Envisioning Oregon's Coastal Futures

Advisory Council Meeting December 3rd, 2021

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7th Advisory Council Meeting
December 3, 2021 (1:00 pm – 3:00 pm)
Virtual Meeting

Meeting Objectives:

- Discuss policies, programs, and events related to the CSZ seismic event and their impacts on coastal residents' risk perceptions.
- Discuss potential policies to improve preparedness actions for a CSZ event, barriers to implementing these policies, and ways to get across these barriers.
- Update the Advisory Council on project progress assessing the property impact impacts of risk signals and policy changes.
- Harness the expertise of the Advisory Council to develop actionable knowledge to inform statewide policies and localized decision-making.

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7th Advisory Council Meeting
December 3, 2021 (1:00 pm – 3:00 pm)
Virtual Meeting

Meeting Agenda:

1:00 - Welcome, Introductions, Meeting Overview

1:10 - Interactive Discussion: Impacts of Tsunami Hazards on Housing Markets – All

1:40 - Presentation of Results of Housing Market Response to Risk Signals (Amila Hadziomerspahic) followed by a Q&A/Discussion of housing market results – All

2:05 - Interactive Discussion: Potential Policies to Improve Preparedness – All

2:35 - Discussion on Messaging Measured Impacts from Policy Changes – All

2:50 - Next Steps for the Project, NSF COPE intro, closing remarks – Peter

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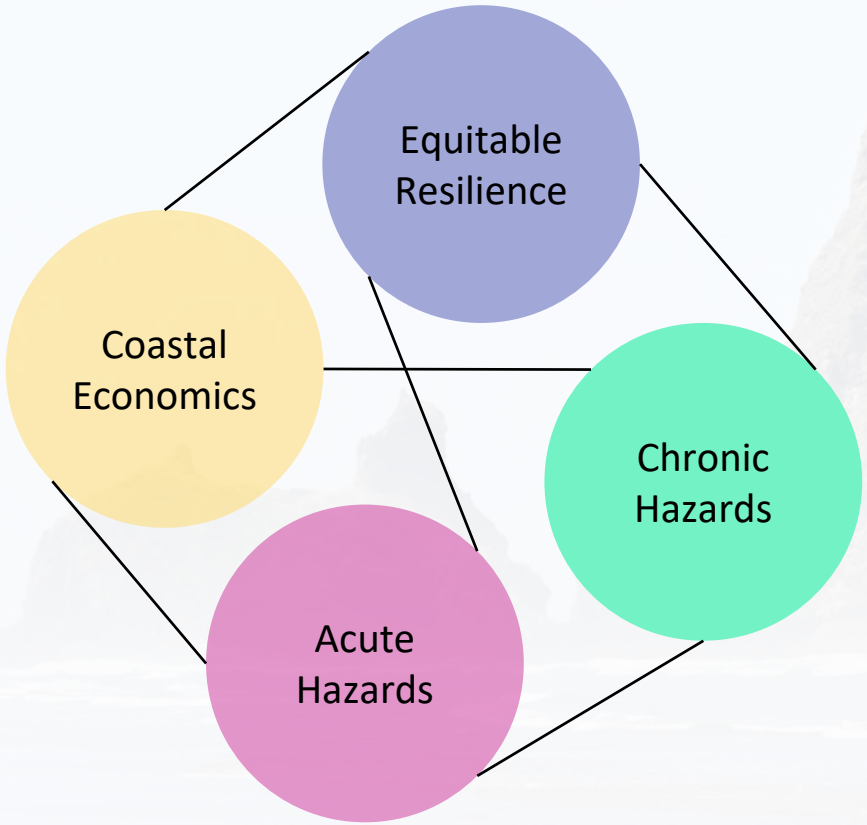
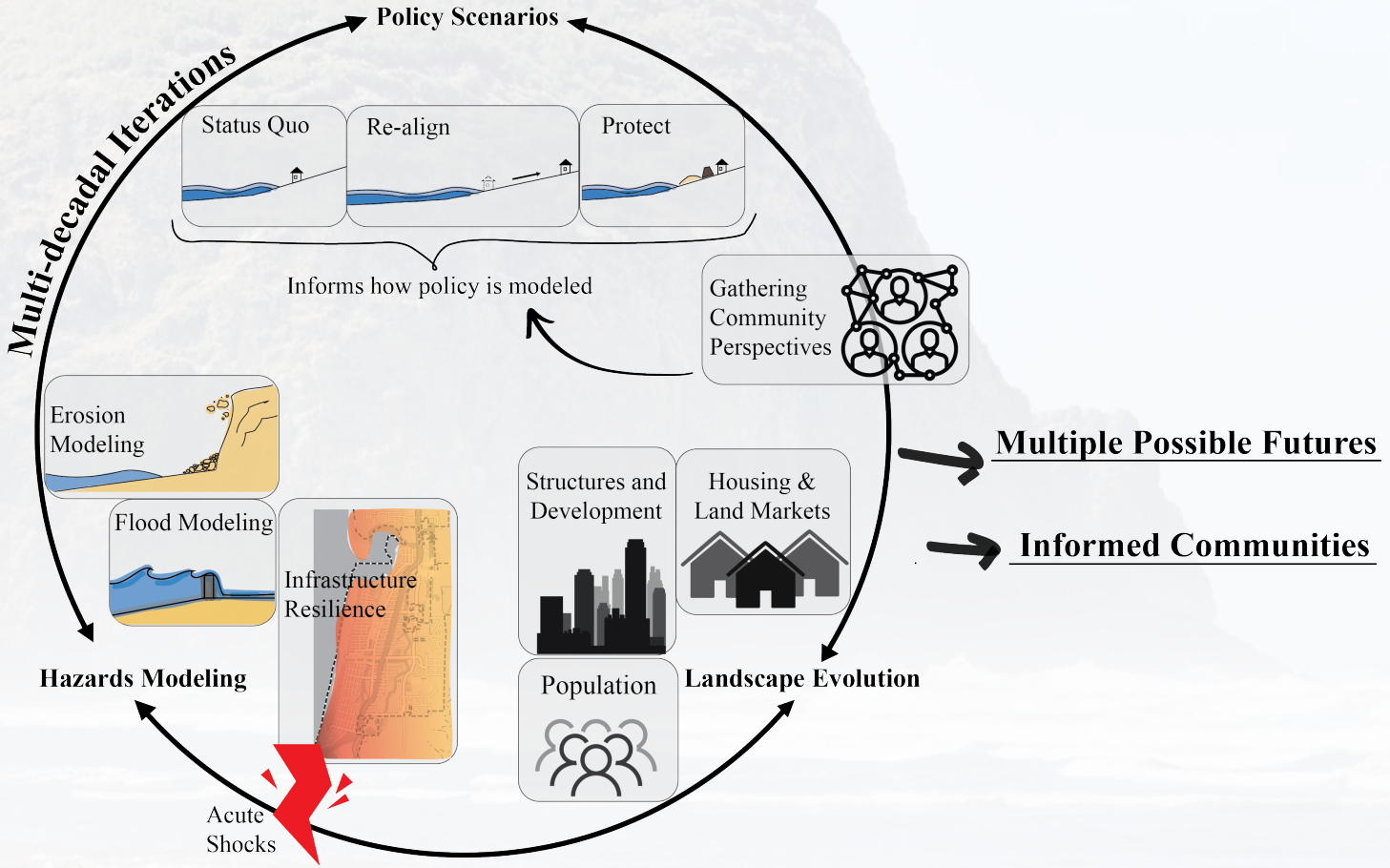
Project Framework





