

1. Introduction and Main Messages

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The Copenhagen COP, held in December 2009, showed the huge social and political relevance attained by climate change. Around 100 heads of state or of government were present in Copenhagen during the summit, and the media followed the event with a scope and intensity never seen until then. Yet Copenhagen was a disappointment for many, with a failure to produce a replacement for the Kyoto Protocol, and with an 'Accord' that was both short and generic. Many factors explain this outcome, but economic issues and concerns are likely to be among the most important. Indeed, we feel that this reflects the increasing role of economics in policy and academic debates around climate change. Copenhagen was largely about costs of policy commitments, costs of policy options (hence the reference to adaptation and deforestation) and about the size and type of financial transfers to developing countries.

Although economics was particularly active regarding climate change from the early days, we are now seeing an increasing involvement and demands on the discipline. Copenhagen reflected the crude economic debate on how to manage scarce environmental resources, the atmospheric capacity to keep greenhouse gases (GHG) with a limited change of the climate, and on the effects of the corrective policies needed to tackle climate change. This book intends to shed light on the foundations, design and effects of climate change policies. It is a book written by economists, thus with an emphasis on the several economic aspects associated with climate change policies, but aimed for a wider audience: policy makers, journalists, scientists, etc. It is also a book that sees the light of the day in a difficult moment for climate change, a few months after Copenhagen and just before Cancun. The growing concerns expressed by climate science are matched with a reluctant approximation by governments and with a kind of deadlock in the search for an international agreement. We believe that this book would be particularly useful in the event of such a global agreement, but also in informing those individual countries (or groups of countries) that may decide to tackle climate change without international, legally binding, commitments.

The book is largely based on the contents of an international workshop on climate change policies, held in Madrid in early 2010. The event was organized by the editors of the book, with the support of the Complutense Institute for International Studies (ICEI) and with the participation of Economics for Energy and FEDEA. The workshop was not designed as a conventional academic meeting, but rather as a way to transfer knowledge to highly informed directors of firms affected by climate change policies and to regulators. In any case, leading international academics in each of the fields covered by the book were invited and joined the workshop. Each chapter of the book thus summarizes the state-of-the-art in the different areas of climate change policies by prestigious climate change economists, and is followed by an expert discussion on the issue by a fellow academic. The book, like the workshop, concludes with in-depth description of real-world developments in climate change policies in three major economies: China, the European Union and the United States.

Although the book is organized in self-contained chapters and discussions, the reader will soon discover that issues should not be dealt with in an isolated manner. For example, international aspects of climate change policies cannot be understood without the issues raised by the national application of climate change policies. Moreover, the effects of national or international policies in this field are interrelated, with the distributional profile often linked to the intensity of corrective incentives. As another illustration, both the size of incentives and distributional consequences are associated with the effects of climate change policies on competitiveness too. However, we decided to proceed this way to organize and facilitate the comprehension of such a wide and challenging issue. This is a topic that, as will be seen in the pages of the book, demands the involvement of most economic disciplines and the use of powerful and diverse methodologies and approaches.

The first question is, obviously, why climate change policies? And the first answer is related to the fact that they respond to possibly the most worrying externality faced by humankind: a global, inter-temporal and huge environmental problem. Unlike many other environmental problems, there are no alternatives here: we are experimenting with our planet. Climate change policies are primarily related and linked to the damage associated with those phenomena, so a primary matter is to define and value that damage. A second important issue, given the extraordinarily long time intervals involved, is discounting. Economists have usually approached climate change issues (including policies) by combining those two questions in their so-called integrated assessment models. As they are inter-temporal cost-benefit constructions, they provide useful information for public policies: how stringent they should be and what type of dynamic profile they should follow (raising stringency and how intensely?). This is, however, a first-best approach to policy definition, as

it usually assumes the existence of a global agreement and the availability of plenty of environmental, technological and socio-economic information.

The second chapter of the book, by Michael Hanemann (University of California at Berkeley), and its discussion by Maria Loureiro (University of Santiago de Compostela) is precisely interested in those basic questions for climate change policies. How should we value climate change impacts? Are non-linearities important? How do we treat the future through discounting? What are the uncertainties involved? How to deal with extreme events? With an interesting and challenging approach, Hanemann presents an overview of the issue and points out some elements that may worsen our previous impact estimates: the consideration of local vs. global temperature changes, of highest vs. average temperature changes, and the linkage of these features with uncertain but highly worrying extreme events.

