Global scenario and other science issues and opportunities for climate related finance, investment, and transition risk assessment

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Four Themes

1. Climate policy «transition» risks and the financial sector
2. Climate policy revenues
3. Energy Investments
4. Climate Change «physical» risks and the financial sector

Climate policy «transition» risks and the financial sector

The importance of an Orderly Transition…

- If the financial community acts on these recommendations we will be two big steps closer to ensuring an orderly transition to a low-carbon economy.
- .. avoid a climate-driven “Minsky moment” – the term we use to refer to a sudden collapse in asset prices.

- Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. *Nature Climate Change*, *7*(4), 283–288.

…a different name for Delayed Action

- Bosetti, V., C. Carraro, A. Sgobbi, and M.Tavoni (2009) Delayed Action and Uncertain Stabilisation Targets. How Much Will the Delay Cost?, *Climatic Change*, Volume 96, Number 3, 299-312
- G. Blanford V. Bosetti C. Carraro R. Richels T. F. Rutherford M. Tavoni (2009) "Breaking the climate stalemate?" VOXEU, http://www.voxeu.org/index.php?q=node/4345
- Bosetti V. and D. Victor (2011). Politics and Economics of Second-Best Regulation of Greenhouse Gases: The Importance of Regulatory Credibility, *The Energy Journal*, Vol. 32, No. 1.
- Jakob, M., Luderer, G., Steckel, J., Tavoni, M., & Monjon, S. (2012). Time to act now? Assessing the costs of delaying climate measures and benefits of early action. Climatic Change, 114(1), 79–99. https://doi.org/10.1007/s10584-011-0128-3
- Luderer, G., Pietzcker, R. C., Bertram, C., Kriegler, E., Meinshausen, M., & Edenhofer, O. (2013). Economic mitigation challenges: how further delay closes the door for achieving climate targets. *Environmental Research Letters*, *8*(3), 034033. https://doi.org/10.1088/1748-9326/8/3/034033
- K. Safarzy´nska and J. C. van den Bergh (2017). Financial stability at risk due to investing rapidly in renewable energy. Energy Policy, 108:12–20, 2017.

- And many others..

