



Insurance Market Responses to Catastrophic Events and the Implications for Catastrophe Modeling

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Agenda



- § Introduction
- § Overview of Cat Modeling
- § Observations
- § Analysis and Results
- § Policy Implications

Introduction

Motivation

- Increasing frequency and severity of catastrophic events worldwide → need for regulatory intervention?
- Concerns for insurer solvency escalated in the wake of financial market crisis

What should we know, that we don't already know, about what private insurers are doing or can do?

Should we expect private insurers to continue to participate in providing property coverage, and if so, under what terms?

If insurers cannot or will not insure against catastrophic events, a subsequent lack of affordable coverage could hamper economic recovery and development.

Introduction

Basis for Participation in Private Markets

- The insurer's decision to participate in the private market depends on expected losses which are a function of:
 - Past profitability and ability to recover from previous losses and reduction in capacity
 - Past events which may/may not have affected the insurer
 - Access to state funds, reinsurance arrangements, and alternative risk transfer mechanisms
 - Regulatory and legal environment
 - Demographics
 - Output of catastrophe models
 - more accurate information on potential future catastrophe losses than insurer's own experience → better estimates of loss costs for insurer's book of business



Management says...

- “Allstate continues to take actions to maintain an appropriate level of exposure to catastrophic events, including:
 - “A reduction of property policies in force in coastal management areas thereby lowering hurricane exposures”
 - “Increased utilization of wind storm pools..”
 - “No writing of new homeowners business in California..”
- “Allstate is working for changes in the regulatory environment, including fewer restrictions on underwriting, recognizing the need for an improving appropriate risk based pricing and promoting the creation of government sponsored, privately funded solutions for large catastrophes.”

Introduction

Research Project Goals

- Identify firm characteristics and exogenous factors that may create a comparative advantage in bearing catastrophic property risks
- What lessons can we learn from:
 - Homeowners vs. commercial insurers?
 - Regulated vs. unregulated environments?
 - **Diversification strategies?**

Introduction

Current Objectives

- Emphasize the potential role of catastrophe models in determining an effective diversification strategy.
- Consider 'enhancements' to current catastrophe models that would improve the underwriting decision making process.

Overview of Catastrophe Modeling

Main Components of Cat Models

- 1) **Event Generation / Hazards** – Simulation of potential events and their propagation across an area.



- 2) **Engineering / Damages** - Estimates the potential damage vulnerability to specific structures caused by the simulated event.



- 3) **Finance / Coverage** - Applies the damages against insurance coverages to determine the financial losses from the simulated event.

Overview of Catastrophe Modeling

Use of Models

- Output can be integrated into the underwriting process
 - *Ex ante*: what's at risk?
 - Review book of business, set coverage limits, policy parameters,
 - Purchase reinsurance to offset the risk...
- Assess the potential value of mitigation activities
- Models are emphasized in the ratemaking process.
 - Pricing and ceding of risk.
 - Assess reserve adequacy (required by rating agencies).
- Insurers and reinsurers often more focused on *ex post* applications, using it to track a storm's impact on aggregated policies and entering claims data.

Overview of Catastrophe Modeling

Limitations

- Models produce probabilistic scenarios based on speculative events that will never exactly match the actual event.
 - Models did not predict Katrina very well: wind damage given more attention than water/storm surge?
- Different models produce different estimates
 - Ambiguity of risk complicates usefulness
- One model is not sufficient
- Risk appetites of insurers differ
- Differential impact of losses on insurers' overall financials

Overview of Catastrophe Modeling

Outlook

- Has the application of catastrophe modeling techniques affected insurer's ability to manage exposure to catastrophe risks?
- Models are limited to property exposures and natural/man-made catastrophic events.
- Can the models be enhanced to provide more useful information for insurers, or what supplemental information is necessary?
 - In evaluation of underwriting strategy
 - In determination of reserves and risk transfers
 - To enhance capacity