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Interactive Discussion: Impacts of Tsunami Hazards on Housing Markets

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What is a tsunami risk signal (information shock)?

- Any *exogenous* event, policy, or change that provides new information about the risk of a Cascadia earthquake and tsunami

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What is a tsunami risk signal (information shock)?

- Any *exogenous* event, policy, or change that provides new information about the risk of a Cascadia earthquake and tsunami
- Types of risk signals:
  - Disaster event (local or distant)
  - "Pure" information shock

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What is a tsunami risk signal (information shock)?

- Any *exogenous* event, policy, or change that provides new information about the risk of a Cascadia earthquake and tsunami
- Types of risk signals:
  - Disaster event (local or distant)
  - "Pure" information shock
- Interested in:
  - Salience: Can the risk signal lead individuals to update their risk perceptions?
  - Permanence: is the effect of the risk signal permanent or temporary?

THE NEW YORKER

ANNALS OF SEISMOLOGY JULY 20, 2015 ISSUE

THE REALLY BIG ONE

An earthquake will destroy a sizable portion of the coastal Northwest. The question is when.

By Kathryn Schulz

July 13, 2015

OREGONLIVE The Oregonian

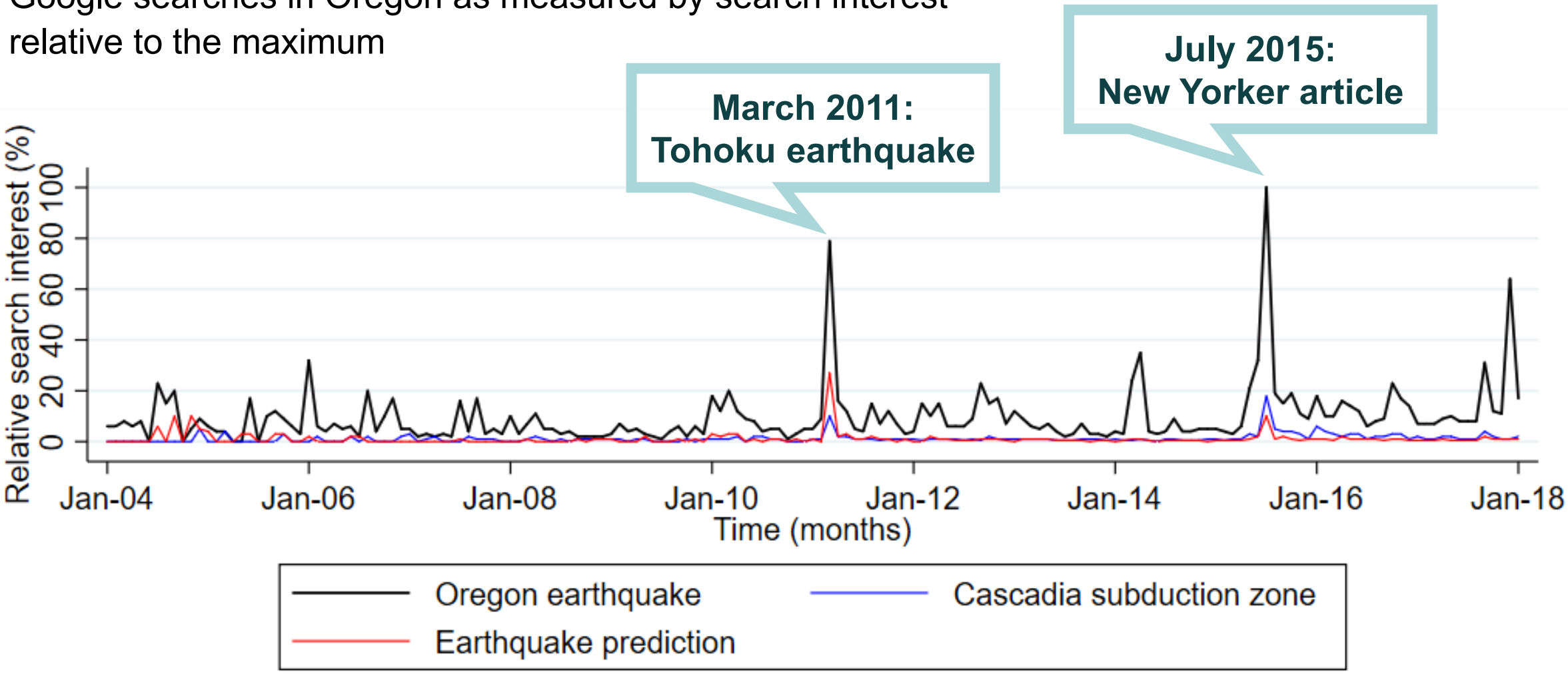
Pacific Northwest

Oregon coast will be 'toast' when Big One hits; politicians will make devastation even worse: The New Yorker

Updated Jul 03, 2019; Posted Jul 03, 2019

Information shocks

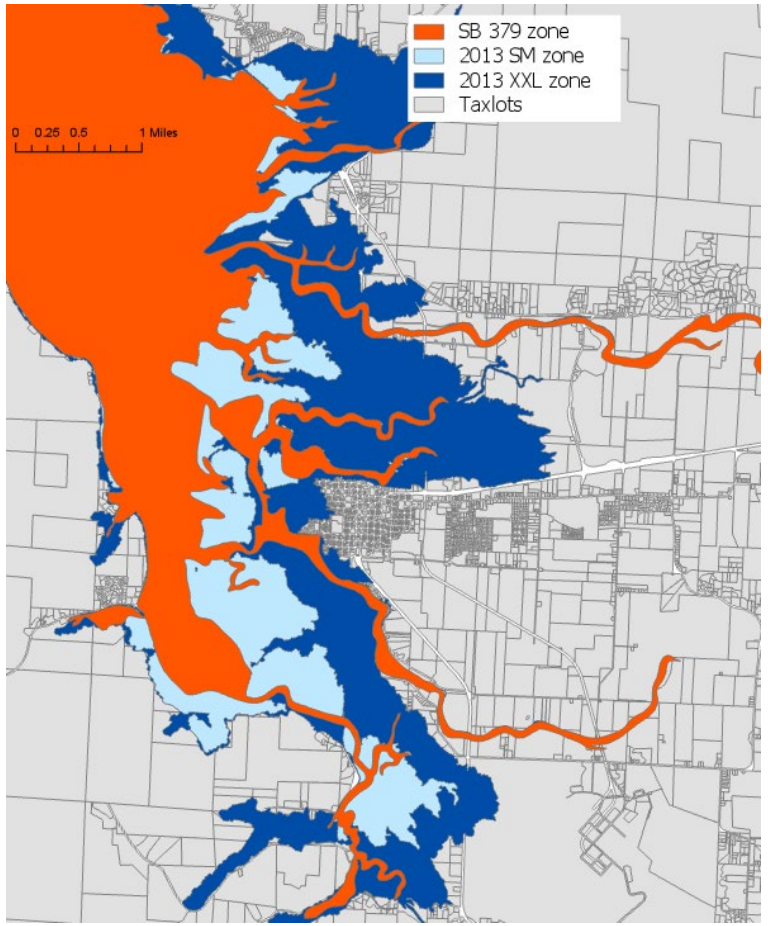
Google searches in Oregon as measured by search interest relative to the maximum



