

# SUMMARY OF “ASSESSING CLIMATE CHANGE”

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The estimated economic value for a long-run project is extremely sensitive to minor alterations to the discount rate. This is because small changes to the annualized rate compound to much more significant differences over these time horizons. There is huge disagreement on the value of long-run discount rates, particularly when it comes to discounting climate change. Kolstad et al. (2014), a contribution to the latest IPCC Assessment Report, consider ranges of the consumption discount rate between 1.4 and 16 percent.

The aftermath of the Stern Review (Stern, 2007) illustrates the disagreement. Stern took a normative stand and advocated for a low discount rate. In a positivist response, Nordhaus (2007) argued for a higher discount rate consistent with observed behavior in the market. There is an ongoing and still largely unresolved debate over the appropriate choice of long-run discount rates. It is in light of this debate that I investigate how the discount rate used to assess intergenerational projects such as climate policy should be determined.

## Chapter 1

*Cross-dynastic intergenerational altruism* (solo-authored, unpublished) investigates how the discount rate is determined when the present generation has concerns for the future that extends beyond the welfare of their own descendants. A key finding is that the discount rate cannot be inferred from the market.

It revisits theoretically the traditional concept of intergenerational altruism used to define the long-term discount rate (in, e.g., Nordhaus, 2007 and, to some extent Stern, 2007). This concept is dynastic in the sense that the present members of a dynasty (family or tribe) do not care directly about the welfare of descendants of other dynasties. I generalize Sen (1961, 1967) and Marglin's (1963) model of intergenerational altruism by developing a cross-dynastic counterpart to the traditional concept, acknowledging that present members of a dynasty may care directly about the welfare of descendants of other dynasties (by a concern for sustainability, or if descendants may move or marry outside the dynasty). The present members of a dynasty may thus place some weight on the next generation as such. This in turn leads to a preference externality, since the saving of one dynasty benefits contemporaries in other dynasties (they also care cross-dynastically). I find that intergenerational altruism cannot be inferred from observed behavior, implying that positive calibration of discount rates does not respect preferences for the future.

I further show that the preference externality decreases with time. This means that a dynasty's preferred discount rate is smaller for long-term projects, leading to a time-inconsistency problem unless the dynasties cooperate. In general, a dynasty's preferred discount rate converges to the socially efficient one only in the limit, as time goes to infinity. This gives a new justification for declining (private) discount rates in the infinite horizon setting.

## Chapter 2

*Destructive intergenerational altruism* (co-authored with Geir Asheim, published in the Journal of the Association of Environmental and Resource Economics) investigates theoretically whether increased intergenerational altruism (by decreasing the discount rate) can reduce the threat of climate change, and finds that long-term wellbeing might be seriously undermined.

It argues that stronger intergenerational altruism (though decreasing the discount rate) can undermine future wellbeing if not complemented by collective action. Given the external effects of greenhouse gas emissions, dynasties (families or tribes living in a setting where there is no climate policy at the country-level) taking care of their descendants do not necessarily contribute to solving the efficiency problem that climate change poses, but may add gravity to the problem. Lowering the discounting rate may thus not promote the interests of future generations.

### Chapter 3

*Discounting disentangled* (co-authored with Moritz A. Drupp, Mark C. Freeman and Ben Groom, published in the *American Economic Journal: Economic Policy*) investigates empirically the extent of heterogeneity in expert opinion on the appropriate discount rate, and obtains a surprising degree of consensus. The project under consideration is generic, but application to climate change is discussed.

It undertakes a survey of (publication-based) experts in economics that influence discounting policy, on the discount rate to be used when assessing intergenerational projects including climate change mitigation. The seminal contribution by Weitzman (2001) was silent on the reasons for this huge variation in opinion, even on whether respondents were using positive or normative principles to inform their response. Methodologically, the survey improves upon some of the key limitations, and is the most detailed survey of expert opinion on the topic. A surprising degree of consensus is obtained. A key finding is that more than three-quarters of experts in economics are comfortable with a discount rate of 2 percent, highlighting that the views of Nordhaus (2007) and Stern (2007) may not be representative.

### Chapter 4

*Updating the Nobel Prize climate-economy model provides support for the UN climate targets* (co-authored with Martin C. Hänsel, Moritz A. Drupp, Daniel Johansson, Christian Azar, Mark C. Freeman, Ben Groom and Thomas Sterner, unpublished) investigates numerically whether the UN climate targets can be optimal in Nordhaus' climate-economy model.

This chapter is under publication in *Nature Climate Change* as *Climate economics support for the UN climate targets*, and is embargoed.