When Insurers Exit:
Climate Losses, Fragile Insurers, and Mortgage Markets

Pari Sastry

Ishita Sen

Ana-Maria Tenekedjieva

Columbia GSB

Harvard Business School

Federal Reserve Board

NY Fed-ECB Workshop

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Introduction

▶ Unprecedented rise in climate-related property damage.

▶ Yet enormous amount of economic activity takes place in the riskiest areas.

▶ Are financial markets providing the right incentives?

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This paper: Mortgage markets (GSEs) mis-calibrate insurance market risks.

⇒ Too much credit originated in risky areas.

⇒ Fragile insurers → elevated mortgage delinquencies after disasters.

⇒ GSEs (taxpayers) bear large unpriced exposure to insurance risk.

GSEs property insurance requirements

► Distribution of physical climate losses through the mortgage market:

| **Households** | **Lenders** | **GSEs** | **Property Insurers** | **Rating Agencies** |
| Home Equity | Mortgage Origination | Mortgage Purchase | Property Damage | Assess Insurers' Solvency |

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▶ Property insurance is **mandatory** to obtain a mortgage.

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▶ Property insurance is **mandatory** to obtain a mortgage.

▶ GSEs' have **Financial Strength Rating** requirements to assess insurers' ability to pay claims.

Rating Agency	Began	Regulated	Fannie Mae	Freddie Mac
AM Best	1899	2007	"B" or better	"B+" or better
S&P Global	1971	2007	"BBB" or better	"BBB" or better
Demotech	1990s	2022	"A" or better	"A" or better

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▶ Differences in insurers' risk are **not priced** by the GSEs (g-fees, LLPAs).

Data

Novel Data: Linking insurance and mortgage markets at a county level for Florida.

Insurance:

1. **Florida QUASR:** insurer-county-year level data
   ▶ Premiums, policies, coverage, cancellations, and transfers from 2009 to 2018.

2. **Annual Insurer Regulatory Filings:**
   ▶ Balance sheet and Reinsurance
   ▶ Underwriting (by state and business line) and Asset holdings
   ▶ Regulatory examinations and restatements

3. **Financial Strength Ratings (FSRs):** FSRs from AM Best, S&P, and Demotech.

Mortgage:

1. **HMDA**: mortgage originations and sales to GSEs
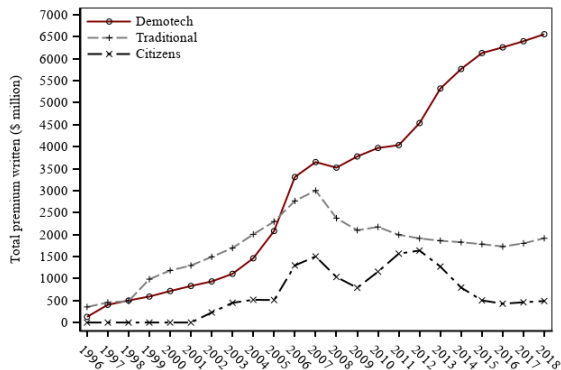2. **McDash**: mortgage performance

Outline

Empirical results:

► **Part 1: Insurance market trends.**

► Part 2: Who bears insurance fragility risks?

► Part 3: Dissecting GSE risks.

    ► Implicit transfer (elevated mortgage delinquencies)

    ► Credit supply distortion (lax screening)
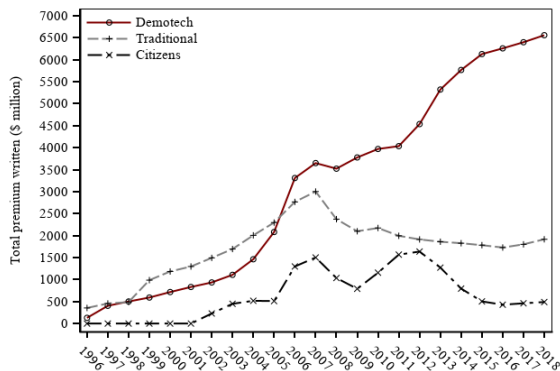
Dramatic growth of fragile insurers

Growth of Demotech insurers

▶ Large market share also in other risky states.

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Fragility of Demotech insurers

▶ Higher **insolvencies**:

	Demotech	Traditional
No. insurers	80	50
Insolvent	15	0
% insolvent	19%	0.0%

▶ Underwrite in **riskier areas**, less **diversified**, less **capitalized**, lower quality **reinsurers**.

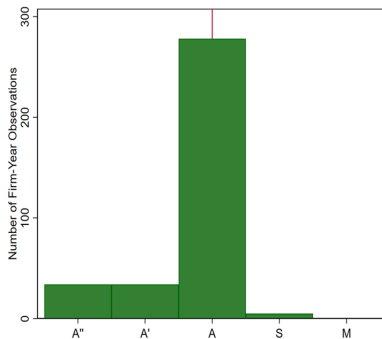▶ High **consumer complaints**, face **lax regulation**.

