion global credit default swaps (CDS) market provided a form of insurance for the holders of MBS and other mortgage-linked assets, for example (Eichengreen et al, 2012).

⁴ Between 2002 and 2007, foreign investors increased their holdings of MBS from \$200 billion to \$1.2 trillion, mutual funds from \$400 billion to \$850 billion, and hedge funds and other private investors grew their share from \$25 billion to \$700 billion, for example (Fligstein and Goldstein, 2010: 21).

By exploiting these value models, financial firms were able to generate new and deepened forms of market power within and between specific urban geographies. The design of the security itself was an important basis for creating financial market liquidity over the fixity of property markets (Gotham, 2009). ” Before home loans could become the basis for complex financial activities, they had to be transformed into a defined and tradable economic good with clearly delineated properties. Housing had to be alienated, objectified and singularized as an economic good (Callon and Muniesa, 2005; Gotham, 2009). Mortgage securitization reduced the universe of housing from one of multiple use values to a calculable exchange value: to the borrower’s promise to pay, collateralized by the property. Financial institutions stratified loans and securities based on the relative security of this promise to pay, predicated on contingencies including the creditworthiness of the borrower and the anticipated stability of the underlying asset’s value. This universalization enabled the mortgage to depart what Callon and Muniesa (2005: 1234) call the “world of supply”, from the fixed territoriality of housing, for that of “the networks of sociotechnical relations constitution the buyer’s world,” for capital markets where securities could be traded at fluid high speed.

This process was facilitated by a shadow banking system.⁵ The growth of shadow banking had significant consequences for the volume, origin, and character of the aggregate money supply flowing through the financial system, ballooning from less than ten percent of total financial sector liabilities to more than 40% in the lead up to the Global Financial Crisis (Adrian and Ashcraft, 2012: 4). Shadow banking provided a source of credit intermediation beyond the bounds of national financial regulatory systems, making capital flows more dynamic but arguably more fragile by virtue of blind spots and unanticipated

⁵ The shadow banking system is “a web of specialized financial institutions that channel funding from savers to investors through a range of securitization and secured funding techniques” (Adrian and Ashcraft, 2012: 2). Adrian and Ashcraft (2012: 11-14) identify various causes for the rise of the shadow banking system, including the need for arbitrage in the light of various market regulations and financial market transaction taxation.

interdependencies (ibid: 2-3). Tax havens emerged as crucial nodes within the shadow banking system. Aalbers (2017: 4) argues that “more than half of world trade and international bank lending passes through tax havens,” with “more than half of all banking assets and a third of foreign direct investment (FDI) by (multinational corporations) pass through tax havens that only account for 3 percent of world GDP; and at least 80 of the largest 100 publicly-traded US corporations and 90 of those in the UK have subsidiaries in tax havens.” Tax havens serve to shift profits between geographies using a variety of techniques, such that “money flows to and through those jurisdictions that have the most favorable regulation for specific practices” (Aalbers, 2018: 923). Palan et al (2010, cited by Aalbers, 2018: 923) characterize the wide variety of tax havens, which have been engineered to provide specialist services to global finance, of which Bermuda emerged as a notable catastrophe (re)insurance specialist haven, as one example (Cummins, 2008a). This territorial architecture protects real estate-linked investments from intrusive regulation and taxation and fuels financial market accumulation.

Although mortgage securities had been issued since the 1960s (Fligstein and Goldstein, 2010: 5), the volume of issuance dramatically increased in first years of the new millennium. The US government sponsored enterprises (GSEs, or ‘agencies’) of Fannie Mae, Freddie Mac, and Ginnie Mae were key players in this transformation. The GSEs source mortgage debt for securitization, with ‘agency’ securities historically constituting the lion’s share of the residential securities market (Gotham, 2009).

In the early 2000s, the volume of mortgage security issuance soared from \$5.3 trillion in 2002, to \$9.4 trillion by 2007 (SIFMA, 2018). This structural transformation was fueled by a financial institution imperative to increase the origination of loans for the purposes of securitization (Gotham, 2009; Fligstein and Goldstein, 2010). Mortgage lenders and related firms were increasingly “more interested in volume than in quality control” (Hellwig, 2009: 166), such that

In order to maintain high profits and volume, originators and conduits aggressively pursued new sources of raw mortgages [...]. The result was that the subprime sector of the market, which had formerly been marginal in size and dominated by specialist firms, quickly became a linchpin of the financial sector (Fligstein and Goldstein, 2010: 7)

This 'originate to securitize' model was partly constituted through subprime lending practices. As the prime borrowing pool disappeared, lenders created subprime products like adjustable-rate mortgages to attract borrowers, lowered or altogether eliminated lending standards, and targeted communities historically excluded from access to credit (especially women of color), often through the use of deceptive and or even illegal lending practices (Aalbers, 2009; Aalbers, 2012; Wyly et al, 2012). The structure of securities (e.g. ability to pool mortgages and divide them into tranches based on the credit riskiness of the underlying loans) allowed higher risk subprime loans to be bundled with prime loans, making them more palatable for capital market investors seeking high quality collateral. In this way, subprime lending could expand the borrower pool underpinning the MBS market with an acceptable degree of risk.

Subprime mortgages accounted for an average of 7.6% of all US mortgage lending between 2000-2003, but comprised 20.1% of the market by 2005 (Faber, 2013). By 2006 up to 75% of all subprime loans were being securitized (Aalbers, 2009: 34). Although subprime lending practices ranged from the merely 'unconventional' to the overtly predatory, the latter ultimately yielded the high rates of default which brought the system to a crisis-point (Aalbers, 2009; Fligstein and Goldstein, 2010): Despite the growing riskiness of the loans underlying mortgage securities, capital market investors, rating agencies, and regulators failed to recognize the potential for systemic financial crisis (Hellwig, 2009; Fligstein and Goldstein, 2010).

These dynamics set the stage for a cascading real estate-financial crisis, first within the US housing finance system and housing market, and then at a global scale. As subprime

borrowers began to default and the stream of income to MBS holders began to dry up, tranches of MBS faced widespread default and devaluation. At the same time, house prices in the US began to decline, with the Case-Shiller National Index registering an 18% drop between the 2006 peak and 2008 (Hellwig, 2009: 156). Rates of decline above 30% were common in cities where subprime lending was particularly strong, particularly in Sunbelt cities like Las Vegas and Miami (Aalbers, 2009: 37; Aalbers, 2012). Once the economy reached a crisis point, and job layoffs became widespread, a second round of mortgage defaults ensued. By 2007, the IMF estimated that up to \$1.1 trillion of MBS were non-prime (Hellwig, 2009: 168). As Hellwig (2009) notes,

In absolute terms, this is a large number. However, this number amounts to less than one fifth of the value of all residential mortgage-backed securities in the United States (\$5.6 trillion), less than one tenth of the value of all residential mortgages in the United States (\$13 trillion), less than one twentieth of the value of residential real estate in the United States (\$20–30 trillion), and presumably less than one fortieth of the value of total private wealth in the United States (Hellwig, 2009: 168).

How, then, did this relatively minor crisis facilitate a collapse in global financial markets?

High rates of default and declining house values suggested that mortgage-backed securities were not only overvalued, but that the financial institutions which specialized in issuing and investing in MBS were also overleveraged to the point of crisis, such that “both profits and losses (were) disproportionately big” (Aalbers, 2009: 35).

Many MBS holders purchased credit default swaps to insulate themselves from such losses (Fligstein and Goldstein, 2010: 18). As mortgage defaults eroded payments to MBS and collateralized debt obligations (essentially, re-securitized securities) holders, they cashed in credit default swaps (CDS) *en masse*.⁶ As such, “at this point the entire global financial system had become infected” (Eichengreen et al, 2012: 1301).

⁶ With a \$440 billion position in the CDS market, the financial firm AIG faced a liability crisis, and ultimately collapsed in late 2008 in one of the seminal moments of the financial crisis (Davidson, 2008). Although AIG’s failure was significant in its own right, subsequent collapses by Bear Stearns

2.3.3. Mortgage Securitization, Part 2: The Urban Political Economy Perspective

The proliferation of mortgage capital through securitization also fueled a broader spatial-economic restructuring of the US metropolis over the post-war era, one which places increasing emphasis on the production and consumption of real estate. Over the same horizon in which a Gowan's (1999) 'Dollar Wall Street' regime created the conditions for global housing-linked investment, the US also underwent a closely linked spatial transformation and "became suburban" (Beauregard, 2006) and the owner-occupied single family home became the cultural, economic, and political cornerstone of this new "crabgrass frontier" (Jackson, 1985).

In the immediate years following the end of the Second World War, the US saw tremendous economic prosperity that was, in part, diverted into and reproduced through the housing finance system (Harvey, 1990; Massey and Denton, 1994; Cohen, 2003). Mortgage market reforms were one of the most important drivers of this process, underpinned by US government interventions designed to encourage home ownership (Jackson, 1985) -- including the GSEs mentioned in the prior section. Between 1940 and a pre-crisis peak in 2004, homeownership rates soared from 43.6% to 69.0% (Federal Reserve Bank of St Louis, 2018). Housing served not only as shelter but also as a vehicle for the creation of a growing middle class. The dual promise of home equity and the shackles of debt served to organize a new model for social reproduction, in the form of a propertied consumer republic (Cohen, 2003).

and Lehman Brothers further exposed the structural interdependencies within finance markets and fed a diffuse investor perception that the US housing boom and bust had generated underappreciated risks within portfolios (Eichengreen et al, 2012).

The spatial-economic restructuring of the US metropolis over the post-war period created new and deepened “cracks in the Keynesian pavement” (Schafran, 2013: 673). Three major tensions within this story of restructuring stand out. First, post-war housing policies redrew the existing contours of the American racial state, with exclusionary lending and planning practices limiting the access of communities of color to the suburban prosperity generated through home ownership (Jackson, 1985; Massey and Denton, 1994; Freund, 2006; Wyly et al, 2012). In conjunction with racial covenants in housing deeds, redlining in mortgage lending, and the power of ‘home rule’ self-incorporation, white prosperity isolated itself in suburban housing, which was systematically (re)segregated from the broader city region. Jobs, infrastructure spending, and other vehicles of opportunity also followed (Massey and Denton, 1994; Schafran, 2013). Funding for public housing was all but eliminated from the Nixon administration onward, while urban renewal had the effect of destroying much of what wealth communities of color had stored in inner city property markets (Massey and Denton, 1994). Later waves of welfare state retreat and revanchist state intervention -- like ‘workfare’ reform and the ‘war on drugs’ -- deepened these lines of racial division within the metropolis, often to violent ends (Morgen and Maskovsky, 2003).⁷

Second, the post-war spatial-economic restructuring of the US also played out unevenly across regions, with the service industry-driven “sunbelt” region capturing a higher share of the nation’s growth relative to the industrial “rustbelt” of the Northeast and Midwest (Bernard and Rice, 1983). The emergence of the sunbelt was facilitated by three overarching drivers: a southerly and westerly bias in federal spending (especially infrastructure and defense spending), the ability of sunbelt cities to attract business and induce investment (through forms of spatial-economic competition and ‘place arbitrage’ in labor and land markets, discussed below), and the broader allure of a higher quality of life in the newer, sunnier, and

⁷ It is worth noting that postwar suburbanization attracted significant critique from other corners as well, drawing the ire of defenders of traditional urban form and habitus like Jane Jacobs (1961), while also sparking new formations of feminist and environmental critique and activism (Hayden, 1981; Hayden, 2003).

seemingly less fraught frontiers of the south and west, at a time of racialized inner city riots, union agitation, and economic decline in the old industrial heartland (Bernard and Rice, 1983: 12-16).

These asymmetrical regional patterns of spatial-economic decline and prosperity were reflected and amplified at the urban scale. From the 1970s onward, local property development assumed a renewed centrality in the making of urban prosperity as the national state retreated from the domain of welfare provision. Harvey (1989) theorizes this as an urban policy shift “from managerialism to entrepreneurialism,” away from the welfare and ‘collective consumption’ functions of the Fordist city, and toward the post-industrial competitive city organized around private capital attraction and retention. Within the entrepreneurial city, the attraction of investment in the built environment – and the spaces of the new service economy in particular – became a central organizing logic of urban governance, as cities sought to compete for capital and talent in a restructuring global urban order (Knox and Taylor, 1995; Florida, 2005; Storper, 2013).

In this context, entrenched local “home rule” and highly devolved tax-and-spend powers (including a reliance on the local property tax base for revenue for urban services) reinforced the importance of development-based growth on the agendas of urban elites and their stakeholders (Logan and Molotch, 1987; Davis, 1990; Stone, 1993; Brenner and Theodore, 2002; Peck and Whiteside, 2016). A “roll out” of new spatial-economic strategies – public-private partnerships between state and business, place marketing, the privatization of infrastructure, state-subsidized private sector urban redevelopment, and new municipal finance models – unfolded against the “roll back” of earlier modes of Fordist welfare provision and regulation, including public service provision or labor and environmental protections (Peck and Tickell, 2002).

City governments became active facilitators of real estate-led local economic development (Smith, 1996; Fainstein, 2001; Weber, 2015). From the 1980s onward, cities increasingly relied on complex financial market mechanisms to realize growth, as in the use of tax increment finance (Weber, 2002) and public-private finance arrangements for infrastructure and welfare service delivery (Ashton et al, 2012, Fields and Uffer, 2015). This property-based growth model was increasingly financed by new assemblages and articulations of global investment capital, the availability of which “fueled redevelopment in cities across the country” (Newman, 2009: 315). A handful of ‘global cities’ – New York, London, Tokyo – emerged as powerful ‘command and control’ nodes within capital markets, specializing in finance, real estate, and other ‘advanced’ management services which coordinate finance activities across an increasingly-planetary economy (Sassen, 1992).

This wave of real estate investment capital was a double-edged sword, at times unleashing waves of gentrification and displacement in the cities which became choice destinations for real estate investment (Smith, 1996), while at other times offering the “potential to transform disinvested communities and the (mortgage) borrowers in them” by “making capital available to those who could not access it in the past” (Newman, 2009: 315). Property markets – and sustained access to property-linked finance markets for both large-scale redevelopment and for neighborhood-level renewal – became the lifeblood of US urban political economy, and a key site of intervention and imagination in the American metropolis.

Within this context, the making and remaking of the city itself became a significant driver of the US economy (Beauregard, 2006; Aalbers, 2012; Schafran et al, 2018). Home construction, sales, and home-related expenditures emerging as significant contributors to aggregate economic expenditure, income, and employment (Case and Quigley, 2008: 162). In 2006 alone, near the pre-crisis peak of the housing boom, construction firms employed roughly 7.5 million workers, while “new investment in residential structures was at an annual rate of over \$800 billion dollars, or over 5.5 percent of nominal gross domestic product” (ibid:

162). Beyond construction work, the homebuilding industry employed combined millions of developers, architects, engineers, designers, brokers, appraisers, and contractors. Fees and taxes from property transactions also contributed to local governments, funding the delivery of services (ibid: 162).

These local-regional dynamics coincided with other processes of spatial-economic restructuring -- including deindustrialization, outsourcing, and rise of a new international division of labor -- which contributed to a third dimension of post-war crisis: wage suppression. Between 1982 and 2007, wages declined in 17 of the 24 OECD countries, translating in 2011 to an annual loss of household income of \$8 trillion (Fernandez and Aalbers, 2016: 75). In the years leading up to the financial crisis, housing ownership-oriented economic policies were used to offset downward wage pressures in the US. Downward wage pressures led homeowners to leverage the growing equity in their home for non-housing consumption (Cynamon and Fazzari, 2008: 14; Fernandez and Aalbers, 2016). In the half-decade between 2000 and 2005, rising real estate values were by far the largest contributor to growing US household wealth, above and beyond the economic effects created through property markets (Case and Quigley, 2008). Steadily increasing real estate prices created a positive wealth effect within the economy, because there is a direct correlation between increases in home values and household spending (Case and Quigley, 2006: 162).

The growing importance of housing equity as a mechanism to offset declining wages was accompanied by the proliferation of household debt (Kotz, 2008). By the end of 1949, the US had \$54.2 billion of outstanding mortgage debt (Federal Reserve Bank, 2018). By the second quarter of 2017, that debt had grown to \$14.6 trillion (ibid), a rate which far exceeded both the population and economic growth rates in the US over the same period.

The gradual deepening of these converging crises reinforced the political economic case for mortgage market innovation through MBS (Gotham, 2009, Wyly et al, 2009). Securitization was intended to enable more capital to enter the housing system, and to therefore expand access to the virtuous property-based production and consumption model at the heart of the postwar US economy (Aalbers, 2012; Wyly et al, 2012). A bipartisan political consensus was formed and sustained around the importance of housing ownership-led economic growth from the 1960s onward (Wyly et al, 2012: 582).

This political consensus led a series of legal and regulatory changes to the relationships between commercial and investment banking, and to the taxation of real estate investment (Gotham, 2009; Wyly et al, 2012). Within the financial system created after the Depression, mortgage lending was limited to a primary market between borrowers and commercial banking institutions – the so-called “originate and hold” lending model (Aalbers, 2012: 12). This made mortgage lending a relatively safe, stable, and local affair, but had the impact of limiting the supply of capital available for mortgages: how – and how much – banks could lend was in several ways limited (Gotham 2009; Wyly et al, 2012). Regulatory changes gradually “created intricate, non-Euclidean spaces of permissible financial transactions” (Wyly et al, 2012: 583), which enabled banks to conduct lending across state lines, to lend between commercial and investment banking divisions, to offer new loan types in certain housing geographies, and to lessen depository requirements. Banks could lend more mortgage capital from wider sources across more territory with fewer restrictions.

The US government proactively developed the secondary market for mortgages, which further enabled primary lenders to grow their lending capacity through the sale of their outstanding mortgages to securities investors (Wyly et al, 2004; Gotham, 2009; Aalbers, 2009; Immergluck, 2011). This served to “speed up and extend real estate and financial flows between regions and communities” (Gotham, 2009: 364). The GSEs of Fannie Mae, Freddie Mac and Ginnie Mae were established as the primary bridges between the primary

and secondary markets by pooling, securitizing, and selling mortgage-backed securities (Gotham, 2009: 361). Tax reforms in 1986 also enabled the segregation of mortgages by risk classes, “insulating the financial performance of securities issued from the financial position of the issuer (ibid: 361).

Securitization also liberated financial institutions from housing debt risk through the design of the special purpose vehicles registered in offshore tax havens (Section 2.3.2), which broke the chain of legal liability between mortgage brokers and the investors that bought them (Wyly et al, 2012: 584). Regulatory and institutional changes thus allowed investors to exploit the value generated through mortgage securitization without full responsibility to the social and material contingencies embedded in property (ibid). This enabled predatory lending without recourse, and while some state governments attempted to limit subprime lending, the federal government actively combatted these efforts through powers of preemption (Immergluck, 2011).

US institutional, regulatory, and legal changes to the mortgage finance system coincided with broader financial market innovations to create the conditions for the mass entry of investment capital into the US mortgage industry (ibid: 584). To summarize, these dynamics set the conditions for the subprime lending and foreclosure crisis at the start of the new millennium, such that:

For most of the post-World War II period, American housing was a Keynesian arrangement, in which the economies of supply-side housing construction cycles were governed by the ‘fundamentals’ of demand for housing as a consumption good, paid for by the wages of an industrial economy. But postindustrialism and deregulated financialization created a more unstable post-Keynesian network of supply-side profit opportunities that were partly unhinged from wages and other fundamentals. Homes, borrowers, and financial obligations became the vehicles for capital accumulation backed by (and driven by) the steady rise in home prices (Wyly et al, 2012: 580)

The housing bubble and MBS practices, and the subsequent global financial crisis, had profound yet asymmetrical consequences across US cities and communities (Aalbers, 2009; Aalbers, 2012; Wyly et al, 2012). Housing markets were central sites of lost wealth and dispossession in the context of this broader economic crisis. Between 2007 and 2011, 11 million homes were foreclosed, or repossessed by loan owners after borrowers defaulted on their loans (Bocian et al, 2012). The direct and indirect consequences of foreclosure are estimated to have destroyed somewhere between \$6 trillion and \$9 trillion of home equity between the top and bottom of the housing boom and bust (US Government Accountability Office, 2013: 21). By 2011, US households held an estimated \$3.7 trillion of negative equity, a measure of the difference between the outstanding mortgage and value of the property (ibid: 21).

The fallout from the foreclosure crisis was marked by several spatial dynamics within cities and neighborhoods. Subprime lending was intrinsically spatial, and as a consequence foreclosures were highly concentrated in the long-standing inner city residential neighborhoods of the industrial rustbelt and in the fast-growing suburban frontiers of sunbelt cities (Newman, 2009; Aalbers, 2012; Wyly et al, 2012; Dymski et al, 2013; Schafran, 2013). Scholars extensively analyzed the spatial consequences of the crises at the parcel, neighborhood, and city levels, and uncovered evidence of negative 'spillover effects' of foreclosures on neighboring property values and community wealth (Schuetz et al, 2008; Immergluck, 2010; Bocian et al, 2012).

House price declines and broader economic crisis generated significant pressures on local and state governments (Doerner and Ihlanfeldt, 2011; Alm and Leguizamon, 2018), including revenue shortfalls and the implementation of austerity measures (Peck, 2012). "Austerity urbanism" (ibid) deepened the existing challenges and contradictions of US post-war spatial economic restructuring, and in some cases prompted municipal bankruptcies, new rounds of asset liquidation and privatization, and growing government reliance on debt markets to

meet obligations (Davidson and Ward, 2014; Peck and Whiteside, 2016). These pressures were particularly pronounced in places which relied more heavily on property market-linked revenues and employment for income and wealth generation, as in the real estate-driven economy of states like Florida (see Chapter 6 for further discussion).

The foreclosure crisis also further deepened geographies of racial inequality within the US metropolis (Newman, 2009; Aalbers, 2012; Wyly et al, 2012; Dymski et al, 2013; Schafran, 2013). Half of the total wealth destroyed by the housing market collapse and foreclosure was held by communities of color (Bocian et al, 2012). Black families lost up to half of their wealth during the housing market crash, while the Latino community saw two thirds of its sum wealth destroyed (Rakesh et al, 2011; quoted in Shapiro et al, 2013: 4). Not only were rates of subprime lending and foreclosure in minority neighborhoods more than double those in white areas (Wyly et al, 2012: 577), communities of color were hit harder by the crisis because a larger share of their wealth was tied to home equity. Combined, these dynamics led to dramatically racialized declines in household wealth between 2005 and 2009: White households lost 16% of their wealth, yet Latino and black household wealth dropped by 66% and 53%, respectively (Rakesh et al, 2011). As a consequence, “the typical black household had just \$5,677 in wealth (assets minus debts) in 2009; the typical Hispanic household had \$6,325 in wealth; and the typical white household had \$113,149” (ibid). The racialized demography of foreclosure reflected how subprime lending was predicated on existing racial-spatial bounds within the US housing finance market exclusion (Wyly et al, 2012; Dymski et al, 2013).

Real estate finance therefore played an important, but not the only part in reproducing the racial-spatial bounds of the housing crisis. For example, Schafran (2013) argues that racialized processes of regional restructuring underpinned the foreclosure crisis in the San Francisco Bay Area, through which legacies of urban and regional planning, community

organizing, and developer interests converged to produce new geographies of subprime lending, segregation and dispossession.

Government interventions also shaped the uneven cartographies of foreclosure fallout, through lending regulations, foreclosure court proceedings, and foreclosure mitigation programs (Claurette and Herzog, 1990; Immergluck, 2013). The federal government launched two types of initiatives to combat the foreclosure crisis, yet competing political interests within the federal government's housing enterprises, and a broader political climate that dodged the question of housing market fairness and financial market accountability, made it difficult to mobilize sufficient resources to make such programs effective (Immergluck, 2013: 200-201). As a consequence, federal interventions "were no match for the nature, scale, and depth of the foreclosure problem" while "(loan) servicers and lender/investors were in the driver's seat" (ibid: 225). A patchwork of local state and community responses to foreclosures also emerged, adding to the uneven landscape of recovery and restructuring -- one which ultimately failed to stop widespread housing dispossession and displacement (Anacker, 2015; Fields et al, 2017).

2.3.4. Learning from the Real Estate-Finance Link

The literature on the real estate-finance link, and the rise of mortgage securitization in particular, raise three lines of inquiry which can bring analysis of ILS to the domain of urban political economy. These relate to (i) how practices of statecraft connect risk capital with specific at-risk places and property, (ii) how (re)insurers and risk capital investors construct and deploy various strategies to mobilize financial value from real estate climate risks, and (iii) how (re)insurance market dynamics mediate geographies of race, class, and power within the urban contexts which are most closely connected to risk capital markets.

The first line of inquiry generated by this review of literature on the real estate-finance link relates to the role of the state in the making of ILS markets. For example, mortgage securitization was made possible through decades of public policy intervention, including but not limited changes in financial regulation, public subsidies and guarantees for particular forms of mortgage lending, and the creation of a state-run secondary mortgage market. The public policies which facilitated the rise of mortgage securitization -- and managed its aftermath -- were forged through changing understandings about the functional relationships between housing, financial markets and larger political economic 'fixes', as well as deeper cultural norms and values about housing ideals. The state is rarely conceptualized explicitly within the literature on ILS, leaving several potential research questions unanswered: How and to what extent do states facilitate the creation of risk capital markets? What are the specific patterns of intervention through which states shape the form and function of insurance markets, and how do these link to private risk capital market dynamics? What are the political and economic pressures, as well as norms and values, which guide these public interventions?

The second line of questions prompted by the real estate finance literature relates to the ways in which how (re)insurers and risk capital investors use accumulation strategies to mobilize financial value from real estate climate risks, and to what ends. Mortgage securitization occurs through a distributed architecture of financial market intermediation, within which multiple institutional actors generate opportunities for accumulation through distinct value models, in ways which operate through distinctive territorial devices and footprints, and which entangle specific real estate assets (and places and residents) in a broader web of financial market institutional interests and imperatives. This market architecture creates substantial value from real estate, including both financial (exchange) value and use value, as in the expansion of housing ownership opportunities. Yet it also generates significant risks, as the subprime "originate to securitized" lending model and the subsequent foreclosure crisis illuminated. Scholars have gone as far as to pinpoint the

foreclosure crisis on the lending practices at the firm level (Dymski et al, 2013) or even the use of particular formulas within financial market risk management calculations (MacKenzie and Spears, 2014).

The MBS case points to limits within our existing understanding of how risk capital markets appropriate value from risk using territorialized accumulation devices and strategies, despite clear similarities in the structure and application of MBS and ILS. The ILS scholarship points to how this market resolves multiple market crises (Section 2.2), yet tells us much less about how -- and how much -- value is captured in this market by specific firms or market mechanisms. What are the techniques of marketization which enable value to be mobilized from risk? What are the geographies of primary insurers and risk transfer institutions which comprise this architecture? How do these firms, strategies, and device thus marry risk and capital between specific real estate geographies and capital markets?

The third and final line of questioning relates to how (re)insurance market dynamics mediate geographies of race, class, and power within the urban contexts which are most closely connected to risk capital markets. The real estate-finance link has become central to contemporary capital accumulation, helping to produce wealth within the 'command and control nodes' of a global financial system and within urban political economies far and wide. The mortgage securitization case demonstrates how specific modes of real estate financialization are both a product and a driver of broader patterns of spatial-economic restructuring, as in the changing role of housing in the context of the US postwar era. Scholars have demonstrated how housing growth-based policies have been central to various aspects of urban life within this context, and how securitization has augmented these dynamics, including its key role in the subprime lending and foreclosure fallout.

Squires (2003) stands as a unique voice at the crossroads between critical housing studies and insurance studies, and has argued that insurance underwriting practices can reproduce

the discriminatory intents and outcomes which have marred US housing finance policy in the past, including unique forms of redlining (i.e. protection gaps) which could generate unequal patterns of property market disinvestment. Yet Squires also recognized that the opacity of insurance markets -- and the limited availability of market data for research purposes, in particular -- have limited opportunities for scholars to examine these relationships in closer detail. While Johnson's (2015) 'splintering protectionism' thesis alludes to this kind of market logic, many questions about the relationships between ILS and the particular urban contexts entangled therein remain unmapped. How, why, and to what extent are particular places and institutions entangled in the securitization of property risk, and to what ends?

In this spirit, scholarship on the real estate-finance link problematizes the capital market-centricity of the existing ILS literature in generative ways. The MBS case in particular points to multiple rationales for the expansion of mortgage markets which emerged 'from the city' rather than simply or solely as a result of the interests of capital market institutions. These range from the push to leverage property growth to create urban economic prosperity in the context of neoliberalization, to the desire to expand access to homeownership by liberalizing mortgage markets, for example. At times, these rationales can appear pragmatic, or even progressive, yet can also produce complex and unintended patterns of urban crisis and restructuring. What is needed, then, is a conceptual tool which enables us to 'see' ILS from the city, and to bring this analysis into dialogue with existing understandings of risk capital market dynamics.

2.4. From the Spatial Fix to the Real Estate Risk Fix

In this final section, I review how Harvey's (1981, 2001) notion of the spatial fix can be used as a conceptual device to bring together as-yet disparate studies of ILS and the real estate-finance link. Not only is the spatial fix a foundational theory within geographical political

economy (Bok, 2018), it also formed the basis for Johnson's (2015) conceptualization of ILS as a catastrophic fix. In this section, I have two aims. First, I situate the origins and evolution of the spatial fix, up to and including a recent wave of 'fix thinking' related to questions of climate risk, of which Johnson's work is a crucial part (Section 2.4.1). Second, I propose that both Harvey and Johnson's thinking can be combined to study ILS as a 'real estate risk fix' (Section 2.4.2). This amended view of the fix, I argue, can be used to extend and cross-pollinate existing accounts of ILS and the real estate-finance link across the lines of inquiry I identified at the end of Section 2.3.

2.4.1. The Spatial Fix: Key Ideas, Origins, and Evolution

At its foundation, Harvey's spatial fix represents an urban-geographical theory of capitalism, one seeks to explain how (over-) accumulation in the 'real' economy is closely linked with the production of the built environment (Schoenberger, 2004; Jessop, 2006; Bok, 2018).

Overaccumulation in the economy is offset through the "typing up and the pinning down of large amounts of capital in place through the production of fixed and immobile capital in the built environment" (Harvey, 2001: 28). This dynamic generates "symbiotic forms of accumulation (suburbs need cars and vice versa)" which displaces the crisis spatially and temporarily. However, the fix also produces new and uneven geographical contradictions which end in crisis -- and which often lend themselves to resolution through new formations of the fix, albeit often after great conflict and upheaval.

As a "root metaphor" for geographical political economy (Bok, 2018), the concept of the spatial fix has proven widely adaptable as a concept. We can understand what -- and how -- the relationships between capital and the urban have been examined using the concept of the spatial fix by briefly tracing its origins and evolution. The concept of the spatial fix emerged out of an Marxist turn within urban-geographical political economy in the late 1970s

and early 1980s (Merrifield, 2002; Bok, 2018). Prior to the 1970s, the Chicago School of sociology dominated urban studies. Led by figures like Robert Park, Ernest Burgess, and Louis Wirth, and heavily influenced by the work of earlier continental sociologists like Georg Simmel (1969 [1903]) and Max Weber (1969 [1921]), the Chicago School pioneered analytical marriages between sociological theory and urban fieldwork, and between the physical environment and social outcomes of cities. Dubbed urban or human ecology, the Chicago School used this approach to theorize processes like racial succession and social mobility across neighborhoods and cities. (Park, 1915; Wirth, 1938; Sennett, 1969).

The Marxian turn in urban studies emerged, in part, as a reaction to perceived limits within the Chicago School (Merrifield, 2002). One crucial voice in this Marxian turn came from Manuel Castells in *The Urban Question* (1979). Working under the guidance of the French structuralist Louis Althusser, Castells decried the lack of rigor and objectivism in urban studies and looked to bring robust empiricism to urban sociology (Stevenson, 2003: 35). Castells argued that urban culture, *writ large*, is: "...strictly speaking, a myth, since it recounts, ideologically, the history of the human species." According to Castells, existing discourses of the urban obscured latent class interests and power, rather than explained them. As a counter, Castells theorized the city in relationship to class conflict and social reproduction. He focused on the organization of collective consumption, of the state's role in delivering the unprofitable collective goods necessary for the reproduction of labor – ranging from roads and highways and schools and hospitals to regulatory infrastructures like planning and insurance. Andy Merrifield (2002) succinctly captures the reasoning of Castells:

"The production of collective goods, he feels, have helped big capital to save off sagging profits. [...] Castells maintains that state intervention in collective consumption offsets the endemic crises of overproduction and systemic reproduction. It becomes something of a crisis manager, ameliorating the system's international contradictions, yet unleashing other, deeper contradictions while demarcating new arenas of political conflict." (Merrifield, 2002: 120)

For Castells, sites of collective consumption and labor organization were the ideal target for urban sociological inquiry and political intervention (Stevenson, 2003: 35). Merrifield (2002: 143) characterizes the early work of Castells as 'defensive'. By limiting his analysis of the city to sites of collective consumption, the urban becomes foreclosed to a battleground of class conflict, something to be secured through political struggle. Merrifield (2002, 142) contrasts the approach of Castells with the more 'offensive' outlook of David Harvey, a second influential neo-Marxist who emerged at the same time. For Harvey, "(u)rban space under capitalism is an 'active moment,' proactively productive and not merely passively reproductive; it is, as Harvey argues, a unit of capital accumulation as well as a site of class struggle" (ibid).

Harvey (1981) proposed the spatial fix as capitalism's "provisional solution to crisis through geographical expansion and temporal deferral" (Bok, 2018: 13). Harvey look to cities to see the spatial fix in motion, because "the production of space through urbanization (is) a key site where the contradictions of capital are always at work" (Harvey, 2001: 28). Within this schema, specific crises of overaccumulation (that is to say, declining returns) in the 'primary' economic sector prompts capital to temporarily move into the built environment, in order to secure returns and to reproduce the conditions for accumulation:⁸

[The spatial fix is] that which is perpetually seeking to resolve the crisis tendencies of capitalism (overaccumulation) through the production of space (consider, as an example, the key role of suburbanization in the United States after 1945 in absorbing surpluses of capital and labor); and that [second] version of the fix which is about the tying up and the pinning down of large amounts of capital in place through the production of fixed and immobile

⁸ Harvey conceptualizes three 'circuits' of capital: the primary, secondary, and tertiary (Harvey, 1978: 103). The primary circuit refers to investment in commodities, to the making of actual things on the classic factory floor. The secondary circuit includes fixed capital (the infrastructure for production, like machines or factory buildings) and a 'consumption fund' (the infrastructure for consumption, like highways or sidewalks), or, more simply, the built environment at large (ibid, 106). Although it is less central to his argument about the relationship between capital and the urban, Harvey theorizes the tertiary circuit as a second release valve for underproductive capital, in terms of investments in science, knowledge, and labor power that aim "to contribute to the processes which continuously revolutionize the productive forces in society" (ibid, 107-108). According to this theory, a crisis in one circuit triggers capital to switch circuit.

capital in the built environment (e.g. the highways systems needed to facilitate suburbanization). Here, the two kinds of fixes both feed off each other to stimulate symbiotic forms of accumulation (suburbs need cars and vice versa) and collide to form a potentially serious contradiction (Harvey, 2001: 28).

Facilitating accumulation through the built environment is not without challenges, however. Unlike other 'real' commodities, real estate has historically been a relatively fixed and non-substitutable good, one which can take a great time to mature in value, and represents a significant sunk cost that is difficult to finance *en masse* (see Polanyi [1944] for a discussion of land as a fictitious commodity). Real estate must be coaxed into financial market existence, or transformed from relative spatial "fixity" to financial market "liquidity" (Gotham, 2009). At the same time, so too do crises of overaccumulation appear within the real estate sector, which prompt capital to abandon particular urban space in search of greater returns in other property and non-property market domains, (re)producing uneven patterns of prosperity and decline within and between places. It is this struggle to transform space into a synthetic unit of accumulation -- and the contradictions which are generated as a result -- which is central to Harvey's theorization of the urban in relation to capitalist development.

Bok (2018: 3-4) argues that "(t)he fix has been variously invoked to denote capital's contradictions, spatialities, and above all insatiable thirst for provisional 'solutions' to periodic crises," marked by an "ambiguous, adaptive character and conduct as a malleable, mobile metaphor" for geographical political economy. Although very much "a resolutely embedded metaphor that foregrounded very real socio-political questions of its time" (ibid: 15), the spatial fix has evolved in meaning and application over the last four decades.⁹ Bok (2018) thus identifies several successive waves of 'fix thinking' which have extended Harvey's original formulation, as seen in analysis of the "institutional fixes" which emerged in the

⁹ The concept of the spatial fix was a product of its time (and place) not only in terms of the types of empirical dynamics Harvey was responding to (e.g. deindustrialization), but also in terms of the gendered, racialized, and provincialized nature of geographical scholarship at the time. Insofar as the grand theorization offered through the spatial fix was seductive, it was also masculinist and seductive, made possible through Harvey's subject position. Harvey would rightly be met with feminist and decolonial critique from scholars like Massey (1991) and, later, Robinson (2005) and Roy (2009).

'extra-economic' spaces of nation-state market regulation in the 1990s (Peck and Tickell, 1994; Jessop, 2006), and later in ideas of the "scalar fix", within which analysis focused on the role of territorial 'scaling' in mediating accumulation (Brenner, 1998; Brenner, 2004).

Bok (2018: 23) also notes the emergence of 'environmentally-oriented' fix thinking within a growing engagement with the "many contemporary efforts to remake socionatures" which "have been shaped by the difficulties of maintaining accumulation in the [neoliberal] era" (McCarthy, 2015: 2489, quoted by Bok, 2018: 26). Within this literature, capital locates new "socio-ecological fixes" (McCarthy, 2015) in carbon offsetting (Bryant et al, 2015), energy and infrastructure provision (McCarthy, 2015; Nugent, 2015), natural resource extraction (Zalik, 2015), and in catastrophe (re)insurance markets (Johnson, 2015). Here, capital simultaneously seeks fixes for the various negative externalities which threaten to erode accumulation (Ekers and Prudham, 2015), while also aims to open up avenues for 'sustainable' pathways to accumulation (Castree and Christophers, 2015).

2.4.2. Towards the Real Estate Risk Fix

Building on Harvey and Johnson, ILS might be seen not only as a 'catastrophic fix' for a crisis of overaccumulation internal to the (re)insurance market, but more broadly as a real estate risk. Following Harvey's original conceptualization of the spatial fix in terms of inner and outer dynamics, ILS might be more fully understood as a fix in two ways. The first relates to how and why ILS markets are constituted through relationships between specific capital market institutions and specific urban geographies. The second relates to how ILS provides a fix which reconciles the growing importance of real estate-linked accumulation within capitalism against the very vulnerability of that real estate to devaluation by climate risk. Insofar as the first dimension of this fix is about the specific challenges and their (temporary) resolution within one geographical context, the second dimension of this fix is

about its relation to a broader crisis of real estate-based accumulation, which itself is perhaps the foundational expression of the original spatial fix Harvey sought to conceptualize. In this respect, could this real estate risk fix act as 'fix for the fix'?

When combined with the specific lines of inquiry which emerged from Section 2.3.4, Prior iterations of fix thinking can help to point how and where the real estate risk fix can be analyzed. The regulationist variations of fix thinking which dominated the 1990s show how provisional formations of statecraft and other institutional formations enable fixes to form at particular junctures, through specific mechanisms and their applications within organizational and institutional contexts. Johnson's analysis of catastrophe bonds, risk modeling, reinsurance rates, and other risk capital market institutional instruments and dynamics gives us fragments of this story, yet questions remain about how and why ILS was facilitated through particular forms of statecraft, for example.

More recent theorizations of the 'scalar fix' point to how fixes are staged within nested and shifting intra- and inter-urban contexts, through which the relationships between space and place are constituted. This round of fix thinking complicated an earlier analytical bias towards the nation-state, and raised questions about how various relationships within and between different scalar geographies are transformed by fixes. Following Section 2.3.4, specific questions remain about how ILS-linked institutions mobilize value from risk across territories, and how such patterns of 'territorialized accumulation' mediate geographies of race, class, and power within the urban settings entangled therein, for example. Johnson gestures to these dynamics through the concept of 'splintering protectionism', which alludes to a connection between ILS and the legacies of post-war urban restructuring which inspired Graham and Marvin (2001) to originally develop the idea of 'splintering urbanism'. This is a productive beginning insofar as it suggests that ILS markets shape -- and are shaped by -- inherited urban-economic geographies. The promise of this amended conceptualization of

the fix rests in the ability to more fully and critically understand the specific urban crossroads through which ILS and risk capital markets are constituted.

2.5. Conclusions

The purpose of this chapter has been to chart a path from the existing capital market-centric ILS literature to scholarship on the real estate-finance link, and to identify a set of conceptual frameworks and empirical lines of analysis which enable the study of ILS as a 'real estate risk fix'. I began by reviewing the existing scholarship on ILS and its critical urban absences, before reviewing the as-yet disparate literature on the real estate-finance link. The latter literature provides both a context and framework for understanding how and why single financial market instruments, including ILS, play a vital role in mediating the relationships between capital and space, and accumulation and urban restructuring. I translated insights from the real estate-finance link scholarship into three lines of inquiry for the study of ILS. I finally returned to Harvey's concept of the spatial fix as a conceptual framework which can and must be adapted to contemplate a mounting and central contradiction within contemporary capitalism and its urban geographies: Real estate forms an increasingly important site of accumulation, yet growing climate risks threaten to disrupt this order -- and the wealth constituted therein.

This literature review sets the stage for the research project which follows, which investigates ILS as a real estate risk fix in the Florida urban context. This review of literatures directly informed the selection of three empirical 'sites' of analysis: (i) Florida public policymaking efforts, which play a critical role in connecting ILS risk capital with residential insured risk, (ii) Florida primary insurer underwriting and risk transfer practices, through which real estate risks are sourced and circulated in value form on global risk capital

markets, and (iii) Florida cities, within which the flow of risk capital is vital to both private real estate lending and public finance.

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3. Research Methodology

3.1. Introduction

In this chapter, I discuss the research approach and methods I employed in this project. I structured my research in two overlapping but distinct phases, which were implemented over the course of one year of fieldwork based in Florida cities, followed by approximately six months of desk work based in Leeds. Following this introduction, the chapter is structured two parts. First, I present a first-person reflection on the motivation and context for this project in Section 3.2. Second, I discuss how and why I conducted a two-part research process over Sections 3.3 and 3.4. I present this chapter in narrative form to trace the origins, workings, and evolutions of my research strategy, and to be frank about how I responded to both clear research needs and methodological limits as I progressed.

3.2. Background & Motivation

The impetus for this doctoral project emerged in 2013, at the crossroads between two Florida urban crises: in the fallout from the foreclosure crisis, and with an eye towards the emerging prospect of sea level rise and deepened climate risks. At the time, Florida's property markets were once again prospering, after the Global Financial Crisis had been built up from -- and subsequently crashed down over -- the state's subprime lending fueled real estate boom and bust.¹⁰ Visible signs of the crisis -- the hollowed out cul-de-sacs, the abandoned stucco-and-masonry homes, the "we buy foreclosed houses" signs peppering street corners -- were disappearing. In places like Miami and coastal Tampa, plans for luxury

¹⁰ Despite accounting for about 6% of the US population, more than 12% of the 7.8 million US foreclosures between 2007 and 2016 were registered in Florida (Vandervelde et al, 2018).

high rise development were beginning to crop up again, while construction also picked up along the state's sprawling suburban *frontera*.

Political and business elites were determined to bring back investment to Florida's largest economic sector -- the making and selling of the state itself, be it as a second home or a beach vacation. Florida's already-low taxes (and lean public services) were cut, growth management protections were rolled back *en masse*, and technical experts were substituted by pro-growth landowners and builders on the state's important resource management and planning boards. A new wave of "buy low, rent high" real estate investment capital was also welcomed to Florida at scale, such that the world's largest private equity firm -- Blackstone -- suddenly became Florida's largest landlord. Realtors, builders, and amateur 'flippers' returned to the market -- only this time they were trading in rentals instead of selling homes, or buying houses at auctions on behalf of New York private equity, rather than out of their own pocket.