Disorderly Transition increases macro-economic cost

Figure 4: The Impact of Policy Credibility on Regulatory Cost

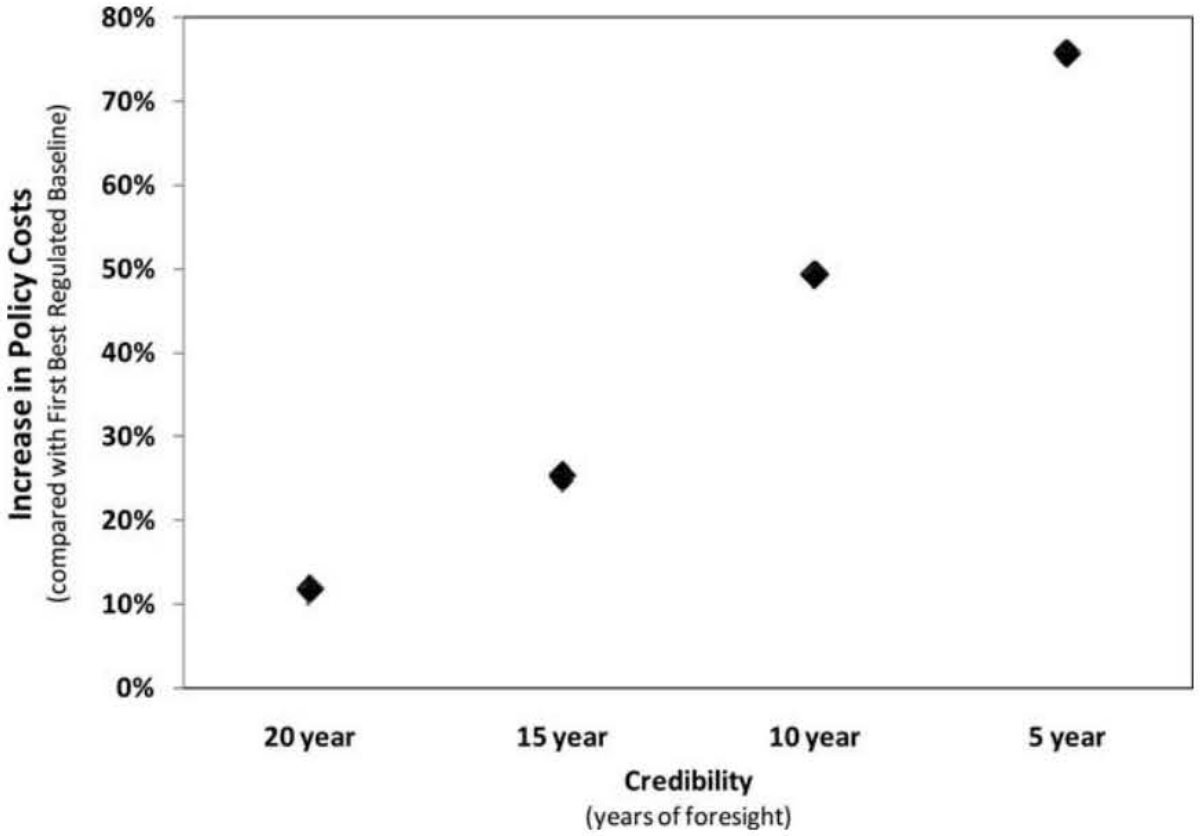
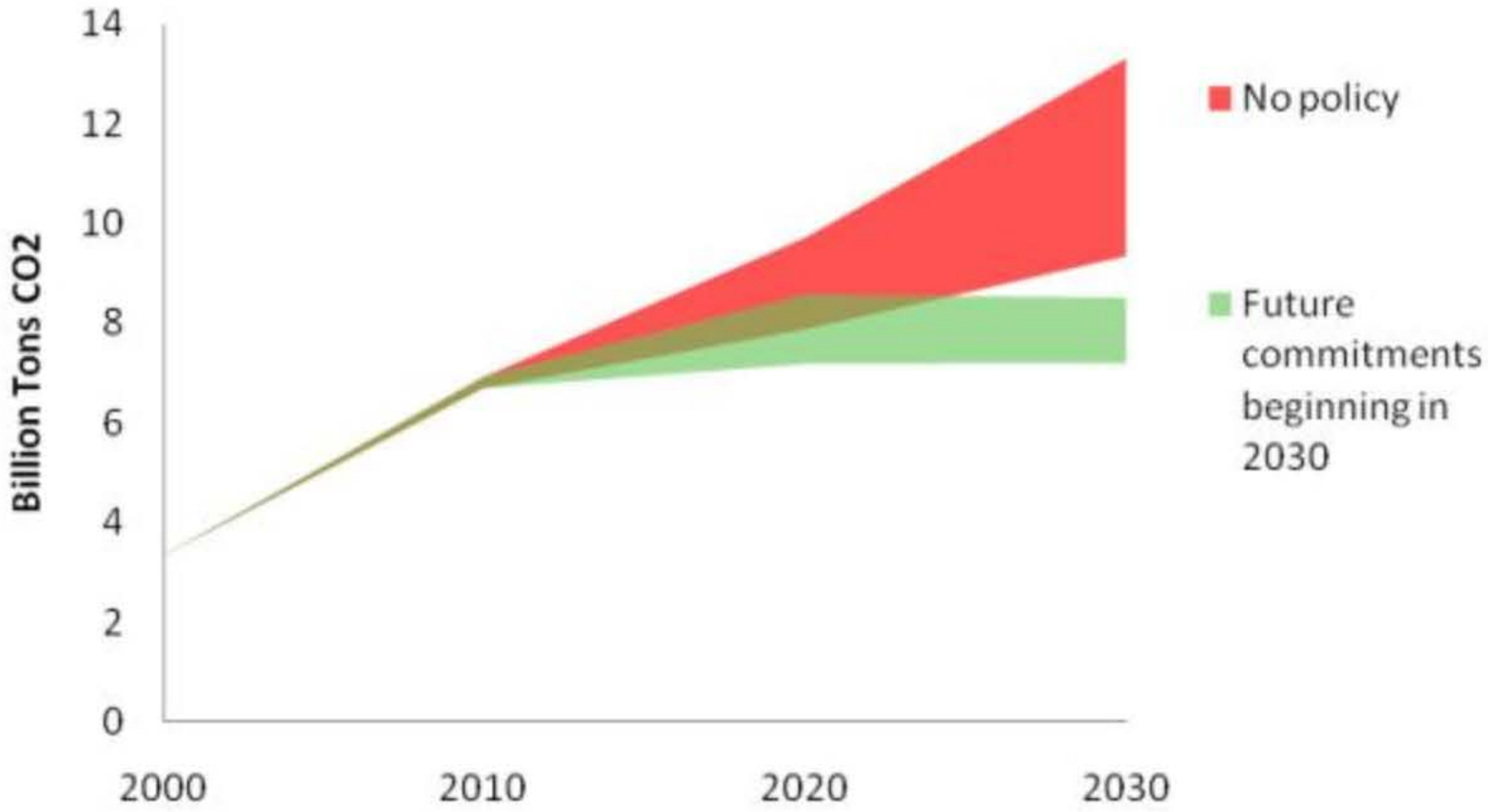


