

# Anticipating Climate Change Across the United States

(Adrien Bilal and Esteban Rossi-Hansberg)

Discussion by:

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## Recap: what paper does

- 1 **Model of forward-looking location and investment choices in a warming world**
- 2 Focus on heat waves in warm counties and storms in coastal counties in the US
- 3 Event studies of 1-in-20-year heat waves
- 4 Event studies of 1-in-50-year storms
- 5 Estimate model parameters
- 6 Quantify magnitude of shocks
- 7 Welfare effects of anticipation and adaptation (starting 2023)

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- 1 Model of forward-looking location and investment choices in a warming world
- 2 Focus on heat waves in warm counties and storms in coastal counties in the US
- 3 **Event studies of 1-in-20-year heat waves**
  - ▶ short-term: wages and income/cap. ↓ (interpretation: -ve productivity shock)
  - ▶ long-term: population ↓ (interpretation: -ve amenity shock)
- 4 Event studies of 1-in-50-year storms
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- 4 **Event studies of 1-in-50-year storms**
  - ▶ long-term ↓ in wages, income/cap. and population
  - ▶ short-term ↑ in mfg investments
  - ▶ (interpretation: capital depreciation shock)
- 5 Estimate model parameters
- 6 Quantify magnitude of shocks
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- 5 **Estimate model parameters**
  - ▶ Recover location fundamentals from steady state (2012) cross-sectional data
  - ▶ Estimate migration and investment elasticities:
    - ★ Simulate shocks and match observed population and investment responses in event studies
    - ★ heat waves  $\Rightarrow$  productivity shocks  $\Rightarrow$  migration elasticity
    - ★ storms  $\Rightarrow$  capital depreciation shocks  $\Rightarrow$  investment elasticity
- 6 Quantify magnitude of shocks
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- 5 Estimate model parameters
- 6 **Quantify magnitude of shocks**
  - ▶ -5.1% productivity shock (and -6.8% amenity shock) from heat waves in warm counties
  - ▶ -17% capital depreciation shock from storms in coastal counties
  - ▶ Multiply by change in probability of heat waves and storms as mean temperature rises.
- 7 Welfare effects of anticipation and adaptation (starting 2023)

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- 6 Quantify magnitude of shocks
- 7 **Welfare effects of anticipation and adaptation** (starting 2023)
  - ▶ Workers migrate away from susceptible areas to pre-emptively avoid expected future losses
  - ▶ Capitalists divest early



Adaptation via migration makes almost no difference to worker welfare!

	Welfare			
	Workers		Capitalists	
	2023	2100	2023	2100
Baseline				
Aggregate (%)	-4.9	-11.6	-0.8	-13.4
St.dev. (p.p.)	2.4	4.2	5.6	46.4
No climate anticipations:				
Aggregate (%)	-4.8	-11.5	-0.5	-13.1
St.dev. (p.p.)	2.4	4.7	3.9	43.1
No adaptation: Fixed population				
Aggregate (%)	-4.8	-11.3	-0.6	-12.6
St.dev. (p.p.)	8.7	16.3	1.8	22.8

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### Takeaways?

- Anticipation induces outflow of population and capital that is more damaging than realized heat waves and storms
- Inability to migrate attracts more capital investment and ultimately net beneficial for both workers and capitalists

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### Questions:

- why such a large drop in welfare almost right away in 2023?
- from shocks between 2012 (steady state) and 2023?

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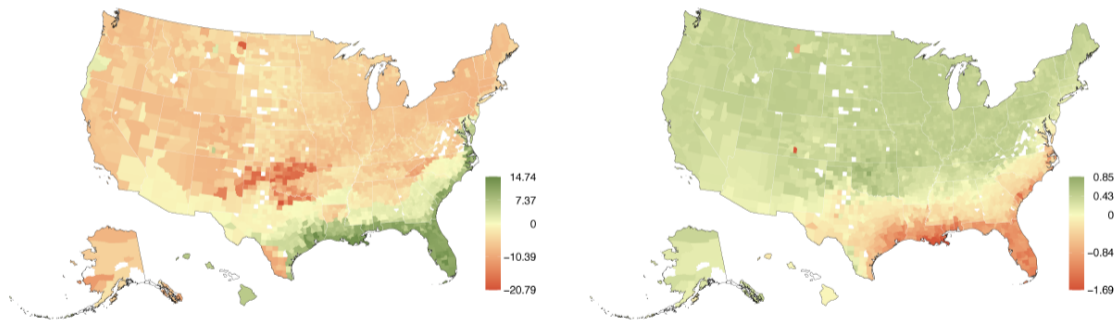
### Questions:

- why welfare loss not larger in 2100?
- because risk-prone counties have already dwindled following storms and heat waves?

## Strong congestion forces?

Figure 11: The impact of shutting down anticipations on mobility and welfare.

(c) Relative population change in 2050 (p.p.). (d) Relative worker welfare change in 2050 (p.p.).



Non-susceptible counties appear to almost always benefit from restricting inflow of climate migrants!

## Other important mechanisms

### ① **Event studies of spillover effects on nearby counties**

- ▶ Can investigate net agglomeration/congestion responses
- ▶ Can inform migration and investment cross-elasticities
- ▶ Shock-induced migration flows might be more informative of bilateral migration responses (than business-as-usual baseline migration flows)
- ▶ Currently, local capitalists do not consider rates of returns in neighboring counties (despite worker migration)
- ▶ Cross-elasticities may also depend on sectoral composition of employment e.g. county-pairs that share a vulnerable sector.

## Other important mechanisms

- ① Event studies of spillover effects on nearby counties
- ② **Nature of capital investments**
  - ▶ How much of observed post-storm investments come from private capitalists versus local/federal governments?
  - ▶ Can local govts be treated like capitalists in the model? Incentives seem somewhat aligned: immobile, care about final good consumption and local capital stock.
  - ▶ How much observed investment in manufacturing versus non-manufacturing (e.g. on amenities as opposed to production)?
  - ▶ e.g. local governments may invest in amenities to attract population (and workers)



## Other important mechanisms

- ① Event studies of spillover effects on nearby counties
- ② Nature of capital investments
- ③ **Sector / occupational composition**
  - ▶ Some sectors are more resilient to extreme weather shocks
  - ▶ Local capitalists may be able to switch investments to less vulnerable sectors
  - ▶ Some sectors offer more locational mobility to workers

## Other important mechanisms

- ① Event studies of spillover effects on nearby counties
- ② Nature of capital investments
- ③ Sector / occupational composition
- ④ **Mobility costs by region**
  - ▶ Worker migrations costs are higher out of some counties than other (possibly due to sectoral composition)
  - ▶ No new data needed: besides calibrating bilateral migration shares (conditional on migration), also use overall migration propensity?

## Other important mechanisms

- 1 Event studies of spillover effects on nearby counties
- 2 Nature of capital investments
- 3 Sector / occupational composition
- 4 Mobility costs by region
- 5 **Heterogeneity across locations in probability of storms and heat waves**
  - ▶ Maybe model tractability required aggregation to warm VS cold counties and coastal VS inland counties
  - ▶ But can apply estimated model to quantify heterogeneous (expected) shocks as mean temperatures rise
  - ▶ Of course, binning of counties may be constrained by frequency of already extremely rare storms and heat waves