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978-0-521-19647-5 - Pricing Carbon: The European Union Emissions Trading Scheme

A. Denny Ellerman, Frank J. Convery and Christian de Perthuis

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Pricing Carbon

The European Union's Emissions Trading Scheme (EU ETS) is the world's largest market for carbon and the most significant multinational initiative ever taken to mobilize markets to protect the environment. It will be an important influence on the development and implementation of trading schemes in the United States, Japan and elsewhere. As is true of any pioneering public policy experiment, however, this scheme has generated much controversy. *Pricing Carbon* provides the first detailed description and analysis of the EU ETS, focusing on the first, 'trial', period of the scheme (2005 to 2007). Written by an international team of experts, it allows readers to get behind the headlines and come to a better understanding of what was done and what happened based on a dispassionate, empirically based review of the evidence. This book should be read by anyone who wants to know what happens when emissions are capped, traded and priced.

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Pricing Carbon

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Frequently used abbreviations

AA	aviation allowance
AAU	assigned amount unit
ATS	Aviation Trading Scheme
BAT	best available technology
BAU	business-as-usual
BOF	basic oxygen furnace
BSA	burden-sharing agreement
CCGT	combined-cycle gas turbine
CCS	carbon capture and storage
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	certified emission reduction
CITL	Community Independent Transaction Log
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
COP	Conference of Parties
CRF	common reporting format
EAF	electric arc furnace
ECX	European Climate Exchange
EEA	European Environment Agency
EEX	European Energy Exchange
ERU	emission reduction unit
EU ETS	European Union Emissions Trading Scheme
EUA	European Union allowance
GHG	greenhouse gas
IEA	International Energy Agency
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
JI	Joint Implementation
LPG	liquefied petroleum gas

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MIT	Massachusetts Institute of Technology
MRV	monitoring, reporting and verification
NAP	national allocation plan
NER	new entrant reserve
OTC	over-the-counter
UCD	University College Dublin
UNFCCC	United Nations Framework Convention on Climate Change
VER	verified emission reduction

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Preface

Pricing Carbon is the result of a multinational research collaboration primarily between researchers (leader in brackets) at the Mission Climat of the Caisse des Dépôts and the University Paris-Dauphine in Paris (Christian de Perthuis), University College Dublin (UCD) (Frank Convery) and the Massachusetts Institute of Technology (MIT) (Denny Ellerman) but also involving researchers from the International Energy Agency (IEA) (Richard Baron and Barbara Buchner), the Öko-Institut in Berlin (Felix Matthes) and the University Paris-Dauphine (Jan Horst Keppler).

The project has been motivated by the belief that the European Union's Emissions Trading Scheme is a significant public policy experiment that should be subjected to a comprehensive and rigorous *ex post* evaluation. It is the world's first cap-and-trade programme for greenhouse gases, by far the largest environmental market in the world and the possible prototype for a global climate policy regime that would be based on emissions trading.

As an *ex post* exercise, the research reported in this book is resolutely backward-looking and focused mostly on the first three years that constituted the trial period of the EU ETS. The tone of the book is more descriptive or positive than normative. The objective is to describe, analyse, and understand what has transpired and not to prescribe what should be, or should have been. The normative preferences of the authors may intrude here and there, but the intent has been to keep these judgements to a minimum and to let every reader draw his or her own conclusions about the European experience during the trial period. Our aim is that readers come away at least well informed, and perhaps persuaded that the problems and solutions are a little more complex than how they are often presented.

Each chapter has a leader (name in brackets) with overall responsibility for delivery, delegated as follows: chapter 2, 'Origins and development of the EU ETS' (Frank Convery); chapter 3, 'Allowance

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allocation' (Denny Ellerman); chapter 4, 'Effects of free allocation' (Barbara Buchner); chapter 5, 'Market development' (Christian de Perthuis); chapter 6, 'Emissions abatement' (Denny Ellerman); chapter 7, 'Industrial competitiveness' (Richard Baron); chapter 8, 'Costs' (Frank Convery); and chapter 9, 'Linkage and global implications' (Christian de Perthuis). Felix Matthes of the Öko-Institut contributed the first drafts of the introductory and concluding chapters, and Jan Horst Keppler of the University Paris-Dauphine contributed the annex on electricity.

There have been substantive contributions to most of these chapters by other scholars, however. Chapter 4 benefited from the work of Sara de Pablos (IEA) and Mar Reguant-Ridó (MIT). In chapter 5, Anaïs Delbosc and Emilie Alberola, in charge of European carbon market monitoring at the Mission Climat, made major contributions. Raphaël Trotignon (Mission Climat) was the recognized master of the data in the central registry of the EU ETS, the Community Independent Transaction Log (CITL). As such, he was primarily responsible for developing the programme that allowed the surrender data to be exploited, and he did the work of separating the electric utility power plants from other combustion sources.

