Aggregate Risk in Dynamic Spatial Equilibrium: Assessing Climate Impacts Across the United States

Bilal, Franco, & Rossi-Hansberg (2026)

Levi Crews (UCLA)

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     - mobile HtM households (Caliendo, Dvorkin, and Parro, 2019) and immobile capitalists (Kleinman, Liu, and Redding, 2023), both **risk averse**
     - **aggregate risk** thru uncertainty re: global temperature, **local risk** thru capital depreciation
     - solve via **Master equation** (Bilal, 2023) → need **second-order approx.** (**SAME**) to include **risk**
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- **punchline** (so far): **risk**, especially **local risk**, can be quite bad!
  - up to 25% loss from **local risk** w/ no trend warming (up to 7% extra loss w/ trend)
  - capitalist precautionary motive → "if one Miami condo may flood, I should build two"
  - worker welfare mostly reacts to capital + can mitigate by moving inland

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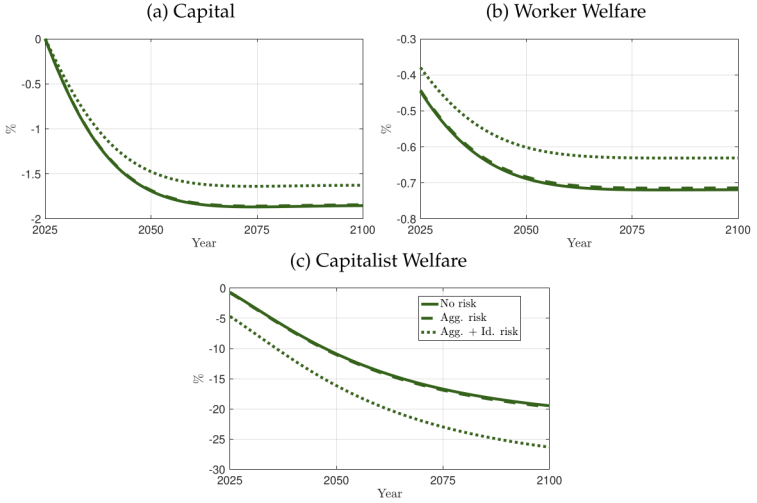

Note: Effect of aggregate local and aggregate risk during the transition towards a a 2°C increase in global temperature by 2100. Panel (a): change in capital stock relative to the deterministic steady state. Panel (b): change in aggregate workers welfare relative to the deterministic steady state. Panel (c): change in aggregate capitalist welfare relative to the deterministic steady state.

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- but what you take to the data is always a ***solved*** model: **FAME** or **SAME**, not **NAME**

. . . to rationalize the same data moments

- most params. ID'd in **NAME**'s **deterministic steady-state** $\rightarrow$ match 2012 cross-section
  - productivities, amenities, migration costs
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  - both papers target the cumulative IRF of investment vs. employment to a capital dep. shock
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  - . . . vs. in **SAME** paper: risk-averse (ζ) + no adjustment costs
  - ***what could ID capital adjustment costs vs. capitalist risk aversion if both in NAME?***
  - also affects estimates of damage function δ_i: **30%** vs. **12%**

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  - **FAME** point estimate of inv. migration elasticity $\nu = 0.56$ with CRRA=1
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    → **less than half!** workers must *look* more responsive b/c they *also* care about risk now. . .

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- Fig. 4: **FAME**(`params`) vs. **SAME**(`params`) → + want **FAME**(`params`) for same **NAME**

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- ***if you reintroduce the risk-free bond, does this all go away?***
  - "if one Miami condo may flood, I should ~~build two~~ *buy bonds!*"
  - what we see now is the welfare cost of **local risk** + **no diversification**

Lots more already on the docket...

- **local volatility** in productivity + amenities, not just depreciation
- ID'd **risk aversion** for workers (not just $\gamma = 1$)
- ***scientific* uncertainty** in how storms and heat waves change
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  - direction of migration flows in response to **risk**
- **meaningful land ownership**
  - this paper $\equiv$ rents accrue to absentee landlords (**FAME** paper $\equiv$ rents shared by capitalists)
  - ***what if you actually modeled owner-occupied housing?*** much bigger state variable...
  - who's exposed to the **risk** of Miami's *land* going under water?

. . . but I still have a wishlist!

1. **incorporate agglomeration in productivity and amenities**:
   - if San Francisco goes under water, do we lose the "special sauce" of American tech (Z_{SF})?
   - . . . or might a new San Francisco pop up where the people migrate ($\bar{Z}_i N_i^{\alpha}$)?
   - when you add **local risk** in Z_i, would just want risk in $\bar{Z}_i$
2. **consider some (but not all) "economy $\rightarrow$ climate change"**
   - global temperature taken as given. . . fair enough, since just US
   - but US may want unilateral decarbonization (Bilal and Känzig, 2025, 2026):
     - ***where do the emissions-intensive activities happen?***
     - is our dirty production already in **risky places** (oil on the Gulf Coast)?

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Incorporate **risk** into **dynamic spatial equilibrium** to assess **climate impacts across the US**

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2. allow capitalists to diversify w/ risk-free bonds
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Thanks!

References

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