Innovating Insurance for Coastal Resilience: Evaluating payment timing & disaster recovery

Abbey Hotard

Assistant Professor | University of South Alabama

Stokes School of Marine and Environmental Sciences

NSF Coastlines and People Hub

COASTAL HAZARDS, EQUITY, ECONOMIC PROSPERITY AND RESILIENCE (CHEER) HUB RESEARCH AIMS

1. Identify, explain, and quantify the interactions and tradeoffs among the coastal community goals of equity, economic prosperity, and resilience to hazards.
2. Develop methods to model long-term hurricane hazards in a way that accounts for climate change and integrates wind, rain, storm surge, and wave hazards.
3. Develop a computational tool to help design policies that can achieve sustainable equity, economic prosperity, and coastal resilience in the context of climate change.

NSF CHEER
COASTAL HAZARDS, EQUITY, ECONOMIC PROSPERITY & RESILIENCE

https://www.drc.udel.edu/cheer/

Stakeholder-based Tool for Analysis of Regional Risk (STARR)

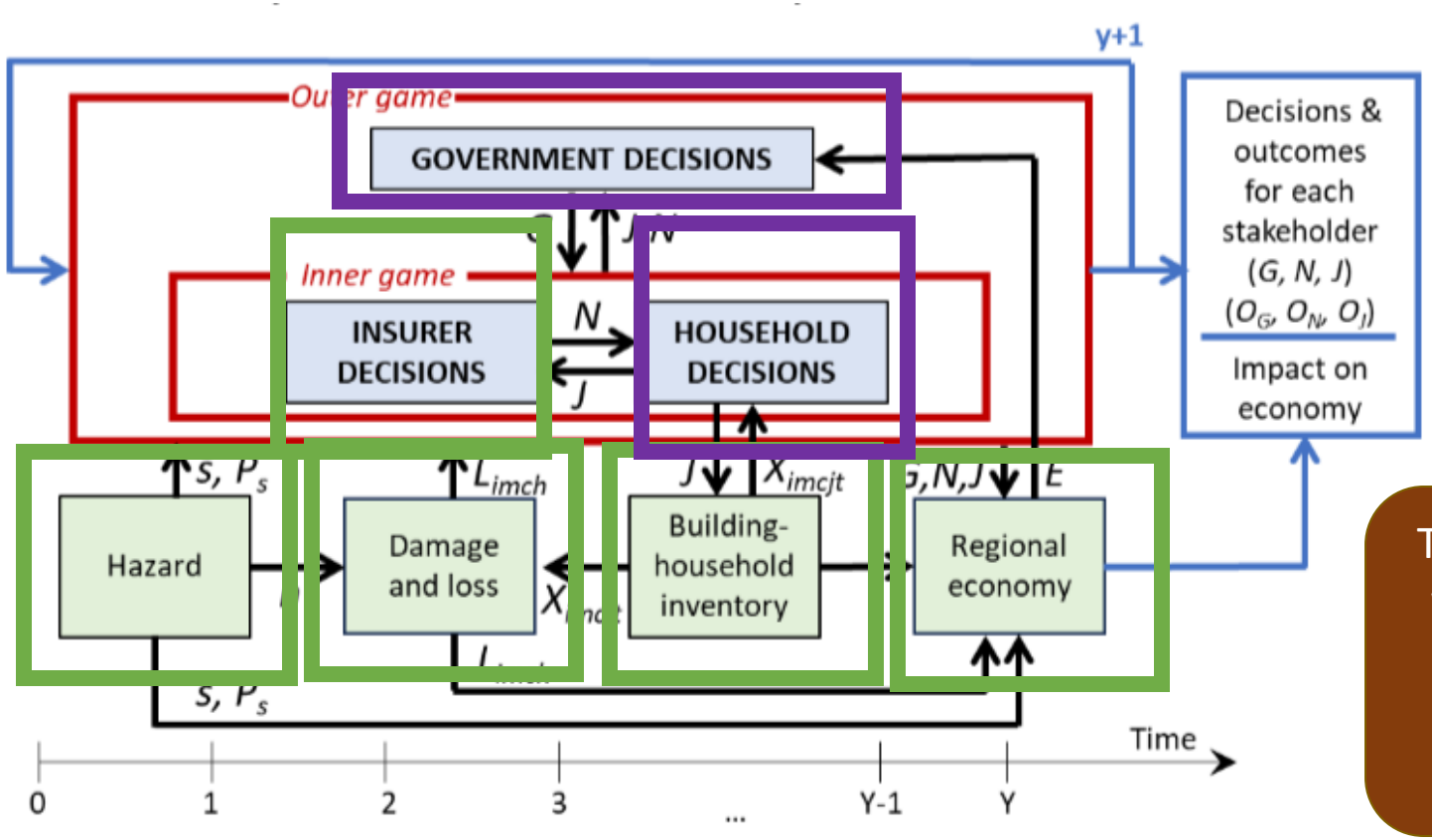


Figure 1. STARR computational framework, modules with inputs and outputs between them

The goal is to identify win-win-win solutions for the economy, risk reduction, and residents of coastal communities.

(Davidson et al., 2025)

Motivation: Insurance Crisis

INSURANCE

A risky business: Customers are f
insure Gulf Coast properties

By Briana Conner

Friday, August 9, 2024

The Washington Post
Democracy Dies in Darkness

Business Economy Economic Policy Personal Finance Work Technology Business of Climate

Personal Finance

Home insurance was once a 'must.' Now more homeowners are going without.

Slammed by p

Oct 9, 2024 - Politics

N.C. homeowner insurer
raise rates by more than 42%

Zachery Eanes

Motivation: Disaster Recovery

Insurance improves disaster recovery outcomes

- More likely to rebuild (Turnham et al., 2011)
- Less likely to report financial burden and incur borrowing (e.g., You & Kousky, 2023; del Valle et al., 2022; Billings et al., 2022)

Payment wait times likely moderate financial benefits

- Delays in government financial resources slow recovery (e.g., Runyun 2006; Resosudarmo et al., 2010; Attary et al. 2020)
- Average claims cycle has been increasing (JD Power, 2025)
    - Current average is 44 days from notice of loss to final payment

Background and Research Objective

Innovations in disaster insurance markets (Kousky, 2022)

- All hazards insurance
- Micro- and meso-insurance policies
- Community based insurance pools
- Parametric insurance models

Objective: Determine household preferences of a tradeoff between (1) getting insurance payments quickly that may not equal to experienced losses and (2) waiting longer for a more accurate (equivalent to losses) payment.

