New approaches to decision-making under uncertainty in the economics of climate change

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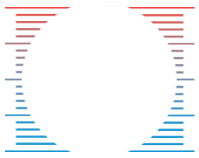

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Examples of economic decisions that depend on climate predictions

- Investment in flood defence and other means of adapting to climate change
- Investment in weather-sensitive methods of energy supply, e.g. wind and nuclear
- Growing new markets for insurance against weather
- National and global greenhouse gas emissions reductions targets

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In the beginning…

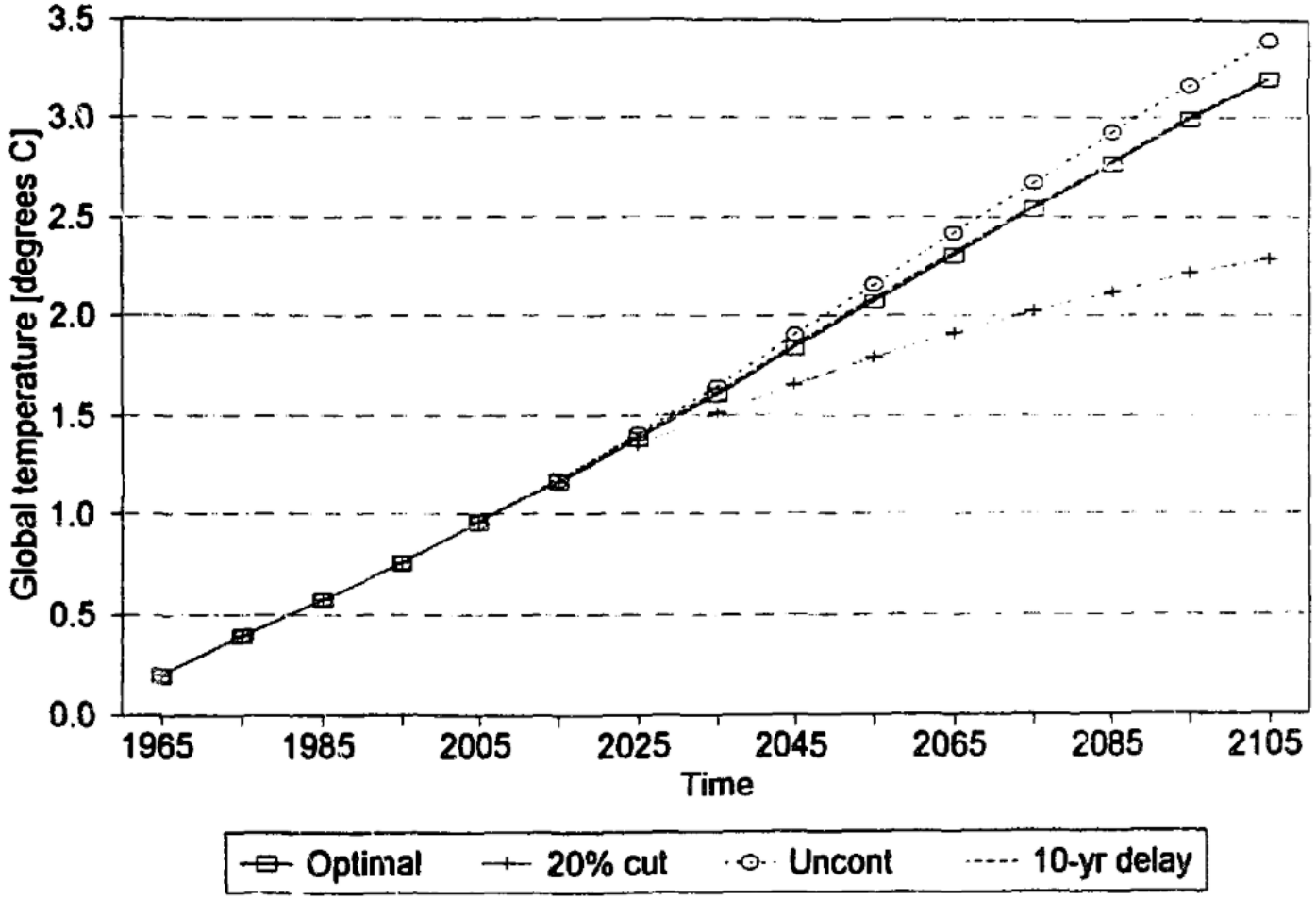
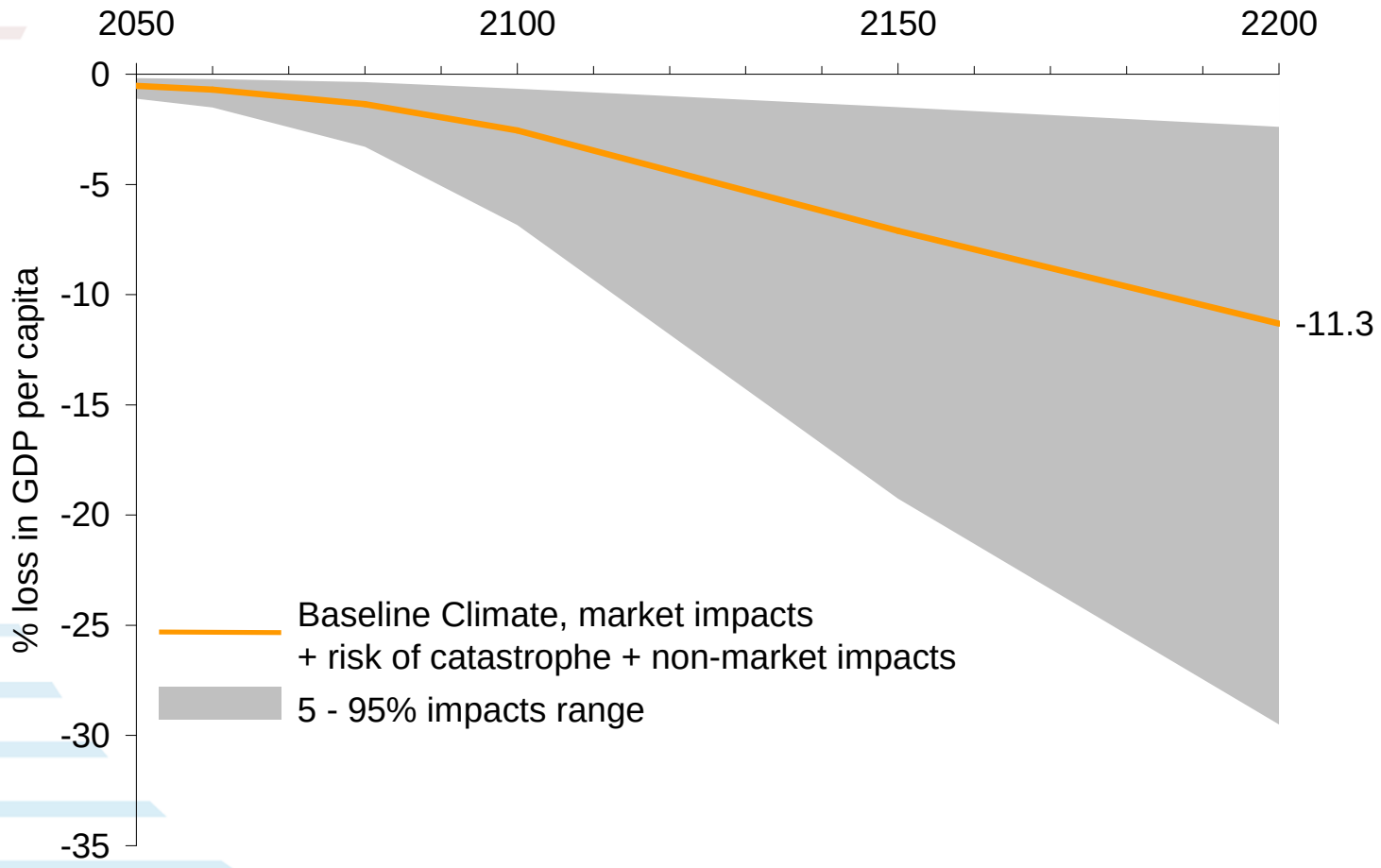


Fig. 4. Global mean temperature (°C, difference from 1860).

