

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

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\*Disclaimer: The views expressed do not represent the views of the Federal Reserve System.

# 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**

Home Equity

**Lenders**

Mortgage Origination

**GSEs**

Mortgage Purchase

**Property Insurers**

Property Damage

**Rating Agencies**

Assess Insurers' Solvency

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Home Equity	Mortgage Origination	Mortgage Purchase	Property Damage	Assess Insurers' Solvency

- 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



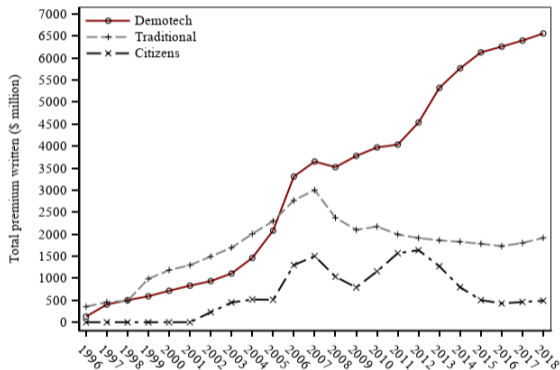
# Outline

## 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

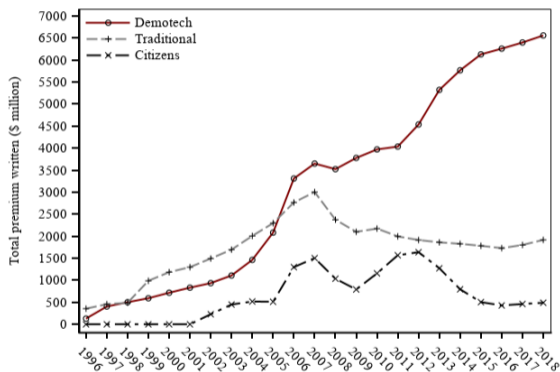
## Growth of Demotech insurers



Large market share also in other risky states.

# Dramatic growth of fragile insurers

## Growth of Demotech insurers



Large market share also in other risky states.

## 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.

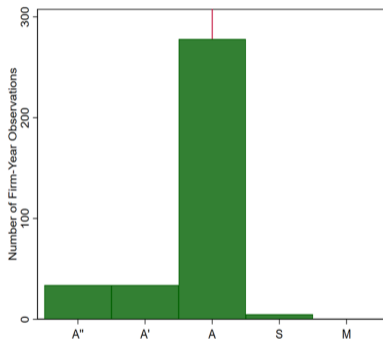
Across US Trends

Observables

Regulation

# Demotech insurers receive inflated ratings

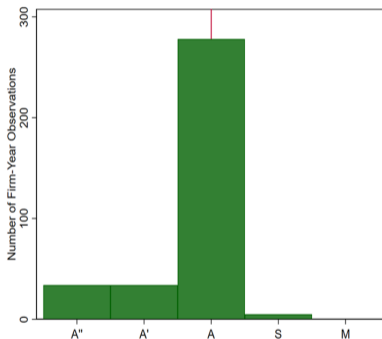
## Demotech ratings



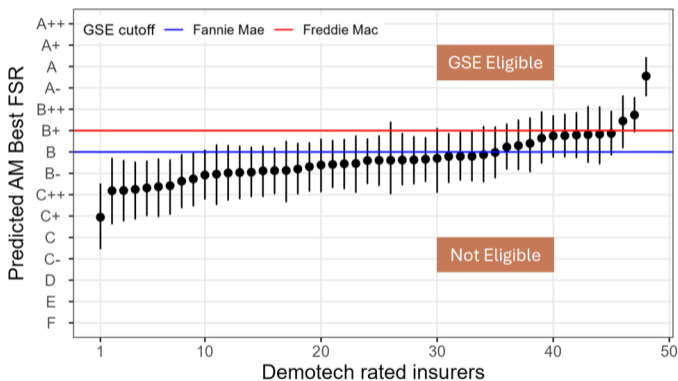
- ▮ A vast majority of Demotech insurers receive an **A (Exceptional) rating** meet GSE eligibility.