Survey Methods

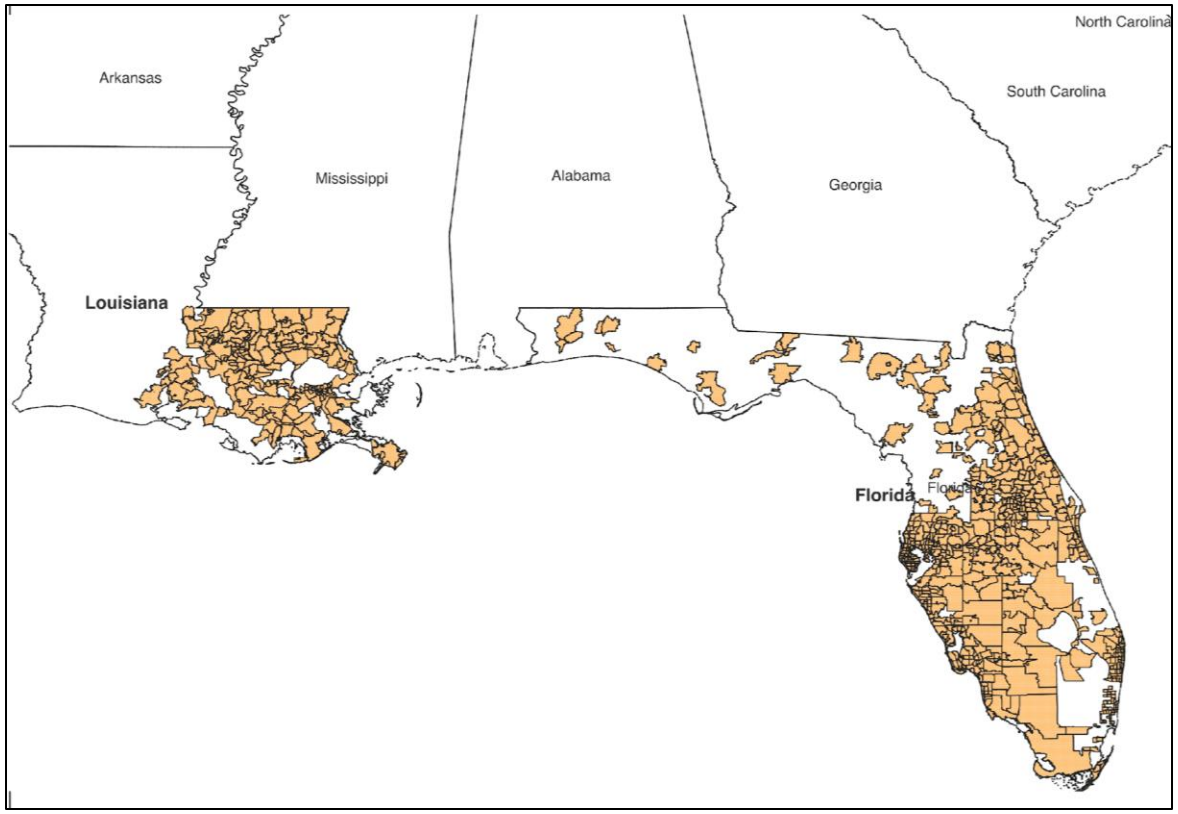
Thematic focus: Scope and timing of financial resources accessed for disaster recovery

Desired Population: Homeowners with recent disaster experience

- Hurricane Ida in Louisiana (2021) and Hurricane Ian in Florida (2022)

Deployment

- Qualtrics Panel (online) (N=538)
  - September 2024
- Genesys Address Based Sample (mail) (N=132; 3% response rate)
  - October 2024 - January 2025



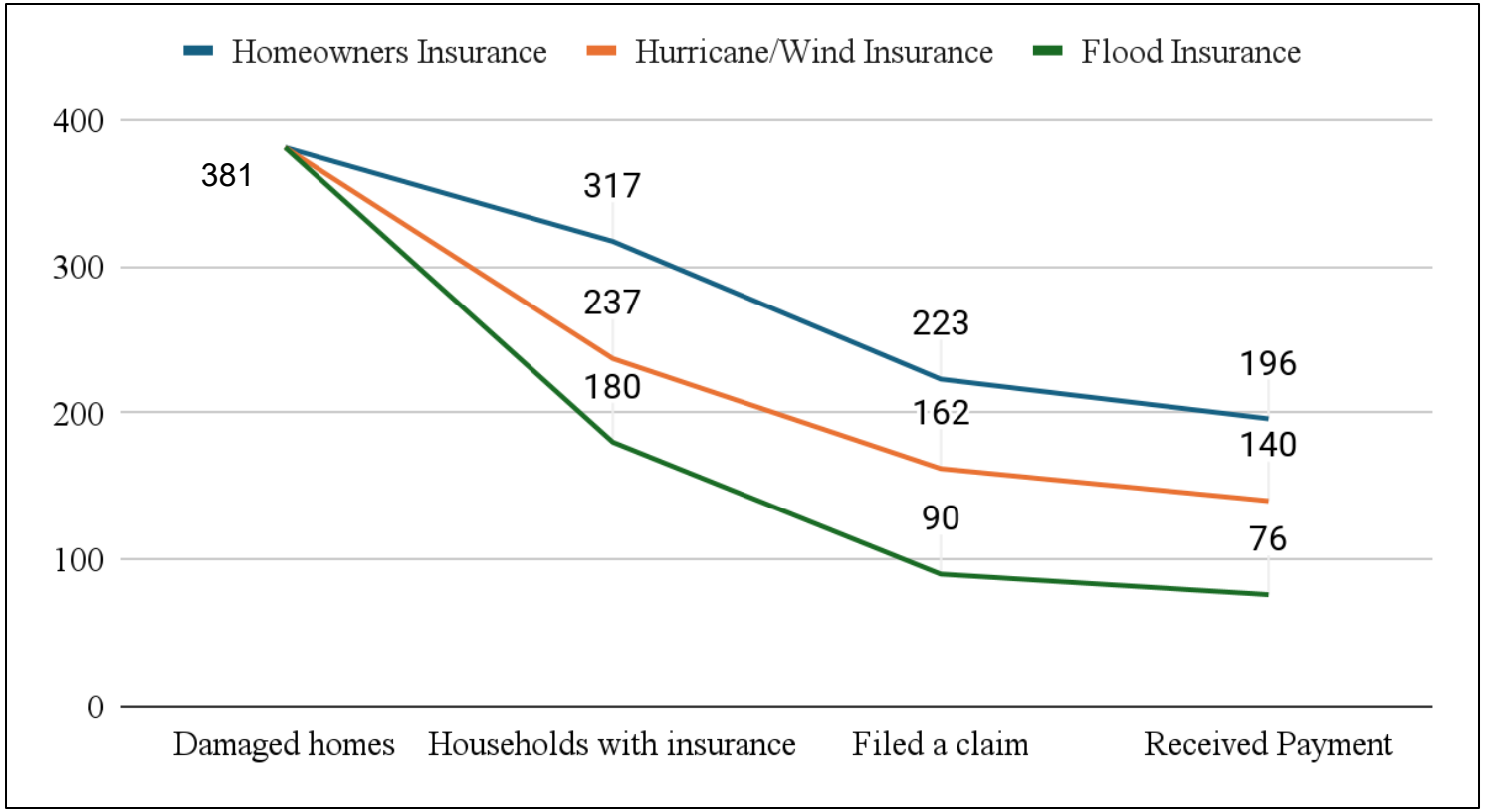
Zip codes in which at least one household applied for FEMA Individual Housing Assistance (Map by Nesar Khan)