Figure shows extra cost for a complete credibility scenario (left side) and increasingly incredible policies, which we model by shortening the period over which agents can anticipate regulation. The shortest "zero credibility" period is 5 years, which is similar to the period needed to ratify and implement an international treaty that is negotiated with no warning. The "complete credibility" scenario is, for reference purposes, the same as variable geometry, variable sectors, no trade scenario shown in figure 3.

Bosetti and Victor 2011

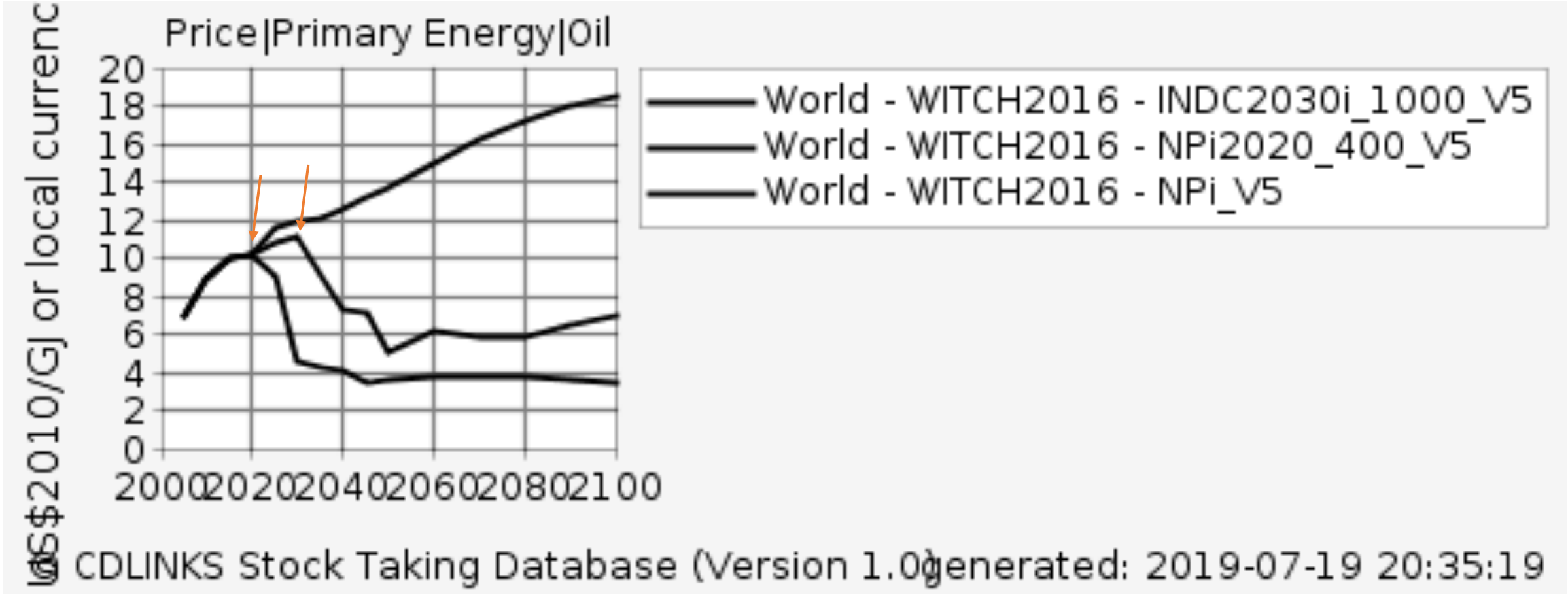
Figure 1. Energy-related CO2 emissions in China under a no-policy reference case and a future commitment scenario