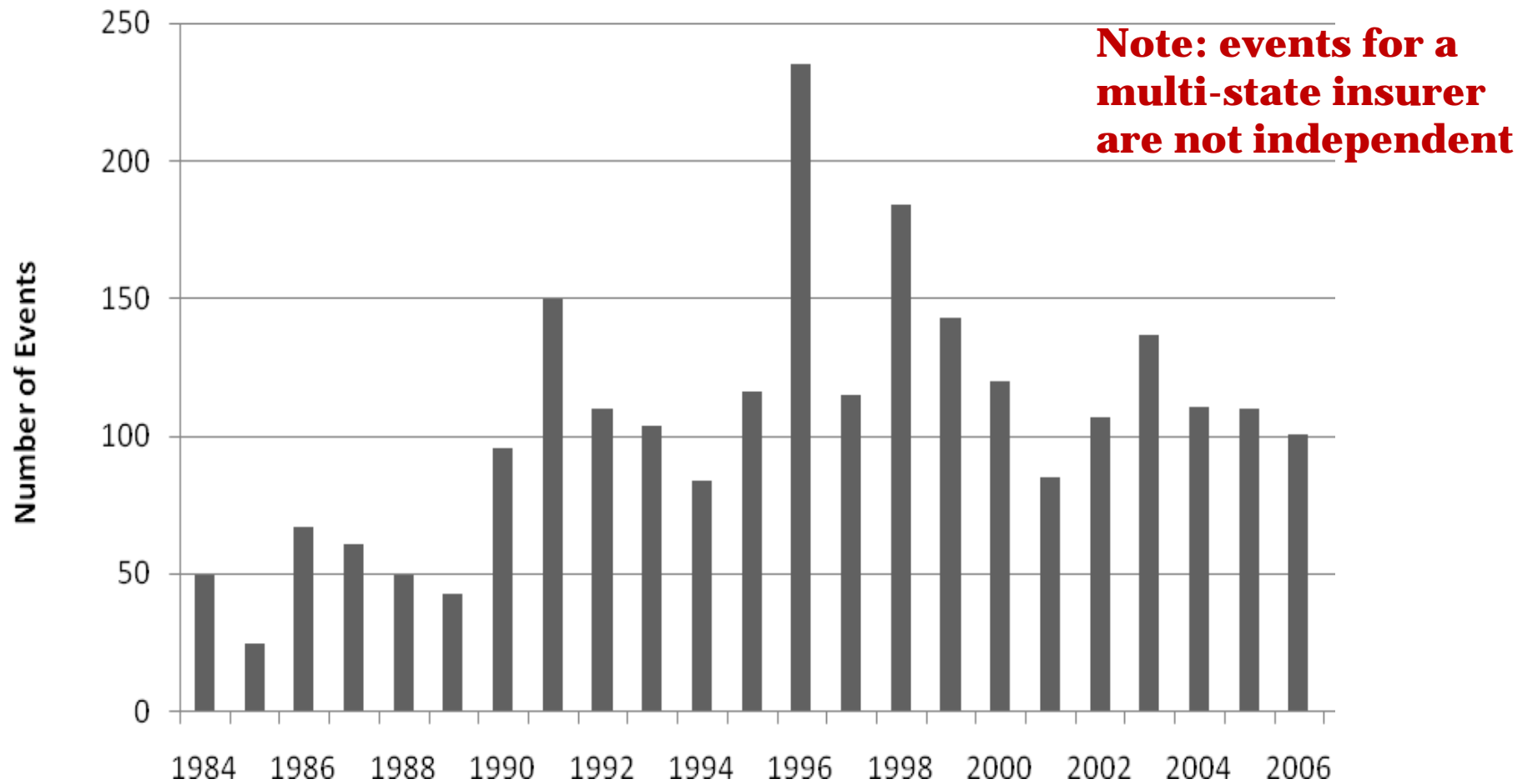
Observations

Data on Property Insurers

- Operating/financial data for all U.S. homeowners and commercial property insurers
 - Source: annual NAIC statutory filings 1984-2007.
 - Includes insurer organizational form, group affiliation
- Catastrophic event data - natural disasters
 - Source: Swiss Re Sigma Reports, 1984-2007.
- State rate filing regulations
 - Source: State statutes.
- 429,692 observations over 24 years