Like so many others, my Mom and Dad (and me, too) bought into the boom. After more than a decade of renting, a moment of homelessness, and a dozen moves across the Tampa Bay region, we rode the wave of seemingly endless mortgage capital into a newly-built three bed, two bath house. This flow of cheap capital and the economic growth machine which it fueled seemed to touch nearly every aspect of life during my formative years. Evenings were spent wandering through the new (and increasingly luxurious) subdivisions and half-built homes which were cropping up on country pastures at an unyielding pace. Mom became a realtor, while my first job was spent working as an office assistant at a local real estate firm. I went to school to study architecture, presumed to ascend to a permanently middle-class position within the Florida growth machine's hierarchical division of labor: of financiers and developers, brokers and designers, construction workers and maintainers. Family friends came to my Mom to buy property and used their life savings to become casual speculators, while the 'flippers' (that is, speculators) that my Mom worked with often became family

friends. Home equity loans allowed my parents to finance their growing debt on the bet that Florida's real estate market was unstoppable.

Schoolteachers taught me at an early age that a good deal of Florida was built on silty sands and porous limestone: shifting, fragile, subject to sudden collapse. By the time Lehman Brothers sank, Chase Bank had already repossessed my family home. Out of a house, out of work, cut off from credit, and mired in bankruptcy court, my family joined the eleven million others who lost their home during the crisis. For us, and for many close to us, the decade which followed was one of unrelenting housing precarity and poverty -- even as construction cranes gradually returned to Florida's city skylines. It was one which fueled mistrust in collective action and the state, where the certainties of seemingly immutable social orders were suddenly made uncertain, and wherein that uncertainty fed new and reactionary forms of anxiety and ethno-racial politics. This formative crisis in many ways pushed me far from Florida, to university degrees at Berkeley and the London School of Economics, where the housing-turned-Global Financial Crisis was almost always central to my studies.

Returning to Florida in 2013, two aspects of the post-crisis juncture struck me. The first was the 'resilience' of big real estate capital, of how nimbly global real estate institutions and their investors mobilized the resources to turn a subprime housing crisis into a prime investment opportunity (Fields et al, 2017). Private equity firms deployed billions in capital to buy hundreds of thousands of foreclosed properties and rent them out at prime rents (often to the types of families which had been evicted from them). In turn, they securitized those rental incomes in new financial products which could be sold to investors, and used that capital to buy even more homes (ibid). The financial institutions which created the subprime lending industrial complex -- and in many ways demanded it to consolidate its market power -- demonstrated striking ingenuity, and once again Florida was a key laboratory. Private equity firms bought more homes in Florida than any other state, and in doing so put a large part of the growth machine back to work: brokers were now buying properties in bulk at foreclosure

auctions, while builders were contracted to fix up the boom-era houses which had been left exposed to Florida's unforgiving natural elements.

I was also struck by the resilience of a certain common sense after the crisis, one which could be called a settler-speculator ethos, and which is etched into the fabric of Florida's built landscape. The story of faraway real estate investment and local market booms and busts is central to the historic narrative of Anglo Florida, such that large swathes of Florida cities are physical reminders of distinct eras of market excess and collapse.

Despite in many ways being home-grown in Florida's *frontera*, the worst financial crisis in half a century only seemed to confirm the principle that land and property market growth were king -- that this particular mode of growth was success. This reflected a material reality -- everyone's livelihood seemed to be directly and indirectly tied to the fortunes of the real estate business, as Packer (2013: 193) writes of the work in Tampa during the Aughts:

In the hierarchy of the boom years, the poor were Mexican day laborers on construction sites; the working class had jobs in the building trades; the lower middle class were bank tellers; the middle class were real estate agents, title insurance agents, and civil engineers; the upper middle class were land use attorneys and architects; and the rich were developers (ibid: 193)

It also seemed to reflect a deeper suspicion and cynicism about surviving on Anglo Florida's settler-speculator frontier, one closely linked to people's work and worth, people's sense of place and possibility. This ethos seemed to be perfectly captured in the fictional figure of Rick Carver, a ruthless real estate broker who specializes in post-foreclosure evictions and flipping in post-crash Orlando in Ramin Bahrani's brilliant 2014 film, *99 Homes*. In one key scene, Carver turns to his protégé Nash, who has himself been recently evicted by -- and now finds himself employed by -- the former:

Don't be soft. Do you think America give a flying rat's ass about you or me? America doesn't bail out the losers. America was built by bailing out winners.

By rigging a nation of the winners, for the winners, by the winners. You go to church, Nash? You go to church? Only one in 100 is gonna get on that ark, son. And every other poor soul's gonna drown. I'm not gonna drown (99 Homes, 2014).

As if by collective amnesia, by 2013, everything seemed to be lining up to make sure the building boom would come back -- and stick around.

That same year, the World Bank and OECD released a landmark report which marked Miami and Tampa as two of the world's ten cities most vulnerable to sea level rise-induced flooding, as measured in potential economic losses (Hallegate, 2013). Therein, a staggering calculus of risk was presented: future floods could cause hundreds of billions of dollars of economic losses in these two Florida cities alone. The World Bank study was one of a handful which sparked a parallel media investigation into Florida's vulnerability to sea level rise. Cinematic in tone, headlines from around the globe proclaimed the death of the Florida metropolis. The *Rolling Stone* promised to reveal why Miami was "doomed" (Goodell, 2013), while the *New Yorker* evoked the fall of Rome: "Miami is flooding" (Kolbert, 2015). Florida's growth against environmental odds emerged as a prime site within these narratives, within which inevitable crisis promised some sort of hubris for decadent real estate developers and climate denialist public officials, including the state's governor (who had allegedly banned his staffers from uttering the words "climate" and "change" in succession) (Korten, 2015).

These narratives illuminated a steadily encroaching, and perhaps inevitable, existential crisis for Florida's coastal cities and regions, where four-fifth of the state's twenty million residents live. By the close of the century, experts estimated that rising seas would put dozens of cities and millions of Florida homes permanently under water, while millions more would be at risk of flooding. While the notion that the Sunshine State was vulnerable to disaster was not new to anyone familiar with life in the nation's most catastrophe-prone state, where "build back better" has long been the mantra, the prospect of six feet of sea level rise represented an

entirely different scenario. In this future, there simply wouldn't be dry ground on which to build back better.

Despite this existential threat, billion-dollar coastal real estate projects were being announced, while almost every state and local public official seemed to be either silent or openly hostile towards the matter of rising seas. There was no statewide climate adaptation vulnerability study or plan, nor any significant resources in place to enable local governments to do that analysis (Taylor, 2017). Nor did Florida's real estate developers, their lenders, or buyers, seem to have a deep concern for the long-term security of the projects or places in which they collectively invested billions of dollars -- nor the technical capacity or even personal will to fathom what this vulnerability would mean to their business.

I began this PhD with the hunch that Florida cities, and Florida's risky real estate markets in particular, were a ground zero for two converging crises. On one hand, the Global Financial Crisis brought a bright light to how central real estate had become to contemporary financialized capitalism. The Florida growth machine was -- and remains -- a key place from which to see this propertied order at its urban origins. On the other, climate risks clearly posed a conundrum to this global real estate-finance nexus. A scientific consensus made it clear that real estate will be increasingly devalued or outright destroyed, through stronger and more frequent hazards like hurricanes or sea level rise-induced flooding (Hallegatte et al, 2013). Even absent major disaster, climate risks could erode the revenue streams constituted through real estate, and in turn disrupt how a great share of the wealth of cities and nations is generated, distributed, and secured through property. This scientific consensus also made it clear that no place had more property, and property value, at risk than Florida and its coastal cities. Florida represented the proverbial canary in the coal mine, one which could potentially shed light on a much deeper and broader global property catastrophe conundrum. But beyond these headline figures, little was being said about how this came to be, how and why and when it really mattered for Floridians (and for those

faraway forces which owned much of Florida), and what could or should be done to govern a problem of such a magnitude.

As I was sketching out this PhD project proposal, the resonance between these seemingly-disparate crises was beginning to ring louder. The 2012 Biggert-Waters Flood Insurance Reform Act set out to restructure the indebted National Flood Insurance Program, but succeeded only in raising the specter of a new real estate crisis in coastal Florida communities. Substantial flood insurance rate increases threatened to severely burden modest-income homeowners living in flood-prone areas (that is, where most Floridians live). Because homeowners in flood zones are required to hold flood insurance by mortgage lenders, a failure to pay would trigger loan default and foreclosure proceedings. House prices would crash; flood insurance costs would scare off all but the cash buyers able to avoid lender insurance requirements. The geographies of Florida's housing crisis would deepen, as mortgage market access and homeownership were pushed further out of reach for the working and middle classes. The Florida real estate community mobilized, and the most significant Biggert-Waters reforms were halted -- and continue to be, even as the NFIP's long-term fate hangs in the balance.

As a student of urban studies and city planning, my first instinct was to turn to the long tradition of urban political-economic analysis, which has studied how and why cities, property markets, and land are developed over time, and how this forms the basis for various forms of urban contestation and change. While I recognized that a series of larger forces -- financialization, post-crisis austerity, and climate change, among others -- were shaping Florida's cities beyond their immediate political boundaries in important ways, I nevertheless set off on fieldwork to understand real estate climate risk governance from the vantage of 'the city'. This meant starting from familiar sites of urban institutional power -- the planning department, the mayor's office, the real estate developer's headquarters -- and in turn following the tensions, forces, and ideas which extended beyond them.

3.2. Research Strategy, Part 1: Climate Risk Governance in the Florida City

In the first part of this research project, I set out to understand how Florida urban elites sought to govern climate risks within the state's property markets through a twelve month field study. I understood urban elites as Fainstein's (2001) "city builders" -- as real estate and property market interests, urban and environmental planners, elected officials, and other civil society organizers who seek to realize or otherwise shape property development. I based this fieldwork in Tampa Bay and Miami, the two largest metropolitan areas in Florida with a combined population of more than ten million residents (equal to roughly half of the state's population). Two sets of questions motivated this research:

- How do Florida urban elites understand climate risks? What techniques, tools, or other methods do they use to assess and respond to these risks? To which institutions and sources of expertise do they turn? How, why, and when do elites enact this knowledge through their practice?
- To what extent might these understandings and their practical responses disrupt or reinforce existing property market dynamics, including real estate investment, housing finance, and public/local government finance?

In the sections which follow, I show how I used elite interviews and other methods to answer these questions, and how the initial findings from this research informed my next round of fieldwork and analysis.

3.2.1. Semi-Structured Elite Interviews and Other Methods

I conducted 58 interviews with urban elites from a variety of professional backgrounds. The interview participants were generally in executive or senior management positions within their organizations, and typically held significant subject matter expertise related to climate change, urban development, or both. Figure 3.1 provides a breakdown of the interview

participants by field, using my own categorization. When used as a reference in the dissertation, these interviews are referred to using these categorizations (e.g. B-6, E-11).

The interviews were generally semi-structured and conversational in nature. My goal was to develop a baseline understanding of each professional’s practice, and the relationships between their practice and the broader context of climate change adaptation in Florida. I sought to understand how, when, and why Florida urban elites engaged in local, regional, state, and national climate risk governance debates and projects, and how they understood the impact of their engagements on their ‘bottom line’ or on the state’s real estate markets or economic health more broadly. What was *at risk* for them? What *value* could they realize through engagement?

Field / Area of Expertise	Interview Count	Reference
Climate Science and Environmental Planning	4	(A-1) through (A-4)
Real Estate and Development	13	(B-1) through (B-13)
Local and Regional Government	14	(C-1) through (C-14)
(Re)Insurance	14	(D-1) through (D-14)
Other Civil Society / Public Policy	13	(E-1) through (E-13)
Sum	58	

Figure 3.1. Schedule of Elite Interviews, Organized by Field. Source: Author

As the field work progressed, and my subject matter expertise deepened, interviews became more tactical and technical. As insights from part one crystalized at the end of the fieldwork process, and as (re)insurance became the focal point of analysis, my conversations with (re)insurers became much more focused in nature. In some cases, I also conducted informal follow-up interviews or email exchanges with participants as the project progressed.

In order to gain access to these elites and their spaces of practice, I relied on three overlapping approaches. First, I identified potential participants through online keyword searches, and directly contacted them using a standard email form letter with information about the project, through which I was able to negotiate access on several occasions. Often, this was sufficient to begin a conversation.

Second, and more often, I gained access to participants through a research and writing partnership with *83 Degrees Media*, a Tampa Bay-area magazine. Between 2016 and 2017, I authored an 8-part series on urban and regional climate risk governance strategies from a variety of public and private institutional perspectives. The series profiled the practices and perspectives of Florida climate scientists, regional urban and planning officials, infrastructure management professionals, real estate and building industry practitioners, (re)insurance industry officials, and other environment-focused civil society stakeholders. I presented myself as both a researcher and reporter, and relied on a mixture of in-person and phone-based interviews. In some cases, interviews included site visits. The series was shared extensively within the Tampa Bay region, opening doors to new conversations, data sources, and follow-up interviews.

Figure 3.2 provides an inventory of the series. At the date of submission, this 8-part series was available online at www.83degreesmedia.com.

Feature Title	Date Published
Tampa Bay Area scientists, policymakers plan for rising sea levels	March 8, 2016
Preparing for climate change: Pinellas County, local towns take steps to get ready	March 15, 2016
Is the global reinsurance industry making Florida more resilient to climate change, hurricanes?	March 22, 2016
Tampa Bay's real estate boom and climate change: 5 big insights	April 5, 2016
Climate change: Across Tampa Bay, environmental organizations mobilize around sea level rise	April 12, 2016

Rethinking Tampa Bay's water resources as the climate changes	April 19, 2016
Retrofitting Tampa Bay for climate change: From understanding to action	April 26, 2016
Florida communities prepare for sea level rise, potential costs to economy	July 25, 2017

Figure 3.2. Schedule of Features, Organized by Title and Date.

Third, I participated in 18 events where either climate change, real estate investment, or Florida's urban future were the primary focus, where I established and deepened relationships with research participants. These ranged from informal conversations which could become formalized through interviews, or follow-up discussions with existing interview participants. As a researcher, it was invaluable to listen to research participants discuss their work in a working context.

In some cases, I attended recurring events more than once, like the One Bay Resilient Communities Working Group, held quarterly by the Tampa Bay Regional Planning Council.

These events including those hosted by:

1. Local and regional governments (e.g. the One Bay Resilient Communities Working Group meetings in 2015 and 2016; a Southeast Florida Climate Compact workshop on economic resilience in 2016),
2. The real estate development and investment community (e.g. the Urban Land Institute Tampa Bay's Annual Real Estate Trends Conference in 2016; the Downtown Tampa Partnership's events on coastal redevelopment in 2015),
3. (Re)insurance industry intermediaries (e.g. RMS's invitation-only 'Resilience' workshop for public officials at Exceedance 2017)
4. Academic institutions (e.g. the University of South Florida's Initiative of Coastal Adaptation and Resilience 2015 workshop, Florida Atlantic University's 2016 Sea Level Rise Solutions conference), and
5. Non-government civil society organizations (e.g. a 2015 Institute on Science for Global Policy workshop on sea level rise in Florida cities, the American Planning Association Florida Chapter 2016 annual conference).

To augment findings from interviews and participant observation at events, I also employed other conventional field methods, such as extensive field visits, photography, and regular personal journaling. I clocked hundreds of miles on Florida roads, consciously visiting a

mixture of urban, suburban, rural, coastal, and inland communities across the state in search of clues about the relationship between the built environment, and past and future climate risk. I also relied on existing writing about Florida cities and environmental politics, and made several visits to archives at the Tampa Bay History Museum, the Hillsborough County Public Library, and the University of South Florida Library's Florida Collection to consult rare texts, including historical planning documents and media publications.

Finally, I participated in several informal and more ordinary spaces of real estate practice. I successfully completed the Florida real estate sales professional sales licensure course. This provided an in-depth introduction to Florida real estate laws and regulations, and an opportunity to understand the existence (or, more aptly, the absence) of existing environmental regulations within the Florida real estate sector. Less formally, the time between class sessions was spent sharing lunch (and smoking breaks) with a dozen other classmates in exurban Florida, chatting about the intersections between the real estate industry and our personal histories and ambitions. Here, over coffee and cigarettes, I probably learned more about the reproduction of 'Florida' than in any other research context. As part of this less formal engagement with the real estate sector I also participated in two group meetings hosted by Real Estate Lives, an informal monthly meeting of real estate professionals in Tampa. Real Estate Lives was established during the peak of the housing-turned-financial crisis as a way for members of the real estate community to help each other find and maintain work, and continues to serve as an important site of solidarity and group support. This spaces also provided an opportunity to learn more about the earlier real estate crisis and its aftermath, and to casually discuss the research topic with an alternative segment of the real estate community, in a less formal space of power.

While insightful, it is important to recognize that these interviews and other forms of engagement did not generate a representative portrait of the demography of Florida cities. Interview participants were male-presenting by a 3:1 ratio. Only 5 of 58 interview participants

presented as non-white, although non-whites comprise 42.1% of Florida's population (and significantly more in the case of Miami). There was also a clear class dimension to these spaces, with suits and ties -- not shorts and flip flops -- filling meeting rooms, even in the peak of Florida summer.

This lack of representativeness can be attributed to the racialized and gendered nature of representation within government, the sciences, and the real estate sector, all of which have variously and widely been critiqued on these matters. To some extent, the results are a reflection of my privileged position as a white male-presenting researcher in possession of many of the embodied signifiers needed to navigate elite spaces.¹¹ Navigating this representational context was often exhausting, and doubtless left many research avenues untraversed for want of capacity to navigate spaces of difference. At many times, I recognized that my research was complicit in making and remaking these divisions: by naming certain spaces and subjects as 'elite' or central to the narrative of real estate climate risk governance, I was reproducing the centrality of such spaces. Recognizing -- and pushing back against -- these limits was central to the writing and research decisions I made, and in part explains why I decided to continue to write about climate change risk governance on topics beyond the scope of (re)insurance as I entered the latter stages of the project, and why I focused specifically on issues of urban equity in part two of my fieldwork.

With this caveat in mind, I made a conscious decision to limit the extent to which I employ direct quotes from research participants in the findings presented in subsequent chapters. Although there are a number of sensitivities around research participant anonymity and confidentiality which inform this decision, the biggest driver is a philosophical one. I decided to focus my analysis -- or, the representation of my findings -- on 'the game', on the systems,

¹¹ Although I identify as non-binary and queer, I -- reluctantly -- have the capacity to put on a suit and tie, or to otherwise mask my gender non-conforming outlook through performative measures. These measures make it possible to 'pass' within several institutional spaces dominated by a demographic which is older, whiter, wealthier, and more conservative than the rest of Florida society.

structures, and debates which informed these spaces of individual agency, rather than on ‘players’;. This is not to say that systems (or firms, or agencies, or governments) are not constituted through individuals making decisions, or that these embodied practices and their political repercussions are not vital areas for research engagement and critique. Rather, with limited time, resources, and personal capacity, I decided that this represented a very important writing project (and a personal political project) which needed to be set aside for future creative engagement. As such, when interview data does appear in the findings, it is generally only to serve as a reference.

3.2.2. Initial Findings: The Spectre of (Re)Insurance

This initial fieldwork provided a strong evidence base from which draw formative findings about climate risk governance within Florida cities. Four interrelated findings emerged. While significant in their own right, I review them here for the purposes of painting a portrait of how and why my research project pivoted from real estate markets more broadly in part one, to (re)insurance markets more specifically in part two of the study.

First, I recognized that the underlying tensions between urban growth and ‘natural’ disaster are far from new in the Florida context. Indeed, the history of the Florida urban project is arguably one of ceaseless urban-environmental crisis and restructuring. Research participants often reflected upon future climate risks by referring back to the insights garnered from prior (or ongoing) urban environmental crises. In many cases, the same institutions which are leading the climate change governance conversation in Florida regions are those which were formed to combat earlier, unrelated crises. Past crises left a direct institutional footprint, but also formed an imaginary of the relationship between growth and disaster.

These participant insights sit comfortably next to the (limited) literature on Florida's urban and natural histories, within which one can also trace a recurring tension between growth and crisis (see, for example, Audirac et al, 1990; Catlin, 1997; Mormino, 2005; Grunwald, 2006; Cater, 2013). Florida's growth-and-crisis dynamic is often boiled down to the tension between state power and private property rights. This tension in many ways shaped the evolution of Florida's contemporary risk governance landscape, and remains central today: it frames the state's selective presence and absence in direct matters of climate risk planning within Florida's cities and regions.

Second, and by extension, I found that this legacy of crisis and restructuring generated an asymmetrical institutional landscape of environmental management expertise. Today Florida research institutions, environmental agencies, and public utilities count world-leading climate science experts among their ranks, and they collectively inform local, state, national, and international climate science and practice. Historically, Florida also had one of the most ambitious growth management and environmental planning frameworks in the United States, and Florida local governments pioneered remarkable approaches to disaster mitigation and response planning at the regional scale (see Audirac et al, 1990; Catlin, 1997).

Yet I found this expertise to be deeply uneven today. For example, local and regional governments largely lacked the institutional resources to conduct meaningful climate change planning. While Tampa Bay benefited from a great trove of climate science expertise, there existed only a limited number institutional pathways to translate these insights into urban policymaking, despite clear ambitions to develop this capacity among more progressive voices. This was variously attributed to a significant lack of state funding (compared to other states with similar vulnerabilities, like California) and state political support (i.e. climate denialism), uneven local and regional political support for climate planning (again, see climate denialism), and a lack of local institutional capacity (owed to post-2008 rollbacks to growth management legislation, austerity, and cuts to local and regional planning staffing).

In the contexts of these institutional absences, questions of socio-economic vulnerability and equity were rarely being investigated, or by extension central to policymaker debates about climate change, notwithstanding a handful of notable exceptions where local politics enabled (or demanded) a more inclusive outlook on urban and environmental planning. These absences also reflected a relative dearth of third sector organizations working on housing, environmental, or social justice issues in Florida cities, relative to other states with longer histories and more deeply rooted (i.e. funded) systems of civil society patronage.

Third, the real estate industry remains king in the coastal Florida metropolis, and is a key arena for understanding the urban-economic mechanics driving climate (in)action. When asked if he was concerned about the consequences of sea level rise at an event at the Miami Art Museum, the Florida billionaire developer Jorge Pérez said: “No, I am not worried about that [...] I believe that in twenty or thirty years, someone is going to find a solution for this [...] Besides, by that time, I’ll be dead, so what does it matter” (Goodell, 2017).



Figure 3.3: Related Group Advertisement for Coastal Florida Projects circa 2017. Source: Developer website

While colorful remarks like those from Mr. Pérez were not uncommon, I found positions on climate change to be far from homogenous within this sector. In no instances did research participants outright deny climate change, although many pointed to local and state figures they viewed as openly hostile to such an agenda. More often, I encountered instances of 'soft' climate denialism, through which the topic was simply not addressed at seemingly-obvious times, as in discussions over long-term local water management infrastructure investment, or in public planning and debate about major waterfront development projects. Here, climate change was significant by virtue of its absence. My attempts to probe this absence, as through the writing project with *83 Degrees*, were generally ignored by developers and real estate interests that I contacted for comment.

I also found examples of climate opportunism, where real estate actors demonstrated active personal interests in facilitating alternative and 'resilient' forms of growth. This was reflected through and in relation to support for 'progressive' urban growth practices, as articulated through initiatives undertaken by the Urban Land Institute or the US Green Building Council local chapters, or in project designs which explicitly embraced their relationship to environmental vulnerability. In some South Florida contexts, climate risks were taken up as a marketing feature of select luxury real estate developments, as an iteration of 'bourgeois environmentalism.' Nowhere was clearer than in the case of Monad Terrace, a luxury tower under construction in Miami Beach that was designed by international 'starchitecture' firm Ateliers Jean Nouvel and Miami's Kobi Karp, which was advertised as being 'flood proof'.



Figure 3.4. Monad Terrace Project Rendering. Source: Project website

The most common industry position, however, could be called climate deferralism. Conversationally, actors would acknowledge the unique environmental vulnerability of real estate investment in Florida cities, but ultimately defer responsibility for addressing the (re-)production of this vulnerability through development to other parties: to planners, to investors, to buyers. In one remarkable moment at a major waterfront redevelopment site in Downtown Tampa, for example, a commercial real estate developer with several decades of experience told me that he accepts the gravity of the risks posed by sea level rise, but has decided to continue his work until some combination of onerous insurance and real estate finance costs, declining consumer demand, or burdensome land use and building code regulations make his development projects unprofitable. In short: climate change was a problem for other actors, not real estate developers, to address.

This takes me to the fourth and final point: property (re)insurance was by far the most frequently cited financial consideration driving climate (in)action across the range of

stakeholder groups I engaged, including both public sector planners and private actors. Property (re)insurance markets appeared in discourse in two ways: through direct engagement *from* (re)insurance market actors in climate risk governance conversations, and through more general concern *about* (re)insurance market access and affordability, particularly for Florida homeowners.

On multiple occasions, property (re)insurance industry executives were invited participants in local and regional meetings on climate risk, ranging from climate science conferences to local economic development and infrastructure planning workshops. In these instances, insurance-linked securities (ILS), catastrophe risk modeling, and other reinsurance market technologies were introduced and discussed as leading catastrophe risk governance solutions. For example, in a 2016 economic resilience workshop organized by the Southeast Florida Climate Compact for regional local government finance and economic development professionals, a Swiss Re executive explained how Florida homeowners insurers used ILS capital and risk modeling, and how these technologies could be adapted to help cities measure the cost benefits of hurricane risk mitigation investments. Florida was on several occasions cited by (re)insurers as both a central problem site (e.g. NFIP deficits and reform) and a context for risk transfer innovation, as in the rise of ILS markets and new products like ‘resilience bonds’ (see Chapter 6).

(Re)insurers have had a longstanding and influential direct role in climate governance conversations in Florida cities. One research participant, a senior sustainability lobbyist, told me that when they began lobbying South Florida governments and institutions on climate change over a decade ago, “it was just me and the reinsurers” (Interview E-13). In many instances, this intimate dialogue has continued over the course of invitation-only sessions. For example, the Miami Dade Mayor, the Beacon Council (a group of local business leaders), the British Ambassador to the US, and the British Consulate in Miami hosted a roundtable on (re)insurance and climate risk governance in Miami (Miami Dade County,

2016). After this meeting, the County passed a resolution to formally facilitate direct dialogue with (re)insurers. Resolution 49-15 enables the Mayor to

“initiate discussions related to climate change with private insurance and reinsurance professional organizations, member local governments in the Southeast Florida Climate Change Compact, the Florida Office of Insurance Regulation’s Department of Finance Services, and other key stakeholders to develop long-term risk management solutions” (ibid).

A subsequent roundtable hosted by the Mayor included representatives from Swiss Re, Lloyd’s of London, Willis Re, several large commercial real estate developers, and a number of local and regional government officials across the domains of planning, economic development, resource management, and risk management and public finance (ibid).

In other cases, the strong link between (re)insurance and urban climate risk governance was reflected more indirectly, through statements *about* the former. For many research participants, Hurricane Andrew’s 1992 landfall and the subsequent (re)insurance market crisis was a fresh memory and their primary point of reference, which foregrounded a body of discourse around ongoing (re)insurance market access and affordability. As I discuss in Chapter 4, Andrew exposed the centrality of (re)insurance within the financial architecture of the Florida metropolis, and in many ways the question of property insurance market stability has never left the agenda of Florida’s political and economic elites.

At other times, more recent debates about the future of the National Flood Insurance Program appeared front of mind for research participants and in other public discourses I encountered during fieldwork. Proposed and ongoing reforms to the program portended severe homeowner rate hikes in coastal Florida, and in turn raised concerns over the cost of homeownership, mortgage default, and the general stability of the state’s coastal real estate markets. With the foreclosure-turned-financial crisis still a fresh memory, the prospect of a new form and round of housing market crisis generated concern for many of the individuals I

interviewed, or witnessed during public events. In most cases, the primary concern was that climate risks could prompt (re)insurers to raise their rates or leave the private insurance market, which could spell disaster for the state's economy, and existing homeowners in particular.

In other instances, (re)insurance was present by virtue of the absence of other concrete means to address climate risks. For example, one common declaration from both public and private actors was that state efforts to mitigate climate risks should be centered on interventions that maintain Florida's long-term favorability as a real estate investment destination. This might entail risk reduction efforts which manage environmental problems, while maintaining low property tax burdens, or mitigating the cost of development -- and thus the end costs to homeowners and real estate buyers, respectively. Yet in many cases, local governments lacked the resources to plan -- let alone finance -- for adaptation projects. Here, property (re)insurance appeared as a seductive alternative (or at least a complementary) strategy to government-led planning, insofar as (i) (re)insurers were already active in the market and keen to provide 'solutions' to cities and property markets, and (ii) because (re)insurance was tied to private property ownership and responsibility, rather than collective state intervention -- the latter less tenable in Florida's 'small government' and lean taxation environment (see Chapters 4 and 6).

In these ways, I found that (re)insurance formed an important part of the "common sense" of Florida's climate risk governance dialogue. In the case of the National Flood Insurance Program, there was a clearly defined Community Rating System (CRS) to facilitate local government risk assessment and mitigation planning efforts, which could directly translate to community-wide flood insurance premium reductions. Despite the bureaucratic complexities and legislative uncertainties associated with the NFIP (which continues to be up for reauthorization and reform at the time of writing), flood insurance was a major focal point of local and regional insurance market discussion and action. For example, I noted several

workshops hosted by regional agencies designed to introduce and train local officials in the NFIP's CRS as a 'quick win' approach to saving residents money (in the form of premium reductions). At the same time, several research participants suggested that political pressure to pass a new piece of legislation -- SB 1090, the so-called 'peril of flood' law which mandated that Florida coastal municipalities begin planning for flood risk (including sea level rise) -- was intended to push local governments into the NFIP's Community Rating System, as part of larger maneuvers to position for Florida's interests at the heart of ongoing NFIP reforms.

At the same time, the private residential (re)insurance market, in which more than 90% of Florida premium dollars are spent, were rarely engaged or analyzed in substantive detail outside of the state-level Florida Office of Insurance Regulation, even within formal local vulnerability assessments expressly mandated to consider housing vulnerability or economic resiliency. (Re)insurance markets haunted conversations, yet largely remained opaque and distant from the immediate terrains of local risk management practice. This spectral presence is captured in this quote from a senior executive working at a Florida branch of an international architecture, planning, and engineering firm:

"So far, there hasn't been much discussion about the real players in this: the (re)insurance industry. Right now, there doesn't seem to be any blowback on coastal areas. Eventually, you can have all the politics and all the plans you want, but this private sector will eventually have to come to the table. If they come to the marketplace too quickly, they'll destroy value in the market, which is not the value of a resilience program." (Interview B-12)

To summarize, part one of the study provided a foundational understanding of contemporary climate risk governance in Florida cities, and highlighted the important -- yet vastly understudied and least well-understood -- role of property (re)insurance within these debates. Although I could have taken many directions with this study -- by expanding upon any number of compelling observations related to real estate finance and local planning efforts --

it therefore seemed most useful to focus my resources on a deeper analysis of property (re)insurance in part two.

3.3. Research Strategy, Part Two: Mapping Florida's (Re)insurance Market

The initial findings and challenges derived from part one guided the design and implementation of part two of my research, which investigated the geographies of Florida residential insurance markets and their regulation by the State of Florida, their connections with global ILS and reinsurance circuits, and their intersections with other housing market dynamics in the Florida city. I reviewed (i) state government public policy documents on (re)insurance regulation, (ii) local government urban and environmental planning reports, (iii) (re)insurance industry reports and grey literature, and (iv) mainstream media reports on (re)insurance and Florida climate risks. I also conducted a forensic financial analysis of ILS in Florida through an examination of the 2015 underwriting practices, risk transfer programs, ownership, and operational strategies of 28 Florida primary insurers. Finally, I investigated Florida's insurance markets at a local level in the Miami Dade area, using a mixture of public actuarial, demographic, and financial data from the Florida Hurricane Catastrophe Fund, the National Flood Insurance Program, the American Community Survey, and Miami Dade local and county municipal sources.

I began part two with the observations about (re)insurance in the Florida city discussed in Section 3.2.2, including (i) (re)insurer narratives about ILS and risk capital in Florida property markets, both historically and looking to future climate risks, and (ii) public policy and local real estate narratives about residential insurance market access and affordability. At the same time that reinsurers positioned Florida in the story of ILS (and ILS in Florida), State of Florida insurance regulators publicly praised the emergence of new ILS-based private risk capital flows into the state's residential insurance market. These narratives seemed

conjoined -- historically, materially, and institutionally -- in the Florida city and its housing system, and I developed part two of the project to identify more precisely how and why.

My approach in part two was motivated by the following working research questions:

- What are the institutional and material connections between Florida residential properties, Florida primary insurers, and (re)insurance and ILS markets?
- What market and regulatory mechanisms, institutions, and other contingencies which constitute this risk transfer architecture? What are the roles of distinctive (re)insurance market institutions, but also Florida state institutions?
- What are the relationships between South Florida's high risk, high value real estate markets and (re)insurance markets? How does ILS capital change these market dynamics, and what are the potential consequences of this for the urban geographies entangled therein?

Finding the appropriate existing scholarship from which to base the design of methods for part two proved challenging. Although there have been several recent critical social science studies of catastrophe (re)insurance markets and their governance (e.g. Johnson, 2015; Grove, 2012; Weinkle, 2015; Elliott, 2017), the direct conceptual and methodological relevance of such work to this study has been limited by scale of focus (e.g. Johnson's capital market-centric analysis, which ignores the Florida state and city contexts), tied to an inappropriate geography (e.g. Grove's work on small Caribbean island nations), or largely focused on a different form of insurance marked by significant differences (e.g. Elliott's 2017 work on the NFIP, which until late in this project did not participate in private reinsurance markets). Moreover, while Weinkle (2015) focused on the Florida case, this work largely focused on insurance public policy and only obliquely engaged with questions of urban political economy. While generative, this scholarship did not lay out a clear path for mapping the geographies of firms, technologies, and flows that connected high value, high risk real estate markets with global risk capital markets. This limited my capacity to borrow and extend methods for "reading" catastrophe (re)insurance markets at the Florida urban scale.

The absence of methodological and conceptual bridges are worth recognizing, not least because a great deal of trial and error consumed the earlier parts of this stage of research. Squires (2003) rightly observes that property insurance markets intersect with -- and can exaggerate -- the pre-existing biases and vulnerabilities that have long been etched into cities and housing markets. Yet Squires also recognizes that property insurance markets remain off the radar of many urban scholars, in no small part because the demographic data disclosures that apply to housing finance have not been extended to include insurance.

For part two, I therefore developed a multi-pronged mixed methods approach to examine the restructuring of Florida's residential property insurance industry in relation to global ILS and reinsurance markets. I found three places from which to situate analysis: (i) in the underwriting and risk transfer programs of Florida primary insurance firms, and their ties to major ILS funds and catastrophe (re)insurers (Section 3.3.1), (ii) in the regulatory and institutional insurance market interventions of the State of Florida (Section 3.3.2), and (iii) in the urban geographical intersections between consumer insurance costs and other demographics, including income and race (Section 3.3.3). I relied on a mixture of sources to triangulate data within and across each of these research strands, including statutory insurer filings and annual financial statements, state regulatory document analysis, proprietary reinsurance database analysis, a review of industry grey literature and trade publication reports, and the aforementioned interviews with (re)insurance figures (the timing of several of which overlapped with part two of the project). The interviews included three Florida public insurance institutions in senior positions, two Florida specialist insurer executives, two Florida specialist insurer catastrophe risk modelers, and seven reinsurance industry intermediaries. The intermediaries offered significant insight into the data and services they provided, which helped me to identify secondary data sources.

To learn how to compile and navigate the wide variety of financial data examined here, I participated in a critical real estate financial accountancy summer school organized by

Manuel Aalbers at KU Leuven.¹² The training also highlighted how to identify and map ownership patterns, executive leadership connections, and other forms of connections, between firms and industries.

3.3.1. (Re)Insurance Underwriting, Risk Transfer, and Risk Capital Markets

My first approach to investigating Florida insurer-ILS connections built on a tried-and-tested “follow the thing” approach (Cook, 2004), the ‘thing’ in this instance being Florida policyholder premium dollars. Insurance premia are the lifeblood of the catastrophe risk transfer industry, linking material properties and places to insurers, intermediaries, and risk capital investors. Floridians pay primary insurers an annual premium in exchange for residential insurance coverage. Primary insurers in turn mobilize and allocate premia in four general ways, (i) covering operational expenses and claims, (ii) ceding a portion to reinsurers and ILS investors, (iii) retaining a portion as part of statutory surplus retention, and (iv) investing a portion, to derive income from investment activities.

The underwriting, investment, and financial activities of primary residential insurers provide a valuable meso-level entry point for examining ILS and (re)insurance market dynamics from local markets to global investors. For my examination, I created a cohort of 28 Florida primary insurers, which collectively wrote \$4.59 billion of direct premium in 2015 based on their 2015 financial statements. \$4.22 billion of this premium was sourced in Florida (with the remainder coming from other states, where some of the case firms also write business). I discuss features of the cohort in further detail in Chapter 5.

¹² This week-long training offered guidance on how to locate and interpret statutory financial filings (i.e. annual financial statements, SEC 10-K reports), regulator financial examination reports, firm investor prospectuses, and other financial materials.

The 28 firms were selected for three reasons. First and above all, each of the firms participated in at least one round of the Citizens Property Insurance (Citizens) Depopulation Program between 2011 and 2015. Under this legislatively-mandated process, the state-owned Citizens invited private specialist insurers to remove (“take out”) their choice of policies in exchange for subsidies from the state. 2011 was chosen as the base year because it represented the peak exposure of Citizens, and 2015 was chosen as the final year of the survey because it was the year for which “take out” insurer financial reports were available. I examine this market context and frame the specialist case in further detail in both Chapters 4 and Chapter 5, which examine the State of Florida and the specialist insurers, respectively.

Second, and by extension, I recognized early in the process that many of the specialists appeared frequently in reinsurance industry reports, databases, and discourse as among the leading users of ILS products. Reports from Aon Benfield, Artemis, and other reinsurance data specialists frequently highlighted the use of ILS products by these Florida specialists. This suggested connections between state policy, primary market restructuring, and ILS and risk capital restructuring which warranted closer examination.

Third, the 28 firms participated in the Citizens depopulation program, which subjected them to Florida ‘Sunshine Law’ disclosures. This made their financial reports, state-conducted financial examinations, quarterly Florida market share reports, and other state correspondence a matter of public record. As a result, their (re)insurance practices were uniquely accessible as objects of analysis.

Figure 3.5 summarizes the four primary data sources I used to construct datasets on the specialists, a rationale for why this data was selected, and notes on the limits with each data source.

Source	Approach and Explanation	Limits
(I) 2015 annual statutory financial statements	<p>The 2015 statements were the most recent made available by the State of Florida Office of Insurance Regulation, as part of a legislatively mandated disclosure of public business (in this case, the Citizens depopulation). For each firm, I recorded:</p> <ol style="list-style-type: none"> 1. A count of each firm's premia earned by line of business (i.e. homeowners as a share of total underwriting) from the Underwriting and Investment Exhibit, Part 1B 2. A breakdown of premium earned by each firm by state from Schedule T: Exhibit of Premiums Written, Allocated by States and Territories 3. records of all reinsurance transactions for each firm during the calendar year from Schedule F, Part 3: Ceded Reinsurance <p>Data points (1) and (2) provide a portrait of the size and focus of the underwriting strategies of each firm, enabling comparison between firms that specialize in Florida and residential risks and those with more diversified lines and territories of underwriting. Data point (3) provides a measure of the number, size, and geography of each firm's risk transfer program.</p>	<p>There are differences in how the State of Florida reports on the the "residential" insurance market and how primary insurers report on their "homeowners" insurance underwriting, which makes it difficult to draw perfect comparisons between data sources I and III.</p>
(II) State of Florida insurer financial examinations	<p>The State of Florida conducts financial examinations of all admitted Florida insurers on a semi-regular basis, and examinations for 26 of the 28 case firms were made publically available as part of the Office of Insurance Regulation reporting on the Citizens depopulation program. The exams date from 2009 to 2014. I used the exam reports to record information on the history, ownership and holding structure, and executive leadership for each firm.</p>	<p>Exams were not available for three of the firms, or were significantly out of date, which limited their usefulness and required external analysis to complement / correct each firm's profile (see source IV).</p>
(III) State of Florida quarterly market share reports	<p>The State of Florida maintains an online public quarterly market share reporting tool (QUASR) for all admitted Florida insurers, with a few exceptions. The reporting tool provides quarterly data dating back to 2009 on the 15 variables (e.g total policies in force, premium earned) for each firm, and is available at the state and county level. I used to QUASR data to evaluate how each take out firm's underwriting patterns changed after their participation in the take out program, providing a baseline against which to search for correlations with other market dynamics (e.g. reinsurance strategy). For each firm I collected data on four variables at two time points: the first quarter of the year of each at the first quarter of the year at which of each firm was authorized to take out policies from Citizens, and at Q4 2015. These four variables included:</p> <ol style="list-style-type: none"> 1. Total Insured Value 2. Total Insured Value in South Florida (Palm Beach, Broward, Miami-Dade, and Monroe Counties) - see <i>Part 3 of the research strategy</i> 3. Policies in Force 4. Policies in Force in South Florida - see <i>Part 3 of the research strategy</i> 	<p>"Residential" market data is broken down into distinct lines of business which do not perfectly correlate with "homeowners" category used in financial statements (source I); state data is only available down to the county level, and so more granular spatial analysis is not possible.</p>
(IV) (Re)insurance and ILS transaction data and reports	<p>I compiled public data related to the 28 case firms from seven (re)insurance and ILS-related sources, including quarterly market reports, transaction and firm databases, and commentary/blogs. These sources complimented other data sources (e.g. case firm business strategies, ownership structures) and provided new insights regarding the overall reinsurance and ILS firms participating in the Florida market. These sources and their main uses include:</p>	<p>Data tends to only reflect publicly traded catastrophe bond issuances and ILS transactions, which limits capacity to link known ILS transactions/reinsurers with the reinsurance data</p>

	<ol style="list-style-type: none"> 1. AM Best - used to confirm ultimate ownership of each case firm and their partner reinsurers/ILS funds. Insightful for understanding market dynamics, power, and geographies because insurance and non-insurance holding companies often own primary insurers and reinsurers registered in different geographies 2. Aon Benfield - quarterly ILS market reports provide market-wide view of ILS, reinsurance dynamics, information on case firm ILS transactions, information on ILS investors/catastrophe reinsurers with ILS platforms, industry commentary/context 3. Artemis - ILS deal database provides transaction data for all public ILS transactions, including transaction type and terms, intermediaries, links to transaction ratings agency reports, and commentary on (re)insurance market strategy 4. Demotech - specializes in ratings for Florida specialist property insurers and provides information on risk transfer, capital retention strategies for case firms 5. Trading Risk - ILS and reinsurance-specialist trade publication with regular commentary and reporting on Florida market and case firm, providing context and information on business strategies, leadership changes, and market conditions 6. Individual case firms - in a handful of cases, privately held case firms provided insight into their reinsurance programs and business strategies on their websites. Two of the 28 firms are publicly traded and disclosed information about their reinsurance programs on their mandatory annual 10-K U.S. Securities and Exchanges Commission reports 7. LinkedIn - In some instances, I used targeted LinkedIn searching to learn about the prior experience of case firm leadership and to draw connections between the insurers, reinsurers, and the state 	<p>collected through source I. In some cases, industry reports provide insight into private ILS transactions, but this is spotty and complete representativeness is unclear. ILS-related retrocession (reinsurance for reinsurers) that include Florida case firm risk is similarly opaque. These variables mean that attempts to estimate direct premium flows between case firms and ILS are always significantly underestimated.</p>
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Figure 3.5: (Re)Insurance Data Sources, Approaches, and Limits.

These sources were used to create three primary datasets:

- A. **Takeout Firm Profiles**, including thick description of each firm's firm strategy, history, leadership, South Florida market share, participation rate in the take out program, and other dynamics
- B. A **Collective Risk Transfer Market Analysis**, comprised of the reinsurance programs of each case firm (measured in premium dollars), a consolidated case market view, and a consolidated reinsurance market view organized by reinsurance territories and holding companies
- C. A **9-Point Comparative Analysis**, which consolidated the above two data sets and evaluated patterns between them.

Dataset A comprises a portrait for each of the 28 case firms, including both key financial figures and ‘thick’ description of the firm’s business strategy, history, ownership structure and market ties (e.g. ownership ties with reinsurers, information use of privately-held ILS platforms), executive leadership structure (and their ties to reinsurance markets, state insurance institutions, and other real estate and finance sectors), rates of Florida market growth, and changing concentration of business in the high risk South Florida region (where many of the Citizens takeout policies originate). The purpose was to build a rich, detailed portrait of each firm and the overall market to understand both the commonalities and distinctions of each firm.

