

LES CAHIERS DE L'ILB

The Institut Louis Bachelier Research Review

N°2

MAY 2011



**A BETTER
UNDERSTANDING OF
FINANCIAL RESEARCH**

Special edition

CLIMATE ECONOMICS

With

Christian de Perthuis

Pierre-André Jouvét

Suzanne Shaw

Boris Solier

Raphaël Trotignon

Guillaume Bouculat

Jérémy Elbeze

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INSTITUT LOUIS BACHELIER

CENTRE D'INNOVATION FINANCIERE



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The Chair on Climate Economics, What for?

It's been quite some time since economists have shown interest in environmental issues. In 1798, Malthus had already underlined the effects of human activity on the environment. Two centuries later, the Kyoto conference reminded everyone of the dangers of climate change to the whole planet. Initially, environmental regulation has been based on taxation – especially with Pigou. Later on, the founding work of Coase taken up by Crocker and Dales established a theoretical base for regulation through the introduction of environmental finance. Forty years later, two major branches of carbon finance, namely, the European market on carbon quotas and those on project mechanisms from the Kyoto protocol have been established since 2005.

The development of these instruments has contributed to the creation of a carbon market which has surpassed most previous expectations by its size and sophistication. Understanding the workings of this market, its impact on the economy and greenhouse gas emissions are the primary goals of our Chair. To achieve these objectives, our researchers concentrate on gathering the maximum number of available information and to interpret data using the ZEPHYR simulation model.

Likewise, the issue of generalizing carbon pricing beyond the European market and the conditions of this expansion are also of our concern. We will better study these issues from a geographical perspective as the Climate Economics Chair increases its partnerships with the network of the best foreign researchers and universities in the field. The Chair will also benefit from the launch of two new sector-specific research initiatives in 2011: one on agriculture, food and forestry; and another on mobility within a low-carbon society.

Through our applied research, we would like to enrich the academic debate and participate towards the implementation of policy recommendations. The close links the Chair has built between academia, research and industry practices will help us achieve our objectives. In the same manner, the permanent exchange between theoretical and practical analysis contributes to a better understanding by decision makers of the stakes involved in climate change.

This demands openness from our researchers. By dedicating this issue to the Climate Economics Chair, the Institut Louis Bachelier Research Review contributes to our external communication goals. We would like to thank the ILB and Cyril Armange, Project Manager of the Review.

Christian de Perthuis et Pierre-André Jouvét
Scientific Directors of the Climate Economics Chair

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PRINTER
IRO - Z.I. rue Pasteur
17185 Périgny cedex



Climate policy

FROM KYOTO TO COPENHAGEN: UNDERSTANDING INTERNATIONAL CLIMATE NEGOTIATIONS

Based on an interview with Christian de Perthuis and on his paper "Cancún: L'an un de l'après Copenhague" (Cahiers de la Chaire Economie du Climat, Information and Debates series, n°8, 2010⁽¹⁾), co-authored with Henri Casella⁽²⁾ and Anaïs Delbosc⁽³⁾.

KEY POINTS

- The agreement reached at the Copenhagen summit marks a break with the logic of the system deployed since Kyoto. The Cancún conference took up its provisions.
- There are many uncertainties as to the commitments of the industrialized countries, not least those of the United States.
- Under the impetus of the developing countries, the agreement considerably increases the proportion of greenhouse gas emissions subject to a reduction commitment filed with the United Nations.
- Much work still remains to be done to implement the next stages of climate negotiation in order to introduce a genuinely cooperative approach, which is the only guarantee of a real reduction in emissions at a global level.

BIOGRAPHY

Christian de Perthuis



Christian de Perthuis has a doctorate in economics and is professor of economics at Paris-Dauphine University and chairman of the Climate Economics Chair scientific council.

His research is concerned in particular with the operation of carbon markets and their link with climate change reduction and adaptation policies.

While many people hoped for a broadening of the system put in place in Kyoto from the Copenhagen summit, the study carried out by Christian de Perthuis and his co-authors shows that the agreement that was signed radically altered international climate negotiations. This new situation must be taken into account if we are to understand the next stages and in particular the issues of the Cancún conference, held in December 2010.

