Evaluating the Effectiveness of the Community Rating System: A Comparative Analysis

(and other CRS-related tidbits)

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Previous Nationwide Analysis

• What activities standout as effective?
• How well does the program perform nationwide?
  – Panel regression models
    • CRS activity points and other factors (control variables)
      – Isolate the effect of each selected CRS activity by controlling for other pertinent variables
(Millions of 2012 U.S. Dollars)

Nationwide: $33.5 Billion in paid claims
Previous Nationwide Analysis

• Nationally-representative sample of 450 CRS communities
  – Unit of Analysis is *community*
    • Losses and predictors are aggregate
      – Cross-sectional time-series (CSTS)/panel models
        » Linear, Random Effects Panel Regression Models

• Quantify in dollar amounts effect of CRS activities on insured flood loss claims
Previous Nationwide Analysis

- **Open space** (420)
- **Freeboard** (element of 430)
- **Flood Protection** (530)

### Average Loss Reduction per CRS community

<table>
<thead>
<tr>
<th></th>
<th>Building and Contents</th>
<th>Content Damage</th>
<th>Building Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>A-V</td>
<td>B-C-D-X</td>
</tr>
<tr>
<td><strong>420</strong></td>
<td><strong>$547,497</strong></td>
<td><strong>$483,869</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FRB</strong></td>
<td><strong>$960,817</strong></td>
<td><strong>$669,260</strong></td>
<td></td>
</tr>
<tr>
<td><strong>530</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Drilling Down: CRS in a Texas Gulf Coast Watershed

- National level important programmatically
  - What works one place may not work in another
- Analysis at the community level can “wash out” some important details
  - Structural and geographic characteristics

- What is the effect of the CRS program and its activities relative to non-CRS communities on insured losses?
Clear Creek Study Area

- 197 square miles
- Adjacent to Galveston Bay
- Portions of four counties

- 22 communities
  - 12 CRS
  - 10 Non-CRS

- Study period: 1999-2009
Clear Creek Analysis: Approach

• Track NFIP claims and CRS activity points from 1999-2009
• Statistical controls included:
  – Elevation (ground)
  – Precipitation
  – Home Age
  – Home Value
  – Floodplain Proximity
  – Post-FIRM status (dichotomous)
  – Year
• All measurements/unit of analysis at the parcel level
• Analyzed with spatial autoregressive (SAR) models
  – Spatial autocorrelation in the error term
• Overall sample: n = 9,555 claims over study period
Clear Creek: Descriptive Results

- Over $335 million in claims from 1999-2009
- 46% of claims outside of the SFHA
- 42% of claims were for Pre-FIRM properties
- Average per-property claim approximately $35K

- TS Allison (2001) generated 40% of claims
- Hurricane Ike (2008) generated 46% of claims

Mean insured losses by year: 1999-2009
Clear Creek Analysis: Results

Control variables behave as expected

<table>
<thead>
<tr>
<th>Control Variable</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>-</td>
</tr>
<tr>
<td>Precipitation</td>
<td>+</td>
</tr>
<tr>
<td>Home Age</td>
<td>+</td>
</tr>
<tr>
<td>Home Value</td>
<td>+</td>
</tr>
<tr>
<td>Floodplain Proximity</td>
<td>-</td>
</tr>
<tr>
<td>Post-FIRM Property</td>
<td>-</td>
</tr>
</tbody>
</table>

• On average:
  - 1’ increase in ground elevation decreases damage by $5,985-$7,785
  - 100’ away from the SFHA decreases damage by 4-5%
  - Post-FIRM properties 79-86% less damage
Clear Creek Analysis: CRS Results

PARTICIPATION:
• On average, structures in CRS communities saw 88% reduction in claim amount
  – Relative to structures in non-CRS communities
    » After controlling for previous variables

CRS POINTS:
• One-point increase in total CRS points reduced loss amount by 0.06%
  – Seemingly small amount, but recall that classes move in 500 point increments.