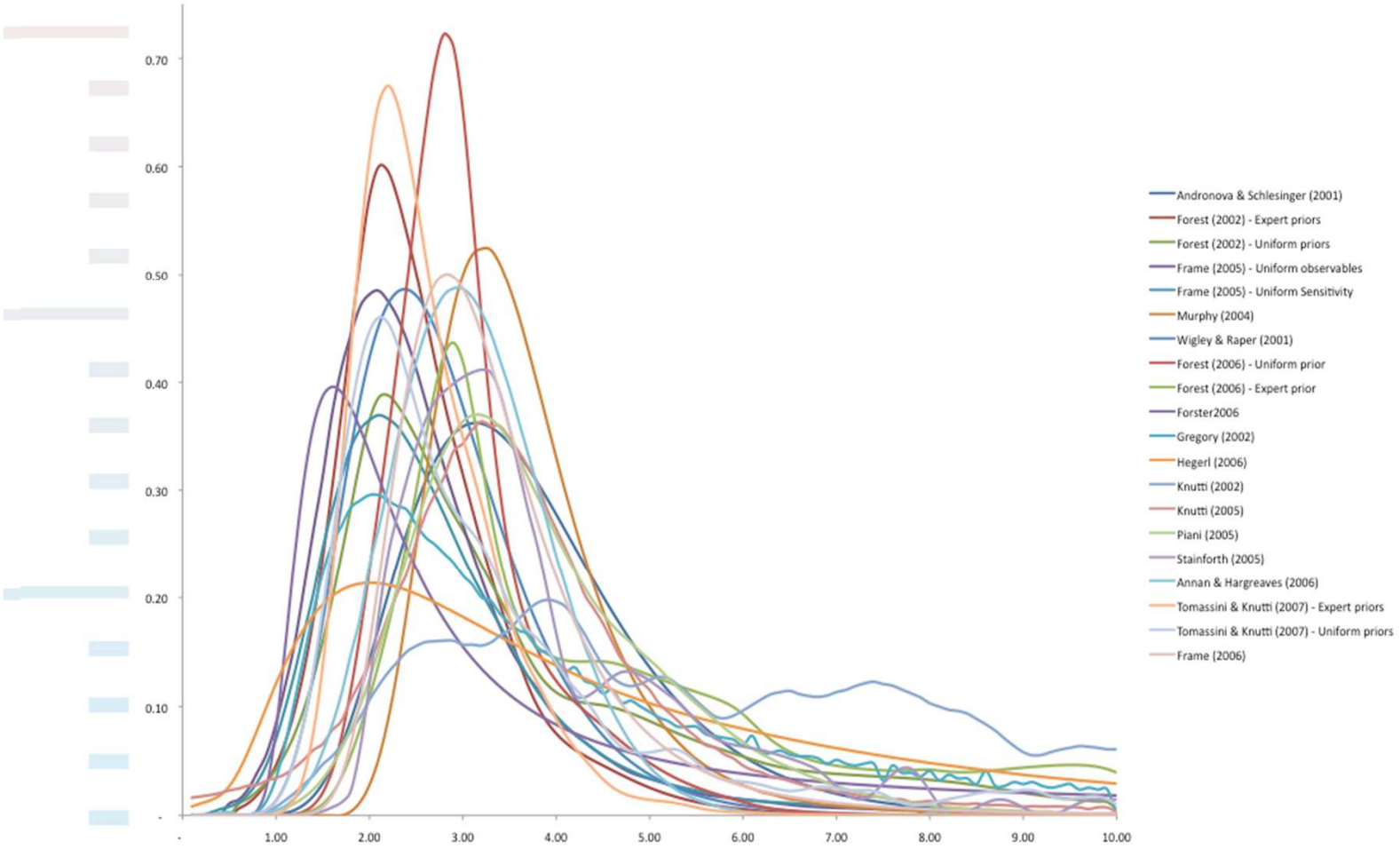
Source: Nordhaus (1993)