Tsunami inundation maps

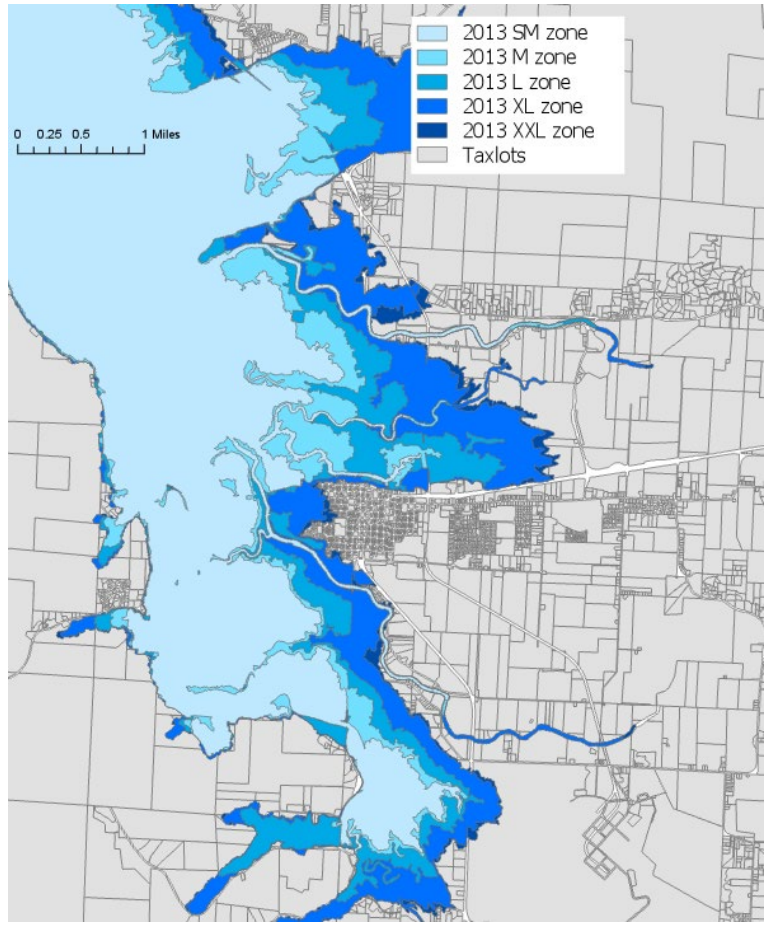
- 2013 tsunami inundation map change
  - 1995 SB 379 line
  - 2013 TIM series

Tillamook Bay, OR



Orange: 1995 SB 379 line

Blue: SM and XXL 2013 scenarios



2013 TIM series: SM, M, L, XL, XXL scenarios

Tsunami blue lines

- Tsunami Blue Line project
  - Visual cues of tsunami risk
  - 2013 XXL line
- Lines were installed between 2016 and 2019 in eleven coastal communities

Newport, OR

Seaside, OR

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Discussion

- The risk signals: Tohoku earthquake/tsunami, 2015 New Yorker article, 2013 map change, Tsunami Blue Line project

- How do you expect people or markets to respond to these risk signals and why?

- How long do you expect these impacts (risk discounts) to remain relevant?

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Discussion

- What other effects are you interested in looking at in relation to these information shocks?
  - Aside from property prices, are there other measurable outcomes of these information shocks?
  - For example, spikes in earthquake survival kit sales and home earthquake retrofitting after the New Yorker article went viral in 2015.

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Presentation of Results of Housing Market Response to Risk Signals