Dataset B includes a breakdown of the 2015 reinsurance transactions reported by each case firm, including the reinsurer name, registered domicile (e.g. Bermuda, the United Kingdom), and the amount of premium dollars ceded. I logged 1,078 transactions above \$10,000 between the 28 case firms and 164 named reinsurers registered in 34 territorial jurisdictions. I also organized this data to construct a consolidated view across all the case firms, organized by the largest reinsurer recipients of premium dollars. This second view allowed me i) to identify key geographies connected to Florida’s market (e.g. Bermuda), ii) to identify key Florida-linked reinsurance firms and their owners, which often accessed the Florida market through multiple reinsurance platforms (e.g. RenaissanceRe Holdings Ltd, one of the largest ILS firms, participated in the Florida market through six distinct companies registered in four territories), and iii) to create a database of the known ILS transactions and funds connected to the Florida market, organized by the amount of premium dollars they earned from the case firms. I used the latter findings to review reinsurance market databases and industry publications (see Data Source IV, Figure 3.5) for additional information about the ILS funds that specialized in the Florida market, including their business strategies, any notable technology innovations used by the firms, and other market insights. This data is presented and interpreted in Chapter 5.

Dataset C was created through a combination of data from Datasets A and B using 9-point criteria (Figure 3.6). I constructed this dataset to examine why the firms -- individually and collectively -- partnered with risk capital markets. These included five factors related to underwriting strategies (1-5) and four factors related to the firm's business strategy and operations (6-9).

The first five factors shared a common indicator (percentage of total premium written ceded to reinsurers), which allowed me to use two techniques to look for relationships. First, I sorted the firms from highest to lowest percentages of total premium ceded to reinsurers and organized the corresponding indicator according to quartiles. Second, I conducted a Pearson correlation to test the extent to which these initial observations were statistically significant by assessing the five underwriting factors against the each specialist's use of reinsurance. Factors 6-9 were evaluated manually, by flagging indicators on a spreadsheet and compiling them as such. The results of this analysis are reviewed in Chapter 5, Section 2.3.

Factor	Question(s)	Key Indicator(s)	Data Source(s)
1. Size of Specialist Firm	Did larger firms procure more reinsurance than smaller firms?	(A) Total direct premium written in 2015 vs (B) Percentage of total premium written ceded to reinsurers	2015 Insurer Financial Statements: Underwriting and Investment Exhibit: Part 1B; Schedule F, Part 3: Ceded Reinsurance
2. Degree of Specialization of Business Line	Did firms with a greater degree of specialization in homeowners lines purchase more reinsurance?	(A) Homeowners lines, as measured as a percent of total direct premium written vs (B) Percentage of total premium written ceded to reinsurers	2015 Insurer Financial Statements: Underwriting and Investment Exhibit: Part 1B; Schedule F, Part 3: Ceded Reinsurance
3. Degree of Specialization in South Florida Risk	Did firms with higher levels of exposure to high risk South Florida ((Monroe, Miami-Dade, Broward, and Palm Beach counties) policies purchase more reinsurance?	(A) South Florida exposure as a percentage of total insured value vs (B) Percentage of total premium written ceded to reinsurers	Q4 2015 Market Share Report data for each firm and for South Florida counties, compiled from the Florida Office of Insurance Regulation
4. Reliance on Depopulation to Grow Business	Did firms which relied more on depopulation to grow their business also purchase more reinsurance?	(A) The ratio between the specialist's (i) policies outstanding in the baseline quarter before their first removal and (ii) the total number of depopulation policies authorized over 2011-15 vs (B) Percentage of total premium written ceded to reinsurers	Citizens Takeout Authorization Consent Forms and depopulation program summary data provided by the Florida Office of Insurance Regulation
5. Reliance on High Risk Coastal Account to Grow Business	Did firms which targeted the high risk Coastal Account for depopulation to grow their business also purchase more	(A) CA policies as a percent of all depopulation authorizations vs (B) Percentage of total premium written ceded to reinsurers	Citizens Takeout Authorization Consent Forms and depopulation program summary data provided by

	reinsurance?		the Florida Office of Insurance Regulation
6. Depopulation as Business Basis	Was the specialist established to expressly to assume policies from Citizens?	(A) Year firm was established and (B) primary underwriting focus at time of start-up	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; supplemented with industry media analysis
7. Leadership Ties to Citizens	Did the specialist's executive leadership team or board include individuals with past ties to Citizens?	(A) Presence of ex-Citizens executives on specialist team	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; supplemented with industry media analysis
8. Leadership Ties to Reinsurers and ILS Funds	Did the specialist's executive leadership team or board include individuals with current or past ties to reinsurers and ILS specialists?	(A) Presence of reinsurance executives on specialist team, or (B) Specialist leadership with prior experience in reinsurance/ILS	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; supplemented with industry media analysis
9. Reinsurer Ownership Stakes	Does/did a reinsurer hold an ownership or investment stake in the specialist? Is there evidence that this ownership stake influenced the specialist's business strategy or risk transfer decisions?	(A) Presence of reinsurer as owner of firm	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; AM Best public ownership records for each specialist and its owners/subsidiaries; supplemented with industry media analysis

Figure 3.6. Specialist Use of Reinsurance and ILS: 9-Point Criteria and Evaluation Approach.

3.3.2. (Re)insurance and the State of Florida's Insurance Institutions

I also examined the role of Florida's public insurance institutions in connecting Florida's residential insurance market with global risk capital markets. During interviews conducted over part one of the research project, the State of Florida appeared as a key institutional force in contemporary debates over Florida's insurance market. At the time, the state was implementing the Citizens depopulation program, and had recently become the largest sponsor of catastrophe bonds. This was variously praised by elected officials, (re)insurance officials, and other civil society actors as a welcome drawback of direct state participation in the market, and a healthy sign that Florida was attracting new forms of risk capital. At the same time, concerns persisted around the affordability of residential insurance, and the State of Florida was often discussed as an important arbiter of market rates -- despite the concerns of private risk capital. This apparent tension, between the state's role in the

attraction of private capital, and in maintaining consumer-friendly rates, became the focus of my investigation.

To understand how the State of Florida regulated private residential insurers and their relationship to risk capital markets, I analyzed two sets of information: (i) State of Florida insurance institutional studies and reports, and (ii) transaction data pertaining to the reinsurance participation of two State of Florida institutions: Citizens and the Florida Hurricane Catastrophe Fund.

First, I examined the actuarial and ratemaking studies, along with financial reports issued by the State of Florida's public insurance institutions and mechanisms over the last five years. The State of Florida maintains a unique and complex insurance landscape, in part because insurance markets are primarily regulated at the state, rather than federal scale, and in part because of Florida's unique catastrophe vulnerability and history of market crisis. As McChristian (2012) writes, Florida's insurance landscape has been one of constant trial and innovation since Hurricane Andrew, including significant state intervention (see Chapter 4, Section 2 for more discussion of this context). Figure 3.7 provides an overview of these public insurance institutions and initiative and the data sourced I relied upon to conduct my analysis.

I compiled public reports related to each institution, including annual reports, program evaluations, actuarial reports, workshop presentations, and meeting minutes published online. The State of Florida's strong freedom of information standard once again facilitated relatively easy access to these sources. Most reports were available online. In a handful of cases, I contacted the State of Florida for additional information, and in one instance had to pay a small handling fee to cover the staff costs of compiling the requested information.

Institution	Data Source(s)
Florida Office of Insurance Regulation	2011-2015 annual reports, Research Reports, Citizens Takeout Requests from Authorized Insurers, Takeout Insurer Financial Examination Reports, QUASR Market Share Data
Citizens Property Insurance Corporation	2011-2015 annual reports, 2015 financial statements, reinsurance brokering contracts, 2015 risk transfer program materials, Depopulation Program reports, online legislative update and workshop presentation materials, interviews with three senior financial and actuarial staff, ratings agency catastrophe bond prospectuses and ratings reports, insurance industry reporting (e.g. <i>Trading Risk, Insurance Insider, Artemis</i>).
Florida Hurricane Catastrophe Fund	2015 annual report, 2015-17 ratemaking and actuarial reports, commissioned third party auditor reports on Cat Fund claims paying capacities, 2015 risk transfer program materials
Florida Insurance Guarantee Association	2015 annual report
Specific Initiatives	Data Source(s)
Florida Commission on Hurricane Loss Projection Methodology	2015 annual report of activities and commission documents
Catastrophe Stress Test Analysis	2015 Catastrophe Stress Test Report
Citizens Depopulation	Depopulation data clearinghouse (online), including market share reports, summaries of takeout program, information on takeout insurer requests
Insurance Capital Build-Up Incentive Program	2015 annual report

Figure 3.7: Florida Public Insurance Institutions: Data Sources.

The second set of information I examined related to the State of Florida’s direct participation in ILS and reinsurance markets. Beginning in 2011, the State of Florida’s Citizens Property Insurance Corporation began to purchase private reinsurance. This quickly expanded to include ILS markets, including sponsorship of the largest catastrophe bond on record. In 2015, the Florida Hurricane Catastrophe Fund followed with its first private reinsurance (retrocession) purchase. Figure 3.8 provides an overview of which resources I leveraged for this part of the examination.

Data Source(s)	Research Rationale
Phone interviews with three senior Citizens financial officers	Obtain context and overview of reinsurance and ILS market participation, including rationale, benefits, limits
Risk transfer program financial data for Citizens, Florida Hurricane Catastrophe Fund	Obtain overview of 2015 reinsurance providers (including ILS funds), premium ceded, and cover provided
Reinsurance industry data sources (see Figure 3.3, part IV)	Understand capital market context, including perspectives from providers to State of Florida (e.g. commentary from interviews, reports) and contracts/deal structures used to sell State risk (e.g. catastrophe bond rating reports, bond price and structure information from Artemis)
Other existing commentary from senior State of Florida insurance leaders	Gain insight into rationales from senior State of Florida insurance institution figures, including the insurance commissioner, through publicly available presentations (e.g. annual Florida Insurance Summit) and interviews

Figure 3.8. Florida Public Insurer Reinsurance Market Participation: Data Sources.

With these two sets of data, I mapped out how and why the State of Florida intervenes in Florida's (re)insurance markets today, and how these activities relate to previous and persistent challenges within the market. The results of this analysis form the basis of Chapter 4, Section 3.

3.3.3 (Re)Insurance Markets in the Miami Dade County Context

Finally, I examined the relationships between (re)insurance and residential housing vulnerability and local government fiscal capacity in the Miami Dade County context. My primary purpose was to bring a sharper quantitative and more spatially granular focus to the initial findings on real estate, (re)insurance, and climate risk governance from part one, and to extend insights from the other two research strands in part two. Residential housing market affordability and stability, along with local government fiscal capacity emerged as two clear domains of Florida urban political economy which were vulnerable to climate risk, and where (re)insurance market dynamics were particularly relevant.

Miami Dade County (henceforth, Miami) was chosen for three reasons. First, it represents Florida's (and indeed, potentially the world's) most economically-vulnerable region to future

flooding, following Hallegatte et al (2013). Far from abstract, this vulnerability is also more immediately visible, owed to Miami's physical geography: "sunny day" flooding in low-lying areas is already a cause for major concern, and serves as a visual harbinger of Miami's growing exposure to climate risk. In short, there is more at stake, more urgently, in Miami. Second, Miami has the highest residential insurance costs in Florida, in part a reflection of the first rationale. Third, Miami's real estate market is also among the single most unequal and (in)secure in the nation.

In this context, residential insurance costs could further exacerbate long-standing housing affordability issues, particularly for mortgage-holding households which are required to maintain policies as a condition of their loan. At the same time, this intra-urban inequality is reflected across a fractured landscape of municipalities, which is largely divided along lines of race, wealth, and proximity to desirable coastal areas. The capacity of local communities within Miami to offset growing insurance costs through other forms of risk mitigation (e.g. physical infrastructure) is in large part a function of the size and stability of its property tax base.

I examined each of these geographies and their intersections by compiling two sets of data: (i) neighborhood-level insurance policy and cost data, and (ii) data related to local housing stock, residential demography (i.e. race and class), and local government public finances. First, I compiled hurricane wind and flood insurance data at the neighborhood-level. For flood insurance, this was relatively straight forward, because almost all flood risk is written through the National Flood Insurance Program, which discloses data on the number of policies, premiums collected, and total insured value of its portfolio at the municipal scale. There are some limits with this data: it does not include the (small, but growing) market for private flood insurance, nor does it disaggregate commercial and residential risks.

Calculating hurricane wind insurance costs posed a much greater challenge. The Florida Office of Insurance Regulation only provides residential (non-flood) insurance data at the county level. Moreover, this data reflects all non-flood risk: isolating the catastrophe component (i.e. hurricane wind risk) and examining its spatiality is essentially impossible. This required that I develop a proxy for household hurricane insurance costs at the sub-county level. I did so using the Florida Hurricane Catastrophe Fund's (Cat Fund) publicly-available reinsurance rates, which allowed me to distill a proxy for hurricane wind insurance costs at the Miami Dade zip-code level.

The Cat Fund was created after Hurricane Andrew (1992) triggered a catastrophe reinsurance affordability crisis, as one way to provide a reliable, low-cost source of hurricane reinsurance for Florida's homeowners insurers (see Chapter 4, Section 2 for context). Participation in the Cat Fund is required by state law for all Florida homeowners insurers. Each insurer must purchase excess of loss reinsurance from the Cat Fund at one of three state-set participation rates. The Cat Fund is the largest reinsurer in Florida, in 2017 projected to collect \$1.176 billion of premium dollars from primary insurers in exchange for up to \$17 billion of reinsurance protection, the former equal to 16.7% of the total \$7.029 billion of risk retained by Florida's primary insurers (Florida Hurricane Catastrophe Fund, 2017).

While the actuarial methods considerations of private homeowners insurers might vary from the Cat Fund, the state's private insurers use similar catastrophe risk modeling and pricing methods to create their own assessments of risk. The Cat Fund data is unique, however, as a market-wide assessment of hurricane risk; unlike individual insurer ratemaking, the Cat Fund's rates are determined in relation to the entirety of insured residential risk in Florida.

The Cat Fund surcharge is a product of actuarial considerations, including but not limited to the spatial location and construction standard of properties. Actuarial methods are used to

assign 1,463 Florida zip codes one of 25 rating territory designations. Residential property owners in each of the rating territories pay a fixed charge based on the spatial location of the property, the property type and its construction (e.g. condominium versus single family home, age, and construction standards), the insured's policy type (e.g. coverage limits, deductible), and the rate at which their insurer has participated in the Cat Fund. While the precise rate charged to the property owner will vary based on a number of adjustments, the overall market ratio of rates charged across territories is fixed from 1 to 37. Figure 3.9 maps these rating territories across the State of Florida, while figure 3.10 focuses on South Florida in particular. Unsurprisingly, the highest rates are found in high value, high risk Miami areas.

I constructed a common scenario in line with the actuarial calculus of the Cat Fund to extrapolate a relative, 'all else equal' hurricane wind cost for the 79 Miami Dade County zip codes for which there was demographic data available through the American Community Survey. I did this by following the Cat Fund's rating process: by assuming a single construction type, deductible, and insurer participation rate across each zip code. For this exercise, I use the masonry-built rate for single family homes because 72% of all residential single family homes in Florida are classified as masonry-built, and because the percentage of housing units which are single family homes exceeded the state average of 54.1% in 13 of the 20 case zip codes. Finally, I assumed a participating insurer rate of 90% for this exercise. However, the 2017 projected participated rate was 74.829%, which reflects a decline in recent years -- likely due to favorable private reinsurance market conditions. The resulting rates enable spatial analysis of hurricane wind insurance costs against other spatial and demographic variables.

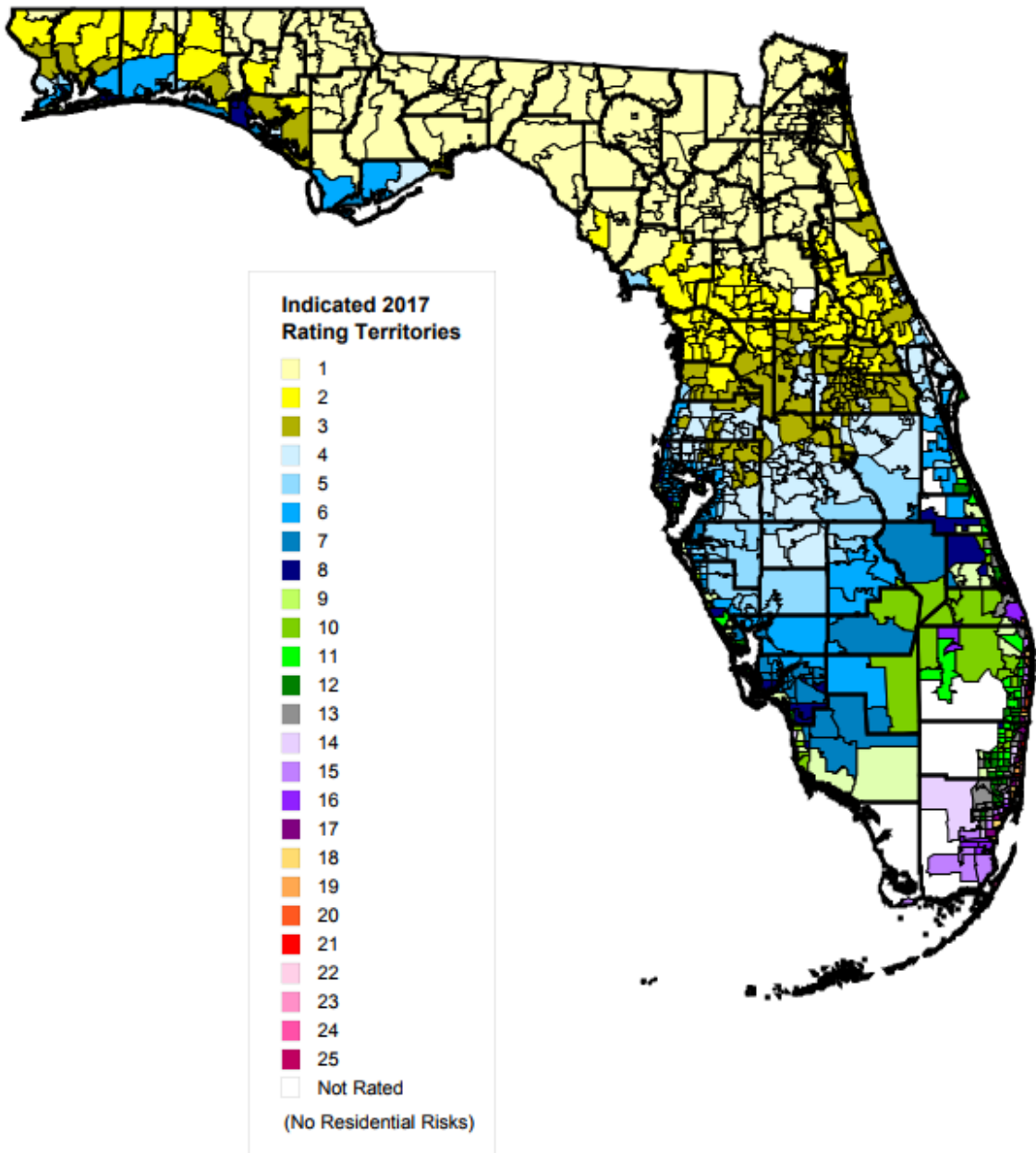


Figure 3.9: Florida Hurricane Catastrophe Fund Statewide Rating Classifications, 2017. Source: Florida Hurricane Catastrophe Fund (2017)

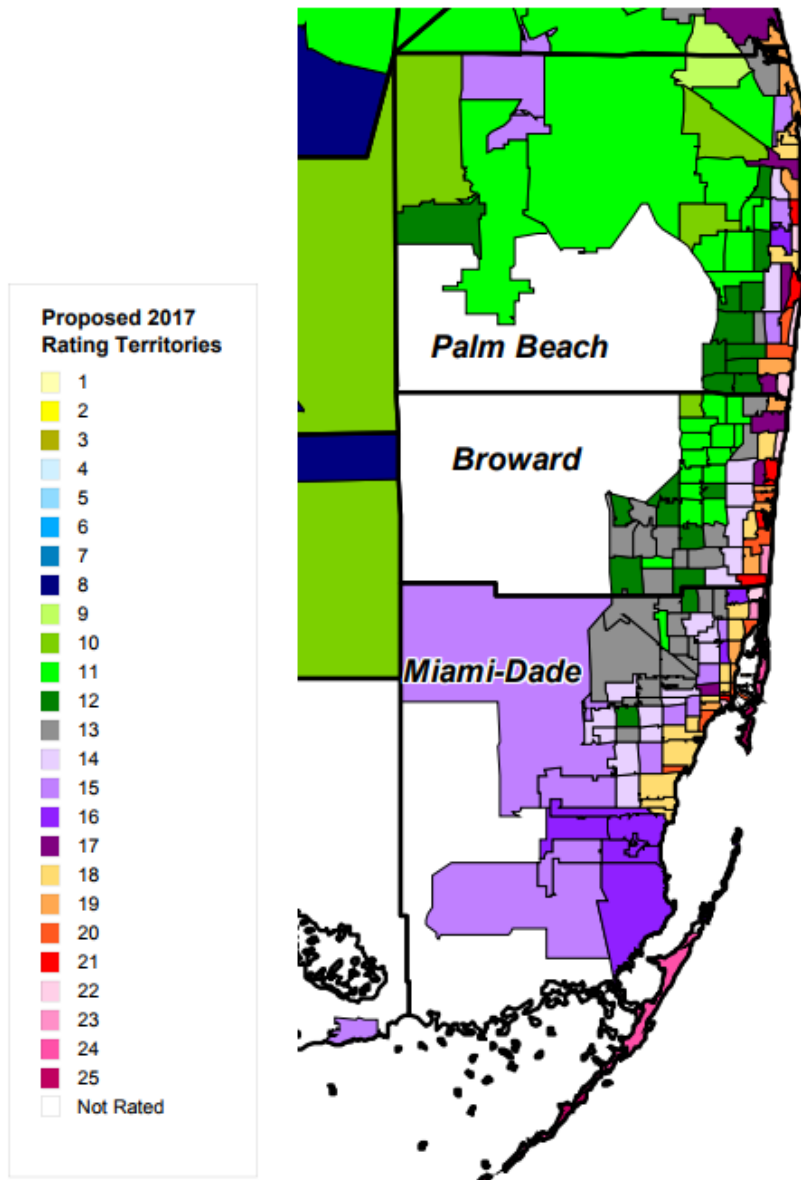


Figure 3.10: Florida Hurricane Catastrophe Fund Rating Classifications for Miami and Surrounding Areas, 2017. Source: Florida Hurricane Catastrophe Fund (2017)

With sub-county flood and hurricane wind insurance cost data available, I compiled a second set of Miami demographic and financial data to facilitate comparative urban analysis (Figure 3.11).

I. Housing Stock	
Variable	Source
Decade of Home Construction, % of Total Stock	2012-2016 American Community Survey 5-Year Estimates (DP04)
Single Family Homes as % of Total Stock	2012-2016 American Community Survey 5-Year Estimates (DP04)
Occupied Units as Number and % of Total Stock	2012-2016 American Community Survey 5-Year Estimates (DP04)
-- of which are Owner Occupied	2012-2016 American Community Survey 5-Year Estimates (DP04)
-- of which are Mortgaged	2012-2016 American Community Survey 5-Year Estimates (DP04)
-- of which the Cost of Housing is > 35% of Household Income (i.e. Housing Cost Burdened), as a % of Total Units	2012-2016 American Community Survey 5-Year Estimates (DP04)
II. Race and Class	
Variable	Source
5-Year Change in Household Income, 2011-2016	2012-2016 American Community Survey 5-Year Estimates (DP04)
Household Income as Percent of Florida Average	2012-2016 American Community Survey 5-Year Estimates (DP04)
Percent White Alone (i.e. not Latino), 2010	2010 Census
III. Local Government Fiscal Context	
Variable	Source
Population	2010 Census
Assessed Property Tax Base Value, Total and Per Capita, 2017 estimates	Miami-Dade County Property Tax Appraiser (2017)
Assessed Property Tax Base Growth, 2016-2017	Miami-Dade County Property Tax Appraiser (2017)
Property Tax Revenue, Total and Per Capita, 2016*	Various Miami-Dade County Local Government Annual Reports. Note: in some cases, data for FY 2016 was not available on local government websites, in which case FY2015 numbers available online through the State of Florida Auditor General were used.
Jurisdiction Year of Incorporation	Various Miami-Dade County Local Government

Figure 3.11. Urban Demographic Variables for Insurance Affordability Analysis. Source: Author

This data can be classified into three types: (i) housing stock characteristics, (ii) residential demographics, and (iii) local government fiscal context. I used this data to examine the local government fiscal capacity to manage climate risks, and mapped the overlap with this geography and insurance costs, to produce the analysis in Chapter 6.

3.4. Conclusions

In this chapter, I have reviewed the research approach and methods employed in this study. In Section 3.2, I presented a first-person reflection on the motivation and context for this project. Sections 3.3 and 3.4 recount the two-part mixed-methods study which I implemented, respectively.

The empirical project presented here represents a novel contribution to insurance and urban studies. This research process was not without its time and budgetary limits and tradeoffs, however. One dimension which is missing relates to individual insurance policyholder experiences, both recently and historically. Hurricane Irma's 2017 landfall represented an opportunity to understand the immediate experience of insurance consumers after disaster, while both Hurricane Andrew and the highly destructive 2004-5 Hurricane Seasons could have been revisited through follow-up interviews with individual insurance policyholders.

A second dimension which is missing this approach is the comparative one. More analysis could be done to compare Florida's insurance market with that of other catastrophe-prone regions within the US, including those with high levels of hurricane exposure but also other hazards, like earthquake risk. Equally, more detailed comparisons between (re)insurance and other financial markets (like real estate lending), or between (re)insurance and physical risk mitigation approaches, could have provided rich and complementary avenues for research.

It should also be noted that some of the methods pursued here were vital for background learning, but not ultimately useful for the type of analysis presented here (e.g. archival analysis, photography). In other cases, background research was essential but ultimately does not appear in the spotlight within the final narrative constructed here (e.g. elite interviews, planning). These latter absences speak more to the demands of the PhD dissertation format than to the usefulness of these forms of inquiry, all of which taught me a great deal about Florida, about myself, and about the improvisational art of doing research.

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4. The Real Estate Risk Fix as Public Policy Goal

4.1. Introduction

State of Florida public policies and insurance institution interventions have played a constitutive role in the development of ILS, and its asymmetrical investment in Florida's residential insurance market in particular. In this chapter, I explain why and how the State of Florida has facilitated the growth of ILS as a public policy 'fix' for the state's crisis-prone insurance market, the instability of which has posed a significant threat to the Florida real estate industry over the quarter century since Hurricane Andrew's catastrophic landfall over metro Miami in 1992.

The persistent crisis within Florida's residential market has been characterized as a tension between consumer affordability and private insurer profitability (Weinkle, 2015), and in the State of Florida has sought an elusive balance between the two. For Florida's six million residential insurance policyholders, affordable and reliable coverage has been a perennial concern, not least because mortgage lenders require borrowers to maintain protection at all times. For Florida's primary insurers, the capacity to profitably underwrite and reinsure the state's unique mixture of high value, high risk policies has also been a major focus of industry innovation and restructuring.

The prospect of crises of affordability and profitability -- in short, of insurance availability -- is significant threat to Florida's real estate-dominated political economy. Insurance secures the real estate assets which underpin both large-scale private housing finance (e.g. mortgage lending) and public sector property-linked finance. In securing assets, so too does insurance secure the reproduction of an economy which relies upon the making and trading of real

estate. In this way, insurance markets have emerged as a domain of significant and continuous public policy concern and intervention.

Insurance market regulation in the US context is distinct from that of other financial markets in that the primary regulatory geography is the State. The State of Florida has developed a distinctive and complex landscape of public insurance institutions and market-shaping mechanisms to enact public policies in response to oft-competing market tensions. These institutions include a large-scale public ‘insurer of last resort’ for consumers, a state-managed hurricane reinsurer through which all private insurers must purchase coverage, a public guarantor in the event of a private insurer insolvency, and other strategic market-making mechanisms which have facilitated the use of innovative risk valuation strategies and entry of new private risk capital flows into the state.

In this chapter, I demonstrate how and why the State of Florida has leveraged these institutions to facilitate the entry of deepened flows of private risk capital and ILS into Florida’s residential market, as one formation of the real estate risk fix. In Section 4.2, I show why the State of Florida adopted an interventionist approach to (re)insurance market crises, in ways which have produced a complex and shifting landscape of public insurance institutions, and which set the stage for a new round of state-led market restructuring which has found a ‘fix’ in the form of ILS.

In Section 4.3, I employ a mixture of public policy and forensic financial analysis to show how the State has fostered the entry of risk capital into the market in three ways. First, the State *stages risk* through various performative exercises and market-making measures, which codify the expanded use of reinsurance by Florida’s primary ‘specialist’ insurers as good market practice. The State’s endorsement of these modes of visualizing and managing risk is important: it legitimates new private insurer business strategies which rely heavily on reinsurance.

Second, the State *sources risk* for reinsurers and ILS. It does so directly by acting as one of the most prominent users of ILS, which have included the sponsorship of a record-setting catastrophe bond issuance, and the privatization of the State's risk transfer program using significant amounts of ILS-backed cover. The State indirectly sources residential risk by transferring consumer policies from the State-run Citizens Property Insurance Corporation ('Citizens') to private specialist insurers using subsidies and other policy mechanisms. Because these specialists have relatively highly concentrated portfolios of Florida risk, they are generally more reliant on external risk capital and have pioneered the use of ILS as such. Through a case including both public and private specialist insurers, I show how these direct and indirect mechanisms move hundreds of millions of dollars of Florida residential policyholder premiums to ILS annually, much of which was hitherto kept on the books of the State as an insurer of last result.

Finally, the State *secures risk* by maintaining a backstop -- a public guarantor -- to socialize any losses which emerge should a private insurer default. By demonstrating its willingness to remain an insurer of last resort, the State stands ready to transfer operational risks from private insurers back to the public. I demonstrate how the State of Florida remains a backstop position at key points in the primary market, and draw inferences about where in the State is most likely to appear in the event of a risk capital market crisis in the future.

Through this analysis, I demonstrate how and why ILS acts as a residential risk fix for the State of Florida, and how the State has thus played a constitutive part in the making of the Florida market for ILS. In doing so, I make visible the ways -- and extent -- to which -- Florida public policies work to make certain forms of residential climate risk marketizable. At the heart of this shifting legacy of market intervention has been an overarching public policy goal to reproduce Florida's real estate sector, against the fragility of the state's residential property insurance market.

4.2. The Emergence of ILS as a Public Policy Fix

The story of ILS in many ways begins on a Miami suburban cul-de-sac in August 1992, in the moments after Hurricane Andrew passed over South Florida as a powerful category five storm, having taken 44 lives across the state. At the time the costliest 'natural' disaster in US history (Rappaport, 1993), Florida saw \$25 billion in losses, including the destruction of tens of thousands of homes and damage to hundreds of thousands more (Smith and McCarty, 1996, Peacock et al, 1997).

Hurricane Andrew represented an urban-financial crisis as much as a 'natural' disaster, the fallout of which foregrounded the creation of ILS as a real estate risk fix. The storm threatened to upend the business of global property reinsurers and Florida's local real estate interests alike. Without adequate capital reserves or reinsurance cover, Florida's insurers struggled to pay claims after the storm. Eight were ultimately declared insolvent, while others required capital infusions from their parent companies (Lecomte and Gahagan, 1998). Floridians were left with \$400 million in unpaid claims, with the State on the line as a guarantor of last resort (ibid: 107). Catastrophe reinsurers substantially increased risk capital rates, and national insurers reduced their Florida exposure (McChristian, 2012).

In the year after Andrew, the remaining insurers increased consumer rates in coastal communities by upwards of 200%, and deductibles by 500% (US House. Committee on Banking, Finance and Urban Affairs, 1993). This crisis was, in part, related to both the affordability and availability of catastrophe reinsurance cover for Florida's peak peril residential insurance market. Global reinsurers thus responded to Andrew (and the subsequent Los Angeles-area Northridge earthquake) by reevaluating their underwriting approach towards high loss, low probability property catastrophes, and by seeking new ways

to expand their overall market capacity to manage this risk. As I discussed in Chapter 2, Section 2, two closely related technologies -- catastrophe risk modeling and ILS products like the catastrophe bond -- emerged as a means for (re)insurers to secure their market power in 'peak peril' underwriting.

As the first major hurricane to make landfall after Florida's post-war property boom, Andrew also revealed significant cracks within the state's property insurance-centric risk management system. In the storm's aftermath, Florida policymakers endeavored to shore up the property insurance market through a pioneering architecture of public insurance institutions, with which they hoped to balance consumer rate affordability against private risk capital profitability (Klein, 2009; Weinkle, 2015). This configuration evolved to comprise an "insurer of last resort" for Florida consumers unable to procure private insurance (which could eventually become the Citizens Property Insurance Corporation)¹³ and a state-run provider of hurricane reinsurance (the Florida Hurricane Catastrophe Fund, or Cat Fund), along with the Florida Insurance Guaranty Association (FIGA), a pre-existing public guarantor to pay policyholder claims in the event of a private insurer insolvency (Lecomte and Gahagan, 1998; Weinkle, 2015).

In the post-Andrew context, Citizens and the Cat Fund helped to insulate the Florida market from reinsurance pricing cycles (Medders and Nicholson, 2017). The Cat Fund was purpose-built to offer a lower-cost, reliable, and minimum level of hurricane reinsurance for all private insurers in the market (Lecomte and Gahagan, 1998; Beatty, 2007). Insurers were required by law to purchase coverage from the Cat Fund at one of three pre-given levels as a

¹³ Citizens was formally created in 2002, ten years after Andrew. However, it was formed from two existing State-run insurance pools: the Florida Wind Underwriting Association (formed in 1970 to write wind-only coverage for residential policyholders) and the Florida Residential Property and Casualty Joint Underwriting Association (formed in 1993 for the remainder of the state's residential market). I refer to this post-Andrew mixture of residential insurers of last resort as Citizens for the purposes of simplification (see Citizens Property Insurance Corporation [2016] for a breakdown of this history and the characteristics of each Citizens account).

condition of participating in the market. Both Citizens and the Cat Fund also had the capacity to finance incurred losses through a structured series of assessments on all Florida policyholders (Cole et al, 2011; Medders et al, 2013), and until recent history did not purchase external reinsurance. In short, these institutions made Florida policyholders reinsurers for one another.

Andrew was only a preview for the 2004 and 2005 Atlantic hurricane seasons, which saw 14 storms trigger \$56 billion in losses statewide in less than two years (McChristian, 2012). The spectre of a real estate crisis once more haunted Florida: insurers threatened to rollback underwriting without rate increases, while property owners sounded the affordability alarm (Grace and Klein, 2009). The Florida legislature responded by passing House Bill 1A (HB1A) in 2007, which limited consumer rate increases required by private insurers, and required Citizens to cover homeowners denied private coverage (Grace and Klein, 2009; Weinkle, 2015). The primary intention of the law was to insulate residential policyholders from rate increases (in large part driven by catastrophe reinsurance costs), and to ensure their access to an insurer of last resort, the state-run Citizens. However, the legislation had several unintended consequences and drew a range of critiques from both insurance industry figures and a remarkable coalition of anti-state, pro-business, and pro-environment institutions¹⁴ (Medders et al, 2013, Weinkle, 2015; Medders and Nicholson, 2017).

One key critique of HB1A was that it encouraged “rate suppression” in the market, pushing the residential insurance rates below the ‘actuarially sound’ or fair market judgement of the

¹⁴ As seen by the example of *Stronger, Safer Florida*, “a nonpartisan coalition comprised of businesses, consumer and environmental groups from throughout Florida. This diverse membership [...] believes that by returning Citizens Property Insurance Corp. back to the insurer of last resort and “right-sizing” the Florida Hurricane Catastrophe Fund, we can better protect all Floridians as well as environmentally sensitive areas throughout the state.” The coalition includes ‘Business Organizations’ (Associated Industries of Florida, Florida Chamber of Commerce, Environmental Organizations (1,000 Friends of Florida, Audubon of Florida, CERES, Florida Coastal and Oceans Coalition, Florida Wildlife Federation, Sea Turtle Conservancy, Surfrider Foundation, the Nature Conservancy), ‘Consumer/Taxpayer Advocates’ (Florida Consumer Action Network, Florida Taxwatch, the R Street Institute), ‘Allied Organizations’ (American Consumer Institute for Citizens Research, James Madison Institute) - see *Stronger Safer Florida* (2018)

price of risk (Medders et al 2013, Weinkle, 2015). HB1A directly reduced Citizens rates to their 2006 baseline, which created downward pressure on the rates charged in the private market (ibid). Medders et al (2013) explain this process -- and its consequences -- as such:

“First, the restriction on residual insurance (Citizens) rates results in a lower-than-fair insurance price for exposures in the involuntary market, shifting the cost of a large loss event to taxpayers. Second, the pressure placed on private insurers to compete with a public insurer (Citizens) that can (and does) undercut private market prices makes it impossible to remain in the private market at systematically fair prices” (Medders et al, 2013: 206)

Figure 4.1 charts the trend in average premium per \$1,000 of property value by type of Florida residential property insurer between 2005 and 2011, demonstrating this clear downward rate trend.

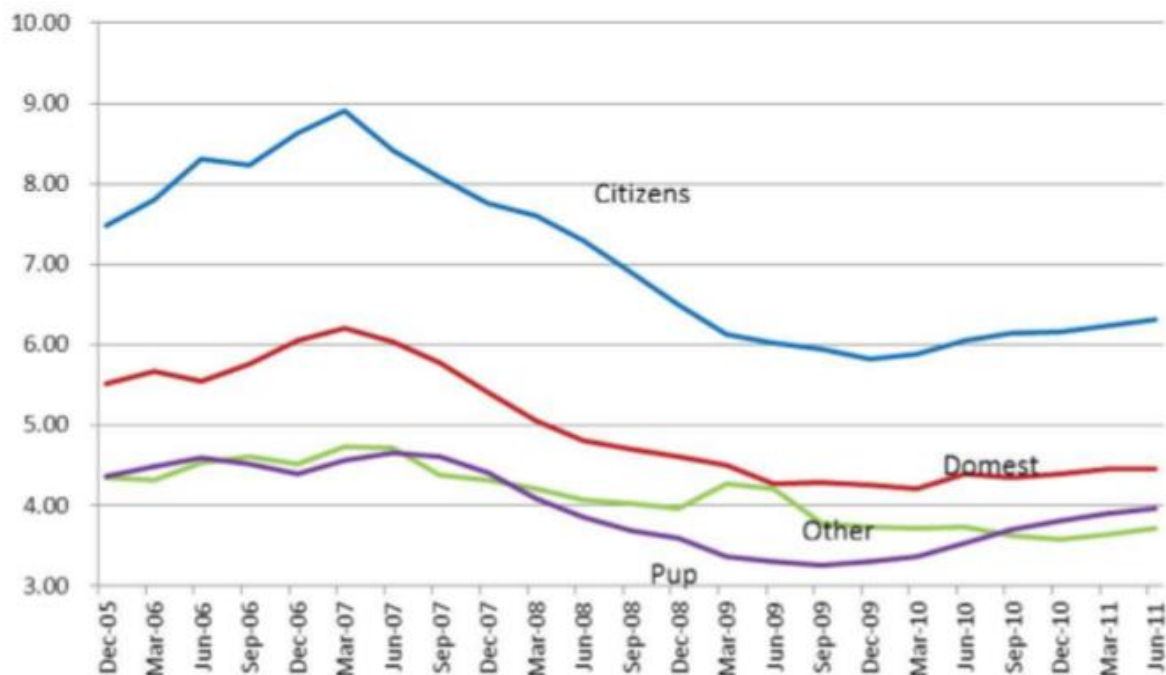


Figure 4.1. Trend in Florida Personal Residential Property Insurance Rate Levels, 2005-2011. Source: Florida Office of Insurance Regulation Quarterly Supplemental (QUASR), quoted in Medders et al (2013: 202). Medders et al define Pup as a Florida-domiciled subsidiary of national carrier, Domestic as a Florida-domiciled insurer primarily writing property insurance, and Other as insurers of mixed scope and scale defined neither as Pup nor Domestic.

A second critique of HB1A related to the redistributive effects of “non-risk based pricing” that it generated within Florida (Medders et al, 2013: 209), whereby the design of the public

insurer and the countermeasures of private insurers resulted in the cross-subsidization of risk across the market: “Insurers who choose to keep capital in the marketplace may utilize cross subsidies within their policy base to balance their pricing strategy—allowing those policyholders with less desirable policies to subsidize the pricing of policyholders that offer more desirable business” (Medders et al, 2013: 207).

Logue and Ben-Shahar (2016) argue that this redistributive dynamic was spatially regressive, with the benefits unfairly accruing to wealthier coastal communities such that the “people who buy higher coverage (namely, who presumably own more expensive homes), or, alternatively, people who live in wealthier zip codes, receive larger subsidies, both in absolute magnitude and as a percent of their premium” (ibid: 608). Thus, inland and more modest-income households were in essence subsidizing the cost of coastal insurance through their homeowners premiums.

This redistributive logic was temporal as much as spatial. HB1A authorized Citizens to sell insurance below actuarially sound rates, and it relied on post-disaster assessments on all Florida property insurance policyholders (including non-homeowners policies, like auto) to finance any future losses to the State-run insurer. After the \$56 billion of insured losses incurred over the 2004 and 2005 seasons, Citizens, the Cat Fund, and FIGA were left in debt to cover losses within the voluntary and residual markets, which triggered a series of six emergency assessments (Florida Association of Insurance Agents, n.d.; Streukens, 2011). Not only were all policyholders insured in the voluntary (private) market responsible for repaying the debt used to pay claims by Citizens and the Cat Fund, the emergency assessments stretched up to ten years into the future. Floridians who entered the market in 2010 or 2015 would, in essence, be repaying losses incurred in 2005, representing a temporal as much as spatial redistribution of risk (Florida Association of Insurance Agents, n.d.).

These State interventions radically restructured the structure of Florida market in the two decades following Andrew. By the close of 2011, Citizens was the largest residential insurer in Florida. It collected 26% of statewide residential premiums, including 58% of the Miami-Dade County market, according to Florida Office of Insurance Regulation market data. Both insurance experts and members of coalitions like Stronger Safer Florida argued that Citizens was displacing the private market, and placing an unfair burden on private market insurance policyholders looking to future disasters (Klein, 2009; Lehrer, 2013; Medders et al, 2013; Lehmann, 2015). The institution which had been designed to champion affordability and stabilize the market was also ostensibly an agent of instability, one which in its own ways raised a spectre of expensive and unfair statewide post-disaster policyholder assessments, seemed to be undermining the private market for insurance, and encouraged risky development practices through redistributive and regressive subsidies on inland communities.

Critics of the Citizens approach found allies in a new political regime after 2011. As an insurance industry veteran and Tea Party leader, Governor Rick Scott (2011-2019) worked with the Florida legislature to reduce the public sector's exposure to residential risk by attracting new private risk capital. By 2015, then-Florida Insurance Commissioner Kevin McCarty (2015) celebrated the "unlimited potential of capital to come" to Florida's homeowners insurance market due to the rise of ILS. For McCarty, the expansion of catastrophe reinsurance markets represented a historic turn in fortunes for the state's disaster-prone property insurance market. At a Florida insurance market summit, McCarty thus attested:

"We are in a position we have never seen before in Bermuda, in London, across the world in terms of investment opportunities. Huge changes are taking place in Bermuda that are transforming the pricing and transforming how we do business. [...] Insurance-linked securities have dramatically changed the marketplace and we believe will benefit the Florida domestic market" (McCarty, 2015).

In a subsequent radio interview, McCarty asserted that the state's property insurers were heading into the next hurricane season "in probably the best position we've been in in over a decade" (Hudson, 2016). Florida's primary insurers had "shed their risk by spreading it to the global insurance market, which is at an all time high in terms of capacity" (ibid). Barry Gilway, the head of the Florida Hurricane Catastrophe Fund and a key figure in the post-Andrew restructuring of the state's homeowners insurance market, echoed McCarty's comments in the same radio interview: "We've never been, ever, in our history, as well prepared financially" for the next disaster (ibid).