Probabilities and expected utility



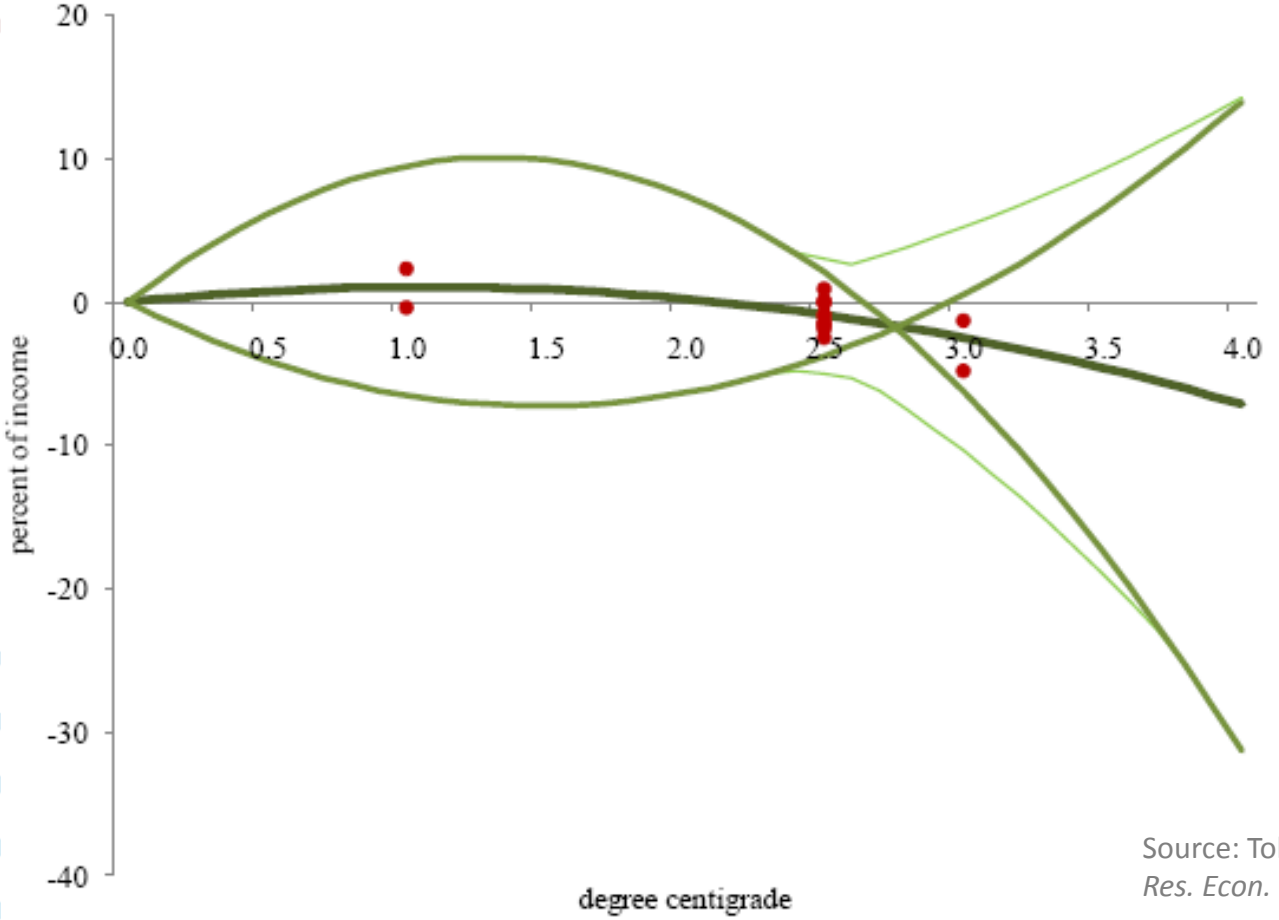
Source: Stern (2007)

But are our climate predictions of sufficient quality to sustain expected utility approaches?



Source: Malte Meinshausen

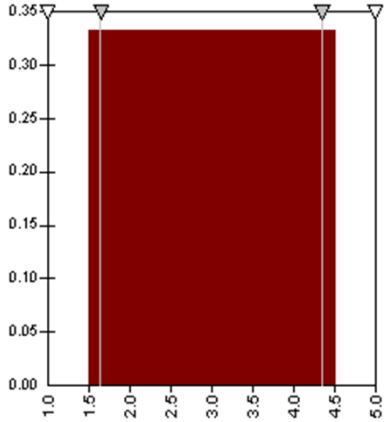
Never mind about climate change, what about our predictions of its economic consequences?