The purpose of the Copenhagen climate conference, which took place in December 2009, was to negotiate an international climate agreement that extended the rules introduced by the Kyoto protocol beyond 2012. Many people were expecting that this summit would widen the existing collaborative mechanism and would, for the period from 2013 to 2020, set new rules governing the capping of greenhouse gas emissions to which the industrialized countries are subject to up

until then. But in actual fact the agreement signed at Copenhagen markedly differed from the logic of existing climate agreements. It neither extended the Kyoto protocol nor is it legally binding. According to the authors, it "simultaneously asserts the principle of financial transfers to facilitate the implementation of climate policies in developing countries and fails to specify how this is to be done." Furthermore, the agreement introduced a vague variable geometry system that

(1) Study also distributed by CDC Climat Research: Etude Climat n°24 d'octobre 2010

(2) Researcher at the Climate Economics Chair

(3) Project Manager at CDC Climat Research

“ Neither a total failure nor a historic advance. ”

is not accompanied by any target dates or quantitative objectives, apart from that of stabilizing the temperature rise to 2 degrees compared the pre-industrial era. While this is an advance, it is only attainable through considerable, not to say currently unrealistic, efforts to reduce greenhouse gas emissions.

Everyone with their own climate recipe

“Copenhagen is a break point in international climate negotiations”, says Christian de Perthuis. “We go from an organization where countries make commitments within a regulated system to another in which each country retains its sovereignty and constructs its own economic instruments to attain the objectives it sets for itself.”

According to Christian de Perthuis and his co-authors, it is the gap between expectations and achievement which explains the confusion that prevailed in the aftermath of the summit. “We talked a lot about the outcome of Copenhagen, often adopting a negative, even catastrophic, view”, Christian de Perthuis says. “Nobody was seriously concerned with the commitments of developing countries. We wanted to measure them to be able to say how the decisions taken will be expressed in real life.”

Of course Christian de Perthuis is the first to admit that the Copenhagen agreement provided real grounds for disappointment, one in particular that he considers to be huge. “On closer examination, you realize that the US commitments are totally dependent on the support of Congress. This is not very different from what happened at Kyoto, where they committed themselves but had not received the support of Congress.” More generally, he considers that “contrary to what we often imagine, there are still many uncertainties about the commitments of industrialized countries. One supposes that things are clear to these countries. In fact, they are not very clear at all.”

Asian initiatives

Yet the fact remains that the Copenhagen agreement has the merit of having brought the large developing countries into heart of climate negotiations. “The Copenhagen conference was neither a total failure nor a historic advance. But it marked a shift in the centre of gravity of negotiations that reflects the world’s changing power relations”, the authors maintain. “Some people criticize, without noticing something completely new: since Copenhagen, the large developing countries have agreed to discuss reducing their own emissions and have made commitments in this respect”, Christian de Perthuis makes clear. “This is fundamental, because the entire increase in greenhouse gas emissions now comes from emerging and developing countries.” American inaction contrasts with the efforts agreed to by Japan, Korea and even China.

Thus following the Copenhagen agreement, commitments cover 80% of global emissions compared to scarcely more than a quarter in the framework of the Kyoto protocol (60% was initially aimed at).

What next?

“In the absence of a unified registration and monitoring system, the exact scope of these commitments is uncertain but, under the best assumptions, remains below the recommendations of the Intergovernmental Panel on Climate Change (IPCC)”, the authors conclude, detailing efforts to implement a genuinely cooperative approach in the next stages of negotiation: strengthening the existing UN system in regard to measurement and verification, extending the existing carbon pricing instruments and making possible the mobilization of additional resources for developing countries.

The Cancún conference made only limited progress in this respect. “There remains a great deal of work to do, because it is a matter of thoroughly reviewing a large part of the governance of international climate agreements.”

METHODOLOGY

This article evaluates the Copenhagen agreement by analyzing in particular the communications that were sent from January to June 2010 by the signatory countries to the secretariat of the United Nations Framework Convention on Climate Change.

