Rebuilding Insurance for a Climate Future

Catastrophe Models, State Regulation, and the National Flood Insurance Program

Dominick Dusseau, Woodwell Climate Research Center

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https://www.ktoo.org/2016/10/06/haiti-slow-revelations-scale-hurricane-destruction/

How Are Premiums Calculated: Catastrophe Models

Premium = *Average Annual Loss*: expected losses each year

➕

Expense Load: costs due to writing policies, loss adjustment, etc.

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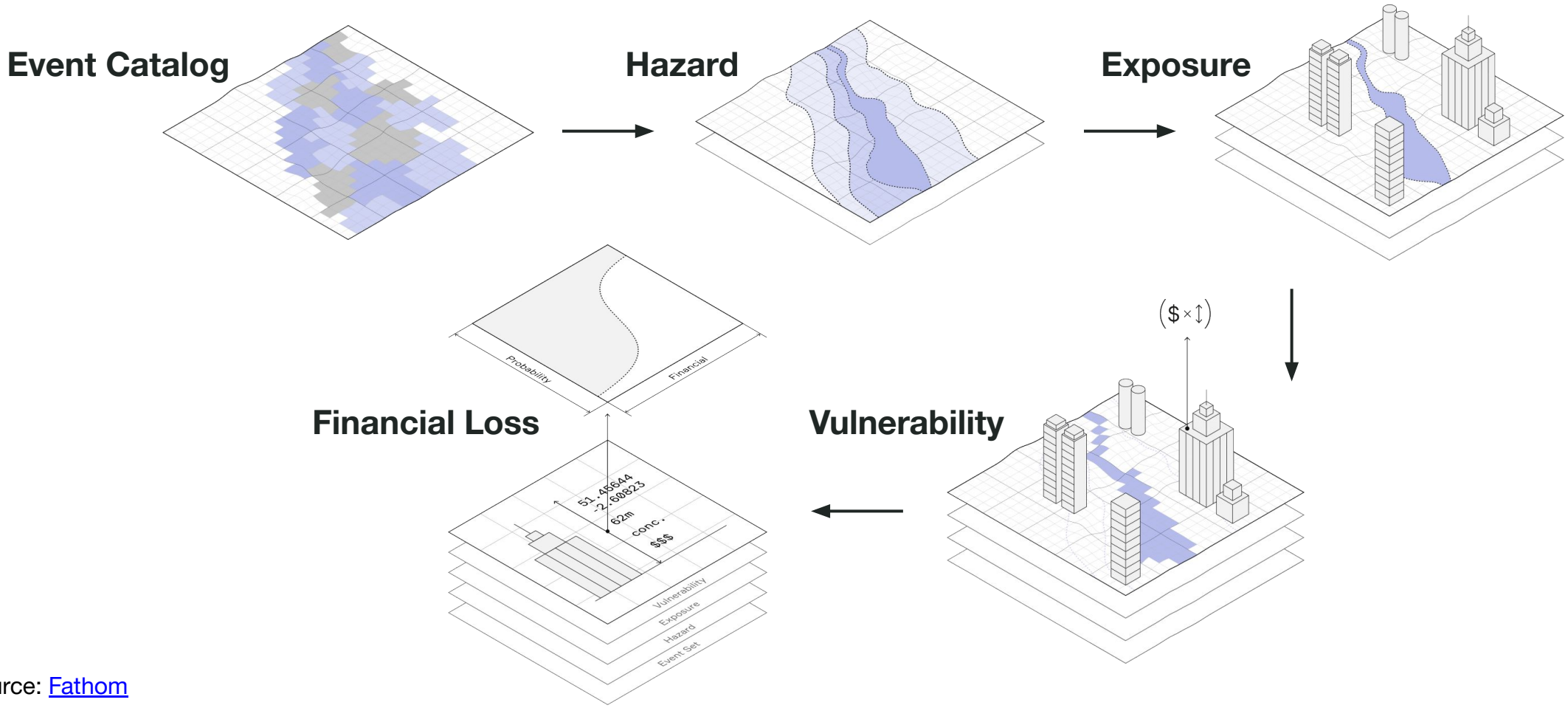
Risk Load: capital to cover catastrophic loss and profit

