Chapter 12
Assessing the Drivers of Intrinsically Complex Hurricane Insurance Purchases: Lessons Learned from Survey Data in Florida

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Abstract In the United States (U.S.), there is no one base policy for property insurance that can cover all disaster perils such as floods and windstorms. Hurricane-based insurance is intrinsically complex because the disaster peril may be excluded from a regular insurance policy and thus homeowners need to purchase a separate policy for that risk. Besides, the coverage for disaster perils often comes with separate deductibles and coverage limits. As a result, homeowners need to acquire a significant amount of information and knowledge to understand the insurance policies and make informed decisions about their coverage choices. This study utilizes decision trees to provide a comprehensive overview of flood and wind insurance purchase outcomes in the state of Florida. We also examine the behavioral, personal, and socio-demographic factors that influence the decision to obtain natural disaster insurance coverage for the various identified types of insurance purchases.

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Our empirical analyses are based on homeowner survey data collected from coastal residents in Florida. We find that different types of flood and wind insurance purchases are related to unique factors, which highlights the importance of distinguishing insurance purchase outcomes. We also provide policy implications that focus on specific targets to improve insurance uptake.

Keywords Natural disaster insurance · Insurance purchase · Hurricane · Flood · Real-time surveys · Protection gap

12.1 Introduction

Hurricanes are a continued threat to the physical and financial well-being of coastal residents throughout the United States (U.S.). From 1980 to 2021, the U.S. experienced 56 tropical cyclones classified as billion-dollar disasters totaling over $1.1 trillion dollars in damage and resulting in 6697 fatalities.[1] In particular, for Florida and other U.S. states bordering the Gulf of Mexico, tropical storms and hurricanes are the costliest natural disasters, with Florida experiencing 29 billion-dollar tropical cyclone events totaling $220 billion in damage from 1980 to 2021, and all Gulf Coast States combined experiencing 43 billion-dollar tropical cyclone events totaling $740 billion in damage over the same period.[2] Climate change may increase the severity of these storms in the future (Marsooli et al. 2019), which highlights the need to improve preparedness for hurricanes to mitigate future damages.

Most damage during a hurricane or tropical storm occurs as a result of powerful winds, as well as from flooding due to large amounts of rainfall and/or high storm surges. Households can reduce potential property damage caused by flooding and windstorms by implementing risk reduction measures. Such measures range from structural alterations to the property, for example home-elevation or flood-proofing, to emergency preparation measures taken during an immediate threat of a hurricane. These latter measures include boarding windows, applying sandbags, and moving belongings to higher floors. Besides physical preparation for storms and hurricanes, households can choose to purchase natural hazard insurance to financially protect against flood and windstorm losses. However, the uptake of natural hazard insurance in the U.S. has been notoriously low, causing a significant insurance protection gap (Lingle and Kousky 2018). For example, of the $7 billion in expected annual flood losses to single-family homes in the U.S., more than 87% are uninsured by the National Flood Insurance Program (NFIP), which is the largest flood insurance provider in the country (Milliman 2021). The insurance gap was exposed by

[1] https://www.ncdc.noaa.gov/billions/summary-stats.

[2] Cost numbers were extracted from https://www.ncdc.noaa.gov/billions/summary-stats/FL/1980-2021 and https://www.ncdc.noaa.gov/billions/summary-stats/GCS/1980-2021. Both costs were CPI-adjusted and did not include Hurricane Nicholas in September 2021.

Hurricane Harvey (the second largest hurricane flood loss in the U.S.) in Texas where only 15% of impacted homeowners in the area had flood insurance (Munich Re 2020).

It is plausible that part of the U.S. insurance gap is due to the intrinsic complexity of the natural disaster insurance purchase itself. In the U.S., there is no one base policy for property insurance that can cover all disaster perils.[3] Instead, policyholders need to purchase an additional endorsement or even a separate insurance policy to cover certain natural disasters, such as floods and windstorms. Additionally, in areas at high risk of these perils, insurance coverage may be mandatory (for example, required for a federally backed mortgage), or is otherwise voluntary. Finally, the coverage that is purchased for natural disasters typically comes with separate deductibles and coverage limits. Consequently, homeowners need to acquire a significant amount of information and knowledge to understand their homeowners' insurance policies and make informed decisions about their coverage options.

The goal of this study is to first demonstrate the intrinsic complexity of natural disaster property insurance coverage in the U.S. by examining the types of flood and wind insurance purchases in the state of Florida. Accordingly, we use decision trees to illustrate the conditions and choices that Florida homeowners need to consider when purchasing natural disaster property insurance coverage. Based on these choices and conditions, homeowners will end up with different choice sets for insurance coverage. As a result, we identify various types of disaster insurance purchases. We then attempt to shed light on behavioral, personal, and socio-demographic factors that influence the decision to obtain disaster insurance coverage for the various identified types of disaster insurance purchases. To do this, we apply empirical analyses of homeowner survey data collected as part of a multi-year research effort on hurricane preparedness by coastal residents in Florida.

Designing policies to improve disaster preparedness, including insurance coverage purchase, needs a better understanding of individual decision-making at different points in time, since certain impacting factors, such as subjective risk or social norms, may be more important at times of high risk compared to low-risk situations. Most studies of individual natural disaster risk perceptions and their relation to risk reduction activities rely on cross-sectional data that are collected at one point in time after the disaster has occurred (e.g., Botzen et al. 2019; Mol et al. 2020), but both risk perceptions and preparedness activities may evolve over time (e.g., Bubeck et al. 2020; Mondino et al. 2020). In our study, we address the notion of evolving risk perceptions and preparedness by applying survey data collected at different times during the hurricane season. One survey was collected during a high threat level of flood and wind damage conducted at the end of the 2020 hurricane season when Hurricane Eta approached Florida, and another was collected during a low-threat situation at the beginning of the 2021 hurricane season.

[3] There may be comprehensive policies that include added-on endorsements to cover disaster perils.

We conduct empirical analyses using the data from the two surveys separately and compare their results because the two surveys were given at different time points to different populations and covered different geographical areas. Our previous survey outcomes have shown that individuals are likely to change their insurance policy between the end and the beginning of the hurricane seasons (Botzen et al. 2020b). Besides accounting for risk levels at different points in time, we also differentiate between types of flood and wind insurance uptake to test for different factors driving uptake of varying insurance policies.

The most important ways in which flood insurance policies differ are in the level of coverage and whether coverage is optional or mandatory. Individuals in the U.S. may be mandated to purchase flood insurance when they live in high-risk flood areas and have federally backed mortgages. Theoretically, we expect that the socio-demographic factors, house characteristics, and individual risk perceptions are more likely to affect voluntary purchase than mandatory purchase. The major underwriter of flood insurance is the NFIP. In Florida, there are several private insurers that provide private flood insurance products. Homeowners may purchase private flood insurance products for more comprehensive flood coverage. We identify four types of flood insurance purchases – mandatory purchase of an NFIP policy, mandatory purchase of a private product, voluntary purchase of an NFIP policy, and voluntary purchase of a private product.

For wind insurance, most individuals can obtain coverage through their standard homeowners' insurance. However, if an individual lives in a coastal area where the wind peril is widely excluded from the standard homeowners' insurance policy, that person only has the choice set of a wind-only policy from state-run programs. In certain areas in Florida, insurers may choose to exclude the windstorm peril and the policyholders must purchase a wind endorsement or a separate wind-only policy to obtain the wind coverage. The wind-only policy is provided mainly through the state-run program – the Florida Citizens Property Insurance Corporation (Citizens). Some private insurers also offer a wind-only policy or a wind-endorsement. We identify four types of wind insurance purchases – homeowners' insurance from a private insurer, homeowners' insurance from Citizens, wind-only coverage from a private insurer, and wind-only policy from Citizens.

We find that the determinants of insurance uptake vary across different types of insurance purchases. For example, regarding flood insurance, we find that the value of contents and home buildings is only positively related to the voluntary purchase and not related to the mandatory purchase and that, in general, the mandatory purchase is much less related to covariates than voluntary purchase. For wind insurance, we find that being a homeowner increases the probability of having coverage through homeowners' insurance, while being a homeowner does not positively relate to the uptake of wind-only policies. Homeowners more frequently have insurance coverage than renters and thus are more likely to have windstorm coverage through their homeowners' insurance.

The remainder of the chapter is organized as follows. First, Sect. 12.2 provides the insurance market context and details the decisions that Florida homeowners need to consider when purchasing natural disaster property insurance coverage for floods

and windstorms. Section 12.3 outlines the survey instrument and its implementation in the field during the two different time periods. Section 12.4 provides the insurance purchase types identified and the regression methodology deployed to assess the behavioral, personal, and socio-demographic factors that relate to the decision to obtain disaster insurance coverage for each type. In Sect. 12.5, we present the empirical results for flood insurance coverage purchases and then wind insurance coverage purchases. Section 12.6 provides our concluding discussion and policy implications.

12.2 Decision Trees and Insurance Purchase Types

We utilize decision trees to demonstrate the complexity of purchasing flood insurance and windstorm coverage, thereby illustrating the process that leads to different types of insurance purchases. The root and branch nodes represent a decision, and the end nodes show the outcomes (i.e., choice sets). We note that consumers often use an agent to purchase insurance. Consumers may not consciously make the decisions shown in the decision tree because the agent can collect their information and help them determine the appropriate coverage. However, the usage of a decision tree can still explain the underlying decision-making process by an agent or a consumer. The complexity of the process also indicates the opacity of the property insurance market and the substantial knowledge that consumers need to acquire to understand their insurance policy. Also, we do not distinguish admitted and non-admitted carriers because sourcing insurance purchases often depends on the agent and is not a policyholder's choice. If the agent can write in both the standard and the non-admitted market, the policyholder is likely to choose the insurer based on the price.

12.2.1 Flood Insurance Decision Tree

Flood risk is not covered by a standard homeowners insurance policy in the U.-S. Homeowners need to purchase a separate flood insurance policy to obtain coverage. Moreover, homeowners located in high-risk flood areas with mortgages from government-backed lenders are required to have flood insurance (FEMA n.d.).[4] The high-risk flood area is also called the Special Flood Hazard Area (SFHA) that

[4]Federal banking regulators have allowed for either a NFIP policy or a private flood insurance. A rule on acceptance of private flood insurance was finalized in 2019. However, Federal Housing Administration (FHA) regulations currently do not allow FHA-insured properties to purchase private flood insurance to fulfill the mandatory requirement.

has a 1-in-100 year flood probability.[5] Homeowners without the mandatory requirement, such as those living in moderate- to low-risk flood areas, can purchase flood insurance on a voluntary basis.