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## Demotech ratings



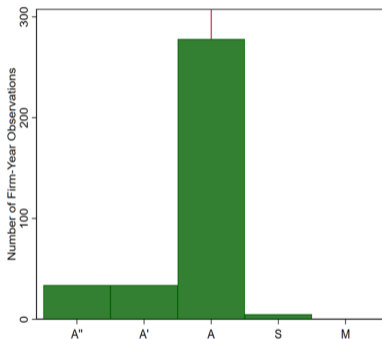
## Counterfactual AM Best ratings



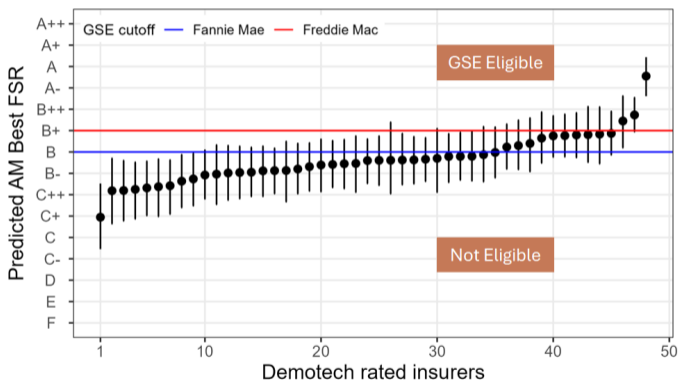
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## Demotech ratings



## Counterfactual AM Best ratings

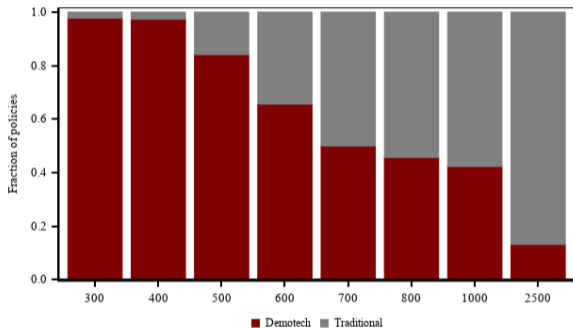


- A vast majority of Demotech insurers receive an **A (Exceptional) rating** meet GSE eligibility.
- Counterfactual ratings: **21%** ineligible Fannie; **67%** ineligible Freddie.

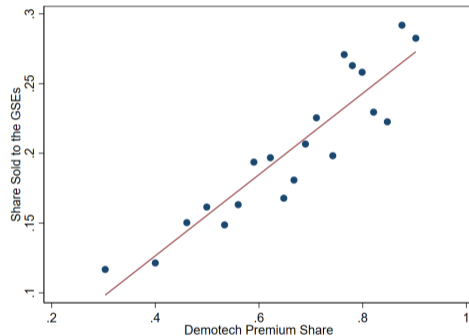
Counterfactual ratings model

# 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:  $\log(GSE)_{c,t} = \alpha + \beta \log(Depopulated)_{c,t} + \gamma_c + \delta_t + X_{ct} + \epsilon_{c,t}$

	log(GSE)	
	(1)	(2)
log(Depopulated)	0.0343** (0.0157)	0.0331** (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: 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      Risks migrating to the GSEs.
  
2. **Distortion:** Lax screening      Too much credit supply in the conforming segment.

# Quantifying GSE exposures: two channels

1. **Implicit Transfer:** Lenders offloading 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 Too much credit supply in the conforming segment.

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2. **Distortion:** Lax screening 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) efficient benchmark.

	Mortgage Denied (Y/N)	
	(1)	(2)
jumbo=1	-0.0265* (0.0152)	-0.0279* (0.0144)
Demotech Premium Share	-0.0166 (0.0164)	-0.0152 (0.0161)
jumbo=1 × Demotech Premium Share	0.0526** (0.0208)	0.0521** (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 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:**  $\text{Serious Delinq}_{c,t} = (\text{Post Irma}_t \times \text{Insolvent Insurer Share}_c) + FE + \text{controls} + \epsilon_{c,t}$ .

	Seriously Delinquent Rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Post Irma=1 × Log Damages	0.000919** (0.000345)	0.000653** (0.000289)			0.000635** (0.000294)	0.000450* (0.000267)
Post Irma=1 × Insolvent Insurer Shares			0.106*** (0.0291)	0.0760*** (0.0242)	0.0853*** (0.0280)	0.0612** (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

# Estimating GSEs' climate and insurance market exposures

$$\text{Expected Losses} = \underbrace{B}_{\text{Baseline}} \underbrace{LGD}_B + \underbrace{P_H}_{\text{Hurricane}} \left( \underbrace{DIR}_{\text{Hurricane}} + \underbrace{INS}_{\text{Hurricane}} \right) \underbrace{LGD}_H$$

- | **Approach:** Extrapolate from the delinquency dynamics during Irma.
- | **Assumption:** Similar insurance fragility patterns for every hurricane.