▭ → Calculated using catastrophe models

Catastrophe Models: How They Work

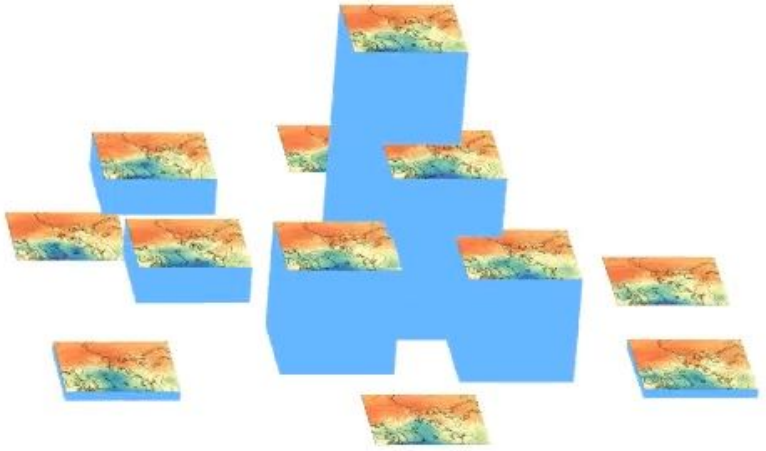


Source: Fathom

Catastrophe Models: Their Value

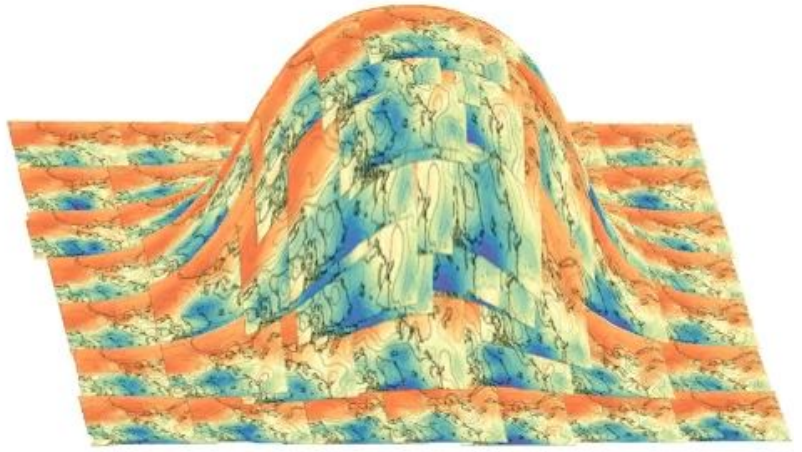
- Historical records for hurricanes and disaster losses are largely limited to the past ~50 years
- Solely relying on historical data could leave out rare and catastrophic events
- Catastrophe models fill the gaps in historical data