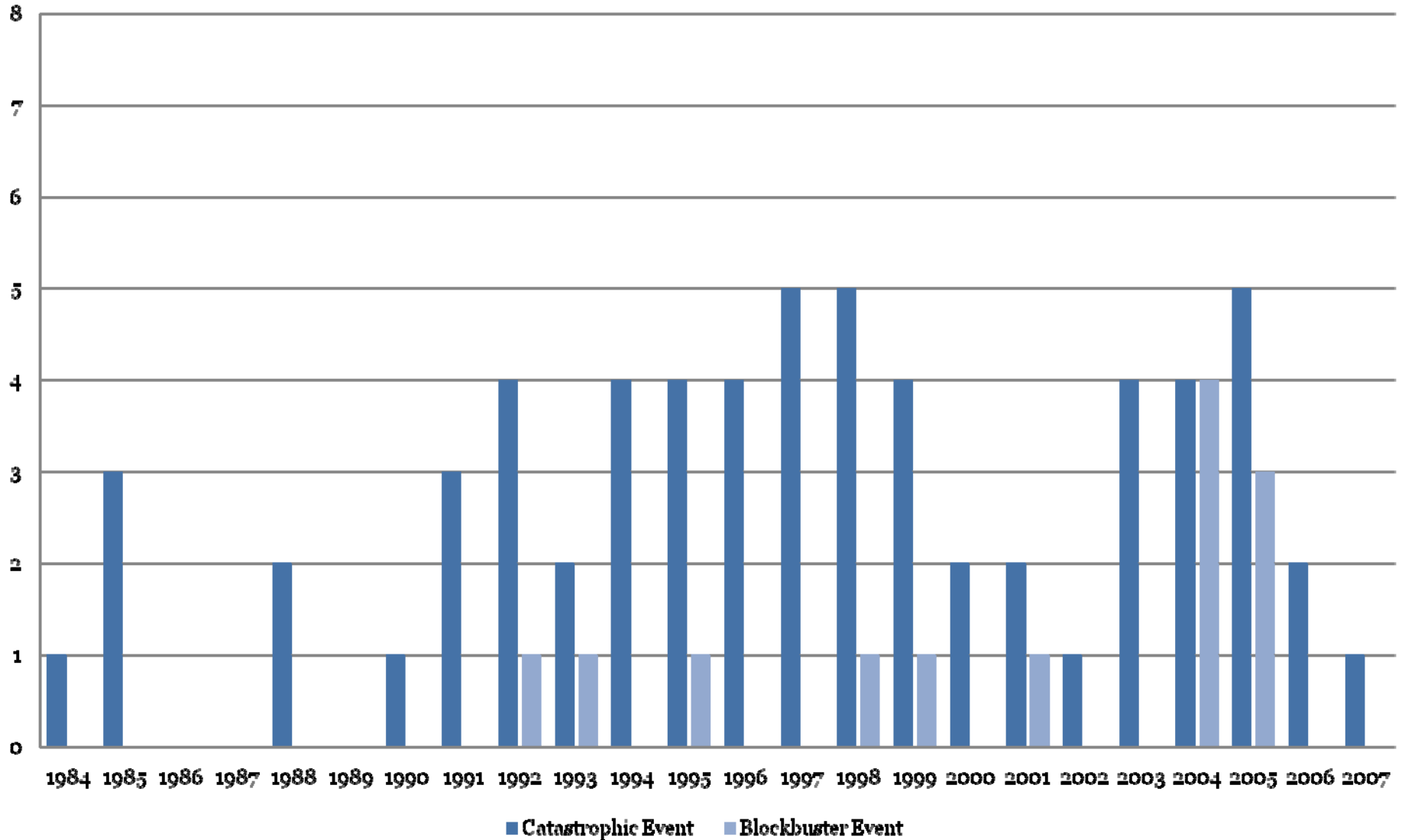
Observations

State-level Catastrophic Events



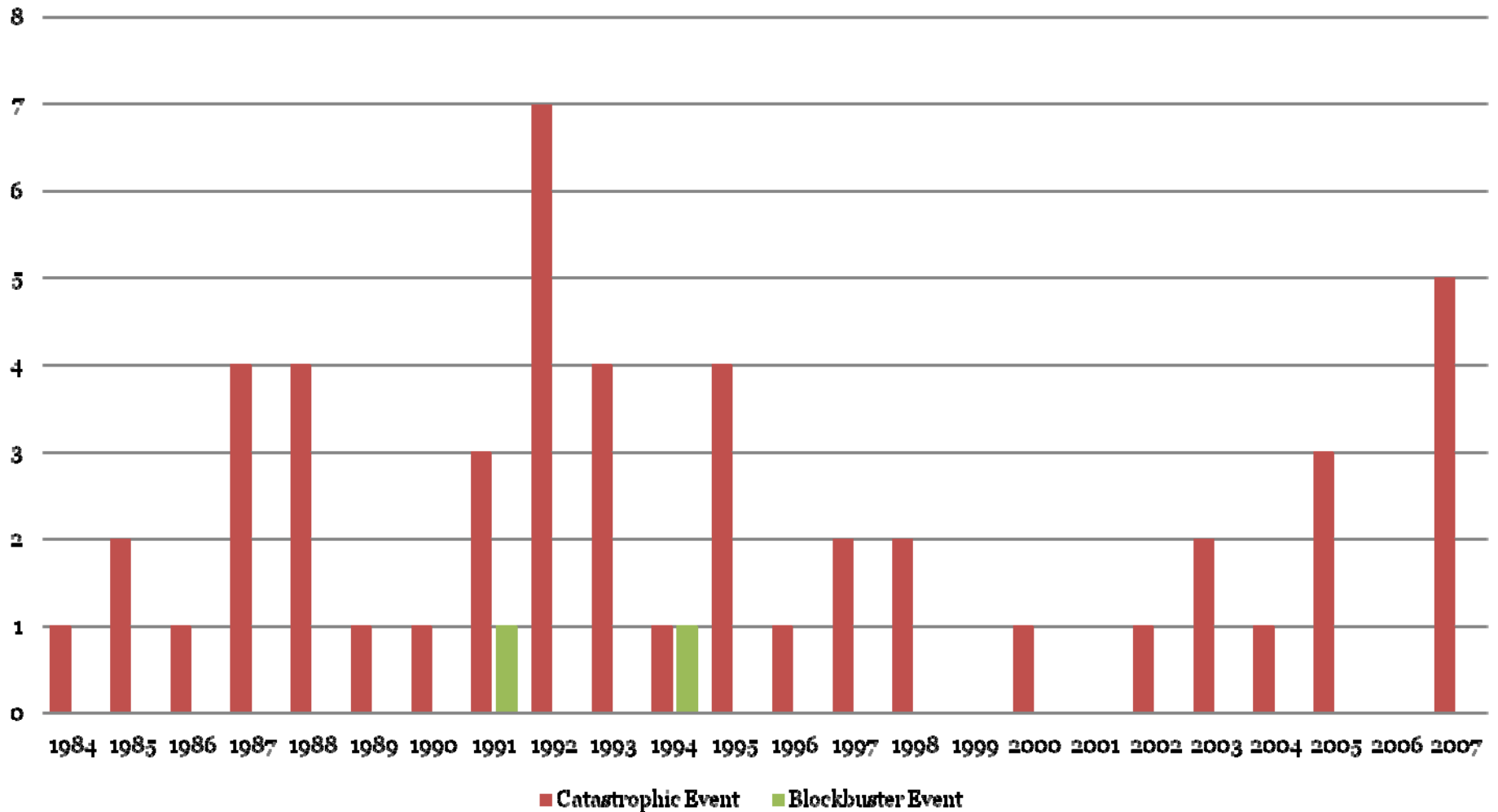
Observations

Catastrophic Events in Florida



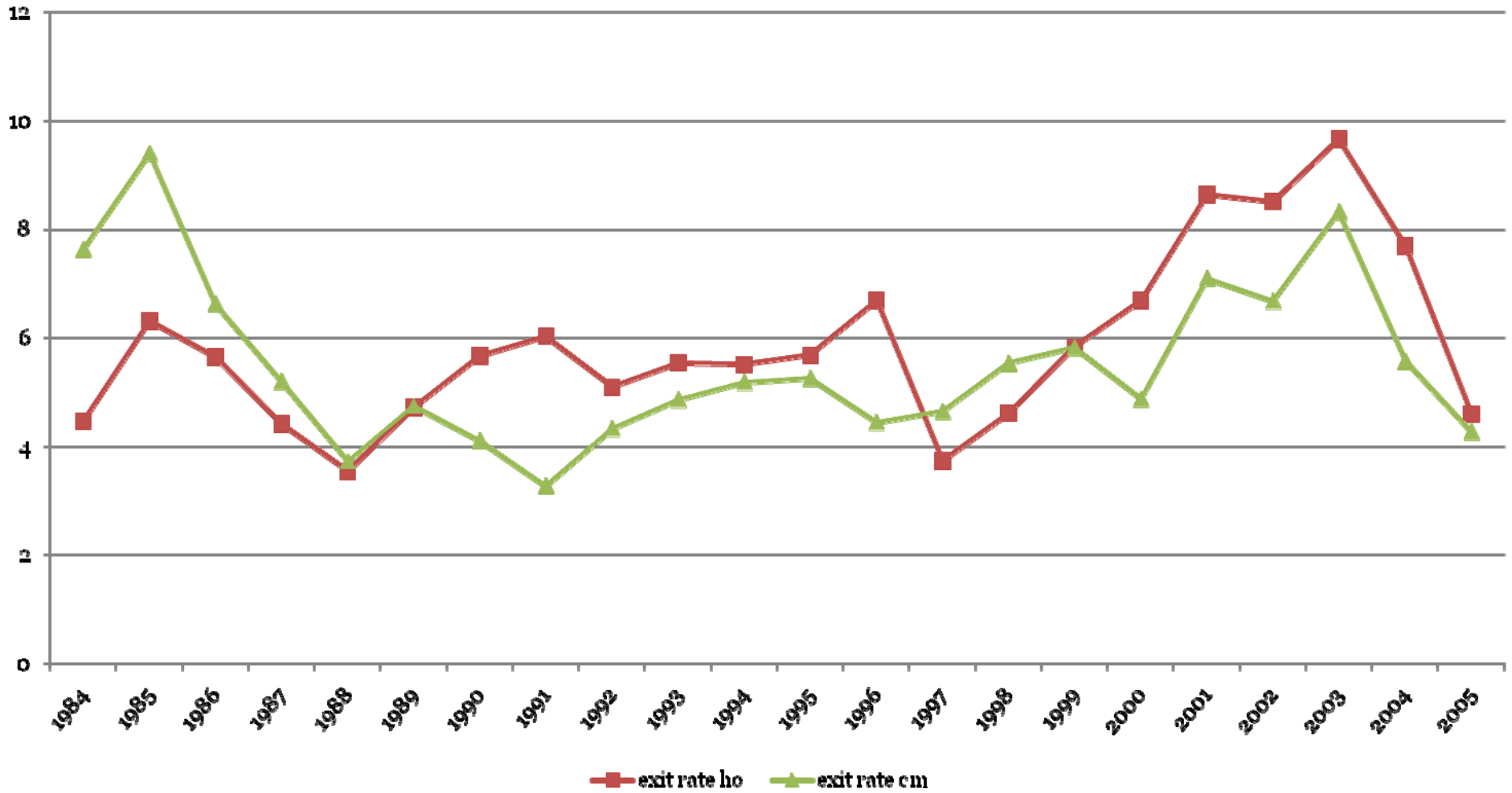
Observations

Catastrophic Events in California