By tethering what one reinsurance industry executive called a "huge pool of potential capital" (Clarke, 2015) to 'peak peril' property insurance markets, ILS capital appeared to be the answer to two central questions that Florida Chief Financial Officer Jeff Atwater posed during that radio interview: "How well are we prepared, and who will absorb that risk? Will it be the global marketplace, or will it be the taxpayers of Florida?" (Hudson, 2016).

Atwater's comments point to the alluring premise of ILS as a real estate risk fix, as seen from the state policymaker's position. On one hand, ILS ostensibly removed pressure on the catastrophe reinsurance market's tumultuous hard-soft pricing cycle by greatly enhancing the supply of risk capital to markets, and in turn limiting the pressure primary insurers face to raise consumer rates after a disaster. Dramatic rate hikes were the primary basis of State intervention in the past, and the resolution of this prospect equally minimizes political and performative pressures on the State to act. On the other hand, the State could now be seen to be working in partnership with (re)insurers to stabilize the market -- a message likely to be far less problematic among vocal critiques of the State's insurance policies, who in the past organized across anti-state, pro-business, and pro-environment interests to lobby for public policy reforms (Stronger Safer Florida, 2018).

This analysis shows why ILS emerged as a real estate risk fix, as seen from the Florida insurance public policy context. Over decades of urban-financial crisis and restructuring, the State of Florida accumulated a powerful position in the residential insurance market, including a direct stake in hundreds of billions of dollars of insured exposure. Yet changing political pressures looked to cede responsibility for this risk to private insurers and their risk capital providers.

This view in many ways rounds out a crucial and hitherto missing component of the mainstream narrative on the emergence of ILS (Chapter 2, Section 2). As reinsurers and ILS investors looked for new domains from which to source risk to shore up declining returns, the Florida market presented a window of opportunity -- a relatively well-known, mature, high value, and captive market for catastrophe risk transfer. Hurricane risk models were robust, while Florida's real estate markets required insurance markets to underwrite millions of mortgaged properties (Kunreuther, 1996; I examine the relationships between insurance and mortgage markets in further detail in Chapter 6, Section 2). The \$486 billion of exposure on the books of Citizens may have hitherto too risky to privately insure, yet now appeared attractive to risk capital, given the changing (re)insurance market fundamentals and competitive dynamics. In short, reinsurers saw a catastrophe fix for their own crisis in more deeply mining Florida residential risk.

Gaining access to this risk, and other forms of residential risk on the books of State-run reinsurer would require more than an eye for opportunity and innovation, however: it necessitated partnership with the State. It was here, at this juncture, that global reinsurers and state policymakers converged on ILS as a real estate risk fix.

4.3. How the State Helped to Build the Florida ILS Market

By 2015, up to half of the ILS market was invested in Florida hurricane risk (Seo, 2015), and the State of Florida's public insurance institutions and guiding legislation played a key part in securing this market outcome. This section identifies three patterns of State action that connected Florida's homeowners insurance industry to ILS, with a specific focus on Governor Scott's first term (2011-2015). As an insurance industry veteran and anti-state "Tea Party" supporter, Scott arguably possessed the technical savvy and ideological orientation to help guide the restructuring of Florida's public insurance institutions to create new channels through which Florida residential risks could move into risk capital market circuits, at a time when broader reinsurance market dynamics were also seeking to mine risk (Johnson, 2015).

In this analysis, I demonstrate how the State of Florida has helped to forge channels between residential insurers and ILS markets by (i) *staging risk* through the forms of market-building advocacy and regulation (Section 4.3.1), (ii) *sourcing risk* through both direct actions (Section 4.3.2) and indirect measures (Section 4.3.3) that move risk from the State to private (re)insurance networks, (iii) and ultimately *securing risk* by maintaining residual market institutions as backstops, which socialize the costs of any market failures that might emerge as a consequence (Section 4.3.4).

4.3.1. Staging Florida Risk

The State of Florida stages residential insurance risk for ILS by performing norms about the use of risk capital products as part of sound risk management practice, and by operationalizing such norms through regulatory strategies and other market-shaping

activities. Monitoring the financial health of an insurer is one of the central aspects of insurance market regulation at the state, national, and international levels. Solvency, or the ability of an insurer to withstand financial stressors, is in turn one area around which state and global regulatory standards are focused, and it is here that reinsurance is positioned as a mechanism which generally improves solvency. A senior property reinsurance executive provides an example of how reinsurance figures into questions of solvency, in this case articulated in relation to European Solvency II requirements:

The Solvency Capital Requirement is set to ensure that each insurer will be able to meet its obligations over the next 12 months with a probability of 99.5% (i.e., being able to survive 199 out of 200 years). A variety of risk “modules” play a role in its calculation. These include underwriting risk, counterparty default risk and market risk.

By using reinsurance, the Solvency Capital Requirement is reduced because part of the cedent’s underwriting risk is transferred to the reinsurer. In the Solvency II standard model, the underwriting risk module comprises mainly premium risk, reserve risk and catastrophe risk and reinsurance can have a risk-reducing impact on all of these elements (Quick, 2014; emphasis added).

In the US context, states assume primary responsibility for regulating insurance markets, and for monitoring the financial health of insurers. Like other states, Florida requires insurers to hold a minimum capital surplus (or balance of capital, net of all liabilities) according to various conditions, ranging from the ownership structure to the lines of business offered (McCarty, 2009). This minimum surplus represents the insurer’s own financial stake in their business, and the amount required both shapes and is shaped by business activities like investment and risk transfer strategies. For example, increasing the minimum surplus would decrease the amount available for investment. Because investment activities are a significant source of returns for insurers, minimum capital standards can shape the profitability of a given line of business or market. Equally, increasing the amount of reinsurance purchased can lower the insurer’s retention, freeing up capital for other activities. The State of Florida Office of Insurance Regulation (FOIR) has taken a “proactive” approach to developing solvency standards which respond to the Florida’s exceptional

hurricane vulnerability, which encourages the use of catastrophe risk transfer products and technologies (McCarty, 2009).

One clear example is the FOIR Catastrophe Stress Test, a multistage evaluation of the financial performance of each property insurer against historic hurricane loss events (Florida Office of Insurance Regulation, 2015). First, FOIR collects data on each insurer’s portfolio of policies and their preliminary (and then final) reinsurance programs. In the second step, FOIR uses catastrophe risk models to simulate the performance of each insurer’s existing portfolio against three historic scenarios: the Tampa Bay Hurricane (1921), the Fort Lauderdale Hurricane (1947), and the 2004 hurricane season, which saw four storms strike the State within a matter of weeks (see Figure 4.3). During this stage, the State uses two catastrophe models, including the insurer’s chosen model -- of which RMS, AIR Worldwide, and CoreLogic are the three major vendors -- and the Florida Public Hurricane Model, which provides an independent and open-book basis for comparison. The projected loss scenarios for each storm are used to assess the financial performance of every insurer, factoring in their use of reinsurance.

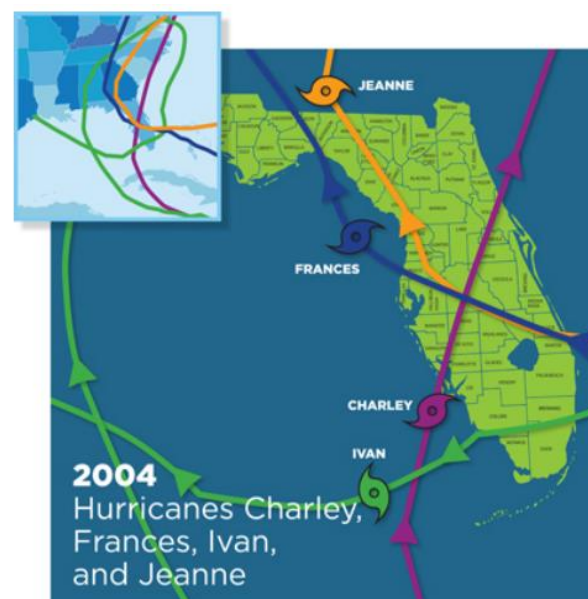


Figure 4.2: 2004 Hurricane Season Scenario: Map of Storm Paths. Source: Florida Office of Insurance Regulation (2015:14)

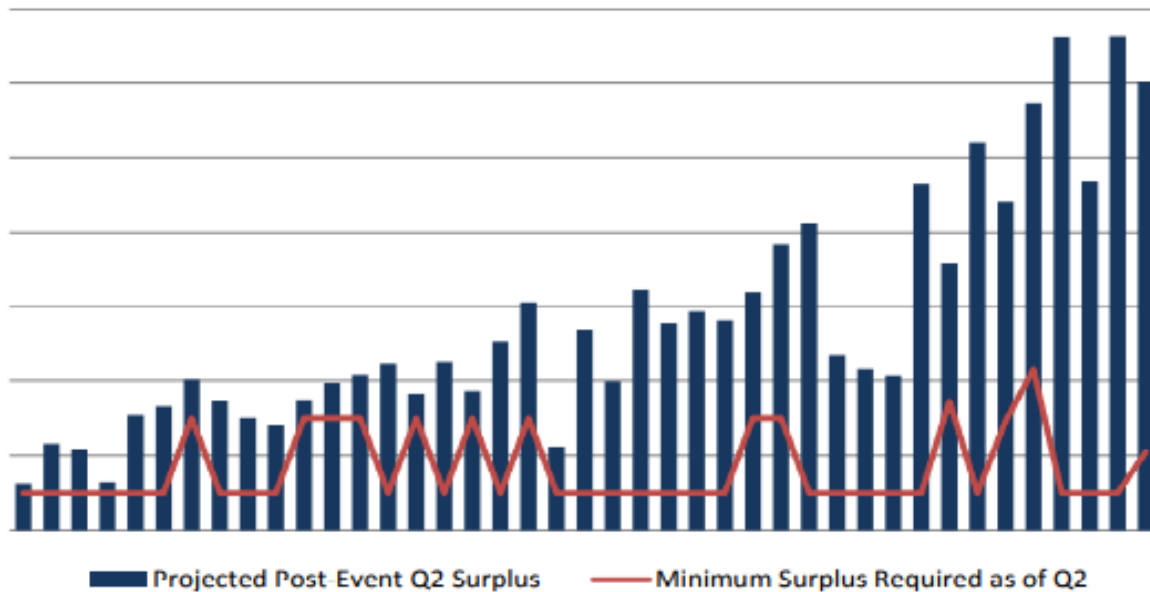


Figure 4.3: Impact of 2004 Hurricanes on Financial Performance of Primary Insurers with <\$100 million of Q2 2015 Surplus. Source: Florida Office of Insurance Regulation (2015: 16)

Figure 4.3, above, charts the estimated post-event surplus of the participating insurers under the 2004 season scenario, and shows that all 67 companies passed in 2015.

Crucially, while Florida statute requires insurers to maintain a minimum capital surplus (which varies according to insurer business strategy), the State does not require a minimum reinsurance purchase (Florida Office of Insurance Regulation, 2015: 9). Instead, FOIR works to coordinate transparency around the availability, pricing, and application of reinsurance as a means to define and enact a ‘best practice’ standard. Indeed, the Catastrophe Stress Test has been a major talking point employed by Florida’s insurance institution leaders in public discourses. This approach can be read as part of broader endeavor by the State to develop regulatory measures that parallel and reinforce the techniques that the private market uses to model, price, and purchase reinsurance coverage (see Johnson, 2014 and Chapter 2, Section 2.1 for more discussion), which positions FOIR as a ‘partner in business.’

In this way, the Catastrophe Stress Test represents a market-staging measure, one which appropriates the risk management vocabularies of the private industry (e.g. through the use of risk models as a valuation and visualization mechanism) and uses them to legitimate the risk governance strategies used by (re)insurers. This is important, because actuarial practices (including risk modeling) determine consumer rates, and in turn have shaped the (shifting) boundaries between the private and residual market.

As social studies of finance-based critiques of actuarial practice have demonstrated, the technologies and conventions which have defined such practice lack permanence, precision, and neutrality (Weinkle and Pielke, 2017). A significant part of the crisis which emerged in the aftermath of HB1A largely focused on questions of actuarial practice, a conflict which was in many ways about who has the power to define and enact knowledge about risk, and the underlying norms, values and interests constitutive thereof (Weinkle, 2017; Weinkle and Pielke, 2017). Insurers employ the notion of actuarial soundness to dis-embed and subordinate a broader range of social interests to the market's calculative norms and interests, and thus expand or contract their market footprint as profitable underwriting conditions emerge and disappear. Yet public backlash against market outcomes which conflict with alternative values (like housing affordability) prompt State interventions which seek to re-embed the market in social concerns around affordability and fairness. There are always multiple 'values at risk' underpinning the construction of risk, which exceed the calculative logic of actuarial assignments (Elliott, 2018).

For example, a major catastrophe risk modeling vendor changed the scientific assumptions which underpin its widely-used wind model in the aftermath of the 2004 and 2005 seasons (St John, 2010). Florida's private insurers used the revised models to reevaluate their exposure to hurricane wind risk, and on this basis sought significant rate increase approvals from the Florida Office of Insurance Regulation. The resulting public concerns over

insurance affordability coalesced around concerns about the scientific integrity of these model changes (St John, 2010).

The Catastrophe Stress Test provides an example of how the State of Florida uses market techniques to subsume such critique and to reinforce the market-making practices of private insurers. For example, it convenes the Florida Commission on Hurricane Loss Projection Methodology (FCHLPM), a dedicated panel of experts first convened in 1995 that reviews and approves the catastrophe risk models that private insurers wish use to price policies on a regular basis (Florida Commission on Hurricane Loss Projection Methodology, 2017). FOIR also funds an independent ‘public model’ developed by Florida State University, and includes groups of experts from computer science, actuarial science, finance, statistics, meteorology and engineering. The FCHLPM team also contracts with private model developers to evaluate and develop methodologies for hurricane loss modeling (ibid). These State technical capacities underpin activities like the Catastrophe Stress Test, which in turn validates the adoption use of risk models as the key calculative device for governing catastrophe risk. The calculative agencies enacted through risk modeling-based actuarial practice are performative but also material: they prefigure a way of understanding and doing risk management, one which makes possible ILS as a fix within a specific field of action.

4.3.2. Sourcing Florida Risk, Part One: Direct Measures

The State of Florida sources residential risk capital markets in direct and indirect ways. First, the State directly purchases risk transfer from private reinsurance and ILS markets, including sponsorship of the single largest catastrophe bond issuance of all time. Second, the State has indirectly supported the growth of private reinsurance capital in the Florida residential market by privatizing large segments of its market participating, including both the direct underwriting of Citizens and the retrocession (reinsurance for reinsurers) activities of the Cat

Fund. Through these indirect mechanisms, the State of Florida has created significant conduits for moving risks to private specialist (re)insurers, many of which are intimately connected with ILS markets. In these direct and indirect ways, the State has provided ILS and risk capital investors with new and often publicly-subsidized access to hundreds of billions of dollars of Florida residential exposure.

The State's direct participation in private reinsurance markets began in 2011 with Citizens' first reinsurance purchase ("placement") of approximately \$575 million of coverage (Gilway, 2015: 7; Interviews D-12, D-13). This placement served as a last layer of protection between Citizens' own surplus and its Cat Fund participation, and its post-event policyholder assessment capacity (Gilway, 2015: 6). Citizens increased its private reinsurance coverage to \$1.500 billion in 2012, \$1.851 billion in 2013, \$3.269 billion in 2014, and up to \$3.906 billion in 2015 (ibid: 7). These purchases included the launch of Everglades Re, a Bermuda-registered special purpose entity designed to issue catastrophe bonds on behalf of Citizens.

It is important to explain the basic architecture of the catastrophe bond, which is the paradigmatic (but not only) ILS product. Like other investment-grade ("Rule 144A") offerings, catastrophe bonds can only be purchased by institutional investors. The Citizens bonds are structured such that proceeds from the bond sale and a portion of its own policyholder premium dollars are held in a special trust, which then invests in highly rated US Treasury money market funds (Standard & Poor's, 2013). Each bond is rated and priced according to its probable loss. The Citizens bonds reinsure the State's high risk coastal account of homeowners insurance policies, largely concentrated in South Florida. For example, 61.1% of the exposure of the Everglades Re 2013-1 series bond was located in four South Florida counties: Miami Dade (23.4%), Palm Beach (16.6%), Broward (Fort Lauderdale) (16.2%), and Monroe (4.9%), according to the bond presale report issued by Standard & Poor's (2013).

The bonds cover a pre-set range, or layer, of losses within the Citizens risk transfer program, the bounds of which are referred to as the 'attachment' and the 'exhaustion' points. The attachment point corresponds to the minimum floor of losses that Citizens would need to incur to 'trigger' the bond payout, and the exhaustion point refers to the point at which the full amount of the bond would be lost to pay claims. The attachment and exhaustion points are calculated in both dollar and probabilistic terms relative to the possible losses incurred across the Citizens portfolio over a range of modeled scenarios within a single annual period. For example, the presale report for the Everglades Re 2013-1 series bond identified an initial attachment point of \$5.139 billion at 2.91%, and an exhaustion point of \$5.389 billion at 2.73% (Standard & Poor's Rating Services, 2013).

If the bond is triggered in part or whole, Citizens can access the investor proceeds ("collateral") held in the trust to pay policyholder claims. The investors receive any remaining collateral plus an expected coupon. Notably, no Everglades Re bond has been revoked by Citizens to date, even after Hurricane Irma's landfall as a major storm in 2017 led Citizens to claim \$126.4 million from reinsurers (Artemis, 2018). Figure 4.4 provides an overview of the four Everglades Re issuances between 2012 and 2015.

The key word that Citizens financial executives use to describe the insurer's purchasing strategy is opportunistic (Interview D-13). When Citizens initially went to the catastrophe bond market in 2012, it met outsized investor demand for its risk. The cost of risk capital was attractive relative to the direct (and indirect, i.e. political) costs of financing losses through post-event strategies (e.g. bond issuances and policyholder assessments). An initial issuance of \$200 million was finalized for \$750 million, equal to a 275% increase; at the time, this was the largest cat bond issuance ever (Adams, 2012). In 2014, Citizens increased the size of the transaction from a planned issuance of \$400 to \$1.5 billion, breaking their own record (Adams, 2014). With the 2015 issuance, Citizens yet again increased the issuance from a planned \$250 million to \$300 million, according to the Artemis ILS Directory.

Over this window, the coupon paid to investors -- one measure of the price of the cat bond cover -- shrank from 17.75% with the 2012-1 series issuance, to 5.15% for 2015-1 (Figure 4.4). In short, capital market appetite for Citizens risk meant that the State was increasingly able to buy more protection at lower cost.

Bond Series	Limit of Cover²	Term¹	Expected Coupon²
Everglades Re 2012-1	\$750 million	2 Years	17.75%
Everglades Re 2013-1	\$250 million	3 Years	10%
Everglades Re 2014-1	\$1,500 million	3 Years	7.75%
Everglades Re 2015-1	\$300 million	3 Years	5.15%

Figure 4.4. Everglades Re Issuances by the Citizens Property Insurance Corporation, 2012-2015. Sources: 1 - Everglades Re Bond Presale Reports (issued by Standard and Poor's, provided by Citizens), 2 - Artemis ILS Directory (2017)

Citizens benefited from these capital market conditions in two closely linked ways, which resonated with the larger public policy goals of the State. First, the increase in private risk transfer reduced Citizens' reliance on post-disaster assessments on Florida policyholders. In 2011, a 1-in-100 year probable maximum loss across the Citizens portfolio would have required \$11.61 billion in assessments (Gilway, 2015: 6). The assessment required was reduced to \$9.53 billion in 2012, to \$5.53 billion in 2013, \$1.69 billion in 2014, and entirely eliminated by 2015 (Gilway, 2015: 6). This means that Floridians insured through the private market had no obligation to repay Citizens' losses from 2015 onward, in part due to the use of private risk transfer.

Second, and related, Citizens' growing use of private pre-event reinsurance diversified the holders of its policyholders' catastrophe risk. An analysis of the 2015 Citizens risk transfer program drawn from internal financial reports and their 2015 statutory financial filings shows that 51 distinct reinsurance entities domiciled in 15 insurance jurisdictions (e.g. New York, Bermuda, or Germany) assumed \$507.6 million of Citizens policyholder premium in

exchange for reinsurance protection. Figure 4.5 offers a snapshot of the 2015 reinsurance program. Highlighted in bold are reinsurers which are known ILS funds or specialists, as flagged on the Citizens reinsurance schedule obtained through a public records request, or as I have verified through the use of the Artemis third party ILS deal database.

Name	Domicile	Size - Premium Ceded
American Standard Insurance Co. of Wisconsin	US-WI	\$682,000
Everest Reinsurance Co	US-DE	\$14,183,000
Munich Reinsurance Co	US-DE	\$3,984,000
Odyssey Reinsurance Co	US-CT	\$290,000
Swiss Reinsurance America Co	US-NY	\$12,481,000
Transatlantic Re	US-NY	\$263,000
Florida Hurricane Catastrophe Fund	US-FL	\$226,435,000
Argo Re Ltd	BMU	\$290,000
Ariel Re Bermuda Ltd (o/b/o Lloyd's Syn. 1910)	GBR	\$1,310,000
Ascot (o/b/o Lloyd's Syndicate 1414)	GBR	\$446,000
Axis Specialty	BMU	\$175,000
Aspen Bermuda Limited	BMU	\$333,000
Brit Global Specialty (o/b/o Lloyd's Syndicate 2987)	GBR	\$1,116,000
Hiscox Insurance Co (Bermuda) Ltd	BMU	\$438,000
Partner Reinsurance Co	BMU	\$617,000
QBE Reinsurance UK Ltd (Bermuda Branch)	GBR	\$972,000
Renaissance Reinsurance Limited	BMU	\$6,167,000
Validus Reinsurance Limited	BMU	\$16,653,000
XL Reinsurance Limited	BMU	\$1,051,000
Korean Reinsurance Company	KOR	\$87,000
Mapfre Re Compania de Reaseguros SA	ESP	\$242,000
Pioneer Underwriting Ltd (o/b/o Peak Re Co Ltd)	HKG	\$338,000
Qatar Reinsurance Co Ltd	QAT	\$2,215,000
Sirius International Insurance Co	SWE	\$1,031,000
Tokio Millennium Re AG	CHE	\$1,453,000
Amlin Bermuda Ltd (o/b/o Amlin AG)	CHE	\$1,739,000
General Insurance Corp of India	IND	\$849,000
Lloyd's Syndicate Number 2001 - Amlin	GBR	\$4,926,000

Lloyd's Syndicate Number 1274 - Antares	GBR	\$304,000
Lloyd's Syndicate Number 1955 - Barbican	GBR	\$249,000
Lloyd's Syndicate Number 2987 - Brit	GBR	\$392,000
Lloyd's Syndicate Number 4444 - Canopus	GBR	\$457,000
Lloyd's Syndicate Number 1084 - Chaucer	GBR	\$1,537,000
Lloyd's Syndicate Number 1729 - Dale	GBR	\$356,000
Lloyd's Syndicate Number 435 - Faraday	GBR	\$780,000
Lloyd's Syndicate Number 33 - Hiscox	GBR	\$405,000
Lloyd's Syndicate Number 2791 - MAP	GBR	\$714,000
Lloyd's Syndicate Number 2007 - Novae	GBR	\$69,000
Lloyd's Syndicate Number 1458 - RenRe	GBR	\$511,000
Lloyd's Syndicate Number 1183 - Talbot	GBR	\$599,000
AlphaCat Re (underwriting by Validus)	BMU	\$4,283,000
Horseshoe Reinsurance Ltd (Coriolis Capital)	BMU	\$1,025,000
DE Shaw Re (Bermuda) Ltd	BMU	\$1,237,000
Collateralised Re Ltd (o/b/o LGT Capital)	BMU	\$5,152,000
Allianz Risk Transfer (o/b/o Nephila Capital)	CHE	\$7,851,000
Poseidon Re Ltd (o/b/o Nephila Capital)	BMU	\$9,417,000
Lloyd's Syn. No. 2357 (o/b/o Nephila Capital)	GBR	\$9,075,000
Pillar Capital Management (Hannover Ruck SE)	DEU	\$2,038,000
Satec (New Re, aka Nouvelle Cie de Reassur S A)	CHE	\$141,000
Everglades Re Ltd	BMU	\$139,030,000
Everglades Re II Ltd	BMU	\$21,162,000
	Total:	\$507,550,000.00

Figure 4.5: Citizens Property Insurance Corporation Reinsurance Program, 2015. Bolded are known ILS capital providers. Sources: Internal schedule provided to author by Citizens, 2015 Citizens Financial Statement Schedule F, Part 3: Ceded Reinsurance.

No less than \$201.5 million of this premium, or 39.7% appears to have gone to alternative reinsurers leveraging ILS investment capital (author's calculations and internal Citizens notes), including premiums dedicated to securitization and sale through Everglades Re. Note that ILS and alternative risk capital markets are estimated to comprise \$81 billion, or about

13.5%, of the \$595 billion reinsurance market (Aon Benfield, 2018), which illustrates the unusually high rate of ILS participation in Florida's residential market.

Measured a second way, the \$201.5 million of premium that Citizens ceded to ILS-linked reinsurers could purchase roughly \$4.0 billion of reinsurance protection. This assumes that Citizens paid a rate similar to the 5.64% Rate-on-Line which was paid by the Florida Hurricane Catastrophe Fund the same year. For comparison, the Everglades Re 2015-1 issuance priced at 5.15%, while Willis Towers Watson Securities Index estimated that US wind-exposed cat bonds were pricing at approximately 5.8% during Q4 2014 (Trading Risk, 2017: 13). In this context, much of the ILS capital provided cover for higher loss, lower probability scenarios – scenarios which have thus far exceeded the losses generated by a major hurricane like Irma (2017).

This calculus likely underestimates the total flow of premium from Citizens policyholders to ILS markets. It is likely that a portion of the premium which initially flowed to non-ILS funds during the first round of the Citizens risk transfer program was ultimately ceded to an ILS fund or other alternative risk capital vehicle, through retrocession. Because publicly traded retrocession-based ILS products tend to be a blend of risks across geographies and initial cedent, it is difficult to precisely estimate how much of the 2015 Citizens premium may have ultimately ended up in ILS markets, above and beyond the initial \$201.5 million.

Over the same period, the Florida Hurricane Catastrophe Fund also became a direct participant in reinsurance markets. In 2015, the Cat Fund received State of Florida authorization to pursue up to \$2.2 billion of private reinsurance placement, with the intent of similarly reducing its reliance on post-event assessments (Artemis, 2015a).

Name	Domicile ¹	Premium Ceded ¹	Total Limit ²
American Standard Ins. Co. of Wisconsin	US-WI	\$845,527	\$15,000,000
Everest Reinsurance Company	US-DE	\$563,685	\$10,000,000
Swiss Reinsurance America Corporation	US-NY	\$11,273,700	\$200,000,000
ACE Tempest Reinsurance Ltd.	BMU	\$563,685	\$10,000,000
AlphaCat Reinsurance Ltd.	BMU	\$1,747,423	\$31,000,000
Amlin AG, Switzerland, Bermuda Branch	BMU	\$422,764	\$7,500,000
Arch Reinsurance	BMU	\$2,818,425	\$50,000,000
Argo Re Ltd.	BMU	\$563,685	\$10,000,000
Collateralised Re Ltd.	BMU	\$4,227,637	\$75,000,000
DaVinci Reinsurance Ltd.	BMU	\$4,932,244	\$87,500,000
Hiscox Insurance Company (Bermuda) Ltd.	BMU	\$845,527	\$15,000,000
Markel Bermuda Ltd.	BMU	\$563,685	\$10,000,000
Renaissance Reinsurance, Ltd.	BMU	\$14,796,731	\$262,500,000
Validus Reinsurance, Ltd.	BMU	\$2,339,293	\$41,500,000
XL Re Ltd.	BMU	\$422,764	\$7,500,000
Lloyd's Syndicate Number 33 - Hiscox	GBR	\$281,842	\$5,000,000
Lloyd's Syndicate Number 609 - Atrium	GBR	\$84,553	\$1,500,000
Lloyd's Syndicate Number 727 - SA Meacock	GBR	\$84,553	\$1,500,000
Lloyd's Syndicate Number 0958 - Canopus	GBR	\$157,832	\$2,800,000
Lloyd's Syndicate Number 1274 - Antares	GBR	\$84,553	\$1,500,000
Lloyd's Syndicate Number 1458 - RenRe	GBR	\$1,409,212	\$25,000,000
Lloyd's Syndicate Number 1910 - Ariel	GBR	\$563,685	\$10,000,000
Lloyd's Syndicate Number 2001 - Amlin	GBR	\$1,268,291.00	\$22,500,000
Nautical Mgmt / Syndicate 2357 - Nephila	GBR	\$2,818,425	\$50,000,000
Lloyd's Syndicate Number 2791 - MAP	GBR	\$422,764	\$7,500,000
Lloyd's Syndicate Number 4444 - Canopus	GBR	\$631,327	\$11,200,000
Satec srl/New Reinsurance Company Ltd.	CHE	\$84,553	\$1,500,000
Taiping Reinsurance Company Ltd.	HKG	\$422,764	\$7,500,000
Korean Reinsurance Company	KOR	\$563,685	\$10,000,000
Sompo Japan Nipponkoa Insurance Inc.	JPN	\$563,685	\$10,000,000
	Totals:	\$56,368,498	\$1,000,000,000

Figure 4.6: Florida Hurricane Catastrophe Fund Reinsurance Program, 2015. Sources: 1 - Internal schedule provided to author by Florida State Board of Administration, 2 - Artemis (2015b)

Through a public records request made to the Florida State Board of Administration, I was able to secure access to a pricing schedule for the Cat Fund's 2015 program. Figure 4.6 gives a snapshot of the reinsurance firms that provided coverage, including their domicile, of the total Florida homeowners insurance premium ceded by the Cat Fund, and the total limit (of coverage) provided by each participating firm. Ultimately, a \$1 billion program was secured for 2015 in exchange for \$56.4 million of policyholder premium dollars collected through every primary Florida insurers, including Citizens. Up to a quarter of this limit was provided through three major ILS funds -- AlphaCat Managers, LGBT ILS Partners, and Nephila Capital -- and the Bermuda-based reinsurer DaVinci Re (Artemis, 2015b).

Figure 4.6 highlights the four ILS and alternative risk capital-backed segments of the Cat Fund reinsurance program (Artemis, 2015b). These four funds provided \$243.5, or nearly one quarter, of the Cat Fund's initial program, which was nearly double the average global reinsurance market share penetration of ILS in the sector.

Collectively, Citizens and the Cat Fund thus directly ceded no less than \$215 million of Florida policyholder premiums to ILS markets, as part of their historic and growing use of private risk capital more generally. Millions more of this premium would ultimately flow to ILS through retrocession. This direct market participation made the State of Florida one of the single largest institutional participants in the ILS market, giving the latter a critical channel through which to access Florida residential risk.

4.3.3. Sourcing Florida Risk, Part Two: Indirect Measures

The direct participation of Citizens and the Cat Fund in the private reinsurance markets from 2011 onward speaks to only one part of the ways in which the State of Florida has facilitated the rise of ILS in the Florida context. Beyond this direct role, the State of Florida has indirectly sourced residential risk for ILS by increasingly privatizing the residential portfolio of

Citizens. The residential 'specialist' insurers which assumed risk from Citizens emerged as key players in a new Florida market which was more deeply reliant on external reinsurance than before (Medders et al, 2013), and emerged as key users of ILS capital. This indirect, two-step route constitutes a critical way in which the State of Florida has facilitated the entry of ILS into the Florida's residential market.

Since 2011, Citizens has been required by State law to offer private insurers the opportunity to select their choice of policies from their book of business, as part of a process called "depopulation". These private insurers, known as "take out" companies, have at times also been given subsidies for agreeing to remove policies. The largest of the so-called "take out insurers," Heritage Property and Casualty, assumed more than 251,000 policies from Citizens between January 1, 2012 and May 31, 2015 (Gilway, 2015: 2), for which the firm received \$52 million from the State to take 60,000 of those policies in 2013 (Dunkelberger, 2013). Over that same horizon, a net of roughly 1.2 million Florida homeowners insurance Citizens policies were assumed by 27 take out insurers over multiple rounds of depopulation (Gilway, 2015: 2).

Depopulation helped to reduce the exposure of Citizens in the South Florida counties of Miami-Dade, Monroe, Broward, and Palm Beach, which had long been areas of asymmetrically high Citizens market activity. Whereas approximately one quarter of the State of Florida's residential policies were concentrated in those four counties at the end of 2015, just over half of the policies on the Citizens books were in South Florida, according to FOIR quarterly market data.

In 2011, Citizens held \$250.77 billion of insured value on its books, of which \$133.82 billion was in South Florida. The average South Florida policy had a total insured value of \$385,887. By comparison, Citizens held \$91.95 billion in total exposure, and \$41.32 billion in South Florida, in 2015. The average South Florida policy was worth \$335,861. Over this five

year window, Citizens removed 424,231 policies, and in doing so saw its total insured value thus drop by 63.3%. Yet their South Florida exposure dropped by 69.1%, and the average policy value dropped by more than \$51,000, or 13% (author's calculations).

Over the same period, the market-wide insured value outstanding in South Florida also dropped, but by only 2.3%. South Florida remained a higher value insurance sub-market, with the average market-wide policy in the four county region worth roughly \$42,000, or 8.9%, more than the Florida state average. The South Florida region was also more at risk to hurricanes, and thus saw higher hurricane risk rates charged on all policies through the Florida Hurricane Catastrophe Fund¹⁵. For example, in Miami Dade County, 79 zip codes were assigned Cat Fund ratings in 2017, all of which were rated above the state average (Florida Hurricane Catastrophe Fund, 2017). The single *least* risky zip code in the county -- 33016 (Hialeah) -- was assigned a territorial classification of 11, in which policyholders are charged a rate equal to 141.6% of the state average all else equal, for example (ibid; author's calculations). The county was also home to the two *most* risky zip codes in the state -- 33149 (Key Biscayne) and 33109 (Fisher Island) -- the latter which is also the richest zip code in the nation (Loudenback, 2018), and which would pay roughly five times the state average per \$1,000 of exposure if they were to buy property insurance. In short, the Citizens depopulation was particularly effective at removing South Florida's higher value, higher risk policies from the program and onto private insurer books.

The depopulation program also deepened a broader pattern of market restructuring in Florida's post-Andrew (1992) homeowners market, whereby large national insurers with Florida subsidiaries were replaced by relatively small, independent Florida "specialist" firms that overwhelmingly write only Florida homeowners policies (Florida Catastrophic Storm Risk

¹⁵ The relative cost of hurricane wind insurance can be seen at the zip code level using data from the actuarial ratemaking report of the Florida Hurricane Catastrophe Fund (Cat Fund) -- see Chapter 3, Section 3 for more information on Cat Fund data.

Management Center, 2013; Fitch Ratings, 2016). Analysis of the 2015 financial statements of the 27 take out firms show that, as a group, they wrote \$4.6 billion of insurance, of which 92% was in Florida and 80% of which was classified as belonging to a homeowners line of business. Together, the firms comprised roughly 40% of Florida's 2015 homeowners insurance market (Fitch Ratings, 2016; author's calculations), and when included with the other Florida specialists wrote more than 60% of the market (Gilway, 2015: 1). While there were significant variations in the underwriting patterns, size, and structure of the firms, 22 of the 27 firms wrote essentially all of their business in Florida (author's calculations; see Chapter 5 for more analysis of these case firms).

The high concentration of risk within the portfolios of a handful of relatively undiversified Florida-domiciled insurance firms is qualitatively distinct from the broader US property catastrophe landscape (Medders et al, 2013: 192). These insurers "conducting homeowners business independently in Florida are either highly sensitive to reinsurance rate volatility, highly sensitive to one large loss event (or several smaller loss events occurring within the same year), or both" (Medders et al, 2013: 191-192). Not only do these firms retain a relatively miniscule surplus (essentially, their own cash reserve) (ibid: 193), they are more reliant on the ebbs and flows of reinsurance market conditions to manage their solvency. The Florida State policy goal to increase the share of private underwriting in the market by transferring risks from Citizens to homeowners specialists deepened this asymmetry by putting more than \$320 billion of new property exposure on the books of the specialists (Gilway, 2015: 4; author's calculations).

In 2015, 53 cents of every premium dollar earned by the 27 take out firms was ceded to reinsurers (author's calculations, drawn from each firm's 2015 financial statement Schedule F, Part 3 disclosure). For five of the firms, over 80% of the policyholder premium earned was transferred to reinsurance firms. Several take out firms assumed policies from Citizens only to pass through all or a majority of the risk to reinsurers and ILS funds. The ratings agency

A.M. Best notes how “the opportunity for immediate growth via a take out afforded companies the opportunity to capitalize on highly favorable reinsurance market conditions” (Artemis, 2015c). For example, the take out firm Weston Insurance Company was explicitly established to remove wind-only policies from the Citizens’ high risk coastal account, and to pass every premium dollar earned to reinsurance markets (Interview D-6, Artemis, 2013).

Although I analyze the reinsurance programs of the take out insurers in extended detail in Chapter 5, there are a few features that are worth mentioning here. 26 of the 27 take out insurers ceded at least some risk to a known ILS platform in 2015, and eight insurers operated a “captive” ILS capital-backed reinsurance facility like Citizens’ Everglades Re platform (author’s calculations).

Figure 4.7 captures a general overview of the take out firms and their reinsurance programs, including the number of reinsurance partners they reported contracts with in 2015, whether or not known ILS capital-backed reinsurers participated in their risk transfer programs, and whether or not the take out insurer operated their own platform (“captive”) to directly access investor collateralized reinsurance capacity. The count of ILS fund participation is almost surely a low estimate, given the use of private (off-market) collateralized reinsurance and retrocession, according to which the take out insurer’s reinsurer may in turn reinsure (“retrocede”) risk to ILS capital-backed firms.

I find that no less than \$329.3 million of policyholder premiums went from the take out insurers to ILS platforms in 2015, enough to purchase in the ballpark of \$5.49 billion to \$6.58 billion of protection depending on the precise cost and application of the capital, assuming a rate on line between 6% and 5%, respectively. Figure 4.8 highlights the top risk capital institutional sponsors of take out insurer cover, drawing on take out insurer financial statements and other industry data.

Take Out Insurer	2015 Direct Premiums Written	2015 Premiums Ceded to Reinsurers			
		Premiums	Partners	ILS Fund?*	ILS Captive?
American Colonial Insurance Co	\$8,701,699	\$1,673,509	33		
American Integrity Ins. Co of FL	\$246,190,860	\$137,789,212	54	x	
Anchor P&C Insurance Co	\$69,966,184	\$15,985,457	22	x	
Avatar P&C Insurance Co	\$30,084,723	\$15,985,457	25	x	
Capitol Preferred Insurance Co	\$73,817,384	\$61,923,199	47	x	
Cypress P&C Insurance Co	\$88,176,131	\$26,335,587	50	x	
Elements Property Insurance Co	\$59,888,361	\$28,547,688	14	x	
First Community Insurance Co	\$142,358,441	\$96,295,546	46	x	
Florida Peninsula Insurance Co	\$261,685,076	\$146,308,938	41	x	
Heritage P&C Insurance Co	\$591,462,141	\$199,734,515	33	x	x
Homeowners Choice P&C Ins. Co	\$400,441,562	\$184,625,551	40	x	
Mount Beacon Insurance Co	\$62,855,844	\$35,134,825	19	x	
Olympus Insurance Co	\$145,927,415	\$169,545,883	32	x	
Prepared Insurance Co	\$70,676,816	\$28,267,318	27	x	
Safe Harbor Insurance Co	\$67,711,852	\$17,739,741	31	x	
Safepoint Insurance Co	\$115,237,984	\$73,529,510	31	x	x
Security First Insurance Co	\$302,948,556	\$161,303,511	42	x	
Southern Fidelity Insurance Co	\$155,519,797	\$48,585,429	50	x	
Southern Fidelity P&C Inc	\$92,622,381	\$29,272,622	47	x	
Southern Oak Insurance Co	\$105,112,207	\$37,045,900	52	x	x
Tower Hill Preferred Insurance Co	\$166,866,537	\$137,054,986	46	x	x
Tower Hill Prime Insurance Co	\$249,473,637	\$208,682,522	55	x	x
Tower Hill Select Insurance Co	\$121,930,763	\$98,378,606	47	x	x
Tower Hill Signature Insurance Co	\$156,728,392	\$113,781,280	46	x	x
United P&C Insurance Co	\$555,389,280	\$185,454,203	49	x	x
Universal Ins. Co of N. America	\$133,648,700	\$80,814,464	40	x	
Weston Insurance Co	\$113,986,002	\$113,263,338	48	x	
	\$4,589,408,725	\$2,453,058,797			

Figure 4.7. Florida Take Out Insurers: Premiums, Reinsurance, and ILS, 2015. Source: 2015 Take Out Insurer Financial Statements; Author's Calculations

ILS Platform	Institutional Sponsor	Domicile	Premiums Assumed	Take Out Cedents
Third Point Re	Third Point Invest Mgmt	Bermuda	\$66,365,000	9
Aeolus Re	Aeolus Capital Mgmt	Bermuda	\$61,742,000	6
DaVinci Re	Renaissance Re Hld	Bermuda	\$35,149,000	23
Poseidon Re	Nephila Capital	Bermuda	\$35,080,000	9
Citrus Re	Heritage Insurance Hld	Bermuda	\$28,895,000	1
Elementum Re	Elementum Advisors	Bermuda	\$28,568,000	2
Greenlight Re	Greenlight Capital	Cayman Is.	\$21,550,000	4
Lloyd's 2357	Nephila Capital	UK	\$12,436,000	1
Securis Re	Securis Invest. Partners	Bermuda	\$9,629,000	4
Horseshoe Re	Horseshoe Group	Bermuda	\$8,364,000	4

Figure 4.8. Top ILS Platforms used by Take Out Insurers, 2015. Source: 2015 Take Out Insurer Financial Statements; Author's Calculations

It is important to recognize that the relationships between individual take out insurers and reinsurers and ILS funds varied significantly across the cohort. This variability is a key part of the story of ILS in Florida, and its use as a 'fix' in relationship to specific insurer business models, risk transfer practices, and close executive leadership ties between Florida insurers and global reinsurers. I return to this story in Chapter 5.

To conclude, these take out firms were only able to remove policies from Citizens insofar as they could secure access to reinsurance and ILS markets -- and the former could only access Florida risk insofar as the State of Florida facilitated the making of the specialist insurers through the Citizens privatization. In this respect, the depopulation program was a second key way in which the State of Florida sourced risk for reinsurance markets. The success of the depopulation measure has even enabled Citizens to reduce its direct spend on reinsurance in recent years, arguably representing an opportunistic two-step process of market-making public policies. Now that the State has enabled the rise of a private specialist class in the primary market, these firms form a crucial bridge between Florida residential policyholders and ILS.

Even in 2017, Citizens remained deeply connected to reinsurance and ILS markets. While ILS capital represented roughly 15% of the overall global reinsurance market capacity in 2017 (Aon Benfield, 2018), 42% of the 2017 Citizens reinsurance program's capacity came from ILS capital-backed sources, equal to \$419 million alone (Artemis, 2017). This included a \$238 million stake from the largest ILS fund (ibid).

Collectively, this two-step represented a significant redistribution of capital -- and hurricane risk -- from Florida's public and private insurers to global reinsurers and ILS investors. Together, Citizens and the take out insurers sent just shy of \$3 billion of premium, in the latter case overwhelmingly sourced from Florida homeowners, to reinsurers in 2015, enough to secure tens of billions of protection against hurricanes (author's calculations). The Cat Fund also ceded \$56 million to reinsurers in 2015, in exchange for \$1 billion of cover. When the total amount of premiums ceded by Citizens, the Cat Fund, and the 27 specialists to known ILS funds is compiled, it equals upwards of \$544 million.

4.3.4. Securing Florida Risk

Against the State of Florida's myriad efforts to stage and source risk for private (re)insurance market circulation in recent years, the State also - and ultimately - acts as a backstop for Florida risk in the event of a market failure in the private (re)insurance market. In this section, I examine the various ways in which State of Florida's insurance institutions stand ready to stabilize the market, should a new crisis emerge, and discuss how they might resolve one potential crisis: that of the future reliability of ILS-based risk capital.

