Comments on "Climate Change Around The World"

by Per Krusell and Anthony A. Smith Jr.

XXVI Annual Conference of the Central Bank of Chile:

"Implications of Climate Change and Ecosystem Services Degradation for Macroeconomic and Financial Stability"

Benjamin García (Central Bank of Chile) - Santiago, Chile - November 27, 2023

Motivation

Climate change matters, and matters heterogeneously across space and time

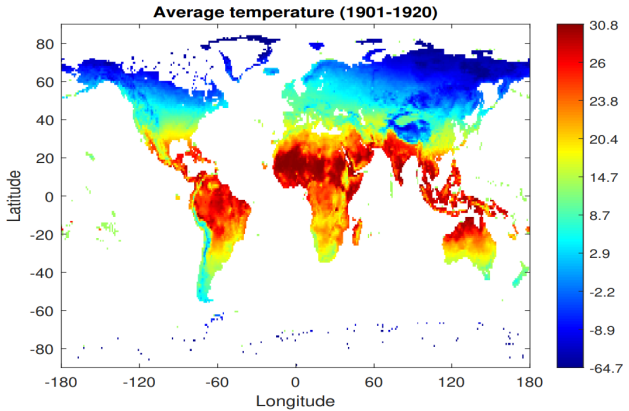

Figure: Average temperature in each of 19,000 different world regions

Paper Summary

- A global general equilibrium model with high degree of geographical resolution (19,000 regions!)
- Heterogeneity across regions and time on temperature and productivity.
- Energy production leads to carbon emissions and carbon emissions lead to increases in temperature.
- Changes in regional temperature are linked to changes in productivity (inverted U shape)
- Carbon taxes are needed for agents to internalize the effect that production has in global warming.

Main insights

- Heterogeneity matters!
- The effects of temperature rising are very different across regions.
- Common carbon taxes also have big disparity in their effects (between 30% in consumption equivalence losses and 10% in gains).
- Overall, climate change leads to big increases in global inequality.
- Results are robust to allowing or disallowing capital flows across regions.

Endowments, green energy and input complementarity

(Even more) heterogeneity across time and space

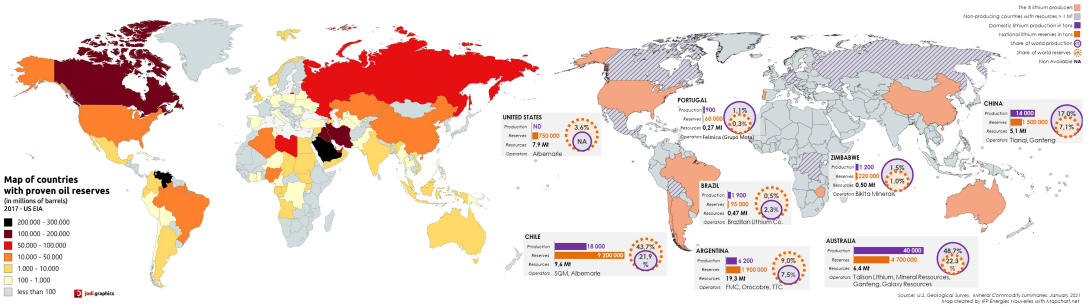

Figure: Oil(left) and Lithium(right) proven reserves.

Source: Oil: U.S. EIA (2017), map from Wikipedia ; Lithium: USGS, 2021, map from IFP energies nouvelles.

Endowments, green energy and input complementarity

(Even more) heterogeneity across time and space

- In base model, χ_t, how green is the prevailing energy bundle does not affect the costs and efficiency of energy production.
- If this assumption hold or not on average may not be of great importance.
- However, the fact that the transition towards greener energies may affect countries heterogeneously depending on their endowments (commodities, wind or solar availability) can have relevant implications in the distribution of the costs and benefits of going green.
- Moreover, implementation should be strightforward: $e_{i,t} = \zeta_{i,t}^{-1} z(\chi_t, W_i) F(k^e, \ell^e, e^e)$