Most flood insurance is provided through the NFIP, which is a federal program administered by the Federal Emergency Management Agency (FEMA). Only property owners in the participating communities can purchase an NFIP policy. There are approximately 23,000 NFIP participating communities nationwide; only 9 communities in Florida do not participate.[6] Homeowners living in non-participating communities must purchase a private flood insurance product that is designed and underwritten by a private insurance company. The private flood insurance product can be a stand-alone flood policy or an endorsement of the homeowners' insurance.[7]

Owners of high-value homes may want to purchase a private flood insurance product to obtain additional coverage beyond the NFIP policy. The NFIP policy has coverage limits of $250,000 for the building and $100,000 for the building contents. In comparison, private flood insurance products have much higher coverage limits, along with some additional benefits, such as more deductible choices, a shorter waiting period, and fewer underwriting questions. In sum, for a mandated flood insurance purchase (top branch of the decision tree), homeowners may have three options to obtain flood coverage: an NFIP policy plus a private flood insurance policy for additional coverage, a sole NFIP policy,[8] or a sole private flood insurance policy (Fig. 12.1).

For a voluntary flood insurance purchase (bottom branch of the decision tree), homeowners living in the NFIP participating communities can buy an NFIP policy. Homeowners located in moderate- to low-risk flood areas (non-SFHA areas, Zone B, C, or X) are eligible for a Preferred Risk Policy (PRP), which has the same coverage as a standard-rated NFIP policy but charges a lower cost.[9] Similarly, policyholders with a voluntary purchase can add a private flood insurance policy for additional coverage. In sum, there are five options for homeowners who purchase flood insurance voluntarily: an NFIP PRP plus a private flood insurance policy, an NFIP standard-rated policy plus a private flood insurance policy, a sole NFIP PRP policy, a sole NFIP standard-rated policy, and a sole private flood insurance policy.

[5] High-risk flood areas begin with the letters A or V on the FEMA flood maps. Moderate- to low-risk flood areas are designated with the letters B, C, and X on the FEMA flood maps. More than 40% of all NFIP flood claims came from outside of high-risk flood areas between 2015 and 2019 (FEMA 2020).

[6] The numbers for Florida are obtained from the Community Status Book, retrieved October 5, 2020 from https://www.fema.gov/national-floodinsurance-program-community-status-book.

[7] Alternatively, homeowners may have a flood endorsement onto a dwelling fire policy.

[8] Private insurance companies can underwrite the NFIP standard insurance policy through the Write Your Own (WYO) Program. But the financial liabilities of these NFIP policies are fully on federal government.

[9] More policy information regarding PRPs is available at https://www.fema.gov/pdf/nfip/manual201105/content/09_prp.pdf.

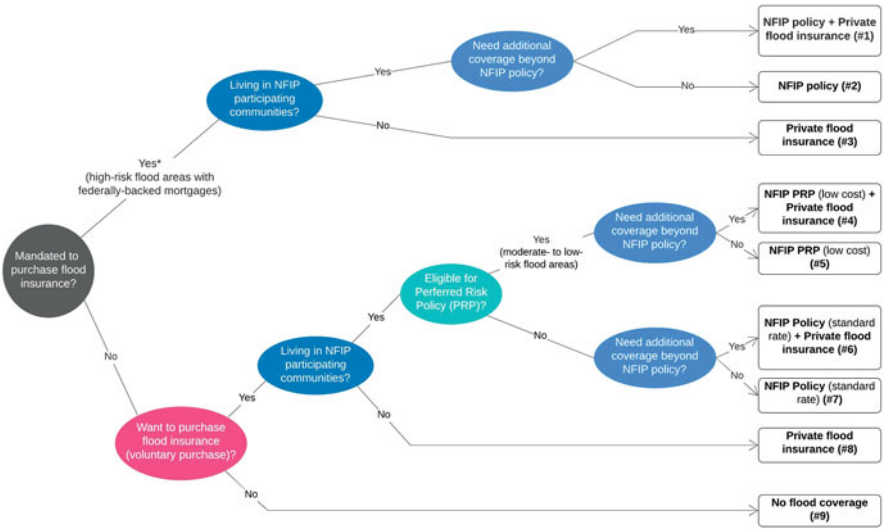

Fig. 12.1 Flood insurance decision tree in Florida. **Note**: *In practice, it is possible that properties that are mandated to have flood insurance do not purchase flood insurance. FHA-insured properties that are mandated to have flood insurance but not located in the NFIP participating communities cannot purchase private flood insurance to fulfill the requirement at this stage. Insurance regulators have been working to change this rule

12.2.2 Windstorm Coverage Decision Tree

Windstorm peril is typically covered by the standard homeowners' (HO) multi-peril insurance policy except in some wind-prone areas. The windstorm loss in some coastal states is subject to a separate deductible. There are three types of wind deductibles:

- Hurricane deductible applied to windstorm damages caused by a named hurricane.
- Named-storm deductible is less restrictive than Hurricane deductible and additionally applies to damages caused by named tropical storms that are not a hurricane at landfall.
- Windstorm deductible is the broadest type and applies to windstorm damages from any source.

Based on the III (2020) and the National Association of Insurance Commissioner's Center for Insurance Policy and Research (CIPR) website, 19 states and the District of Columbia currently have a hurricane or named storm deductible in place.[10] Unlike the NFIP flood policy, homeowners' insurance is specific to states because different

[10]More detailed information is available at https://www.agordon.com/blog/bid/163479/wind-deductible-vs-hurricane-vs-named-storm-deductibles and the CIPR website https://content.naic.org/cipr_topics/topic_hurricane_deductibles.htm.

states can employ different triggers and amounts for windstorm deductibles. The residual markets in different states may also have different eligibility requirements, policies, programs, and management rules. We focus on the decision-making process in Florida because our survey data do not cover other states.

In Florida, homeowners living in coastal areas may not find a standard HO multi-peril insurance policy from a private insurer or may only find coverage with extremely high premiums. In this case, homeowners can turn to the Citizens Property Insurance Corporation (Citizens), the residual market and last resort of high-risk homeowners.[11] A homeowner is eligible for a Citizens policy if one of the following criteria is met: (1) no comparable private-market offers of coverage are received, or (2) comparable private-market offers of coverage are received, but the premiums are more than 15% higher than a comparable Citizens policy.

Another issue is that, in some high-risk regions, private insurers can exclude the windstorm peril from the coverage. According to the Florida Statute s. http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0600-0699/0627/Sections/0627.712.html, admitted insurers are required to offer windstorm coverage in the base policy except in areas covered by the Citizens Coastal Account. The Citizens Coastal Account, formerly known as High Risk Account, is for wind-only and multi-peril policies for personal residential, commercial residential, and commercial nonresidential risks located in eligible coastal high-risk areas, i.e., in areas that were defined on January 1, 2002 to be eligible for coverage by the Florida Windstorm Underwriting Association. Surplus line underwriters are not subject to s. http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0600-0699/0627/Sections/0627.712.html.

When the windstorm peril is excluded, homeowners can purchase a wind-only policy from Citizens covering only damages from hail and windstorms. Only properties in areas within the boundaries of the Citizens Coastal Account are eligible for Citizens wind-only policies. On the demand side, policyholders may voluntarily exclude the windstorm peril and purchase a wind-only policy if the latter is a cheaper option.

High-value properties are ineligible to obtain coverage from Citizens and thus, must purchase coverage from private insurers. Effective January 1, 2017, housing units with a replacement cost of $0.7 million or over are not eligible for any coverage by Citizens (the replacement cost limit is $1 million in Miami-Dade and Monroe counties).[12] In Florida, a few private insurers provide a wind-only policy or an

[11] Citizens was established by the Florida Legislature in 2002 when the state combined two separate high-risk insurance pools – the Florida Windstorm Underwriting Association and the Florida Residential Property & Casualty Joint Underwriting Association. The company website is https://www.citizensfla.com/insurance-101.

[12] Based on s. 627.351(6)(a)3.d., effective January 1, 2017, a structure that has a dwelling replacement cost of $700,000 or more, or a single condominium unit that has a combined dwelling and contents replacement cost of $700,000 or more, is not eligible for coverage by the corporation. Such dwellings insured by the corporation on December 31, 2016 may continue to be covered by the corporation until the end of the policy term. Rules and processes were revised in December 2019; see details at Citizens website.

endorsement for windstorm damages.[13] When the windstorm peril is excluded from the base policy, the high-value houses must find wind-only coverage from these private insurers

In Florida, both HO multi-peril insurance and wind-only insurance have a hurricane deductible that applies to wind damages caused by a named hurricane. A hurricane deductible can be either a flat amount of $500 or 2%, 5%, or 10% of the home's total insured value. The $500 flat deductible is only available for certain types of policies, such as homes with a total insured value of less than $100,000. The hurricane deductible applies only once during a hurricane season.[14] In sum, policyholders in Florida may have four options to obtain windstorm coverage: a standard homeowners' multi-peril policy from a private insurer, a homeowners' multi-peril policy from Citizens, and a private homeowners' multi-peril policy excluding windstorm peril plus a Citizens wind-only policy, and a private homeowners' multi-peril policy excluding windstorm peril plus a private wind-only policy (Fig. 12.2).

In Florida, there are several programs to help homeowners access the state's increasingly expanding insurance market. The Clearinghouse program established by Citizens helps policyholders with no option other than Citizens to shop around and find better property coverage from private insurers. Policyholders are not eligible for Citizens if a comparable offer of coverage is received through the Clearinghouse with a premium less than 15% higher than the Citizens premium. The Homeowners Rate Comparison Tool (CHOICES) on the Florida Office of Insurance Regulation (OIR) website[15] provides users the average rate quotes for three coverage examples and the user's county from various insurance companies (including Citizens). The quotes reflect the most recent rate filings approved by the OIR office. The Florida Market Assistance Plan (FMAP), run by Citizens, is a free and online referral service that matches property owners with agents who can help the property owners find private-market coverage.

Under Florida law, policyholders can obtain premium discounts for implementing certain types of mitigation measures. The first layer discount is for new building codes and eligible for houses built after 2001 or houses built before 2001 but with an updated roof construction that meets the 2001 Florida Building Code. The second layer discount only applies to the hurricane-wind portion of the premium. It includes two types of wind mitigation measures – securing the roof and protecting windows from flying debris.[16]

[13] There are around 10 private insurers that sell wind-only policies in Florida, according to our communications with the Florida Office of Insurance Regulation (OIR) staff.