As the public insurance institution that handles the outstanding business of the Florida's insolvent insurers, the Florida Insurance Guarantee Association (FIGA) is the clearest such

backstop. FIGA pays out policyholder claims in the event of a private insurer insolvency, once all other sources of reinsurance have been exhausted (Streukens, 2011; Medders and Nichols, 2017). Membership in FIGA is mandatory for all companies writing policies in the state. FIGA was created in 1970 with the statutory authority to levy assessments on all Florida policyholders to pay claims that arise after an insurer insolvency (up to \$650 million), and above and beyond which it is authorized to raise post-event bonds through a related entity called the Florida Insurance Assistance Interlocal Agency (Florida Insurance Guaranty Association, 2018). In 2006, for example, FIGA was authorized by the courts to issue \$750 million in post-loss bonds on behalf of Leon County (ibid). Between 2004 and mid-2011, FIGA alone processed 78,215 policyholder claims worth \$1.76 billion after 22 private insurer insolvencies (Streukens, 2011: 7).

The Cat Fund is also designed to be a backstop for the reinsurance market, in the event of a post-disaster hike in catastrophe reinsurance pricing. For now, it appears that the downward reinsurance pricing pressure created by the expansion of ILS capital will insulate Florida's insurers from catastrophe reinsurance price hikes, arguably diminishing the importance of the Cat Fund. For example, the ratings agency A.M. Best (2017) estimates that the industry would need to see \$75 billion of losses to see a major change in price conditions, equal to roughly three times the projected U.S. property insurance losses from Hurricane Irma. Nevertheless, the Cat Fund remains should the availability of investment capital for reinsurance ultimately diminish significantly.

Finally, Citizens acts as a backstop for Florida's "voluntary" market. One stock market analyst, commenting on Florida's publicly-traded homeowners specialists, noted that up to 40% of the take out policies transferred out of Citizens during an earlier era of depopulation from 2007-2011 were ultimately returned to the State's insurer, after five insurers declared insolvency, at a taxpayer loss of up to \$400 million (RH Analytics, 2014). Citizens can perhaps be best understood as an "accordion," in the words of one of its senior financial

executives, which changes shape according to dynamics in the market, and which stands always ready to absorb both the highest risk and the lowest return segments of the market (Interview D-13).

Addressing the failure of earlier depopulation participants at the 2015 Florida Insurance Summit, Florida Insurance Commissioner Kevin McCarty responded that “(t)his is America. Companies do fail.” The role of the State, he argued, was to ensure the flow of private risk capital to the Florida market was encouraged through sound regulatory intervention (McCarty, 2015). McCarty did not convey the importance of the State’s backstopping function in his remarks, through which the ultimate risk of private capital’s failure in the Florida market must -- and long has been -- ultimately secured by the public.

In the past, unexpectedly high loss events and high post-disaster reinsurance costs have been the major drivers of crisis and restructuring in the Florida residential context (Section 4.2). The rise of ILS capital and ILS-related technologies (like the widespread adoption of catastrophe risk modeling) ostensibly resolves these crises, helping to visualize (and better price) high loss, low probability low events and by attracting capital specifically to this kind of loss event. As Johnson (2015) argues, this fix works only insofar as the availability of alternative risk capital continues to grow. Johnson therefore poses a critical question: What if a financial market crisis, independent of climate risks or internal catastrophe reinsurance market dynamics, disrupts the flow of capital to the ILS trade?

While it is beyond the scope of this analysis to speculate about the extent to which disruptions in the flow alternative risk capital are a threat to the stability of this real estate risk fix, it is clear that the State of Florida’s institutions remain poised to absorb any primary market insolvencies which may result in such an event. What is clear from this analysis, and that which follows in Chapter 5, is that the ways in which Florida’s specialist insurers rely on ILS and reinsurance varies according to their business models. In some instances, specialist

firms act as 'fronts' for reinsurers and risk capital providers (and, in at least one case, cede essentially every premium dollar written to external risk capital providers), rather than traditional insurers which retain a large share of the risks they write. These firms appear to be most closely dependent on reinsurance market conditions, and are exceptionally exposed to South Florida residential property in particular. If external risk capital costs increase, and these unique specialists are unable to compensate by increasing rates on the South Florida policies which they asymmetrically write (due to State regulatory limits on rate increases), this insurer model could be more vulnerable to crisis than others, and therefore may point to a market segment where the State of Florida will likely be required to step in.

4.4. Conclusions

State of Florida public policies and insurance institution interventions have played a constitutive role in the development of ILS, and its asymmetrical investment in Florida's residential insurance market in particular. In this chapter, I demonstrated why and how the State of Florida has facilitated the growth of ILS as a public policy 'fix' for Florida's crisis-prone insurance market, as part of a project of more broadly securing the state's risky real estate development industry. I argue that the state of Florida cultivated the rise of this risk capital market to offset seemingly-intractable tensions within the Florida residential market, between consumer affordability and private insurer profitability

I identified three patterns through which the State of Florida has constituted ILS markets, by staging, sourcing, and securing risk. I show how the State *stages risk* through various performative exercises and market-making measures, which codify the expanded use of reinsurance by Florida's primary 'specialist' insurers as good market practice. Equally, the State sources hundreds of millions of dollars of insured risk for ILS annually. It does so in

two key ways: as a direct and pioneering user of ILS, and through programs like the Citizens depopulation, which seed a captive private specialist insurer market that is reliant on third party risk capital. Finally, the state secures risk by maintaining a public guarantor to socialize the prospect of a private insurer default, enabling more 'innovative' private insurer risk capital models.

This analysis demonstrates the decisive role of the state in the making of the Florida market for ILS. Not only has this story been empirically absent from mainstream (re)insurance studies, it also offers an alternative way of seeing the state, as a constitutive force rather than obstacle to 'actuarially sound' private market practice. In doing so, it highlights the ways in which public policies make certain forms of climate risk more or less marketizable, often in close conjunction with private capital. Indeed, much of the risk which the state has ceded to the specialists was hitherto considered 'residual' or unmarketable.

This analysis also points to the selective and at times highly entrepreneurial presence of the State of Florida in engineering fixes for Florida's property catastrophe conundrum, the interventionist appearance of which is striking in the context of the limited resources which have been made available to plan and finance physical risk reduction efforts. Indeed, throughout my formative interviews with Florida urban elites, the absence of State of Florida support (financial, technical, or otherwise) for climate change adaptation planning was a recurring theme. The selective presence and absence of the State of Florida provides a context for understanding how and why insurance has become so vital to Florida cities seeking to manage climate risks, a topic to which I return in Chapter 6. It also helps to contextualize how Florida residential insurers and their risk capital providers have been granted access to a structural market for insurance cover through selective practices of statecraft -- and how the State facilitates the functional, if extractive risk capital market practices constituted thereby. In Chapter 5, I examine how a particular subset of Florida insurers -- the specialists -- form a crucial bridge between the state's residential

policyholders and risk capital markets, enabling substantial financial market value to be appropriated from Florida real estate climate risk.

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5. The Real Estate Risk Fix as (Re)Insurance Market Logic

5.1. Introduction

ILS markets provide a functional, if extractive risk capital fix for Florida's high value, high risk residential insurance market. In this chapter, I show how this aspect of the real estate risk fix is constituted through the underwriting and risk transfer practices of Florida's 'specialist' insurers, and their interface with global reinsurers and third party risk capital providers. The former rely upon external risk capital to write high concentrations of real estate exposure for upwards of half of the Florida residential market, while the latter leverage the specialists to source a large share of the risk which underpins a lucrative accumulation strategy built around securitization.

In Section 5.2, I conduct a case study of the underwriting and risk transfer practices of 28 Florida specialist insurers. Through an analysis of insurer financial statements, regulatory examination reports, and public (re)insurance industry data, I demonstrate how the specialists play a clear, material role in constituting ILS and risk capital markets through their underwriting and risk transfer programs. I find that the specialists cede half of every premium dollar they earned in 2015, or \$2.95 billion, from Florida policyholders to 164 reinsurers and ILS funds operating across 35 distinct territorial sites, ranging from Bermuda to Qatar. I find that at least 26 ILS funds and special purpose entities assumed \$529.56 million of this premium for securitization or other forms of third party capital collateralization -- sufficient to secure between \$8 and 10 billion of property catastrophe cover for the specialists, and equal to the nearly one third of global ILS issuance that year.

Beyond this novel cartography of risk transfer, I also examine how and why each specialist positioned itself in relation to risk capital markets through a nine factor analysis. From direct

ownership links to reinsurers and risk capital institutions, to leadership connections and new business models which target high risk residential underwriting, I uncover a plurality of pathways, means, and mechanisms which animate how and why the specialists partnered with risk capital markets.

In relationship to the real estate risk fix, these findings illuminate the good, bad, and ugly facets of ILS as a risk capital 'fix'. The results validate the pro-risk capital thesis that expanded reinsurance and risk capital access fixes crisis-prone markets by enabling private underwriting to absorb more risk, including that which has hitherto been relegated to the state's residual insurers. Yet the results can also be read as a sign that certain specialists (and their risk capital providers) are working in concert -- and with direct and indirect public subsidies -- to explicitly target relatively high risk Florida policies for growth. This validates Johnson's (2015) hypothesis that capital market conditions may be pushing (re)insurers to write increasingly risky business in order to source 'raw' risks for the market, as a fix for a crisis of overaccumulation.

The language of contingency provides a third way to understand the asymmetrical entanglement between the specialists and risk capital markets. In Section 5.3, I argue that risk capital markets are able to secure market rule by bringing unique market-making devices to bear on these contingencies. Leverage over four devices -- the specialist insurers, catastrophe risk models, offshore special purpose entities, and the use of subsidiarization -- enable risk capital markets to transfigure Florida real estate risk from amorphous fixity into an idealized state of financial market liquidity. Through this process, risk capital institutions appropriate substantial value from risk.

Insofar as this fix is functional in that it pairs risk with capital, I contend that it is also inherently extractive: it does little to fundamentally mitigate the underlying material risk against which it is constituted, and it deepens asymmetrical processes of inter-urban

accumulation by moving value from a market hinterland to a market core, to the (re)insurance command and control nodes of London, New York, and beyond (Section 5.3.2). This analysis moves critical insurance scholarship towards a greater empirical understanding of the urban origins and workings of risk capital markets, while also posing critical questions about how value-from-risk is constructed and circulated to asymmetrical urban-geographical ends.

5.2. Bridging Risk with Capital: The Florida Specialists and Risk Capital Markets

5.2.1. Introducing the Specialists

Florida's 'specialist' insurers write a large part of the Florida residential insurance market, and act as a crucial institutional bridge between property and risk capital markets. Whereas national insurers spread their exposure to catastrophe risks over larger portfolios of business, the Florida specialists almost exclusively write policies within the state's residential market -- hence their name. As such, they are unable to diversify and 'de-risk' their portfolios against the prospect of a large-scale loss event, like a major hurricane landfall, without access to reinsurance.

The specialist firms emerged through processes of crisis, intervention, and innovation in the Florida market following Hurricane Andrew (see Chapter 4, Section 2). The post-Andrew era saw large national insurers and their subsidiaries give way to independent specialist insurers as the largest firms in Florida's residential business (Fitch Ratings, 2016; Medders et al, 2013). The specialists became 'fixing' institutions in the Florida market with significant state assistance (e.g. the Citizens depopulation), as part of a new market order which has sought to attract private underwriting to the state in recent years (see Chapter 4, Section 3).

Yet the specialists' concentration of Florida exposure can leave these firms uniquely vulnerable to major loss events, and in turn highly dependent on external risk capital to ensure their solvency (Medders et al, 2013). The specialist dilemma illuminates an inherent geographical limit within the Florida insurance market: How can underwriters reliably and profitably absorb growing, high value, and highly concentrated risks?

This geographical limit represented a market opportunity for risk capital providers, which developed the capacity to marketize and diffuse catastrophe risk through ILS and other reinsurance products (see Chapter 4, Section 2). One 'fix' -- that which seeks to deconcentrate the portfolios of the Florida specialists -- furnishes a second fix, which seeks to anchor footloose capital to risk. This dual risk fix is not without tensions. As alternative risk capital has suppressed traditional reinsurance margins and rates in recent years, reinsurers have increasingly sought to assume control of the entire risk transfer 'supply chain,' up to and including command over the origination of risk in primary insurance underwriting. In extreme scenarios, this could generate logics of 'underwriting to securitize' reminiscent of the mortgage securitization crisis, should securitization become the primary profit motive of (re)insurer business decisions.

The Florida specialists and their underwriting and risk transfer practices provide critical insight into this risk capital fix and its tensions. The specialists play a vital role in contributing to -- and benefiting from -- this risk capital fix, not least because they are among the most prominent and regular users of ILS products like catastrophe bonds. To understand this two-way processes in critical detail, I conducted a forensic financial analysis of a case of 28 specialist insurer financial statements, with a focus on their underwriting and reinsurance practices in 2015. I also examined State of Florida examination reports on their financial health, interviews with (re)insurers, and (re)insurance grey literature and media analysis, in order to the understand the contexts and drivers of Florida market for ILS and the specialists

in particular. Figure 5.1 introduces the 28 case firms and the key data about the composition of their underwriting in 2015, which was heavily concentrated in Florida residential business.

The 28 firms wrote \$5.81 billion in premiums, of which 94.3% was drawn from Florida and 78.7% covered residential policies, according to their 2015 statutory financial statements (Figure 5.1). Within Florida, the firms wrote 2.88 million residential policies, or 48% of the residential policies outstanding statewide at the end of 2015. Their policyholders paid \$5.03 billion in premiums in 2015, equal to 50.1% of the Florida residential (non-flood) market, against \$931.80 billion of property exposure. These firms include the state-owned Citizens and the 27 private specialists which assumed risk from Citizens between 2011 and 2015 through a process known as ‘depopulation’ (see Chapter 4.3 for more on Citizens, depopulation, and ILS).

Primary Insurer	Direct Premium Written (2015) ¹	Florida DPW (%) ¹	Residential DPW (\$) ²
American Colonial Ins Co	\$8,701,699	99.4%	87.5%
American Integrity Ins Co of FL	\$246,190,860	100.0%	68.6%
Anchor P&C Insurance Co	\$69,966,184	100.0%	73.2%
Avatar P&C Insurance Co	\$30,084,723	100.0%	100.0%
Capitol Preferred Insurance Co	\$73,817,384	75.1%	60.7%
Citizens Property Insurance Co	\$1,267,754,200	94.3%	78.7%
Cypress P&C Insurance Co	\$88,176,131	100.0%	77.4%
Elements Property Ins. Co	\$59,888,361	100.0%	68.4%
First Community Insurance Co	\$142,358,441	81.1%	47.1%
Florida Peninsula Insurance Co	\$261,685,076	100.0%	100.0%
Heritage P&C Insurance Co	\$591,462,141	100.0%	69.2%
Homeowners Choice P&C Insurance Co	\$400,441,562	100.0%	90.6%
Mount Beacon Insurance Co	\$62,855,844	100.0%	100.0%
Olympus Insurance Co	\$145,927,415	100.0%	85.8%
Prepared Insurance Co	\$70,676,816	100.0%	92.2%
Safe Harbor Insurance Co	\$67,711,852	99.9%	82.4%

Safepoint Insurance Co	\$115,237,984	98.7%	57.5%
Security First Insurance Co	\$302,948,556	100.0%	81.3%
Southern Fidelity Insurance Co	\$155,519,797	60.3%	65.9%
Southern Fidelity P&C Inc	\$92,622,381	100.0%	71.8%
Southern Oak Insurance Co	\$105,112,207	100.0%	72.4%
Tower Hill Preferred Ins, Co	\$166,866,537	100.0%	77.8%
Tower Hill Prime Insurance Co	\$249,473,637	100.0%	85.2%
Tower Hill Select Insurance Co	\$121,930,763	100.0%	99.6%
Tower Hill Signature Ins. Co	\$156,728,392	100.0%	82.7%
United P&C Insurance Co	\$555,389,280	61.2%	87.5%
Universal Insurance Co of North America	\$133,648,700	63.8%	80.0%
Weston Insurance Co	\$113,986,002	100.0%	100.0%
Average	\$209,184,390	94.1%	80.1%
Sum	\$5,811,454,756		

Figure 5.1: Florida Specialist Insurers: Total Premiums Written and other key underwriting characteristics, 2015. Source: 2015 insurer statutory filings, compiled from Underwriting and Investment Exhibit: Part 1B and Schedule T: Exhibit of Premiums Written, Allocated by States and Territories)

It is important to recognize that Citizens is distinct from the private insurers in critical ways. As I demonstrated in Chapter 4 it is state-run and has unique post-loss finance capacities which make it subject to unique ‘extra-market’ forces and non-financial considerations, including direct political oversight through state legislative bodies. As Figure 5.1 shows, it is also more than seven times larger than the average private specialist. Yet as I also argued in Chapter 4, Citizens and its privatization affords a critical site for seeing how ILS has emerged at a residential market segment which has historically proven crisis-prone. Recall that the depopulation program saw private specialists enter into an agreement with the State of Florida to assume residential risk from Citizens, segments of which were hitherto considered too unprofitable for private insurers to write. The story of ILS is in part a story of how the mutually constitutive boundary between Florida’s ‘voluntary’ (private) and ‘residual’ (public) market has shifted in relation to risk capital market conditions, and how these shifts have changed how, why, and above all *where* private capital sources risk against property.

5.2.2. How the Specialists Use Reinsurance and ILS

I found that the specialists played an important role in originating risk for reinsurers, and for ILS underwriters in particular. In 2015, the case firms ceded 50 cents of every policyholder premium earned, or \$2.95 billion, to risk capital markets, to manage their uniquely concentrated exposure to Florida catastrophe risk. Figure 5.2 represents a composite of 28 distinct portraits of the underwriting and risk transfer activities of each specialist firm, which I compiled using statutory filings from 2015.

The percent of DPW column (3A) refers to the share of all premium written which a given insurer ceded to reinsurers expressed as a percent of their DPW. For example, American Colonial reported that they ceded \$1,673,509, or 19 cents of every premium dollar earned to reinsurers, while Weston ceded \$113,263,338, or essentially every dollar earned.

The partners column (3B) refers to the number of reinsurance entities which were named as recipients of premium by each specialist on Schedule F, Part 3 of their filings. On average, each specialist relied on 40 reinsurers for risk capital. The number of reinsurance partners varied across the firms, however. For example, Elements named only 14 reinsurance partners, while Tower Hill Prime listed 55 distinct reinsurers.

Collectively, the specialists named 164 distinct reinsurance entities distributed across 1,078 specialist-reinsurer relations, not including reported relationships where \$10,000 or less was ceded. These reinsurance entities were registered in 36 insurance jurisdictions, which include overseas nations and U.S. states, the latter which are treated as separate insurance markets akin to a foreign state. Bermuda was by far the largest destination for Florida specialist premiums, and captured 36.4% (or \$1.018 billion) of this flow across 376 relationships with 52 reinsurers.

1. Specialist Insurer	2. 2015 Direct Premium Written	3. 2015 Reinsurance	
		A. Percent of DPW	B. Partners
American Colonial Insurance Co	\$8,701,699	19.23%	33
American Integrity Insurance Co of FL	\$246,190,860	55.97%	54
Anchor P&C Insurance Co	\$69,966,184	22.85%	22
Avatar P&C Insurance Co	\$30,084,723	28.39%	25
Capitol Preferred Insurance Co	\$73,817,384	83.89%	47
Citizens Property Insurance Co	\$1,267,754,200	40.04%	51
Cypress P&C Insurance Co	\$88,176,131	29.87%	50
Elements Property Insurance Co	\$59,888,361	47.67%	14
First Community Insurance Co	\$142,358,441	67.64%	46
Florida Peninsula Insurance Co	\$261,685,076	55.91%	41
Heritage P&C Insurance Co	\$591,462,141	33.77%	33
Homeowners Choice P&C Insurance Co	\$400,441,562	46.11%	40
Mount Beacon Insurance Co	\$62,855,844	55.90%	19
Olympus Insurance Co	\$145,927,415	116.19%	32
Prepared Insurance Co	\$70,676,816	40.00%	27
Safe Harbor Insurance Co	\$67,711,852	26.20%	31
Safepoint Insurance Co	\$115,237,984	63.81%	31
Security First Insurance Co	\$302,948,556	53.24%	42
Southern Fidelity Insurance Co	\$155,519,797	31.24%	50
Southern Fidelity P&C Inc	\$92,622,381	31.60%	47
Southern Oak Insurance Co	\$105,112,207	35.24%	52
Tower Hill Preferred Insurance Co	\$166,866,537	82.13%	46
Tower Hill Prime Insurance Co	\$249,473,637	83.65%	55
Tower Hill Select Insurance Co	\$121,930,763	80.68%	47
Tower Hill Signature Insurance Co	\$156,728,392	72.60%	46
United P&C Insurance Co	\$555,389,280	33.39%	49
Universal Insurance Co of North America	\$133,648,700	60.47%	40
Weston Insurance Co	\$113,986,002	99.37%	48
Sums	\$5,743,176,923	50.42%	134
Averages	\$209,184,390	53.47%	40

Figure 5.2. The Florida Specialists' Reinsurers, 2015. Source: 2015 insurer statutory filings, compiled from Schedule F, Part 3: Ceded Reinsurance disclosures.

Other reinsurance destinations which received over \$100 million of specialist premiums included Delaware (11.4% of premiums ceded to 7 reinsurers), which is a common location for financial company registration given favorable tax and regulatory requirements, along with traditional centers of reinsurance market power including the UK (7.5% of premiums to 41 reinsurers, largely operating through the Lloyd's of London syndicate system), Switzerland (5.6% of premiums to 9 reinsurers), New York (5.1% of premiums to 7 reinsurers), and the tax haven of the Cayman Islands (3.9% of premiums to 10 reinsurers).

In many cases, several reinsurance entities were subsidiaries of one holding company. For example, the German reinsurance giant Allianz assumed \$125,540,000, or 4.4% of all the case firm's 2015 premiums ceded, through at least four distinct entities: Allianz Global Corporate & Specialist SE (Germany), Allianz Risk Transfer (Switzerland), Allianz Risk Transfer (Bermuda), and Allianz Global Risks Reinsurance Co. (Germany). I examine the use of subsidiarization in more detail in section 5.4. Notably, the single largest reinsurer remained the state-run Florida Hurricane Catastrophe Fund, which assumed \$619.07 million (or about 20%) of all premium, in part due to state laws which mandate that each Florida insurer participate in the fund (see Chapter 4).

This splintering risk transfer architecture is an artefact of how insurer risks are mobilized and placed with reinsurers. Each specialist worked with a reinsurance broker and other intermediaries to strategically distribute their risk between internal accounts (i.e. statutory minimum surplus) and external risk transfer partners.¹⁶ Insurers contract reinsurance brokers to place segments of their risk with external capital providers, including ILS investors.

¹⁶ Depending on the parameters of their risk management program, insurers allocate premiums in three general ways: for retention (as in a minimum surplus, defined by legal solvency requirements), investment (to generate returns for the firm), or risk transfer (to external reinsurers, which also assume the financial liability which corresponds to the premium). One premium allocation decision informs others: ceding risk can lower surplus requirements and free an insurer to write more business, for example.

The spring reinsurance renewal season is a key juncture in this process, during which primary insurers take 'roadshows' to reinsurance centers like New York and London to meet with capital providers (Interview D-11). During the renewals process, insurers and their brokers create a bespoke reinsurance program comprised of layered tranches of exposure which ascend from the lowest probable losses to the highest, given the scope and horizon of the insurer's risk management decisions. Brokers match insurer risks with disparate sources of capital using a range of reinsurance instruments, which vary in term from a few months to a few years, cover highly specific loss scenarios, and employ different types of loss triggers. The placement process is a synthetic and iterative one, which entails extensive risk modeling and quantification exercises, but also long standing personal relationships with room for individual judgement (Interviews D-11, D-13; Jarzabkowski et al, 2015). By the end of the annual reinsurance process, the risk transfer programs of each firm resembles a quilt work of reinsurance instruments, splintered by size, cover, and capital source.

Figure 5.3 provides an example of the 2015 reinsurance program for a first event loss scenario for one of the specialists, the Tampa-based Heritage Property and Casualty, derived from their SEC 10-K filings for 2015. As losses grow (or rise up the reinsurance 'tower'), different layers of reinsurance protection may be triggered. This visualization simplifies the program into five types of capital. The orange represents Heritage's retention: up to \$9 million of losses. After \$9 million of losses, external reinsurance would be triggered, including cover from Osprey Re (purple) and Citrus Re (grey), both of which are captive reinsurers and the latter which is backed by ILS capital, along with cover from the Florida Hurricane Catastrophe Fund (green) and 29 other reinsurers (blue).

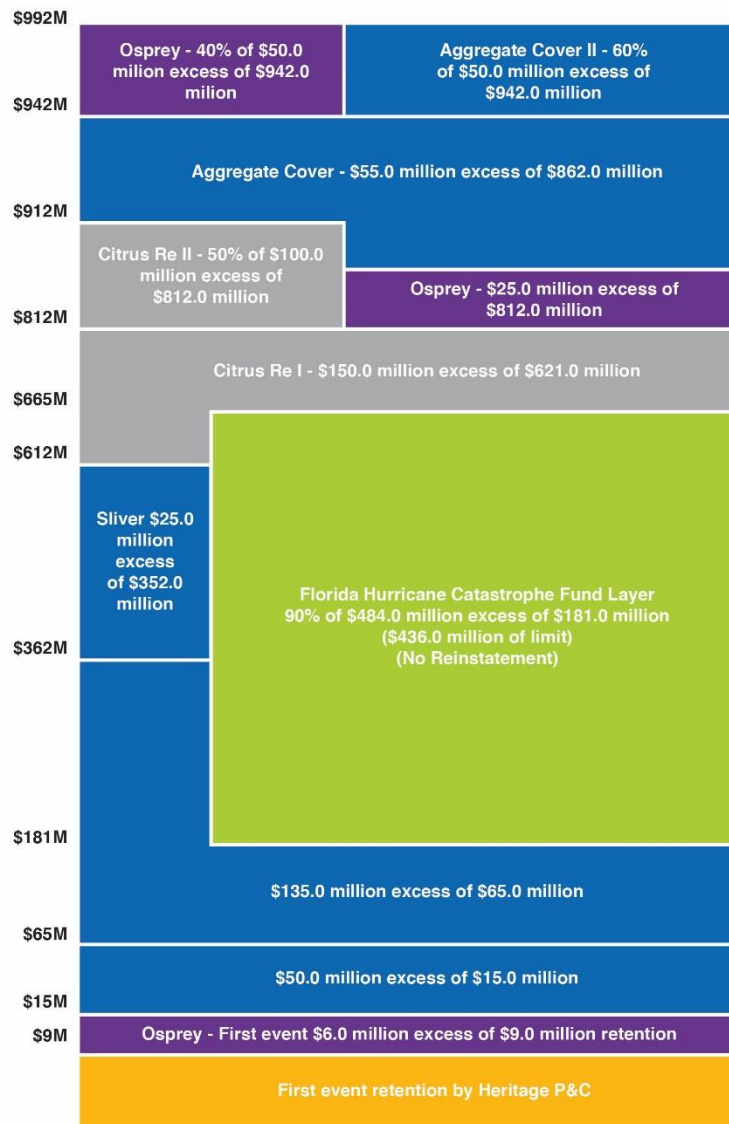


Figure 5.3. Example of a Reinsurance Program: 2015 Heritage First Event. Source: Heritage Property & Casualty Company SEC 10-K.

I calculate that no less than \$529.56 million of the total specialist premium ceded in 2015 went to specialist platforms for securitization or other forms of third party risk capital collateralization. As I explain below, this estimate underestimates the full extent to which specialist premium dollars went to ILS markets for securitization. Nevertheless, I estimate

that this sum alone was enough to secure between \$8 billion and \$10 billion of cover for the specialists in 2015, or an amount equal to roughly one third of the total estimated outstanding ILS issuance of \$25.96 billion in 2015.¹⁷

Figure 5.4 provides an overview of the top ten ILS platforms, their institutional sponsor, the total premiums assumed as reported in each specialist insurer's Schedule F filing, and the number of specialists which ceded premium to each platform. Column 2 includes two catastrophe bond issuing platforms controlled by Florida specialists -- Everglades Re (Citizens) and Citrus RE (Heritage), and two associated with traditional reinsurance institutions -- Lloyds of London (Syndicate 2357, on behalf of Nephila Capital) and Allianz Risk Transfer (again working in partnership with Nephila Capital). Notably, Nephila Capital accessed Florida specialist premiums through at least three distinct institutional platforms. Bermuda was by far the largest base of registry for the ILS platforms used by Florida specialists (column 3). Finally, column 4 highlights the number of specialists which ceded premiums to each sponsor, including wholly-controlled 'captives' with one cedent (e.g. Everglades Re) and multi-partner platforms like Nephila Capital Poseidon Re.

My estimate doubtless underrepresents the full extent to which Florida specialist premium dollars flowed to ILS markets for capital market consumption. My estimate likely does not fully account for hybrid risk transfer strategies like that represented by the Allianz-Nephila relationship noted in the discussion of Figure 5.4 above, in part due to ambiguities in the reporting language used by the specialists, and in part due to a lack of secondary data against which to validate my own categorization. Such partnerships are one means through which 'traditional' reinsurers leverage ILS-based instruments to raise and place risk capital, and this nuance can be lost in the reporting tables provided by insurer financial filings.

¹⁷ To calculate this, I assume a rate-on-line near the 5.8% average recorded on the Willis Capital Markets Issuance tracker on the online Artemis ILS Database. The total cover can be roughly surmised by multiplying the premium ceded by the rate-on-line.

1. ILS Platform	2. Institutional Sponsor	3. Domicile of Platform	4. Premiums Assumed (Millions), 2015	4. Specialist Cedents
Everglades Re	Citizens Property Ins Co	Bermuda	\$160,192	1
Third Point Re	Third Point Investment Mgmt	Bermuda	\$66.365	9
Aeolus Re	Aeolus Capital Management	Bermuda	\$61,742	6
Poseidon Re	Nephila Capital	Bermuda	\$44,497	11
DaVinci Re	RenaissanceRe Holdings	Bermuda	\$35,149	23
Citrus Re	Heritage Insurance Holdings	Bermuda	\$28,895	1
Elementum Re	Elementum Advisors	Bermuda	\$28,568	2
Greenlight Re	Greenlight Capital	Cayman Is	\$21,550	4
Lloyd's Syn. 2357	Nephila Capital	UK	\$21,511	1
Allianz Risk Transfer	Nephila Capital	Bermuda	\$9,998	3
		Others	\$149,808	
		Sums	\$561,976	

Figure 5.4. Top Specialist ILS Platforms and other Key Data, 2015. Source: Source: 2015 insurer statutory filings, compiled from Schedule F, Part 3: Ceded Reinsurance disclosures; plus additional secondary analysis through ILS industry databases, reports, and fund prospectuses.

Moreover, and by extension, my estimate does not include retrocession (reinsurance for reinsurers), which is a significant basis of ILS market activity yet difficult to quantify and link to specific firms and their underwriting geographies given that ILS-based retrocession instruments contain risk which may be sourced by several reinsurers from a variety of insurers and perils. In other words, retrocession contains risk no less than twice removed from the initial policyholder. Using the Artemis Deal Database, I noted at least 17 retrocession bonds outstanding in 2015 which were likely to include at least some Florida hurricane risk, and which may have included risk assumed from Florida specialist, and in turn retroceded by the reinsurer to investors (Figure 5.5).

Catastrophe Bond	Issuer	Cover (Millions)	Named Perils	Term
Queen Street XI Re Ltd (2015; IRL)	Munich Re	\$100	US Hurricane (3 seasons), Australian Cyclone (4 seasons)	3-4 hurricane seasons
Kilimanjaro Re Ltd (2015-1; BMU)	Everest Re	\$625	U.S., Canada, Puerto Rico, D.C. names storm and earthquake	4 years
Queen Street X Re (2015)	Munich Re	\$100	US Hurricane (3 seasons), Australian Cyclone (4 seasons) - includes Florida named storm	3-4 seasons
Atlas IX Capital Limited (Series 2015-1)	SCOR Group	\$150	U.S. named storm, U.S. and Canada earthquake	4 years
Galileo Re Ltd. (Series 2015-1)	Catlin	\$300	U.S. named storms, U.S. earthquake, Canada earthquake, European windstorm	3 years
Tradewynd Re Ltd. (Series 2014-1)	AIG	\$500	U.S., Canada, Mexico, Caribbean, Gulf of Mexico, D.C. named storms. U.S., Canada, Mexico, Caribbean, D.C. earthquakes	1-3 years
Tramline Re II Ltd. (Series 2014-1)	Amlin AG	\$200	U.S. named storm, U.S. earthquake, European windstorm	4 years
Kilimanjaro Re Ltd. (Series 2014-1)	Everest Re	\$450	U.S. named storms, U.S. earthquakes	4 years
Queen Street IX Re Ltd.	Munich Re	\$100	U.S. hurricane, Australia cyclone	3-4 years
Loma Reinsurance (Bermuda) Ltd. (Series 2013-1)	Argo Group	\$172	Tropical cyclones, U.S. earthquake, U.S. severe thunderstorm	4 years
Tradewynd Re Ltd. (Series 2013-2)	AIG	\$400	U.S., Caribbean, Gulf of Mexico named storms. U.S., Canada earthquake	1-3 years
Galileo Re Ltd. (Series 2013-1)	Catlin	\$300	U.S. named storms, U.S. earthquake, Canada earthquake, European windstorm	3 years
Northshore Re Limited (Series 2013-1)	AXIS Capital Holdings	\$200	U.S. hurricane, U.S. earthquake	3 years
Mona Lisa Re Ltd. (Series 2013-2)	Renaissance Re and DaVinci Re	\$150	U.S. and Puerto Rico named storms. U.S. earthquakes	4 years
Mythen Re Ltd. (Series 2013-1)	Swiss Re	\$100	U.S. hurricane	2 years
Queen Street VIII Re Ltd.	Munich Re	\$75	U.S. hurricane, Australia cyclone	3 years
Sunshine Re Ltd. (Series 2013-1)	FL Muni.Ins Trust	\$20	Florida hurricanes	3 years
	Sum:	\$3,942		

Figure 5.5. ILS Retrocession Bonds with US Hurricane and Other Exposures, 2015. Source: Artemis Deal Directory

Finally, my estimate does not capture private third party risk capital placements facilitated by reinsurers and ILS funds domiciled in favorable jurisdictions like Bermuda, where such transactions are not required to be disclosed. As I discuss further in section 5.4, private placements are increasingly the choice route for pairing risk with capital for more focused and strategic purposes, because they are generally less cost-intensive than catastrophe bond issuances and can be tailored more precisely to the needs of the issuer and investor.

To summarize, this analysis shows the magnitude to which the case specialists ceded premiums to reinsurers, with the case firms leveraging an average of 40 reinsurance partners based across a variety of insurance jurisdictions to 'de-risk' their portfolio. It also demonstrates the critical role the specialists play in feeding risk to ILS, such that up to one third of all 2015 ILS issuance may have originated from these firms and their Florida policyholders. The analysis also reveals that the entanglements between the specialists and risk capital markets varied widely, however. Why were certain specialists much more likely to leverage ILS and reinsurance relative to their peers?

5.2.3. Why the Specialists Use Reinsurance and ILS

The differentiated entanglements between Florida specialists and risk capital markets informed a second round analysis, through which I examined core features of each specialist's business strategy and their uses of reinsurance. I constructed a portrait of each specialist around nine factors which could explain why the case firms -- individually and collectively -- partnered with risk capital markets. These included five factors related to underwriting strategies (Figure 5.6) and four factors related to the firm's business strategy and operations (Figure 5.7).

Factor	Question(s)	Key Indicator(s)	Data Source(s)
1. Size of Specialist Firm	Did larger firms procure more reinsurance than smaller firms?	(A) Total direct premium written in 2015 vs (B) Percentage of total premium written ceded to reinsurers	2015 Insurer Financial Statements: Underwriting and Investment Exhibit: Part 1B; Schedule F, Part 3: Ceded Reinsurance
2. Degree of Specialization of Business Line	Did firms with a greater degree of specialization in homeowners lines purchase more reinsurance?	(A) Homeowners lines, as measured as a percent of total direct premium written vs (B) Percentage of total premium written ceded to reinsurers	2015 Insurer Financial Statements: Underwriting and Investment Exhibit: Part 1B; Schedule F, Part 3: Ceded Reinsurance
3. Degree of Specialization in South Florida Risk	Did firms with higher levels of exposure to high risk South Florida ((Monroe, Miami-Dade, Broward, and Palm Beach counties) policies purchase more reinsurance?	(A) South Florida exposure as a percentage of total insured value vs (B) Percentage of total premium written ceded to reinsurers	Q4 2015 Market Share Report data for each firm and for South Florida counties, compiled from the Florida Office of Insurance Regulation
4. Reliance on Depopulation to Grow Business	Did firms which relied more on depopulation to grow their business also purchase more reinsurance?	(A) The ratio between the specialist's (i) policies outstanding in the baseline quarter before their first removal and (ii) the total number of depopulation policies authorized over 2011-15 vs (B) Percentage of total premium written ceded to reinsurers	Citizens Takeout Authorization Consent Forms and depopulation program summary data provided by the Florida Office of Insurance Regulation
5. Reliance on High Risk Coastal Account to Grow Business	Did firms which targeted the high risk Coastal Account for depopulation to grow their business also purchase more reinsurance?	(A) CA policies as a percent of all depopulation authorizations vs (B) Percentage of total premium written ceded to reinsurers	Citizens Takeout Authorization Consent Forms and depopulation program summary data provided by the Florida Office of Insurance Regulation

Figure 5.6. Underwriting Factors as Potential Drivers of Risk Capital Market Participation. Source: Author

For the first set of factors, I was able to identify a few broad patterns. The specialists with a larger underwriting footprint (factor 1) generally used more reinsurance and ILS. The 14 smaller specialists sent an average of 47.5% of their direct written premium to reinsurers, whereas the 14 larger specialists sent 59.5% of their premium. Smaller specialists ceded premium to an average 2.86 ILS platforms,¹⁸ while larger specialists ceded premium to an average of 4.79 ILS platforms. These results fall in line with expectations, as larger

¹⁸ By ILS platform, I refer to the full list of funds identified in Figure 5.4; this categorization underestimates the full depth and breadth of ILS participation. Combined with the limited sample size, this limits the extent to which these numbers verify a pattern.

specialists are likely to find economies of scale when procuring reinsurance. In the case of ILS, and catastrophe bond issuances in particular, transactional costs (like structuring and rating a bond) mean that larger issuances will be more cost effective as a reinsurance strategy. Without scale, it may be that smaller firms find it more cost effective to rely upon more traditional sources of risk transfer, or on smaller off-book third party-collateralized arrangements.

Factor	Question(s)	Key Indicator(s)	Data Source(s)
6. Depopulation as Business Basis	Was the specialist established to expressly to assume policies from Citizens?	(A) Year firm was established and (B) primary underwriting focus at time of start-up	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; supplemented with industry media analysis
7. Leadership Ties to Citizens	Did the specialist's executive leadership team or board include individuals with past ties to Citizens?	(A) Presence of ex-Citizens executives on specialist team	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; supplemented with industry media analysis
8. Leadership Ties to Reinsurers and ILS Funds	Did the specialist's executive leadership team or board include individuals with current or past ties to reinsurers and ILS specialists?	(A) Presence of reinsurance executives on specialist team, or (B) Specialist leadership with prior experience in reinsurance/ILS	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; supplemented with industry media analysis
9. Reinsurer Ownership Stakes	Does/did a reinsurer hold an ownership or investment stake in the specialist? Is there evidence that this ownership stake influenced the specialist's business strategy or risk transfer decisions?	(A) Presence of reinsurer as owner of firm	Florida Office of Insurance Regulation Financial Examination Reports for each insurer; AM Best public ownership records for each specialist and its owners/subsidiaries; supplemented with industry media analysis

Figure 5.7. Business Strategy and Operational Factors as Potential Drivers of Risk Capital Market Participation. Source: Author

The specialists with higher degrees of specialization in homeowners lines (factor 2) also appeared to rely more on external risk transfer. For the 13 firms for which residential lines comprised less than 80% of their business, the average percent of premium ceded to reinsurers was 49.7%. For the 15 firms which wrote more than 80% of their business as residential risk, the percent of premiums ceded to reinsurers was 56.7%. Similarly, the

former firms partnered with an average of 3.23 ILS platforms, while the latter specialists partnered with an average of 4.33 such firms. This differential ratio of risk capital market participation persisted even when the comparative threshold was shifted to residential rates of 85% and 90%, even as the overall average rates of participation increased. This finding is also expected, given that more specialized underwriters by definition do not have the ability to manage their exposure to loss events through a diversified book of business. Without the ability to diversify, more specialized firms would in theory expect to face relatively higher losses than a less specialized peer, all else equal, and would thus be more reliant on external risk capital to de-risk their business.

There was no apparent distinction in the use of reinsurance for the insurers which focused their underwriting in South Florida counties at above average rates, relative to those which wrote at below average rates (factor 3), nor was there a clear pattern of difference between those which relied more on depopulation to grow at a higher rate relative to their peers (factor 4). However, the insurers which targeted Coastal Account policies for depopulation at a rate above the group average (factor 5) ceded 61% of their premium to reinsurers, versus 47% for those which targeted Coastal Account policies at a below-average rate. Following the commentary on factor 2, this is expected: higher degrees of specialization in high risk underwriting is likely to yield a greater reliance on external risk capital.

I conducted a Pearson correlation to test the extent to which these initial observations were statistically significant by assessing the five underwriting factors against the each specialist's use of reinsurance. Figure 5.8 summarizes the outputs of this analysis.

Although the r scores suggest some (albeit weak) correlations between factors and the rate of reinsurance use, the high p scores suggest that there is no statistically significant relationship between them. Combined with the limited sample size of 27 insurers, these results point to limits to drawing decisive conclusions about the relationship between these

five underwriting factors and the use of reinsurance by each specialist using these factors and form of analysis.

Underwriting Factor	R Score	P Score
1 - Overall Size	-0.0328	0.874
2 - Concentration of Homeowners Business	0.0776	0.700
3 - Concentration of South Florida Business	-0.1464	0.467
4 - Depopulation Growth Ratio	0.1224	0.543
5 - Targeting Coastal Account	0.1945	0.331

Figure 5.8. Results of Correlation Test of Relationships between Specialist Underwriting Factors and Use of Reinsurance. Source: Author's calculations

Findings from the qualitative analysis of the second set of factors complemented these quantitative observations. I found that 15 of the 27 private specialists were established as new insurers or restructured from existing insurers in order to assume policies from Citizens (factor 6). The median year in which these firms of these 15 firms initiated (or restarted) writing business was 2012. They ranged from the smallest specialist (American Colonial) to the largest (Heritage), and collectively wrote \$2.36 billion of premium in 2015. Although they ceded \$1.80 billion to reinsurers, or 45.8% of their business, the reinsurance spend within the cohort ranged from 19.2% (American Colonial) to roughly 100% of their premium earned (Weston).

Three specialists (Anchor, Elements, and Southern Oak) counted former Citizens Governors or executive leaders among their teams (factor 7). Relative to their size and to their peers, two of these three specialists had highly ambitious plans to grow their underwriting through depopulation. Anchor was authorized to remove 188,000 policies from Citizens during its first year of operation (2015), while Elements was authorized to assume 175,000 policies in its first two years of operation (2013-15). The third, Southern Oak, was established in 2004 to assume policies during an earlier round of Citizens depopulation, during which it registered

consistent losses and was required to be restructured by the State of Florida. By 2010, Southern Oak was authorized to resume depopulation, and between 2011 and 2015 was authorized to remove 302,500 policies. Although beyond the immediate scope of this discussion, a fourth specialist, Heritage, also drew notable public attention for receiving nearly \$30 million in additional subsidies from Citizens to assume up to 60,000 Citizens policies in a November 2013 transaction, shortly after the firm made a \$110,000 donation to the governor's 2014 reelection campaign and following a contentious partisan vote by the Citizens board (Ribbens, 2015). These four firms collectively wrote \$826.38 million in direct business in 2015. This finding suggests that, for a significant segment of the specialist market, relationships with the public insurer's leadership may have played a key role in facilitating their growth through depopulation, which in turn made possible their participation in reinsurance markets.

Five of the specialists' executive leadership teams or boards included individuals with current or past ties to reinsurers and ILS specialists (factor 8). One specialist, Cypress, was purchased in 2014 from a Texas-domiciled insurer and restructured to capitalize on the Citizens depopulation program. It was led by three executives who previously held senior management positions at 8 reinsurers, including a role as the Chief Underwriting Officer at Aeolus Capital -- one of the oldest Bermuda-based ILS funds with \$3 billion of assets under management.¹⁹

A second specialist, Elements, had ties to three reinsurers, including two -- Arch Capital Group and Axis Capital -- which each controlled billion-dollar ILS funds in Bermuda. Until 2016, the CEO of a third specialist -- Mount Beacon -- was formerly with Marsh Securities and Swiss Re, which are the second and third largest ILS brokers,²⁰ while the Chief

¹⁹ According to the Artemis *Insurance Linked Securities (ILS) Managers & Funds Directory*, accessed on 13 August 2018.

