Report on
'Dispersion of Temperature Exposure and Economic Growth: Panel Evidence with Implications for Global Inequality'

The thesis undertakes an empirical analysis of the effect of temperature and dispersion of temperature on economic growth using a fixed-effects panel regression model. The model is used to compute projections of future economic growth up to the end of the century, using scenarios for climate change, population and economic growth. The empirical scenarios enable analysis of the degree of inequality that is projected to occur between rich and poor countries based on the impact of climate change having differential effects for 'hot' and 'cold' countries. The non-linearity is motivated theoretically and modelled using a quadratic function for temperature and dispersion.

Comments

1. The thesis extends the model of Burke, Hsiang and Miguel (2015) to allow for dispersion effects to enter non-linearity in the dynamics of the effect of temperature on GDP growth, where dispersion is measured as the standard deviation of daily temperature anomalies. Although the effect is significant at the 5% level, both linear and squared, the improvement in fit is very small. To 'sell' the importance of dispersion in the analysis, it would be nice to show what effect modelling dispersion has on the discussion of inequality in the later section. This would link the two aspects of the thesis more closely.

2. There are some aspects of the functional form specification for equation (18) that could be considered in further work. A quadratic transformation of a variable with a non-zero mean results in a high correlation between the variable, the non-linear transformation and the intercept (or country fixed effect). A simple route to resolving this problem would be to use an orthogonal polynomial such as the Hermite, or to de-mean the variable before taking the non-linear transformation, and then to again de-mean the variable after taking non-linear transformation. In this case, it would be straightforward to include higher order polynomials. Given the evidence of non-normality in figure A2, 3rd and 4th order polynomials may be needed to pick up skewness and kurtosis. This could be tested with little cost if they were included orthogonal to the current regressors. A test of non-linearity would help to determine

whether the quadratic functional form for temperature and dispersion is sufficient to model all the non-linearity in the data.

Selection could be applied to the model in table 1. Why not exclude precipitation as it not statistically significant? Furthermore, there are no time dynamics, but lags of temperature and dispersion could play a role. These would be straightforward to include.

3. The question of endogeneity between GDP growth, temperature and dispersion is difficult to address. How can your scenario projections account for efforts to adapt to increased temperature and dispersion through mitigation investment?

4. If you have daily data on temperature anomalies, you could compute alternative definitions of dispersion to see what is most costly in terms of economic growth. For example, you could hypothesize that high dispersion due to extreme weather events rather than high dispersion due to a regular pattern of seasonality (if temperature anomalies are measure relative to the annual mean rather than a seasonal daily mean) is more costly in terms of GDP growth.

5. How sensitive are the results to the population weighting used? If agriculture is the industry most affected by climate change then it could be argued that the least populated areas would be the most affected. If you estimate the same model with an equally weighted spatial aggregation on temperature and dispersion rather than population weighted, would your empirical results be much affected?

6. Figure 2b is quite hard to read as there is a lot of information in the figure which is hard to process visually. There appears to be a lot of volatility within country over time, but the two aspects that can't be seen from the data are (i) is the standard deviation in annual temperature exposure increasing over time for most countries, and (ii) is the temporal volatility extreme or would it lie within 2 standard errors of a normal distribution, i.e. if you put error bands around each time series plot, does the frequency of outliers increase over time.

Corrections

- p.21, last line. 'results. but' Either comma or capital letter.
- p.25, line 14. Spelling $\rightarrow$ baseline.
- p.27, line -3. 'the the'. Delete 'the'.

- p.30, line 10. Subscript ϕ_{1b} and ϕ_{2b}.
- p.36, 3rd paragraph. Table 3.3 should be table 2.
- p.51, title of figure A2. Spelling $\rightarrow$ temperature.