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Threshold Effects on Climate Change Policy

Morteza Chalak

Assistant Professor

Centre for Environmental Economics and Policy, School of Agricultural and Resource economics

University of Western Australia

35 Stirling Highway, Crawley 6009

E-mail: Morteza.Chalak@uwa.edu.au

David J. Pannell

Winthrop Professor

Centre for Environmental Economics and Policy, School of Agricultural and Resource economics

University of Western Australia

35 Stirling Highway, Crawley 6009

E-mail: David.Pannell@uwa.edu.au

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Threshold Effects on Climate Change Policy



THE UNIVERSITY OF
WESTERN AUSTRALIA

Morteza Chalak*, David Pannell*

*Centre for Environmental Economics and Policy, School of Agricultural and Resource Economics, University of Western Australia, Australia

Introduction:

Climate scientists have expressed concerns about possible sudden changes due to crossing a temperature threshold. For example, above a certain temperature level, we may face melting of the ice sheets of Greenland and west Antarctica – events that would have large economic consequences due to rising sea levels (Yohe and Schlesinger 1998).



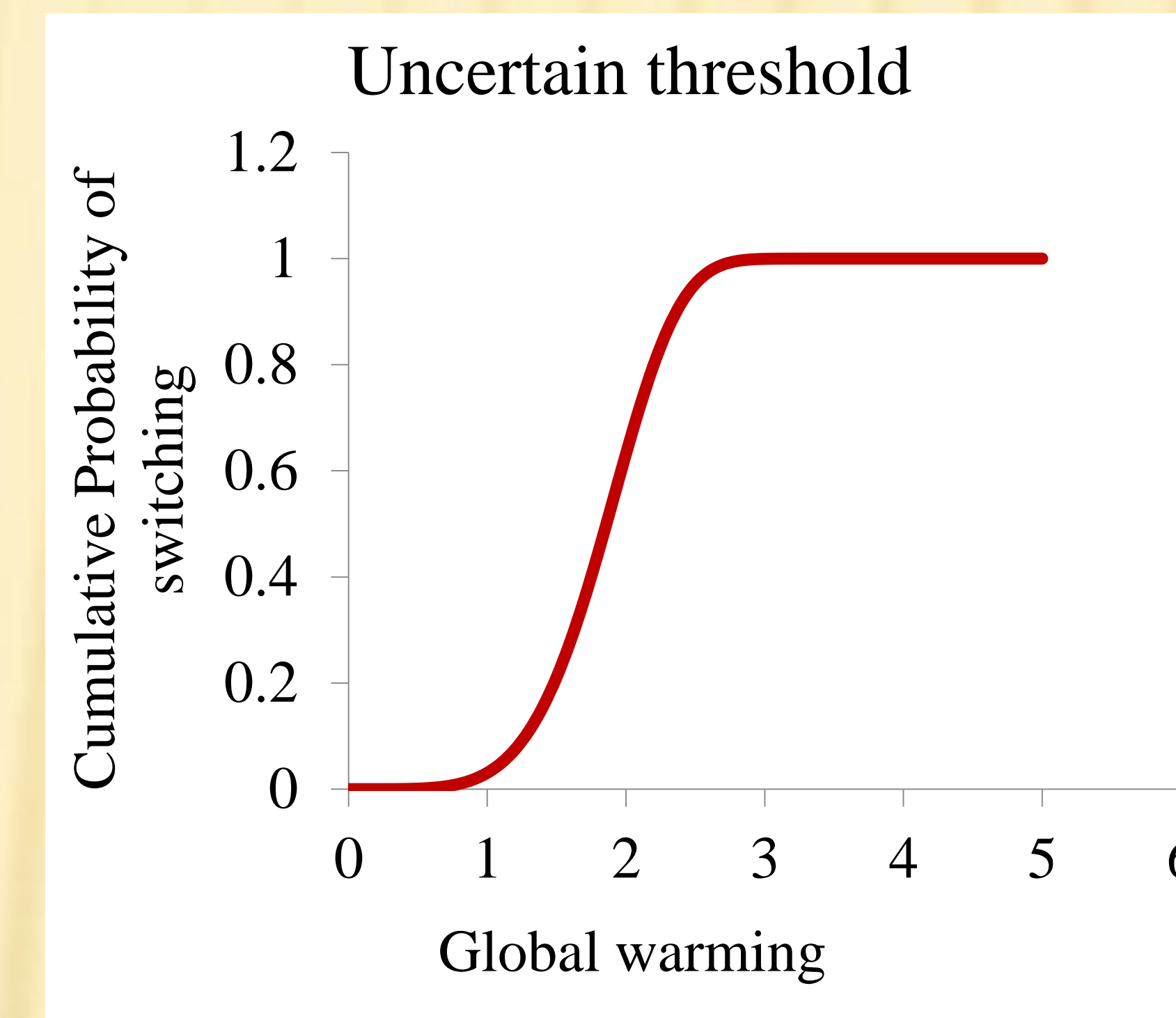
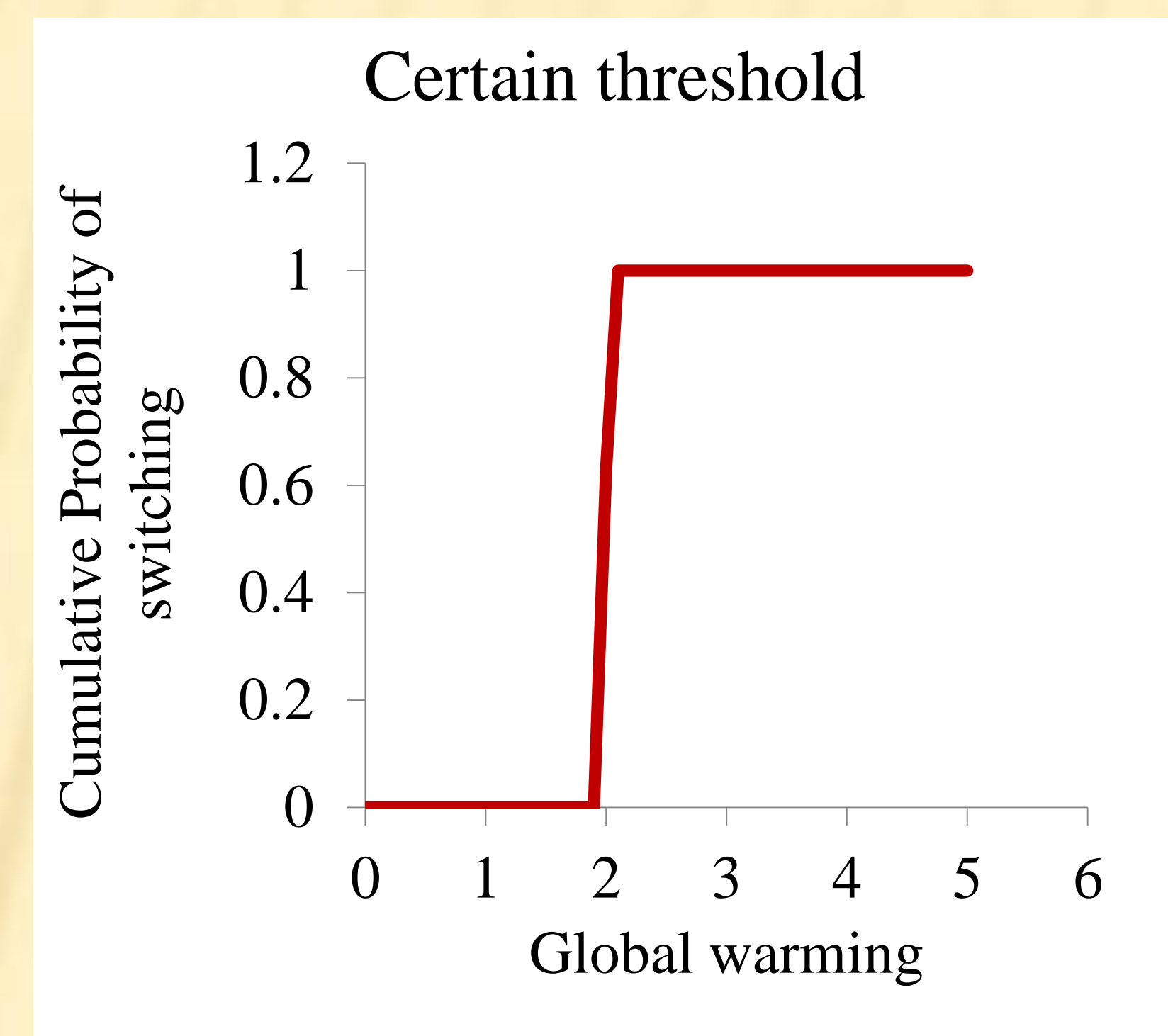
Although we suspect there may be a threshold temperature for this melting, there is high uncertainty about it. We study the economic consequences and policy implications of this uncertainty.