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The Really Big One

>10,000

Potential fatalities due to a combined 9.0 Cascadia earthquake and tsunami

$30 billion

Estimated economic losses – almost 1/5th of Oregon's gross state product

1-3 years

Estimated time to restore drinking water

Risk salience and resilience

- Improving resilience at the state, county, individual level
- Individuals' preparedness actions → depend on risk beliefs

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- If the risk is not salient, individuals will likely underprepare themselves
- Gap between subjective risk perceptions and objective risk?

Research question

- Does the tsunami risk discount in property values increase following information shocks about tsunami risks?

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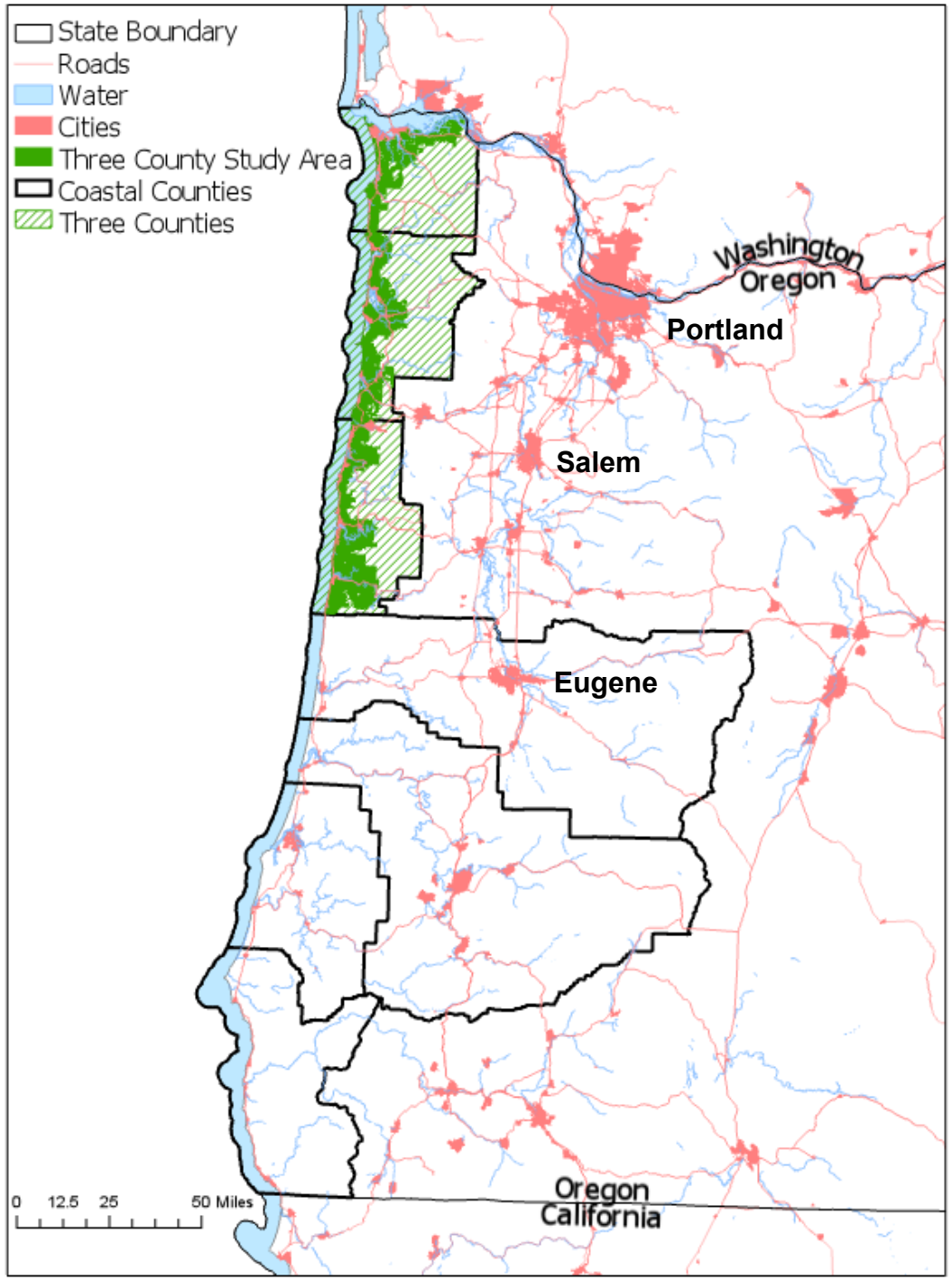
- Does the tsunami risk discount in property values increase following information shocks about tsunami risks?
- The housing market's response to three sets of risk signals:
  - Two exogenous events – the March 11, 2011 Tohoku earthquake and tsunami and the July 20, 2015 New Yorker article "The Really Big One"
  - A hazard planning change – the release of new official tsunami inundation maps in 2013
  - Visual cues of tsunami risk – the Tsunami Blue Line project