Note that agreeing to future commitments beginning in 2030 leads to reconfiguration of capital stock beginning immediately. The ranges reflect differences between the two models used in the parallel studies.

Blanford, Bosetti, Carraro, Richels, Rutherford, Tavoni (2009)

Minsky Moment, the Oil Price in scenarios of disorderly transitions



Opportunities

- Communicate this set of **well known and robust results to users**
- Write white paper exploring **impacts on prices (and value of resource in the ground) and investments using existing "disorderly transitions" scenarios**.
- Transition and agro-land use changes

Climate policy revenues

Carbon Revenues

- Carbon Tax interacts with distortionary taxation
  - Barrage, Lint (2018) “Optimal Dynamic Carbon Taxes in a Climate-Economy Model with Distortionary Fiscal Policy” *Review of Economic Studies.*
- Equity - Efficiency trade offs
  - Bosetti, V., & Maffezzoli, M. (2013). Taxing Carbon Under Market Incompleteness. *SSRN Electronic Journal*.
  - Goulder, L. H., Hafstead, M. A. C., Kim, G., & Long, X. (2019). Impacts of a carbon tax across US household income groups: What are the equity-efficiency trade-offs? *Journal of Public Economics*, *175*, 44–64.
- Financial Sustainability
  - Bednar, J., Obersteiner, M., & Wagner, F. (2019). On the financial viability of negative emissions. *Nature Communications*, *10*(1)
  - Bowen, A., Campiglio, E., & Tavoni, M. (2014). A Macroeconomic Perspective On Climate Change Mitigation: Meeting The Financing Challenge. *Climate Change Economics*, *05*(01)

