Climate Damages and Climate Policy

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In Dire Straits

- “It is a fact that the climate crisis acutely threatens the survival of mankind.”
- “Solutions are extremely costly and have to involve;
  - complete change of lifestyle,
  - degrowth,
  - unseen structural change,
  - new economic system,
  - perhaps even removing democracy,
  - ,…”
- I will provide a quite different narrative.

How to assess climate damages?

- Two types of studies to quantify consequences of climate change.

i. **Bottom-up**. Specify areas of impacts. Study consequence at high geographic resolution and sum.

ii. **Aggregate correlation studies**. Use natural variation in weather (e.g., variation over time in yearly average temperature) and correlate with outcome variable like GDP growth rate.

Type i) Bottom-up

- **EU's PESETA project** good example of bottom-up approach. Consequences for 11 categories including: heat waves, windstorms, droughts, flooding, wildfires, agriculture and energy supply.
- **Results**: non-trivial but non-catastrophic impacts if 2 or 3 degrees global warming would hit our current society. Aggregate cost for EU in the order a percent of GDP. Similar to IPCC reporting 0.2-2% GDP losses from 2° warming.
- Increased mortality due to heatwaves and costs of flood damages largest but not only concern. Measures to build resilience very important.
- Substantial differences within EU. North not much affected.
- **Conclusion**:
  - Bottom-up studies provide credible, scientific and consistent evidence about climate damages. Very useful for adaptation planning.
  - But they exclude many costs like conflicts, migration, loss of biodiversity, tipping points and black swans. This is due to lack of evidence and not hidden.