Study area and data

- Three northern coastal counties: Clatsop, Tillamook, and Lincoln
  - First: within 1 mile of the original tsunami inundation line
- Seven coastal counties:
  - Second: outside of the original tsunami evacuation zone
  - Third: neighborhoods around blue lines
- Data: Property sales, tsunami inundation zone, elevation, location information



Methodology: First Analysis

- Spatial property value framework:
  - Difference-in-differences model

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  - What it does: uses a *treatment* and an *event* to measure the effect of the *treatment* (tsunami inundation zone) *after* the event
  - What we're interested in: the treatment effect

Methodology: First Analysis

- Spatial property value framework:
  - Difference-in-differences model
  - Three primary models: I, II, III

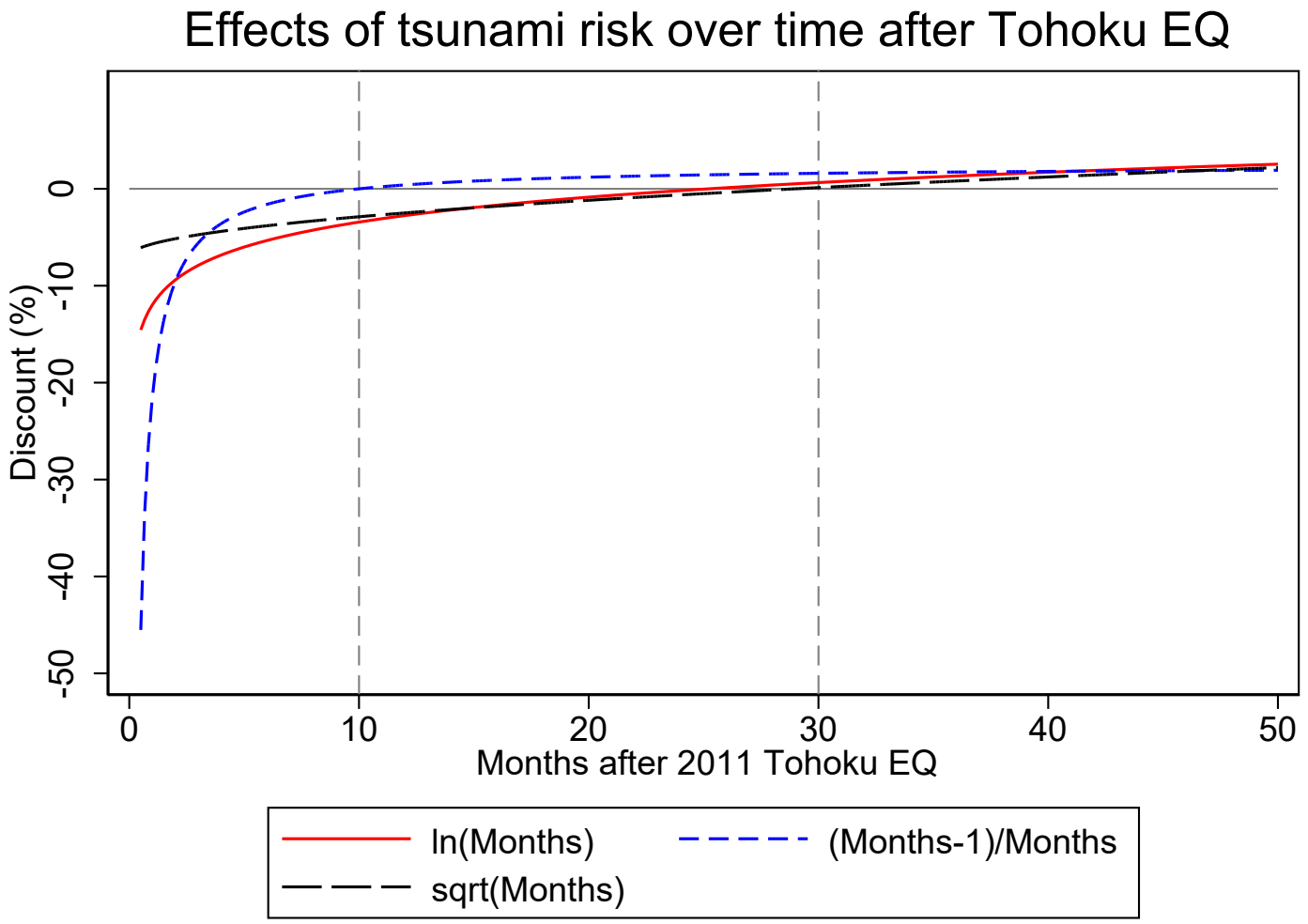
Table 2. Difference-in-Differences Selected Results, First Analysis Sample, Full Data

