

# Discussion of Climatic Constraints on Aggregate Economic Output by Burke and Tanutama

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## Comments summary

- Data is really exciting! Lots to learn from GDP and temperature differences at a finer scale
- You allude to spillovers/linkages within countries. That is an exciting direction to take this data.
- With state-year FE in the panel, you lose important variation in temperature. What is the endogeneity you are concerned about?
- The main takeaway, that exposure level and not income drives heterogeneity, needs more evidence
- Long-difference methodology is unusual, and may need revisiting
- Other comments at the end...

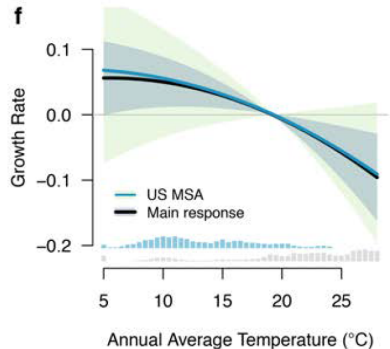
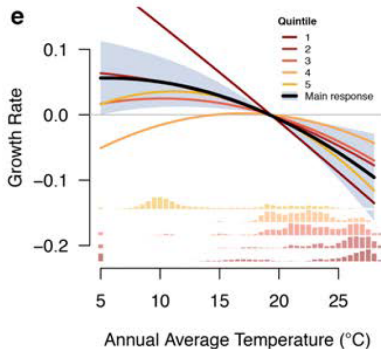
# Panel specification

$$y_{istd} = \underbrace{f(T_{ist})}_{\substack{\text{deviations from} \\ \text{state-yr FE and} \\ \text{local mean}}} + \lambda_1 P_{ist} + \lambda_2 P_{ist}^2 + \rho_d + \underbrace{\alpha_j}_{\substack{\text{local} \\ \text{mean}}} + \underbrace{\eta_{st}}_{\substack{\text{state-yr} \\ \text{FE}}} + \varepsilon_{istd}$$

- Remaining variation in temperature will be driven by geographically large states
- Estimated response function will exclude long-run changes that are correlated within state
- What is the endogeneity in the time-variation of  $T_{ist}$  that you are worried about?

# Main conclusion needs more evidence

A big takeaway in the paper is that it is exposure as opposed to vulnerability (income) driving the different responses to temperature.



# Long-difference regression

Start with the following equation representing GDP long-run fundamentals as a function of temperature

$$Y_{istd} = b_0 + b_1 T_{istd} + b_2 T_{istd}^2 + \alpha_{isd} + \varepsilon_{istd}$$
$$\frac{\partial Y_{istd}}{\partial t} = b_1 \frac{\partial T_{istd}}{\partial t} + 2b_2 T_{istd} \frac{\partial T_{istd}}{\partial t} + \frac{\partial \varepsilon_{istd}}{\partial t}$$

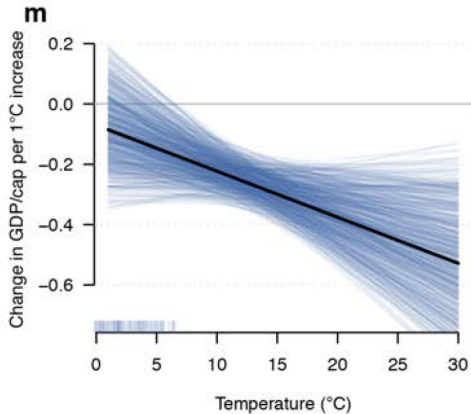
Whether long-run growth responds to long-run changes in temperature depends on the level (baseline) temperature.

What you have

$$\underbrace{\hat{\lambda}_{isd}}_{\frac{\partial Y_{istd}}{\partial t}} = \beta_1 \underbrace{\hat{\phi}_{is}}_{\frac{\partial T_{istd}}{\partial t}} + \beta_2 \underbrace{\hat{\phi}_{is2}}_{\downarrow} + \underbrace{\eta_s}_{?} + \underbrace{\rho_d}_{?} + \varepsilon_{isd}$$

$$T_{ist}^2 = \alpha_{is} + \phi_{is2} year_t + \varepsilon_{ist}$$

# Long-difference regression



- The calculation of the panel effect (in order to compare it to the long-difference effect) is unclear
- Recent paper by Ashwin Rode et al. (long et al.) in Nature shows that income is a key determinant of energy consumption in response to warming. Why can't we see that in this data?