

CLIMATE TIPPING AND ECONOMIC GROWTH: PRECAUTIONARY CAPITAL AND THE PRICE OF CARBON

Frederick van der Ploeg
University of Oxford
and St. Petersburg State University

Aart de Zeeuw
Tilburg University
and Beijer Institute

Abstract

The optimal reaction to a climate tipping point which becomes more imminent with global warming is to be precautionary in adjusting capital to prepare for the calamity and to price carbon to make catastrophic change less imminent. The saving response can be positive or negative. If the mean lag for impact of the catastrophe is long enough, the saving response will be negative, because the precautionary return in the Keynes-Ramsey rule becomes negative. We also show the separate effects of the elasticity of intertemporal substitution (EIS) and the relative risk aversion (RRA) using Duffie-Epstein preferences. Focusing on a productivity catastrophe, we calibrate our model and show how sensitive the policy responses are to the degrees of EIS and RRA, the trend rate of economic growth, the hazard rate, and how long it takes for the catastrophe to have its full impact. (JEL: D81, H20, O40, Q31, Q38)

The editor in charge of this paper was Dirk Krueger.

Acknowledgments: We are grateful to the detailed comments and advice of Dirk Krueger and five anonymous referees. We also thank Darrell Duffie, John Hassler, Niko Jaakkola, Larry Karp, Per Krusell, Derek Lemoine, Matti Liski, Thomas Lontzek, Antony Millner, Billy Pizer, Christian Traeger and Sweder van Wijnbergen for helpful comments. We have benefited from presentations in London, Amsterdam, Bergen, Berlin, Modena, Oxford, Paris, and Tilburg, the EAERE Conference, Toulouse, 2013, the Beijer Institute Workshop, Stockholm, 2014, the CESifo Conference on Energy and Climate Economics, Munich, 2014, the International Energy Workshop, Beijing, 2014, the RES Conference, Manchester, 2015, the CEPR Summer Symposium in International Macroeconomics, Tarragona, 2015, and the NBER Environmental and Energy Economics Summer Institute, Cambridge, 2015. We acknowledge financial support from an ERC Advanced Grant (FP7-IDEAS-ERC Grant No. 269788), the BP funded OXCARRE, and the 7th EU Framework Programme (Socioeconomic Sciences and Humanities - SSH.2013.2.1-1 – Grant Agreement No. 613420). Van der Ploeg is also associated with the Vrije Universiteit Amsterdam.

E-mail: rick.vanderploeg@economics.ox.ac.uk (van der Ploeg); A.J.deZeeuw@uvt.nl (de Zeeuw)