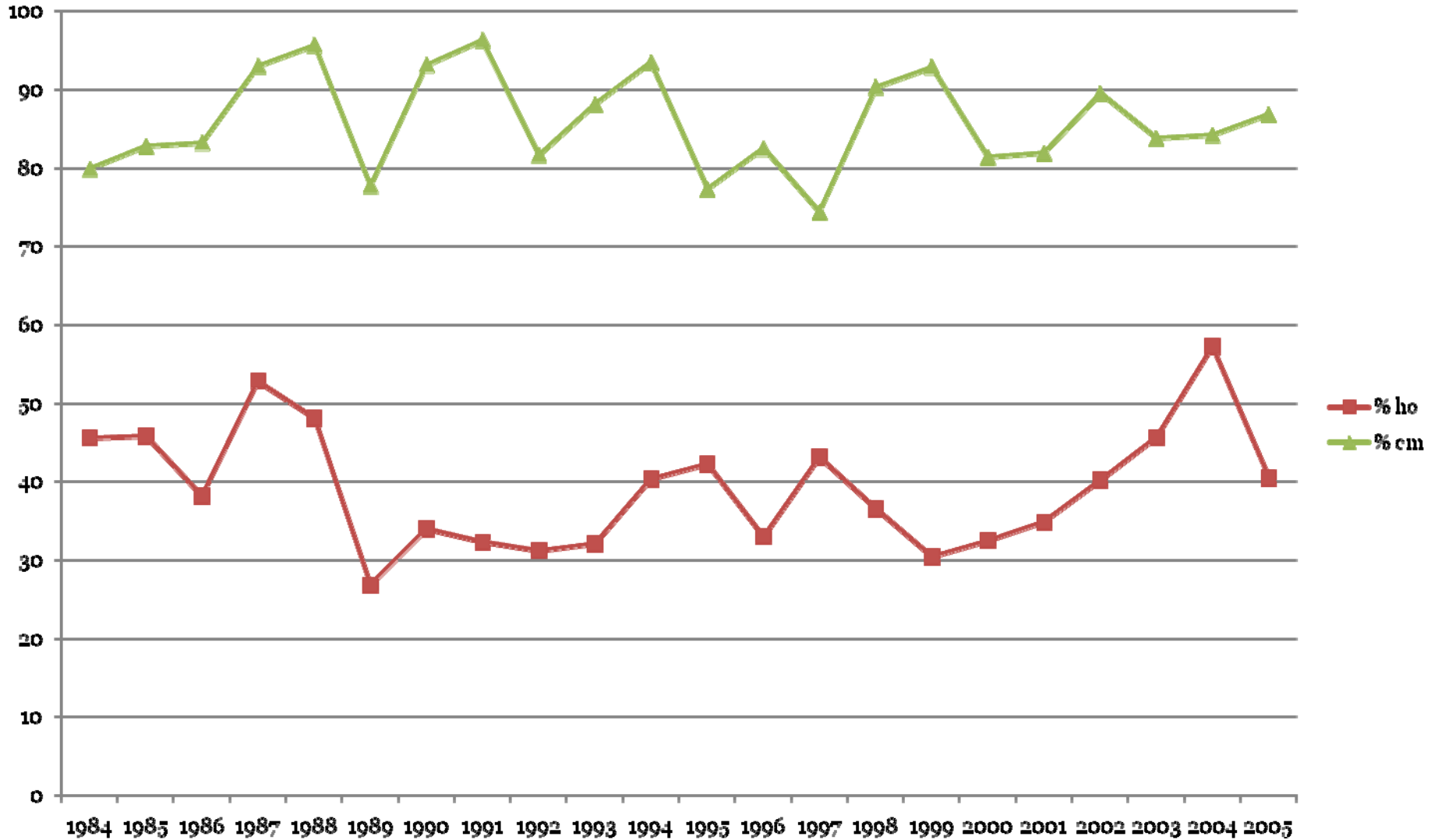
Observations

Rates of Exit, 1984-2005



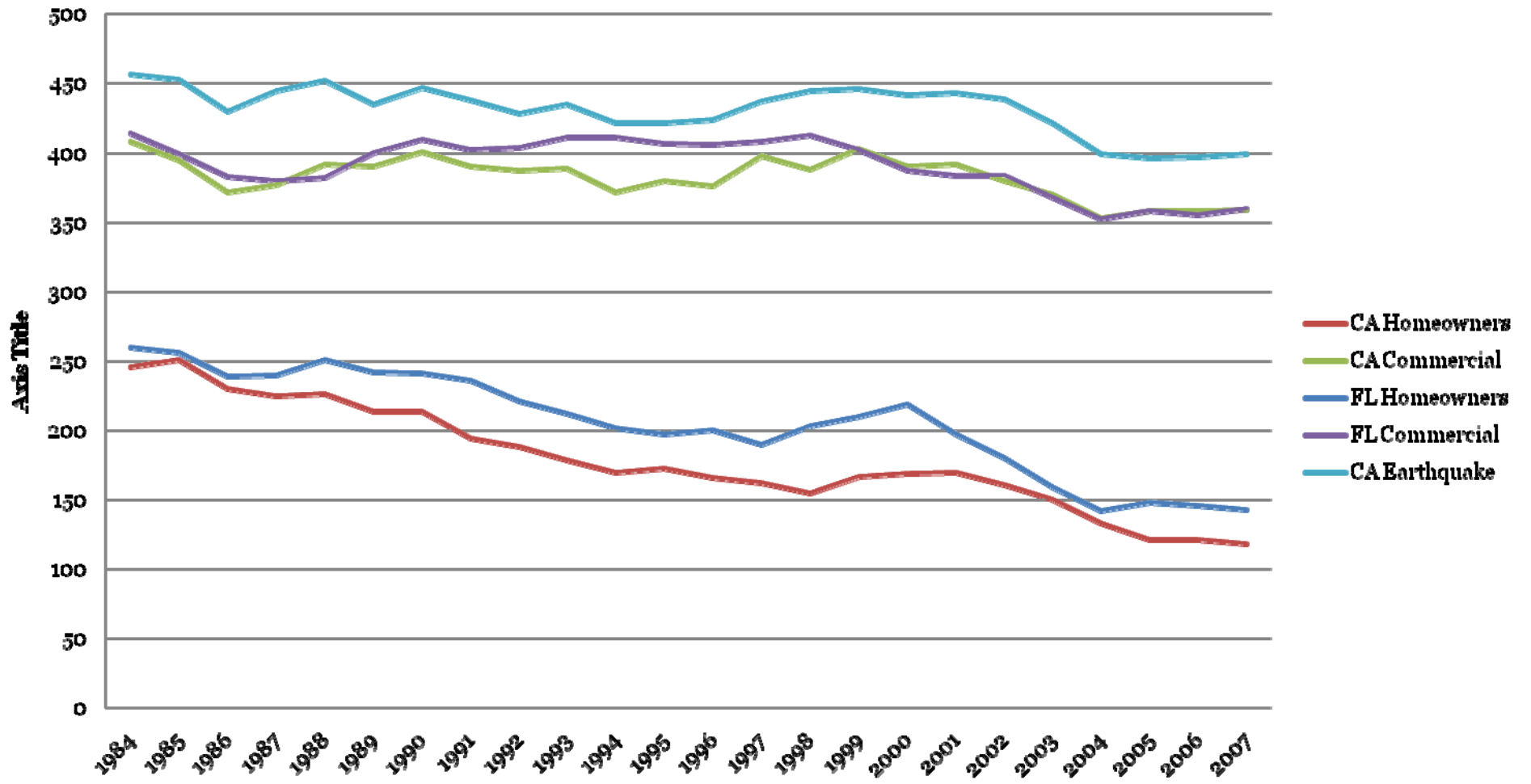
Observations

“Complete” exits from property line



Observations

Number of Private Insurers



Observations

Homeowners vs. Commercial Property