Historical Record Events



Incomplete catalog of all possible disaster events

Catastrophe Model Events



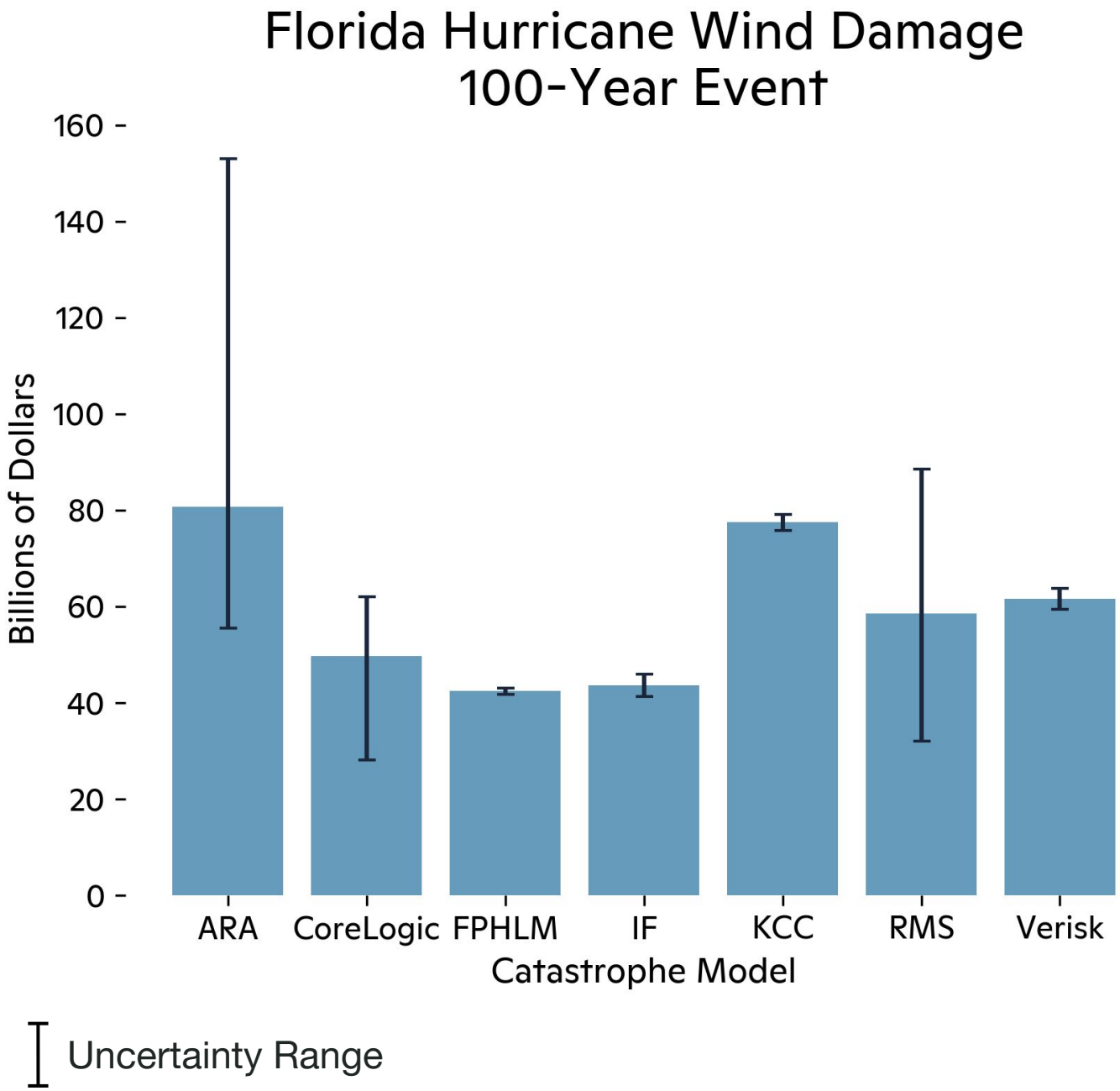
Full range of statistically possible events

Source: Google SEEDS

Catastrophe Models: Their Drawbacks

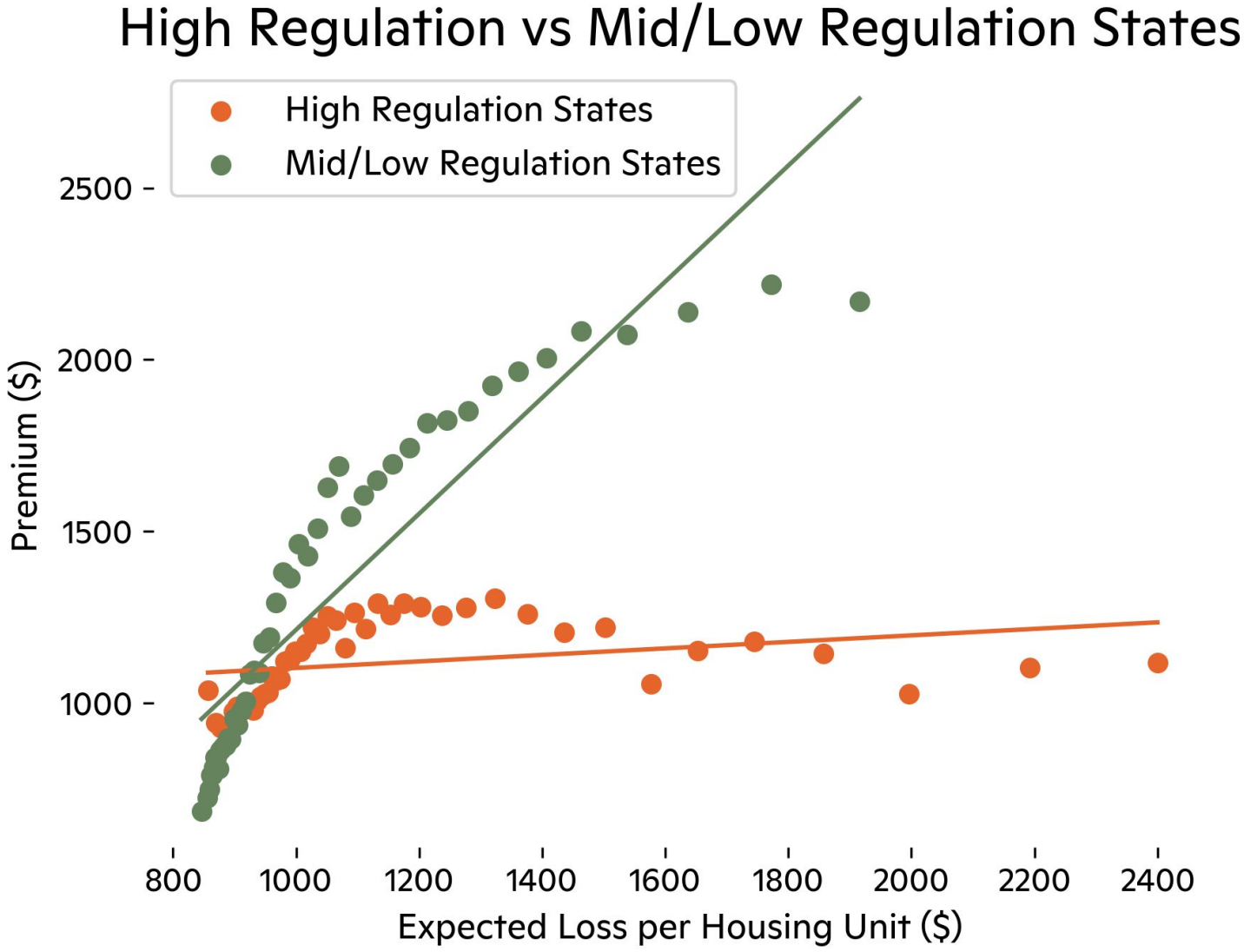
- Average annual loss may be similar, but extreme event and property-level estimates have a wide range
- Only a handful of states review and regulate catastrophe model use in insurance ratemaking
- U.S. needs a national public catastrophe model for assessing private models and hazard mitigation planning