Source: Tol (2012) in *Env. & Res. Econ.*

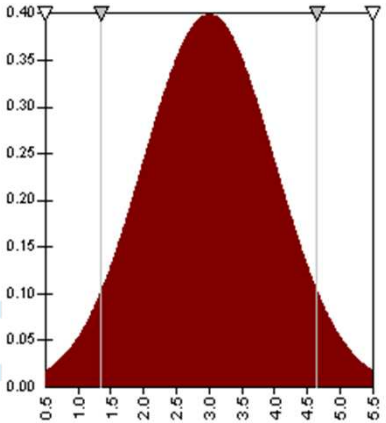
An alternative: the smooth model of decision making under ambiguity

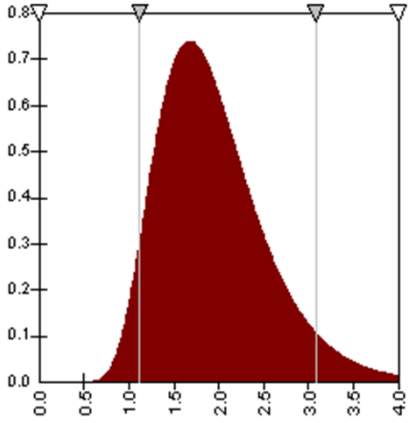
2nd order probabilities



$$V(f) = \sum_m p_m \varphi\left(EU_m(f)\right)$$

1st order probabilities





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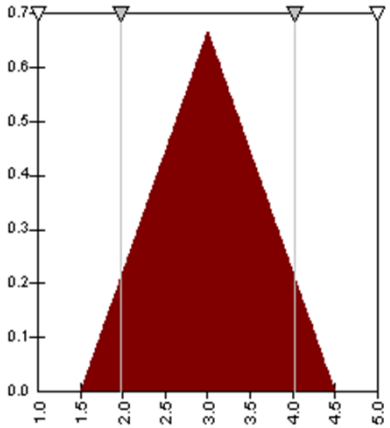

Another alternative: robust control

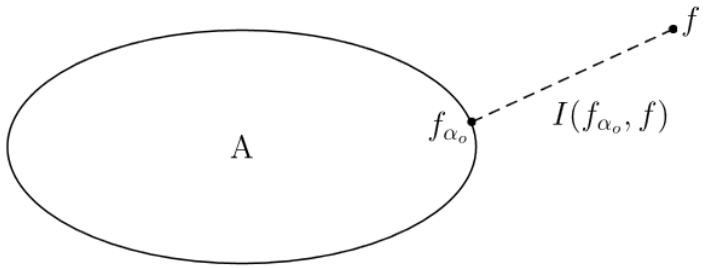

Figure 1.6.1: Econometric specification analysis. Suppose that the data generating mechanism is f and that the econometrician fits a parametric class of models $f_\alpha \in A$ to the data and that $f \notin A$. Maximum likelihood estimates of α eventually select the misspecified model f_{α_o} that is closest to f as measured by entropy $I(f_\alpha, f)$.

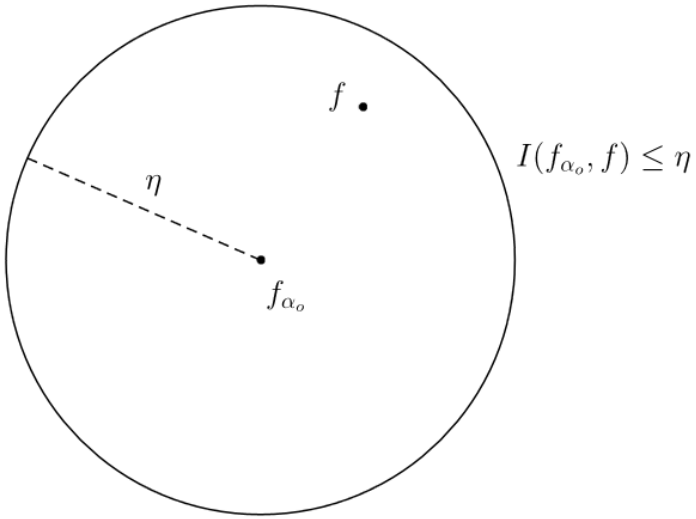

Figure 1.7.1: Robust decision making: A decision maker with model f_{α_o} suspects that the data are actually generated by a nearby model f, where $I(f_{\alpha_o}, f) \leq \eta$.

$$\max V(a) = \min_{f_\alpha} E_{f_\alpha} U(a)$$

Some concluding thoughts

- Recent developments have enabled research into the economics of climate change to be more realistic and sophisticated about uncertainty
  - But realistic and sophisticated *enough*?
- Policy relevance: general or specific?
  - Confirming the precautionary motive behind emissions targets
  - Some specific lessons for adaptation, e.g. real options story tends to warn against hasty investment in climate-proofing infrastructure