It shows how Copenhagen represents a shift in the centre of gravity of international climate negotiations. It then offers an analysis of the “variable geometry” system of commitments introduced by the agreement and examines the requisite conditions for leaving Copenhagen from above.

Applications

- For governments. This study shows the way forward to overcome the limitations of Copenhagen and to put new life into the agreement, so as to develop instruments to reduce greenhouse emissions worldwide with greater economic efficiency.
- For economic actors. This research establishes a link between international diplomacy and the economic instruments that are being set up in the field: emissions trading markets, carbon taxes, project mechanisms. It allows actors to better anticipate the conditions under which they will operate tomorrow, in the various carbon markets.

Further reading

Christian de Perthuis has written numerous articles that can be consulted on the Internet, as well as two books on global warming:

- “Le Changement climatique” co-authored with Anaïs Delbosq and published by Le Cavalier Bleu in the Idées Reçues collection
- Christian de Perthuis “Et pour quelques degrés de plus... Nos choix économiques face au risque climatique”, Pearson. Grand prix du livre des dirigeants 2009. Deuxième édition en anglais “Economic Choices in a Warming World”, Cambridge University Press



Climate change

HARMONIZING AND EXTENDING THE EXISTING INSTRUMENTS

Based on an interview with Suzanne Shaw and on her paper "Quel(s) type(s) d'instruments employer pour lutter contre le changement climatique?" (Vie et Sciences Economiques n°183-184, June 2010⁽¹⁾), co-authored with Christian de Perthuis⁽²⁾ and Stephen Lecourt⁽³⁾.

BIOGRAPHY

Suzanne Shaw



Suzanne Shaw is currently project leader at the Climate Economics Chair and a doctoral student at Paris-Dauphine University. Of Jamaican origin, she studied engineering at the University of the West Indies (Trinidad and Tobago), then went on to take a Masters 2 in the Economics of Sustainable Development, Energy and the Environment at the Ecole Polytechnique and a Masters in Sustainable Development at the University of Edinburgh. Suzanne Shaw has also been a scientific officer at the European Commission (Energy Institute of the Joint Research Centre) and has worked on various projects in the energy sector as an engineer and consultant. Her research for the Chair concerns CO₂ price formation and modelling in the European emissions trading market.

KEY POINTS

- The main instruments used in environmental policies are all relevant and can be used in a complementary manner. None of them is applicable to all situations.
- For a more effective and efficient climate policy, made necessary by the targets for reducing greenhouse emissions specified in the Copenhagen agreement, these instruments should be harmonized and extended to a larger number of actors.

An in-depth study of the main instruments used in environmental policies shows that while they are all useful and can be complementary, they should nevertheless be improved and harmonized in order to better combat climate change.

The paper by Suzanne Shaw, Christian de Perthuis and Stephen Lecourt presents the two main types of instrument – regulatory and economic – used in environmental policy-making, particularly in regard to combatting climate change. The first is the most commonly used at a government level, especially in the form of standards setting emissions limits for pollutants per unit produced or consumed. The authors point out that while regulation by standards is effective from an environmental standpoint if it is used skilfully by the authorities, it is not suited to all environmental issues.

Indeed, since the regulatory authorities have very imperfect knowledge of the costs of achieving compliance in the regulated entities, imposing a standard may result in a higher overall cost. "This is why economists have long advocated the use of economic tools, which achieve the same environmental benefits at lower cost," they write. This category of instruments includes taxes and cap-and-trade systems for greenhouse gas emissions, and is characterized by pricing environmental damage so that it is taken into account in the polluter's economic calculations.

(1) Study also distributed by Paris-Dauphine University Chair Finance and Sustainable Development: Cahiers du PREC n°5, June 2010

(2) Professor of economics at Paris-Dauphine University and chairman of the Climate Economics Chair Scientific-Council

(3) Researcher at the Climate Economics Chair and IHS-CERA, PhD student in economics at Paris-Dauphine University

“ We give examples of what has worked and why. ”

No ideal instrument or universal solution

“We present the context and the underlying theory and the way in which the instruments are used, and we explain why some are appropriate in particular cases,” says Suzanne Shaw. “For example, there is more use of standards at a national level or for a limited number of installations in a sector where alternative technologies are already developed. Tradable allowances are used in other cases, at the international level where the number of players is very high and there are very different possible outcomes, and where the cost of emissions reduction can potentially be much higher if standards are used”.