Descriptive Statistics – Damage & Insurance Claims

Home sustained damage: 57%

Filed insurance claim: 36%
(64% of those reporting damage)

Received payment: 32%
(57% of those reporting damage)



Total N = 670

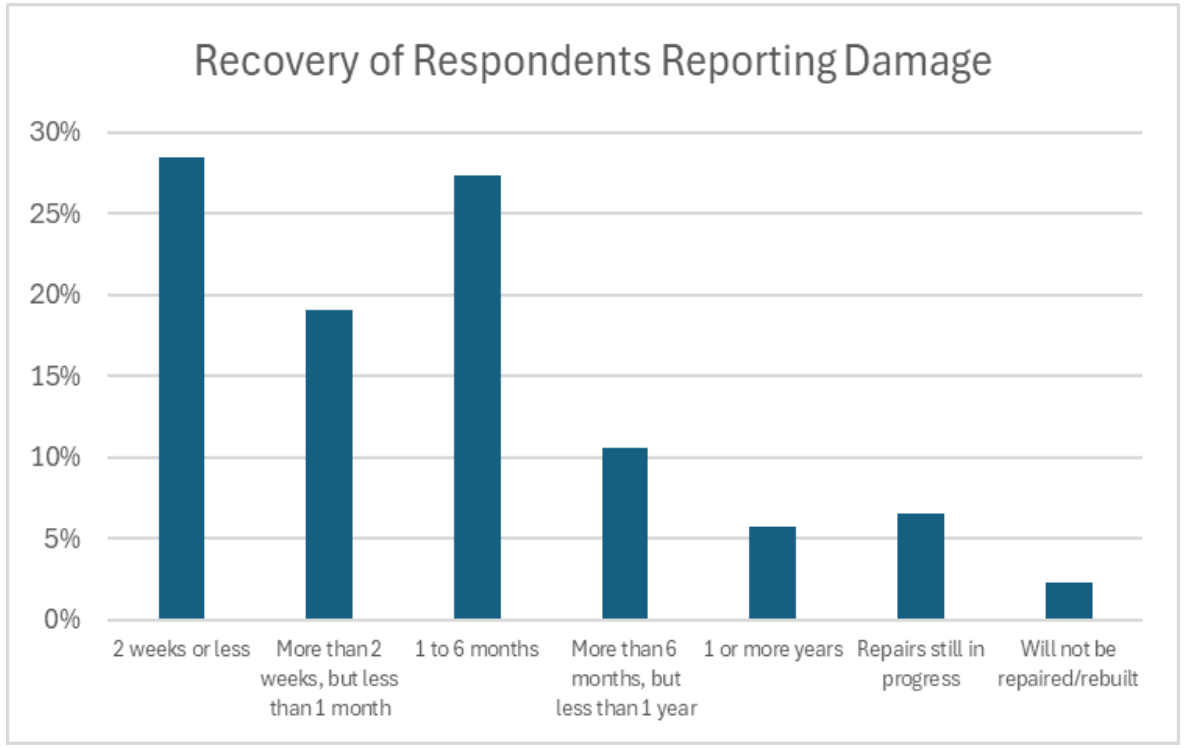
Insurance Payments & Recovery Time

Payment Timing

- 39% of those who received a payment, received it within one month of filing a claim
- 87% received at least one payment within 6 months of filing a claim

Disaster Recovery

- 75% of those reporting damage recovered within 6 months
- Receiving insurance payments earlier was significantly associated with faster recovery



