



Decision making with fat tails

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Dismal Theorem

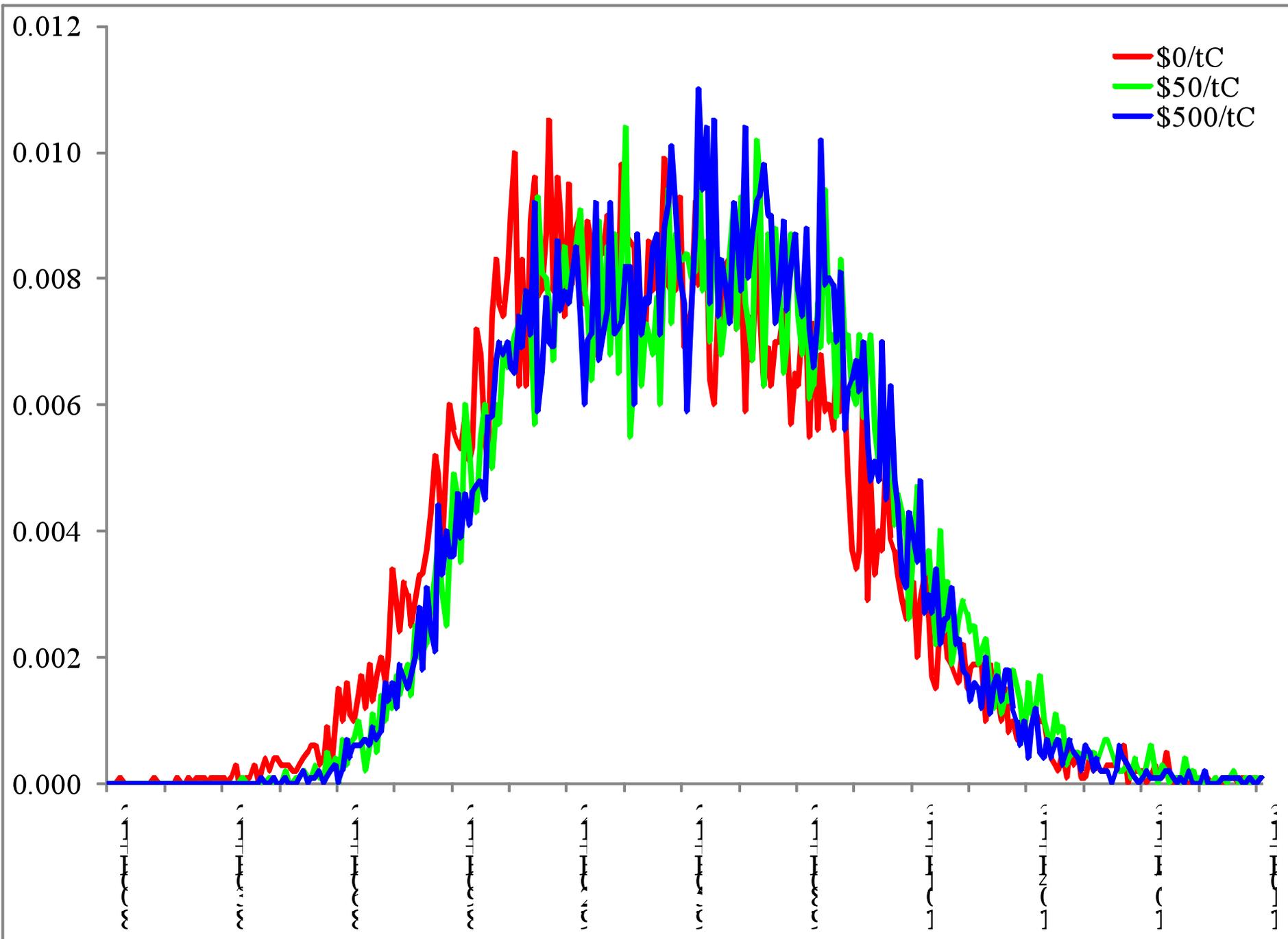
- Weitzman (2009) shows that the uncertainty about climate change may be too large for expected utility maximisation
- There is a non-zero chance that the impact of climate is so large that welfare shrinks - the Ramsey discount rate goes negative - net present welfare is large and negative in this scenario - and this impact grows faster than its probability falls
- The expectation is unbounded
- The Pigou tax is arbitrarily large