▶ Across US Trends   Observables   Regulation
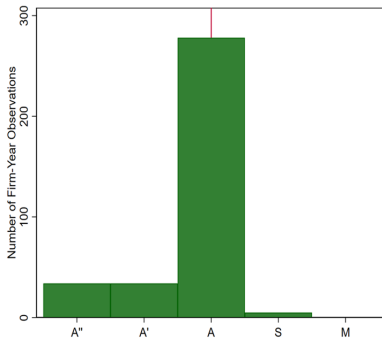
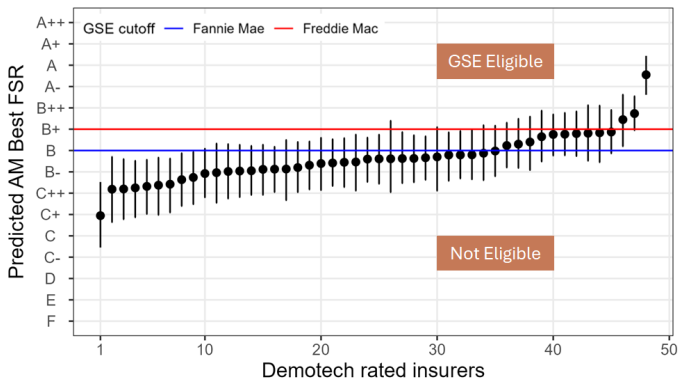# Demotech insurers receive inflated ratings

Demotech ratings

▶ A vast majority of Demotech insurers receive an **A (Exceptional) rating** → **meet GSE eligibility**.

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Demotech ratings

Counterfactual AM Best ratings

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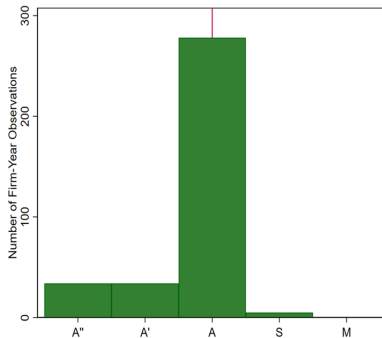# Demotech insurers receive inflated ratings

Demotech ratings   **Counterfactual AM Best ratings**
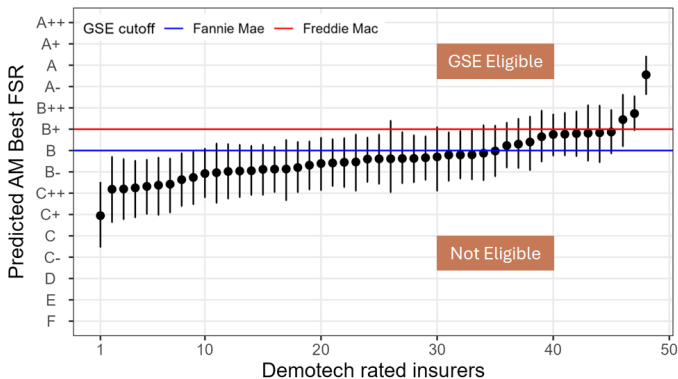

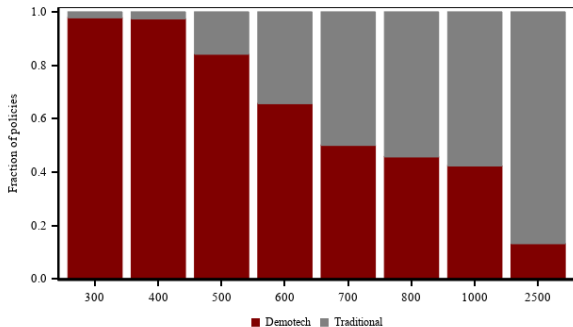▶ A vast majority of Demotech insurers receive an **A (Exceptional) rating** → **meet GSE eligibility**.

▶ **Counterfactual ratings: 21%** ineligible Fannie; **67%** ineligible Freddie. ▶ Counterfactual ratings model
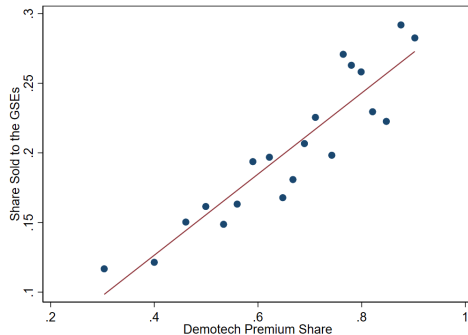
Who bears insurer fragility risk?

Demotech market share by Coverage

Demotech market share and GSE purchases

▶ Demotech insurers dominate the conforming (GSE eligible loans) segment.

Are lenders aware of insurance counterparty risk? Test: Depopulation

Empirical challenge: High risk borrowers are more likely insured by Demotech insurers.

Citizens depopulation natural experiment:

▶ Citizens → Florida's government backed insurer-of-last-resort.

▶ Depopulation: Large program to transfer policies to private insurers (>850K b/w 2009-18).

▶ Only Demotech insurers participated (39/40).

▶ Participating insurers have higher insolvency rates and counterfactual AM Best rating ∼C++.

▶ **Advantage:** Shift from a **high quality** to a **low quality** insurer for the **same** borrower.

▶ **Test:** After the Depopulation, do lenders sell mortgages they had previously retained?

Lenders strategically offload insurance counterparty risk

Depopulation test: $log(GSE)_{c,t} = \alpha + \beta log(Depopulated)_{c,t} + \gamma_c + \delta_t + X_{ct}\Gamma + \varepsilon_{c,t}.$

	log(GSE)	
	(1)	(2)
log(Depopulated)	0.0343**	0.0331**
	(0.0157)	(0.0162)
County FE	Y	Y
Year FE	Y	Y
Controls	N	Y
Sample Period	2009-2018	2009-2018
Number of Observations	619	618
Adjusted R-squared	0.974	0.974

► log(GSE) \$ value of seasoned mortgages sold to GSEs.
► log(Depopulated) policies transferred from Citizens to Demotech. Details

Challenges:

► Lenders retain few mortgages, and those retained are the best quality: $\beta \approx 0$.