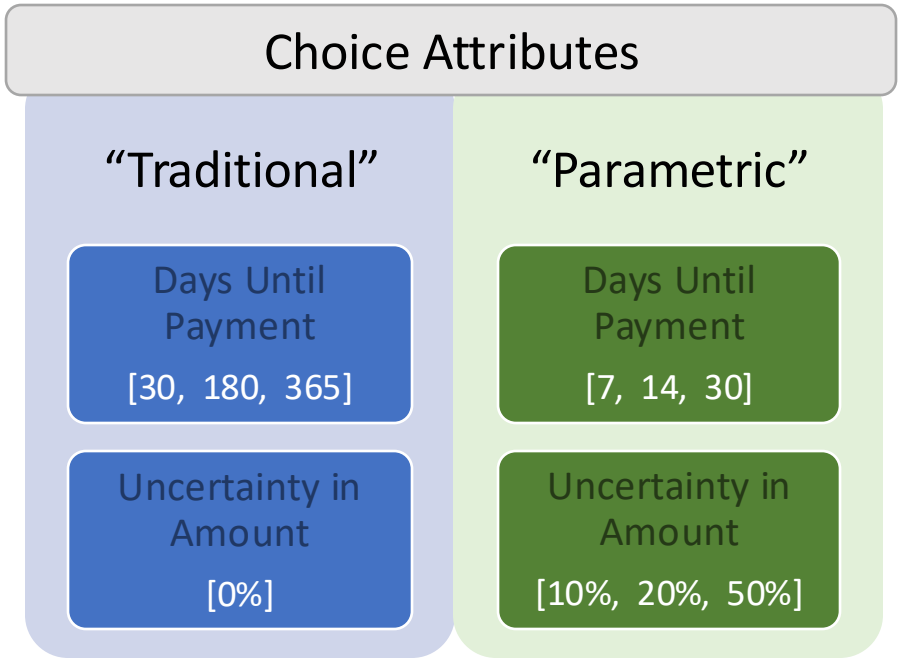
(N = 214)

Parametric Insurance Discrete Choice Experiment

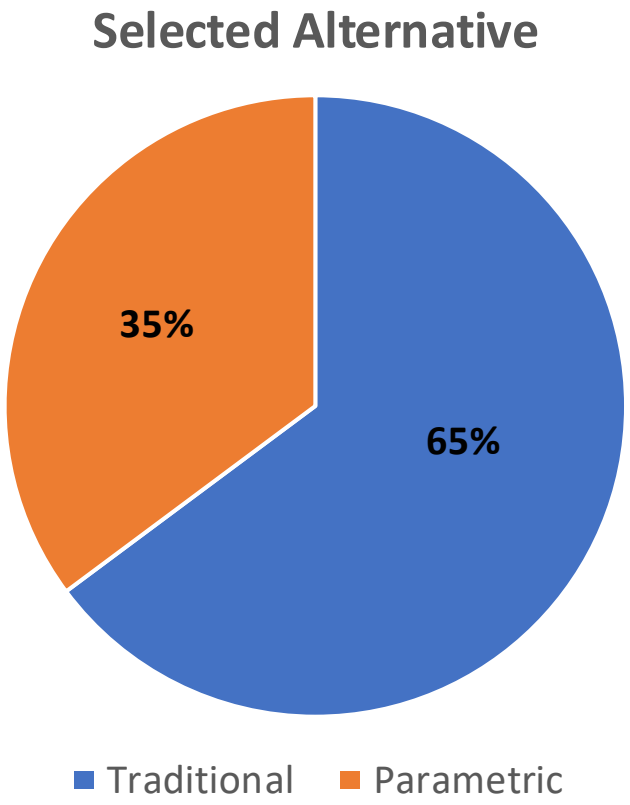
Q: If you were to purchase a new insurance policy for your home that would cover damages from a hurricane, which model of payment would you prefer?

A) You receive full payment within **${Traditional # Days}** days of filing a claim, and the payment will be **equal** to the total value of the damages to your home.

B) You receive payment within **${Parametric # Days}** days after the event, but the amount is somewhere between **${Parametric % Uncertainty}** less than the value of damages to your home and **${Parametric % Uncertainty}** more than the value of damages to your home.