Variables	Labels	Model I	Model II	Model III
Diff-in-Diff				
sb379xtohoku	SB 379 tsunami in. zone (=1) x sold after 2011 earthquake and before 2015 article	-.08889**		-.06753**
		(.0415)		(.03399)
xxl2013xarticle	2013 XXL tsunami in. zone (=1) x sold after 2015 article		.0064	
			(.02397)	
sb379xarticle	SB 379 tsunami in. zone (=1) x sold after 2015 article			.0269
				(.02441)
Observations		5890	9160	15627
R-squared		0.376	0.441	0.411

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Results: Decay Effects

- Three out of four tests suggest there's a decay effect
- Plot these effects over time
- Suggests the risk premium decays between 10 months and 30 months after the Tohoku event
- → 7-9% risk premium that decays within 2.5 years of Tohoku event



Methodology: Second Analysis

- Spatial property value framework:
  - Difference-in-differences model

Methodology: Second Analysis

- Spatial property value framework:
  - Difference-in-differences model
  - Five primary models: 1, 2, 3, 4, 5

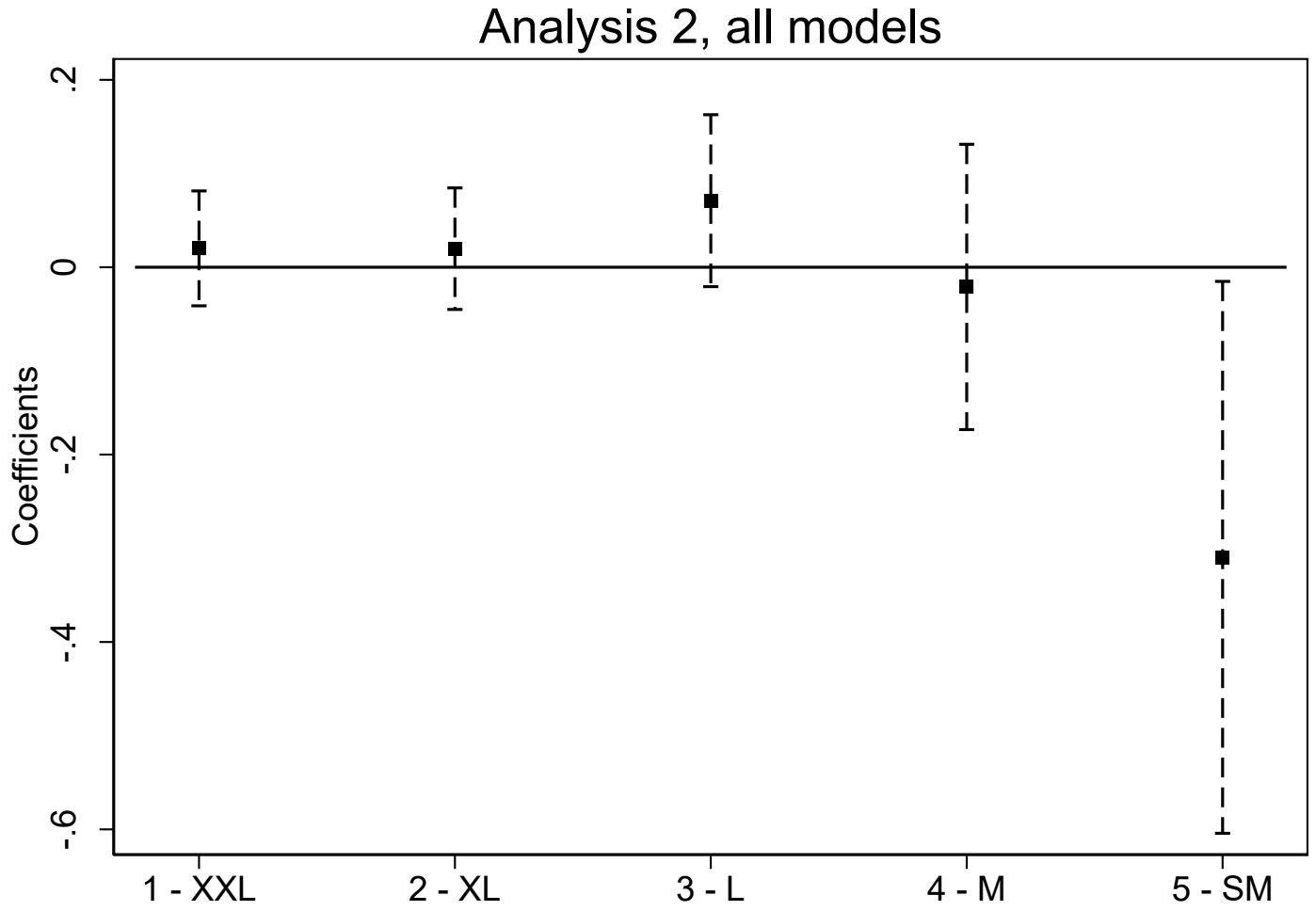
- Model 1: 2013 XXL line and 2013 map change