[14] When homeowners incur wind losses under the second hurricane, the deductible of the second claim will be either the remainder of the unused hurricane deductible or the AOP deductible, whichever is greater. See more details at the Florida's Chief Financial Officer's website.

[15] The CHOICES system is for four types of insurance including homeowners at https://www.floir.com/choices.aspx.

[16] To learn more about the wind mitigation discount, see Form OIR-B1-1655 from Florida OIR available at https://www.floir.com/siteDocuments/OIR-B1-1655.pdf.

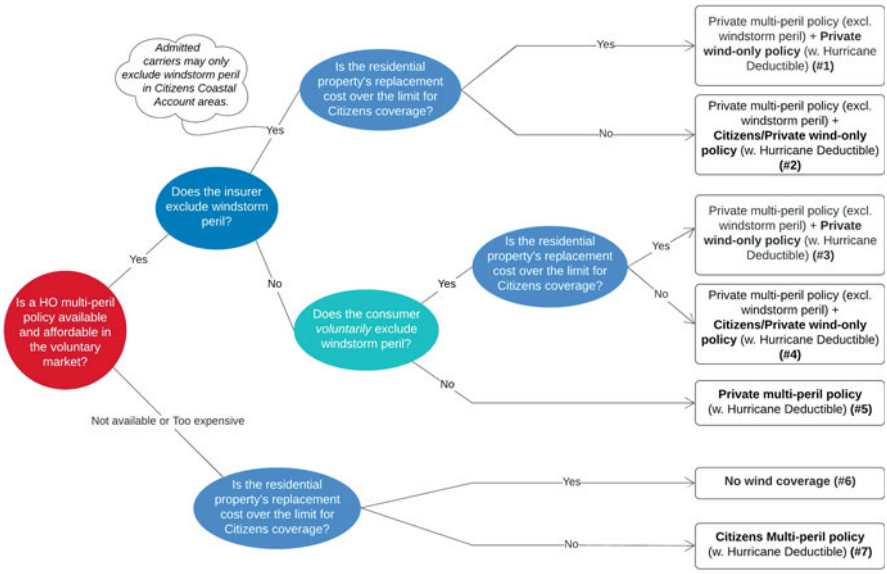

Fig. 12.2 Windstorm coverage decision tree in Florida. **Note**: The voluntary/private market includes admitted carriers and surplus line (i.e., non-admitted) underwriters. The replacement cost limit for the Citizens coverage is $0.7 million in Florida except in Miami-Dade and Monroe counties, where the limit rises to $1 million. A private wind-only policy at the end nodes can be a separate wind-only policy or an endorsement for windstorm damages onto the base policy

Our analysis focuses on the state of Florida. However, the situations in other coastal states can be different. The NFIP program provides federal flood insurance, but private flood insurance products may not be a choice for homeowners in all coastal states. For wind insurance coverage, the deductibles of wind coverage vary across states. For example, Louisiana has three types of windstorm deductibles in different areas. Homeowners in wind-prone areas may have a hurricane or named-storm deductible, whereas those in low-risk wind areas may have a windstorm & hail deductible of a lower amount. As a result, the wind coverage in Louisiana can vary by the types of deductibles. Besides, the state-run program is different among states in terms of eligibility requirements and other regulations rules. Therefore, the decision trees for other coastal states should be tailored to state-specific conditions and regulations.

12.3 Survey Instrument and Field Implementation Summary

12.3.1 Real-Time, Repeated Surveys

This study is part of a multi-year research effort on hurricane preparedness of coastal residents in Florida. We conducted five surveys from 2019 to 2021, some of which were distributed during a hurricane threat (real-time survey). We aim to better

understand individual decision-making during the threat of a disaster as well as in its aftermath.

The analysis of this chapter focuses on the last two surveys (i.e., survey 4 and survey 5) that we conducted during the 2020 hurricane season and at the beginning of the 2021 hurricane season. The 2020 hurricane season produced a record-breaking 30 named storms, including six major hurricanes (Blackwell 2020). Survey 4 was distributed just before Hurricane Eta hit Florida. Hurricane Eta approached Florida from Central America but decreased in power before landfall on the Florida Keys on November 8 as a tropical storm with maximum sustained winds of 100 km/h (65 mph) (Insurancejournal.com 2020). After reentering the Gulf of Mexico, it regained power, becoming a category 1 hurricane, and veered back towards Tampa Bay on November 11, where heavy rains and a powerful storm surge caused significant damage. On November 12, Eta was reduced to a tropical storm with maximum sustained winds of 85 km/h (50 mph) and made landfall for the second time in Florida in Cedar Key. Although no deaths were reported because of the storm, estimated direct damage to structures exceeded $1.1 billion, of which insurance firms covered approximately half (AON 2020). Figure 12.3 exhibits the track of Hurricane Eta and its development in terms of strength classifications.

Survey 4 was conducted as an online survey on November 10 and 11, 2020. It was given to households living along the Gulf coast of Florida. As Fig. 12.4 shows, most survey respondents were located close to the Tampa Bay area where Hurricane Eta was expected to make landfall on November 12. In total, the survey received 844 responses.

Survey 5, also conducted as an online survey, was given to households living along the Gulf and Atlantic coasts of Florida. The survey was sent out between May 26–June 7, 2021, to examine individual hurricane preparedness before a hurricane

Fig. 12.3 Final track of hurricane/storm Eta. (Source: weather.com 2020)

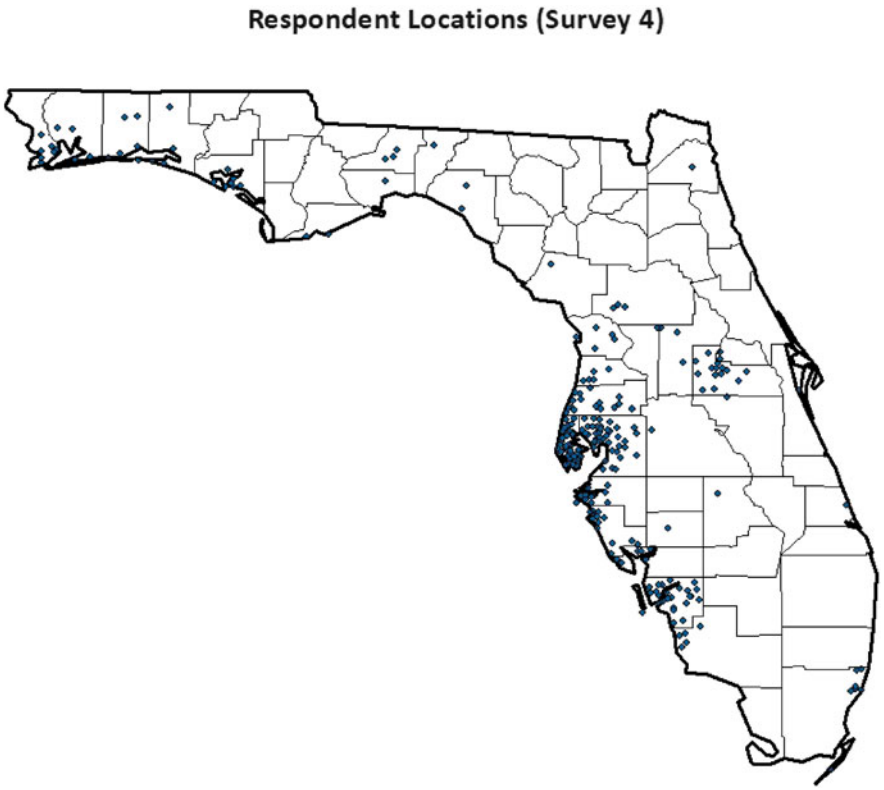

Fig. 12.4 Location of respondents to the survey conducted in November 2020

season. In total, 1245 respondents completed the survey, and their locations are shown in Fig. 12.5.

12.3.2 Sampling and Variable Coding

This chapter focuses on findings from Surveys 4 and 5 since these surveys contained detailed questions regarding the types of respondents' insurance purchases. Table 12.1 summarizes the information of Survey 4 and Survey 5. Both survey 4 and survey 5 were implemented via the market research company Downs & St. Germain Research. Their panel was randomly sampled from the population in the geographic regions of interest with the overall aim to obtain a representative sample based on socio-demographic characteristics.

Table 12.2 provides information about the way in which the survey questions were asked as well as their variable coding for the statistical analysis.

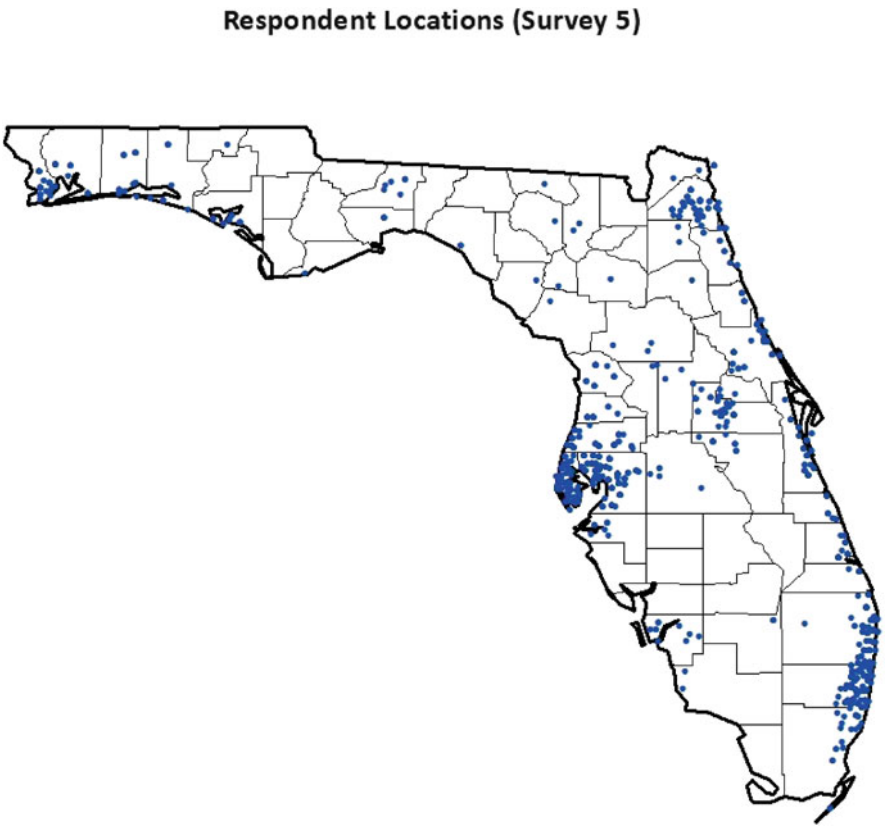

Fig. 12.5 Location of respondents to the survey conducted in May and June 2021

Table 12.1 Information of two surveys

	Survey 4 (n = 844)	Survey 5 (n = 1245)
Dates	November 10–11, 2020	May 26–June 7, 2021
Real-time?	Yes (Hurricane Eta)	No, beginning of the season
Location	Florida, Gulf of Mexico	Florida, Gulf & Atlantic coasts
Survey method	Online	Online
Sampling method	Random sampling	Random sampling