In their study, the authors show that these different instruments all have advantages and can even be used jointly, particularly for combatting climate change. “We wanted to correct the mistaken idea that there is an ideal solution, for people are often favorable to one rather than another”, Suzanne Shaw says. “For example, some people favour standards on the basis that in theory they always achieve their environmental goal, whereas in reality this is not so. If the standard is too high, the goal is not attained, or is attained at great expense. The point is not only to attain it, but to do so in the most efficient way possible. The same is true for emission allowances markets compared to taxes: allowances markets are better accepted internationally but using them is not an exclusive choice; taxes may also be used in conjunction with them to enhance overall efficiency.

They both are legitimate solutions.”

Complementary tools to be adapted to the situation

Take the example of Sweden, which as well as participating in the European market trading, has adopted a carbon tax. “We do not recommend that all countries do the same, but depending on the the goal aimed at, this complementarity between tools should be sought.” Suzanne Shaw insists that there is no single recipe applicable to every case. “The characteristics of each situation must be taken into account in deciding which instruments are most appropriate. We give examples of what has worked and why. In the case of allowances and taxes, people tend to think that you should use one or the other, but they can be used complementarily, to be mutually reinforcing. In some areas such as transport and households, which are not necessarily suited to cap-and-trade schemes, taxes can be used instead.”

Prospects for extension and harmonization

There are also the Kyoto Protocol project mechanisms, which, say the authors, improve the overall efficiency of allowances markets but need improving so as to allow more actors to participate in the reduction of greenhouse gas emissions. In view of the objectives in this respect embodied in the Copenhagen agreement, they also consider it necessary to find appropriate links between the different instruments so as to fight more effectively against climate change.

“The challenge is to create a consensus among nations on the mobilization of economic and regulatory instruments for linking the various national and regional systems that will be set up, and thus to achieve all the objectives efficiently and fairly”, they conclude.

METHODOLOGY

This paper describes the theory and practical application of the main instruments used in environmental policies, particularly those relating to the fight against climate change. The authors present the context and issues involved in the choice of instruments at different levels (regional, national, international) and analyze the prospects for harmonization of these instruments and their extension to a larger number of actors, with a view to producing a more effective and efficient climate policy.

Applications for the authorities

- This paper discusses the usefulness of the various instruments used in environmental policy, and shows their complementarity in some cases. Thus the governments of different countries should be encouraged not to neglect any means of meeting targets for reducing greenhouse gas emissions.
- The authors show that the way forward globally to reduce GHG emissions and thus fight against climate change is through the extension and harmonization of instruments. Governments should therefore be guided by this in the next stages of climate negotiations.

Further reading

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Pricing carbon

A WAY OF FINANCING GREEN GROWTH

Based on an interview with Boris Solier and on his paper "Le carbone : catalyseur d'une nouvelle croissance" (Conseil Economique pour le Développement Durable, Ministère de l'Ecologie, du développement durable, des transports et du logement) co-authored with Christian de Perthuis⁽¹⁾.

KEY POINTS

- Carbon emissions reduction policy will in future become increasingly constraining and be extended to other sectors (air transport) and to other greenhouse gases.
- Companies should prepare for the general adoption of the sale of allowances by auction in Europe. This will permit the funding of future emissions reduction policies initiated by the authorities.

BIOGRAPHY

Boris Solier



Boris Solier is a graduate of Montpellier I and Paris-Dauphine universities. He is a researcher at Climate Economics Chair and a doctoral student in economics at the Centre de Géopolitique de l'énergie et des matières premières (CGEMP). His research focuses in particular on the organization of energy markets and their interaction with pricing mechanisms for greenhouse gas emissions. He is the co-author, with Raphaël Trotignon, of the book "Comprendre les enjeux énergétiques", published in September 2010 by Pearson.