Source: FCHLPM; Weinkle et al. (2016)



State Regulation: Climate Risk and Premiums Mismatch

- Each state regulates insurance premiums independently
- Some states limit insurance premium increases more strictly than others
- A consequence is the cross-subsidization of risk across states
- One solution is creating an Optional Federal Charter through Congress where insurance regulation becomes similar to the dual banking system



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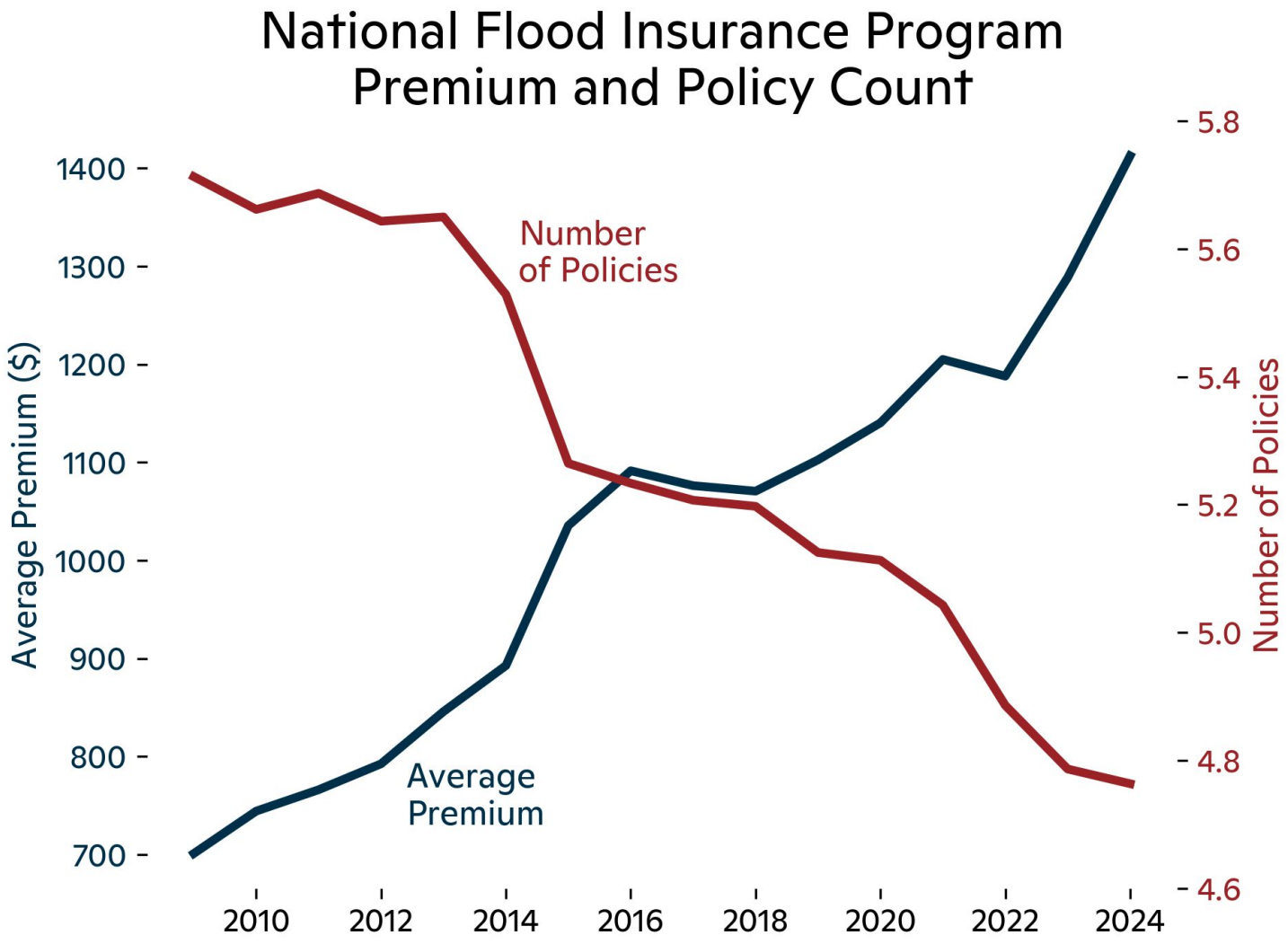
National Flood Insurance Program (NFIP): Current Status