12.4 Measures and Method

12.4.1 Measures of Insurance Purchase Types

Based on the survey questions, we can separate mandatory versus voluntary purchase of flood insurance. The mandatory and voluntary flood insurance purchase can

Table 12.2 Coding of variables

Variable	Coding
Number of ex ante risk reduction measures	The sum of ex ante risk reduction measures applied by a respondent, including home elevation; flood-proof paint or coating; a sump pump and/or a drainage system; flood-resistant building materials; water-resistant floor; and the installation of electrical and central heating systems above potential flood levels.
Premium discount for flood risk mitigation[a]	*"Did you receive a premium discount on your flood insurance for taking any of these (the above flood risk mitigation) measures?"* 1 = Yes, 0 = No
Window protection	*"Did you implement the following measures to reduce the windstorm damages to your home? Window protection such as shutters, plywood panels, or hurricane proof glass."* 1 = Yes (in or before 2021), 0 = No (plan to do in 2021 or not plan to do)
Roof retrofit[a]	*"Did you implement the following measures to reduce the windstorm damages to your home? Roof construction that meets the 2001 Florida Building Code such as roof covering, roof-deck attachment, and roof-to-wall connection."* 1 = Yes (in or before 2021), 0 = No (plan to do in 2021 or not plan to do)
Hip roof[a]	*"Did you implement the following measures to reduce the windstorm damages to your home? Hip roof, i.e., roof sloping down to meet all your outside walls (like a pyramid)."* 1 = Yes (in or before 2021), 0 = No (plan to do in 2021 or not plan to do)
Premium discount for wind risk mitigation[a]	*"Did you receive a premium discount on your windstorm insurance coverage for taking any of these measures?"* 1 = Yes, 0 = No
Worry about flooding	*"I am worried about the danger of a flood at my current residence."* 1 = Strongly disagree to 5 = Strongly agree
Perceived flood impact	*"What would it cost to repair the damage to your home and its contents if your home did flood?"* 1 = Less than $10,000 to 7 = $200,000 or more
Perceived flood probability	*"What is your best estimate of how often a flood will occur at your home?"* 1 = Less often than 1 in 1000 years to 7 = More often than 1 in 10 years
Worry about windstorm[a]	*"I am worried about the danger of a windstorm at my current residence."* 1 = Strongly disagree to 5 = Strongly agree
Perceived wind impact[a]	*"What would it cost to repair the damage to your home and its contents if your home did suffer a windstorm?"* 1 = Less than $10,000 to 7 = $200,000 or more
Windonly_territory	Identify whether the respondent's home is located within the Florida Citizens Coastal Account Area (wind-only policy eligible area) based on the latitude and longitude of their home. 1 = Yes, 0 = No

(continued)

Table 12.2 (continued)

Variable	Coding
Trust in government flood policies	*"How much do you trust the ability of government officials to limit flood risk where you live, for example by maintaining levees and enforcing building codes? Do you:"* 1 = Not trust them at all to 4 = Trust them completely
Risk taking/risk aversion	*"Using a 10-point scale, where 0 means you are not willing to take any risks and 10 means you are very willing to take risks, what number reflects how much risk you are willing to take?"* For risk aversion, the inverse is taken, i.e., 0 = Very willing to take risk (response = 10) to 10 = Not willing to take risk (response = 0)
Internal locus of control	*"Using a 10-point scale, where 0 means you have no control and 10 means you have complete control, what number reflects how much control you think you have over how your life turns out?"* Scale from 0 to 10
Social norm for insurance uptake	*"Most people who are important to me would think that someone in my situation ought to purchase flood insurance."* 1 = Strongly disagree to 5 = Strongly agree
Regret of no insurance	*"I would regret not purchasing flood insurance coverage if a flood were to occur next year."* 1 = Strongly disagree to 5 = Strongly agree
Regret of having insurance	*"I would regret purchasing flood insurance coverage if no flood were to occur next year."* 1 = Strongly disagree to 5 = Strongly agree
House owner	0 if the respondent rents his/her house; 1 if the respondent is a property owner
Value of home building	*"What is approximately the current market value of your home?"* 1 = Less than $100k to 8 = $800k or more
Value of home content	*"What is approximately the value of your home contents?"* 1 = Less than $5000 to 8 = $75,000 or more
Length of residence	*"How long have you lived in your home (in years)?"*
Underfloor basement	*"Does your home have a basement, cellar or crawlspace?"* 1 = Yes for basement, 0 = No basement
Age	*"How old are you?"* in years
Education	*"What is your highest completed level of education?"* 1 = Some high school to 5 = Post graduate
Income	*"Which of the following describes your total household income for 2019 before taxes?"* 1 = Less than $10,000 to 6 = $125,000 or more
Female	*Was the respondent male of female?* female = 1, male = 0
Financial difficulty due to COVID-19	*"Did you experience any financial difficulties as a result of the coronavirus that prevented you from purchasing insurance for your home?"* 1 = Yes, 0 = No
Trouble purchasing flood insurance[a]	*"Have you had trouble getting or renewing your flood insurance because of natural disasters in the past?"* 1 = Yes, 0 = No
Trouble purchasing homeowners insurance[a]	*"Have you had trouble getting or renewing your homeowners insurance because of natural disasters in the past?"* 1 = Yes, 0 = No

[a]These questions were only included in Survey 5

Table 12.3 Distribution of flood insurance purchase types

Flood PH types	Definition	Survey 4		Survey 5	
		Freq.	Percent	Freq.	Percent
Mandatory NFIP	Mandated to purchase flood insurance, and only purchased the NFIP policy	46	6%	79	8%
Mandatory private insurer	Mandated to purchase flood insurance, and purchased a private flood product	28	4%	60	6%
Voluntary NFIP	Voluntarily chose to purchase flood insurance, and only purchased the NFIP policy	62	8%	70	7%
Voluntary private insurer	Voluntarily chose to purchase flood insurance, and purchased a private flood product	41	6%	108	11%
None	No flood insurance	567	76%	690	69%
Subtotal		**744**	**100%**	**1007**	**100%**
Don't know[a]	Don't know if have a flood policy	91		171	
	Having flood insurance but don't know insurance type (if mandatory or insurance provider)	9		67	
Total		**844**		**1245**	

[a]The data of respondents who don't know any needed information are not used in the analysis due to lack of information

be further distinguished by where the individuals obtained the insurance – NFIP policy versus private flood insurance. The flood policyholders are primarily measured by four *mutually exclusive* types – *mandatory NFIP, mandatory private insurer, voluntary NFIP, and voluntary private insurer*.

Table 12.3 shows the frequency and percentage of different types of flood insurance purchases. For both Surveys 4 and 5, we have slightly more voluntary purchase of flood insurance than mandatory purchase. About 10% of respondents in Survey 4 and 17% of respondents in Survey 5 purchased a private flood insurance product. The NAIC report[17] showed that the private flood premiums written was 8% of the total flood premiums written in Florida in 2018. We have a slightly higher percentage of private flood insurance buyers possibly because our sample is mostly limited to coastal counties.

Based on our survey questions, in Survey 4, the wind coverage purchases can be divided into two types – obtaining wind coverage from the homeowners' insurance (*homeowners' insurance*) or from a wind-only policy (*wind-only policy*). There are 331 respondents whose homeowners insurance covered the windstorm peril and 34 respondents who had to obtain windstorm coverage through a wind-only policy.

In Survey 5, we asked the policy type question separately for individuals who purchased wind coverage from private insurers and from the Florida Citizens. Therefore, there are four types of wind insurance purchases for Survey 5 –

[17]National Association of Insurance Commissioners (NAIC), December 2019, "Considerations for State Insurance Regulators in Building the Private Flood Insurance Market."

Table 12.4 Distribution of wind insurance purchase types

Wind PH types	Definition	Survey 4		Survey 5	
		Freq.	Percent	Freq.	Percent
Homeowners' insurance from a private insurer	Coverage through a homeowners' insurance policy from private insurers	331	47%	309	33%
Homeowners' insurance from Citizens	Coverage through a homeowners' insurance policy from Florida Citizens			112	12%
Wind-only coverage from a private insurer	Coverage through a wind-only policy (or wind endorsement) from private insurers	34	5%	73	8%
Wind-only policy from Citizens	Coverage through a wind-only policy from Florida Citizens			15	2%
None	No wind coverage	341	48%	435	46%
Subtotal		**706**	**100%**	**944**	**100%**
Don't know[a]	Don't know if have wind coverage	138		253	
	Having wind insurance but don't know insurance type (insurance provider or policy type)			48	
Total		**844**		**1245**	

[a]The data of respondents who don't know any needed information are not used in the analysis due to lack of information

homeowners' insurance from a private insurer, homeowners' insurance from Citizens, wind-only coverage from a private insurer, and wind-only policy from Citizens.

Table 12.4 shows the frequency and percentage of different types of wind insurance purchases. The majority of respondents (47% in Survey 4 and 45% in Survey 5) obtained their wind coverage through their homeowners' insurance policy. Only 10% or fewer respondents purchased a wind-only policy.

12.4.2 Other Survey Variables

To study insurance purchase behavior, we examine the influence of sociodemographic factors, house characteristics, flood risk perceptions, wind risk perceptions (only in Survey 5), the regret of having or not having flood insurance, the social norm for flood insurance, the mitigation measures, the premium discount for implementing measures (only in Survey 5), the trouble of obtaining insurance due to disaster activities (only in Survey 5), the financial difficulty of purchasing insurance due to COVID-19, and the trust in the government's ability to limit flood risk.