CRS ACTIVITIES:
• All CRS activities analyzed had statistically significant effects on reducing loss amounts in the Clear Creek Watershed.
## Clear Creek Analysis: CRS Results

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mean Points</th>
<th>Max Possible</th>
<th>Mean Per Point Reduction</th>
<th>Total Mean Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>320: Map Information</td>
<td>124</td>
<td>140</td>
<td>-$177</td>
<td>-$16,240</td>
</tr>
<tr>
<td>330: Outreach Projects</td>
<td>110</td>
<td>315</td>
<td>-$205</td>
<td>-$16,457</td>
</tr>
<tr>
<td>340: Hazard Disclosure</td>
<td>12</td>
<td>81</td>
<td>-$358</td>
<td>-$4,105</td>
</tr>
<tr>
<td>350: Flood Protection Information</td>
<td>32</td>
<td>66</td>
<td>-$845</td>
<td>-$18,544</td>
</tr>
<tr>
<td>360: Flood Protection Assistance</td>
<td>33</td>
<td>71</td>
<td>-$310</td>
<td>-$8,893</td>
</tr>
<tr>
<td>410: Additional Flood Data</td>
<td>29</td>
<td>1,373</td>
<td>-$443</td>
<td>-$10,841</td>
</tr>
<tr>
<td>420: Open Space Protection</td>
<td>106</td>
<td>900</td>
<td>-$82</td>
<td>-$7,671</td>
</tr>
<tr>
<td>430: Higher Regulatory Standards</td>
<td>259</td>
<td>2,720</td>
<td>-$126</td>
<td>-$21,023</td>
</tr>
<tr>
<td>440: Flood Data Maintenance</td>
<td>90</td>
<td>231</td>
<td>-$395</td>
<td>-$22,133</td>
</tr>
<tr>
<td>450: Stormwater Management</td>
<td>69</td>
<td>670</td>
<td>-$187</td>
<td>-$10,764</td>
</tr>
<tr>
<td>510: Floodplain Management Planning</td>
<td>64</td>
<td>309</td>
<td>-$344</td>
<td>-$16,187</td>
</tr>
<tr>
<td>520: Acquisition/Relocation</td>
<td>317</td>
<td>3,200</td>
<td>-$41</td>
<td>-$10,792</td>
</tr>
<tr>
<td>540: Drainage System Maintenance</td>
<td>216</td>
<td>330</td>
<td>-$143</td>
<td>-$20,302</td>
</tr>
<tr>
<td>610: Flood Warning Program</td>
<td>84</td>
<td>225</td>
<td>-$109</td>
<td>-$8,071</td>
</tr>
</tbody>
</table>
Clear Creek Analysis: CRS Results

- Activities 440 (flood data maintenance), 430 (higher regulatory standards) and 540 (drainage system maintenance) had the largest effect.
- Followed closely by 510 (FP management planning), 350 (flood protection information), 330 (outreach projects), and 320 (map information).
- *BUT:* is a function of how many points communities have (or have not) accrued in each activity.
Clear Creek Analysis: CRS Results

- Still lots of room to move, esp. in 430.
Conclusions from a smaller-scale

- When comparing damage between CRS/Non CRS communities:
  - *Homes in CRS participating communities had significantly lower claim amounts*
  - Individual CRS Activities significantly reduce loss amounts

**BUT:**
- Variation in activity effectiveness
- Differential between per-point and mean savings
- Lots of room to improve based on mean points and maximum points
- The right “mix” is dependent on scale/situation
Moving Forward...

• Individual level analyses are nice—allow measurements that cannot be done at community level
  • Can still suffer from a lack of variation across CRS variables

• Currently scaling back up to community to conduct comparative, nation-wide analysis of CRS vs. non-CRS (NFIP) communities
Comparing CRS vs non-CRS in the U.S.

- Approach must be different
  - 20,000+ NFIP communities; < 1200 CRS communities
- Currently in the process of matching CRS and non-CRS communities.
  - Propensity Score Matching
  - Current matching criteria include:
    - Property Tax Rate (-)
    - Education (+)
    - Housing Units (+)
    - Proportion of SFHA (+)
    - Structures in SFHA (-)
    - NFIP Policies (+)
    - Year Built (+)
    - NFIP Entry Year (-)
    - Coastal (+)
    - Precipitation (*)
Comparing CRS vs non-CRS in the U.S.

• Overarching goal, after establishing the matched communities: Determine the average effect of CRS program on flood loss claims
  – Relative to non-CRS communities
Thanks...Questions?