²⁰ According to the Artemis *Catastrophe bond and ILS issuance banks & brokers leaderboard*, accessed on 13 August 2018.

Financial Officer of the ILS fund Aeolus Capital was on the insurer's board. A fourth specialist, Safepoint, was established under a CEO who previously served as Executive Director of Global Property Underwriting and Chief Actuary at Flagstone Re, prior to which he held senior positions at three other larger reinsurers.

A fifth specialist, Weston, was also established and run by the former Assistant Vice President of US Underwriting for RenaissanceRe; he also held a role on the RenaissanceRe Ventures team, and previously worked for large industry firms including Hannover Re and QBE. RenaissanceRe is among the largest reinsurers of Florida hurricane risk and operates one of the oldest and largest Bermuda-based ILS funds with more than \$3.6 billion of assets under management.²¹ Weston's Chief Financial Officer was previously in the same role for a RenaissanceRe subsidiary, while the specialist's Chief Underwriting Officer joined the firm after serving as President of Sirius Capital Management, a Bermuda ILS manager, among several other industry ties.

Six of the specialists were partially owned or received investment from reinsurers and ILS funds (factor 9), including both Elements and Safepoint. Figure 5.9 provides an overview of these investments.

Through personal leadership ties, interlocking directorships, and direct ownership stakes, individuals and institutions with unique knowledge about both Citizens (factor 7) and reinsurance underwriting and ILS (factors 8 and 9) played a key role in constituting the specialists as a bridge between Florida's residential trade and risk capital markets. Jarzabkowski et al (2015) note that the reinsurance industry is an intimate and intensely relationship-oriented one, with personal relationships and revolving experience between firms both appearing as common features of the market, and that such embodied expertise

²¹ See note 3.

and interpersonal trust is critical to distributing large-scale risk between firms. This interpersonal infrastructure helped create the conditions in which the specialists could rely upon, or at times were even structured to create, risk capital placement opportunities with reinsurers.

Specialist Insurer	Reinsurance Owners/Investors
Elements Property Insurance Co	As of 2014, Elements Property Insurance Holdings was partly owned by two reinsurers - AXIS Group (41.6%) and Arch Reinsurance Company (14.6%). RenaissanceRe Ventures was also an initial debt investor in the company.
Safepoint Insurance Co	Nephila Capital, the largest ILS fund, was an initial investor in the company.
Security First Insurance Co	As of 2013, 10% of Security First Insurance Holdings LLC was held by Mount Whitney Holdings, which is a subsidiary of Everest Re.
Tower Hill Prime Ins Co	As of 2013, RenaissanceRe Ventures held a 29% stake in Tower Hill Holdings, and was also the prior owner of Tower Hill Prime.
Tower Hill Select Ins Co	Tower Hill Select was also controlled by Tower Hill Holdings.
Tower Hill Signature Ins Co	As of 2013, RenaissanceRe Ventures held a 25% stake in Tower Hill Signature Insurance Holdings.

Figure 5.9. Specialist Insurers with Reinsurance Owners and Investors. Source: Florida Office of Insurance Regulation Examination Reports for each insurer; secondary media analysis

In several cases, these leadership and ownership connections could be clearly linked to the business strategies and reinsurance purchasing decisions of specialists. For example, Everest Re held an ownership stake in Security First, and was also the specialist's largest private reinsurer. In the case of Elements, partial owners Axis Capital and Arch Re assumed \$4.90 million and \$1.88 million of premium in 2015, respectively, while former investor RenaissanceRe took \$2.82 million. Together, these three reinsurers assumed \$9.64 million from Elements, equal to 46.8% of the firm's total private reinsurance spend that year. These kinds of relationships suggest that reinsurers may be leveraging their control over (or close ties with) specialists in order to more directly access their choice of risks. This finding is consistent with both Johnson's (2015) broader thesis and industry perspectives (Montross, 20156) which contend that declining rates of return in the sector are fueling market

innovations which bypass intermediation and position risk capital 'closer' to the source of risk to control margins.

Further to this observation, I found that several specialists were expressly created by reinsurers to leverage depopulation as a way to channel risks to risk capital markets. This was most apparent in the case of Weston, which targeted high risk hurricane wind-only policies from the Citizens Coastal Account, and ceded essentially all policyholder premium to reinsurers, in exchange for commissions from latter. Tower Hill Prime also funneled risk from Citizens to risk capital markets, ceding all premium earned through at least one Citizens depopulation to captive reinsurance platforms in the Bermuda and the Cayman Islands. Orange Grove Re, the Bermuda captive, was established as the same type of special purpose entity used by ILS managers to raise third party risk capital. Although it did not begin to participate in depopulation until 2016, after the focus period of this study, an insurer called State National assumed policies from Citizens solely on behalf of Nephila Capital, the largest ILS fund, as part of a fronting arrangement, likely as a way to source 'raw' risk for securitization.

These examples provide the first empirical substantiation of Johnson's (2015) argument that reinsurers may be "underwriting to securitize", which raises more questions than answers: Is this a sign of market triumph over the geographical limits of traditional catastrophe (re)insurance underwriting, or could this push mean that underwriting standards are being eroded, in ways which may generate a deeper risk capital market crisis down the line (in terms of higher industry losses, and/or a large-scale retreat of alternative risk capital)? Does this have implications for the coverage provided to specific places, or even specific properties and policyholders targeted thereby?

These questions are difficult, if not impossible, to answer without a large-scale market disruption as a test case. Hurricane Irma's South Florida landfall nearly provided such a test

in 2017, but a last minute change of course and loss of strength diverted the storm away from a once-in-a-generation Miami disaster. Initial expected US non-flood insured losses of 'only' \$25 billion pale in comparison to those which could have been many times higher (Insurance Journal, 2017), and AM Best estimates that Irma's landfall is far less than the \$75 billion disaster they believe would be necessary to significantly disrupt pricing conditions and underwriting dynamics in risk capital markets (AM Best, 2017).

Less than a year after landfall, and with claims still being processed and replacement risk capital still entering Florida, Irma appeared to have made a noticeable but not transformative change on ILS markets. The Eureka Hedge ILS Advisers Insurance Linked Securities Fund Index, which tracks the performance of ILS funds, dropped by 9.4% from an all-time high of 201 in August 2017 to 183 the following month, and has only partially recovered in the interim. In June 2018, Heritage extended the maturity on four tranches of outstanding Citrus Re catastrophe bond issuances worth up to \$262.5 million (Artemis, 2018), while a \$20 million tranche of Safepoint's Manatee Re (2016-1) issuance was also fully paid (Artemis, 2017b).

The results validate the pro-risk capital thesis that expanded reinsurance and risk capital access fixes crisis-prone markets by enabling private underwriting to absorb more risk, including that which has hitherto been relegated to the state's residual insurers. In the Irma context, ILS markets appear to have functioned as designed by paying out claims, and by enduring a significant loss event without major disruption to the cost and availability of capital.

Yet the results can also be read as a sign that certain specialists (and their risk capital providers) are working in concert -- and with direct and indirect public subsidies -- to explicitly target high risk Florida policies for growth. This substantiates Johnson's (2015) hypothesis that capital market conditions may be pushing (re)insurers to write increasingly

risky business in order to supply raw risks to the market, as a fix for a crisis of overaccumulation.

Contingencies	Examples
Insurer Firm Size	Direct premiums written by the private specialists firms varied from \$8.7 million on the small end to \$591.5 million on the large end. Larger firms may be more active ILS users and reinsurance market participants, perhaps because they have a sufficiently large basis of insured risk with which to justify the costs and benefits of large-scale risk transfer.
Insurer Portfolio of Business	Reinsurance may afford a way to 'de-risk' more concentrated portfolios for some insurers. Most case firms were overwhelmingly focused on Florida residential risk, although others had diversified to other states or lines of business. Some firms actively targeted growth in high risk South Florida policies through depopulation, while others reduced their regional exposure over the study horizon. Above and beyond depopulation alone, insurer underwriting patterns were shaped by factors including the income and credit-worthiness of applicants, the physical quality and construction of the given properties, the location and relative exposure of properties to particular perils (like wind), and the concentration of existing business in a territory. The material composition of each portfolio inform the extent to which firms required reinsurance, and will also be compared against their reinsurers' portfolios as the latter seek to balance the pairing of risk with capital.
Insurer Value Model	There were clear differences in the value models of insurers, which varied from traditional strategies which draw on returns from invested premium (the 'float'), to those which relied on fees from reinsurers derived by 'fronting' risk capital in the primary market. The more traditional American Colonial retained the majority of the risk it writes by sending 19% of direct premiums written to reinsurers, while Weston acted as a pass through between Florida and reinsurers, sending 99% of its earned premium.
Regulatory Constraints	As demonstrated in Chapter 4, the policyholder rates, risk modelling practices, risk retention (surplus) minimums, and reinsurance minimums required for each firm were subject to state-level regulations. Florida's regulatory landscape included programs which incentivized risk capital investment, but also those which added operational costs and uncertainties. For example, all private insurers are required to purchase reinsurance through the state's Hurricane Catastrophe Fund, and the state operated with the authority to levy policyholder assessments on all private firms in the event of a public or private insurer insolvency after a disaster.
Management Capacity	The ownership and executive management teams of the case firms varied significantly, with several counting reinsurers and ILS funds among their board or ownership. In some cases, the existing personal connections of the case firm's leadership were central to their business model.
Reinsurance Program Design	The reinsurance instruments the specialists used varied in design, liquidity, and cost. For example, reinsurance agreements can be treaty-based or facultative depending on the cedant's risk transfer goals. Moreover, the cost effectiveness of third party risk capital is further informed by the liquidity and duration of ILS products. Cat bonds circulate on a well-established secondary market for multi-year terms, while sidecars are targeted for specific short term applications. The former has high transactional costs, while other instruments like industry loss warranties rely on existing indices and are thus more affordable.
Reinsurance Jurisdictions and their Territorial Advantages	The territorial destination of Florida policyholder premiums depended in part on the specific geographical advantages afforded by specialist centers like Bermuda, where favorable tax and regulatory regimes enable reinsurers to carefully structure bespoke instruments - but also limit their tax obligations. At the same time, London, Zurich, New York and other traditional reinsurance destinations continued to play important command and control roles in this context; not only did these traditional centers often ultimately retain ownership control over special purpose reinsurers in jurisdictions like Bermuda, they also housed the brokers and intermediaries which structured transactions between case firms and risk capital investors.

Figure 5.10. Potential Contingencies which Inform Specialist Use of Risk Capital. Source: author's analysis

A third way of understanding this uneven entanglement is through the language of contingency. In Figure 5.10, I distill insights from the mapping exercise in Section 5.2 and factors analysis in this section into seven contingencies which capture the context in which each specialist negotiated their participation in risk capital markets.

In this analysis, I have demonstrated how the specialists play a crucial, material role in the making of ILS markets. Yet I also found no single one-size-fits-all answer to questions of how and why specialists participated in reinsurance and ILS markets, nor one which could conclusively confirm or counter a binary view of the risk fix. Instead, I identified a plurality of means and mechanisms -- from interpersonal connections to underwriting patterns, the use of specific risk transfer instruments to distinctive insurer business models -- which help explain how insured contingencies like a once-in-a-generation Miami hurricane are transformed into the basis for risk capital markets.

5.3. Functional, if Extractive: Risk Capital and the Territories of Market Rule

The prior section concluded with an open-ended tension: the specialists play a clear part in constituting ILS markets, yet do so through a plurality of contingent means and mechanisms. In this section, I reconcile this tension by critically mapping the territorial means and mechanisms which enable risk capital to enact market rule over contingency.

I identify and examine the interplay between four market-making devices and their territories, which enable financial markets to mobilize value from Florida real estate risk (Section 5.3.1). Insofar as this market architecture is functional in pairing risk with capital, I also contend that it is inherently extractive: it does little to fundamentally mitigate the underlying material risk against which it is constituted, and it deepens asymmetrical processes of inter-urban accumulation by moving value from one market hinterland to a market core, to the (re)insurance command and control nodes of London, New York, and beyond (Section

5.3.2). These findings raise critical questions about power and value, which are useful to deepening our understanding of the urban political economies of climate risk and resilience.

5.3.1. From Specialist Contingencies to Market Rule

In Section 5.2, I mapped the (re)insurance market architecture which extends through Florida's specialists, connecting millions of property owners with reinsurers and risk capital investors through a plurality of market mechanisms and means. In this section, I turn towards reinsurers and show how they mobilized financial value across this contingent architecture using four market-making devices.

Questions of contingency and calculation are at the heart of Johnson's (2013) analysis of catastrophe bonds and the technologies which enable their market existence. Johnson examines how "more-than-human phenomena" like major hurricanes are "produced as risks -- that is to say, how their contingencies are calculated, abstracted, and coaxed into circulation as financial instruments, which trade on contingent in an idealized and normative fashion (2013: 30). Johnson's analysis largely focuses on the use of catastrophe risk models as the key market-making device for transforming a range of insured contingencies into ILS. While I see catastrophe risk models as one key device, I find three additional devices which work in concert in the Florida context to transform real estate risk into a vector for financial market reward.

The first market-making device which reinsurers relied upon is the specialist firm itself. Through a mixture of direct ownership stakes, close personal ties, and business partnerships, reinsurers leverage the exceptional risk capital demands of the Florida specialists to originate business in an increasingly competitive business. The market window provided by depopulation afforded a means to transcend the existing geographical

boundaries of the Florida market, through which hitherto ‘trapped’ Florida risks could be de-concentrated and distributed across the market for consumption and circulation. Minimum solvency standards, rate controls, ‘actuarially unsound’ competition from public institutions, and other variables increasingly landed large segments of the Florida residential market on the books of the state’s residual insurers, where it was too unprofitable to write (Chapter 4, Section 2).

The rise of the specialists provided a critical point of entry to access the Florida market in a regulatory context where offshore investment funds are not able to directly write primary risk. Direct influence over a handful of specialists worked to solidify a new Florida market norm, where primary insurers increasingly served directly and indirectly as conduits for third party risk capital underwriting, securitization, and trade.

Second, catastrophe risk models enabled Florida’s primary insurers to construct underwriting portfolios around a new currency of risk.²² Such models simulated the consequences of thousands of hypothetical loss events (e.g. Florida hurricanes) through a proprietary synthesis of geospatial data on physical risks, engineering data on insured properties, and financial data specific to the insurer. This calculative practice enabled the contingent exposures of individual properties to be reconstituted as an aggregate, against which insurers synthesize bespoke risk management strategies.

At the same time that the State of Florida offered new insurers a range of subsidies to enter the market and assume risk from Citizens (see Chapter 4, Section 3), institutional expertise inherited from former Citizens leaders and from reinsurance industry veterans enabled the specialists to quickly and opportunistically construct and modulate portfolios with an eye towards external risk capital costs and availability. It is telling that the CEO of one specialist,

²² Chapter 2, Section 2.1 contextualizes the use of catastrophe risk models in greater detail.

Prepared, was led by a former senior director from the North American Strategic Opportunities Group at one of the largest catastrophe risk modeling firms, “where he focused on the use of catastrophe risk management tools to determine optimum uses of catastrophe modeling results for insurance, reinsurance, and reinsurance brokerage companies.”²³

Once aggregated, these primary insurers’ portfolios could in turn be disaggregated and distributed across a global network of reinsurers and risk capital providers. Reinsurers also used catastrophe risk models to construct and modulate their own portfolios of risk, and to arrive at pricing consensuses with other reinsurers and with external ILS investors. This process of territorial synthesis, decomposition, and re-combination became central to the market’s workings.

Third, a new offshore geography was engineered to facilitate the new forms of property catastrophe risk trade. Bermuda was by the far the most important of these geographies, emerging after Hurricane Andrew and developing in subsequent spurts as major reinsurance market disruptions -- including 9/11 and Hurricane Katrina -- created opportunities for new forms of arbitrage (Cummins, 2008), and providing a home to firms like RenaissanceRe, which was the single largest hurricane reinsurer (St. John, 2010). Unsurprisingly, my financial analysis found Bermuda to be the largest destination for Florida specialist policyholder premiums. In 2015, the 28 case firms sent \$1.05 billion-- or 36.4% of all their reinsurance spending -- to 52 distinct Bermuda-registered reinsurance entities, over 374 transactions.

Bermuda provided favorable regulatory and taxation conditions for reinsurers (and later, ILS funds), to design and develop risk capital instruments which afforded several benefits. Bermuda regulations enabled reinsurers to establish special purpose entities and other

²³ Derived from the Prepared website’s Leadership page, accessed on 14 August 2018

holding corporations, which functioned as segregated accounts for writing unique (and risky) reinsurance contracts. Segregation allowed reinsurers to manage one territorial limit to risk -- the concentration of risk in markets like Florida -- by delineating a new territorial container, one which offset the threat of contagion to broader lines of business.

Bermuda also enabled reinsurers to market bespoke instruments for collateralizing out-of-country insured risk with investor capital from across the world. This included 'off the shelf' products like catastrophe bonds, which could be cost effectively registered to special purpose companies, listed, and traded tax free on the Bermuda stock exchange, as well as more bespoke products which could remain off balance, including sidecars and industry loss warranties. Over time, these benefits gradually attracted hedge fund-style ILS specialists, which used their classification as offshore reinsurers to limit the tax burdens on returns earned for institutional investors (Seessel, 2001; Basak, 2017).

Both large global reinsurers and new ILS funds leveraged this geography of convenience as the basis for a fourth market-making device: subsidiarization, through which reinsurers leverage a global network of subsidiary firms and 'platforms' to maximize and control regulatory, tax, and product benefits. For example, Munich-based insurance giant Allianz assumed \$125.5 million of premium from the 28 specialists firms through four holding companies in Bermuda, Germany, and Switzerland, while the ILS specialist RenaissanceRe captured \$129.2 million through six entities registered to Bermuda, the UK's Lloyd's market, and Maryland.

This networked risk transfer architecture enabled reinsurers to assume multiple Florida positions simultaneously, such that no single firm was left with an exceptional exposure to a given insurer, loss event, or market segment. In 2015, no private reinsurer assumed more than 6.8% of the collective premium ceded by the 28 case firms, for example. Even after assuming this risk, reinsurers and ILS investors traded it once again as part of their own

portfolio management strategies through practices like retrocession and secondary market trades of catastrophe bonds.

Although retrocession is a highly opaque process, it is estimated that roughly 12% of non-life reinsurance premiums are ultimately ceded this way (European Systemic Risk Board, 2015), and that over half of all property catastrophe retrocession is provided by ILS (Artemis, 2016). ILS products also circulate on a secondary market, which registers roughly 200 quarterly transactions at approximately \$1 million each (Artemis, 2017a). In these ways, risk capital remained semi-liquid throughout the term of cover.

Through these four market-making devices -- the specialist firms, catastrophe risk models, offshore special purpose entities, and the use of subsidiarization -- risk capital institutions were able to transfigure Florida real estate risk from amorphous fixity into idealized and relative financial market liquidity. Yet these services came at a great expense: Fees associated with modeling, structuring, placing, and trading risk products comprise a core 'value mode' (Christophers, 2015; see Chapter 2, Section 2) through which the (re)insurance market can appropriate value from risk. For example, one senior financial officer at a case firm revealed to me that reinsurance brokers generally received a 10-15% 'finder's commission' from every participating reinsurer, of which each specialist averaged 40 (Interview D-14). Assuming a 10% flat commission, the reinsurer placement process from the case firms could have yielded upwards of \$295 million for brokers in 2015 alone, in what represents only one link in the risk transfer value chain.

5.3.2. Contradictions on the Urban Horizon

Insofar as this market architecture is functional in pairing risk with capital, it is also inherently extractive. Each year, Floridians spend more than \$10 billion on residential insurance

premiums, upwards of half of which flows to reinsurers and ILS investors where it is transfigured into a vector for financial institution accumulation. The value mobilized through this architecture returns only as a contingent promise to pay -- one which secures the workings of Florida's real dominated urban political economy yet does little to fundamentally mitigate the underlying material risk against which it is constituted.

This point reiterates a central tension throughout this thesis regarding the elusive public policy search for the 'ideal' balance between risk transfer and risk mitigation as climate risk finance mechanisms. The extent to which Floridians can afford to finance one of the largest risk transfer markets in the world without leveraging the value which is produced therein to reduce their material exposure to risk is a critical public policy question. As other forms of property-level finance are leveraged to finance climate risk management scenarios in Florida cities (as examined in Chapter 6), in ways could strain the resources of modest-income property owners, the state's already-existing insurance affordability concerns are only likely to become more pronounced. (Re)insurers will have to contend with the political consequences which may follow attempts to increase insurance rates to reflect more severe climate risk outlooks (as in the form of stronger hurricane wind events), which in the past have been major drivers of 'anti-market' public policy intervention (see Chapter 4).

This risk capital architecture also deepens asymmetrical processes of inter-urban accumulation in the context of a financialized economy. Financial markets comprise a growing share of the total economic activity in countries like the United States, are increasingly controlled in a handful of urban 'command and control centers', and now more than ever structure through accumulation through real estate-linked instruments (Sassen, 1992; see Chapter 2, Section 3). Risk capital markets furnish a 'fix' for the climate exposures of this architecture of accumulation, while also serving as a new vector for real estate-linked financialization. The inherently geographical workings of the market-making devices risk capital institutions use to construct market rule enable fees and other forms of value to be

mobilized and appropriated from a market hinterland -- Florida's residential cul-de-sacs -- to a market core comprised of (re)insurance command and control nodes including London and New York. The accrual of wealth through this architecture is intensely urban in origin and destination. The London Market Group, which lobbies on behalf of The City's reinsurers, thus articulates:

"The London Market now controls more than £60bn of annual premiums, employs 48,000 people and generates more than 20% of 'The City's' GDP and, in aggregate, over 8% of London's GDP. Almost all this takes place in a few blocks of the City of London within a five minute walk from the Lloyd's building" (London Market Group, 2014: 1).

Far more than a story of high net worth investors, tax dodgers, or wealthy City financiers, this architecture provides a functional service to millions of ordinary Florida homeowners. At the same time, pension and mutual funds representing thousands of working- and middle-class individuals represent a critical source of current -- and potential -- demand for ILS markets (Pensions Age, 2012; Johnson, 2015).

Recognizing these contradictions provides one step forward. Returning to the question of value -- and the construction, circulation, and appropriation of value, in particular -- provides a second. This cartography of value-from-risk provides a way conceptualize how risk capital markets operate internally, but also to begin to think about how they modify the relationships within and between places: London reinsurers may be exploiting risk in Florida, but they are also generating significant value for an urban economy, while at the same time enabling both highly speculatively and higher ordinary forms of finance-led accumulation.

Moving forward, it is important to think about how this market architecture produces and reproduces uneven geographies, while also posing questions about how the value-from-risk appropriated therein might be directed to a different, more productive and equitable ends within places-at-risk. To raise this question, it is important to first understand how insurance market practices interface with the city today, and to understand how these markets 'fix' (or

can potentially disrupt) key systems of urban reproduction, ranging from real estate lending to public finance and risk governance. It is to this ends that I turn to a case study of Miami in the chapter which follows.

5.4. Conclusions

In this chapter, I demonstrated how ILS markets provide a functional, if extractive risk capital fix for Florida's high value, high risk residential insurance market. I examined how this second aspect of the real estate risk fix is constituted through the underwriting and risk transfer practices of Florida's 'specialist' insurers, and their interactions with global reinsurers. This analysis provided detailed documentation of how and why the former rely upon external risk capital to write high concentrations of real estate exposure for upwards of half of the Florida residential market, while the latter leverage the specialists to source a large share of the risk which underpins a lucrative and global risk capital trade built around securitization.

Beyond demonstrating the material extent of the financial ties between the specialists and risk capital providers, I also showed how these firm-to-firm, risk-to-capital relationships are highly contingent on a variety of factors, ranging from underwriting and operational choices, to direct risk capital ownership stakes in the specialists and interlocking board membership. I argued that risk capital markets are able to secure market rule by bringing four market-making devices to bear on these contingencies. Such devices enable risk capital markets to transfigure Florida real estate risk from amorphous fixity into an idealized state of financial market liquidity, and to therefore appropriate substantial value from risk.

I therefore argued that insofar as the risk fix is functional, it is also extractive: it does little to fundamentally mitigate the underlying material risk against which it is constituted, and it

deepens asymmetrical processes of inter-urban accumulation by moving value from this market hinterland to a market core, to select (re)insurance command and control nodes. As such, the attempt to abstract risk (and extract value) from territorial never fully succeeds without generating new limits and potential crises.

In doing so, I have sought to move critical insurance studies towards a greater empirical understanding not only of the urban origins and territorial workings of this risk capital market, but also the urban outcomes of its redistributive logics. This sets the stage of Chapter 6, in which I turn to the Florida city as the object of analysis, in which I show how (re)insurance provides a real estate risk fix for processes of urban reproduction. The power, opportunities, and limits of how this fix can mobilize value-from-risk to more productive and equitable urban ends are central to the analysis which follows.

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6. The Real Estate Risk Fix in the Unequal Metropolis

6.1. Introduction

In this chapter, I examine the real estate risk fix in the context of contemporary Miami.²⁴

There are two key aims to this analysis. First, I seek to demonstrate how and why (re)insurance markets came to be closely connected to two key aspects of urban reproduction: residential mortgage lending (Section 6.2) and property-based public finance (Section 6.3). In Section 6.2.1, I show how residential mortgage lending and property (re)insurance became structurally linked through the standardization and convergence of US residential property insurance markets and housing policies, and through the uneven presences and absences of US federal housing and disaster policies. This arrangement created a structural market for (re)insurance, one which positioned mortgage borrowers as the key party responsible for financing property risk in the context of a multi-trillion dollar global financial market. In Section 6.3.1, I demonstrate how the fiscal power of Florida local governments is closely linked to property markets, with real estate-linked revenues serving as by far the largest direct source of revenue to municipalities. By protecting the properties which underpin this fiscal order from devaluation by disaster, I argue that (re)insurance also became an infrastructure of the Florida local growth state.

My second aim is to show these interdependencies create emergent and deepened forms of contradiction and crisis within Miami, which arguably pose both challenges and opportunities to the extension of (re)insurance capital as a real estate risk fix. Through an analysis of the geographies of Miami housing, I find that (re)insurance costs stand to exacerbate long-standing home affordability issues along existing lines of race and class (Section 6.2.2). In

²⁴ By Miami, I refer to Miami Dade County. The City of Miami is explicitly named when I am solely referring to it. By South Florida, metro Miami, or the Miami region, I refer to the four county regional area comprised by Miami Dade County, Monroe County, Broward County, and Palm Beach County.

this way, the (re)insurance capital so deeply invested in South Florida (Chapter 5) could morph from an instrument of housing protection into one of precarity, potentially generating a new wave of mortgage default, foreclosure, and neighborhood devaluation long before Miami doorsteps are permanently inundated by rising seas.

I find that the ongoing influx of (re)insurance capital into Florida property markets also reinforces a highly unequal order of intra-urban municipal fiscal power, within which municipalities with wealthier property tax bases have a greater fiscal capacity to manage the costs of climate risk mitigation. In Section 6.3.2, I show how (re)insurance stands to reproduce this inequality in two key ways. First, cities without large endowments of property-based wealth against which to finance the costs of adaptation could increasingly defer responsibility to individual property owners and their insurers, in ways which solidify the political economic importance of (re)insurance market access and availability (as argued in Chapter 4). I show that the cartography of communities in which this dynamic is most likely to appear closely overlaps with that of at-risk housing identified in Section 6.2.2.

Second, (re)insurers also find new opportunities to deploy risk capital advisory services (including new ILS products called resilience bonds) to Florida cities, many of which lack the internal technical capacity to visualize, price, and finance climate risk mitigation. Yet in doing so, (re)insurers solidify a property value-centric understanding of risk, one which lends itself to a regime of splintering protectionism, in which wealthy cities can afford to protect high value areas from climate risks at the same time that insufficiently valuable areas are left to the steady encroachment of market devaluation.

These two lines of analysis show how and why (re)insurance markets became critical to the political economy of Florida cities, and Miami in particular, in ways which bring both the state-level public policy analysis of Chapter 4 and the firm-centric analysis of Chapter 5 into sharper spatial and demographic focus. At the same time that this real estate risk fix seeks

to insure the security and stability of Miami's property markets, it also stands to produce new and deepened crises and contradictions. Rendered here is a portrait of two closely linked 'cities' within the city. The first is a peripheral geography of mortgaged homes with borrowers still struggling to make ends meet in a post-foreclosure crisis context, one in which rising insurance costs could create a new wave of devaluation and dispossession. The second: a core geography of wealthier and whiter coastal enclaves, which face an existential vulnerability to climate risk yet continue to see growth far above the already-high regional average. (Re)insurance market dynamics could deepen this story of inequality, in ways which help to realize Johnson's (2015) splintering protectionist imaginary.

This story of already-existing urban inequality represents both a challenge and an opportunity to (re)insurers. Unaddressed, these contradictions could erode the very basis against which (re)insurers capture value from risk. This could occur indirectly, in the form of property market devaluation, as rising insurance costs and other forms of property-based climate risk finance (e.g. infrastructure fees, bond finance) erode the value of the property against which (re)insurers mobilize value. This could also occur indirectly, as growing housing affordability concerns prompt new forms of political crisis and state market intervention which could once again limit market opportunities for (re)insurers, as has happened throughout Florida's post-Andrew history (as discussed in Chapter 4).

6.2. (Re)Insurance and Residential Mortgage Lending

6.2.1. How and Why (Re)insurance and Mortgage Markets Converged

(Re)insurance markets secure the liquidity of the US housing finance and securitization system, and the local real estate and global financial market political economies which in turn rely upon the latter. In this section, I show how and why this arrangement came into

being in the US context, through the standardization and convergence of American residential property insurance markets and housing policies, and through the uneven presences and absences of US federal housing and disaster policies. This arrangement has generated a structural market for (re)insurance within the US housing system, such that access to risk capital is integral to the workings of the latter. Moreover, it places a great structural importance on the individual residential property owner as the key party responsible for financing property risk in the US urban context. This responsibility extends far beyond individual homes and home loans to underpin a multi-trillion dollar global mortgage-backed securities market, yet is ultimately managed at the level of individual property owners, through ordinary residential insurance policies.

It is first important to understand how (re)insurance markets relate to the US residential mortgage lending system at a conceptual level. Insurance ostensibly 'de-risks' a mortgage by defining and carving out the catastrophe exposure of the properties which form the material basis of loans, which in turn form the basis of complex real estate-finance products like mortgage-backed securities. Unlike other 'real' commodities, real property has historically been a relatively fixed and non-substitutable good, one which can take a great time to mature in value, represents a significant sunk cost that is difficult to finance en masse, and which is exposed to highly particular geographic forces, including catastrophe. In this context, insurance can be understood as one of many mechanisms which seeks to transform property from relative fixity to liquidity (Gotham, 2009). In this way, mortgage debt attached to properties in places with significant catastrophe exposure can be 'purified' of this risk and treated as a relatively homogenous raw market input, one which serves as interchangeable fodder for highly liquid securities (as discussed in Chapter 2, Section 3). As I demonstrated in Chapter 5, this process is made possible through the capacity of (re)insurers to marketize climate risk across a global institutional assemblage of firms and intermediaries.

(Re)insurance markets can be therefore pictured as a parallel, flanking financial infrastructure which underpins the (much larger) mortgage finance system at the point of at-risk property. This arrangement enables mortgage capital to flow relatively 'blindly' into high-risk property markets, where it in turn facilitates the buying and trading of local real estate. Of the 4.79 million owner-occupied homes in Florida, 58.7%, or 2.81 million, were thought to be mortgaged, according to American Community Survey (2016) estimates, against which tens of billions of dollars of mortgage payments flow through to financial markets annually. This mortgaged property has a sum replacement value worth hundreds of billions of dollars, which must be secured through (re)insurance, or risk default and foreclosure, a mass event which could potentially create a cascading property market crisis (see Chapter 4, Section 2). Sustained mortgage access is central to the market value and exchangeability of these properties, which in turn generates a high volume of residential market activity. In 2016, Florida registered \$78.9 billion in single family home sales, and \$25.2 billion in townhome and condominium sales, for example (Florida Realtors, 2016).

The close ties between residential (re)insurance and mortgage lending were forged and strengthened over time through the standardization of insurance products with mortgage finance, as well as the evolution (and absences) of US federal housing and disaster policies. As in the creation of the conventional mortgage, the most common residential insurance policy – the HO-3 – emerged through a process of market reforms and public policy interventions. In the early part of the 20th century, residential insurance policies were offered on a bespoke basis by property brokers, as a supplement to real estate sales. “The selling of property insurance overlapped significantly with the growth of the modern realty brokerage industry,” noted Weiss (2002 [1987]: 36), such that “the majority of brokers, both large and small, sold some form of property insurance on a commission basis.”

The streamlining of residential insurance policy types by state and national professional organizations and regulatory bodies transformed a relatively heterogeneous set of insurance

products into an increasingly standardized lineup of “HO” (homeowners) insurance packages. Launched in 1950, the modern HO multi-peril policy included fire and hurricane wind risk, but excluded perils which were considered too difficult to profitability underwrite (Hunt, 1962). Crucially, the making of the standard HO product necessitated state intervention to cover these ‘uninsurable’ property perils, as in flood or earthquake risk (ibid). The federal government thus assumed wholesale responsibility for insuring all risk associated with the peril of flood through the National Flood Insurance Program (NFIP), inaugurated in 1968 (Wriggins, 2016; Elliott, 2017). As early as the 1960s, state and local governments also created ‘residual’ markets within private markets to ensure coverage for those deemed deserving – in practice, homeowners in higher risk areas (Longley-Cook, 1962; Hartwig and Wilkinson, 2009; Newman, 2009). Hurricane risks often posed challenges to insurance markets, and so were treated in the latter fashion, through the creation of risk sharing pools and other residual market mechanisms by state and local institutions (Longley-Cook, 1962; Lecomte and Gahagan, 1998). The role of the State of Florida in Florida’s residential hurricane insurance market was the topic of Chapter 4.

This streamlined residential insurance market was institutionally conjoined with the mortgage market through federal housing policies, which required that the properties underpinning loans be secured by insurance (Kunreuther, 1996). This requirement remains in the present-day guidelines that the Federal National Mortgage Association (Fannie Mae) issues to lenders that wish to sell their mortgages to the secondary mortgage market. For example, the Fannie Mae (2018) selling guide policy B7-3 explicitly mandates catastrophe insurance coverage for all loans it purchases from originating lenders:

It is important to note that the development of the structural market for residential insurance has also been indirectly encouraged by protection gaps within US federal disaster recovery policies, in ways which also emphasize the use of insurance by individual property owners.

Even as scope of federal disaster aid dramatically expanded over the 20th century (Moss, 1999), private property insurance remained a key mechanism for financing disaster recovery. After Hurricane Katrina, the federal government spent over \$200 billion on recovery projects (Struyk, 2017), while insurers paid approximately \$41 billion in claims (Marsh, 2015), for example. However, the primary focus of federal disaster policy remains on ensuring immediate access to adequate housing after a catastrophe, rather than on financing wholesale property replacement. As a result, there are limits to the maximum amount of assistance individual property owners can receive. For example, individual housing habitability and repair assistance grants are capped at \$33,000 per property (Lindsay, 2017). Beyond cash assistance, Small Business Administration home loans are limited to a maximum of \$200,000 for residential structural repairs and an additional \$40,000 for personal property replacement, largely to cover uninsured losses (Federal Emergency Management Agency, 2009). Equally, the NFIP caps coverage at a total insured value of \$250,000, which leaves losses above this threshold to self-insurance (that is, self-funded) or to a private surplus flood insurance policy.

While significant, post-disaster access to public sector resources remains complex, unequal, and opaque for residents (Fothergill et al, 1999; Colten et al, 2008; Gotham and Campanella, 2011; Gotham and Campanella, 2013; Hernández et al, 2018). For property owners with a mortgaged property in relatively high value property markets, this assistance could help to offset -- but would likely not fully cover -- the costs of repairing a property to habitability. As a consequence, property insurance became essential for those wealthy enough to own property, but not to self-insure.

Florida's residential insurance market composition reflects this tenure bias, with owner-occupied properties constituting an outsized share of the market. This is particularly evident in Miami Dade County, where rental tenures comprise more than 40% of the total housing

tenure, yet the residential market overwhelmingly backs owner-occupied and mortgage properties. According to Florida Office of Insurance Regulation data, there were slightly less than 469,000 residential (non-flood) insurance policies outstanding countywide in Q4 2017, against almost exactly one million housing units countywide (of which 85% were occupied, according to 2016 ACS estimates). However, there were only 44,807 tenant's insurance policies against 404,450 renter-occupied units. Whereas the total insured value of all outstanding residential policies in the county was \$175.7 billion, the value insured by tenants was only \$1.35 billion -- less than 1% of the market. At the same time, there were approximately 286,000 mortgaged properties countywide according to 2016 ACS estimates, equal to nearly 60% of the residential insurance market alone.

This legacy of market standardization and public policymaking together created a risk management system which delegates perhaps the greatest share of responsibility for financing property climate risk to residential borrowers. Individual homes and homeowners -- rather than other sites, scales, or actors -- became the primary and privileged 'site' at which these two distinct capital markets touch. As such, there is an unequal exposure to catastrophe risk within the transactional space of the mortgage, and an asymmetrical responsibility for managing risk within a globalized real estate finance system. While institutional investment capital can flow into the mortgage system blind to the catastrophe risks embedded within the properties which form the material basis of the market, it is ultimately the borrower who must manage this risk through insurance (or self-insurance).

6.2.2. (Re)Insurance and Housing Affordability in Miami

The analysis in Section 6.2.1 raises an important question for high risk areas with large concentrations of mortgaged property: Could household (re)insurance costs become a driver of housing precarity? In many ways, the spectre of this question has long haunted debates

over insurance regulation in Florida (as I discussed in Chapter 4). However, there has been limited empirical analysis of the geographies of residential insurance affordability -- an issue doubtless affected by the opacity and limited availability of insurance market data (Squires, 2003; Nance, 2015).

Using a mixture of actuarial data from the Florida Hurricane Catastrophe Fund and underwriting data from the National Flood Insurance Program, I mapped the relative cost of hurricane (wind) and flood insurance policies at a relatively granular urban scale, against housing cost burden measures.²⁵ Following American Community Survey protocol, I defined 'housing cost burdened' as those households that spend more than 35% of their income on housing, inclusive of insurance. I used ACS data to identify 20 Miami-Dade County zip codes where the number of owner occupied, mortgage-holding households which are housing cost burdened is at least 50% above the county average (Figure 6.1). Within these 20 zip codes, 16.95% of all total housing units are occupied by housing cost burdened households.

This baseline geography of at-risk housing clearly rings the central business district and wealthy coastal neighborhoods of the Atlantic-facing half of the county, but also lower income areas with high rentership rates like Little Havana and Allapattah to the immediate east of the central business district (as shown in Figure 6.1). Just under one quarter of Miami-Dade's one million residents live in these twenty areas, yet they are home to more than 40% of the at risk housing units in the county. On average, about 11% of Miami Dade housing units are at-risk, but in the case areas the concentration is roughly double the county average rate, and in areas likes Kendall and Richmond West the rate of housing units at risk nears 28%.

²⁵ For a detailed discussion of how I calculated insurance costs using Cat Fund and NFIP methods and data, see Chapter 2.

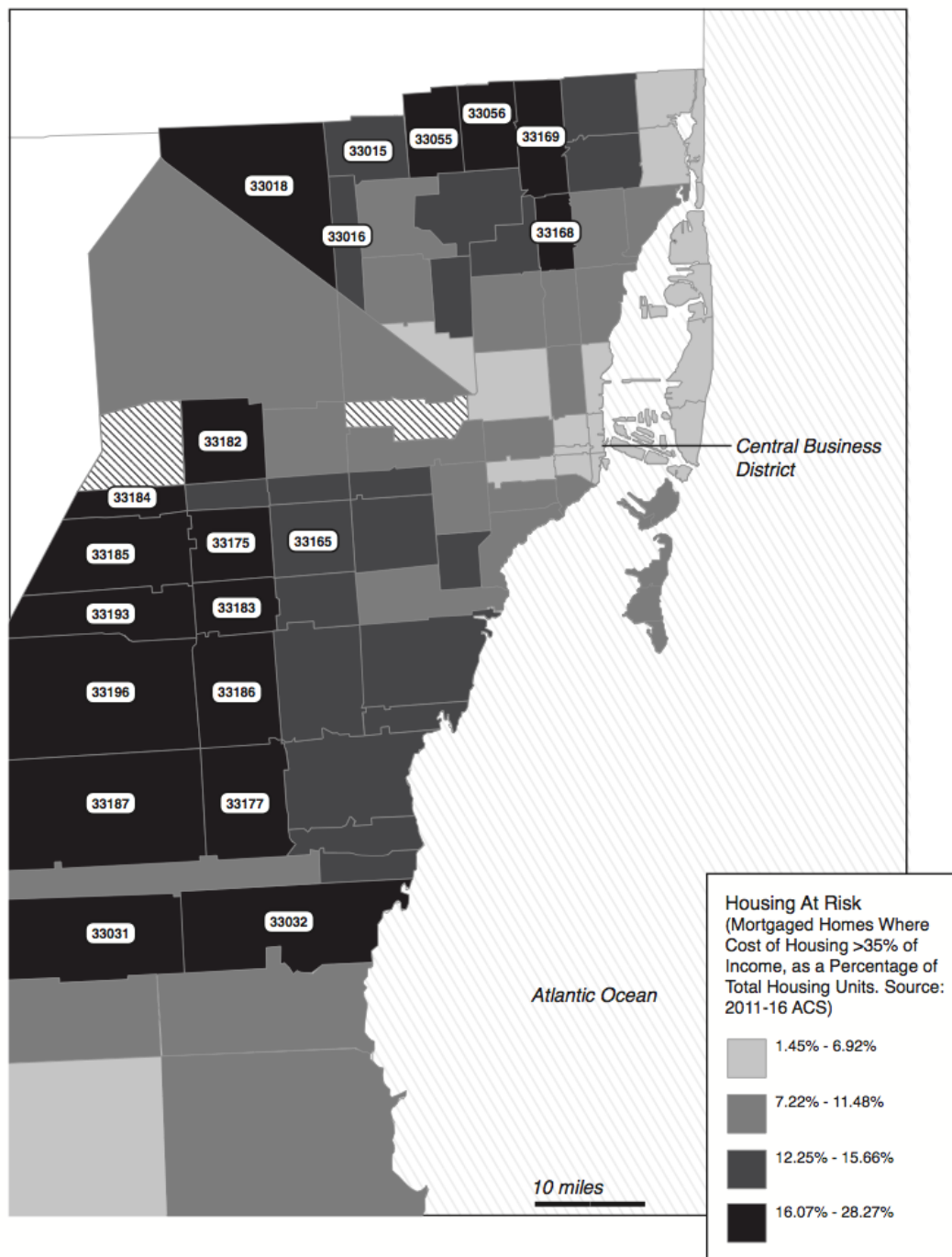


Figure 6.1: Housing At Risk: Mortgaged Homes Where the Cost of Housing is Greater than 35% of Income, as a Percentage of Total Housing Units per Zip Code. Source: 2011-2016 American Community Survey data.

These at-risk geographies are predominantly places where Miami's non-white middle class lives. Unadjusted for population density, on average only one in ten residents in these areas

identified as white alone, compared with 15.4% for the county at large. The zip codes include Miami Gardens, Florida's largest majority-black city (and the third-largest major black city in the nation, behind Detroit and Jackson, MS), but also Latino enclaves like Kendall and relatively more white and working-class suburbs in Homestead to the south.

Moreover, incomes have recovered unevenly after the crisis, and in many cases have declined relative to 2011. Between 2011 -- the worst of the crisis in Florida -- and 2016, the national average household income increased by 4.6% (American Community Survey, 2011-16). In Florida, the recovery in household wages was less than half the national average, rising by roughly 2.4% over the same period, while in Miami Dade County it was essentially non-existent at 0.6% (ibid). In fourteen of these areas, household incomes declined, and in one case fell by over 23%.