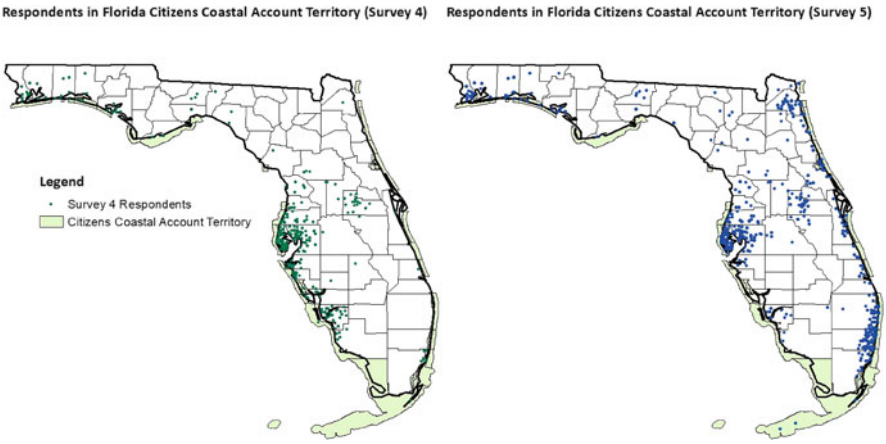

Fig. 12.6 Respondents in citizens coastal account territories

In addition to using individuals' wind risk perceptions, we also include a proxy for objective wind risk to study how windstorm coverage uptake is affected by objective risk. The variable, *Windonly_territory*, is based on whether a respondent lives within the boundaries of Florida Citizens Coastal Account Territories. The two maps below show the overlap of our respondents with the Coastal Account Territories for Survey 4 and Survey 5, respectively (Fig. 12.6). Essentially, the Coastal Account Territory covers the areas along the coastal lines of the Florida state. These areas are deemed as high-risk wind areas by Florida Citizens; only residents located within these areas are eligible for Citizens' wind-only policies. The variable *Windonly_territory* takes a value of 1 for the respondents located within the Coastal Account Territories and 0 otherwise.

The summary statistics of variables are displayed in Table 12.5. The average flood insurance uptake rate was 25% in Survey 4 and 36% in Survey 5. The average wind insurance uptake rate was 52% in Survey 4 and 56% in Survey 5, both higher than the flood insurance uptake rate of the same survey. Surveys 4 and 5 have different populations, but the two populations have similar mean values for the factors that may influence the insurance purchase.

12.4.3 Regression Methods

We use different models to examine the overall insurance uptake and the uptake of different insurance purchase outcomes. Our method to examine the overall insurance uptake is the fixed-effects Logit regression model. The dependent variable, *insurance purchase*, is a dummy variable equal to 1 if the respondent has purchased

Table 12.5 Summary statistics of variables

	Survey 4			Survey 5		
	N	Mean	Std. dev	N	Mean	Std. dev
Insurance uptake:						
Flood policy	753	0.247	0.432	1074	0.358	0.479
Wind policy	706	0.517	0.500	992	0.561	0.496
Influencing factors:						
Worry about flooding	839	2.712	1.268	1210	2.756	1.199
Perceived flood probability	676	0.105	0.207	974	0.090	0.183
Perceived flood impact	674	3.714	1.969	971	3.821	1.975
Worry about windstorm				1208	3.475	1.118
Perceived wind impact				980	3.789	1.959
Trust in government flood policies	796	2.734	0.780	1137	2.553	0.810
Number of ex ante risk reduction measures	844	1.315	1.524	1245	1.530	1.935
Window protection	794	0.486	0.500	1245	0.516	0.500
Roof retrofit				1245	0.561	0.497
Hip roof				1245	0.425	0.495
Premium discount for flood risk mitigation				739	0.108	0.311
Premium discount for wind risk mitigation				804	0.267	0.443
Trouble purchasing flood insurance				1245	0.142	0.349
Trouble purchasing homeowners' insurance				1245	0.153	0.361
Internal locus of control	835	7.404	2.258	1229	7.206	2.346
Risk taking	838	5.827	2.527	1228	5.818	2.575
Regret of no insurance	795	3.551	1.134	1142	3.613	1.083
Regret of having insurance	807	2.984	1.168	1152	2.941	1.186
Social norm for insurance uptake	790	3.108	1.176	1140	3.111	1.118
Financial difficulty due to COVID-19	844	0.217	0.412	1060	0.208	0.406
Age	832	46.73	17.49	1245	49.66	19.20
Education	839	3.222	1.055	1229	3.265	1.095
Income	813	3.480	1.405	1194	3.626	1.373
Female	837	0.687	0.464	1245	0.640	0.480
Value of home building	692	3.251	1.814	1031	3.596	1.856
Value of home content	716	4.581	2.279	1058	4.757	2.179
House owner	814	0.649	0.478	1190	0.703	0.457
Length of residence	814	9.026	9.723	1178	11.09	10.73
Underfloor basement	844	0.040	0.197	1245	0.074	0.262
Windonly_territory	803	0.052	0.223	1181	0.094	0.292

Note: The length of residence is winsorized at the 99% level because the maximum value is extremely large

insurance coverage and 0 if they have not purchased insurance. The fixed-effects Logit regression model is given by:

$$Insurance\ purchase_i = f(\boldsymbol{\beta X_i} + \gamma_c + \epsilon_i)$$

where i indicates survey respondents and γ_c is county-fixed effects. On the right-hand side, we include independent variables $\boldsymbol{X_i}$ for demographic factors (e.g., age, female, education, income), house characteristics (e.g., home value, contents value, length of residence, underfloor basement), risk perceptions (e.g., worry, damage estimated), the mitigation measures implemented and the associated premium discount, psychology factors (e.g., internal locus of control, risk-taking, regret, social norm), and other factors (e.g., trust in government's ability to deal with flood risk, financial difficulty due to COVID-19). ϵ_i is the zero-mean error term.

To examine the uptake of different types of purchase outcomes, we use a Multinomial Probit regression model because the dependent variable for purchase outcome has different categories. The outcome of not buying insurance is always specified as the base outcome so that each insurance policy type is compared against the no coverage category. The Multinomial Probit regression model is given by:

$$Insurance\ purchase\ outcome_i = f(\boldsymbol{\beta X_i} + \epsilon_i)$$

where *insurance purchase outcome*$_i$ has multiple categories because households can have different insurance purchase outcomes for flood and wind. The flood insurance purchase has five categories. Each category can be linked to the decision tree (Fig. 12.1) as follows:

- Outcome 1: no insurance = no flood coverage (end node 9); base outcome
- Outcome 2: mandated purchase and buying only NFIP policies (end node 2)
- Outcome 3: mandated purchase and buying private flood product (end nodes 1 & 3)
- Outcome 4: voluntary purchase and buying only NFIP policies (end nodes 5 & 7)
- Outcome 5: voluntary purchase and buying private flood product (end nodes 4, 6, 8)

For the windstorm coverage, the dependent variable for Survey 4 has three outcomes and is linked to the decision tree (Fig. 12.2) as follows:

- Outcome 1: None = no wind coverage (end node 6); base outcome
- Outcome 2: wind coverage through homeowners' multi-peril insurance (end nodes 5 & 7)
- Outcome 3: wind coverage through a wind-only policy (end nodes 1–4)

The dependent variable for Survey 5 has five outcomes and relates to the decision tree (Fig. 12.2) as follows:

- Outcome 1: None = no wind coverage (end node 6); base outcome
- Outcome 2: wind coverage through homeowners' multi-peril insurance from private insurers (end node 5)
- Outcome 3: wind coverage through a wind endorsement or a wind-only policy from private insurers (end nodes 1–4)
- Outcome 4: wind coverage through homeowners' multi-peril insurance from Florida Citizens (end node 7)
- Outcome 3: wind coverage through a wind-only policy from Florida Citizens (end nodes 2 & 4)

Mitigation measures and insurance purchases may be jointly determined by factors such as an individual's risk aversion level and the public mitigation measures implemented at the county level. We asked about the individual's risk aversion (or risk taking) level in the surveys and have controlled this factor in the regression. We also incorporated county-fixed effects in the Logit model for the overall insurance coverage uptake. The fixed effects capture unobservable factors that are the same within a county.

The mitigation measure variables may be endogenous because of reverse causality. Individuals may decide whether to implement mitigation measures depending on their insurance coverage level. The timing of insurance purchases and mitigation measure implementation cannot be established based on the survey questions. We cautiously interpret our results as correlations rather than causations.

12.5 Empirical Results

12.5.1 Results of Flood Insurance

12.5.1.1 Survey 4 Results

For all regression models, we report marginal effects at the means.[18] The sample size of the regressions is based on non-missing observations. The respondents could answer "Not sure" or "Don't know" to most of the survey questions.

Table 12.6 shows the regression results for the overall flood insurance uptake. We find the value of home contents and the worry about flooding positively relate to purchasing flood insurance. For example, when the value of home contents increases by one level, the probability of purchasing flood insurance increases by 0.23 on average, with other things equal. Anticipating regret for not having insurance if a flood were to occur next year is associated with an 0.35 increase in the probability of purchasing flood insurance. A stronger social norm for insurance uptake also

[18] This is the marginal effect of x variable on the y variable when holding other covariates at their mean values.

Table 12.6 Overall flood insurance uptake (Survey 4)

	Flood insurance uptake
Age	0.005
	(0.008)
Education	0.078
	(0.143)
Income	−0.239
	(0.143)
Female	−0.377
	(0.278)
House owner	0.021
	(0.211)
Value of home building	−0.122
	(0.168)
Value of home content	0.230**
	(0.072)
Length of residence	−0.015
	(0.019)
Underfloor basement	1.038*
	(0.407)
Worry about flooding	0.281*
	(0.124)
Perceived flood probability	−0.796
	(0.727)
Perceived flood impact	0.103
	(0.071)
Risk taking	−0.008
	(0.049)
Internal locus of control	−0.058
	(0.042)
Regret of no insurance	0.353*
	(0.171)
Regret of having insurance	−0.179
	(0.101)
Social norm for insurance uptake	0.683**
	(0.161)
Number of ex ante risk reduction measures	0.205
	(0.124)
Financial difficulty due to COVID-19	−1.067**
	(0.345)
Trust in government flood policies	−0.161
	(0.207)
County fixed-effects	Yes
Observations	402
Log-likelihood	−158.5

Note: The table reports the marginal effect at the mean of the fixed-effects Logit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

positively relates to the flood insurance purchase probability and the average increase is 0.68.