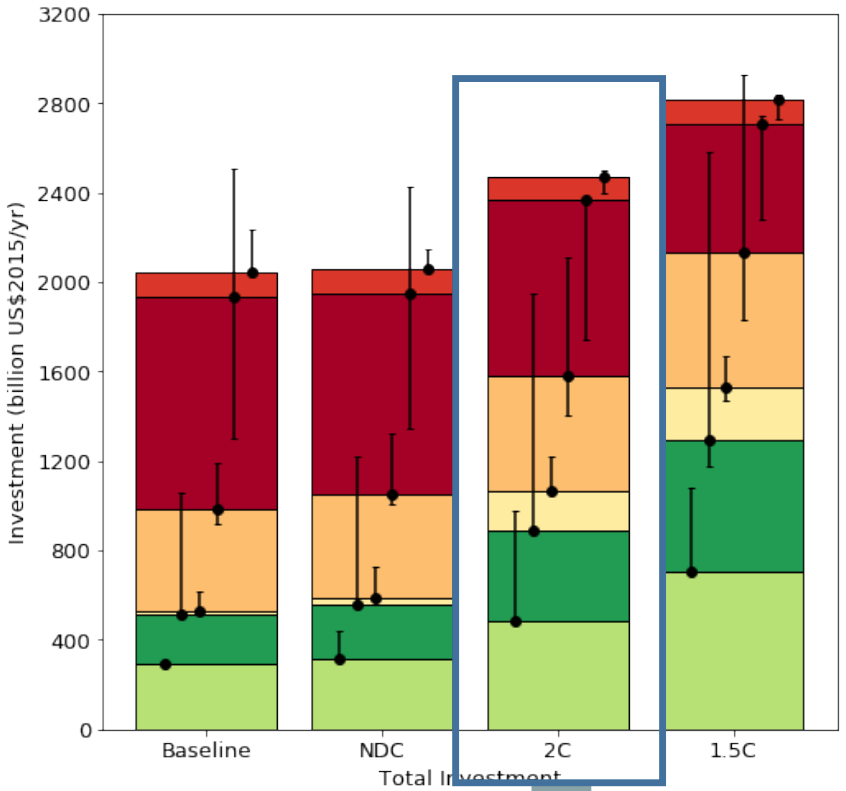
Opportunities

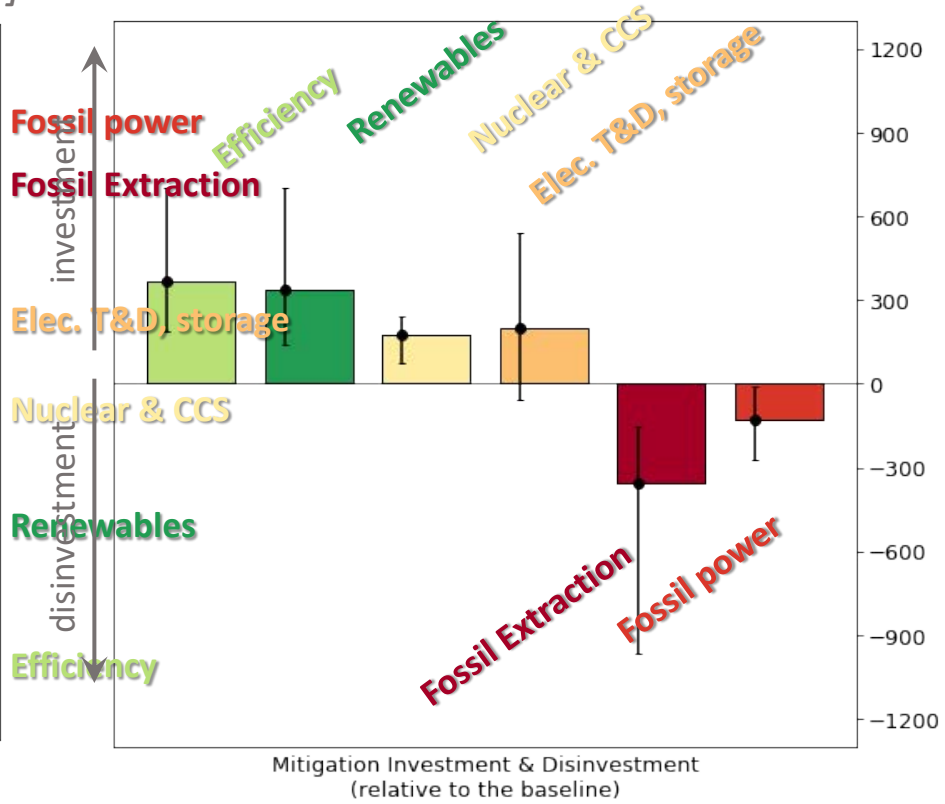
- Explore existing data on revenues from carbon pricing from existing scenarios
- Explore public finance implications of policy instruments **beyond carbon pricing**
- **Explore inequality implications of climate policy (risk of conflict)**

Energy Investment Gaps

Global Investment Portfolios for 1.5°C and 2°C

[average annual investments, 2016-2050]