Although tougher climate change policies are vindicated by the second chapter, its conclusions may lead us to contemplate second-best approaches to climate change policies. Indeed they are very common in other environmental policies and mostly respond to informational constraints, but not only that: they are also explained by the imperfections of the real world. Scientific and technological uncertainties, or incomplete international agreements may recommend the setting of a safe limit (e.g. the 2°C of Copenhagen) that should be reached by policies. This is a kind of insurance approximation, quite common in many private decisions and public policies, where the limit is an acceptable (expected) level of damage and the premium the cost of reaching it. Given the vital importance of the issue and the difficulties associated with defining and quantifying first-best options, the second-best approach to climate change policies is gaining momentum both in academia and policy making.

Traditionally, as in the Kyoto Protocol, climate change policies have focused on mitigation. Yet, adaptation to climate change is nowadays playing a large role in climate change and policy discussions. The reasons are to be found in the growing scientific evidence on the accelerated climate change and on the potentially large detrimental effects that may still arise even with full GHG mitigation from now onwards. Thus, adaptation is not viewed anymore as a surrender but rather as a fact and as part of climate change policies. Although private adaptation will play an essential role in the form of behavioural changes to climate changes, adaptation is also closely related to public policies. Firstly because adaptation has in many cases the nature of a public good (e.g. infrastructures to protect certain areas from sea-level rise) and thus requests public intervention. Secondly because adaptation may facilitate policy adoption, as it is often locally appropriable in contrast with climate change mitigation. Yet adaptation should not be merely added to mitigation policies, as overall effectiveness and efficiency demands a careful combination of policy approaches.

The importance of adaptation in climate change policies and strategies, with the need for yielding funds for adaptation in developing countries, has been stated by the Copenhagen Accord, which reflects the relevance of this matter from an international perspective too. Juan C. Ciscar (IPTS, EC), Daniele Paci (IPTS, EC) and Lucia Vergano (IPTS, EC) deal with all the preceding issues in the third chapter of the book, discussed by Noemi Padrón (University of La Laguna). The emphasis is, however, in the economic quantification of adaptation costs and thus they provide a very complete picture of the methodological approaches and of the main results of literature. Ciscar, Paci and Vergano believe that, by producing and disseminating fine economic studies on adaptation, a knowledge gap may be overcome and climate policies can be largely improved.

The fourth chapter deals with the cornerstone of climate change policies: mitigation. The Co-chair of WG3 of the IPCC (precisely devoted to mitigation strategies), Ottmar Edenhofer (PIK), Brigitte Knopf (PIK) and Gunnar Luderer (PIK) focus on the international dimensions of mitigation (linking their work to later chapters on international agreements and interactions). In an interesting interpretation, they suggest that policies may benefit but also need to be cautious (to be applicable) with the reallocation of rents from fossil fuel owners to GHG permit holders. They also stress the importance of technologies that do not involve GHG emissions for a successful application of mitigation policies (linking their conclusions to the following chapter on technologies). The chapter and its discussion, by Xavier Labandeira (University of Vigo), emphasize the role of pricing instruments in mitigation policies, although the problems that may arise with their sole application recommend a richer but coordinated policy menu.

At this point it is necessary to recall yet another reason for (second-best) GHG mitigation policies. In this sense, the so-called secondary benefits of corrective policies are nowadays attaining a wider and increasing audience. Given the close association of GHG emissions with fossil-fuel combustion, mitigation policies may lead to a reduction of energy dependence (vulnerability and export of rents) and to sizeable environmental co-benefits (reduction of non-GHG, usually local, pollution). Both issues are of great importance for the definition and implementation of both national and international climate change policies, as they may induce countries to introduce GHG mitigation policies due to collateral dividends.

Chapters five, six and seven are in a way offsprings and part of the mitigation section of the book. In chapter five Pablo Del Río (CSIC) and his discussant, Gregory Unruh (Thunderbird), focus on how to design policies that are proactive with low-carbon technologies. It is clear that this is a crucial question to tackle mitigation and to face the climate change problem. The linkage with the previous chapter is evident: can a mitigation device foster

technological change (the dynamic incentive mentioned before) or should it be complemented with other approaches? Their conclusion is not far from that of the mitigation chapter either: a pure mitigation instrument is necessary but probably not sufficient to foster the required technologies. By combining mitigation and technological policy mechanisms (generally in the form of subsidies, to deal with the positive technological externalities), effectiveness and cost-effectiveness may be enhanced.

Let us imagine now that GHG mitigation policies (also with the promotion of clean technologies in mind) have the required intensity to modify the behaviour of producers and consumers. As energy-related GHG emissions are so important, the economic effects are likely to be paramount. Some of them will be specifically related to sectors that are particularly GHG-intensive and subject to international competition which, in the event of an incomplete international agreement, may lose production, jobs and emissions to their competitors. This is the setting for the sixth chapter, by Philippe Quirion (CIRED), and for his discussant Pedro Linares (Comillas Pontifical University). Quirion starts by clarifying the basic concepts on this debate (competitiveness and leakage), to proceed with a brief but concentrated section on empirical evidence. His conclusions tend to curtail the importance given to this issue within the climate policy debate: most of the sectors involved have a low labour intensity and are much more dependent on outright energy prices. However, this does not preclude him from exploring the climate policy alternatives that may be used to reduce carbon leakage: tax border adjustments and exemptions on pricing mechanisms.