Preliminary Results

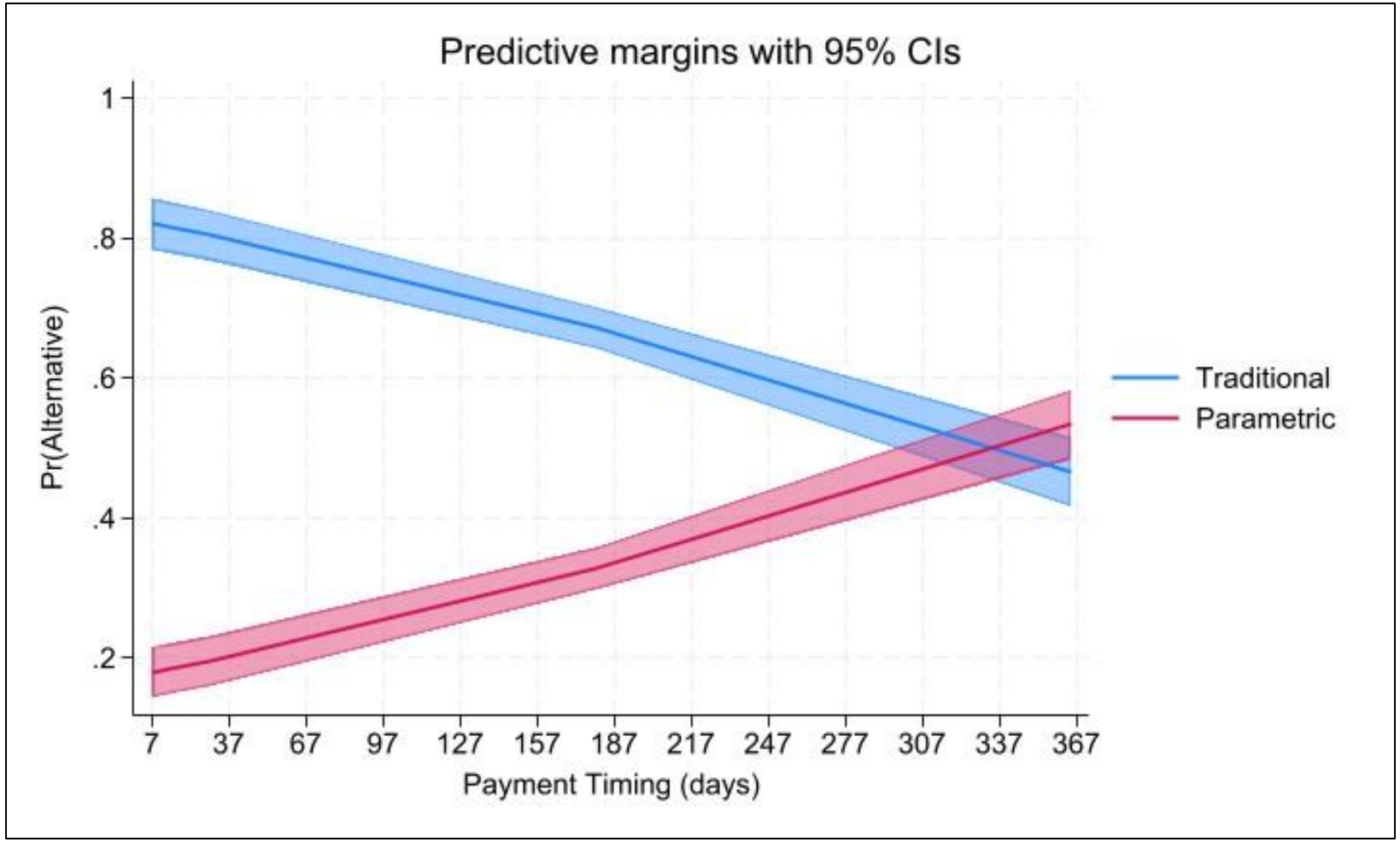


Mixed logit choice model — Number of obs = 2,122; Number of cases = 1,061; Panel variable: id — Number of panels = 535; Time variable: choiceset — Cases per panel: min = 1, avg = 2.0, max = 2; Alternatives variable: dce_alt — Alts per case: min = 2, avg = 2.0, max = 2; Integration points: 0; Log likelihood = -642.8976; Wald chi2(2) = 84.17; Prob > chi2 = 0.0000

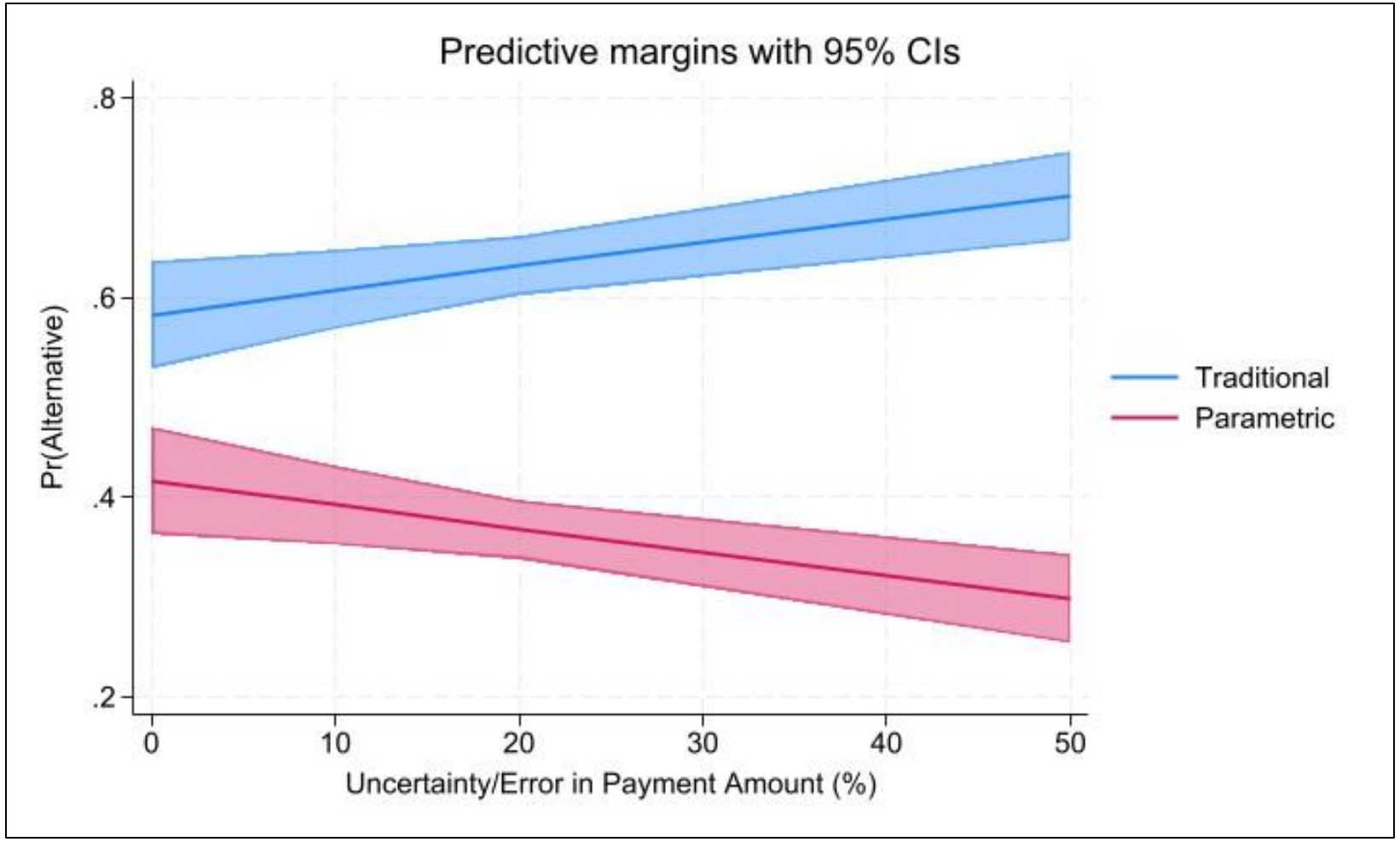
choice_dummy	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
dce_alt						
dce_days	-.0046551	.0005198	-8.96	0.000	-.0056739	-.0036363
dce_uncertain	-.0113219	.0040089	-2.82	0.005	-.0191793	-.0034646
A	(base alternative)					
B						
_cons	-1.179344	.1542632	-7.65	0.000	-1.481694	-.8769936