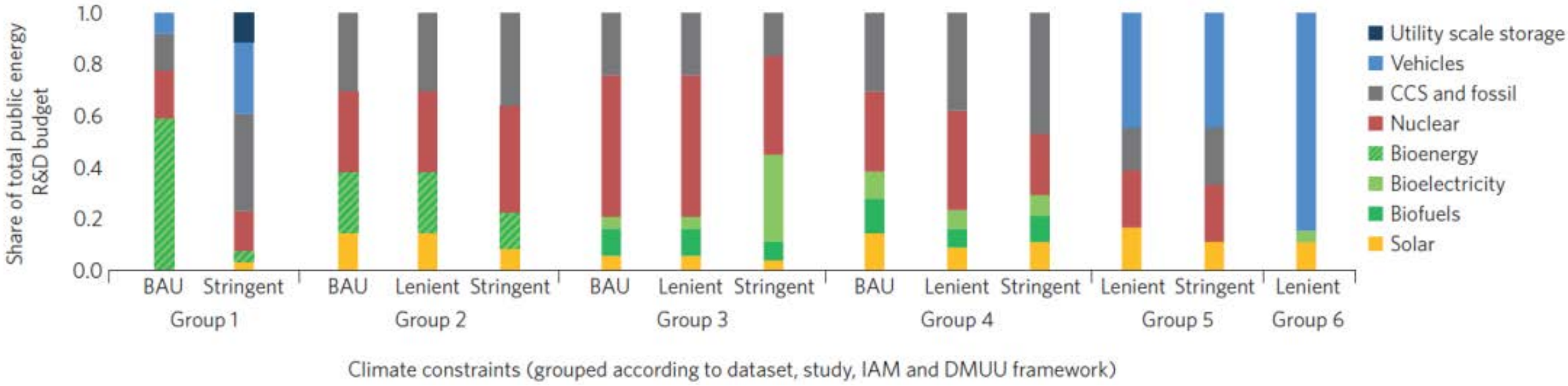
Whiskers = model ranges (n = 6)

Bars = model means (n = 6)
Whiskers = model ranges (n = 6)

2 °C compared to baseline

McCollum et al. 2018, Nature Energy

Or changes in Energy R&D



Anadon, Baker Bosetti 2017 Nature Energy

Few existing analysis of change in Investment Patterns in response to climate policy