For a company, it is not in its economic interest to spontaneously commit itself to green growth. The regulatory authorities have ways of creating such an interest. Boris Solier and Christian de Perthuis show, for example, that the creation of a market for carbon emissions can be dual source of financing for green growth: upstream, by encouraging companies to innovate in order to emit less CO₂, and downstream, by using the revenue to fund carbon emissions reduction policies.

In a market economy, the costs and risks associated with the release of CO₂ into the atmosphere are not taken into account by the price system. The authors consider that government intervention is justified to make good this "market failure". To avoid impeding growth, the regulatory authorities have incorporated environmental costs into prices in the form of taxes or emissions caps. Such a system exists at the global level through the Kyoto protocol and at the European level through the EU emissions trading scheme, and is being developed at the national level.

The creation of carbon rent

By introducing constraints on CO₂ emissions, the authorities give a value, a price to carbon (directly in the case of a tax, indirectly in the case of the market after setting a cap on the amount released). This carbon rent "consists of two parts, scarcity rent and differential rent," says Boris Solier. Scarcity rent represents the quantity of emissions authorized by the policy in force, which increases the price of carbon. Even when emissions allowances are allocated free of charge, this represents an opportunity cost for companies that use these rights for com-

(1) Professor of economics at Paris Dauphine university and chairman of the Climate Economics Chair scientific council

“ By introducing constraints on CO₂ emissions, the authorities give a value, a price to carbon. ”

pliance rather than reselling them in the market. Individuals are affected by these costs, since in the absence of international competition, the producer passes them on to the consumer by raising the selling price. In the case of a tax, the impact is more visible, since it is directly applied to the product, and the consumer therefore pays it at the moment of purchase. Differential rent, for its part, arises from the search for efficiency in terms of carbon emissions, since the reduction of emissions enables companies to generate a surplus of allowances that can then be priced on the market. But carbon rent also can also finance emission reductions outside Europe. Boris Solier gives the example of the “clean development mechanism”, linked to the Kyoto protocol, that allows companies in industrialized countries to invest in emissions reduction projects in developing countries in order to meet their emissions reduction targets.

General adoption of the sale of allowances in Europe

During first two stages of the European emissions trading scheme, Boris Solier says, the possibility for governments of selling emissions allowances by auction was considerably underused. Indeed, he argues that initially governments were eager for the system to be accepted by industry and did not want to impose too heavy a financial burden on companies. In France, auctions have been very much less used than in countries such as Germany. He also notes that such

reluctance on the part of governments is illogical given the huge deficits created by stimulus policies. According to Boris Solier, who gives the example of France, “if all allowances were sold by auction, the state would collect the value of the carbon rent” – which could finance major projects to support green growth in both the EU and developing countries.

The possibility for the authorities of going further

As of 2013, the European emissions reduction programme plans on auctioning all CO₂ allowances for the electricity sector and 20% of allowances for other sectors not subject to international competition. The aviation industry is the next major sector to come within the field of application of the European market. Boris Solier argues that the contribution of the price of carbon to green growth could shift into a higher gear as of now if, firstly, the authorities maximized the selling of allowances by auction and reinvested a significant portion of the revenue to fund green projects, and secondly, if the carbon price were extended to diffuse emissions sectors through the introduction of carbon taxes. Another very important and little known aspect of the European CO₂ emissions trading system is that an individual or NGO may purchase allowances (which they will not use) in order to reduce the emissions cap proportionately. As Boris Solier points out, “it is a way of giving value to environmental protection.”

METHODOLOGY

The authors drew on several data sources to calculate their estimates, in particular the book co-authored by Christian de Perthuis for calculating CO₂ emission reductions under the European emissions trading scheme and the domestic projects mechanism. They also used data published by the European Commission, the French ministry of the environment and INSEE. In this way they were able to calculate the shortfall needing to be made up in public finances due to the low use of allowances auctions, as well as the potential revenue linked to the introduction of a carbon tax in France.