- Risk Rating 2.0 introduced actuarial pricing to the program in 2021
- Premiums have continued to rise under Risk Rating 2.0; many policies still don't represent "true-risk"
- Policy counts have dropped
- Means-based assistance would increase coverage for low-income households



Source: NFIP

National Flood Insurance Program: Community Rating System (CRS)

- Communities that implement flood risk reduction activities receive flood insurance discounts for their residents
- Examples include preserving open space, floodplain development regulation, flood warning systems, stormwater maintenance

Source: FEMA

CRS Credit Points, Classes and Premium Discounts

CRS Credit Points	CRS Class	CRS Discount (Premium Reduction)
4,500+	1	45%
4,000 – 4,499	2	40%
3,500 – 3,999	3	35%
3,000 – 3,499	4	30%
2,500 – 2,999	5	25%
2,000 – 2,499	6	20%
1,500 – 1,999	7	15%
1,000 – 1,499	8	10%
500 – 999	9	5%
0 – 499	10	0

NFIP Community Rating System Cross-Subsidization Example

30% Discount

Community A
(Class 4)

0% Discount

Community B
(Class 10)

NFIP Community Rating System Cross-Subsidization Example

30% Discount

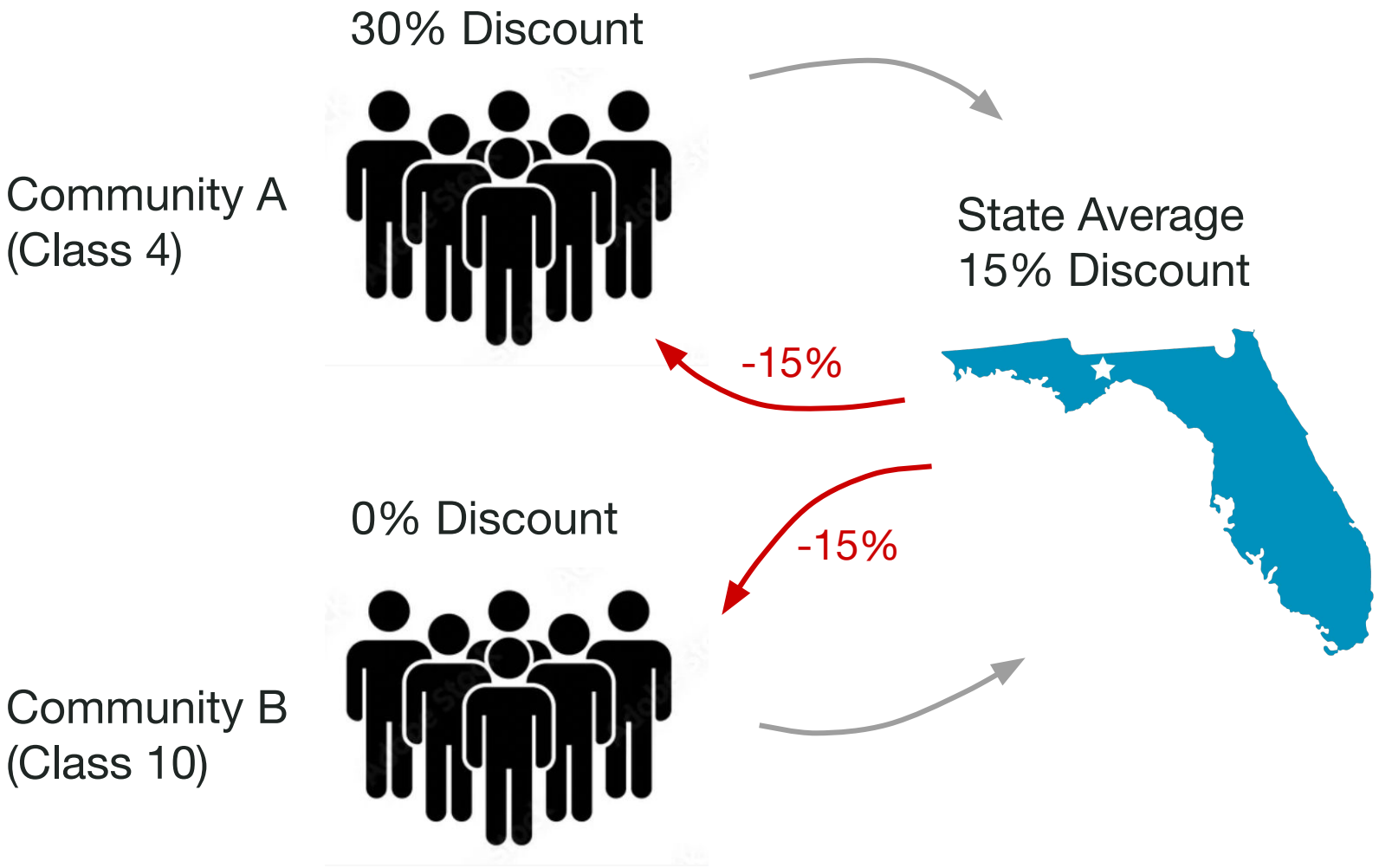
Community A
(Class 4)