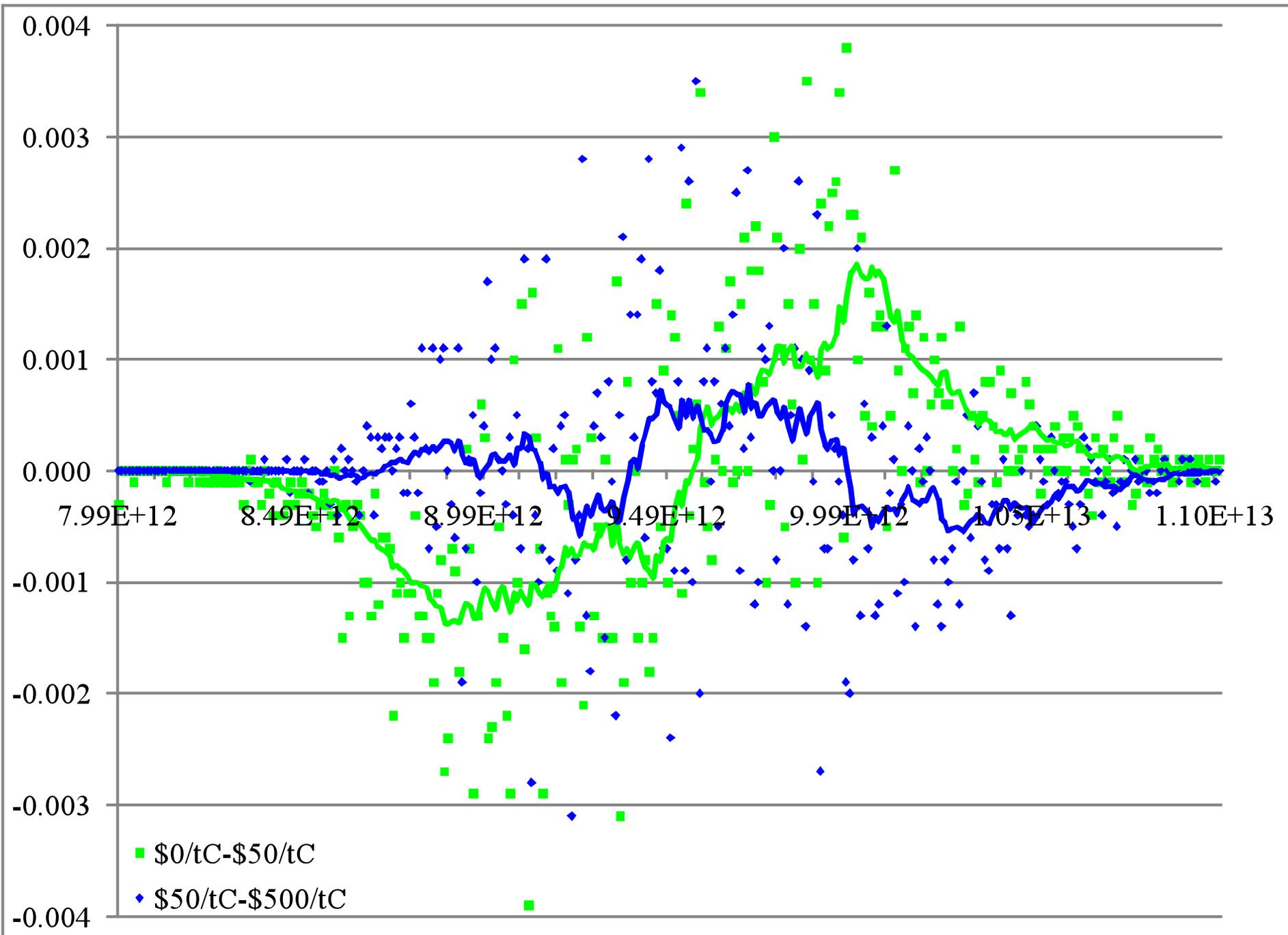


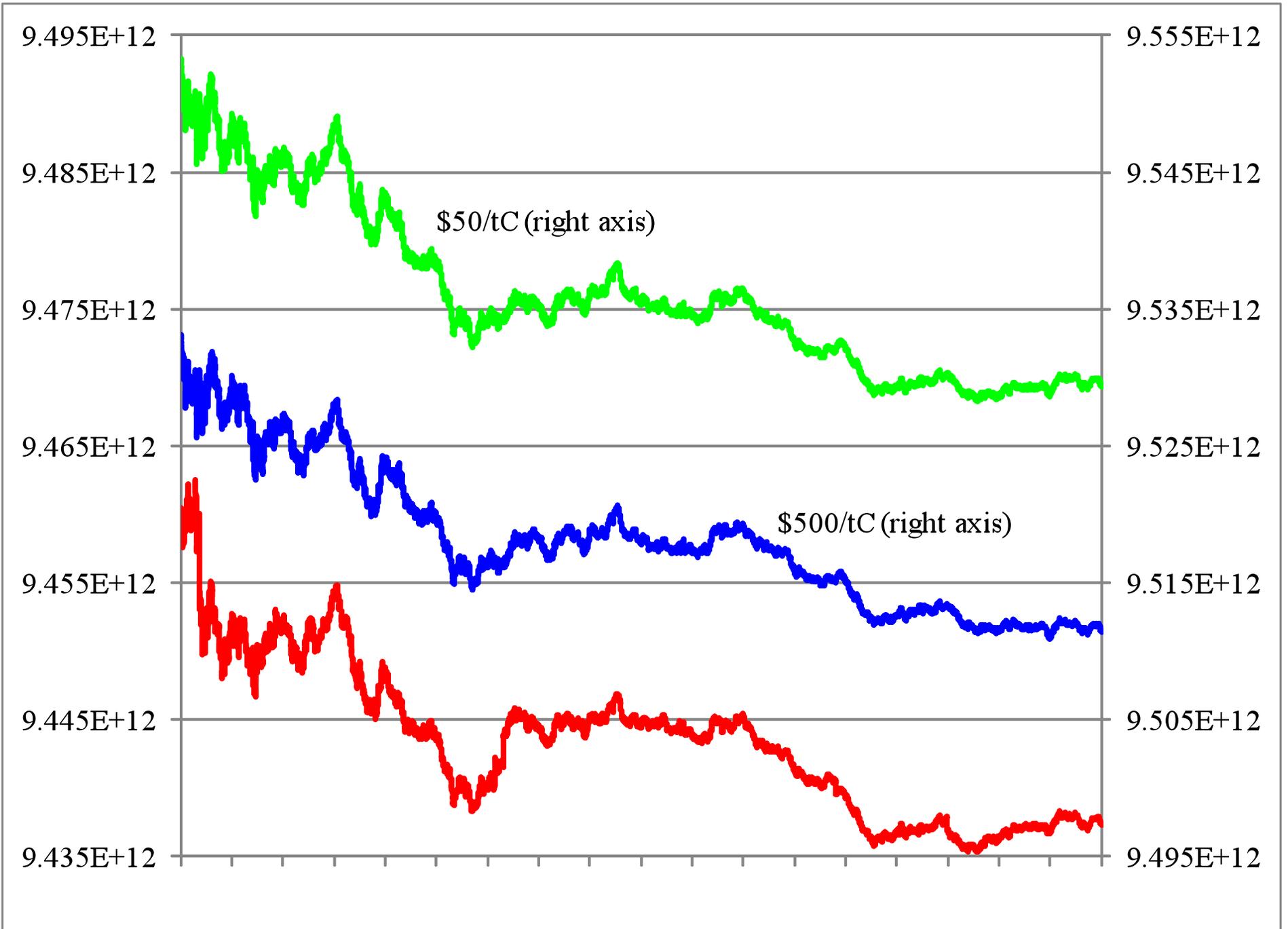
Policy Implications

- Some see the Dismal Theorem as a formalisation of the Precautionary Principle, others as a justification of stringent climate policy
- That's not true: The Dismal Theorem only says that you cannot use cost-benefit analysis in certain circumstances
- Weitzman does not indicate what to do instead
- Fossil fuels are an essential input in the short run, so an arbitrarily large carbon tax would do a lot of harm