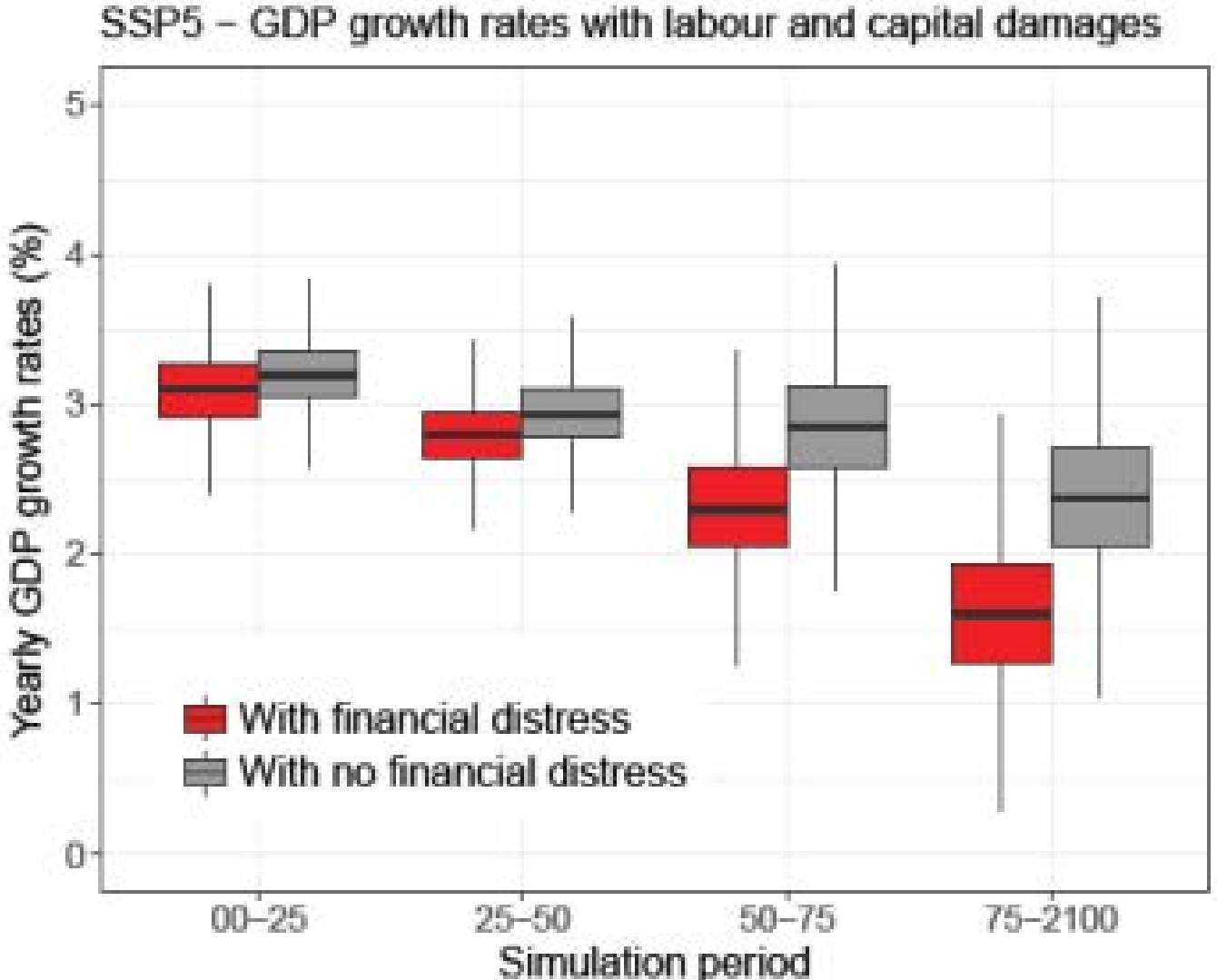
- Mccollum, D., Nagai, Y., Riahi, K., Marangoni, G., Calvin, K., Pietzcker, R., … Van Der Zwaan, B. (2013). Energy Investments Under Climate Policy: A Comparison Of Global Models. *Climate Change Economics*, *04*(04).
- McCollum, D. L., Zhou, W., Bertram, C., de Boer, H.-S., Bosetti, V., Busch, S., … Riahi, K. (2018). Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals. *Nature Energy*, *3*(7), 589–599.
- Anadon, Baker Bosetti 2017 Nature Energy

Opportunities

- Explore the role of **disorderly transition on investments numbers** (so far attention was on committed emissions, lock-in of capital, idle capacity)
- **Huge uncertainties on Energy Efficiency Investments numbers**
- Bring the focus on **non energy investments** as well
- Investments in innovation and energy R&D portfolio

Climate Change **“physical” risks** and the financial sector

Climate change impacts through the financial sector may be large and are mostly neglected