Having a basement is positively related to purchasing flood insurance and having financial difficulty due to Covid-19 has a negative relationship with the flood insurance purchase. The magnitudes of the marginal effects for both variables are greater than one. The marginal effect being greater than one is possible because the derivative at a point is the tangent line of the curve at that point, which could be steeper than one.[19]

The flood insurance purchase can be further divided into five outcomes. Theoretically, we expect that different types of insurance purchases may be related to different factors. For example, the demographic factors, house characteristics, and risk perception variables may affect voluntary purchase more than mandatory purchase because policyholders are not supposed to make decisions based on these factors when they are mandated to purchase insurance. The purchase of a private flood insurance product may be related to factors that reflect the households' needs for more comprehensive coverage.

The regression results regarding the flood insurance purchases across various types are reported in Table 12.7. Our results show that different types of flood insurance purchases (in different columns) are associated with different factors. The mandatory purchase of an NFIP policy is not significantly associated with any factors, and the mandatory purchase of a private product is only significantly and positively related to the worry about flooding. One-level increase in the worry about flooding increases the probability of the mandatory purchase of a private product by 0.005.

In comparison, voluntary purchase of flood insurance is associated with more factors. The voluntary purchase of an NFIP policy is positively related to the value of contents, the worry about flooding, the regret of having no insurance when a flood occurs next year, and the social norm for flood insurance. The financial difficulty due to Covid-19 and the trust in the government's ability to deal with flood risk negatively relate to the voluntary purchase of an NFIP policy.

The voluntary purchase of a private flood insurance product is positively related to the dummy variable measure of respondents' homes having a basement. This may be explained by the fact that the NFIP policy does not cover the contents in the basement so individuals must obtain the basement coverage from a private flood insurance policy.

Comparing the results in Tables 12.6 and 12.7, we find that some factors that do not have a significant relationship with the overall insurance uptake may significantly relate to certain insurance purchase outcomes. For example, the trust in the government's ability to deal with flood risk negatively relates to the voluntary purchase of an NFIP policy. Individuals may have a lower incentive to purchase flood insurance if they believe the local government is effectively dealing with the

[19] See more at the Stata website https://www.stata.com/support/faqs/statistics/marginal-effect-greater-than-1/.

Table 12.7 Uptake of various flood insurance purchase types (Survey 4)

	No insurance (base)	Mandatory purchase of NFIP	Mandatory purchase of a private product	Voluntary purchase of NFIP	Voluntary purchase of a private product
Age	−0.002	−0.000	−0.000	0.001	0.001
	(0.002)	(0.000)	(0.000)	(0.001)	(0.001)
Education	−0.004	0.000	−0.000	0.011	−0.007
	(0.018)	(0.000)	(0.003)	(0.011)	(0.013)
Income	0.027	−0.000	−0.002	−0.013	−0.011
	(0.025)	(0.000)	(0.005)	(0.013)	(0.015)
Female	0.087*	0.000*	−0.000	−0.047	−0.040
	(0.035)	(0.000)	(0.004)	(0.030)	(0.021)
House owner	−0.019	0.000	0.006	0.040	−0.028
	(0.031)	(0.000)	(0.004)	(0.032)	(0.027)
Value of home building	0.023	0.000	−0.005	−0.019	0.001
	(0.020)	(0.000)	(0.005)	(0.010)	(0.010)
Value of home content	−0.045**	−0.000	0.005	0.025**	0.015
	(0.010)	(0.000)	(0.005)	(0.007)	(0.008)
Length of residence	0.004	0.000	−0.001	−0.002	−0.001
	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)
Underfloor basement	−0.172**	−0.000	0.000	0.076	0.114*
	(0.064)	(0.000)	(0.006)	(0.052)	(0.051)
Worry about flooding	−0.045*	−0.000	0.005*	0.029*	0.011
	(0.019)	(0.000)	(0.002)	(0.012)	(0.011)
Perceived flood probability	0.161*	0.000	0.004	−0.114	−0.051*
	(0.070)	(0.000)	(0.010)	(0.065)	(0.025)
Perceived flood impact	−0.010	−0.000	0.003	−0.002	0.009
	(0.012)	(0.000)	(0.002)	(0.007)	(0.007)
Risk taking	−0.003	0.000	−0.001	0.004	0.000
	(0.010)	(0.000)	(0.001)	(0.007)	(0.004)
Internal locus of control	0.011	0.000	0.001	0.000	−0.013*
	(0.007)	(0.000)	(0.002)	(0.006)	(0.006)
Regret of no insurance	−0.047*	0.000	0.002	0.039**	0.006
	(0.024)	(0.000)	(0.004)	(0.011)	(0.017)
Regret of having insurance	0.029*	−0.000	0.006	−0.012	−0.023*

(continued)

Table 12.7 (continued)

	No insurance (base)	Mandatory purchase of NFIP	Mandatory purchase of a private product	Voluntary purchase of NFIP	Voluntary purchase of a private product
	(0.012)	(0.000)	(0.004)	(0.010)	(0.009)
Social norm for insurance uptake	−0.090**	0.000	0.005	0.049**	0.036*
	(0.026)	(0.000)	(0.005)	(0.015)	(0.016)
Number of ex ante risk reduction measures	−0.001	0.000	0.011	−0.010	−0.000
	(0.023)	(0.000)	(0.008)	(0.008)	(0.011)
Financial difficulty due to COVID-19	0.118**	−0.000	−0.013	−0.100**	−0.005
	(0.043)	(0.000)	(0.013)	(0.024)	(0.019)
Trust in government flood policies	0.039	0.000	−0.002	−0.042*	0.004
	(0.026)	(0.000)	(0.004)	(0.020)	(0.014)
County fixed-effects	No				
Observations	413				
Log-likelihood	−295.2				

Note: This table reports the marginal effect at the mean of the Multinomial Probit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

flood events. Anticipating regret if one were to hold insurance when there was no flood has a negative relationship with the voluntary purchase of a private flood insurance product. This means that individuals are less likely to purchase the private flood insurance product for additional coverage beyond the NFIP policy if they anticipate regretting this decision in the case no flood occurs.

Moreover, some factors that have a significant relationship with the overall insurance uptake may not hold the same relationship with the different types of insurance purchases. For example, the dummy variable for having a basement only positively relates to the voluntary purchase of a private flood insurance product, perhaps because an NFIP policy does not provide coverage for contents in the basement. The value of home contents is only positively related to the voluntary purchase of an NFIP product and not related to mandatory purchases.

12.5.1.2 Survey 5 Results

We conduct the same regressions in Tables 12.6 and 12.7 again using the responses from Survey 5 because our previous surveys have shown that households may

change the insurance purchase decision (add a policy or drop a policy) during the period between the end of last year's hurricane season and the beginning of this year's hurricane season. Therefore, we examine whether the findings from Survey 4 (the end of 2020 hurricane season) are still observed in Survey 5 (the beginning of 2021 hurricane season).

Table 12.8 reports the results for the overall flood insurance uptake. Anticipated regret for having no insurance if a flood were to occur next year and the social norm for buying flood insurance consistently have a positive relationship with flood insurance uptake; the financial difficulty due to Covid-19 consistently relates to reduced flood insurance uptake.

The dummy variable for respondents' homes having a basement is negatively related to flood insurance uptake, which is opposite to the Survey 4 finding. This relationship will be further explored when we examine the insurance purchase outcomes by type because the dummy variable for a basement does not have the same relationship with all types of insurance purchase outcomes.

The value of the home building is similar to the value of home contents and positively relates to the flood insurance uptake. The risk-taking variable is a new factor in Survey 5 that positively relates to the probability of purchasing insurance. This is not consistent with the extant literature that insurance purchase is positively associated with an individual's risk aversion (Robinson et al. 2021). However, the significant relationship disappears when we examine the insurance purchase outcomes by type.

Table 12.9 reports the regression results regarding various types of flood insurance purchases from Survey 5. For Survey 5, we find more factors related to the mandatory flood purchase than Survey 4. The difference may be due to the difference in samples or the difference in survey time. In practice, the mandatory purchase requirement is not well-enforced (Lingle and Kousky 2018), which leaves some room for individuals to make their own choice.

We observe a similar pattern that some factors that do not have a significant relationship with the overall insurance uptake may significantly relate to certain insurance purchase outcomes. For example, the length of residence and the number of ex-ante risk reduction measures taken do not relate to the overall flood insurance purchase but are positively associated with the mandatory purchase of an NFIP policy. Age and the trust in the government's ability to deal with flood risk have insignificant relationships with overall flood insurance uptake but are negatively related to the mandatory purchase of a private flood insurance product.

The dummy variable for whether the household has ever experienced trouble obtaining flood insurance is not related to the overall flood insurance uptake; however, it has different relationships with different types of insurance purchases. It is positively related to the mandatory purchase of an NFIP policy and negatively related to the voluntary purchase of a private flood insurance product. Based on the decision tree in Fig. 12.1, individuals may have trouble obtaining flood insurance if their communities do not participate in NFIP. In this case, individuals need to purchase a private flood insurance product. We expect a positive relationship between this variable and the uptake of an NFIP policy because individuals who

Table 12.8 Overall flood insurance uptake (Survey 5)

	Flood insurance uptake
Age	−0.006
	(0.009)
Education	0.222
	(0.116)
Income	−0.149
	(0.123)
Female	0.161
	(0.175)
House owner	0.048
	(0.323)
Value of home building	0.205**
	(0.071)
Value of home content	−0.035
	(0.062)
Length of residence	0.008
	(0.011)
Underfloor basement	−0.801**
	(0.278)
Worry about flooding	0.088
	(0.121)
Perceived flood probability	1.316
	(0.745)
Perceived flood impact	0.011
	(0.093)
Risk taking	0.098**
	(0.036)
Internal locus of control	0.055
	(0.056)
Regret of no insurance	0.274*
	(0.109)
Regret of having insurance	−0.059
	(0.063)
Social norm for insurance uptake	0.589**
	(0.100)
Number of ex ante risk reduction measures	0.108
	(0.085)
Premium discount for flood risk mitigation	0.545
	(0.363)
Trouble purchasing flood insurance	0.327
	(0.411)
Financial difficulty due to COVID-19	−0.985**

(continued)

Table 12.8 (continued)

	Flood insurance uptake
	(0.183)
Trust in government flood policies	0.099
	(0.142)
County fixed-effects	Yes
Observations	433
Log-likelihood	−204.6

Note: The table reports the marginal effect at the mean of the fixed-effects Logit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

used to live in non-participating communities but sought flood insurance might make efforts to make their community join the NFIP program and increase the availability of the NFIP insurance coverage.