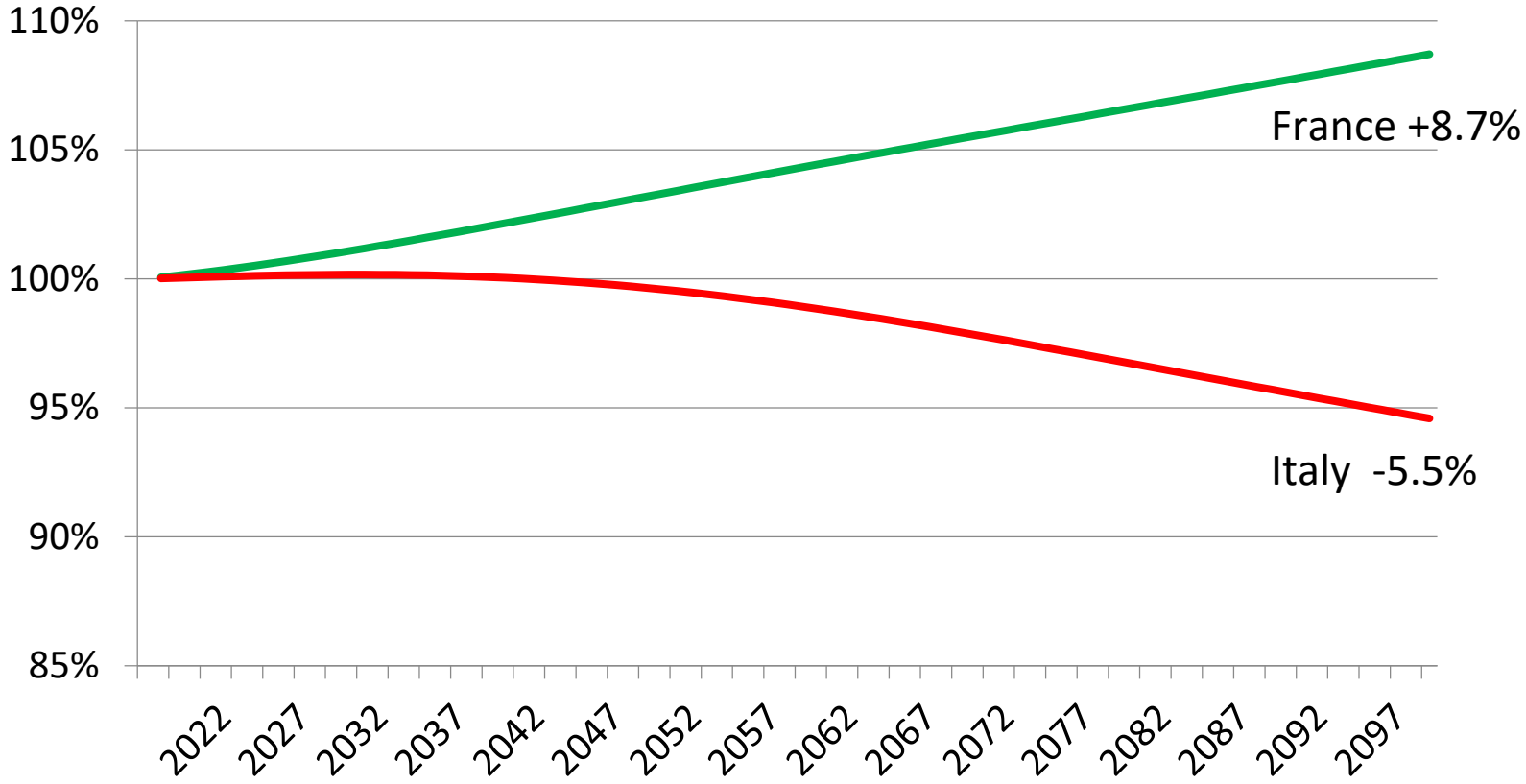
Type ii) Correlation studies

- **Idea**: Use natural variation in e.g., yearly or decadal average temperature. Assume climate change has the same effect as this variation on variable of interest.
- Difficult approach. What are the mechanisms? Can we extrapolate or are effects temporary? Many things can go wrong, especially if analysis is not embedded in our understanding of the process of long-run economic growth.
- Example of **influential** study. Burke et al. 2015 estimate a global quadratic relationship between yearly average national temperature and GDP growth rate.