N = 535

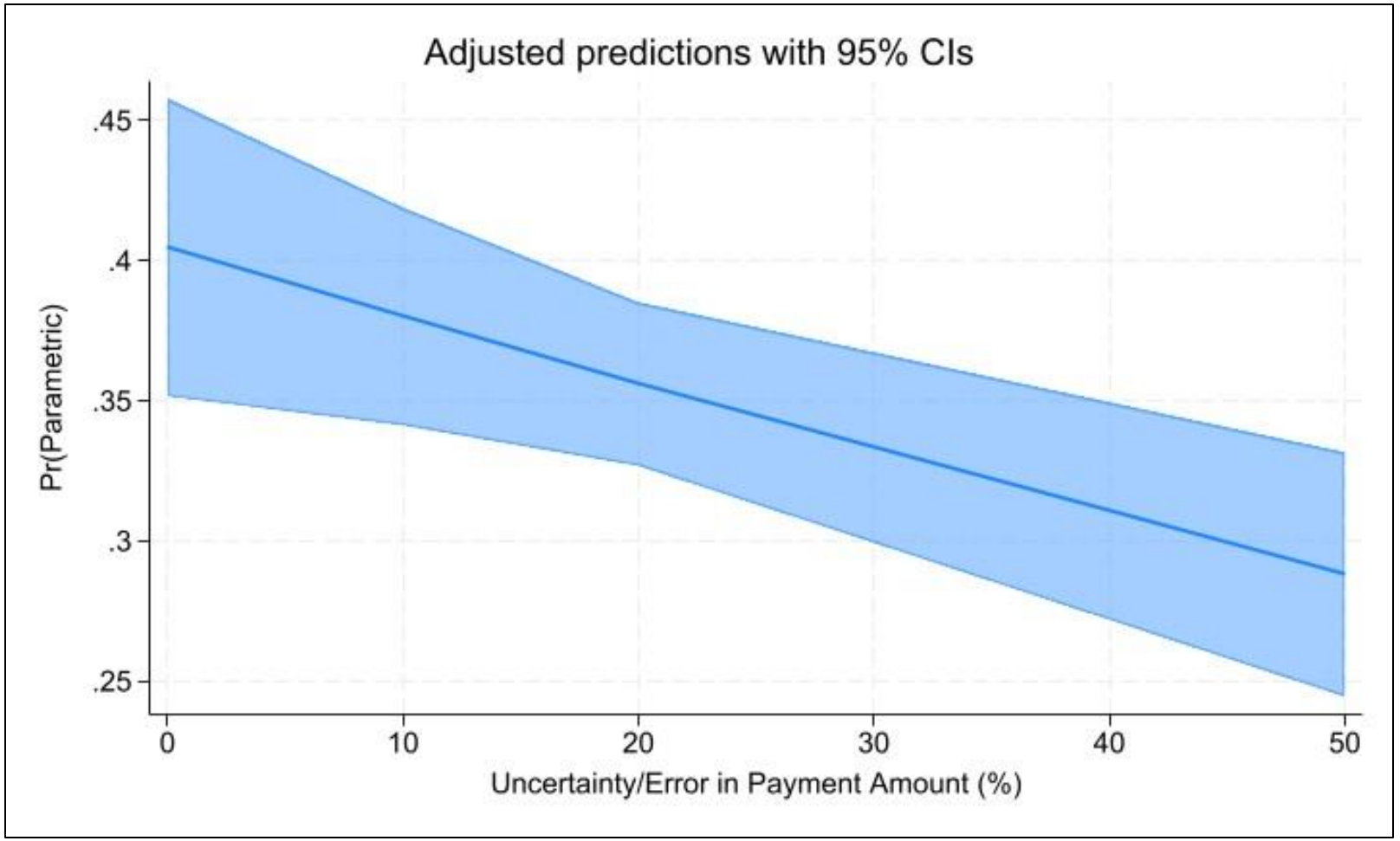
Preliminary Results: Wait Time



Preliminary Results: Uncertainty in Amount

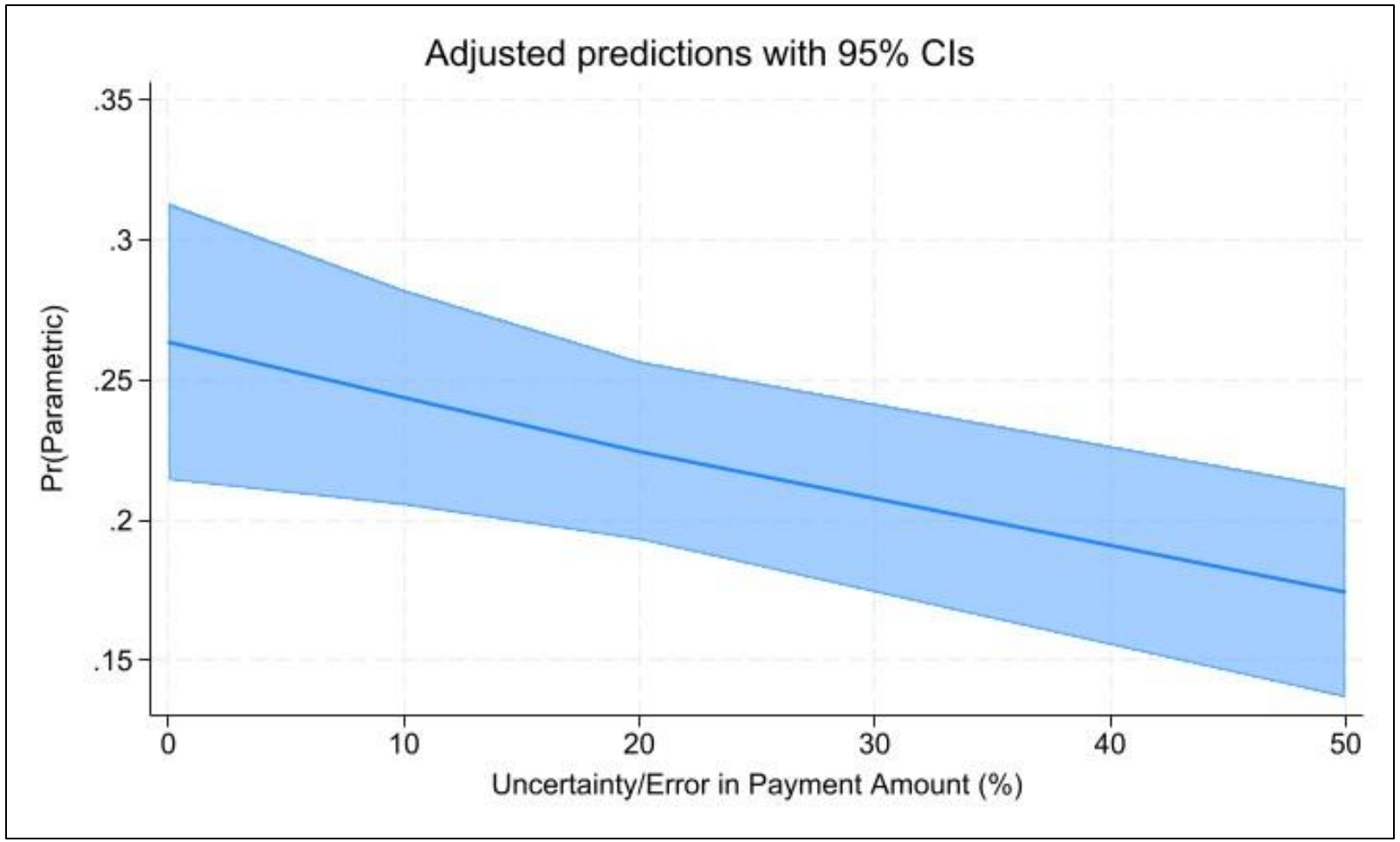


Base Model Results: 1 Month Wait Time – Parametric



After 1 month, the **probability of a parametric** model with 90% accuracy being selected is **38%**

Base Model Results: 6 Months Wait Time - Parametric



After 6 months, the **probability of a parametric** model with 90% accuracy being selected is **24%**

Working Sociodemographic Model

Preliminary analyses suggest that **previous disaster insurance experiences are unrelated** to current preferences.

- Payment wait time
- Recovery time
- Satisfaction with insurer

Sociodemographic model suggests:

- Employment status
  - **Retirees are less likely to prefer a parametric model**
- Home value
  - **Homeowners of higher valued homes ($500K+) are 14% less likely to prefer a parametric model** than homeowners of $150k home

Integration points: 0 Wald chi2(6) = 93.34
Log likelihood = -592.55083 Prob > chi2 = 0.0000

choice_dummy	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
dce_alt						
dce_days	-.0046501	.0005435	-8.56	0.000	-.0057152	-.0035849
dce_uncertain	-.0110986	.0041839	-2.65	0.008	-.0192988	-.0028984