	No hurricane	Hurricane
Probability <sup>(1)</sup>	73%	<b>27%</b>
Default rate <sup>(2)</sup>	1.2%	<b>1.7%</b>
Loss given default <sup>(3)</sup>	40%	<b>40%</b>
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: <sup>(1)</sup> CAT 3/4 hurricanes in FL. US National Hurricane Center (2023); <sup>(2)</sup> Our estimates; <sup>(3)</sup> An and Cordell (2019).

# Conclusion

**This paper:** Mis-calibrated GSE insurance requirements      growth of fragile insurers.

- | GSEs bear large unpriced exposure to climate due to insurance risk      taxpayer externality.
- | Too much GSE mortgage origination in risky areas      distorted credit supply.



# Appendix

# 1. Conforming Loans Default in Fragile Areas After Irma

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

	$\pm 10\%$ of the CLL	
	Conforming	Jumbo
Post Irma $\times$ Insurance Fragility	0.068 (0.030)	-0.032 (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 <sup>2</sup>	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 **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:  $Y_{l,c,t} = \beta_1(\text{Post Irma}_t \times \text{Insurance Fragility}_c) + FE + \text{controls} + \epsilon_{l,c,t}$ .

	± 10% of the CLL			
	New Policies Share - Demotech		Mortgage Denied (Y/N)	
	Conforming	Jumbo	Conforming	Jumbo
Post Irma × Insurance Fragility	2.109*** (0.622)	-1.907** (0.951)	-0.221 (0.164)	0.498** (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 × Log(damages).

### Predictions:

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

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

| **Assumption:** Similar insurance fragility patterns.

|  $P_H = 27\%$ ;  $P_{INS} = 4\%$ ;  $INS = 27$ .

|  $P_B = 39$ ,  $LGD_{B,H} = 40\%$ .

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

## Excess origination

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

| **Assumption:** Jumbos efficient benchmark.

|  $J = 84\%$ ,  $\Delta = 2.7\%$ ,  $C = 87\%$ .

| **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

▶ Back

# Data

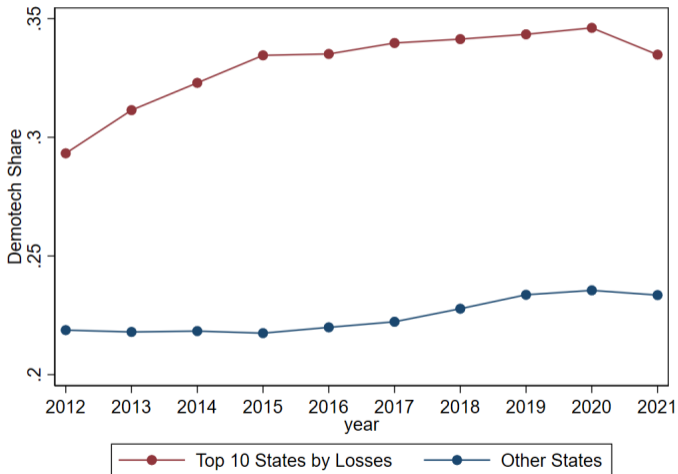
## Insurance:

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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



# Counterfactual AM Best ratings of Demotech insurers

## Step 1: AM Best rating replication model.

- | Mapping observable insurer characteristics to AM Best FSRs.

$$AMBFSR_{it} = \alpha + \beta \bar{X}_{it} + \epsilon_i \quad (1)$$

- | Choosing characteristics:

- | Literature: measures of insurers' risk and capitalization from Kojen and Yogo (2015).
- | LASSO regression.
- | AM Best factors from publicly available reports.

- | Model explains 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.

$$AMBFSR_{DEM} = \alpha + \beta X_{DEM} \quad (2)$$

- | Construct confidence intervals numerically using bootstrapping. Back

Note: 1,000 predicted values simulated for each model. Dots = average, bars = 90% confidence interval.

