Australian Economic History Review, Vol. 50, No. 1 *March 2010*
ISSN 0004-8992 doi: 10.1111/j.1467-8446.2009.00268.x

RESPONSES OF ECONOMIC SYSTEMS TO ENVIRONMENTAL CHANGE: PAST EXPERIENCES

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Current discussions of climate change are overly focused on the science underpinning environmental impact, with little attention to socioeconomic consequences. The economics of environmental change in particular is insufficiently informed by the lessons that past experiences can yield. Drawing on case studies from Europe and Asia, this special issue underlines the importance of historical context, as well as markets, institutions, technology, and the role of international trade in understanding how economic systems have responded to environmental changes. Past economies have responded dynamically to environmental change rather than simply constrained deterministically by the climatic and ecological events that have engulfed them.

JEL categories: N50, N54, N55, Q00, Q54

Keywords: climate change, economic systems, environment, institutions, markets

The papers in this special issue are based on presentations in the session 'The Response of Economic Systems to Environmental Change: Past Experiences' at the World Economic History Congress (Utrecht, 3–7 August 2009) and at the pre-conference workshop (Aix-en-Provence, 24 January 2009).[1] A reason to organise the session was the impression that current discussions on the economics of environmental change are insufficiently informed by the lessons that past experiences can yield. Several examples can be given, but the most obvious example relates to the current global discussion on climate change. Historical climatological data have informed predictions of future climate change, but the debate on the possible consequences of climate change has hardly assessed the economic responses that may abate these consequences.

1 We gratefully acknowledge the hospitality of the *Centre de recherche en Developpement Economique et Finance Internationale* (DEFI, particularly research unit EA4265) at the University Aix-Marseille II for the workshop. We also thank James Foreman-Peck for his chairmanship and his comments on the papers, as well as the Environmental Economics Research Hub at the Australian National University (http://www.crawford.anu.edu.au/research_units/eerh/index.php) for its financial support for the workshop.

The 2007 report of the Intergovernmental Panel on Climate Change (IPCC) does not discuss abating economic responses. It warns that increasing temperature will decrease crop productivity countries at low latitudes, increase the frequency of drought that lowers crop yields, and increase crop damage and failure. And it expects these effects to affect crop production negatively and increase the risk of hunger.[2] These dire predictions are grounded in the analysis of available evidence on climate change and its impact on crop production, but they fail to account for ways in which economic systems may respond and work to offset these expected outcomes. For example, the Asia chapter of the 2007 IPCC report has little to say on the economics underlying predictions of the impact of climate change on agricultural production and the spectre of hunger in Asian countries.[3] By contrast, the 2007 Stern report did acknowledge that the effects of climate change will depend on the degree of adaptation that economies may generate, but noted that the transaction costs of such processes require clarification.[4] In the absence of such information, adaptive processes could not be accounted for in the report's predictions.

Apart from the difficulty of quantification, processes of abatement in response to environmental changes are likely to be highly context specific, and therefore difficult to take into account in modelling exercises for predicting future changes. Nevertheless, it is relevant to develop a deeper understanding of adaptive processes by studying past experiences of the adaptive responses of economic systems to exogenous environmental changes. The study of environmental history is by now well advanced.[5] For example, we are now better informed about historical processes of deforestation and soil erosion. However, the economic history of environmental change is in several respects still in its infancy.

Several exogenous changes such as climate anomalies, the spread of new strains of pests and diseases, large volcanic eruptions, or meteor strikes and their consequences for mankind in terms of harvest failures, famines, epidemics, and similar events have been studied, particularly for Europe.[6] In some cases, these resulted in an enduring disruption of economic conditions and a drastic decline of living standards. In addition, other studies investigated gradual and more durable

2 Parry, *Climate Change*, pp. 11–12, 18.

3 The only economic considerations offered in volume 2 of the 2007 IPCC report are declarations that sustained economic growth, industrialisation, and urbanisation will aggravate problems of pollution and therefore climate change in much of Asia, which by implication have negative consequences for crop production and food supply (Parry, *Climate Change*). Likewise, for example, the agriculture chapter in volume 3 of the IPCC report on mitigation of the impact of climate change says little about the economics of climate change and agricultural production that substantiates the claims in volume 2 (Metz *et al.*, *Climate Change*). The chapter expresses concerns about an increase in Asia in methane production and the concomitant release of CO_2 in the atmosphere due to the growth of demand for animal products in the continent, before discussing policy options to reduce greenhouse gas emissions.