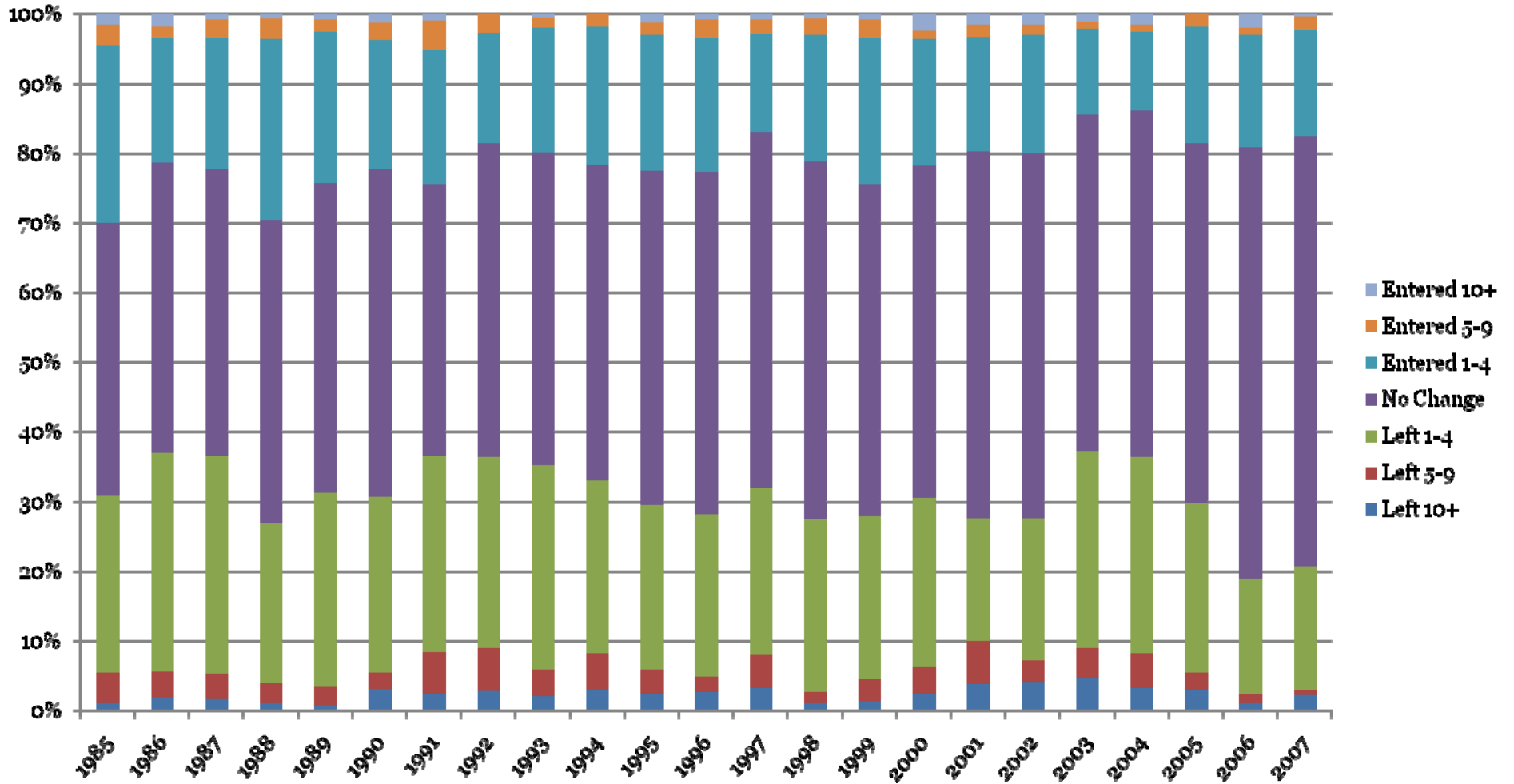
- Property lines differ on basis of:
 - Exposures – size and concentration

Line of business	Katrina	Rita	Wilma
Homeowners	53% of claims reported; 42% of losses paid	28% of claims reported; 20% of losses paid	51% of claims reported; 48% of losses paid
Commercial Property*	25% of claims reported; 43% of losses paid	37% of claims reported; 68% of losses paid	19% of claims reported; 37% of losses paid
Auto – PD	15% of claims reported; 7% of losses paid	23% of claims reported; 7% of losses paid	22% of claims reported; 7% of losses paid