Research question:

How is optimal pricing of carbon emissions affected by uncertainty about the temperature threshold for major sea-level rise?

Model:

We assume that there is a temperature threshold, above which there is a 10% loss in GDP due to sea level raise. In one scenario we assume this threshold occurs at 2°C. The other, has a probability distribution for the threshold, with mean 2°C



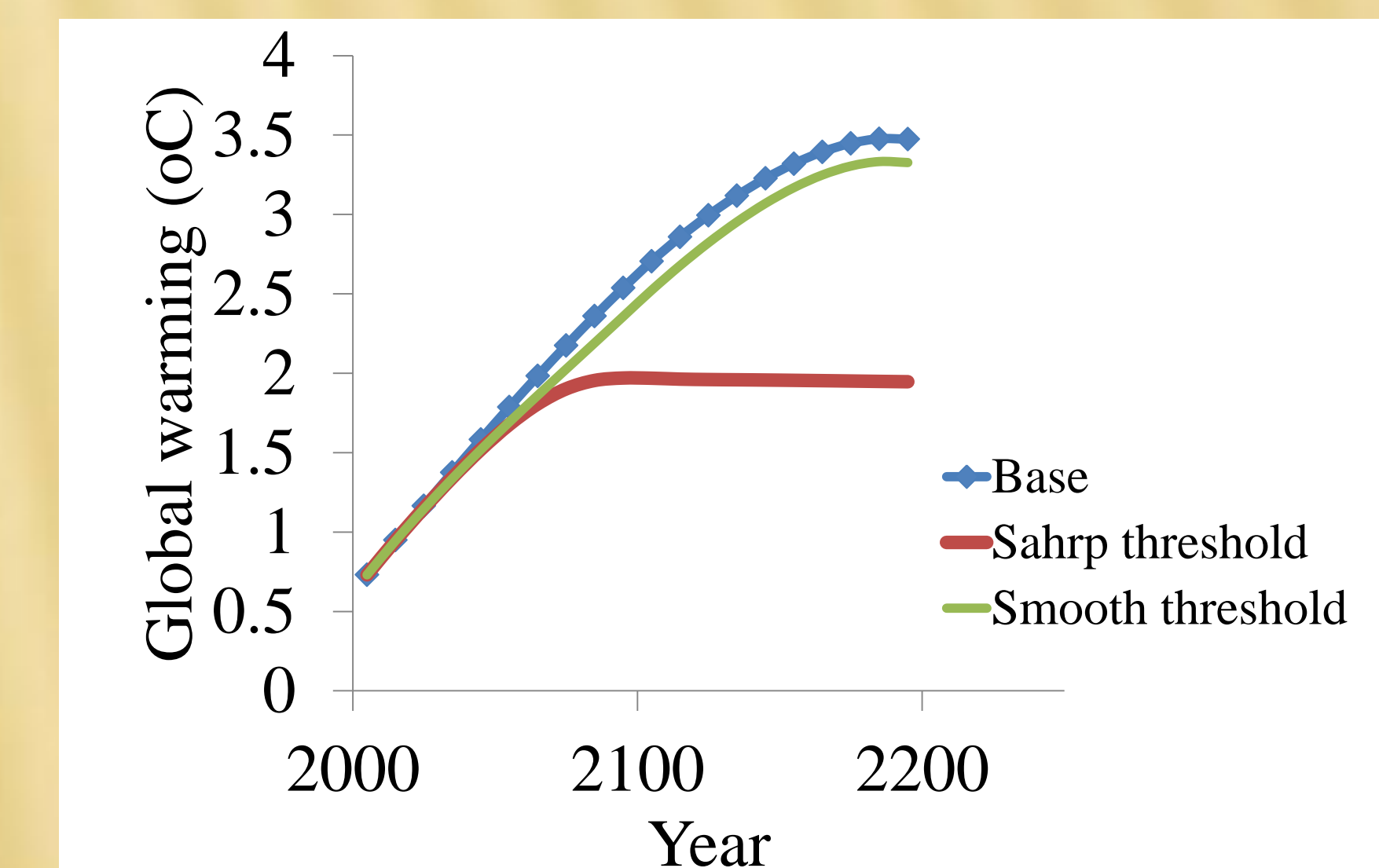
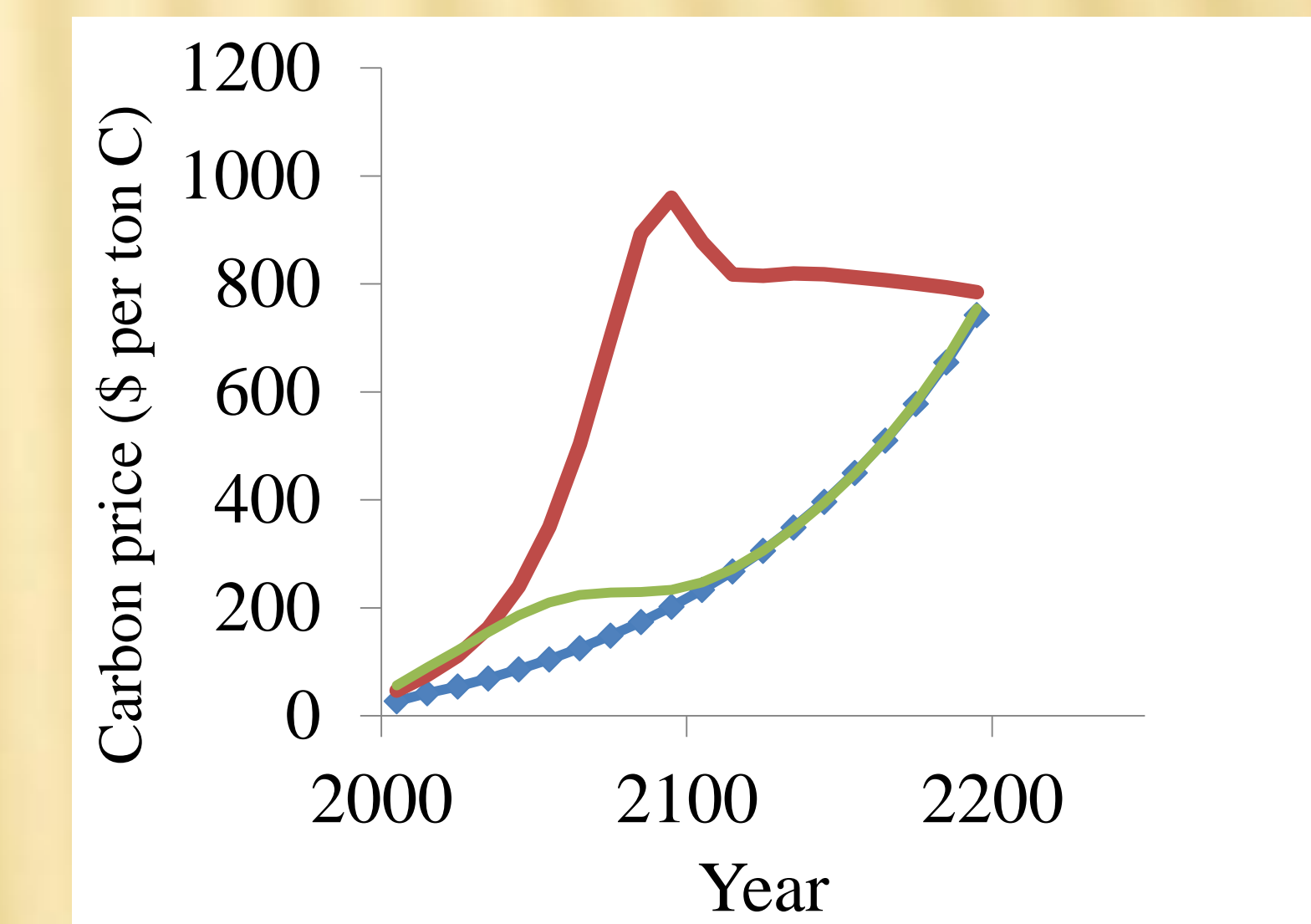
We use the DICE model (Dynamic Integrated model of Climate and the Economy) developed by Nordhaus (2009) to test the effect of certain and uncertain thresholds.



Results and conclusions

Results show the following:

- If there is a substantial increase in damage above a threshold temperature, the optimal carbon price is higher than for a scenario without such a threshold.
- After about 50 years, the carbon price given a certain threshold becomes much greater than under an uncertain threshold.
- The optimal strategy under a certain threshold keeps the temperature just below the threshold, whereas the optimal strategy for an uncertain threshold does not prevent the temperature rising substantially.



References:

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Yohe, G. W., and Schlesinger, M. E. 1998. Sea-level change: the expected economic cost of protection or abandonment in the United States. *Climatic Change*, 38(4), 447-472.