4 Stern, Economics of Climate Change, pp. 83–4.

5 See for example Krech *et al.* Encyclopedia of World Environmental History.

6 See for example Stothers, Volcanic dry fogs; Richards and McNeill, *Unending Frontier*; Baillie, *New Light*; Campbell, Nature as historical protagonist.

environmental changes, particularly in rainfall and temperature patterns, and how these affected agricultural output, human settlements, and health conditions. Some studies have explored market behaviour and the response of public authorities during famines induced by climate anomalies.[7] Others analysed public policy responses to outbreaks of epidemics.[8] But often missing in historical studies of environmental change is a rigorous assessment of how economic systems responded to such exogenous shocks and changes. This is partly due to difficulties with data availability or access, and the fact that historians are generally prepared to work with idiosyncratic, incomplete, and context-dependent data that would deter specialists in the field of current environmental change. Consequently, there are still ample opportunities for historical studies to contribute answers to a range of relevant questions. For example, did factor markets drive economic adjustment to environmental change? Did public policy aim and/or succeed in facilitating change? Were the responses of economic systems dependent on technological and/or institutional innovations? What was the role of trade and migration in economic system responses? And perhaps most importantly, under what conditions did market failure, or public policy failure, obstruct effective responses to environmental change?

This special issue of the *Australian Economic History Review* cannot answer all those questions. The aim of this issue is to contribute to understanding the ways in which economic systems responded to and accommodated environmental changes or shocks, as well as the nature, extent, and speed of the adaptive processes that they generated. The issue contribute a few relevant European and Asian case studies that underline the importance of historical context, as well as markets, institutions, technology, and the role of international trade in understanding how economic systems responded to environmental changes. Together, they demonstrate that historical studies could offer insights that may inform the current debate about environmental change, even though the historical cases of environmental change and exogenous shocks were of a different nature and magnitude than the current issue of climate change.

Our five articles begin with a contribution from Tirthankar Roy, who focuses on two case studies of collective response to storms and floods in colonial India. The study highlights quite different outcomes depending on how private agents, state actors, markets, and institutions intersect in addressing the challenge to livelihoods of these environmental events. Jean-Pascal Bassino and Jean-Pierre Dormois turn their attention to understanding the response of Mediterranean wheat growers in the late nineteenth century to increased uncertainty in rainfall. They find the decline in wheat production was not simply environmental, but reflected farmers' risk adverse planting strategies in the presence of both institutional change (French protectionist tariffs) and a decline in average rainfall. In a study of the wine industry in Catalan Spain, Marc Badia-Miro, Enric Tello,

7 O'Grada, The ripple that drowns; O'Grada, *Famine*; Saito, The frequency of famines.
8 Hays, Burdens of Disease; Hopkins, Greatest Killer.

Francesc Valls, and Rammon Garrabou illustrate how the historical evolution of a community – grounded in the differentiated natural, social, and cultural fabric of a place – can instil resilience in an economic system in the face of exogenous environmental shocks. Drawing on Indonesian weather and rice market data for the late 1930s, Pierre van der Eng shows that the high degree of integration of rice markets across Java, despite the largely subsistence-oriented nature of rice production, abated the negative consequences of annual rainfall anomalies. He highlights the potential mitigating effect of markets on food shortfalls predicted for Asia from the impact of climate change. Janet Hunter's study of the impact of widespread drought in Korea and Japan in 1939 again underscores the analyses of other articles: assessing the impact of climatic fluctuations require an interdisciplinary approach that considers the economic, social, political, and cultural context in which such change occurs. Markets, farmers, public opinion, and state-driven public policy all played a part in the perception of and the response to climate-induced change in food supplies in Japan in 1939–40.

Looking forward, one of the most promising avenues for future research in the field of the economic history of environmental change will require the rigorous analysis of a combination of qualitative and quantitative data on economic and environmental conditions. For example, multi-secular series reporting annual or seasonal rainfall and temperature patterns are available for a number of European countries, as well as several Asian countries. In fact, climate data comparable to those compiled several decades ago by Le Roy Ladurie in pioneering work on Europe are available for Japan for a period of about a millennium.[9] Such data have hardly been used to study the relationship between climate patterns, demographic trends, living standards, and institutional change.[10] Other research can be done on comparative perspectives on environmental change, or on how economic systems responded to the combined effect of exogenous shocks and largely endogenous changes in the natural environment, such as deforestation. In all, the study of past episodes of economic system responses to environmental change will help to understand the processes of adaptation and abatement that currently appear elusive.

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9 Le Roy Ladurie, *Times of Feast*; Mikami, Climatic variations.

10 With exceptions of course, such as Clingingsmith and Williamson (Deindustrialization).

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