Results:

► GSE purchases ↑ by 1.8% (9% of average) due to insurance counterparty risk.

Identifying assumptions:

► Depopulation timing is exogenous: not correlated with a decline in borrower quality.
 → Schedule is pre-determined.
 → Insurer unlikely to choose low quality borrowers.

Quantifying GSE exposures: two channels

1. **Implicit Transfer**: Lenders offloading $\rightarrow$ Risks migrating to the GSEs.

2. **Distortion**: Lax screening $\rightarrow$ Too much credit supply in the conforming segment.

Quantifying GSE exposures: two channels

1. **Implicit Transfer**: Lenders offloading $\rightarrow$ Risks migrating to the GSEs.

   ▶ Outcome: mortgage default.

   ▶ Measurement: What is the additional default from fragile insurance for the same borrower?

2. **Distortion**: Lax screening $\rightarrow$ Too much credit supply in the conforming segment.

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2. **Distortion**: Lax screening $\rightarrow$ Too much credit supply in the conforming segment.

   ▶ Outcome: mortgage denials.

   ▶ Measurement: How many fewer mortgages originated if banks could not offload insurance risk?

Excess credit supply in "Demotech" counties (Distortion)

▶ Whether mortgage denials vary by insurer risk differentially in jumbo vs. conforming loans?

▶ Assumption: Jumbo (what is retained) $\rightarrow$ efficient benchmark.

	Mortgage Denied (Y/N)	
	(1)	(2)
jumbo=1	-0.0265*	-0.0279*
	(0.0152)	(0.0144)
Demotech Premium Share	-0.0166	-0.0152
	(0.0164)	(0.0161)
jumbo=1 × Demotech Premium Share	0.0526**	0.0521**
	(0.0208)	(0.0201)
County FE	Y	Y
Year FE	Y	Y
Controls	N	Y
Number of Observations	2,275,138	2,250,777
Adjusted R-squared	0.0112	0.0131

▶ Denials insensitive to insurer quality for conforming loans.

▶ But sensitive in the jumbo segment (more Demotech more likely to deny).

▶ GSE risk $\rightarrow$ credit supply expansion in the conforming segment.

Serious delinquency after Hurricane Irma (Transfer)

▶ Hurricane Irma hit Florida in Sep 2017. Triggered significant insurer insolvencies.

▶ **Event study:**   Serious Delinq$_{c,t}$ = β(Post Irma$_t$ × Insolvent Insurer Share$_c$) + FE + $controls$ + $\varepsilon_{c,t}$.

	Seriously Delinquent Rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Post Irma=1 × Log Damages	0.000919**	0.000653**			0.000635**	0.000450*
	(0.000345)	(0.000289)			(0.000294)	(0.000267)
Post Irma=1 × Insolvent Insurer Shares			0.106***	0.0760***	0.0853***	0.0612**
			(0.0291)	(0.0242)	(0.0280)	(0.0241)
County FE	Y	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y	Y
Number of Observations	1250	3800	1250	3800	1250	3800
Adjusted R-squared	0.773	0.813	0.780	0.814	0.788	0.815
Time Period	9/2016-9/2018	9/2016-12/2022	9/2016-9/2018	9/2016-12/2022	9/2016-9/2018	9/2016-12/2022

▶ Delinquencies ↑ by ∼**20 bps** due to direct damage. Further ↑ by ∼**26 bps** due to insurer fragility

Pretrends   Dynamic treatment effect

Estimating GSEs' climate and insurance market exposures

$$\text{Expected Losses} \quad = \quad \underbrace{\delta_B LGD_B}_{\text{Baseline}} \quad + \quad \underbrace{P_H(\delta_{DIR} + \delta_{INS})LGD_H}_{\text{Hurricane}}.$$

▶ **Approach:** Extrapolate from the delinquency dynamics during Irma.

▶ **Assumption:** Similar insurance fragility patterns for every hurricane.

	No hurricane	Hurricane
Probability [1]	73%	**27%**
Default rate [2]	1.2%	**1.7%**
Loss given default [3]	40%	**40%**
Loan size	$100	
Expected loss	$ 0.53	
Expected loss (hurricane)	$ 0.05	
% losses (hurricane)	9.6%	
Contribution of insurance fragility	57%	

▶ **∼10% of GSE losses** are due to climate, due in large part to local insurance market fragility.

Sources: [1] CAT 3/4 hurricanes in FL. US National Hurricane Center (2023); [2] Our estimates; [3] An and Cordell (2019).

Conclusion

This paper: Mis-calibrated GSE insurance requirements $\rightarrow$ growth of fragile insurers.

▶ GSEs bear large unpriced exposure to climate due to insurance risk $\rightarrow$ taxpayer externality.

▶ Too much GSE mortgage origination in risky areas $\rightarrow$ distorted credit supply.