Lamperti, Bosetti, Roventini, Tavoni 2019

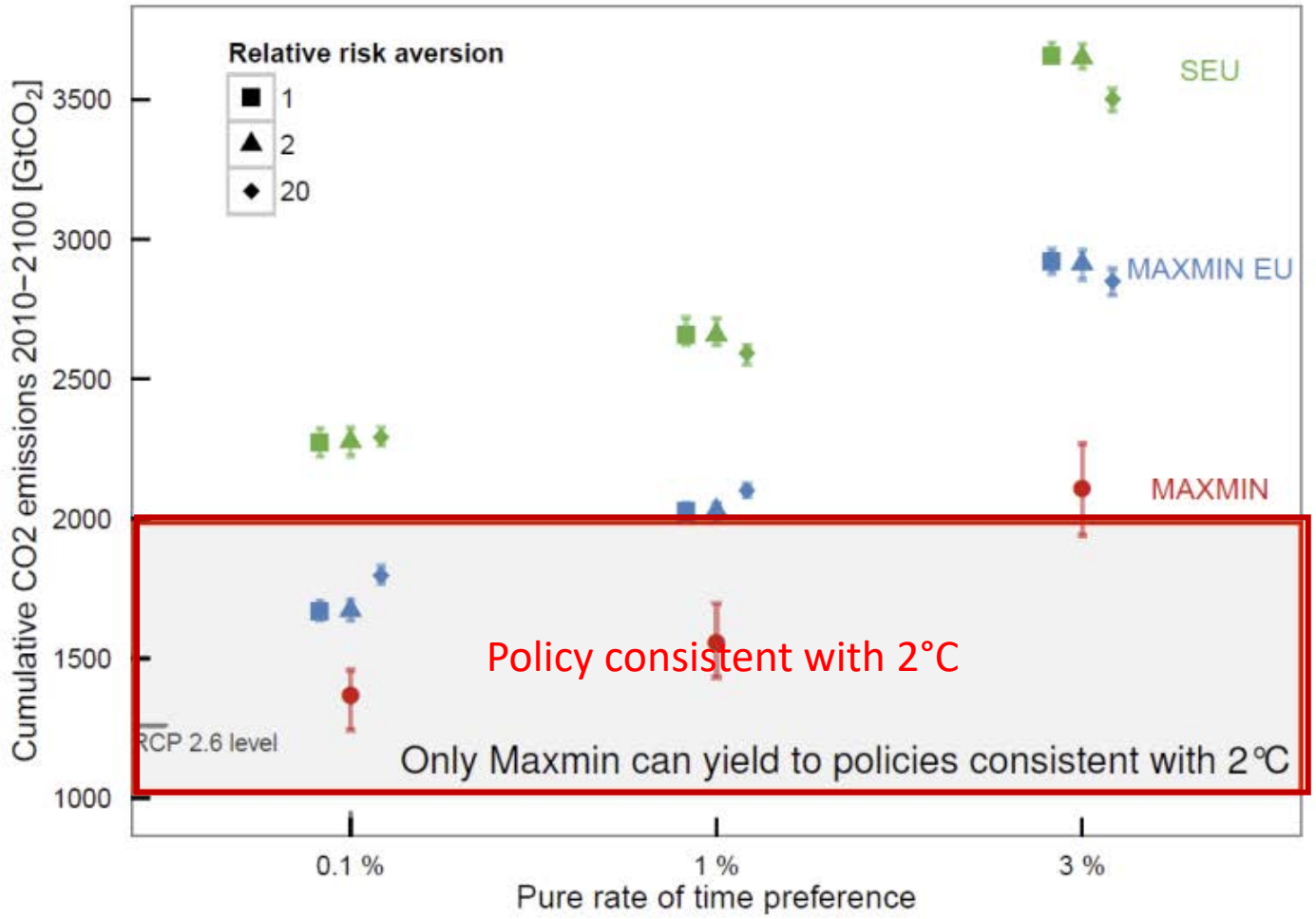
Climate Physical Risks and Financial Sector

- Dietz, S., Bowen, A., Dixon, C., & Gradwell, P. (2016). ‘Climate value at risk’ of global financial assets. *Nature Climate Change*, *6*(7), 676–679.
- Dafermos, Y., Nikolaidi, M., & Galanis, G. (2018). Climate Change, Financial Stability and Monetary Policy. *Ecological Economics*, *152*, 219–234.
- Lamperti, F. Bosetti, V, Roventini, A, Tavoni, M (2019) The public costs of climate-induced financial instability, MIMEO

Opportunities

- In the end, we want to hedge physical and transition risks.
- **NEED TO BRING THE TWO TOGETHER IN UNIFIED FRAMEWORK**

CBA under Uncertainty



Drouet, Bosetti, Tavoni, 2015, Nature CC

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Thank you!