- Regulation and public policy attention

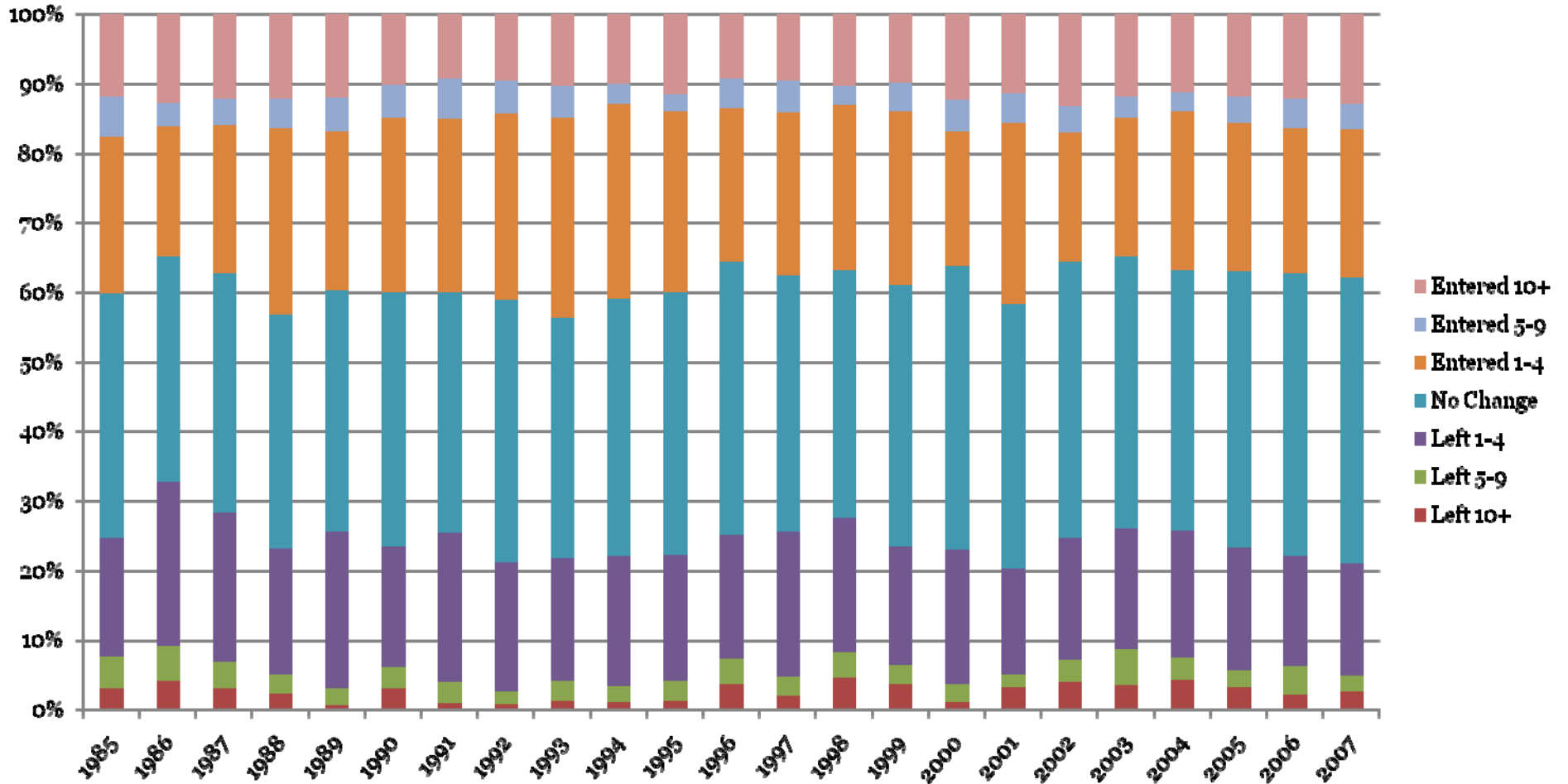
Observations

State Diversification Efforts - Homeowners



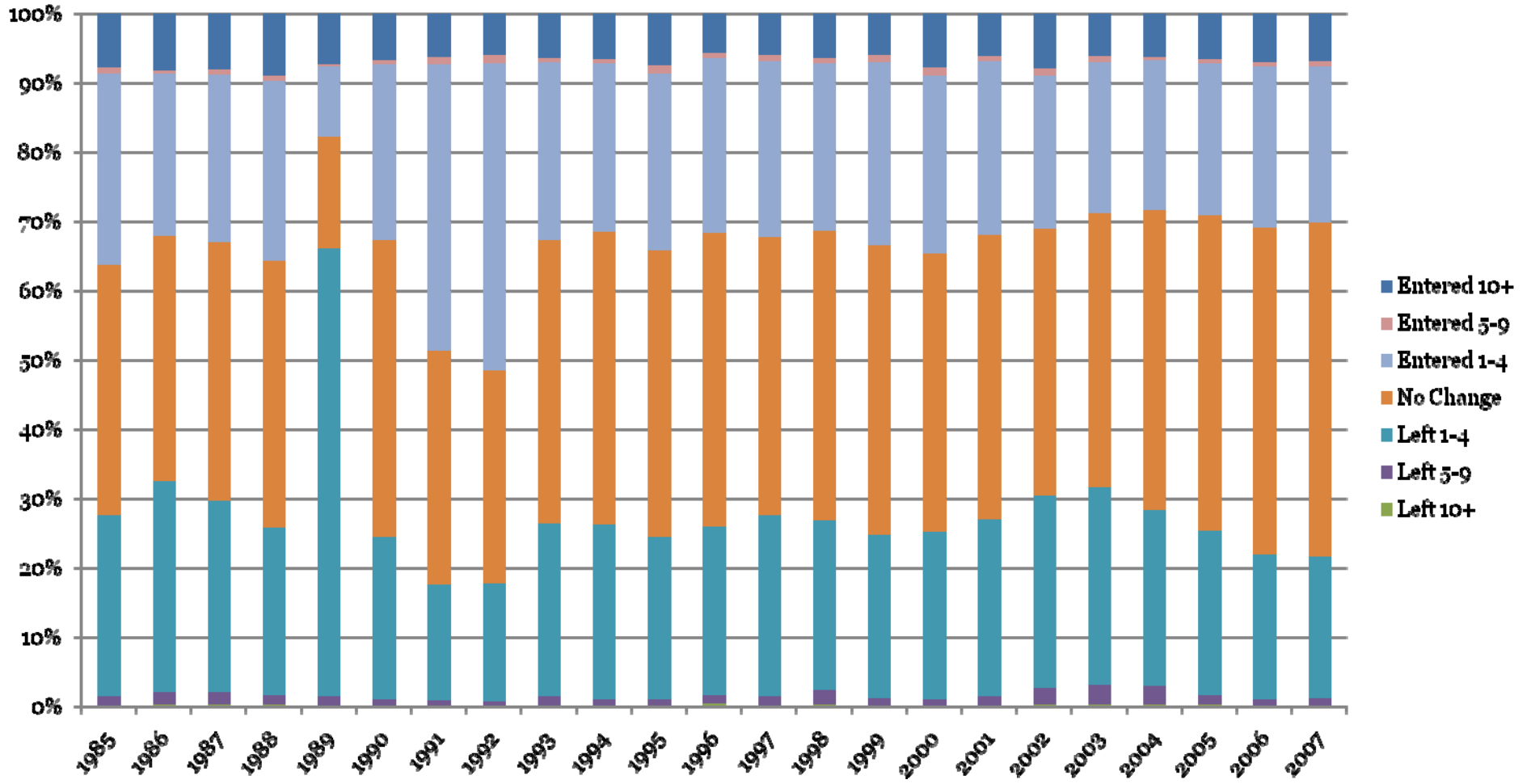
Observations

State Diversification Efforts – Comm. Property



Observations

Line of Business Diversification Efforts



Analysis and Results

Empirical Analysis

- Estimating the direct effects of catastrophe modeling on insurer activities is complicated.
 - Models are continuously updated with new event data.
 - Insurers do not report cat model output.
- Some indirect/implied effects may be apparent...
 - Underwriting profitability
 - Entry and exit behavior
 - Diversification efforts

Analysis and Results

Underwriting Profitability

- Loss ratios are lower following unexpected catastrophic events, as expected
 - Greater negative effect of catastrophic events on loss ratios of HO vs. CM
 - Confirms differences in underwriting portfolios and flexibility in contract terms?
 - Are models more readily applied to commercial risks? Or more accurate in estimating them?
 - “Blockbuster” events have even greater impact
- Even greater negative effect in states with prior approval regulation
 - Confirms effect of regulation on risk adequate pricing?

Analysis and Results

Exit from the State

- An insurer will exit a state if profitability cannot be sustained through other means.
- Past underwriting performance is less important than the history of unexpected catastrophes
- Insurers leaving the HO market, *on average*:
 - Have lower surplus
 - Write few lines of business
 - Write in fewer states

Analysis and Results

Role of Diversification

- **Costs and benefits of diversification:**
 - Transaction costs; non-diversifiable risks
 - Increased capital; diversifiable risks
- **Geographic diversification should reduce insurer's risk due to natural disasters**
- **Line of business diversification: evidence suggests undiversified insurers outperform diversified insurers [Liebenberg & Sommer, 2008]**
- **For property insurers, consider:**