Chapter seven deals with another consequence of intensive mitigation policies: regressive effects associated with the uneven distribution of (energy) GHG-related costs across individuals. Indeed, climate change policies may be effective, even efficient, and still face barriers for their real-world application due to this question. Equity issues are at the core of the international debate on climate change effects and solutions, but Corbett Grainger (University of Wisconsin at Madison) and Charles Kolstad (University of California at Santa Barbara), with the discussion of Alberto Ansuategi (University of the Basque Country), focus on the distributional outcomes from national mitigation (pricing) policies. Grainger and Kolstad carry out an empirical study for the US, which they relate to other existing evidence for Asia, Europe, Oceania and South Africa. Their conclusion is clear: carbon regulations range from slightly regressive to proportional which, although it does not provide a full distributional picture of climate change policies, may recommend the introduction of offsetting devices.

Actually, chapter seven is a good reference point to approach the international aspects of climate change policies as, one way or another, the following three chapters deal with the distribution of burdens across countries

and world regions. Yet, before describing the remaining chapters, it may be useful to take stock and emphasize the numerous difficulties faced by climate change policies at a national level. Distributional problems, negative effects on competitiveness, mitigation costs, or uncertain levels of damage provoke significant constraints on national policy-making that also have obvious effects on the international domain. Therefore, slow and disappointing outcomes from international negotiations probably should be interpreted in this context.

Carlo Carraro (University of Venice) and Emanuele Massetti (FEEM), with the discussion by Emilio Cerdá (Complutense University), provide the basis for the developments in this second part on the international aspects of climate change policies. They approach the issue from a game-theoretical perspective, as the characteristics of the climate change problem (a global externality with an inter-temporal dimension) require these methods. After reviewing the sizeable theoretical literature in a compact manner, they assess some of the qualitative results through an integrated assessment model with a game theoretic structure (WITCH). On the basis of all that, Carraro and Massetti conclude that Copenhagen-type outcomes are quite likely in the future due to the difficulties in achieving a global agreement signed by all relevant countries.

One obvious difficulty for a global agreement is the presence of strong emerging economies. On the one hand, the growing GHG emissions from these countries preclude any solution to the problem without their participation. On the other hand, such countries are developing and demand a special treatment because they are not responsible for historical emissions. This important and interesting topic is analysed in chapter nine by Anil Markandya (BC3) and his discussant, Ibon Galarraga (BC3), with three rising economic powers in mind: Brasil, China and India. Markandya suggests that a double mechanism can be used to achieve meaningful mitigation in emerging economies: an international carbon market that could allocate part of its rents in these countries (as advanced in chapter four), and a system of explicit transfers from developed to developing countries that could compensate the latter for the historical emissions of the former.

The use of similar incentives between developed and developing countries is considered in chapter ten. Axel Michaelowa (University of Zurich) and his discussant, Francisco André (University Pablo Olavide), analyze the present and future of the Clean Development Mechanism (CDM). Originally designed to render GHG mitigation and development compatible, CDM is a project-based mechanism introduced by the Kyoto Protocol. Michaelowa describes CDM as the most successful market mechanism in climate policy so far, an example of efficient bottom-up approximations, which should be preserved in the post-2012 climate policy regime.

Three small interrelated chapters (11A–11C) close the book, dealing with real applications of climate change policies and their future perspectives in

the three most important GHG emitters. Indeed, China, the European Union (EU) and the United States are nowadays responsible for around 55% of carbon dioxide global emissions, the main GHG. ZhongXiang Zhang (East–West Center) provides a very interesting and clarifying account of China’s stance and prospects regarding climate change corrective policies. Antonio Soria (IPTS) and Bert Saveyn (IPTS) describe and comment on the European climate change package. Finally Vicki Arroyo (Georgetown University) presents an updated account of the situation and complexities of US climate change policies.

We would like to conclude this introduction by indicating that we are extremely happy and honoured to edit this book. First of all, because we feel that we are providing a useful, and missing so far, product for the post-2012 debate on climate change policies: a book that can be used both to inform national climate change policies and to shed light on the difficulties and possibilities of advance in international climate agreements. Secondly, because we believe that we have been able to assemble one of the best possible teams to carry out this endeavour. Thirdly, because we always intended to give birth to a product written by economists, with the state-of-the-art in the economics of climate change, to interested and well-informed actors in this field that are not economists. And, finally, because we managed to do so just after Copenhagen and just before Cancun.

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