Appendix

1. Conforming Loans Default in Fragile Areas After Irma

Event study design: $\text{Defaults}_{l,c,t} = \beta_1(\text{Post Irma}_t \times \text{Insurance Fragility}_c) + FE + controls + \varepsilon_{l,c,t}.$

	$\pm$ 10% of the CLL	
	Conforming	Jumbo
Post Irma $\times$ Insurance Fragility	0.068**	-0.032
	(0.030)	(0.046)
Loan controls	Yes	Yes
County Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
Origination Fixed Effect	Yes	Yes
Observations	122,785	17,105
Adjusted R^2	0.011	0.027

▶ Insurance fragility: Ex-ante market share of insolvent insurers.
▶ Controls: FICO, DTI, LTV, Post $\times$ Log(damages).

Predictions:

▶ In fragile areas:
Conforming (=Demotech): $\beta_1 > 0$.
Jumbo (=Traditional): $\beta_1 \approx 0$.

Results:

▶ Defaults $\uparrow$ **27 bps** for **conforming** loans due to insurance fragility (70% of baseline).

Robustness:

▶ Conforming loans in high insolvent areas not negatively selected. Pretrends

2. Excess Credit Supply in the Conforming Segment After Irma

Event study design: $Y_{l,c,t} = \beta_1(\text{Post Irma}_t \times \text{Insurance Fragility}_c) + FE + controls + \varepsilon_{l,c,t}$.

	$\pm$ 10% of the CLL			
	New Policies Share - Demotech		Mortgage Denied (Y/N)	
	Conforming	Jumbo	Conforming	Jumbo
Post Irma $\times$ Insurance Fragility	2.109***	-1.907**	-0.221	0.498**
	(0.622)	(0.951)	(0.164)	(0.215)
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Controls	N	N	Y	Y
Number of Observations	265	254	25,571	10,118
Adjusted R-squared	0.768	0.730	0.0231	0.0349
Sample	County-year		Loan application-level	

- ▶ Insurance fragility: Ex-ante market share of insolvent insurers.
- ▶ Controls: DTI, log income, Post $\times$ Log(damages).

Predictions:

- ▶ Demotech Share of New Policies:
  Conforming: $\beta_1 > 0$. **Jumbo**: $\beta_1 < 0$.

- ▶ Mortgage Denials:
  Conforming: $\beta \approx 0$. **Jumbo**: $\beta_1 > 0$.

Results:

- ▶ Jumbo denials ↑ by ∼2pp due to lender screening fragile insurers.

- ▶ No screening in the conforming segment where Demotech share of new policies grows

Estimating GSE risks from insurance market fragility

Approach: extrapolate from the default and denial dynamics during Irma.

Implicit transfer

$$\mathbb{E}(\text{Losses}) = \underbrace{\delta_B LGD_B}_{\text{Baseline}} + \underbrace{P_H P_{INS}(\delta_{INS}) \times LGD_H}_{\text{Insurance Fragility}}$$

- ▶ **Assumption**: Similar insurance fragility patterns.

- ▶ P_H= 27%; P_{INS}**= 4%;** δ_{INS} = 27.

- ▶ $\delta_B = 39$, $LGD_{B,H} = 40\%$.

- ▶ **16% of GSE losses** are due to insurance fragility.

Excess origination

$$\text{Excess loans} = \frac{N_{Conf}}{N_{Jumb}} (\underbrace{\frac{\alpha^C}{\alpha^J}}_{\text{Observed}} - \underbrace{\frac{\alpha^C}{\alpha^J + \alpha^\Delta}}_{\text{Efficient}})$$

- ▶ **Assumption**: Jumbos → efficient benchmark.

- ▶ $\alpha^J = 84\%$, $\alpha^\Delta = 2.7\%$, $\alpha^C = 87\%$.

- ▶ ∼**1** excess conforming per **2** jumbo applications
  → **9k loans, \$2Bn excess origination per year.**

Homeowners vs. Flood

|	**Homeowners insurance**	**Flood insurance**
1. Who sells	Private sector	Government
2. Coverage sold per year	>\$15 trillion	\$1 trillion
3. % of losses (natural disasters)	93%	100%
4. Risks covered	All perils except flood	Flood
5. Take up	85%	< 20%
6. Mortgage requirements	Mandatory for all homeowners	Mandatory only in high risk zones
7. GSE requirements	FSR based	N/A

Data

Insurance:

1. **Florida QUASR:** insurer-county-year level data
   - premiums, policies, coverage, cancellations, and transfers from 2009 to 2018.

2. **Annual Insurer Regulatory Filings:**
   - Balance sheet
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3. **Financial Strength Ratings (FSRs):** FSRs from AM Best, S&P, and Demotech.

Mortgage:

1. **HMDA**: mortgage originations and sales to GSEs
2. **McDash**: mortgage performance

Demotech market share across US states

▶ Back
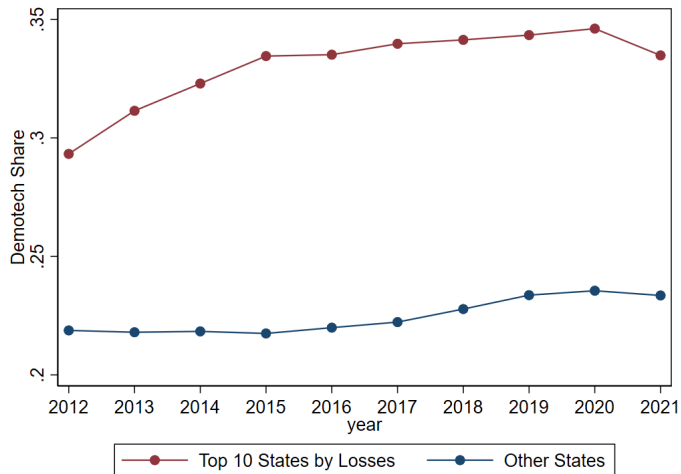
Counterfactual AM Best ratings of Demotech insurers

Step 1: AM Best rating replication model.