The pattern that some factors that have a significant relationship with the overall insurance uptake may not hold the significant relationship with all types of insurance purchases also exists in Survey 5. For example, the value of buildings, similar to the value of contents in Survey 4, is only positively related to the voluntary purchase of an NFIP product. The dummy variable for having a basement has a negative relationship with the overall flood insurance uptake in Survey 5, which is contrary to the finding in Survey 4 because the basement indicator is only negatively related to the voluntary purchase of an NFIP policy. The underlying explanation is likely to be the same. The basement indicator is either positively related to the purchase of a private flood insurance product or negatively related to just buying an NFIP policy because an NFIP policy does not provide coverage for contents in the basement. Such coverage needs to be obtained through private flood insurance products.

12.5.2 Results of Wind Coverage

12.5.2.1 Survey 4 Results

Table 12.10 shows the regression results for the overall uptake of windstorm coverage. Owning a home significantly increases the probability of having windstorm coverage by 0.85, possibly because most homeowners buy property insurance for their homes, but few tenants purchase renters' insurance. Implementing window protection against wind damages positively relates to the purchase of windstorm coverage. This is possibly due to the premium discount for implementing window protection, which is mandated in Florida.

Table 12.11 reports the results regarding different types of windstorm insurance purchases. Buying coverage through the homeowners' insurance and buying coverage through the wind-only policy are associated with different factors. The

Table 12.9 Uptake of various flood insurance purchase types (Survey 5)

	No insurance (base)	Mandatory purchase of NFIP	Mandatory purchase of a private product	Voluntary purchase of NFIP	Voluntary purchase of a private product
Age	0.003	0.000	−0.002*	−0.001	−0.000
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Education	−0.046	0.016	−0.001	−0.006	0.038*
	(0.026)	(0.012)	(0.016)	(0.008)	(0.018)
Income	0.013	0.005	−0.004	0.002	−0.015
	(0.030)	(0.014)	(0.018)	(0.014)	(0.021)
Female	0.001	0.007	−0.010	−0.007	0.010
	(0.042)	(0.028)	(0.033)	(0.027)	(0.032)
House owner	0.012	−0.008	0.046	0.042	−0.092
	(0.069)	(0.021)	(0.038)	(0.057)	(0.056)
Value of home building	−0.044*	0.010	0.011	0.034**	−0.010
	(0.018)	(0.009)	(0.009)	(0.013)	(0.009)
Value of home content	0.013	−0.016	−0.010	−0.006	0.019
	(0.014)	(0.008)	(0.008)	(0.011)	(0.010)
Length of residence	−0.002	0.003*	−0.001	−0.001	0.000
	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)
Underfloor basement	0.219**	−0.040	−0.069	−0.055**	−0.055
	(0.081)	(0.033)	(0.046)	(0.017)	(0.077)
Worry about flooding	−0.033	0.036**	0.015	0.013	−0.031
	(0.027)	(0.011)	(0.017)	(0.008)	(0.021)
Perceived flood probability	−0.206	0.016	0.034	0.133*	0.023
	(0.135)	(0.041)	(0.074)	(0.066)	(0.113)
Perceived flood impact	−0.009	−0.013	0.001	0.009	0.013
	(0.018)	(0.010)	(0.011)	(0.007)	(0.014)
Risk taking	−0.012	0.008	−0.003	−0.009	0.016
	(0.008)	(0.004)	(0.004)	(0.005)	(0.009)
Internal locus of control	−0.015	0.005	0.005	0.021**	−0.017
	(0.013)	(0.006)	(0.006)	(0.006)	(0.009)
Regret of no insurance	−0.062**	0.060**	0.008	0.029**	−0.035*
	(0.022)	(0.016)	(0.015)	(0.009)	(0.017)
Regret of having insurance	0.024	0.006	−0.015	−0.004	−0.012

(continued)

Table 12.9 (continued)

	No insurance (base)	Mandatory purchase of NFIP	Mandatory purchase of a private product	Voluntary purchase of NFIP	Voluntary purchase of a private product
	(0.014)	(0.011)	(0.011)	(0.010)	(0.012)
Social norm for insurance uptake	−0.137**	0.029*	0.051**	0.013	0.044**
	(0.025)	(0.013)	(0.015)	(0.012)	(0.010)
Number of ex ante risk reduction measures	−0.032*	0.024**	0.006	0.000	0.002
	(0.016)	(0.007)	(0.008)	(0.005)	(0.008)
Premium discount for flood risk mitigation	−0.054	0.019	0.074	−0.066	0.026
	(0.081)	(0.027)	(0.040)	(0.034)	(0.043)
Trouble purchasing flood insurance	0.013	0.052*	0.051	0.038	−0.155**
	(0.092)	(0.027)	(0.044)	(0.037)	(0.054)
Financial difficulty due to COVID-19	0.256**	0.011	−0.072	−0.037	−0.159*
	(0.049)	(0.037)	(0.037)	(0.046)	(0.073)
Trust in government flood policies	−0.011	0.031	−0.025*	0.007	−0.002
	(0.036)	(0.021)	(0.011)	(0.013)	(0.027)
County fixed-effects	No				
Observations	428				
Log-likelihood	−428.0				

Note: This table reports the marginal effect at the mean of the Multinomial Probit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

homeowner indicator only has a positive relationship with the coverage through the homeowners' insurance. The wind-only policy uptake is higher for tenants than homeowners. The window protection variable also has a positive relationship solely with the purchase of homeowners' insurance. This is possible because the state-level mandated premium discount for wind mitigation measures primarily applies to the standard homeowners' insurance policies from private insurers.

The variable, *Windonly_territory*, is an indicator for whether the property is located within the Florida Citizens coastal account territories. It increases the probability of wind-only policy purchase as only properties within these territories are qualified for purchasing a wind-only policy from Florida Citizens.

Table 12.10 Overall wind coverage uptake (Survey 4)

	Wind coverage uptake
Age	0.012
	(0.008)
Education	−0.131
	(0.114)
Income	0.136
	(0.088)
Female	−0.133
	(0.261)
House owner	0.852**
	(0.166)
Value of home building	0.110
	(0.093)
Value of home content	0.035
	(0.052)
Length of residence	−0.009
	(0.010)
Windonly_territory	1.125
	(0.695)
Risk taking	0.016
	(0.043)
Internal locus of control	0.065
	(0.062)
Window protection	0.423**
	(0.159)
Financial difficulty due to COVID-19	−0.003
	(0.144)
County fixed-effects	Yes
Observations	491
Log-likelihood	−261.6

Note: The table reports the marginal effect at the mean of the fixed-effects Logit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

Overall, we find that different types of wind insurance purchases relate to different factors. Some factors may only affect certain insurance purchase types (e.g., house owner and window protection for coverage through homeowners' insurance).

12.5.2.2 Survey 5 Results

We conduct similar regressions using Survey 5 to compare the findings of the two surveys. We include more variables for Survey 5 because it covered more survey

Table 12.11 Uptake of various wind coverage purchase types (Survey 4)

	No coverage (base)	Homeowners' insurance	Wind-only policy
Age	−0.003	0.004*	−0.001
	(0.002)	(0.002)	(0.001)
Education	0.038	−0.030	−0.008
	(0.031)	(0.034)	(0.006)
Income	−0.025	0.008	0.017
	(0.025)	(0.029)	(0.013)
Female	0.029	−0.024	−0.005
	(0.066)	(0.073)	(0.014)
House owner	−0.258**	0.289**	−0.031**
	(0.040)	(0.037)	(0.011)
Value of home building	−0.014	0.006	0.008
	(0.020)	(0.018)	(0.006)
Value of home content	−0.016	0.023*	−0.007*
	(0.012)	(0.012)	(0.003)
Length of residence	0.004	−0.005	0.001
	(0.002)	(0.002)	(0.001)
Windonly_territory	−0.271*	0.197	0.074**
	(0.120)	(0.123)	(0.020)
Risk taking	−0.007	0.005	0.002
	(0.011)	(0.012)	(0.003)
Internal locus of control	−0.020	0.023	−0.003
	(0.014)	(0.012)	(0.003)
Window protection	−0.095*	0.093*	0.002
	(0.040)	(0.040)	(0.015)
Financial difficulty due to COVID-19	0.073*	−0.130**	0.057**
	(0.035)	(0.031)	(0.013)
County fixed-effects	No		
Observations	494		
Log-likelihood	−357.7		

Note: This table reports the marginal effect at the mean of the Multinomial Probit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

questions than Survey 4. The results for the overall wind coverage uptake are reported in Table 12.12. In addition to the house owner dummy variable, the worry about windstorms and the dummy for being located in wind-only territories both increase the probability of having wind coverage. The properties located within the Florida Citizens coastal account territories (wind-only territories) tend to have higher objective wind risk; the property owners may be more concerned about windstorm damage and are more willing to obtain insurance than those not located in high-risk wind areas.

In addition to window protection, we also included two other questions about whether respondents have implemented protection against wind damage in Survey 5. All wind damage mitigation measures we included are qualified for a premium discount based on Florida law. The variable of premium discount for implementing wind risk mitigation measures increases the probability of having windstorm coverage. The financial difficulty due to Covid-19 reduces the overall uptake of wind coverage.

For Survey 5, we divide the insurance purchase outcomes by where the individuals purchased the coverage and have four types of insurance purchase outcomes. The results for the uptake of different types of windstorm insurance purchases are reported in Table 12.13. Similar to Survey 4, the positive relationship between being a homeowner and the wind coverage uptake is only for coverage through homeowners' insurance. The premium discount for implementing mitigation measures only positively relates to the homeowners' insurance policies from private insurers.

The worry about windstorms is only positively related to the homeowners' insurance from Citizens. We failed to find a significant effect of *Windonly_territory* on wind-only policies because the last column reports insignificant marginal effects. This may result from the small sample problem – the Citizens wind-only policy category only has 15 respondents.

In Table 12.12, we find that individuals who have had trouble obtaining wind coverage are more likely to have wind coverage at the survey time. But this positive relationship disappears when we examine the various types of insurance purchases. Based on the decision tree in Fig. 12.2, the private insurers can only exclude the windstorm peril from the standard homeowners' insurance policy in some high-wind risk areas; in this case, households must purchase a wind-only policy. Thus, individuals who have had trouble obtaining wind coverage from their standard homeowners' insurance policy may have a better understanding of the wind-only policies. However, we fail to find significant relationships in Table 12.13 possibly because the sample size of the Citizens wind-only policy category is small.