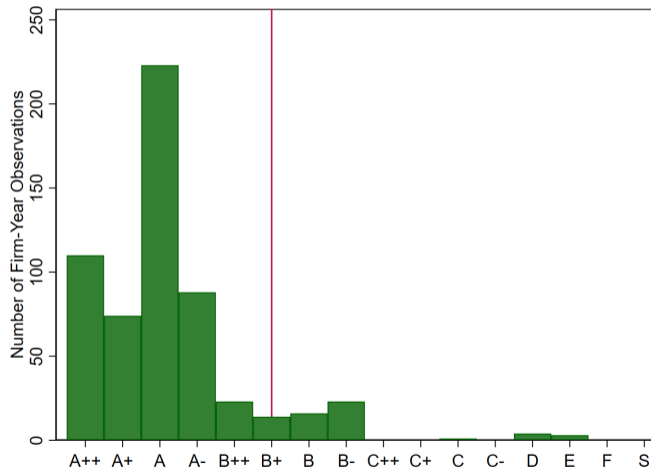


# AM Best rating replication model (panel)

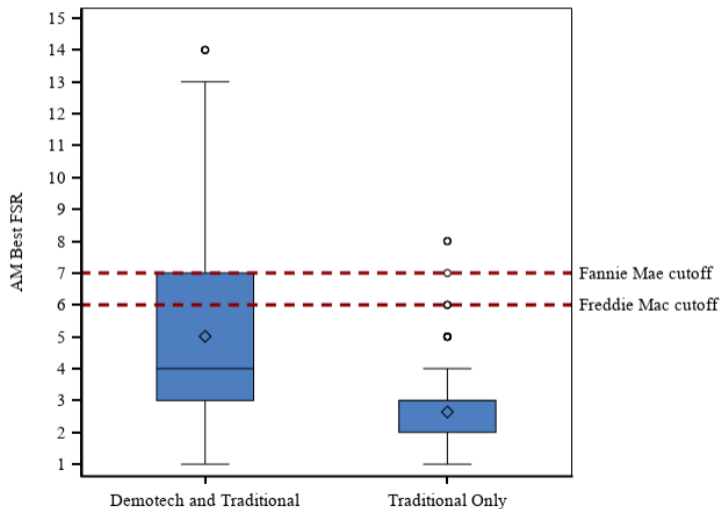
	AM Best rating <sub>it</sub>		
	(1)	(2)	(3)
% bonds in NAIC 3+	0.838 (1.362)		
% assets in equities	-1.185** (0.569)		-1.127** (0.561)
No. states selling HO	-0.012*** (0.005)	-0.011** (0.004)	-0.012*** (0.004)
% of assets in the group	0.012*** (0.003)	0.009*** (0.002)	0.012*** (0.003)
% premium from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

▶ Back

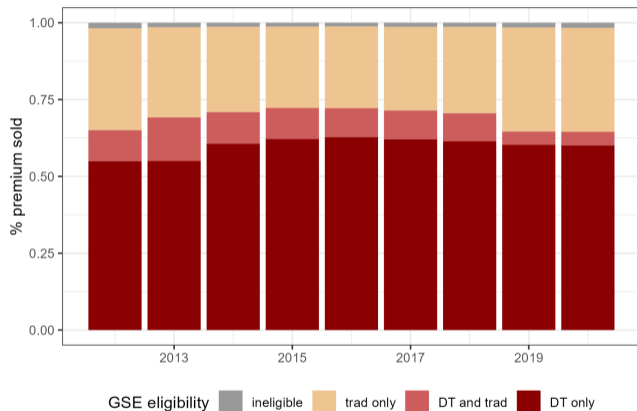
# AM Best FSRs distribution



# Ratings shopping (suggestive evidence)



# GSE ineligible insurers have minimal market shares



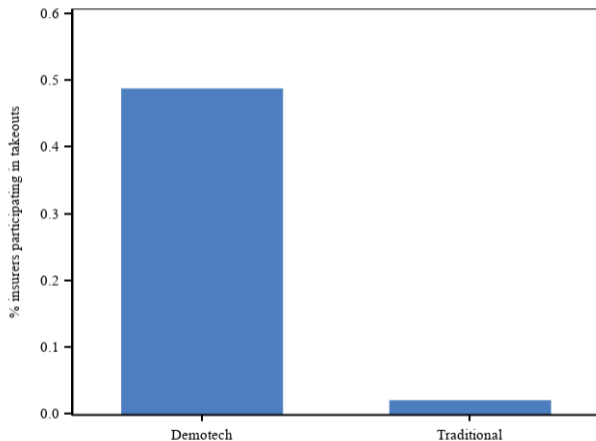
| GSE ineligible insurers have minimal market shares. [▶ Back](#)

# 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

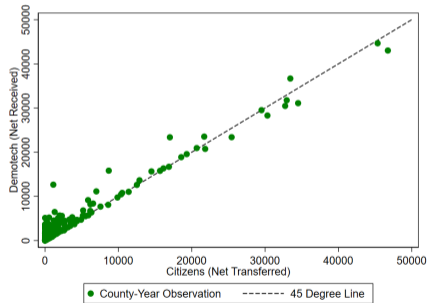
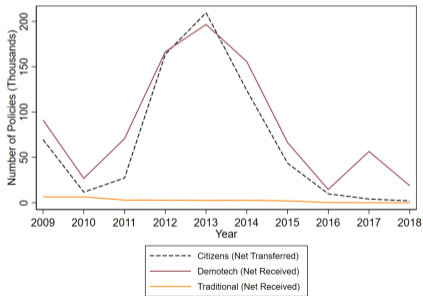


- | 40 insurers participate, of which 39 are Demotech.
- | Participating insurers have higher insolvency rates and counterfactual AM Best rating C++.
- | Depopulation: shift from a **high** quality to a **low** quality insurer.