▶ Mapping observable insurer characteristics to AM Best FSRs.

$$AMBFSR_{it} = \alpha + \beta \bar{\boldsymbol{X}}_{it} + \epsilon_i \tag{1}$$

▶ Choosing characteristics:
   ▶ Literature: measures of insurers' risk and capitalization from Koijen and Yogo (2015).
   ▶ LASSO regression.
   ▶ AM Best factors from publicly available reports.

▶ Model explains $\sim 60\%$ of the variation in AM Best FSRs. ▶ Predictive model ▶ Distribution

Step 2: Predict counterfactual ratings of Demotech insurers

▶ For the last year an "A" or higher rating was assigned by Demotech.

$$\widehat{AMBFSR}_{DEM} = \widehat{\alpha} + \widehat{\beta} \boldsymbol{X}_{DEM} \tag{2}$$

▶ Construct confidence intervals numerically using bootstrapping. ▶ Back
   Note: 1,000 predicted values simulated for each model. Dots = average, bars = 90% confidence interval.

AM Best rating replication model (panel)

|	AM Best rating$_{it}$		
	(1)	(2)	(3)
% bonds in NAIC 3+	0.838		
	(1.362)		
% assets in equities	−1.185**		−1.127**
	(0.569)		(0.561)
No. states selling HO	−0.012***	−0.011**	−0.012***
	(0.005)	(0.004)	(0.004)
% of assets in the group	0.012***	0.009***	0.012***
	(0.003)	(0.002)	(0.003)
% premium from HO	0.024***	0.023***	0.024***
	(0.003)	(0.003)	(0.003)
Leverage ratio	−5.474***		−5.591***
	(1.461)		(1.447)
Leverage ratio^2	8.838***	3.644***	8.921***
	(1.578)	(0.572)	(1.571)
Log(Assets)	−1.584***	−0.520***	−1.572***
	(0.482)	(0.050)	(0.481)
Log(Assets)^2	0.042**		0.042**
	(0.018)		(0.018)
Log(RBC ratio)	−0.276***	−0.095	−0.286***
	(0.100)	(0.093)	(0.099)
Loss Ratio (Florida)	0.478***	0.388***	0.491***
	(0.140)	(0.141)	(0.138)
% premiums reinsured	1.505***	2.177***	1.529***
	(0.332)	(0.287)	(0.330)
Constant	17.550***	8.446***	17.579***
	(3.537)	(1.289)	(3.535)
Variable choice	All	Lasso	Selected
Observations	589	589	589
R^2	0.588	0.564	0.588
Adjusted R^2	0.580	0.558	0.580

▶ Back

AM Best FSRs distribution
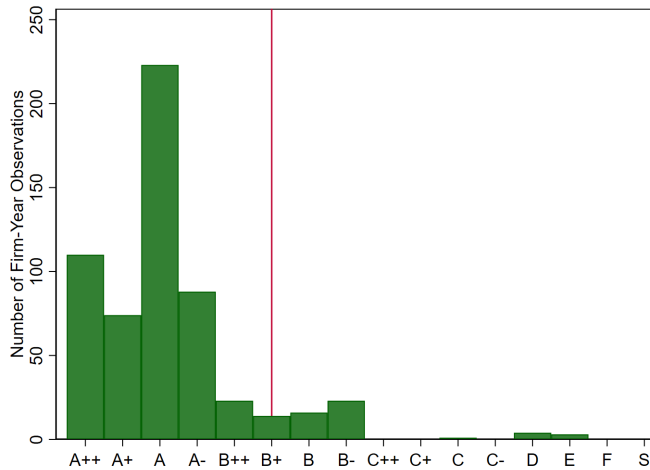
▶ Back

Ratings shopping (suggestive evidence)
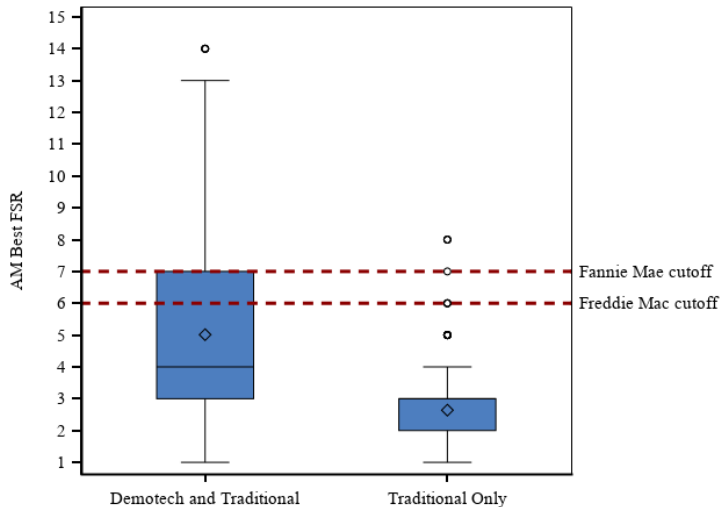
# GSE ineligible insurers have minimal market shares
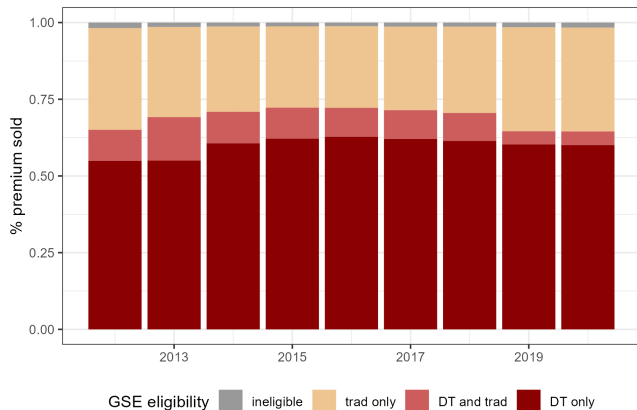
► GSE ineligible insurers have minimal market shares. ► Back