- Model 5: 2013 SM line and 2013 map change

Results: Comparing treatment effects

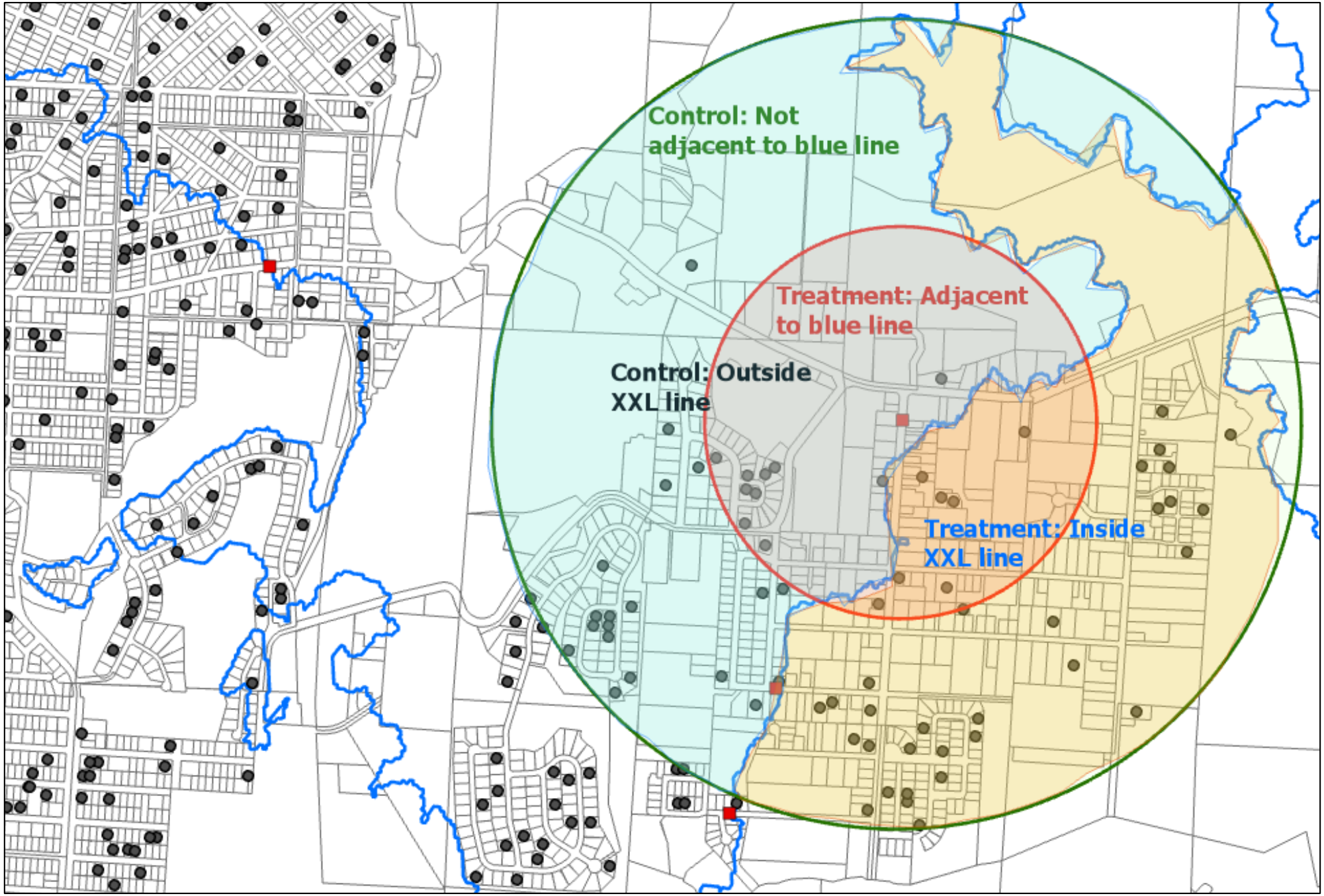
- Plot treatment effect estimates with 95% confidence intervals for all five models