 - In how many states does insurer operate?
 - In how many other lines of business does insurer operate?

Analysis and Results

Diversification and Profitability

- For homeowners insurers, 1985-2007
 - diversification across states is detrimental to performance
 - diversification across lines reduces loss ratios
 - neither form of diversification is significant in pre-1995 period

- For commercial insurers, 1985-2007
 - diversification across states is beneficial
 - diversification across lines has no effect for whole period, detrimental for 2000-2007

Policy Implications

Goals of Regulation

- Regulator's goal is to ensure the property insurer's solvency
 - Risk-based capital measures consider all operations
 - Cat models consider property risks
 - Integrated approach is needed?
 - And where do group affiliates fit in?
- Balance public policy goals of insurer solvency and affordability to consumers.
 - “Just let insurers set actuarially fair prices”
- State regulatory requirements make entry/exit complicated.

Policy Implications

Proposals to enhance *capacity*

- Capacity = the ability of insurers to pay customer claims following a catastrophic event *and* their willingness to offer catastrophic coverage, particularly subsequent to catastrophic event [see GAO-05-199].
- Insurers' capital may be required for other types of claims besides claims involving catastrophic risk.
- Proposals to enhance capacity need to clearly identify all needs for that capital.
 - e.g., change in accounting standards to allow insurers to set aside funds on a tax-deductible basis to establish reserves for potential future catastrophic events.

Policy Implications

Entering a Brave New Insurance World

Increase in catastrophic events



Increased scrutiny of financial transactions



Increased need for modeling strategies to assist insurers
in developing adequate strategies

*Evidence from successful strategies of the past can
supplement output from cat models to create
manageable portfolios of property risks*