Insurance regulation

| (a) Regulatory supervision over time	2009-2013 (1)	2014-2018 (2)	Difference (1) - (2)
Likelihood of exam in a year (%)	36.2	28.1	8.1
% insurers ever restated	34.4	24.6	9.8
% exams with restatements	37.6	21.3	16.3**
(b) Regulatory supervision across insurers	Demotech (1)	Traditional (2)	Difference (1) - (2)
Likelihood of exam in a year (%)	32.6	25.7	6.9
% insurers ever restated	35.5	28.6	6.9
% exams with restatements	30.8	21.4	9.4
(c) Consumer complaints	Demotech (1)	Traditional (2)	Difference (1) - (2)
Share of complaints	87.9	12.1	75.9***
Likelihood of any complaints in a year (%)	79.7	48.5	31.2***

▶ Back

Demotech insurers dominate the depopulation program
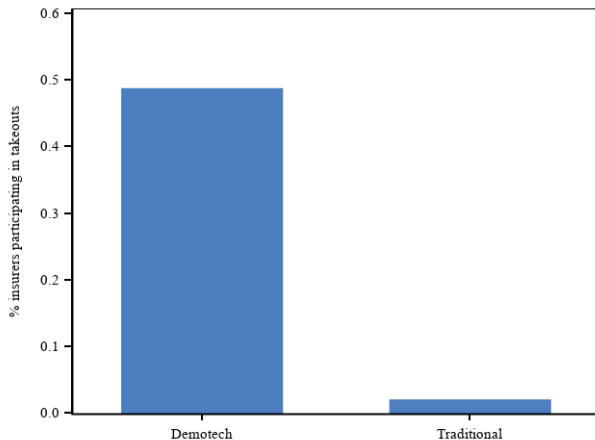
▶ 40 insurers participate, of which 39 are Demotech.

▶ Participating insurers have higher insolvency rates and counterfactual AM Best rating ∼C++.

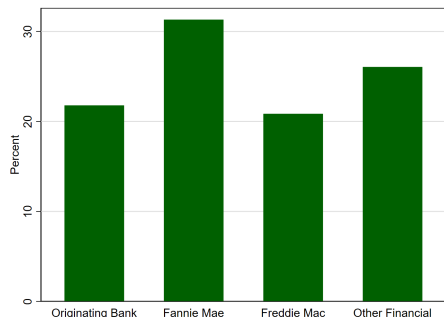▶ Depopulation: shift from a **high** quality to a **low** quality insurer.

▶ Back

Citizens to Demotech policy flows

▶ **Assumption:** Policies transferred to Demotech insurers come from Citizens.

    ▶ Challenge: we observe total transfers at an insurer-county-year level; not policy level data.

    ▶ Almost one-for-one relation between policies transferred from Citizens to policies received by Demotech insurers
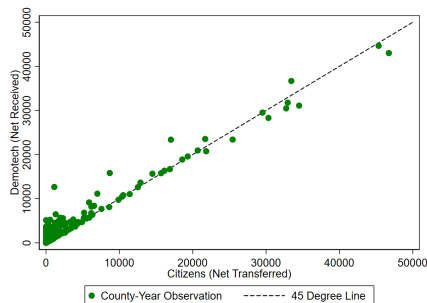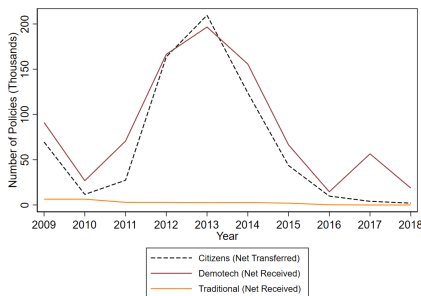
Back

On-balance sheet conforming loans (Back)

(i) Share of conforming mortgages retained/ sold (HMDA)

(ii) Time to GSE sale (McDash)

Percent

Originating Bank   Fannie Mae   Freddie Mac   Other Financial

Fraction

Number of months since origination

0   12   24   36   48   60   72   84
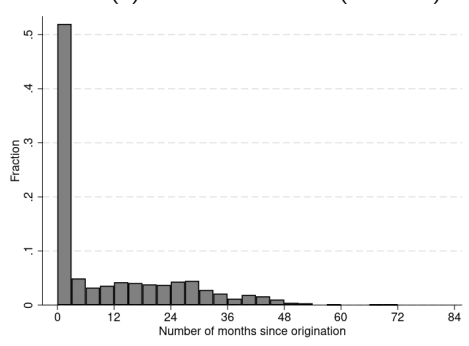
▶ Significant heterogeneity in time-to-securitization for conforming loans (Keys, Seru & Vig, 2012)