State Average
15% Discount

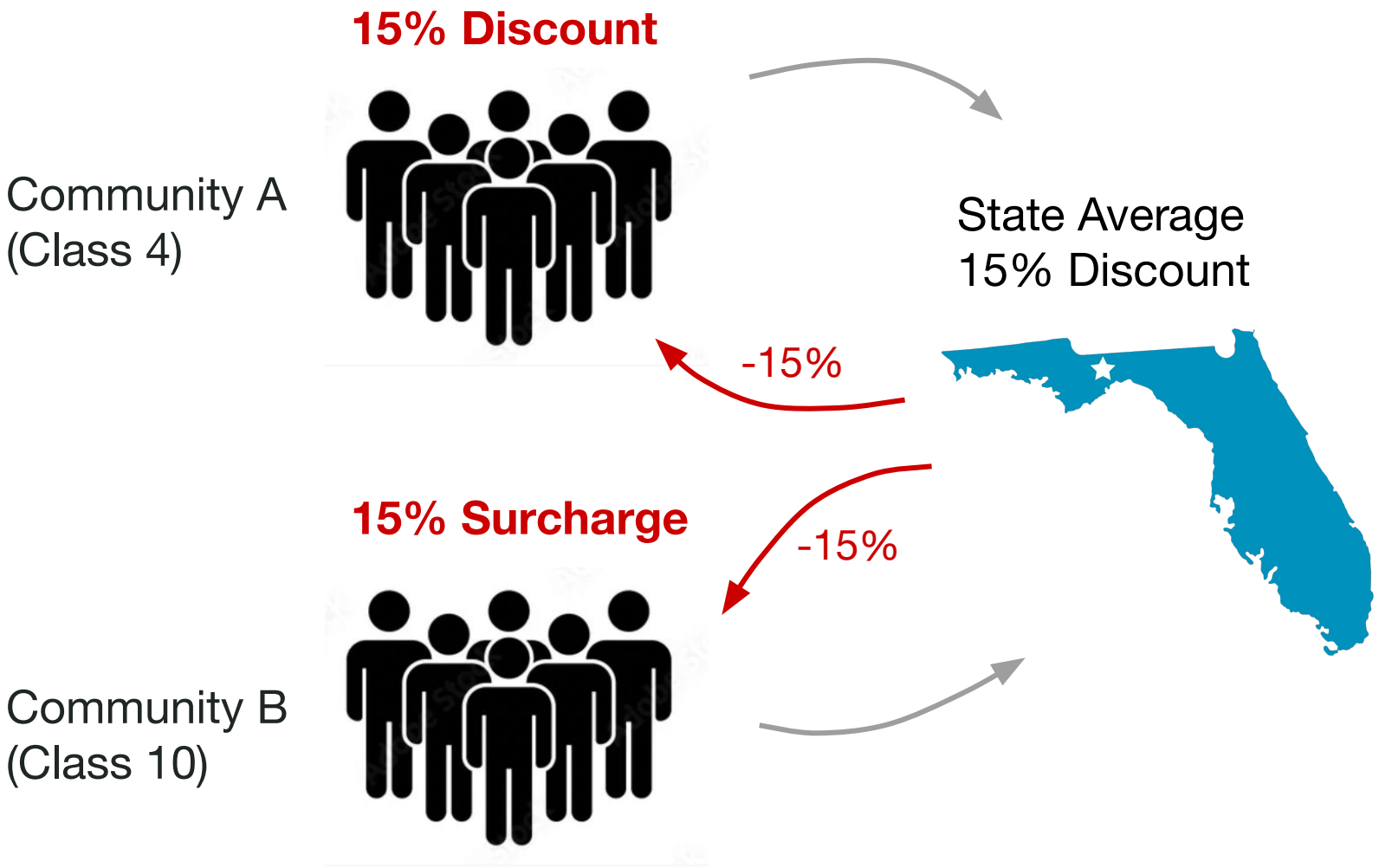
0% Discount

Community B
(Class 10)

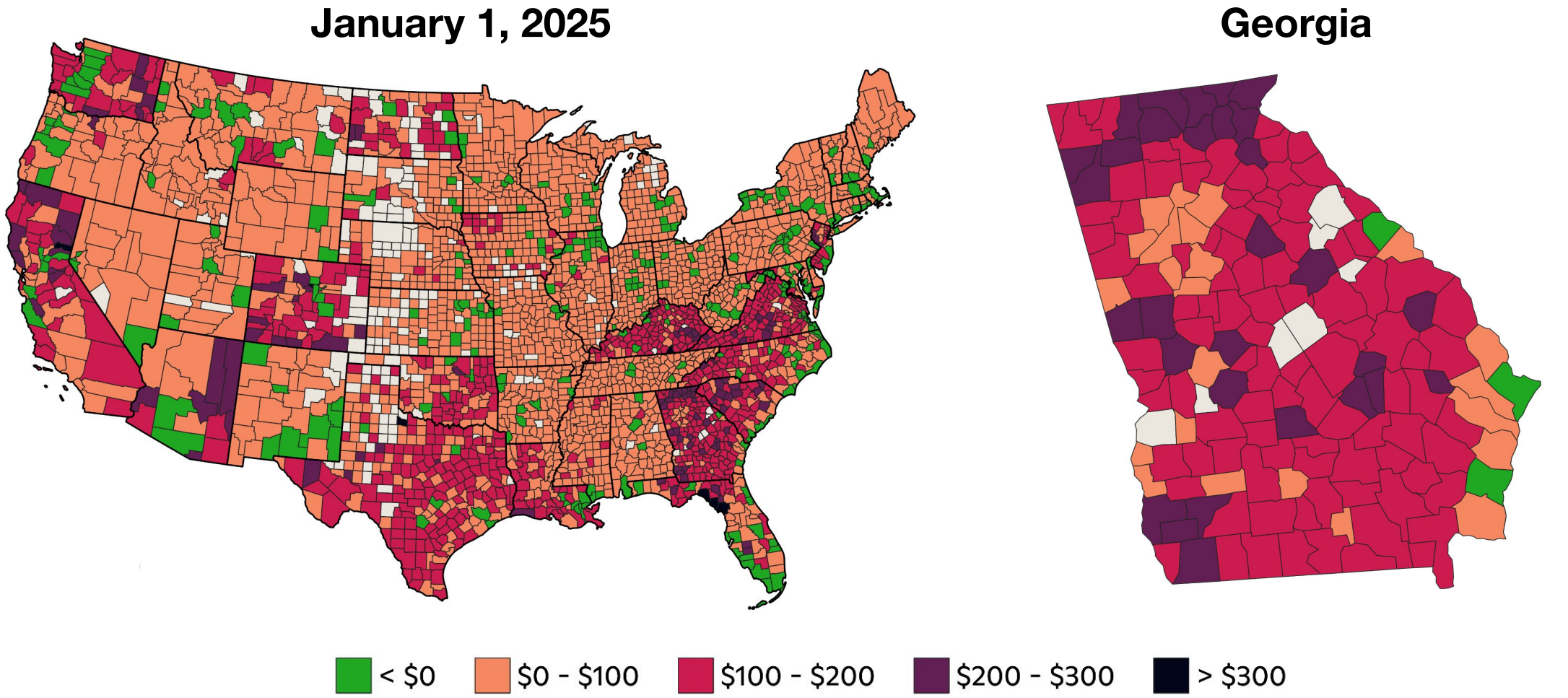
NFIP Community Rating System Cross-Subsidization Example