A	(base alternative)					
B						
1.retired	-.4651499	.1519703	-3.06	0.002	-.7630062	-.1672936
homevalue2						
2	-.1564849	.1984965	-0.79	0.430	-.5455308	.232561
3	-.2826492	.1875124	-1.51	0.132	-.6501667	.0848683
4	-.6934618	.2281392	-3.04	0.002	-1.140606	-.2463172
_cons	-.7869693	.2062825	-3.82	0.000	-1.191276	-.382663

Follow Up

Q: Insurance estimation methods: There are several different methods in which insurance companies can estimate the amount of money you are owed following a disaster. We would like you to consider the following methods and answer a few questions.

Insurance Adjuster

A representative of the insurance company inspects damage to your home in-person. Compensation for damages typically takes 30-120 days after filing a claim with the insurance company. The final estimate of damages can be disputed

Computer Loss Models

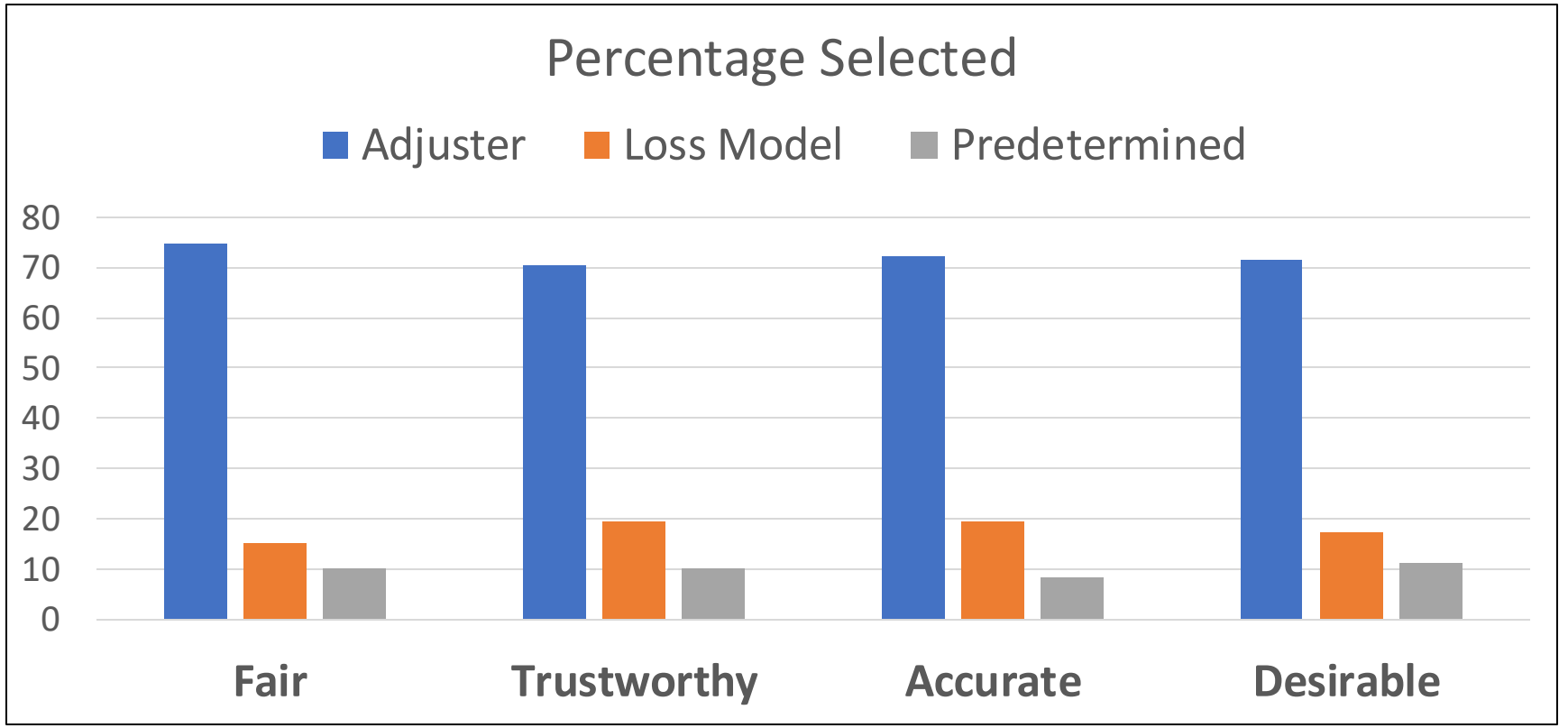
An insurance company estimates the damage to your home using a computer model that considers the strength of a hazard (such as a hurricane) as it affected your neighborhood and the damage most likely to occur. Compensation is typically distributed faster than when determined by an insurance adjuster, but the final estimate of damages is not negotiable.