▶ Time-to securitization is longer for better mortgages (Adelino, Gerardi & Hartman-Glaser, 2019)

▶ Banks retain higher share of conforming loans when capital improves (Buchak, Matvos, Piskorski & Seru, 2022)

Effect of depopulation on number of loans securitized

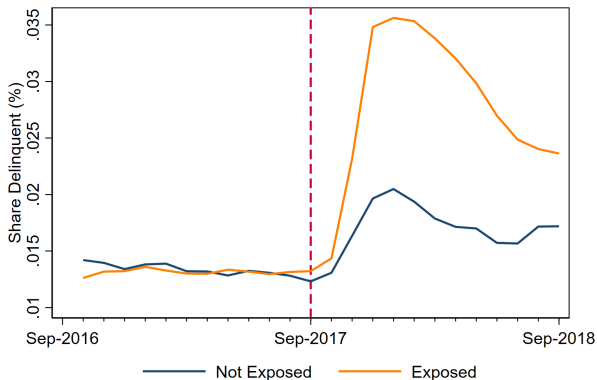|	(1)	(2)	(3)
Depopulated Policies	0.0639***	0.0714***	0.0623***
	(0.00913)	(0.00971)	(0.00847)
Year FE	N	Y	N
Controls	N	N	Y
Sample	2009-2018	2009-2018	2010-2018
Obs	670	670	596

$$\text{Num GSE}_{c,t} = \alpha + \beta \text{ Num Depopulated}_{c,t} + \delta_t + X_{ct}\Gamma + \varepsilon_{c,t}$$

▶ Magnitudes: 6 out of 100 depopulated policies are sold to GSEs. Assuming banks retain 20% of mortgages $\rightarrow$ purchase rate of 30%. ▶ Back

Delinquency trends by exposure to Irma

- Serious delinquencies: 90+ DPD, foreclosures, REO.
- Exposed: Counties receiving Presidential disaster declaration. ▸ Back

Demotech insurers have lower premiums

|	Premium		Premium growth	
	(1)	(2)	(3)	(4)
Demotech	69.66***	-38.08**	0.0002	-0.013***
	(11.3)	(18.2)	(0.002)	-0.002
Year FE	Y	Y	Y	Y
County FE	N	Y	N	Y
Risk controls	N	Y	N	Y
N	46,313	46,311	39,555	39,554

$$Y_{i,c,t} = \beta \text{Demotech}_i + \delta_t + \delta_c + \Gamma \text{Risk controls}_{i,c,t} + \varepsilon_{i,c,t}$$

▶ On average higher because they serve riskier housholds. Lower after controlling for risk.

▶ Magnitudes: Demotech policies are \$38 cheaper and premium growth is 1.3% lower per year (controlling for risk using coverage as a proxy). ◂ Back
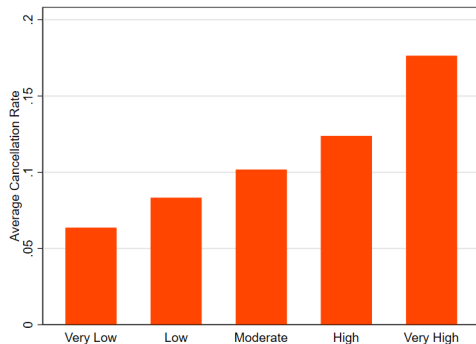
Traditional insurers exit after climate events

(i) Cancellations by climate risk
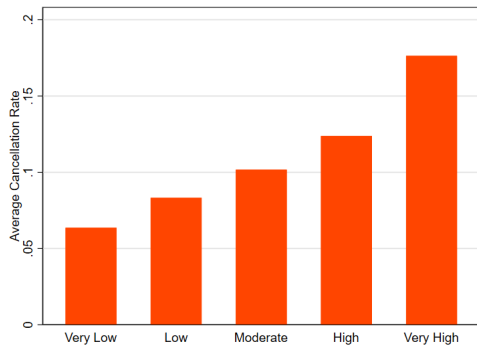
(ii) Event study: hurricane Irma

Traditional insurers exit after climate events

(i) Cancellations by climate risk

(ii) Event study: hurricane Irma

	Cancellation Rate			
	(1)	(2)	(3)	(4)
Post_Irma × Traditional	0.119***	0.0993***	0.326***	
	(0.0194)	(0.0184)	(0.0241)	
Post_Irma × Traditional × High Risk				0.0796**
				(0.0319)
County FE	Y	Y	Y	N
Year FE	Y	Y	Y	N
Insurer FE	Y	Y	Y	N
County-Year FE	N	N	N	Y
Insurer-Year FE	N	N	N	Y
County-Insurer FE	N	N	N	Y
Observations	18414	17083	1330	18050
Adj R-squared	0.0822	0.0906	0.109	0.422
Sample	All	Low Risk	High Risk	All

▶ High cancellations, particularly in riskier counties which rise even further after natural disasters.

Demotech insurers are worse on observables (1/3)

1. **Riskier liabilities:** Demotech insurers underwrite more in high risk counties.