Biases and learning

(Even more) heterogeneity across time and space

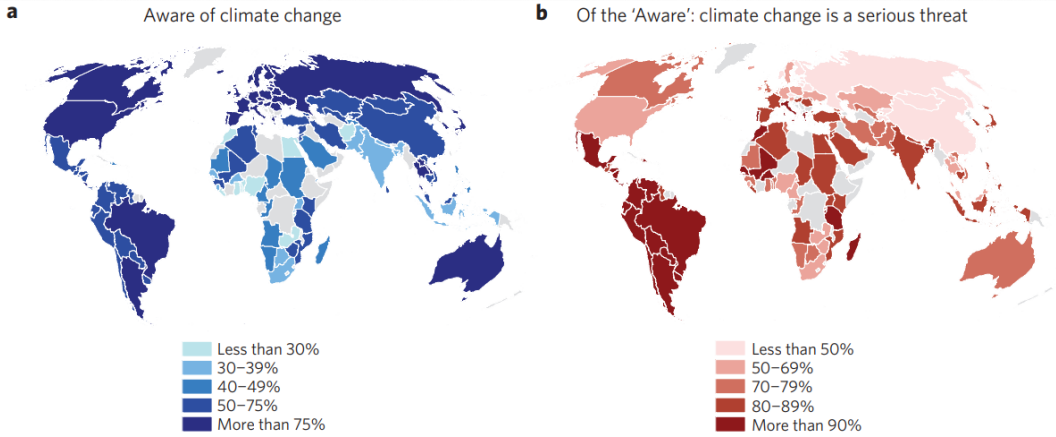

Figure: Climate change awareness, Lee et al. (2015)

Biases and learning

(Even more) heterogeneity across time and space

- Perception of existence and dangers of climate change might be biased
- If elected politicians don't fully internalize the consequences of climate change

$$\hat{D}(T_{i,t})' < D(T_{i,t})' \ , \ \hat{T}(S_t)' < T(S_t)'$$

- It is likely prescribed tax would deviate from optimal.
- Hopefully, there is a learning process where $\hat{D}(T_{i,t})$ and $\hat{T}(S_t)$ converges to $D(T_{i,t})$ and $T(S_t)$

$$\hat{x}_t = \hat{x}_t^- + K_t(z_t - C\hat{x}_t^-)$$

- Geographical differences in the signal to noise ratio could lead to heterogeneity in climate awareness and increase disagreement about taxes.

Biases and learning

(Even more) heterogeneity across time and space

- Perception of existence and dangers of climate change might be biased
- If elected politicians don't fully internalize the consequences of climate change

$$\hat{D}(T_{i,t})' < D(T_{i,t})' \ , \ \hat{T}(S_t)' < T(S_t)'$$

- It is likely prescribed tax would deviate from optimal.
- Hopefully, there is a learning process where $\hat{D}(T_{i,t})$ and $\hat{T}(S_t)$ converges to $D(T_{i,t})$ and $T(S_t)$

Denial $\leftrightarrow$ Anger $\leftrightarrow$ Depression $\leftrightarrow$ Bargaining $\leftrightarrow$ Acceptance

- Geographical differences in the signal to noise ratio*, or other idiosyncratic characteristics,* could lead to heterogeneity in climate awareness and increase disagreement about taxes.

Conclusions

- Compelling paper on the quantitative importance of climate change on welfare
- Even more important, a very compelling paper on the importance of regional heterogeneity on the determination of winners and losers from climate change.
- Incorporating additional sources of heterogeneity may improve model predictions (hopefully keeping the model manageable and solvable).
- Two of such possible extensions are proposed, ones that may be of first order importance to asses the implications of a green transition in countries that feature high degree of complementarity with green technology.

Comments on "Climate Change Around The World"

by Per Krusell and Anthony A. Smith Jr.

XXVI Annual Conference of the Central Bank of Chile:

"Implications of Climate Change and Ecosystem Services Degradation for Macroeconomic and Financial Stability"

Benjamin García (Central Bank of Chile) - Santiago, Chile - November 27, 2023

Bibliography I

LEE, T. M., E. M. MARKOWITZ, P. D. HOWE, C.-Y. KO, AND A. A. LEISEROWITZ (2015): "Predictors of public climate change awareness and risk perception around the world," *Nature climate change*, 5, 1014–1020.