Predetermined Compensation Tables

An insurance company publishes a table of compensation values for different hazards (such as hurricanes). Every person in the area of the hazard would be eligible for this amount. Compensation is distributed immediately following a disaster, but it is most likely less than the actual value of damages to your home. The compensation amount is not negotiable.

Follow Up

Q: Which of these methods is the most fair? …trustworthy? …accurate? ….desirable?



N = 511

Conclusions & Next Steps

Recap

- Longer wait times for insurance payments are associated with longer recovery times
- Most households would prefer a traditional insurance model over a parametric insurance model to cover damages

Next steps for insurance analyses

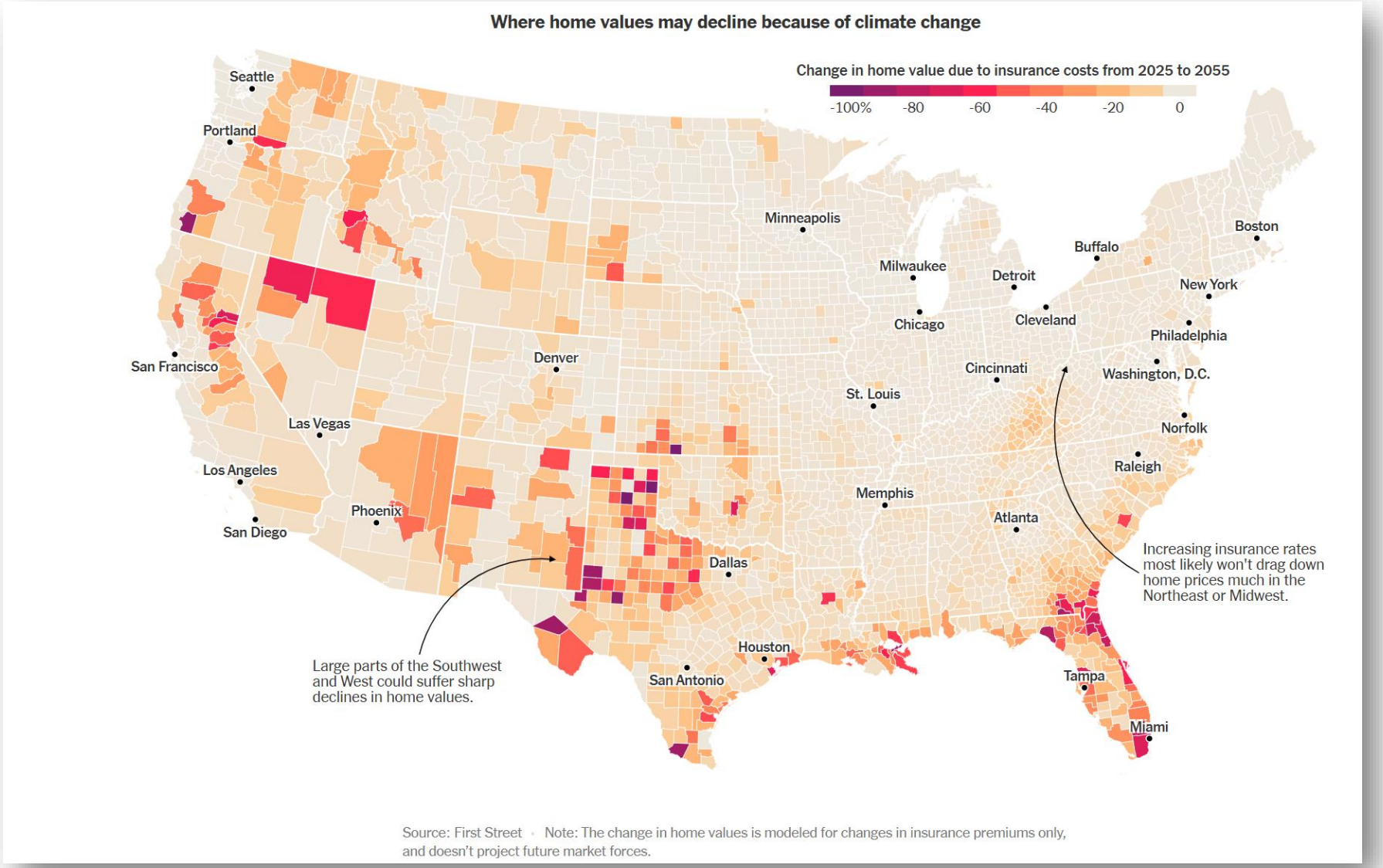
- Refine sociodemographic model and check robustness
- Develop choice experiments for micro- and/or stacked parametric insurance policies

Ongoing Related Analyses:

1. Quantify effects of scope & timing of financial resources on recovery
2. Assess sociodemographic patterns for resources used
3. Predict displacement based on perceptions of habitability (using reported damage attributes)

Supplemental Information

Change in home value due to insurance costs



Partner Insights: North Carolina Insurance Underwriting Association

Time take to file claim after loss

- Avg = 22 days
- Min = 0 days
- Max = 1,103

Wait time from claim to payment

- Mean = 68 days
- Min = 0 days
- Max = 1,615 days

Data averaged from Hurricanes Matthew (2016), Florence (2018), Dorian (2019) and Isaias (2020)

Survey Instrument Thematic Sections

Satisfaction with Payment Timing