$$GDP\ growth_{i,t} = \beta_1 Temp_{i,t} + \beta_2 Temp_{i,t}^2 + \text{country fixed effect and common trend}$$

- Estimates $\beta_1 > 0$ and $\beta_2 < 0$. Cold countries gain and hot lose from climate change. Losses larger than gains. Global effects an order of magnitude **larger** than in bottom-up studies.
- **Problem**: results for individual countries are not credible. I used estimates to quantify effects in EU if the global mean temperature increases by 2.5 degrees C this century.

Effects of 2.5 degrees increase in Global Mean Temperature on GDP/capita in EU15



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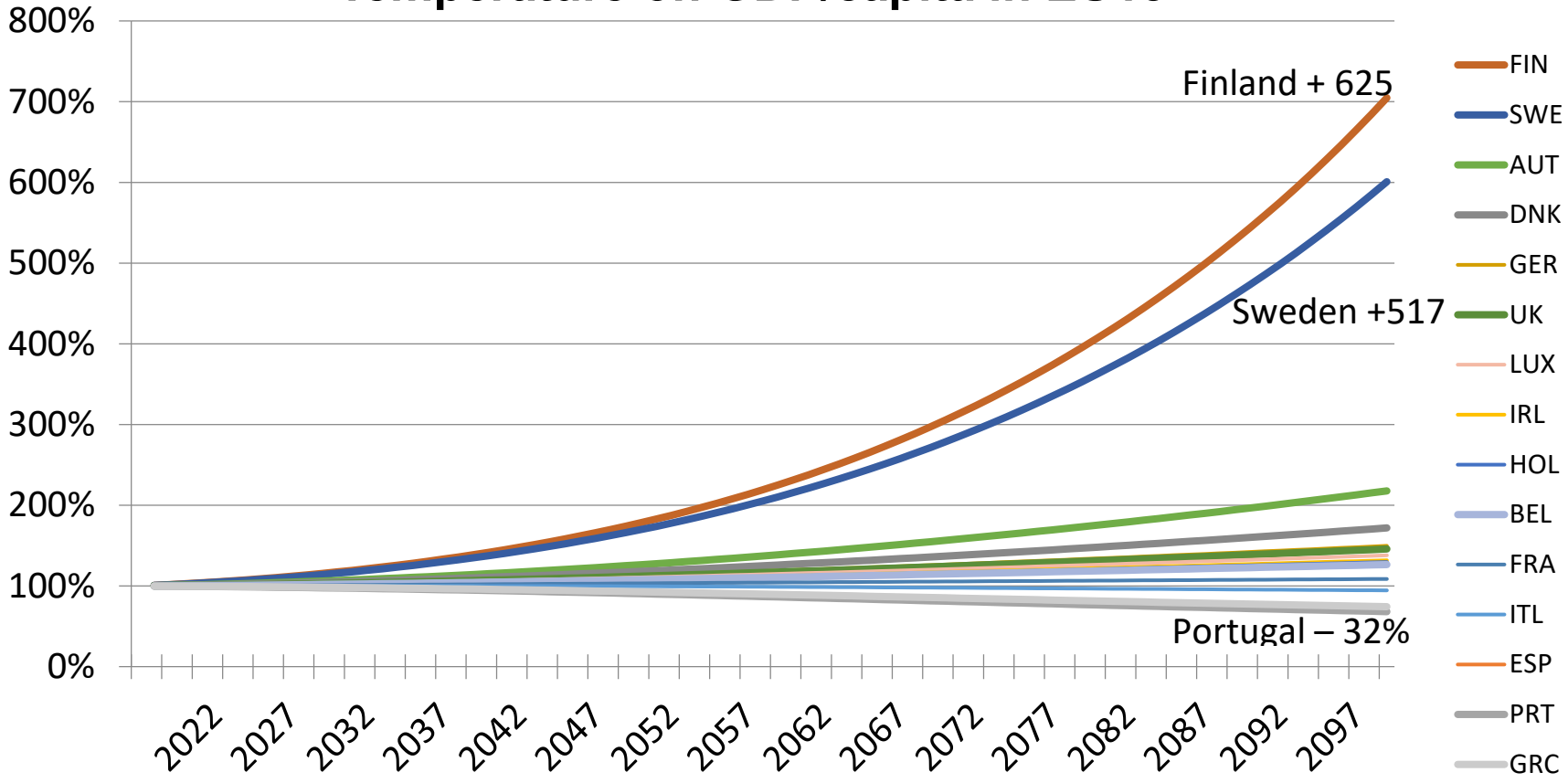