Home values and rates of owner-occupation in these areas are above the county average -- comfortably above the inner-city working-class barrios near the center of Miami like Little Havana and Allapattah, yet far below the extremes seen in wealthy coastal enclave towns like Bal Harbor or Golden Beach. The housing stock in this geography largely falls into two categories, including older suburbs which predate Hurricane Andrew (1992) and subsequent changes to the Florida building code, and newer areas to the east and south that were in some cases developed entirely post-Andrew. While the latter geographies have a greater degree of built-in resilience, reflected in lower hurricane wind insurance costs, the former are more likely to have a greater share of building stock which are relatively expensive to insure.

Finally, it is worth noting that this geography overlaps with that of the foreclosure crisis, with 19 of the 20 zip codes having witnessed combined foreclosure rates above the Miami Dade county average. In the first quarter of 2013, 9% of all properties in the county were classified as either real estate-owned (repossessed by the lender; henceforth, REO), or had a *lis*

pendis status (foreclosure pending).²⁶ As a group, the twenty areas had a combined REO and *lis pendis* rate of 13.5%. In West Kendall (33194), Homestead (33032), North Miami (33168), and Richmond West (33187), the combined rates were near or over twice the county average. Thus, while these high risk areas represented only 24% of the housing units in the county, they comprised 35% of those categories at some stage of foreclosure. That the geography of foreclosure overlaps with that of housing at risk is important: for many residents in these neighborhoods, the spectre of foreclosure never disappeared.

Figure 6.2 maps the Catastrophe Fund hurricane wind insurance rates charged to policyholders as a percent relative to the state average rate for 79 Miami Dade County zip codes.²⁷ The Cat Fund is a state-owned reinsurer which provides up to \$17 billion of hurricane cover to the state's primary property insurers. All primary insurers must participate in the Cat Fund at one of three levels, and the Cat Fund's rates are in turn calculated on a view of the entire Florida market (rather than solely on one insurer's participation in the market). Because it is a public entity, the rates and ratemaking approach must be published. Actuarial methods are used to assign 1,463 Florida zip codes one of 25 rating territory designations. The rates which residential insured are charged are contingent upon the spatial location of the property (rating territory), as well as the property type and its construction (e.g. condominium versus single family home, age, and construction

²⁶ While the foreclosure crisis (and overall decline in real estate market fortunes) largely bottomed out in 2011, Florida's legal system created long delays in foreclosure processing. In Miami Dade County in Q1 2013, for example, *lis pendis* and REO rates were 54.6% and 142.1% above their respective 2011 rates (Miami Dade County Department of Regulatory and Economic Resources, n.d., compiled from RealtyTrac data).

²⁷ For example, a homeowner with a frame-built single family home located in rating territory 1 (the least vulnerable), and a 3% deductible on a policy insured by a firm with a 90% participation rate in the Cat Fund will pay a rate of \$0.1435 per \$1,000 of insured exposure. A neighbor with the same insurer and policy type, but with a masonry-built single family home, will pay \$0.1036 per \$1,000 of insured exposure. All else equal, if the same properties were moved to rating territory 25 (the most vulnerable), the property owners would pay \$5.3034 and \$3.8293 per \$1,000 of exposure, respectively. Accordingly, if the frame-built homeowner held a policy with a maximum exposure of \$400,000 in territory 1, they would pay \$57.40 through their annual policy. If the same property were located in rating territory 25, they would pay \$2,121.36 annually. By comparison, the masonry-built homeowner would pay \$41.44 and \$1,531.72.

standards), their policy type (e.g. coverage limits, deductible), and the rate at which their insurer has participated in the Cat Fund.

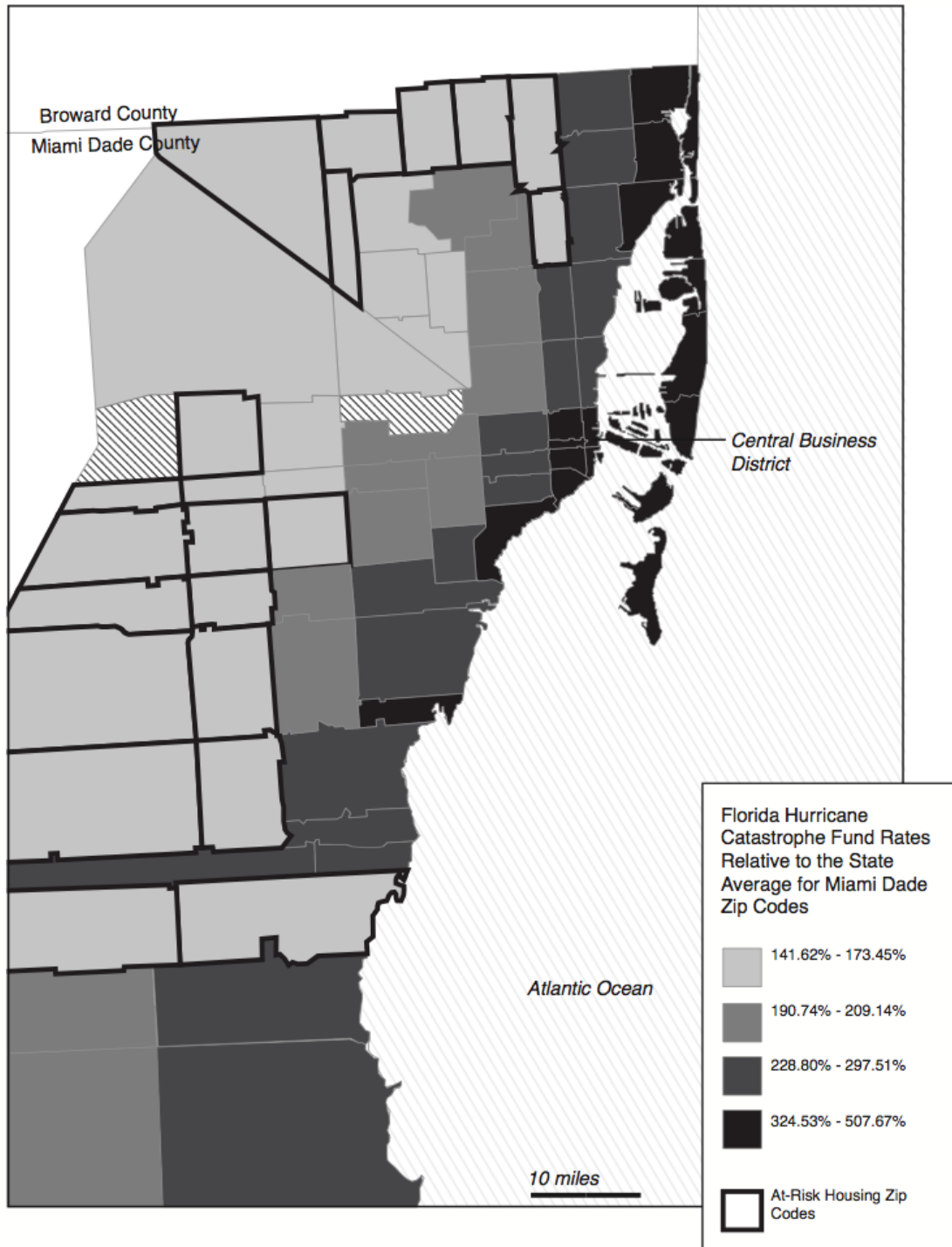


Figure 6.2: Florida Hurricane Catastrophe Fund Rates Relative to the State Average for Miami Dade Zip Codes. Source: Florida Hurricane Catastrophe Fund 2017 (Exhibit XIX), adapted by author to highlight at-risk housing zip codes.

While the precise rate charged to the property owner will vary based on a number of adjustments, the overall market ratio of rates charged across territories is fixed from 1 to 37, from the least to the most risky territories. If one assumes a common construction style, policy rate, and insurer participation rate, the cost of hurricane wind insurance per \$1,000 can be calculated at the zip code level. This enables a relative comparison of hurricane insurance costs which are risk-adjusted to a zip code level.

The twenty zip codes with at-risk housing are highlighted in bold. Perhaps unsurprisingly, the most at risk zip codes pay rates which are at or below the Miami Dade County average relative rate, given their inland context which (somewhat) insulates them from the greatest exposure to wind losses, and given the relatively lower average property value in these contexts. However, these rates are still well above the Florida state average: the lowest cost per policy was 141.82% above the average state rate, all else being equal. While these areas may not capture media attention as high value, high risk, or high cost insurance markets, the consumer costs of insurance remains well above a state average, which is already the highest in the nation (National Association of Insurance Commissioners, 2015).

In order to examine the socioeconomic implications of these relative rates within at-risk zip codes, I constructed a common scenario in line with the actuarial calculus of the Cat Fund, and examined the results relative to non-insurance variables like income and race. This method is discussed in further detail in Chapter 3, Section 3.3. Figure 6.3 shows the wide geographical variability in end-policyholder Cat Fund participation costs, which can be taken as an imperfect and partial proxy for the cost of hurricane insurance. When multiplying the selected Cat Fund charge per \$1,000 of exposure (column C) by the median home value for each at-risk zip code (column D), we can begin picture how the hurricane wind risk component of residential insurance costs are spatialized across Miami's most at-risk housing geographies.

In turn, I charted how these unequally distributed costs intersect with race and class across the region. The costs of Cat Fund cover as a percentage of household income are reflected in Figure 6.4. Highlighted in bold are the fourteen at-risk zip codes where household incomes have declined since 2016. This represents a potentially troubling neighborhood dynamic, where declining incomes converge with relatively high hurricane insurance costs, and where further and ongoing analysis of insurance costs and affordability could be focused in the future.

A. Zip Code	B. Percent of Homes at Risk	C. Masonry-Built Single Family Rate per \$1,000 of Exposure	D. Median Home Value	E. Cat Fund Cost per Policy (= C x D)
33165	15.19%	\$1.4387	\$247,900	\$1,069.96
33016	15.66%	\$1.0682	\$153,100	\$490.62
33015	16.07%	\$1.3083	\$197,400	\$774.78
33186	16.38%	\$1.4387	\$231,900	\$1,000.90
33169	16.52%	\$1.3083	\$155,100	\$608.75
33032	16.94%	\$1.7258	\$148,900	\$770.91
33196	16.95%	\$1.5775	\$256,200	\$1,212.47
33183	17.86%	\$1.3083	\$193,000	\$757.51
33056	19.42%	\$1.3083	\$137,000	\$537.71
33018	19.65%	\$1.3083	\$204,300	\$801.86
33168	20.55%	\$1.5775	\$144,000	\$681.48
33177	21.61%	\$1.4387	\$182,400	\$787.26
33193	21.64%	\$1.4387	\$217,600	\$939.18
33175	21.81%	\$1.1851	\$240,500	\$855.05
33055	23.90%	\$1.1851	\$146,500	\$520.85
33182	25.04%	\$1.4387	\$270,200	\$1,166.21
33031	25.27%	\$1.7258	\$312,800	\$1,619.49
33185	25.67%	\$1.4387	\$290,300	\$1,252.96
33194	27.86%	\$1.5775	\$274,400	\$1,298.60
33187	28.27%	\$1.5775	\$271,400	\$1,284.40
<i>Miami Dade</i>	<i>11.29%</i>	<i>\$1.7258</i>	<i>\$221,100</i>	<i>\$1,144.72</i>

Figure 6.3: Comparative Estimation of Florida Hurricane Catastrophe Fund Charges for a Hypothetical Property across At-Risk Zip Codes. Sources: Florida Hurricane Catastrophe Fund 2017 Ratemaking Report, author's calculations.

A. Zip Code	B. Cat Fund Cost	C. Median Household Income (2016)	D. Median Household Income Rate of Change (2011-16)	E. Cat Fund Cost as a Percent of Income	F. Race: Percent White Alone
33165	\$1,069.96	\$43,227	-3.25%	2.48%	9.2%
33016	\$490.62	\$40,299	4.13%	1.22%	5.5%
33015	\$774.78	\$48,170	-10.39%	1.61%	9.1%
33186	\$1,000.90	\$62,150	-6.56%	1.61%	19.0%
33169	\$608.75	\$38,965	-15.88%	1.56%	3.9%
33032	\$770.91	\$42,710	-7.80%	1.80%	9.8%
33196	\$1,212.47	\$70,376	8.03%	1.72%	13.7%
33183	\$757.51	\$51,505	-5.15%	1.47%	12.4%
33056	\$537.71	\$37,776	-13.50%	1.42%	1.5%
33018	\$801.86	\$52,752	4.14%	1.52%	4.7%
33168	\$681.48	\$41,886	-9.21%	1.63%	5.0%
33177	\$787.26	\$52,836	-11.53%	1.49%	9.4%
33193	\$939.18	\$50,396	1.88%	1.86%	8.3%
33175	\$855.05	\$51,250	-2.48%	1.67%	6.8%
33055	\$520.85	\$40,930	-6.36%	1.27%	3.8%
33182	\$1,166.21	\$67,042	-8.74%	1.74%	8.6%
33031	\$1,619.49	\$54,500	-23.91%	2.97%	47.9%
33185	\$1,252.96	\$74,547	-10.70%	1.68%	8.8%
33194	\$1,298.60	\$79,587	4.88%	1.63%	12.3%
33187	\$1,284.40	\$69,976	7.51%	1.84%	16.9%
<i>Miami Dade</i>	<i>\$1,144.72</i>	<i>\$44,224</i>	<i>0.61%</i>	<i>2.59%</i>	<i>15.4%</i>

Figure 6.4: Hurricane Wind Insurance Costs, Race, and Income in At-Risk Miami Dade Zip Codes. Sources: Florida Hurricane Catastrophe Fund (2017); American Community Survey (2011-2016)

Figure 6.4 also shows that, with the exceptions of 33186 (Kendall) and 33031 (The Redlands), these particularly vulnerable housing geographies are far more likely to be non-white than the hyper-diverse Miami-Dade County average. Given the historic challenges people of color have had in accessing home ownership, this represents an area of particular concern for housing advocates and policymakers. These areas may be those in which future studies of hurricane insurance affordability (or risk mitigation) should be targeted.

When it comes to mitigating underlying wind risks, household income and home value are also important variables. Unlike flood risk mitigation, which is typically implemented at a neighborhood level, wind risk mitigation is focused on building-level new construction standards or on strategic retrofits. In this case, individual property owners assume responsibility for financing such measures. The Cat Fund provides a limited pool of funds for property-level mitigation projects (up to \$3.4 million per year), and private insurers are required to offer premium discounts to policyholders who implement measures. However, the scale and efficacy of these programs has been questioned by policymakers and researchers alike (RMS, 2010; Medders and Nicholson, 2018). In practice, this approach may leave those households with both a limited income and lower home values against which to borrow at a disadvantage when seeking to implement climate risk mitigation measures. Absent alternative interventions, this may mean that residents in lower income areas are structurally more dependent on insurance -- rather than physical mitigation -- as a way to manage hurricane exposure.

I also examined the intersection between flood insurance costs and housing affordability in Miami. Whereas hurricane wind risks written through the homeowners insurance market, nearly all flood risks are written through the federal government National Flood Insurance Program (NFIP). The data used in this analysis reflects NFIP coverage only, which means these figures underestimate the total homeowner spend on flood insurance, particularly in the coastal areas where property values and risks are higher, and where private surplus flood insurance may be available or more attractive.²⁸ These figures are also limited because they reflect combined residential and commercial coverage.

²⁸ Private flood insurance is an increasingly popular alternative to the NFIP. The most common form is surplus insurance, which allows property owners to cover risks above the NFIP's maximum cover of up to \$250,000 per residential property. There are a handful of private insurers which have been authorized to sell NFIP-commensurable flood insurance in Florida, which has emerged as a pioneer for alternative flood insurance products. As of July 2018, this market data has not been made public.

While Cat Fund data is available at the zip code level, the most granular scale for public NFIP data is at the municipal level. I compared municipal-level data from Q1 2018 against the housing and demographic indicators used in the hurricane analysis, as a means to identify both distinct and overlapping areas of housing affordability concern. However, I used a benchmark of 33% of housing units at risk (rather than 50%) for this analysis, to offset the averaging effect associated with the larger geographical scale, which likely obscures the neighborhood nuances visible at a zip code-level of analysis.

Across Miami Dade County, there were 342,084 NFIP policies in force at the end of the first quarter of 2018. \$77.19 million of premiums were collected against \$151.14 billion of total insured value. Countywide, the average policy cost \$442 per year (figure 6.5). Not reflected in this geography are unincorporated areas, wherein 136,659 of the policies (and \$151.1 billion of the exposure) are written across the county, at an average rate of \$377 per policy. Unincorporated communities are reflected in empty white outlines in figure 6.5.

It notable that wealthy- and second home-dominated barrier island communities with perhaps the greatest coastal exposure -- like Sunny Isles Beach and Bal Harbour -- have relatively low average rates. This could suggest that residents in these areas largely do not rely upon the program for coverage, but also in part a reflection of the relative low concentration of commercial flood exposure (e.g. hotels) in these communities relative to their 'destination' neighbors. Equally remarkable, and away from the coast, are Medley and Opa-Locka. These represent areas with some of the highest average policy rates in the county, which can be explained by the high rates of commercial coverage in these areas, with the former acting as an almost exclusively non-residential industrial enclave for the region.

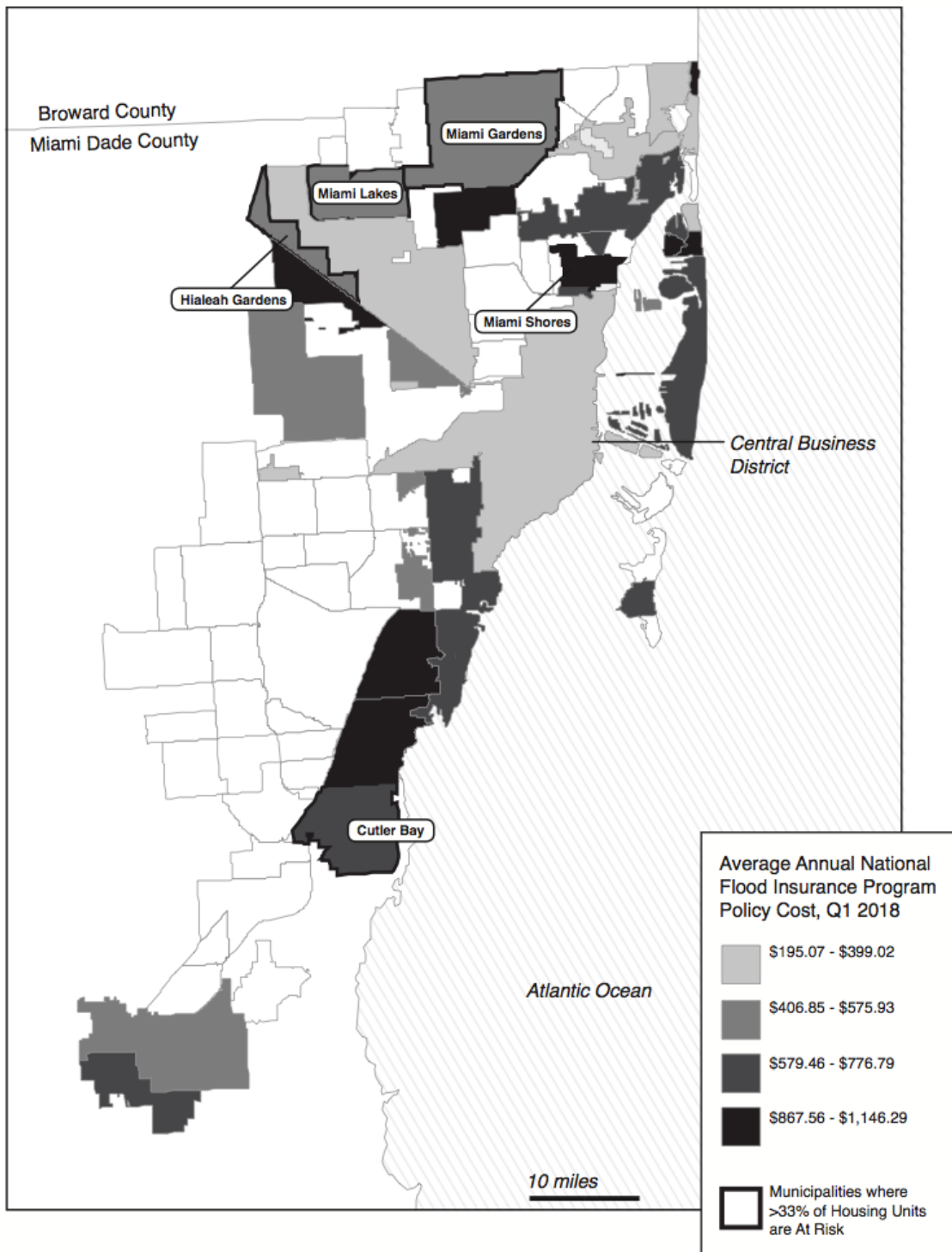


Figure 6.5: Average Annual National Flood Insurance Program Policy Cost, Q1 2018. Source: National Flood Insurance Program (2018)

There are five municipalities with rates of housing at risk more than 33% of the county average: Hialeah Gardens, Cutler Bay, Miami Lakes, Miami Shores, and Miami Gardens.

These are labelled on Figure 6.5.

Four of these five municipalities overlap with the geography of high risk zip codes from the hurricane insurance analysis, while the fifth - Cutler Bay - is comprised of households with above average housing costs. Cutler Bay is also directly adjacent to several of the 20 case zip codes. Insurance premiums comprise just over 1% of the median household income for these five areas, which is above the average countywide spend on flood insurance (as shown in figure 6.6). This geography is split along lines of race and class: Miami Lakes and Miami Shores saw rates of income growth above even the national average, while the other three were closer to the county average. Remarkably, the largely-black Miami Gardens saw median household incomes decline by nearly 12%, while the highest rate of income growth was in Miami Shores, which is among the whitest cities in the county. Miami Gardens households earn far below the county average income, yet pay the highest percentage of their income to flood insurance among the case group.

A. Municipality	B. Median Owner Occupied Home Value (2016)	C. Average Premium per Policy	D. Median Household Income (2016)	E. Median Household Income Rate of Change (2011-16)	F. Flood Insurance Premiums, % of Income (2016)	G. Race: Percent White Alone
Hialeah Gardens	\$148,000	\$498	\$43,576	2.12%	1.14%	2.20%
Cutler Bay	\$216,500	\$639	\$66,929	2.67%	0.96%	29.90%
Miami Lakes	\$326,500	\$407	\$72,225	13.22%	0.56%	12.30%
Miami Shores	\$442,000	\$1,071	\$101,047	23.40%	1.06%	45.50%
Miami Gardens	\$141,600	\$570	\$39,012	-11.77%	1.46%	3.30%
Miami Dade	\$221,100	\$442	\$44,224	0.61%	0.20%	15.4%

Figure 6.6: Flood Insurance Costs, Race, and Income in At-Risk Miami Dade Zip Codes. Sources: National Flood Insurance Program (2018); American Community Survey (2011-2016)

This geography is marked by an uneven exposure to current and future flood exposure. Mean sea levels in the Miami region are projected to rise by upwards of six feet by 2100 (Southeast Florida Climate Compact, 2015). Although all five municipalities include

properties which are at or below approximately six feet in elevation, two cities -- Miami Gardens and Cutler Bay, include land nearer to three feet in elevation (see Figure 6.10 in the section which follows).

When comparing Miami Gardens and Cutler Bay, the age of the building stock is one of the most striking differences. In Miami Gardens, more than 77% of properties -- or 26,965 homes -- were built prior to 1980, compared with only 41.7% for Cutler Bay. This is an important signal of the construction style and standard of the property, as well as the land use planning and infrastructural context in which the neighborhoods were developed -- factors which have important consequences for the exposure of properties and neighborhoods to current and future flood risk, because flood risk mitigation measures are generally undertaken at the neighborhood level. The 1980s marked an important turning point in Florida planning regulation, during which legislation like the Growth Management Act of 1985 and subsequent updates saw the creation of significant land use planning, development, and environmental protection controls (Audirac et al, 1990; Catlin, 1997; Carter, 2013). Participant observation from climate change planning workshops and anecdotal field observations suggest that communities which developed prior to this legislation face unique challenges in terms of retrofitting properties and infrastructure to mitigate climate risks (Events 3 and 15; Interview C-4). Relative to Cutler Bay, homes in Miami Gardens are significantly older and have a lower estimated property value, and the municipality is 'built out' without room for future development.

As I argue in Section 6.3, this means that places like Miami Gardens (and its residents) have a structural disadvantage when it comes to mobilizing property market-based mechanisms (like new high value, tax revenue generating development) to finance climate risk reduction projects. This is critical, because risk reduction projects can offset rising flood insurance costs, as through the National Flood Insurance Program's Community Rating System, or in proposed private finance schemes which link risk reduction projects to lower insurance

premiums (see discussion of resilience bonds in Section 6.3.2). Without access to such community-wide mechanisms, this means that individual property owners in areas like Miami Gardens may bear more responsibility for financing rising catastrophe risk costs through individual insurance policies, even if many risk reduction projects are only cost-effective or practical when implemented at a community scale.²⁹

Finally, I examined geographies where hurricane wind insurance costs and flood insurance costs intersect with at-risk housing. The result was distinctive cartography, yet one which overlapped along the peripheral edges of Miami Dade County. Changes in household incomes represent one key measure for thinking about how and where insurance costs may become a vector for new or deepened forms of housing precarity (and potential foreclosure): will household incomes grow enough to keep pace with rising insurance costs?

I found that the housing question remains one about wealth and poverty. To picture where the geographies identified in the previous sections intersect, figure 6.7 offers a combined and speculative map of housing vulnerability. The map presents the areas where household incomes either outright declined between 2011 and 2016 (dark grey) or recovered below the national average of 4.85% over the same period (light grey). This includes 16 zip codes which stood out from the hurricane wind insurance cost analysis, and 3 municipalities which stood out in the flood insurance cost analysis.

²⁹ See Figure 6.11 in Section 6.3.2 for an example of how (re)insurers model the cost-benefits of risk transfer versus risk mitigation.

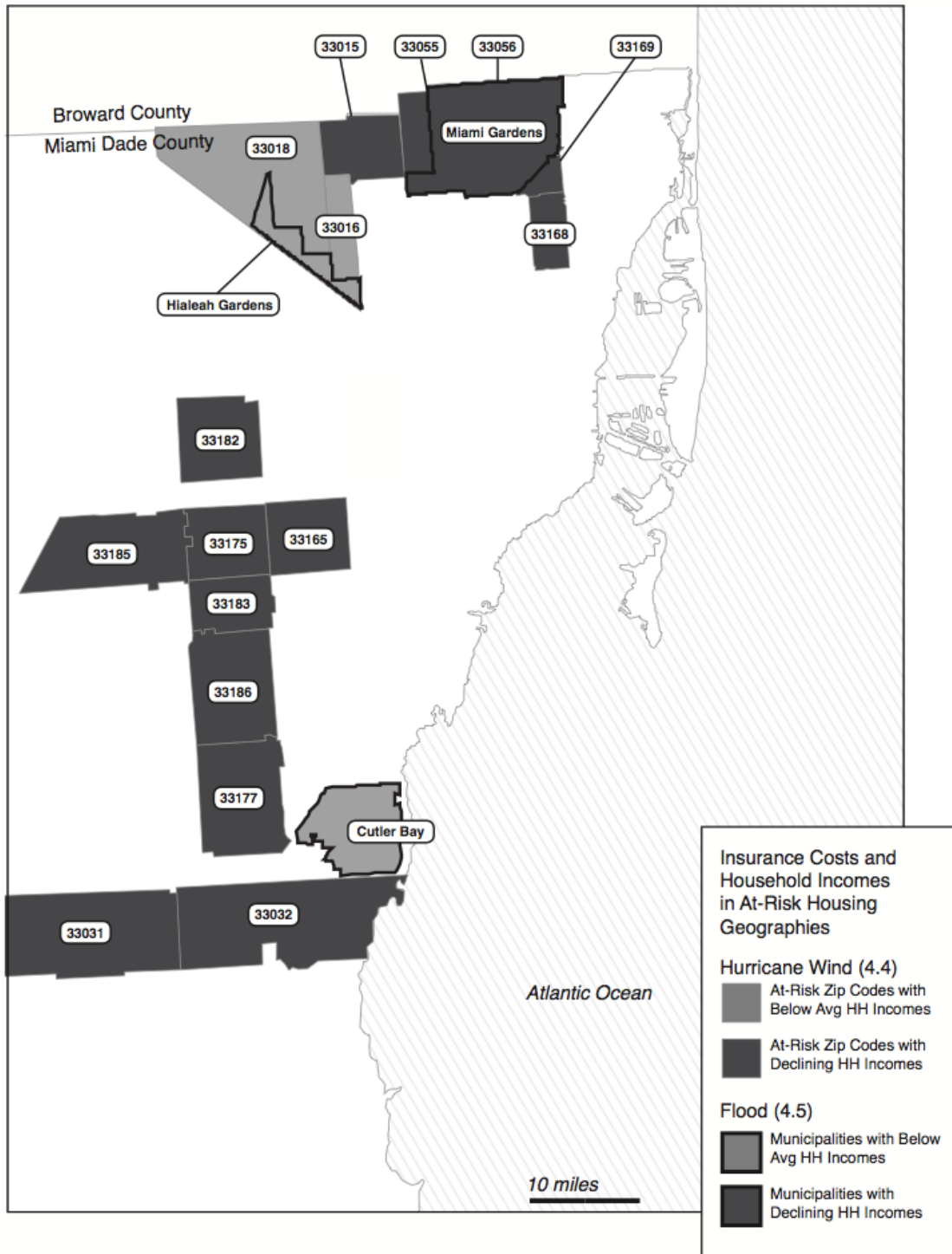


Figure 6.7: Insurance Costs and Household Incomes in At-Risk Housing Geographies. Source: author's analysis, drawing on data from the Florida Hurricane Catastrophe Fund (2017), the National Flood Insurance Program (2018), and American Community Survey (2011-2016)

This cartography reveals one area of overlapping concern: Miami Gardens to the north. As mentioned, this area has relatively high rates of hurricane wind insurance costs and flood

risk, while also seeing relatively low (and declining) household incomes. Moreover, the building stock in this area tends to be older, built prior to significant reforms to local building codes and planning regulations. Importantly, it is the main site of African American homeownership in the region, and in the nation more broadly.

A second area of concern can be found to the south of the county, where the adjacency between Cutler Bay and zip code 33032 (Homestead) suggests a related geography of combined household exposure to high insurance costs. These areas have seen relatively stronger recoveries in household income since 2011, have higher overall average incomes and stronger property values, and were developed more recently than Miami Gardens.

Two conclusions can be drawn from this preliminary analysis. First, there are demonstrable signs that rising insurance costs could exacerbate Miami's housing affordability crisis, particularly for those households with mortgages that are housing cost burdened. This prospective crisis largely falls along existing lines of housing market segregation. People of color are disproportionately residents of the neighborhoods where high insurance costs intersect with high housing costs for mortgage-holding households. Looking to the future, could rising insurance costs outstrip the rate of household income growth, in ways which erode the financial security and accessibility of homeownership?

Second, rising insurance costs could not only contribute to a housing affordability crisis for existing households, but could also limit opportunities for future homeownership. Signs of this dynamic are particularly apparent in areas with relatively high exposures to flood risk. Although the National Flood Insurance Program subsidizes rates for the 'grandfathered' households which lived in flood prone areas prior to the creation of the NFIP, subsidies are not extended when there is a change in property ownership, nor is the presence of subsidies guaranteed in the context of the program's future uncertainty. Although many of its impacts were temporarily offset (and remain unresolved through the legislative process), the

aftermath of the Biggert-Waters Flood Insurance Reform Act (2012) provided an insight into this potential scenario. In one instance, annual flood insurance premiums would have risen from \$1,700 to \$17,000 after the sale -- and removal of the subsidy -- on property bought for \$205,000, for example (Harrington, 2013; Interviews B-4 and B-5).

Nance (2015) finds that NFIP reforms have triggered real estate market devaluation in the Houston region, in ways which have had disproportionately negative impacts on homeowners of color, for example. Beyond the devaluation of property, significant increases in flood insurance costs could also represent a critical barrier to homeownership in largely non-white neighborhoods, where the incomes of existing households have not rebounded in keeping with national or state averages after the crisis. In this way, housing affordability issues in the aforementioned Miami Gardens example might also be imagined as an intergenerational as much as a contemporary social justice issue: In addition to being largely black, this community boasts some of the most affordable, owner-occupied housing in the county. In the context of a broader and persistent affordability crisis in Miami, which has been dubbed the most unequal housing market in the US (Nehamas, 2015), could unique avenues to minority homeownership be lost to rising insurance costs or other costs of climate risk finance?

In terms of the real estate risk fix, this analysis illuminates how insurance can become a vector of housing precarity as much as one of protection. The historic institutional fusion between insurance and mortgage markets, along with the asymmetrical catastrophe exposure of stakeholders entangled within the transactional space of the mortgage, set the stage for this dynamic, one which unfolds across already-existing and long-standing spatial divisions within the at-risk metropolises like Miami.

6.3. (Re)Insurance and the Fiscal Power of the Local State

6.3.1. Property Value-at-Risk and the Local State

Real estate markets are central to the fiscal capacity and power of the Florida local state. Beyond the broader economic multiplier created by the direct investment and employment generated through the real estate and construction sector, the making and trading of property directly constitutes the largest share of income for Florida local governments. By protecting the properties which underpin this fiscal order from devaluation by disaster, (re)insurance plays a critical infrastructural role within the Florida growth state. However, there are great inequalities within this property-centric mode of public finance, which reflect asymmetries within the value and stability of urban and regional real estate markets. In this section, I show how and why Florida local governments have a structural imperative to secure and grow property-based incomes, and how this generates disparities in the fiscal power of local governments in the Miami context. This sets the stage for understanding how local government reliance on (re)insurance markets can both reinforce and deepen spatial differences, as cities seek to manage climate risk (Section 6.3.2).

In the absence of a statewide income tax, property-based revenues are vital to the fiscal capacity of Florida municipalities to deliver services. Four types of income -- property taxes, impact fees, building permit fees, and documentary stamp incomes -- generated \$16.45 billion in combined income for Florida local governments in 2015 (Florida Office of Economic and Demographic Research, 2016).³⁰ These four income sources are equal to 31.6% of total local government revenue in 2015, not inclusive of enterprise revenue.³¹

³⁰ This is not inclusive of revenues generated by Special Independent Districts, like Florida's five Water Management Districts. Special Independent Districts have the capacity to generate revenue through property tax and other mechanisms, which collectively totaled \$16.06 billion in 2015 (Florida Office of Economic and Demographic Research, 2016).

³¹ Enterprise revenue includes income directly tied to the delivery of a specific service, as in waste collection fees paid for waste collection services.

The largest source of real estate-linked revenue is property tax, which accounts for \$12.96 billion, or 24.9% of all non-enterprise local government revenue in Florida (Florida Office of Economic and Demographic Research, 2016). Documentary stamp tax collections, levied against real estate transaction, provided the second largest source of real estate-linked revenue for the Florida public sector, equal to \$2.12 billion in 2015 (Florida Office of Economic and Demographic Research, 2016). Two types of fees linked to new development also constituted an important source of local government income. Impact fees, which are levied on new development to pay for the expansion of local services and infrastructure, provided \$729.22 million in income in 2015 (ibid).³² At the same time, building permit fees tied to planning permission for new development also generated \$645.51 million revenue for county and local municipalities in 2015 (Florida Department of Financial Services, 2018c; Florida Department of Financial Services, 2018d). Beyond property taxes and real estate-linked fees, fees generated through enterprise services like stormwater and wastewater provision are also often major source of local government income and expenditure. While these fees are not linked directly to property market transactions or conditions, they are indirectly connected insofar as property assessments and local option taxes (e.g. 1% infrastructure sales taxes) are the primary way in which local governments finance capital improvements.³³

As a consequence of this close link between fiscal capacity and local real estate market conditions, Florida faces a highly variable revenue-and-spend regime relative to peers in other states:

“Prior to the Great Recession, fueled by skyrocketing local property taxes and

³² Impact fees must be expressly tied to new development according to the state’s dual rational nexus: they must be demonstrably linked to new development, and their expenditure must be tied to the provision of services and infrastructure related to the assessed development.

³³ There is an implicit pressure to maintain low fees for these services to promote a relatively low cost of living within a municipality, which is particularly important when two neighboring areas are competing for new growth, or when existing local residents organize to oppose onerous increases in these fees.

rapidly increasing sales and documentary stamp tax collections at the state level, Florida's state and local revenue ranking climbed to its all-time high (22nd [of 50 states]). As the economy soured, so did revenue collections, as they fell dramatically from their windfall levels. Florida's ranking has dropped 20 spots to 42nd in FY 2014 (latest available 50-state data)." (Florida Taxwatch, 2017)

This larger story is reflected in data on the declines in property-linked tax revenues between the height of the real estate boom of the 2000s and the market's trough. At the peak of Florida's real estate market boom in 2005, documentary tax collections peaked at \$4.1 billion. In 2009, they were \$1.1 billion -- a decline of over 73% (Florida Office of Economic and Demographic Research, 2018). Building permit fees fell by 52% over the same horizon (Florida Department of Financial Services, 2018c; Florida Department of Financial Services, 2018d). Local impact fees fell by 68% from their 2006 high to their 2011 low, and county impact fees dropped by over 80% between 2006 and 2009 (Florida Department of Financial Services, 2018a; Florida Department of Financial Services, 2018b).

Less directly, long-standing growth machine politics (Logan and Molotch, 1987) also reproduce the centrality of real estate market concerns within the design and management of the Florida local state (Audirac et al, 1990; Catlin, 1997; Carter, 2013; Interview C-3; Interview F-3; Interview F-5). In this regard, the prospect of property market devaluation due to climate risks is also a direct threat to the fiscal and political stability of Florida local governments and the interests entrenched therein.

In this context, (re)insurance is central to the reproduction of the fiscal capacity of the Florida local state. (Re)insurance secures the property markets (and value) which undergirds public sector finance by directly financing post-disaster reconstruction at large scale, and indirectly by ensuring local market access to the real estate capital (i.e. residential mortgage lending) which facilitates the building, buying, and selling of local real estate. The Florida local state has a structural imperative to protect and to grow property market values. In this way, sustained (re)insurance market access and affordability is as much a Florida local

government issue as it is one of associated with homeowners (Event 1, Event 2; see Chapter 4, Section 2).

While (re)insurance reproduces the Florida local growth state, it also reinforces a highly fractal landscape of local state 'haves and have-nots'. The history of municipal incorporation in Florida's urban regions is largely a tale of two entwined stories, in which cities and towns were incorporated by settler-speculator developers to facilitate a 'brand' of development, or by wealthy (and whiter) residents who ceded from the metropolis to create enclaves of prosperity. Although the South Florida story is marked by a particularly colorful history of fanciful developers and their more or less tasteful utopian visions (Redland, 1970; George, 1986; Nijman, 2011; Connolly, 2014), it is also part of broader legacy of 'home rule' urbanism, racialized succession, tax revolts, and the neoliberal splintering of the state, and debt-and-growth politics, all of which have shaped the structuring of US cities and regions in recent decades (see Chapter 2, Section 3).

As a consequence of these patterns of historical development, Florida's highly variable tax and spend regime manifests along stark lines of race and wealth. In turn, Florida local governments are not on equal fiscal grounds when it comes to delivering critical services -- including those related to climate risk governance, like physical risk reduction projects.³⁴ This dynamic particularly evident by looking at patterns of property market revenue and fiscal power within the Miami Dade County context, beginning with property taxation. Figure 6.8 provides a list of property tax rates and levies (projected revenue) across 33 Miami Dade municipalities for the 2017-18 fiscal year. Collectively, these municipalities levied approximately \$1.03 billion in annual property taxes. (This table is not inclusive of the further \$1.85 billion of county-wide property taxes which were levied that year, nor does it include

³⁴ For the older Florida municipalities which are built out, have aging infrastructure, which cannot leverage real estate redevelopment, or which are otherwise relatively unattractive to real estate investment, the capacity to leverage growth is limited, for example. Some cities may have older infrastructure which is more costly to maintain, or have a residential base with a higher demand for public services.

revenues from the non-residential City of Medley.) Through an analysis of local government FY 2016-17 financial statements, I found that property taxes typically provided roughly a third of local revenue to Miami Dade municipalities. In instances where smaller municipalities relied on other local or county governments to deliver services,³⁵ I calculated that property tax comprised upwards of three quarters of all public income.

The wide distribution of taxable property values and millage rates point to variability in both the capacity and willingness of local governments to derive income from property markets. This, in turn, informs the extent to which the fiscal power of local governments is vulnerable to -- and able to respond to -- growing climate risks, including property market devaluation. There are four dynamics which inform this context.

Municipality	Taxable Property Value (17)	Millage Rate (17-18)	Property Taxes Levied (17-18)
Aventura	\$10,098,997,863	1.726	\$17,409,708
Bal Harbour	\$5,314,206,510	1.970	\$10,440,071
Bay Harbor Islands	\$1,031,587,742	4.000	\$4,111,208
Biscayne Park	\$195,190,024	9.700	\$1,883,963
Coral Gables	\$15,172,014,090	5.559	\$84,181,222
Cutler Bay	\$2,371,190,614	2.391	\$5,653,255
Doral	\$12,080,554,247	1.900	\$23,052,174
El Portal	\$147,250,932	8.300	\$1,219,434
Florida City	\$466,739,387	7.186	\$3,387,426
Golden Beach	\$1,035,263,421	7.480	\$7,740,790
Hialeah	\$9,500,349,638	6.302	\$59,918,483
Hialeah Gardens	\$1,165,367,342	5.161	\$6,018,222
Homestead	\$2,608,632,678	5.922	\$15,494,007
Indian Creek	\$570,381,417	6.609	\$3,758,165
Key Biscayne	\$8,646,769,884	3.000	\$25,901,933
Miami	\$49,621,309,999	7.437	\$367,915,463

³⁵ A small city might subcontract police and fire services to the county government, or share water management infrastructure with an adjacent town, as examples.

Miami Beach	\$37,397,062,490	5.722	\$214,420,143
Miami Gardens	\$4,206,824,771	6.936	\$29,287,080
Miami Lakes	\$3,017,332,354	2.335	\$7,044,932
Miami Shores	\$1,052,123,341	7.900	\$8,292,312
Miami Springs	\$1,121,725,782	7.358	\$8,243,653
North Bay Village	\$1,037,240,053	5.650	\$5,867,221
North Miami	\$2,839,843,057	7.500	\$21,252,096
North Miami Beach	\$2,535,675,965	6.400	\$16,214,292
Opa-Locka	\$803,622,462	8.999	\$7,282,411
Palmetto Bay	\$2,808,998,560	2.329	\$6,527,910
Pinecrest	\$4,595,327,858	2.300	\$10,553,776
South Miami	\$1,793,210,812	4.300	\$7,761,840
Sunny Isles Beach	\$11,097,893,299	2.300	\$25,559,059
Surfside	\$2,150,458,492	4.800	\$10,296,290
Sweetwater	\$1,664,458,925	4.215	\$7,038,581
Virginia Gardens	\$261,912,040	5.150	\$1,348,554
West Miami	\$475,308,716	6.886	\$3,289,219
Sum*	\$198,884,824,765	-	\$1,028,364,893

Figure 6.8: Projected Property Taxation Rates and Revenues in Miami Dade County Municipalities, 2017. Not inclusive of unincorporated areas*. Source: Miami Dade County Property Appraiser (2017)

First, the capacity to leverage property tax to provide services is first and foremost a function of the total value of local real estate. The local property tax base per capita -- the raw amount of real estate value per resident, against which taxes can be levied -- provides one critical metric for representing this value. In Miami Dade County's 33 local municipalities, the local property tax base per capita ranged a low of \$39,255 in the largely-black Miami Gardens, to \$6,632,342 in the enclave island community of Indian Creek.

At the same time, a community's will to tax itself is a second important factor, as expressed in the millage rates in figure 6.8. These rates vary for a number of reasons, ranging from low tax ethos to high demand for public services. As a result of the value of the property tax base, and the different rates at which communities taxed themselves, the total property tax

revenue per capita ultimately varied from \$126 in Cutler Bay to \$42,073 in Indian Creek -- the latter 334 times the amount of the former.