	Share underwritten in high risk counties		
	Premiums	Number of Policies	Coverage
	(1)	(2)	(3)
Demotech	0.0242***	0.0243***	0.0215***
	(0.00505)	(0.00488)	(0.00504)
Observations	924	924	924
Adjusted R^2	0.022	0.025	0.017
year_fe	Y	Y	Y

Note: High risk counties are those classified by FEMA as being in risk categories 3, 4, and 5.
Back

Demotech insurers are worse on observables (2/3)

2. **Poor diversification:** Demotech insurers are significantly less diversified across geographies, business lines, and group structure.

|	Demotech (1)	Traditional (2)	Difference (1) - (2)
No. states selling HO	3.45	27.7	-24.2***
	(0.73)	(2.87)	
% of insurers selling in only 1 state	0.56	0.1	0.46***
	(0.06)	(0.04)	
% premium from HO	0.70	0.24	0.45***
	(0.03)	(0.03)	
No. insurers in the group	5.9	18.5	-12.6***
	(1.0)	(2.2)	
% belonging to a 2 or less insurer group	0.46	0.04	0.42***
	(0.06)	(0.03)	

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Demotech insurers are worse on observables (3/3)

3. **Solvency and reinsurance:** Demotech insurers have less capital relative to risks, rely more on reinsurance, and have riskier and concentrated reinsurance relationships.

	Demotech (1)	Traditional (2)	Difference (1) - (2)
(a) Balance sheet and solvency			
Assets ($ million)	312.4	3914.6	-3602.3***
	(150.4)	(1020)	
RBC ratio	2173	3790	-1617*
	(517.1)	(876.3)	
(b) Reinsurance			
% premiums reinsured	0.47	0.15	0.32***
	(0.03)	(0.04)	
% reinsurance partners rated above A	0.33	0.39	-0.07*
	(0.01)	(0.04)	
Fraction of premiums ceded to largest partner	0.13	0.04	0.09***
	(0.02)	(0.01)	

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Dynamic treatment effect of insurer insolvencies
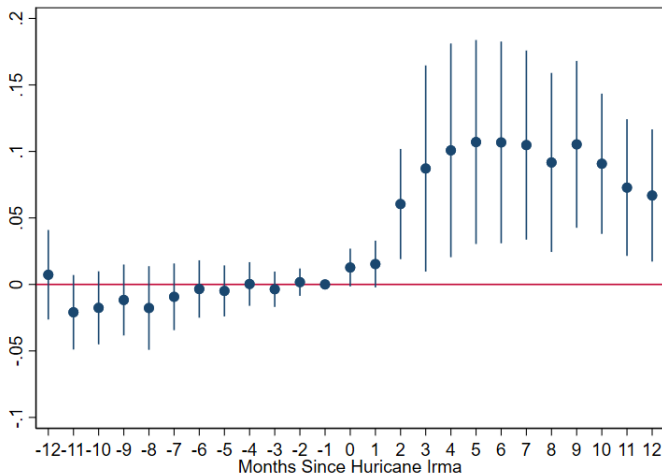
Conforming loans default more after storms

	Share Seriously Delinquent (%)			
	(1)	(2)	(3)	(4)
conforming=1	0.00732***	0.00561***	0.00791***	-0.0233
	(0.000987)	(0.00152)	(0.00132)	(0.0214)
post_irma=1 × conforming=1	0.0213***	0.0357***	0.0470***	-0.0200
	(0.00177)	(0.0121)	(0.00433)	(0.0951)
post_irma=1 × log_damages	0.000807***	0.00226	0.000874	0.0224
	(0.000283)	(0.00150)	(0.000587)	(0.0135)
Constant	0.00325***	0.0181***	0.0125***	0.0462
	(0.000904)	(0.00267)	(0.00285)	(0.0455)
County FE	Y	Y	Y	Y
Year-month FE	Y	Y	Y	Y
Number of Observations	Y	Y	Y	Y
Adjusted R-squared	1Y	FULL	FULL	FULL
Sample	FULL	FULL	Insolvency Exposure (top 25%)	Insolvency Exposure (bottom 25%)
N	2250	6840	2812	988
r2_a	0.806	0.385	0.843	0.273

▶ Conforming loans default more after Irma than jumbo loans, over the short and long-term
▶ This result is driven by counties exposed to the insolvent insurers

Climate Risk in Florida

▶ Climate refers to the average weather conditions of a place/region over a long period (NOAA).

▶ "Climate losses" refers to the property damage caused by climate events (e.g. hurricanes).

▶ There is heterogeneity across Florida in terms of climate risk exposure (FEMA).

▶ Tropical hurricanes in the Atlantic basin have increased in intensity since 1980
(Emmanuel, Nature, 1987; Emmanuel, Nature, 2005; Sobel et al., Science, 20106; Guzman and Jiang, Nature Communications, 2021; Garner, 2023, Scientific Reports; IPCC, 2023; Wehner and Kossin, 2024).

   ▶ Large debate over attribution to global warming

Mortgage Default in Florida

Recourse:

▶ FL: recourse state that requires judicial foreclosure and ruling on deficiency

▶ Deficiency = Unpaid balance - max(fair market value of the property, foreclosure sale price)

▶ In practice deficiency judgments happen rarely (Ghent and Kudylak, RFS, 2011).

    ▶ Recourse does not impact default propensities for Fannie/Freddie

    ▶ Loans are explicitly non-recourse for FHA/VA

Forbearance:

▶ GSEs extend "forbearance" to borrowers after disasters for 3 months (typical) - 12 months

    ▶ A temporary reduction or suspension in monthly mortgage payments

    ▶ Can include non-reporting of missed payments to credit bureaus

▶ GSEs has various options for repayment of the unpaid amount

    ▶ reinstatement after forbearance; gradual repayment over 12 months after forbearance; deferral to the end of the loan; permanent loan modification