Chapter 6 could not have been written without the contributions of Erik Delarue from the University of Leuven, Belgium, and his thesis supervisor, Professor William D'haeseleer, who graciously agreed to the use of the model they developed to support the project. Meghan McGuinness and Stephan Feilhauer at MIT also contributed significantly to the case studies of the United Kingdom and Germany. A final noteworthy, albeit more indirect, contributor to this chapter was Anke Herold of the Öko-Institut in Berlin. Without her earlier work in comparing the two main data sources for greenhouse gas data in Europe, the CITL and the United Nations' common reporting format data, it would not have been possible to develop the longer data series for the ETS sectors that allowed projections of counterfactual emissions to be made.

Chapter 7 was a team effort to which many contributed. Neil Walker (UCD) provided the section on the cement sector, Romain Lacombe (MIT) that on refineries and Julia Reinaud (IEA) the sections on the iron and steel sector and aluminium. Philippe Quirion of the Centre International de Recherche sur l'Environnement et le Développement (CIRED) also contributed to the sections on cement

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and iron and steel. In chapter 8, Jurate Jaraite (UCD) provided the unique analysis of transaction costs and a very useful survey of modelling and other analyses concerning the expected cost of the EU ETS. Chapter 9 benefited from the contributions of Cate Hight (Mission Climat), who wrote the section on expanding the scope of the EU ETS, Benoît Leguet (Mission Climat), an expert on the Kyoto project mechanisms, and Morgan Hervé-Mignucci (Mission Climat and University Paris-Dauphine), who studied the links between European allowance prices and Kyoto credit prices on the world carbon market.

In addition to those who contributed directly, we have benefited from the support and insights of the following: from University College Dublin, Corrado Di Maria provided quality control and encouragement in equal measure, while Barry Anderson and Luke Redmond also provided suggestions. At MIT, Paul Joskow, Henry Jacoby, John Parsons and Mort Webster were invaluable colleagues in their unflagging interest and support. The project also benefited from the insights of Jean-Marie Chevalier, Patrice Geoffron and Jan Horst Keppler, the energy economics team at the University Paris-Dauphine. Another virtual participant was Dora Fazekas of Corvinus University of Budapest and Columbia University, whose work on auctions and how Hungarian firms responded to the EU ETS provided valuable insights. Workshop and administrative logistics would have been impossible without the able assistance of Malika Boumaza at the Mission Climat, Frances Goldstein and Joni Bubliski at MIT and Sarka Sebkova at the University of Prague.

We would be very remiss if we did not acknowledge the contributions of the European Environment Agency in Copenhagen, in particular the interest and help from Hans Vos and Andreas Barkman. Peter Zapfel at the European Commission has also been extremely supportive of our efforts and helpful in making sure that we understood many of the decisions that were made. They are not implicated in any of the conclusions that we have drawn.

A project of this scale and import cannot happen without resources. We were fortunate indeed to garner what was necessary from generous donors on both sides of the Atlantic. The head of the Caisse des Dépôts, Augustin de Romanet, understood at an early stage the importance of this research project, and was instrumental in bringing together the coalition of French companies that provided the funds for the European participants in the project and in supplying much of the

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administrative and logistical support that this effort required. The European funds were managed by the Association pour la Promotion de la Recherche sur l'Economie du Carbone (APREC), a non-profit association launched by the Caisse des Dépôts and University Paris-Dauphine under the direction of Pierre Ducret. BlueNext, Electricité de France, Euronext, Orbeo, Suez, Total and Veolia were the main contributors to this association. To all these companies, and to their employees, who were tireless in sharing their insights with us, particular thanks are due. The American side of the collaboration could not have occurred without the generous financial support of the Doris Duke Charitable Foundation. Andrew Bowman, the foundation's director of climate change programmes, deserves special credit for providing just the right combination of encouragement and guidance. Finally, we readily acknowledge the many unsung ways in which the institutions with which the authors are associated provided encouragement, not least in providing salary support and tolerating the demands of this project on our time. In this group, particular gratitude is due the International Energy Agency, and especially to Claude Mandil for his early support to this project.

Good writing requires freedom from the daily pressure of meetings, e-mails, phone calls and sundry intrusions that most are heir to at their home base. Some of us were fortunate to escape for a writing interlude to the welcoming embrace of the offices of Mission Climat of the Caisse des Dépôts in Paris and the Center for Energy and Environmental Policy Research at MIT, and this helped move the project forward.

Many of the research results in this volume were initially presented at a series of four workshops held in April 2007 in Paris, January 2008 in Washington, June 2008 in Prague and September 2008 in Paris. The questions and comments by participants have had more impact in shaping our thinking than those who made them might imagine. We are very grateful to all of them, as well as to the organizations that hosted these meetings: the Caisse des Dépôts for the two meetings in Paris, MIT's Center for Energy and Environmental Policy Research for the meeting in Washington and Jirina Jilcova and her team at the Institute for Economic and Environmental Policy, University of Economics, Prague. A highlight of the social side was the dinner graciously hosted in his residence by the French ambassador to the United States, Pierre Vimont, which provided an opportunity for

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American and European carbon market experts to engage in a very productive dialogue.

To all we extend our thanks, both for their direct contributions and their sharing of our belief in the need for objective, dispassionate analysis and better understanding of public policy experiments, which by their nature are always controversial.