Third, the extent to which local governments can extend their property tax base by capturing rising real estate values during real estate growth cycles also varied. In 2011, Miami Dade's countywide property tax roll reached its lowest post-crisis point, with a total assessed value of \$186.96 billion (Miami Dade Property Appraiser, 2012). By 2017, a regional real estate boom period was entering its late stages and the property tax base had grown 46% to \$272.43 billion (Miami Dade Property Tax Appraiser, 2017). The rate of growth in local property tax bases varied widely across the county, however. In coastal enclaves like Surfside and Bal Harbour, the property tax base soared in value by 111.3% and 126.8%, respectively (ibid; author's calculations), whereas Florida City registered a decline of -0.4%. A great deal of Miami's inward real estate investment comes from overseas buyers which target their buying in high value coastal settings. Between August 2015 and July 2016, \$6.2 billion of market sales came from overseas buyers, equal to 39% of the volume of real estate transactions in metro Miami over that period (National Association of Realtors, 2017). Four-fifths of this investment went to Miami-Dade County, and disproportionately flowed into new-build, high-value, high rise condominium construction in central coastal areas: the average sales price for foreign-bought property was 62% above the regional average, while 55% of sales were for condos (ibid). This investment fueled a luxury high rise building boom in a handful of coastal communities and other residential areas, while significant parts of the rest of the county saw much more modest (or even negative) property tax base appreciations.

Fourth, beyond local real estate market patterns, Florida local government revenues are also shaped by state regulations. Public budgets must be balanced on annual basis according to state law. This means that a significant decline in taxable property values must be matched by new fees or by a decrease in services, all else being equal (Holcombe, 2015). Local governments are also constrained by statewide legislated caps on property tax increases,

which are limited to 3% per year for owner-occupied properties, and 10% per year for secondary (investment) properties (Florida Department of Revenue, 2017c). While these requirements may insulate property owners from dramatic tax hikes during real estate market booms, it also limits the ability of local governments to grow their revenue against the existing property tax base during these windows of prosperity.

These four dynamics have clear geographical patterns, with well-defined race and class fault lines. Wealthier, whiter and coastal municipalities within Miami Dade County held larger property tax bases, and saw higher rates of post-crisis property tax base growth. The percent of residents of the six local governments with the lowest property tax base capacity per capita who self-identified as white alone were 28.5% (Cutler Bay), 5.6% (Florida City), 4.2% (Hialeah), 14.4% (Miami Lakes), and 4.1% (Homestead), largely below the hyper diverse average of 15.4% (American Community Survey, 2016). By comparison, residents in the six places with the highest property tax base capacity per capita who self-identified as white alone were 70.9% (Indian Creek), 71.8% (Golden Beach), 68.1% (Bal Harbour), 36.5% (Key Biscayne), and 40.5% (Miami Beach). Similar disparities in household incomes persisted across this geographical divide.

Against the backdrop of this highly uneven fiscal capacity, equally particular sea level rise risks threaten to erode the property tax bases of local governments or to otherwise impair real estate markets. Figure 6.9 charts the range and average elevation of land in each Miami Dade local government. Unlike older US cities in which wealthy residents historically congregated at higher elevations above the smells, sights, and sounds of the industrial city, in Miami and other Florida cities, wealth is largely concentrated in coastal areas (Keenan et al, 2018).

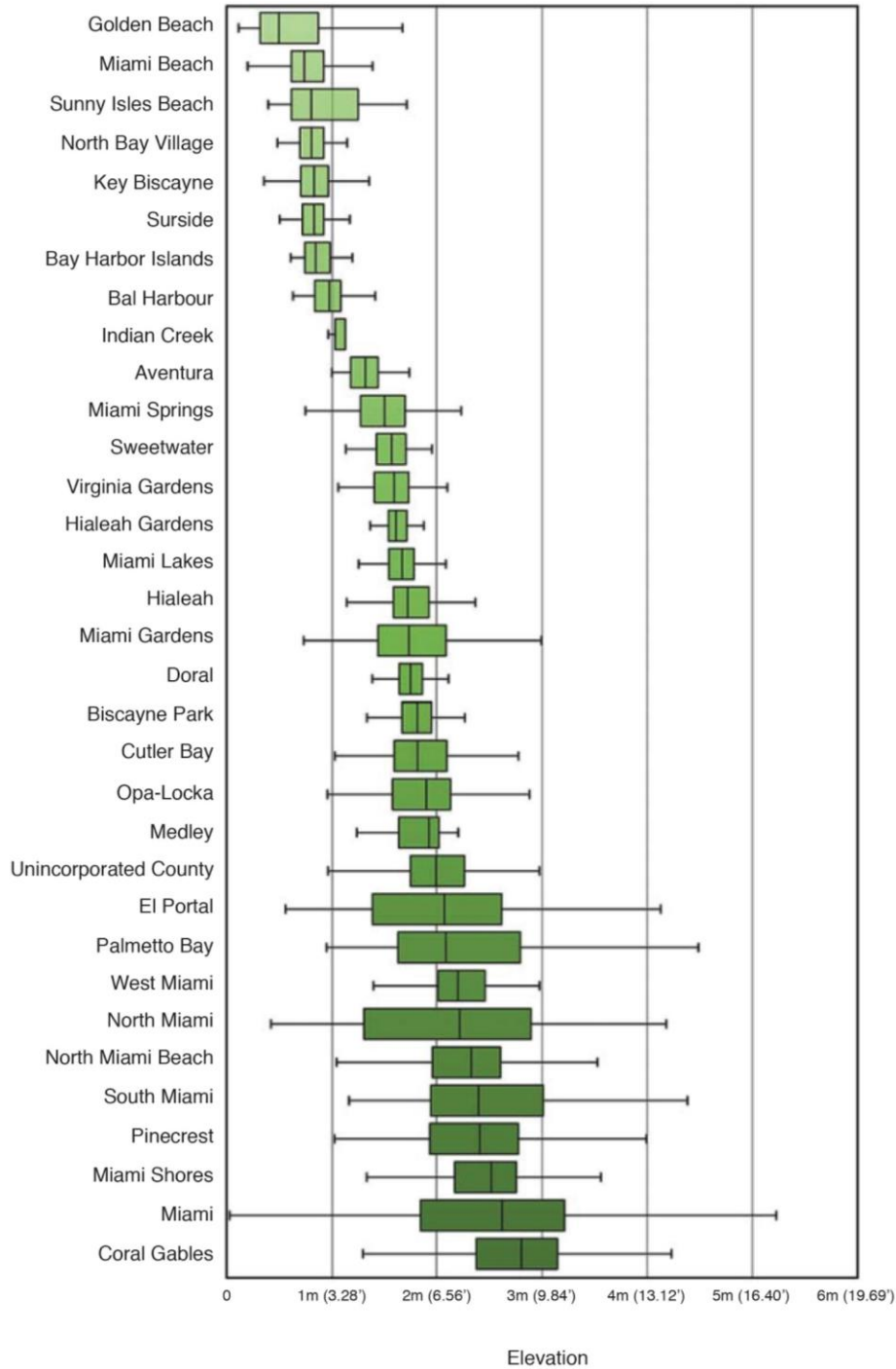


Figure 6.9. Average Elevations for Municipalities in Miami Dade County. Source: NAVD83 US data, adapted by author from Keenan et al (2018: 5). Note: All observations within the shaded boxes account for 2 standard deviations from the mean.

As a consequence, higher-value property markets are more exposed to sea level rise, higher intensity hurricane winds, and greater hurricane-induced storm surge. In South Florida, the mean sea level of the Atlantic is expected to swell between 31" (2.58') and 81" (6.75') by the

close of the century -- the latter scenario enough to submerge half of Miami Dade's land area (Southeast Florida Climate Compact, 2015: 5). The mean elevation for every municipality from Golden Beach to Opa-Locka falls below 6.75', for example. For every municipality in the range between Golden Beach and Aventura, a 6.75' sea level rise scenario would permanently inundate every property in the jurisdiction.

This conjoined fiscal-physical vulnerability has prompted several local governments to implement high-profile, high-cost flood risk mitigation efforts. For example, Miami Beach is raising roads and installing anti-flood pumps across the low-lying barrier island to keep their \$34.4 billion property tax base—which yielded 51% of the city's 2016/17 budget—high and dry (Miami Dade County Property Appraiser, 2016; City of Miami Beach, 2016). The half billion dollar project, one of many on the drawing board for the island, is being financed through municipal bonds, the first \$90 million tranche of which will be repaid through a 84% flat increase of property owner stormwater assessment fees (Flechas and Staletovich, 2015). As one of the wealthiest cities in the region, Miami Beach can afford these mitigation efforts, yet nevertheless has faced hurdles in financing large-scale risk mitigation works.

One hurdle relates to the affordability of adaptation measures for existing residents: the 84% increase in stormwater assessment fees implemented in Miami Beach represented a regressive tax, such that each property owner -- independent of the value of their property or income -- paid the same rate. This signals a deeper property market affordability challenge, according to which local governments will face political as much as economic challenges in financing large-scale risk mitigation projects across their property tax bases. Perversely, this may incentivize local governments in high-growth, high-risk areas to encourage more development, rather than to limit it. "In this light," writes Meyer (2014: 7), "Miami's construction cranes aren't monuments to climate-change denial. Quite to the contrary—they are the instruments that may, indirectly, allow the city to survive it" by extending the fiscal

capacity of the state to finance mitigation, and by limiting the extent to which existing residents are burdened with such costs.

A second hurdle relates to the capacity of local governments to maintain access to traditional capital markets to finance risk reduction projects through municipal bonds. Concerned about the long-term debt Miami Beach will incur to finance adaptation infrastructure, the credit rating agency Moody's has given the city's first bond issuance a negative outlook,³⁶ and the city is contemplating higher property tax assessments in the future to soften the concerns of rating agencies (Flechas and Staletovich, 2015). This response deepens the aforementioned affordability tension, and raises questions about the extent to which less wealthy local governments can finance adaptation along a similar pathway. In the post-crisis context, Miami Beach's real estate market -- and thus fiscal capacity -- has grown at rates which far outstripped the county. How do comparable poor cities with stagnant or declining property tax bases go to capital markets to finance risk reduction projects through long-term municipal debt, in this context?

Cities without the ability to leverage growth to the same extent to finance risk reduction infrastructure will have to cut other public services to fund risk mitigation projects or will defer the costs of risk to individual property owners, all else being equal. Without community-scale risk reduction services providing by the local state, individual property owners must therefore increasingly self-finance risk mitigation (e.g. property retrofits) or rely on risk transfer. While some property-level risk mitigation retrofits are relatively affordable and cost effective (e.g. wind ties for roofs), many are extremely cost intensive (e.g. raising an entire home)

³⁶ Interview subjects expressed concerns that public debt issuances would become more expensive in the future, as bond rating agencies began to signal concerns about the exposure of local property tax bases to environmental hazards. This latter concern has proven to be consequential, as Moody's Investors Services recently announced that they would be incorporating climate risks into their municipal bond ratings decisions in the future. In practice, it is anticipated that Moody's may look to municipal issuers to hold a climate risk mitigation plan which includes data on the extent to which their property tax bases are secured -- see Moody's Investors Services (2017).

(Interview B-8). For all but the wealthiest of property owners, this dynamic will likely increase Florida's reliance on third party risk capital to finance the state's primary residential insurance market. Instead of mitigating physical risks up-front, this simultaneously leaves property owners to wait for disaster (and hope that their insurance enables them to rebuild) while also keeping them hostage to insurance rates. In these two connected ways, climate risks can deepen existing intra-urban inequalities in local government fiscal capacity, while also heightening the importance of (re)insurance market access and affordability.

6.3.2. (Re)Insurance as Public Sector Risk Fix

(Re)insurance provides two 'fixes' in the context of this unequal urban landscape of property-based public fiscal capacity and climate vulnerability. First, higher concentrations of property exposure (through increased growth) demand sustained access to (re)insurance market capital. Simply put, there are higher concentrations of higher value property in risky contexts. While much of this high value growth may directly come from overseas buyers or investors which are more inclined to self-insure, it has broader spatial consequences as market value increases are displaced to neighboring areas. This increases the sheer volume of property which must be financed through conventional market means and thus insured. It also reinforces Florida's longstanding (re)insurance market conundrum, in which the sector and state market regulators have struggled to manage high concentrations of underwriting risks, and have turned to ILS capital as a result (as discussed in Chapter 4). By extension, these dynamics also reproduce (re)insurer demand for ILS capital, while also furnishing a supply of raw risk for securitization (see Chapter 5). Sustained ties between the risk transfer industry and broader capital markets are arguably made more important by this 'grow to defend' logic, in ways which only heighten the political economic centrality of (re)insurance in the Florida context. This insight directly supports Johnson's (2015) "splintering protectionism" hypothesis, according to which the availability of affordable risk capital feeds risky

urbanization, while also deepening the reliance of such places on (re)insurers and their capital market partners.

Should there be a crisis which changes the cost or availability of risk capital, existing property market inequalities could be deepened. While prosperous areas can afford to self-insure or to finance climate risks through other means (like physical risk mitigation), residents living in municipalities without strong fiscal capacities to otherwise manage risk would be more exposed to ebbs and flows in the cost and availability of (re)insurance. This has particularly important consequences for residents with mortgages, who must maintain insurance as a condition of their loan (Section 6.2.2). Perhaps unsurprisingly, the geography of municipalities with limited fiscal capacity has close overlaps with that of increasingly at-risk housing. Areas like Miami Gardens represent a ground zero where high fiscal and physical vulnerabilities to climate risk converge with an already-vulnerable housing market. More research is urgently needed to investigate how these geographies converge, and how they generate specific city- and neighborhood-level vulnerabilities.

(Re)insurers also increasingly bring to bear new climate risk valuation and finance technologies and expertise to Florida cities, many of the latter which lack the institutional capacity to plan and finance risk mitigation projects. Faced with austerity conditions after the financial crisis, Florida local governments saw significant cuts to their planning staffs and faced legislative changes which rolled back growth management laws under the pretense of restarting the real estate sector, which was particularly devastated by the crash (Interview C-3). At the same time, the State of Florida has not developed a statewide climate adaptation plan, nor has it made available any large funding sources for local governments to leverage for planning and project implementation, beyond one small-scale adaptation planning pilot grant program (Interview F-8).

In this context, (re)insurers have emerged as prominent voices at local and regional climate governance forums and workshops, including two which I attended (Event 2, Event 9). As one long-time climate change activist attested in an interview, “it was me and the reinsurers back in the day” (Interview F-9). Over the last two decades, (re)insurers have hosted several close-door meetings with South Florida local government officials to discuss how risk capital products can be used to plan, price, and prioritize climate risk management projects (Miami Dade County, 2016; Interview C-13; Interview E-6; Event 15). In 2015, Miami Dade County Commissioners adopted Resolution 49-15, which directed the Mayor to:

“initiate discussions related to climate change with private insurance and reinsurance professional organizations, member local governments in the Southeast Florida Climate Change Compact, the Florida Office of Insurance Regulation’s Department of Finance Services, and other key stakeholders to develop long-term risk management solutions.” (Miami Dade County, 2016: 2).

One example of a “reinsurer’s perspective” on city resilience comes from a 2014 presentation by Swiss Re before the Miami Dade County Sea Level Rise Task Force (Swiss Re, 2014). Drawing on findings from the latter’s Economics of Climate Adaptation project, which employed risk modeling technologies to evaluate the cost effectiveness of adaptation measures across disaster-prone contexts including Florida, the presentation outlined how the public sector might begin to develop their own cost-benefit analysis techniques for specific sea level rise adaptation retrofits.

Figure 6.10 shows this cost-benefit curve for thirty common flood risk mitigation measures that could be implemented in Southeast Florida, under a given 2030 climate scenario. The study found that interventions like beach nourishment, roof retrofits, and stricter base elevations for new construction were cost effective techniques (denoted by the dashed line, or a cost-benefit less than 1.0), while relocating roads and electrical services and elevation retrofits to existing properties were not cost effective. Swiss Re argued that 40% of this

exposure could be mitigated by cost effective mitigation measures, while a second 40% would be more efficiently managed using private risk transfer (e.g. insurance) (Swiss Re, 2014: 13).

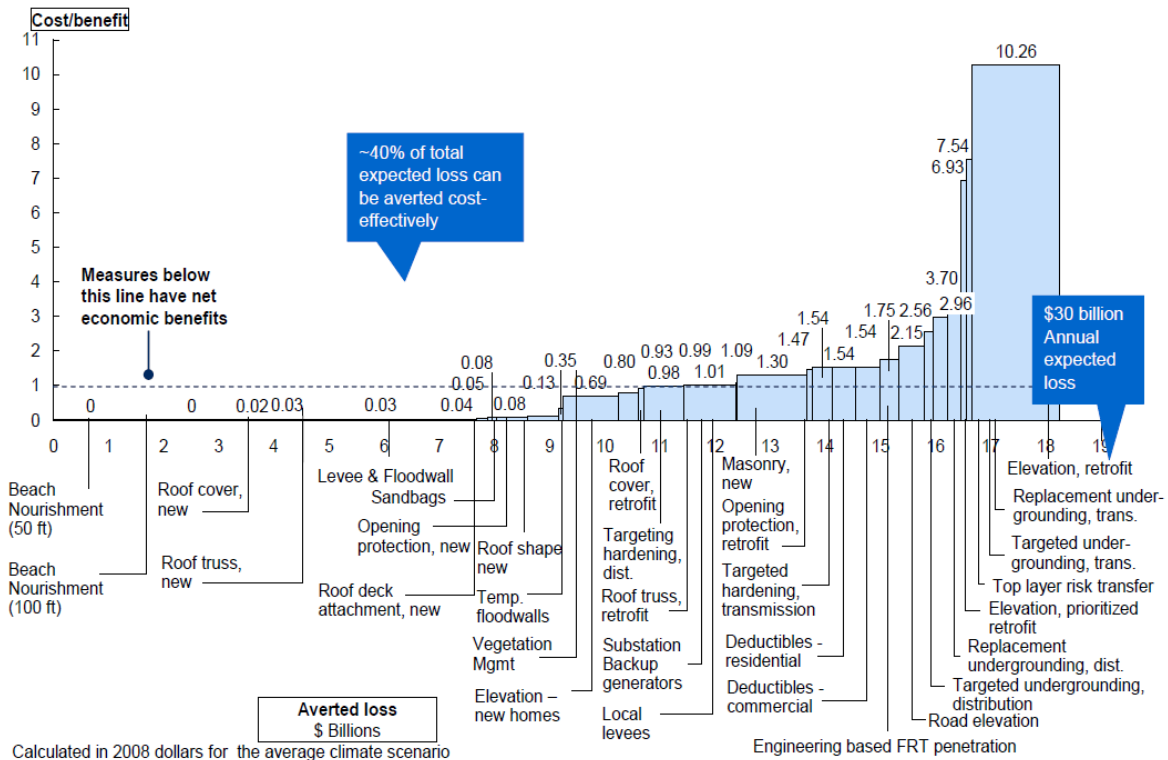


Figure 6.10. Florida Local Climate Adaptation Cost/Benefit Curve. Source: Swiss Re (2014: 11)

Beyond this cost-benefit expertise, (re)insurers also possess the ability to model and price climate risks at the property scale, using the same catastrophe risk modeling technologies which are used to structure reinsurance programs and ILS products. For example, under the Rockefeller Foundation’s 100 Resilient Cities Program, the largest catastrophe risk modeling vendor (RMS) partnered with the City and County of San Francisco, California to construct a property-level model of the city’s vulnerability to sea level rise for the year 2100, as part of its sea level rise adaptation planning process (Figure 6.12). Areas in red denote ‘sky high’ property exposures -- and correspond with high rise, high value properties. RMS and city officials worked together to construct a ‘cost of inaction’ scenario under two scenarios: 66" and 108" (66" SLR plus 100-year extreme tide). The latter scenario found \$77 billion of

public and private property at risk of inundation. The output was a political as much as scientific construct, one expressly designed to communicate risks and mobilize political support for adaptation projects (Event 15; City and County of San Francisco, 2016: 6-8).

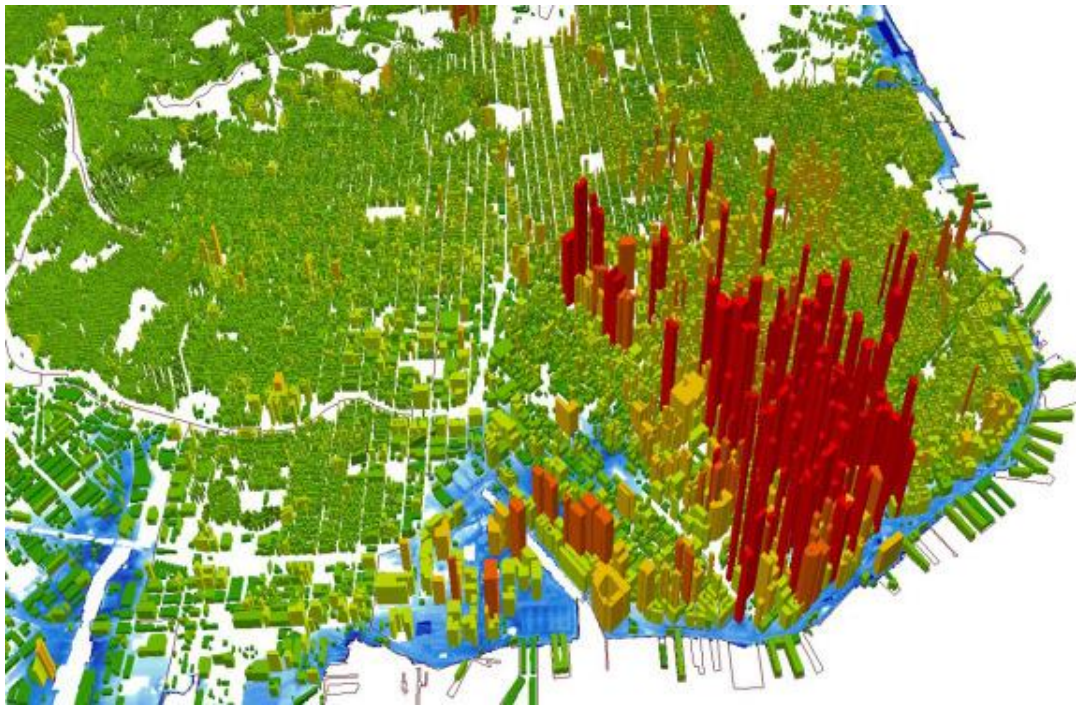


Figure 6.11. City of San Francisco Sea Level Rise Property Value Vulnerability Visualization. Source: City of San Francisco, 2016: 6-8

Recently, (re)insurers have also announced plans to adapt ILS products to finance city-level risk transfer and mitigation. Take, for example, a recent Swiss Re-backed proposal for an ILS-based “resilience bond” (Vajjhala and Rhodes, 2015), through which reinsurance tools including catastrophe risk modeling and a breadth of existing industry data on risk reduction engineering techniques are enlisted to assess the cost-benefits of neighborhood-level climate adaptation infrastructure over a centuries-long horizon. The initial case included studies that range from the use of higher seawalls to keep Miami Beach streets dry, to the application of flood pumps to avoid another Sandy-like inundation of Manhattan’s subways. City leaders, it is proposed, could leverage these big data-powered insights to make stronger cases for public climate-ready infrastructure investment. At the same time, cities can enjoy the benefits of municipal catastrophe insurance while receiving a reduction in their rates as

risk reduction infrastructure projects are completed. These rate reductions may even be securitized upfront to unlock a new source of project finance, its proponents suggest (Vajjhala and Rhodes, 2015; Vajjhala and Rhodes, 2017; Interview D-4).

As of August 2018, post-Harvey Houston's 'Ike Dike' infrastructure project was a front runner to be financed through the first resilience bond, in large part due to absence of traditional forms of public finance (Kaskey, 2018). The project, which would defend low-lying areas (including Houston's oil refinery facilities), has to date struggled to secure traditional funding sources, which have made the resilience bond an attractive alternative financing strategy (ibid). Speaking to the Houston example, one senior (re)insurance figure directly likened this opportunity to the crisis of overaccumulation within risk capital markets: "The market is overcapitalized at the moment so there is lots of hungry capital looking for a home. [...] This is a good time to be thinking about innovative risk finance and project finance" (Kaskey, 2018).

It is thus remarkable to witness (re)insurers developing new forms of 'urban resilience' advisory services at the same time that the industry seeks to offset declining profit margins through other forms of market innovation, including the use of ILS-backed technologies in the Florida residential market (see Chapter 5). This represents a potential second wave of the real estate risk fix, in which (re)insurers secure new opportunities to appropriate value from urban climate risk against the need to protect at-risk property contexts. This fix also meets a growing local government demand for climate risk management expertise in a context in which public sector planning capacities to manage climate change analyze have been eroded by austerity and ideological battles at the level of state government.

All else being equal, (re)insurance can directly and indirectly 'fix' the reliance of Florida property tax on real estate-linked income. Yet this reliance on (re)insurance could reproduce existing spatial inequalities and deepen the exposure of South Florida communities by

enabling a 'grow to defend' climate adaptation finance model. These dynamics stand to create new or exacerbated political and economic crises, as some cities find the resources to adapt at a community scale while others delegate responsibility to individual property owners to manage their risk -- and the steady devaluation of property values likely to follow.

6.4. Conclusions

In this chapter, I examined how (re)insurance risk capital secures two central drivers of the production of space within the Florida metropolis: residential mortgage lending and property-linked public finance. I analyzed these interdependencies in the contemporary Miami context, where clear signs of new and deepened patterns of contradiction and crisis are emerging as the region's exposure to climate risk grows. I showed how (re)insurance costs could exacerbate long-standing home affordability issues along Miami's existing lines of race, class, and other neighborhood variabilities, and could help to trigger a new wave of mortgage default, foreclosure, and neighborhood property devaluation long before Miami doorsteps are permanently inundated by rising seas.

I also demonstrated how (re)insurance markets reproduce a highly unequal order of intra-urban municipal fiscal power, within which municipalities with wealthier property tax bases have a greater financial capacity to manage the costs of climate risk mitigation. On one hand, cities without large endowments of property-based wealth against which to finance the costs of adaptation could increasingly defer responsibility to individual property owners and their insurers, in ways which solidify the political economic importance of (re)insurance market access and availability. On the other, I identified how (re)insurers have found new opportunities to deploy risk capital advisory services (including new ILS products called resilience bonds) in metro Miami and other urban contexts.

This analysis deepens our understanding of how and why (re)insurance markets are critical to the political economy of Florida cities, and Miami in particular, in ways which bring both the state-level public policy examination and the firm-centric analysis of Chapters 4 and 5, into sharper spatial and demographic focus, respectively. Following Johnson (2015), I demonstrated how (re)insurance can act as a force of ‘splintering protectionism,’ within which wealthy property owners and cities can afford to protect high value areas from climate risks at the same time that insufficiently valuable properties and places are left to the steady encroachment of market devaluation. Unaddressed, these tensions stand to erode the material basis against which (re)insurers capture value from risk, directly as rising insurance costs and other forms of property-based climate risk finance (e.g. infrastructure fees, bond finance) chip away at the value of the property against which (re)insurers mobilize value, or indirectly as political crises prompt market interventions which could once again limit market opportunities for (re)insurers.

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7. Conclusions

7.1. Summary of Core Findings

In this dissertation, I critically examined insurance-linked securitization (ILS) as a 'real estate risk fix' in the Florida urban context. My primary aim was to explain how, why, and where ILS markets have been constituted through Florida's real estate sector, and to consider what this close link means for the political economy of Florida cities in the context of mounting climate risks.

Through a multifaceted research process, I arrived at one overarching conclusion: ILS and (re)insurance risk capital markets are closely linked with the production of space in the Florida urban context. I have demonstrated how and why this risk capital serves a critical infrastructural role within Florida cities, one which enables the reproduction of the state's \$4 trillion real estate market -- at least for now. At the same time, I have shown how Florida real estate constitutes the most important basis of the global ILS trade, the latter which mobilizes substantial value from risk through an institutional architecture of (re)insurers and risk capital intermediaries. I have argued that this arrangement is functional, yet extractive, in ways which may generate new and deepened patterns of urban political and economic crises within the context of Florida's long-unequal real estate markets.

I organized this analysis across three main 'sites' of empirical analysis: (i) Florida public policymaking efforts, which are instrument in bridging insured residential real estate with ILS and risk capital markets (Chapter 4), (ii) Florida primary insurer underwriting and risk transfer practices, through which real estate risks are mined and mobilized in value form through a global risk capital market architecture (Chapter 5), and (iii) Florida cities, within which the

flow of risk capital is essential to the mortgage lending and public finance systems that underpin local real estate-dominated political economies (Chapter 6).

In Chapter 4, I investigated the risk fix as a public policy goal. I argued that Florida public policymakers have cultivated the entry of ILS capital into the state as a means to offset long-standing (re)insurance market crisis tendencies that have threatened to destabilize Florida's real estate-driven political economy. I uncovered three main ways in which the State of Florida fosters the entry of risk capital into the residential market. First, the state *stages risk* through various performative exercises and market-making measures and results which codify the use of additional reinsurance as good industry practice. Second, the state *sources risk* for reinsurers and ILS, both directly by acting as one of the most prominent users of ILS, and indirectly by moving risk from public institutions to private specialist insurers which tend to be heavily reliant on external risk capital and have thus been pioneering users of ILS. Finally, the state *secures risk* by maintaining a backstop -- a public guarantor -- to socialize any losses which may emerge should these speculative ventures in risk capital innovation falter.

Chapter 4 not only demonstrated the constitutive role of the state in the making of the Florida market for ILS, it also highlighted key ways in which public policies make certain forms of climate risk more or less marketizable, often in close collaboration with private capital. Indeed, much of the risk which the state has ceded to the specialists was hitherto considered 'residual' or unmarketable. This analysis also pointed to the selective and at times highly entrepreneurial presence of the State of Florida in engineering fixes for Florida's property catastrophe conundrum, the interventionist appearance of which is striking in the context of the limited resources which have been made available to plan and finance physical risk reduction efforts. The selective presence and absence of the State of Florida provides an important context for understanding how and why insurance has become so vital to Florida

cities seeking to manage climate risks -- and how Florida residential insurers and their risk capital provides have access to structural market for insurance.

In Chapter 5, I analyzed the risk fix as a (re)insurance market logic. I argued that ILS provides an underwriting fix for Florida's risk capital-reliant 'specialist' insurers and their risk-seeking reinsurance partners. Through a forensic firm-level analysis, I showed how 28 specialists play a decisive role in constituting ILS and risk capital markets through their underwriting and risk transfer programs, and found that the specialists ceded half of every premium dollar they earned in 2015, or \$2.95 billion. This value-from-risk flowed from millions of Florida policyholders to 164 reinsurers and ILS funds operating across 35 geographies, ranging from Bermuda to Qatar. I found that no less than 26 ILS funds and special purpose entities assumed \$529.56 million of this premium for securitization or other forms of third party capital collateralization -- enough to procure between \$8 billion and 10 billion of property catastrophe cover for the specialists, and alone equal to the nearly one third of global ILS issuance that year. In addition, I argued that these firm-to-firm and risk-to-capital relationships were highly contingent on a variety of factors, which ranged from firm underwriting and operational choices, to direct risk capital ownership stakes in the specialists and interlocking board membership.

I critically mapped how risk capital market institutions bring several market-making devices to bear on these contingencies, which enabled them to transform Florida real estate risk from amorphous fixity into an idealized state of financial market liquidity, and to thereby appropriate substantial value from real estate risk. Insofar as this risk fix is functional, it is also extractive: it operates as form of rent capture which does little to fundamentally mitigate the underlying material risk against which it is constituted. In doing so, the fix deepens asymmetrical processes of inter-urban accumulation, by siphoning value from this market hinterland to select (re)insurance command and control nodes, including London, New York, and Zurich. This analysis has afforded critical insurance studies with a greater empirical

understanding of the intra-urban origins and territorial workings of this risk capital market through specific firm-to-firm relationships, and brought focus to the inter-urban outcomes of its redistributive logics which thus follow.

In Chapter 6, I examined how these first two fixes come together to secure two central drivers of the production of space within the Florida metropolis: residential mortgage lending and property-linked public finance. I analyzed these interdependencies in the contemporary Miami context, where clear signs of new and deepened patterns of contradiction and crisis are emerging as the region's exposure to climate risks grow. First, I showed how (re)insurance costs could exacerbate long-standing home affordability issues along Miami's existing lines of race and class. In this way, I argued that the risk capital so deeply invested in South Florida could morph from an instrument of housing protection into one of precarity, generating a new wave of mortgage default, foreclosure, and neighborhood devaluation long before Miami doorsteps will be permanently inundated by rising seas.

Second, I showed how (re)insurance markets reproduce a highly unequal order of intra-urban municipal fiscal power, within which municipalities with wealthier property tax bases have a greater financial capacity to manage the costs of climate risk mitigation. On one hand, I concluded that cities without large endowments of property-based wealth against which to finance the costs of adaptation could increasingly defer responsibility to individual property owners and their insurers, in ways which solidify the political economic importance of (re)insurance market access and availability. On the other, I also observed how (re)insurers have found new opportunities to deploy risk capital advisory services (including new ILS products called resilience bonds) to Florida cities, many of the latter which lack the internal technical capacity to visualize, price, and finance climate risk mitigation in a post-Financial Crisis context of austerity and political conservatism. .

Through this urban analysis, I demonstrated how and why (re)insurance markets became critical to the political economy of Florida cities, and Miami in particular, in ways which bring both the state-level public policy examination and the firm-centric analysis of Chapters 4 and 5 into sharper spatial and demographic focus. Following Johnson (2015), I mapped out the ways in which (re)insurance may act as a force of 'splintering protectionism,' within which wealthy property owners and cities are able to protect high value areas from climate risks at the same time that insufficiently valuable properties and places are left to the steady encroachment of market devaluation. Unaddressed, these tensions could directly and indirectly erode the material basis against which (re)insurers capture value from risk, as rising insurance costs and other forms of property-based climate risk finance (e.g. infrastructure fees, bond finance) erode the value of the property against which (re)insurers mobilize value, or as political crises prompt market interventions which could once again limit market opportunities for (re)insurers, respectively.

7.2. Research Contributions and Future Engagements

7.2.1. Extending the Spatial Fix

This project extends Harvey's seminal theory of the spatial fix to conceptualize and investigate the relationships between finance, the built environment, and climate risk. While there are vibrant and growing strands of critical research on the relationship between finance and the built environment (e.g. studies of the financialization of housing markets or infrastructure provision), and on the nexus between finance and the environment (e.g. the financialization of energy production or disaster management), to date there exists very little research which brings these three dynamics together conceptually or empirically (as argued by Castree and Christophers, 2015). This is a critical absence, insofar as processes of

financialization and the consequences of anthropogenic climate change converge in actually-existing geographies to produce profound new global challenges.

In this dissertation, I have started with one such challenge -- the global property catastrophe conundrum posed by the growing centrality of real estate within financialized capitalism, and the deepening vulnerability of much of that real estate to climate risks -- and have critically examined its articulation in one context: the production of Florida's risky real estate markets, and more specifically in relation to the extended webs of spatial relations which emerge to offset the crises which are generated therein, as seen in the articulation of global risk capital markets through the Florida residential insurance trade. I have used Harvey's concept of the spatial fix -- and ideas which emerged from it, including Johnson's (2015) notion of the catastrophic fix -- to arrive at an understanding of how ILS and risk capital markets provide a 'real estate risk fix' in this context.

Beyond offering a means to grapple with this triad -- between finance, the built environment, and climate risks -- this dissertation also extends the concept of the spatial fix in two ways. First, I have demonstrated how ILS functions as a unique and multifaceted iteration of the 'fix', one which merits attention in its own right, one with two dynamics. ILS markets at once enable real estate risk to be transformed into financial market value, in theory offsetting two parallel crises within financial markets: investment capital is provided with a secure outlet which is not correlated with the ebbs and flows of the economy, while (re)insurers are enabled to transfer 'peak peril' risk beyond the immediate institutional bounds of the market. At the same time, and in 'Harveyian' dialectical fashion, this first dynamic facilitates a second: by transferring the prospect of devaluation from Florida (re)insurers to global risk capital markets, ILS enables the reproduction of the key aspects of the state's risky real estate markets -- at least for now. I have demonstrated how many uncertainties and internal contradictions endemic to this fix -- ranging from the long-term availability of low-cost risk capital to the stability of Florida's real estate-centered urban political economy in the face of

growing affordability pressures and environmental vulnerabilities -- call into question its longevity.

Second, this fix can and must also be understood as a 'fix for the fix' -- as a solution to a much broader crisis associated with the security of the spatial fix in the face of growing climate risk. To summarize, Harvey's formulation of the spatial fix provides an urban-geographical theory of capitalism, one which reasons that (over-) accumulation in the 'real' economy is closely linked with the production of the built environment (Jessop, 2006; Gotham, 2009; Bok, 2018). Accordingly, overaccumulation in the 'real' economy is offset through investment in the built environment. While this dynamic generates "symbiotic forms of accumulation" (Harvey, 2001: 28) that displace the crisis, this fix is spatially uneven and always temporary: falling rates of return in investment in the built environment invariably drive capital to other horizons.

Climate risks -- from the outright destruction of property, to the devaluation of the rents which can be extracted from the built environment -- represent a threat to the very security of the spatial fix as a mechanism for managing internal crises of overaccumulation. The real estate risk fix represented by ILS can be understood as an answer to this conundrum. By facilitating (re)insurance market capacity in high value and high risk contexts like Florida, risk capital (ostensibly) helps to secure the financial architectures which facilitate the flow of capital to and from the built environment. In this dissertation, I focused specifically on how ILS and risk capital markets secure two such architectures -- residential mortgage lending and public finance -- which in turn underpin two of the largest asset classes that comprise the ~\$100 trillion of outstanding global capital invested (Hewitt EnnisKnupp, 2014): the \$9.30 trillion US mortgage-related securities market (SIFMA, 2018), and the \$3.85 trillion US municipal bond market (ibid). Not only do mortgage- and municipal debt-linked assets represent long-term, multi-decadal investments in cities and regions with growing climate exposures, they also rely upon the security of the value and liquidity of real estate markets today.

It is possible, but as yet unclear, that the contradictions generated by this more specific real estate risk fix could be refracted across this broader financial market architecture over time, in a cascading fashion. This could be a gradual process, as formal market infrastructures evolve to govern risks in new ways or shift to accommodate different priorities, or it could be a relatively abrupt one, sparked by a series of near-term urban disasters-turned-financial crises. Within the 2017 Atlantic Hurricane Season alone, three hurricanes -- Harvey, Irma, and Maria -- generated insured losses of \$92 billion, or 0.5% of the US GDP, according to Swiss Re (2018). Not only were these three storms by far the largest contributors to what was a record-breaking year for global insured losses (ibid), they also could have been substantially worse. While Hurricane Irma triggered upwards of \$30 billion of insured losses across the Caribbean and United States, last-minute changes to the storm's course avoided what could have been a \$130 billion Miami landfall (Artemis, 2017). While Irma could have exhausted upwards of 20% of the \$600 billion of global reinsurance coverage outstanding, the actual losses remained tens of billions away from significantly disrupting ILS risk capital markets (AM Best, 2017).

Insofar as (re)insurance is a critical frontier for understanding the nexus between finance, the built environment, and climate risk, it is far from the only one. Nor does Florida's ILS-dependent 'fix' encapsulate the larger story of the ways in which global real estate-finance institutions and other cities and regions increasingly seek to manage climate risk. From large-scale physical risk reduction projects in flood-prone regions like the Netherlands, to real estate asset management strategies which calibrate capital investment in risky-regions, both at-risk places and at-risk institutions are deploying strategies for governing exposure which exceed the bounds of (re)insurers. Future research can deploy the concept of the real estate risk fix to critically analyze, compare, and contrast the ways in which this global property catastrophe conundrum is encountered in different contexts.

Tactically speaking, this study offers a number of empirical and conceptual points of entry for such a project. With no methodological blueprint for studying (re)insurance and real estate climate risk governance to work from, I have employed a wide range of methods in this project which range from elite interviews to forensic financial analysis. I am confident that these data sources and research techniques can facilitate further analysis, debate, and experimentation in the study of real estate climate risks across other geographies.

7.2.2. (Re)Insurance, Risk and Value

The thesis makes a contribution to a second domain of research and practice: (re)insurance and climate risk management. Observations and open-ended questions about (re)insurance persisted throughout conversations with Florida urban elites, yet extensive knowledge about how, why, and where these markets work -- or fail -- remained fragmentary and underdeveloped. This project addresses a fundamental need for an alternative, relational, and interpretative cartography of (re)insurance in Florida, one which takes the city as its empirical and conceptual point of departure.

Insofar as (re)insurance has been missing from urban studies, the urban has also been missing from (re)insurance scholarship. For too long, neoclassical insurance studies have taken the production of space for granted, as something which sits as a presupposed dilemma, or which represents a roadblock to engineering more 'efficient', or 'actuarially sound' market outcomes. Even existing and more critical accounts of ILS -- including the foundational work of Johnson (2015) -- have neglected the constitutive role of the Florida case in their theorization.

As a result of these absences and oversights, urban-geographical differences often fade to the background of the more mainstream analyses of ILS and (re)insurance, in favor of

inward-looking, opaque, and often deeply ideological debates which are often abstracted from the social and political life of markets. In a way, critical discussion of the *urban* nature of the problems which (re)insurance markets have been constructed to solve get obscured or neglected outright. Ultimately, this may blind the market's greatest proponents -- including those with noble intentions -- from understanding the limits and contradictions generated by the same innovations which seek to fix longstanding market tensions. In this dissertation, I have worked to push beyond these limits by bringing the spatial -- and therefore social and political economic -- machinations of risk capital markets to the fore, in support of a more critical insurance scholarship.

By bringing the production of space to the fore, this analysis raises questions about both the value and risks generated therein -- and the value risk capital markets generate from risk in particular. I have shown how (re)insurance markets represent a highly functional and integral infrastructure of urban reproduction in the Florida context, yet remain extractive and incomplete as a holistic climate risk 'solution'. Florida's reliance on (re)insurance to manage real estate climate risks, and the reluctance of state-level leaders to enable local governments and individual property owners to manage those risks through alternative means, stands to amplify persistent dynamics of urban poverty, precarity, and inequality moving forward. I have brought the State of Florida's highly entrepreneurial role in risk transfer to the forefront precisely to invite further research and debate about how the State may approach questions of climate risk governance in more holistic and equity-oriented way.

One common agenda for both researchers and policy-practitioners could focus on developing strategies for financing and implementing risk mitigation and risk transfer in more comprehensive fashion, one which minimizes -- rather than reproduces -- vulnerabilities. The kernels of such an approach already exist, as in the existing premium rebates offered through the NFIP's Community Rating Scheme or in proposals for the resilience bond, which both transform risk reduction into clear value forms. Given that a wide range of Florida urban

elites recognize the benefits (and vulnerabilities) of the state's (re)insurance market ties, one forward step would involve bringing together stakeholders to develop consensus around what these more comprehensive approaches might be, up to and including planning and finance strategies which leverage the unique capacities of (re)insurers and risk modelers to value and mobilize risk. One challenge will be to ensure a persistent and critical eye towards these very constructions of value and risk -- concepts which are often presented as technical and neutral, in ways which mask nested power relations, asymmetrical economic interests, and uneven distributional outcomes. Rather than dispose of these concepts and tools entirely, there is an opportunity to open up the very process through which these concepts are defined and marshalled: value and risk for whom?

On this note, this dissertation also seeks to put (re)insurance more squarely on the agenda of civil society organizations in Florida cities, particularly those concerned with questions of housing affordability and environmental justice. Here, I have presented the foundation of a more comprehensive form of housing and community vulnerability analysis, one which explicitly considers how (re)insurance affordability converges with the fiscal capacity of households and local governments to manage risk. The approach offered here has been limited by a lack of more spatially granular (re)insurance underwriting data, and would greatly benefit from input and ideation from civil society stakeholders in Miami and beyond. Nevertheless, the analysis can provide a new way of bringing critical questions of equity and inclusion into conversations about climate risk and finance, which too often remain out of reach and elite.

In this dissertation I have charted a critical, if functionalist approach to explaining how, why, where, and to what ends ILS both originated and operates in the Florida urban context. I have done so in the hope that the insights offered here inspire others to take up Derickson's (2018: 432) call to "anticipate the future in ways that reclaim and rework, rather than merely respond to, forms of thought and shared ontologies that characterize and accompany the

Anthropocene.” Insofar as the new frontier represented by ILS draws on a speculative view towards urban futures, it also demands we also cultivate parallel, alternative gazes.

For now, however, hundreds of workers continue to toil on dozens of half-realized high-rises which tower over Miami’s flat waterfront. Large late afternoon storm clouds gather above the Magic City, on time as ever. The blue-greens of Biscayne Bay turn a darker shade of blue-black, and the seas continue to rise.

7.3. Works Cited

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