▶ Back

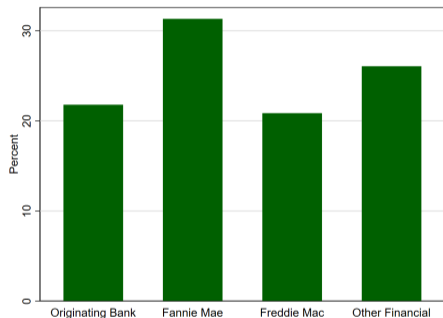
# Citizens to Demotech policy flows

- | **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

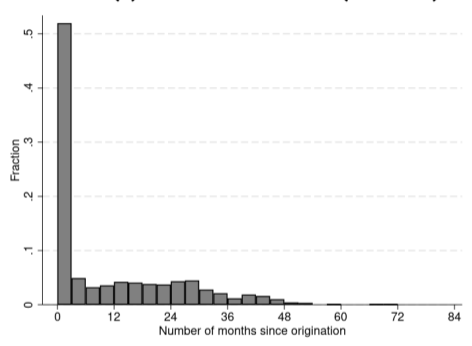


# On-balance sheet conforming loans Back

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



(ii) Time to GSE sale (McDash)



- 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)



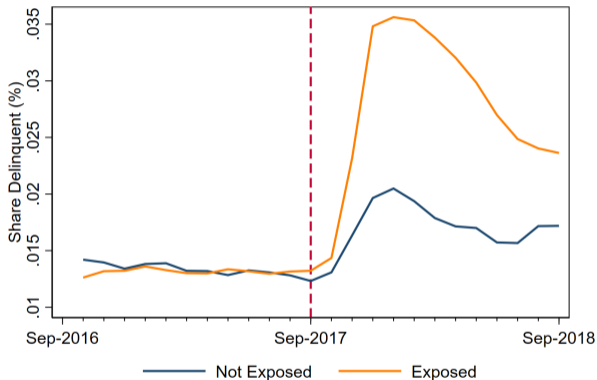
## Effect of depopulation on number of loans securitized

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

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

- Magnitudes: 6 out of 100 depopulated policies are sold to GSEs. Assuming banks retain 20% of mortgages 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*** (11.3)	-38.08** (18.2)	0.0002 (0.002)	-0.013*** -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

$$Y_{i,c,t} = \text{Demotech}_i + \alpha_t + \beta_c + \gamma \text{Risk controls}_{i,c,t} + \epsilon_{i,c,t}$$

- | On average higher because they serve riskier households. 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

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		Cancellation Rate			
		(1)	(2)	(3)	(4)
Post_Irma	Traditional	0.119*** (0.0194)	0.0993*** (0.0184)	0.326*** (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 (1)	Number of Policies (2)	Coverage (3)
Demotech	0.0242*** (0.00505)	0.0243*** (0.00488)	0.0215*** (0.00504)
Observations	924	924	924
Adjusted R <sup>2</sup>	0.022	0.025	0.017
yearfe	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 (0.73)	27.7 (2.87)	-24.2***
% of insurers selling in only 1 state	0.56 (0.06)	0.1 (0.04)	0.46***
% premium from HO	0.70 (0.03)	0.24 (0.03)	0.45***
No. insurers in the group	5.9 (1.0)	18.5 (2.2)	-12.6***
% belonging to a 2 or less insurer group	0.46 (0.06)	0.04 (0.03)	0.42***

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



# Dynamic treatment effect of insurer insolvencies

# Conforming loans default more after storms

		Share Seriously Delinquent (%)			
		(1)	(2)	(3)	(4)
conforming=1		0.00732*** (0.000987)	0.00561*** (0.00152)	0.00791*** (0.00132)	-0.0233 (0.0214)
postLirma=1	conforming=1	0.0213*** (0.00177)	0.0357*** (0.0121)	0.0470*** (0.00433)	-0.0200 (0.0951)
postLirma=1	log_damages	0.000807*** (0.000283)	0.00226 (0.00150)	0.000874 (0.000587)	0.0224 (0.0135)
Constant		0.00325*** (0.000904)	0.0181*** (0.00267)	0.0125*** (0.00285)	0.0462 (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
- |  $\text{Deficiency} = \text{Unpaid balance} - \max(\text{fair market value of the property, foreclosure sale price})$
- | 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