12.6 Discussion and Conclusion

Inadequate insurance coverage and disaster preparation are major obstacles for society to deal with the increasing risk posed by hurricanes. Surrounded by water and regularly impacted by hurricanes, Florida is extremely vulnerable to flood and wind damage. Although it has the highest flood insurance market penetration rate in the U.S. (35% NFIP and 3% private sector policies in 2018), there is still a considerable coverage gap (Lingle and Kousky 2018).

By conducting and analyzing two surveys of households in Florida, in this chapter, we sought to explore motives and characteristics of households with regard to the uptake of flood insurance during the direct threat of Hurricane Eta in November 2020 and in June 2021 at the start of the hurricane season. Moreover, the unique factors that only drive the insurance purchase of a specific type of policy

Table 12.12 Overall wind coverage uptake (Survey 5)

	Wind coverage uptake
Age	0.023**
	(0.006)
Education	0.023
	(0.080)
Income	−0.126
	(0.113)
Female	−0.104
	(0.350)
House owner	0.493*
	(0.240)
Value of home building	0.070
	(0.094)
Value of home content	−0.052
	(0.096)
Length of residence	−0.009
	(0.005)
Worry about windstorm	0.325**
	(0.113)
Perceived wind impact	0.092
	(0.082)
Windonly_territory	0.587*
	(0.277)
Risk taking	−0.031
	(0.044)
Internal locus of control	0.057
	(0.064)
Window protection	−0.221
	(0.169)
Roof retrofit	0.409
	(0.260)
Hip roof	0.378
	(0.278)
Premium discount for wind risk mitigation	1.058**
	(0.233)
Trouble purchasing homeowners insurance	0.812**
	(0.290)
Financial difficulty due to COVID-19	−0.951*
	(0.474)
County fixed-effects	Yes
Observations	493
Log-likelihood	−201.9

Note: The table reports the marginal effect at the mean of the fixed-effects Logit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

Table 12.13 Uptake of various wind coverage purchase types (Survey 5)

	No coverage (base)	Homeowners' insurance from a private insurer	Wind-only coverage from a private insurer	Homeowners' insurance from Citizens	Wind-only policy from Citizens
Age	−0.005**	0.004*	0.003*	−0.001	−0.000
	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)
Education	0.001	−0.030	0.022	0.004	0.000
	(0.015)	(0.024)	(0.023)	(0.016)	(0.000)
Income	0.025	−0.025	0.001	0.001	−0.000
	(0.021)	(0.023)	(0.016)	(0.021)	(0.000)
Female	0.020	−0.114*	0.029	0.057*	0.000
	(0.061)	(0.046)	(0.032)	(0.028)	(0.001)
House owner	−0.120**	0.203**	−0.091	0.006	−0.000
	(0.046)	(0.075)	(0.067)	(0.043)	(0.000)
Value of home building	−0.010	0.016	−0.003	−0.003	−0.000
	(0.016)	(0.013)	(0.013)	(0.013)	(0.000)
Value of home content	0.009	−0.003	−0.002	−0.004	−0.000
	(0.017)	(0.021)	(0.014)	(0.009)	(0.000)
Length of residence	0.002	−0.006*	0.002	0.002	−0.000
	(0.001)	(0.003)	(0.002)	(0.002)	(0.000)
Worry about windstorm	−0.071**	0.030	0.004	0.036**	−0.000
	(0.023)	(0.024)	(0.018)	(0.014)	(0.000)
Perceived wind impact	−0.017	0.005	0.014	−0.001	−0.000
	(0.015)	(0.017)	(0.011)	(0.006)	(0.000)
Windonly_territory	−0.142**	−0.022	0.122	0.039	0.000
	(0.045)	(0.079)	(0.066)	(0.043)	(0.000)
Risk taking	0.006	−0.006	−0.009	0.008*	0.000
	(0.009)	(0.009)	(0.006)	(0.004)	(0.000)
Internal locus of control	−0.026*	0.043**	−0.013	−0.004	−0.000
	(0.012)	(0.013)	(0.010)	(0.005)	(0.000)
Window protection	0.026	−0.036	0.009	0.004	−0.000
	(0.044)	(0.050)	(0.054)	(0.031)	(0.000)
Roof retrofit	−0.076	0.079	0.056	−0.055	−0.000
	(0.042)	(0.054)	(0.045)	(0.037)	(0.000)
Hip roof	−0.046	−0.019	0.013	0.041	0.000
	(0.055)	(0.043)	(0.035)	(0.038)	(0.001)
Premium discount for wind risk mitigation	−0.193**	0.121**	0.052	0.012	0.000

(continued)

Table 12.13 (continued)

	No coverage (base)	Homeowners' insurance from a private insurer	Wind-only coverage from a private insurer	Homeowners' insurance from Citizens	Wind-only policy from Citizens
	(0.042)	(0.038)	(0.033)	(0.027)	(0.000)
Trouble purchasing homeowners insurance	−0.098	−0.067	0.097	0.058	0.000
	(0.072)	(0.072)	(0.059)	(0.037)	(0.001)
Financial difficulty due to COVID-19	0.163*	−0.083	−0.036	−0.041	0.000
	(0.065)	(0.072)	(0.053)	(0.043)	(0.000)
County fixed-effects	No				
Observations	476				
Log-likelihood	−538.0				

Note: This table reports the marginal effect at the mean of the Multinomial Probit Regression model. Standard errors in parentheses are clustered by county
**p < 0.01, *p < 0.05

are assessed. We demonstrate that various types of insurance purchases can exist for flood and windstorm insurance, and they can have a unique decision-making process as they may have a different choice set.

We use a decision tree to illustrate the complex insurance purchase process and show how individuals can end up having different insurance purchase outcomes. We also conducted regression analyses to assess the drivers of various types of insurance purchase outcomes. In general, we find that different types of insurance purchases relate to unique factors. With flood insurance, we find that mandatory purchase is related to fewer explanatory variables than voluntary purchase. For example, only the voluntary purchase of an NFIP policy is positively related to the value of possession contents, the anticipated regret of having no insurance when a flood occurs next year, and the social norm for flood insurance. Regarding wind coverage, we find that being a homeowner increases the probability of purchasing homeowners' insurance policies but does not increase the uptake of wind-only policies. Homeowners more frequently have insurance coverage than renters and thus are more likely to have windstorm coverage through their homeowners' insurance.

This research contributes to the limited existing literature that distinguishes types of natural disaster insurance purchases in understanding insurance uptake decisions (Brody et al. 2017; Botzen et al. 2019; Petrolia et al. 2015). Botzen et al. (2019) make the distinction between mandatory and voluntary flood insurance coverage in their study. Brody et al. (2017) specifically focus on the voluntary purchase of NFIP policies by properties located outside the 100-year floodplain. We provide a

comprehensive overview of insurance policy types. For flood insurance, in addition to the distinction between mandatory and voluntary purchase, we also distinguish the insurance purchase by the underwriter. As the private flood insurance products provide coverage beyond the NFIP coverage limits, the purchase of a private flood insurance product is positively associated with the homeowner's demand for basement coverage and negatively related to the financial difficulty due to Covid-19. With the development of the private flood insurance market, the distinction based on the underwriter will become more important in the future.

Regarding wind insurance coverage, Petrolia et al. (2015) study wind insurance in coastal states. They look at the overall wind coverage uptake but include a dummy variable to indicate whether the wind peril is excluded from the regular homeowners' insurance policy and to represent wind-only policies. In our analysis of drivers of wind insurance purchases, we explicitly distinguish regular homeowners' insurance and wind-only policies to examine the unique factors associated with each type. Since a few insurance companies in Florida can offer wind-only policies, we also separate the wind insurance purchase based on the underwriter to provide a comprehensive view of the wind insurance purchase outcomes in Florida. We find that factors such as wind damage mitigation measures and the premium discount for wind mitigation measures are positively associated with only homeowners' insurance purchases.

Our results also highlight the importance of distinguishing different types of insurance purchases when studying the drivers of natural disaster insurance purchases. We find factors that do not have a significant relationship with the overall insurance uptake but are significantly related to certain insurance purchase types. For example, trust in the government's ability to deal with flood risk does not relate to the overall flood insurance uptake but is negatively related to the voluntary purchase of an NFIP policy. Individuals may have a lower incentive to purchase flood insurance if they believe the local government is effectively dealing with the flood events.

We also find factors that have different relationships with different types of insurance purchases. The indicator for having a basement has a positive relationship with the overall flood insurance uptake in Survey 4 and a negative relationship with the overall flood insurance uptake in Survey 5. The two results are contrary because the basement indicator has opposite relationships with two insurance purchase types. When we look at the flood insurance purchase at a more granular level, the basement indicator is positively related to buying a private flood insurance product in Survey 4 and negatively related to buying an NFIP policy in Survey 5. As the NFIP policy does not cover the contents in the basement, such coverage needs to be obtained through a private flood insurance product. Therefore, if we do not distinguish insurance purchase types, we may fail to understand the underlying reasons for observing different relationships between having a basement and the overall insurance uptake across the two surveys.

Given the increased costs from natural disasters, insurance against hurricane perils (e.g., flood, windstorm) is vital to individuals to cover their property damages and reduce their financial vulnerability to damage caused by natural disasters.

Acknowledging the drivers of flood and wind insurance uptake can inform policy design related to insurance uptake. For example, the perception of flood risk may be low for individuals who lack knowledge about flood risk, causing a low uptake of coverage within this group. This may require campaigns to raise risk awareness, such as the NFIP Community Rating System (CRS) seeks to do (Li and Landry 2018). Consistent with Robinson and Botzen et al. (2019), our result shows the psychological factor – the anticipated regret of having no insurance when a flood occurs next year, increases flood insurance demand, especially the demand for voluntary purchase. This suggests that policies can promote communication to enhance insurance uptake and overcome the feeling of regret.

Another type of policy is through the norm-nudge (Mol et al. 2021), where individuals are made aware of insurance uptake and risk-reduction effort in their neighborhood. Previous papers have found that insurance and mitigation measures are complements for flood and wind risks (Botzen et al. 2019; Petrolia et al. 2015). Our results also show such a positive relationship for mandatory flood insurance purchase (mandatory requirement is not well-forced in practice) and for wind coverage via homeowners' insurance. Therefore, policies may be designed to apply a degree of social pressure on individuals that have not taken mitigation measures.

In this chapter, we seek to uncover what is deterring certain types of individuals from purchasing natural disaster insurance and contribute to the policy debate related to the low demand for natural disaster insurance. Although our data and analysis are limited to Florida, our method of distinguishing the types of natural disaster insurance purchases may apply to other coastal states as well. The decision trees and the specific insurance purchase outcomes should be tailored to state-specific regulations and conditions.

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