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- Estimates $\beta_1 > 0$ and $\beta_2 < 0$. Cold countries gain and hot lose from climate change. Losses larger than gains. Global effects an order of magnitude larger than bottom up.
- **Problem**: results for individual countries are not credible. I used estimates to quantify effects in EU if the global mean temperature increases by 2.5 degrees C this century.
- **Conclusion**: Correlation studies unlikely to provide credible information. Does not solve problem of how to quantify things missing from bottom-up studies, tipping points, re-settlement, biodiversity, black swans…

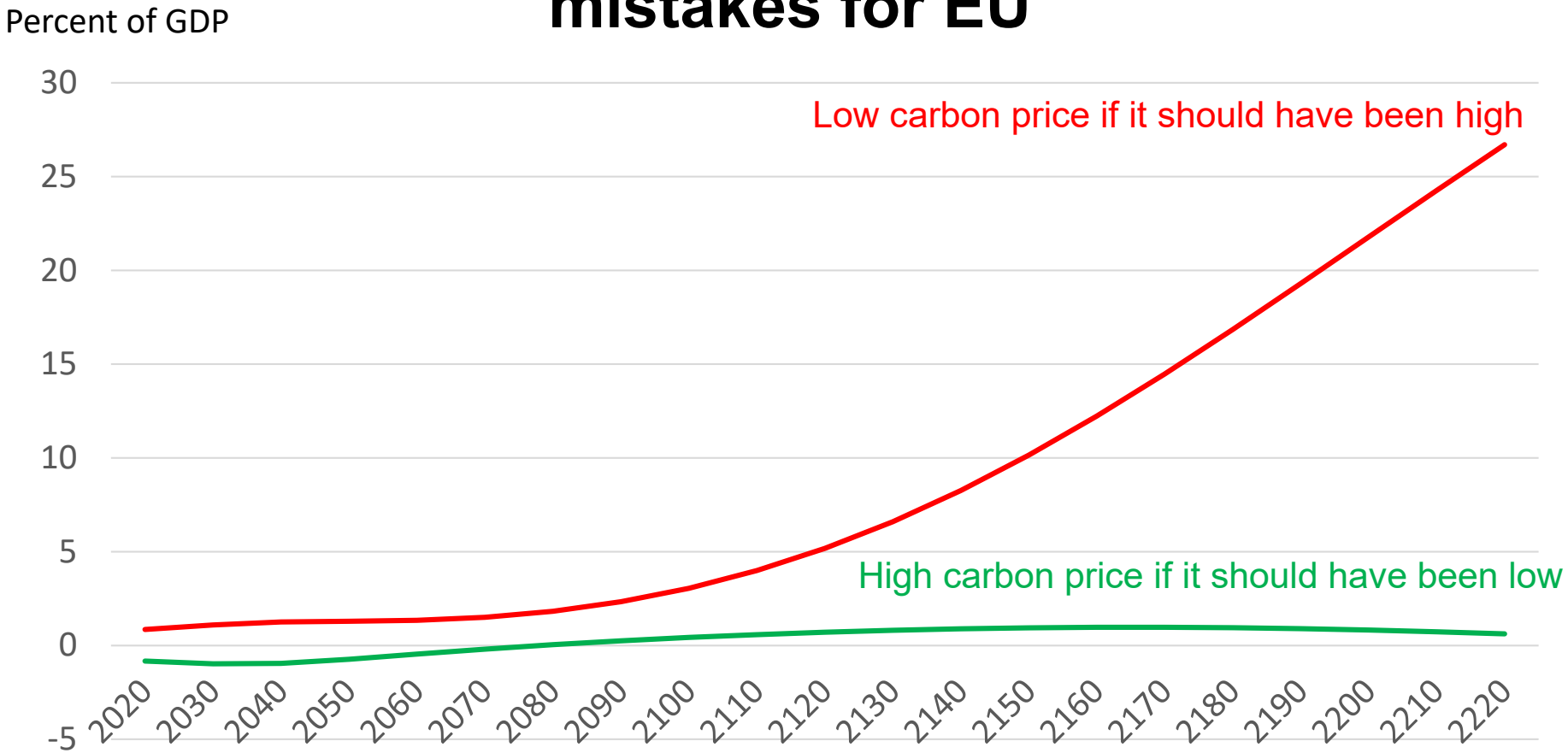
What to do when you don’t know

- Scientific evidence from bottom-up studies built on observational data points to fairly small and **non-catastrophic** consequences of climate change.
- But science **cannot rule out** very large dangers. Tipping points, collapse of globally important eco-systems, climate wars are possibilities that science cannot assign probabilities to. What then to do?
- One approach – use **guesswork** and speculation about the climate system, damages, and preferences to form assumptions that produce very **high optimal tax rates**.
- Nordhaus’ framework of Integrated Assessment Models (IAMs) can **easily incorporate** such assumptions. But this is a questionable approach that fails to be convincing.
- Nevertheless – I argue that IAMs with assumptions based on **evidence** can give highly **useful** policy advice.

Cost of possible policy mistakes

- Facing high uncertainty – policy will very likely *ex post* turn out to be suboptimal.
- In work with Krusell, Olovsson and Reiter, we therefore calculate consequences of two **opposite policy mistakes**.
    1. **Hope for the best.** Setting a low global carbon price (≅ zero) while we eventually learn that we should have set it high.
    2. **Precaution**. Setting a high global carbon price (≅ Swedish CO_2 tax) while we eventually learn that we should have set it low.
- Turns out that these mistakes have very **asymmetric** costs.

Cost of global climate policy mistakes for EU



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- Turns out that these mistakes have very asymmetric costs.
- These results come from an IAM building on a standard and **well-tested** global growth model. No speculative assumptions.
- Reason for result is that a price on emissions has relatively small distortionary costs but is quite effective also if it is modest (say 5 cents/ltr gasoline) provided it is (almost) global.

Conclusions

- Climate change is for real but aggregate consequences probably not very large.
- However, impossible to credibly assess probability of less likely and much worse scenarios.
- But this is not a **“wicked problem”**.
- An orderly transition, based on a global price of emissions, is an **insurance**. Not too costly if not needed but good to have if bad things happen. Small effect on growth and no need for a new economic system or “radical policies”.
- Even a modest price has large implications if imposed globally. But very costly to compensate for **free-riders**. Focus on implementing this robust conclusion rather than continuing endless discussions on the “optimal tax” based on speculative assumptions.
- EU ETS a showcase to the world. Should be expanded to transport and heating.
- Also need a **Plan B** for very bad-case scenarios. Possibilities exists and are not necessarily expensive. Planning for this should start now.

Using Lightsails as parasols