NFIP Community Rating System Cross-Subsidization Example



Community Rating System Average Net Cost Added to Policies



Dusseau et al. (2025). Inequity in Action: U.S. Rural Counties Subsidize Flood Insurance Discounts. Under review at One Earth.

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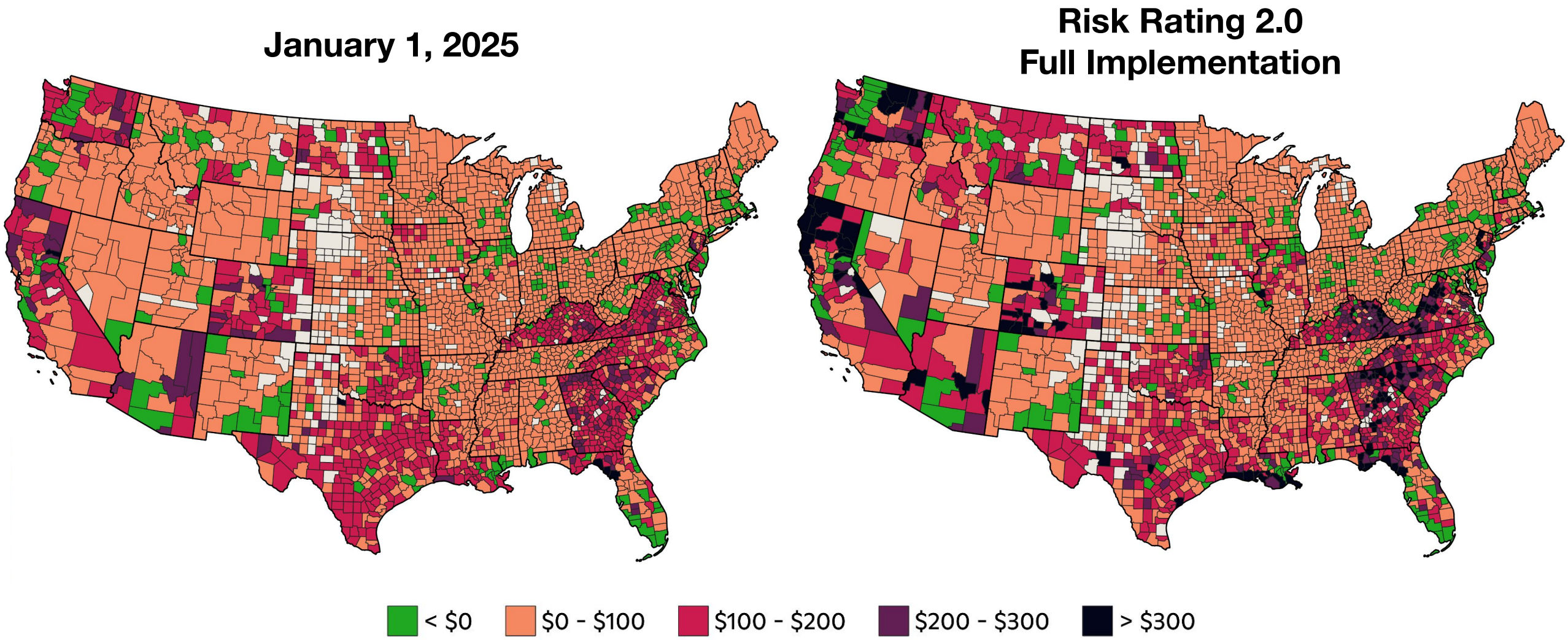

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