- Risk discount may exist for homes that were not in the original tsunami inundation zone but are in the most vulnerable inundation zone following the 2013 map update



Methodology: Third Analysis

- Spatial property value framework:
  - Difference-in-differences model
  - Triple differences model


Control: Not
adjacent to blue line
Treatment: Adjacent
to blue line
Control: Outside
XXL line
Treatment: Inside
XXL line

Overlap

Methodology: Third Analysis

- Spatial property value framework:
  - Difference-in-differences model
  - Triple differences model

- Difference-in-differences model:
  - Treatment: Whether the house is in the neighborhood around the blue line
  - Event: Indicates that the sale happened after the blue line was installed

Methodology: Third Analysis

- Spatial property value framework:
  - Difference-in-differences model
  - Triple differences model

- Triple differences model:
  - Treatment: Whether the house is in the neighborhood around the blue line
  - Event: Indicates that the sale happened after the blue line was installed
  - Sensitivity: Whether the house is inside the 2013 XXL inundation zone.

Results: Comparing Models

- Tested 100 models:
  - Treatment range: 500-3000 ft
  - Control range: 1000-8000 ft
  - Straight line vs network distance

Yachats, OR

Results: Comparing Models

- Tested 100 models:
  - Treatment range: 500-3000 ft
  - Control range: 1000-8000 ft
  - Straight line vs network distance

- Focus on road network distances since blue lines are placed on roads

Yachats, OR

Results: Comparing Models

- Tested 100 models:
  - Treatment range: 500-3000 ft
  - Control range: 1000-8000 ft
  - Straight line vs network distance
- Final model: 1000 ft, 2500 ft
- Suggests an 8% risk discount for properties adjacent to a blue line
- Suggests lack of sensitivity to whether a property is inside the tsunami inundation zone

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Conclusion

- Potential risk discounts identified in the three analyses suggest
  - Three types of tsunami risk signals – exogenous events, hazard planning changes, and visual cues – may be salient to coastal residents
  - Exogenous tsunami risk signals may shift homebuyers' subjective risk perceptions

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  - Three types of tsunami risk signals – exogenous events, hazard planning changes, and visual cues – may be salient to coastal residents
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- A salient risk signal may be able to induce individuals to take preparedness actions

Conclusion

- Potential risk discounts identified in the three analyses suggest
  - Three types of tsunami risk signals – exogenous events, hazard planning changes, and visual cues – may be salient to coastal residents
  - Exogenous tsunami risk signals may shift homebuyers' subjective risk perceptions
- A salient risk signal may be able to induce individuals to take preparedness actions
- Given Oregon's current and chronic under-preparedness for a Cascadia event, additional policies are needed to mitigate hazard risk

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Interactive Discussion: Potential Policies to Improve Preparedness

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Discussion

- What are you hearing from stakeholders about blue lines or hazard maps?

- Tsunami Blue Line project impacts
  - Positive: Readjust risk perceptions
  - Negative: Lower home values
- →A double-edged sword

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Discussion

- Another example: FEMA's buyout program
- White communities have disproportionately received more federal buyouts after a disaster than communities of color (NPR)
- Nonwhite neighborhoods in otherwise white counties are the areas of greatest buyouts and demolition (Elliott et al., 2020)

https://www.npr.org/2019/03/05/696995788/search-the-thousands-of-disaster-buyouts-fema-didnt-want-you-to-see

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Discussion

- Maladaptive outcomes: unintended negative outcomes of a policy that either fail to reduce risk or that generate negative consequences for others
- May be barriers to policy implementation?
- May be metrics to consider measuring?

https://www.nytimes.com/2021/06/07/climate/FEMA-race-climate.html

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Top policies that can help mitigate acute hazards:

1. Relocate critical infrastructure away from tsunami zones
2. Relocate housing out of tsunami zones
3. Relocate community assets away from tsunami zones
4. Reroute key transportation routes out of tsunami zones
5. Expand UGBs to allow for new development away from tsunami zones

- What are some maladaptive outcomes of these policies? Barriers to implementation or potential metrics to consider in Envision?
- How do we overcome these barriers?
- If we were to implement them, how do we measure the policies' impacts?

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Other policies that can help mitigate acute hazards:

6. Provide vertical evacuation facilities in coastal communities
7. Hazard zone development restrictions: Development within safest site or outside of hazard zones
8. Provide incentives/subsidies for construction outside of hazard zones
9. Implement more stringent building codes
10. Reinforce critical infrastructure
11. Reinforce key road networks and bridges
12. Financial incentives for homeowners and landlords to move out of the tsunami inundation zones
13. Model the impact of Tsunami Hazard Overlay Zones (vs no such zones) to estimate the ability of those exclusion zones to affect the physical impact of the tsunami and the recovery response afterwards

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Other policies that can help mitigate acute hazards:

- Reinforce residential building (e.g. seismic retrofits)
- Reinforce community assets (e.g. food banks, community centers, resource centers)
- Reinforce key employment centers
- Provide incentives/subsidies for property owners - buyback programs

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Discussion on Messaging Measured Impacts from Policy Changes

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Discussion

- What is the right way to message this information?
- How could a county official communicate earthquake and tsunami risk to their residents?
- How do you communicate to the community about policies that you know would have maladaptive outcomes (negative impacts)?

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Next Steps for the Project, NSF COPE Intro, Closing Remarks

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