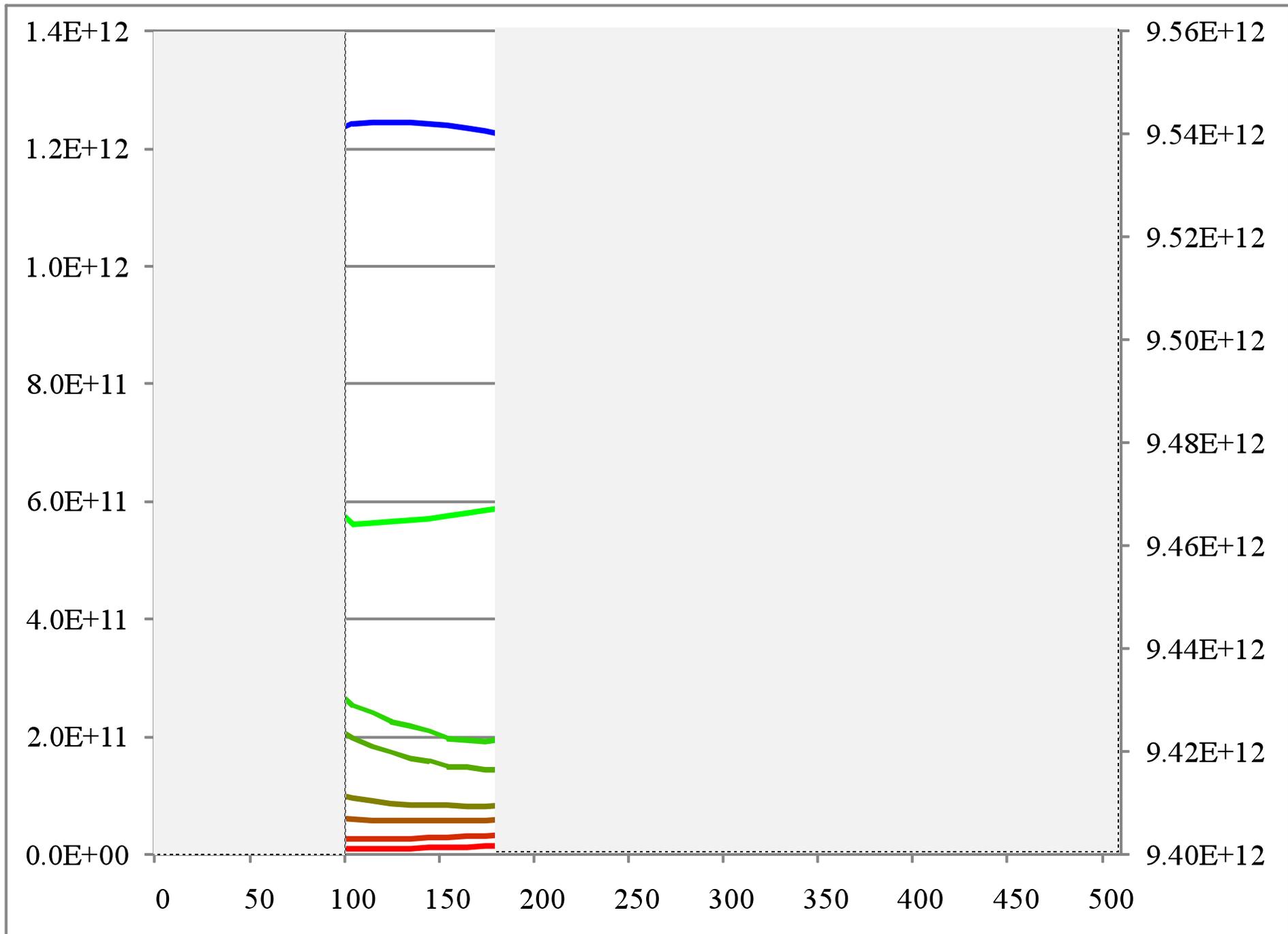




Minipercentile Regret

- Minimax regret is a standard decision criterion in case of large uncertainty
- For every state of the world, find the optimum tax
- For every tax in each state of the world, calculate the welfare difference from the optimum
- Across states of the world, find the tax that minimises regret
- As continuous on the real line, we here use percentiles rather than the maximum

