Flood Insurance Coverage in Dare County: Before and After Hurricane Floyd

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- Flooding is a ‘catastrophe risk’
  - Losses correlated across parcels
  - Limited data for estimating probabilities & loss
  - Government provision of disaster relief – ‘charity hazard’
  - ‘Adverse selection’ – only risky parcels will insure
- Private insurers reluctant to offer flood insurance
- National Flood Insurance Program (1968):
  - Create incentives for sound floodplain management
  - Make insurance available through partnership with private insurance agencies (sale/service – WYO)
National Flood Insurance Program

- Initial phases of NFIP—Flood Insurance Rate Maps
  - Subsidized insurance premium apply to pre-FIRM
  - Post-FIRM required to meet stricter building standards

- Initially, low demand for flood insurance

- Subsequent legislation encouraged purchase & mitigation projects
  - Mandatory coverage for mortgaged properties in SFHA
  - Incentives for community hazard mitigation – CRS
  - Erosion losses occurring during flooding covered
Objectives

- Combine data on flood insurance demand in Dare County for different time periods
  - How have coverage and deductible changed over time?
  - Are mandatory provisions being enforced?
  - How has subsidy status changed over time?
  - Does demand vary with subsidy status?
  - Does demand vary by risk classification (flood zone)
  - How sensitive is demand to price? Income? Demographic factors?
Dare County, North Carolina

- 386 square miles of land
- 30,000 residents; 6 millions tourists/year
- 20,400 residential structure – est. replacement value of $2.9 billion (2000 – 2002)
- Vulnerable to ocean and sound flooding/storm surge
  - Source: Dare County Hurricane Mitigation Plan
Data

- 1998 survey of homeowners in the near coastal zone (included site visits, GIS, and tax assessor data)
  - Initiated by FEMA to examine influence of erosion on NFIP
  - N = 1064, but for many variables only about 400 obs.
- 2008 survey of homeowners on barrier islands (includes GIS and tax assessor data)
  - Explore the effect of hazard perceptions on mitigation & behavior (RENCI)
  - N = 137
## Summary Statistics: Dare County

<table>
<thead>
<tr>
<th>Variable</th>
<th>1998 (s.d.)</th>
<th>2008 (s.d.)</th>
<th>Test statistic (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>0.533 (0.499)</td>
<td>0.903 (0.296)</td>
<td>$\chi^2 = 65.97 (&lt;0.00)$</td>
</tr>
<tr>
<td>Flood insurance (2008$)</td>
<td>121,204 (140,005)</td>
<td>189,859 (85,536)</td>
<td>$MW = 6.37 (&lt;0.00)$</td>
</tr>
<tr>
<td>Building value (2008$)</td>
<td>114,054 (189,644)</td>
<td>228,296 (166,407)</td>
<td>$MW = 10.76 (&lt;0.00)$</td>
</tr>
<tr>
<td>Insurance/value</td>
<td>0.556 (1.075)</td>
<td>1.147 (0.764)</td>
<td>$MW = 2.54 (0.0108)$</td>
</tr>
<tr>
<td>Deductible (2008$)</td>
<td>1927 (3623)</td>
<td>3177 (4096)</td>
<td>$MW = 7.95 (&lt;0.00)$</td>
</tr>
<tr>
<td>Mortgaged</td>
<td>0.490 (0.500)</td>
<td>0.760 (0.428)</td>
<td>$\chi^2 = 13.26 (&lt;0.00)$</td>
</tr>
<tr>
<td>Required</td>
<td>0.118 (0.323)</td>
<td>0.615 (0.488)</td>
<td>$\chi^2 = 99.75 (&lt;0.00)$</td>
</tr>
<tr>
<td>Subsidy</td>
<td>0.424 (0.494)</td>
<td>0.232 (0.423)</td>
<td>$\chi^2 = -19.03 (&lt;0.00)$</td>
</tr>
</tbody>
</table>
Flood Insurance Coverage (thousands 2008$)

- **2008**
  - Low frequency of non-participants
  - Many at upper bound

- **1998**
  - High frequency of non-participants
  - Few at upper bound
Methods

- Multivariate regression analysis to analyze insurance coverage choice

- *Tobit* model with upper ($0) and lower ($250K) bound – maximum likelihood estimation
  - Marginal premium
  - Risk (flood zone)
  - Assessed building value
  - Subsidy status, mortgage status
  - Income, education
Results

- Price responsiveness:
  - $\epsilon_p = -0.645$ for average property in 1998
  - $\epsilon_p = -0.018$ for average property in 2008
- Coverage in V-zone $29,900$ greater
- Coverage in A-zone $9800$ greater
- Very small effect for building value: $1$ increase in assessed building value increases coverage by $0.02$. 
Results

- Coverage is $14,100 greater for mortgaged properties
- $1 increase in household income increases coverage by $0.52
- Coverage lower for those for whom high school is highest level of educational attainment.
Discussion: Dare County

- Participation in NFIP has increased significantly
  - This is probably due to better enforcement of federal requirements regarding federally backed mortgages in SFHA (100-year flood zone)
    - More mortgaged properties
    - More property owners claim they were required to purchase flood insurance
- Coverage amounts have increased (in real dollars)
- Deductibles have increased
- Number of subsidized properties has decreased

Hurricane Floyd Symposium: Sept. 2009
Discussion: Dare County

- Flood insurance demand is not very responsive to price (likely reflects federal requirements)
- Coverage is greater in higher risk zones
  - Could partly reflect requirements in SFHA
  - But, V-zone is much greater than A-zone
- Coverage greater for higher valued buildings
- Coverage increasing in income and education
Conclusions

- Flood insurance coverage along the coast of NC appears to have increased since Hurricane Floyd.
- There are still parcels that qualify for subsidized flood insurance, but the proportion has decreased.
- Coverage demand is not price sensitive.
- Coverage greater in higher risk zones and for more valuable structures.
- Coverage higher for wealthy and more educated.
Hurricanes in Dare County

1999

- **Dennis**: Aug. 28 to Sept 4
- Stalled along the Outer Banks, pounded barrier island for 3 days, then looped back to make landfall on Cedar Island.
- Thousands of people who did not evacuate were stranded and lashed with 70 mph winds. Beach erosion was massive.
- Flooding stats
Hurricanes in Dare County

1999

- **Floyd**: Sept. 15-16
- Weakened from a cat 5 to a cat 2, brushed the NC coast.
- Left behind record rainfall in an already saturated area.
- Flooding stats
- Largest natural disaster in state history