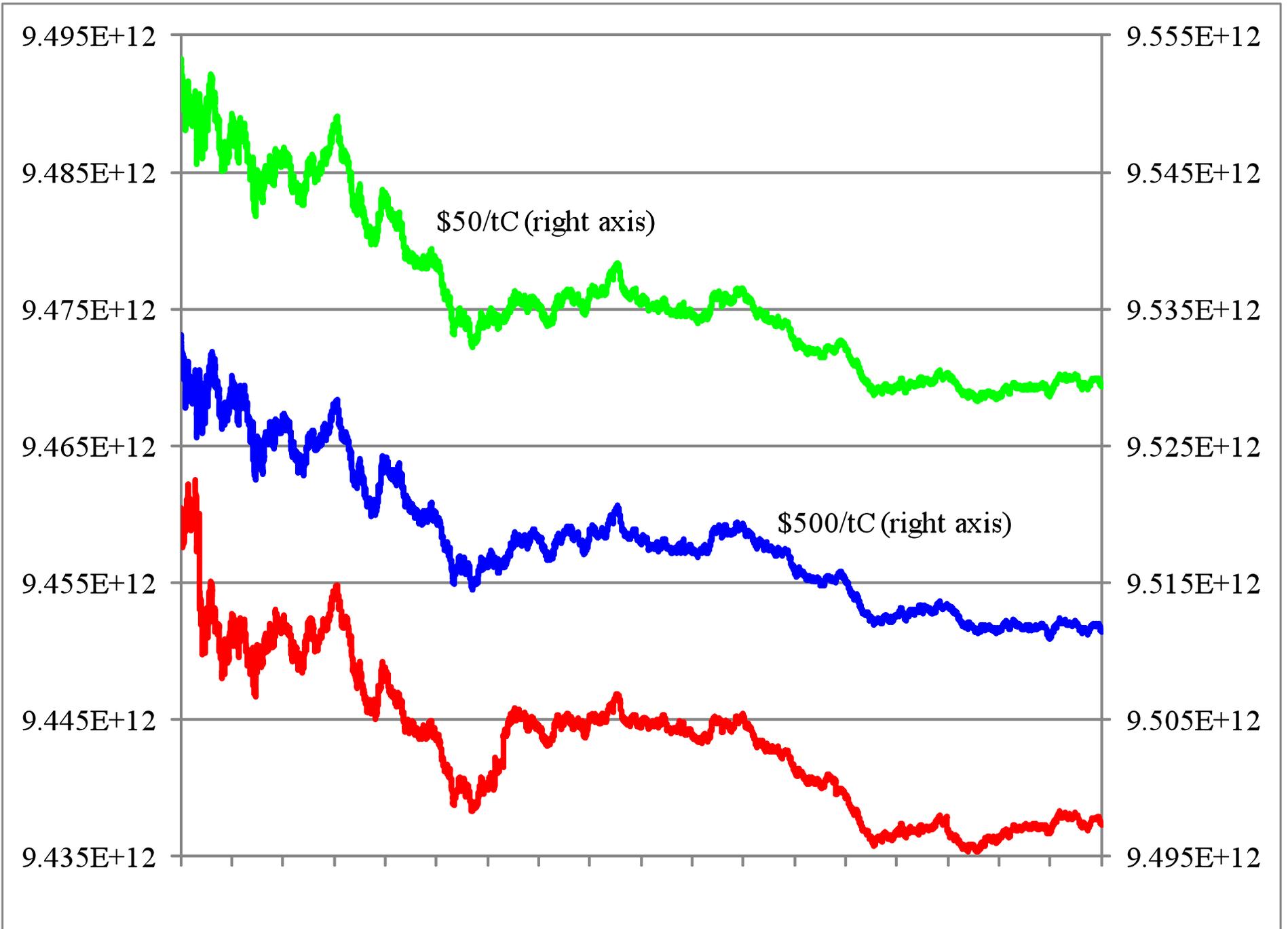




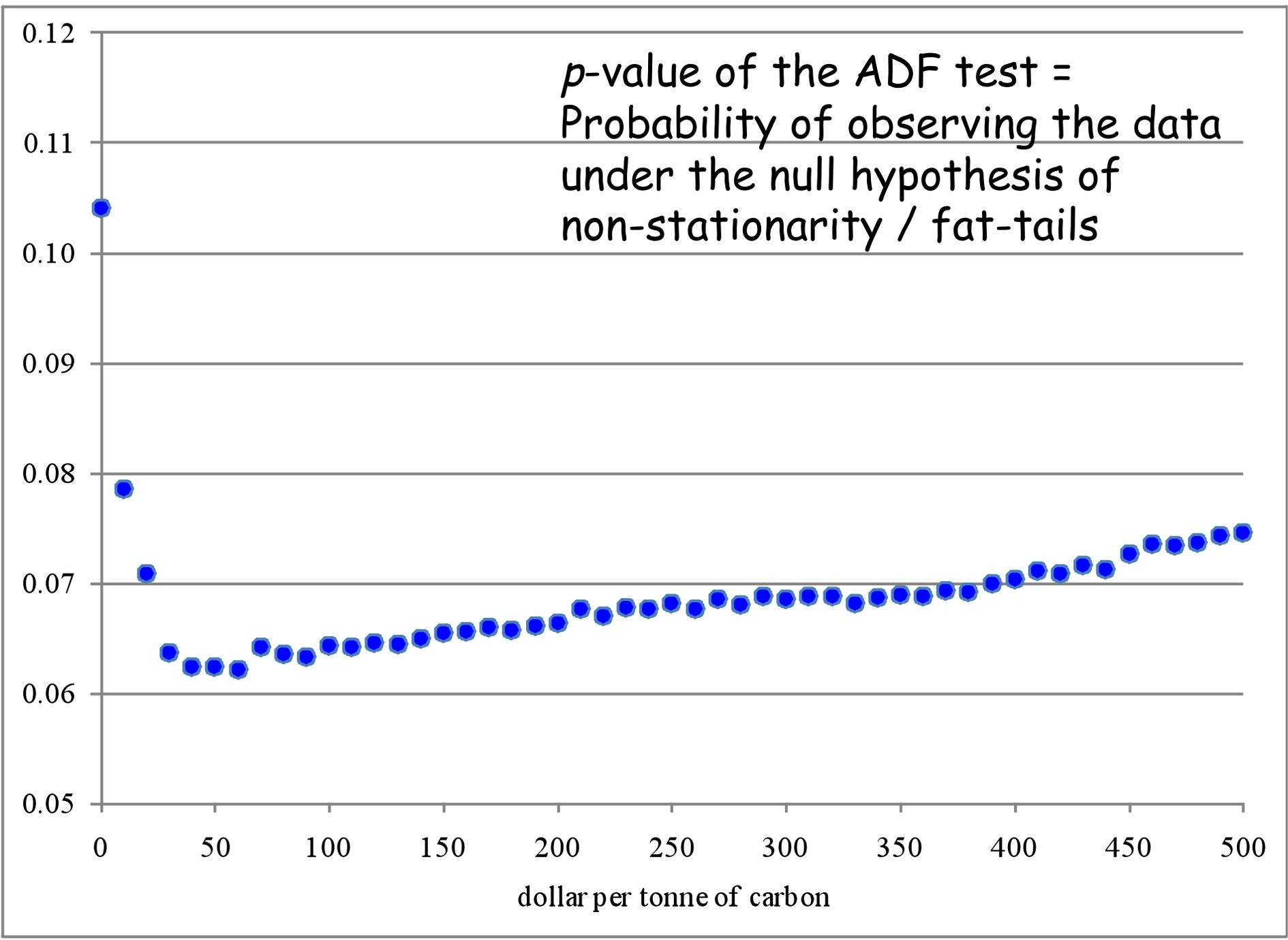
Alternatives

- In minimax regret, you do the best you can in each state of the world, and make sure you are robust to uncertainty
- There is no guarantee, however, that the outcome will be acceptable: Regret may be a small difference between very low levels of welfare
- Regret is a measure of the slope of the welfare function, rather than its level
- We therefore introduce two new criteria
 - (Minimize the risk in the tail / VAR)
 - Minimize the fatness of the tail





p-value of the ADF test =
Probability of observing the data
under the null hypothesis of
non-stationarity / fat-tails



Conclusions

- There is dangerous climate change
- There is dangerous climate policy too
- We characterise the Dismal Theorem in a Monte Carlo analysis of a numerical model
- We use four alternative decision criteria, two old, two new, which show that the “Pigou with fat tails” tax should be between \$10 and \$340/tC
- That’s a large range, but it is not an arbitrary number