Applications for the authorities

- Carbon pricing mechanisms can finance green growth on a sustained basis, on condition that all the potential they represent is fully exploited (by auctioning allowances, taxing diffuse emissions sectors, etc.).
- The existence of a price for carbon is an incentive for technical progress and greatly contributes to the emergence of new technologies that are both low-carbon and a source of growth.

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Carbon taxation

TAKING ADVANTAGE OF EXISTING EXPERIENCE TO COMBAT POLLUTION MORE EFFECTIVELY

Based on an interview with Jérémy Elbeze and on his paper “Vingt ans de taxation du carbone en Europe : Les leçons de l’expérience” (Cahiers de la Chaire Economie du Climat n°9 – January 2011), co-authored with Christian de Perthuis⁽¹⁾.

KEY POINTS

- Carbon taxation and allowances markets can be complementary. It is simply a matter of finding an effective linkage of the two.
- Revenues from carbon taxation can be put to various uses: compensating households, reducing taxes or public deficits, and financing environmental measures.
- To be effective, the initial carbon tax rate should increase over time and be dedicated to attaining environmental objectives.
- As well as environmental benefits, carbon taxation can also result in minor economic benefits.

BIOGRAPHY

Jérémy Elbeze



Jérémy Elbeze graduated in economics and management from the ENS Cachan and has a further qualification in economics. He is a researcher at the Climate Economics Chair, which he joined after postgraduate training under the leadership of Christian de Perthuis at the CDC Climat Research. His research is concerned with environmental taxation in general and carbon taxation in particular.

How can carbon taxation be used wisely? What use should the revenues be put to? Is carbon taxation compatible with an emissions trading system? Does it have a positive effect on the environment and the economy? These are among the questions Jérémy Elbeze and Christian De Perthuis have endeavoured to answer in their study of the varied experience of carbon taxation in a number of European countries over the past 20 years.

Traditionally, economics textbooks present two ways of reducing greenhouse gas emissions: a CO₂ emission allowances market, such as the one introduced in Europe in 2005, which has now become the benchmark system; and carbon taxation. The aim of a carbon tax is to change the relative prices of goods or energy sources according to their CO₂ content, in order to orient economic actors towards less polluting forms of production and consumption.

“In theory, a carbon tax is a simple and effective economic instrument for reducing CO₂ emissions,” Jérémy Elbeze and Christian De Perthuis write. “In practice, setting up a such a system turns out to be much more complex. The social acceptability of the tax, imperfect information, competitiveness management, the existence of other environmental policy measures and political lobbying are all factors that complicate the simplicity of the original concept.”

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“ The study of the European experience reveals the many economic, political and social decisions. ”

Hybrid systems have demonstrated their effectiveness

The European Commission launched an initial proposal for a carbon tax on industrial emissions in 1990. Although it was never implemented, Sweden nevertheless committed itself to a similar project in 1991. Other Scandinavian countries followed suit, and most recently Switzerland and Ireland, though a French carbon tax project was abandoned in the spring of 2010. “We began working on this subject when a carbon tax was scheduled to be introduced in France, and we wanted to see what lessons we could draw from the various European experiences,” Jérémy Elbeze explains. “This is something that will necessarily happen in the medium term in France and throughout Europe, so we wanted to understand how it had developed elsewhere.” Foremost among the lessons they have learned through observing European initiatives in this area is the complementarity of emissions markets and carbon taxation. Although these two routes are generally presented as alternatives, they are, says Jérémy Elbeze, “able to cover all emissions when they are combined. In actual fact, a cap-and-trade scheme cannot easily be used to reduce the various so-called diffuse emissions, emanating from sources such as household heating, small businesses, hauliers, etc. What seems to be emerging in regard to the way environmental policies are organized are hybrid systems that use emissions trading to control concentrated emissions from large industrial plants and carbon taxation to control diffuse emissions.”

Varied utilization methods

Provided, however, that the two systems use a separate base. “Otherwise, there are revenue transfers that undermine the effectiveness of the system”, Jérémy Elbeze says. “The few countries that

have taxed companies subject to caps are currently ceasing to do so.” The authors add that it “seems necessary in the long term for carbon prices from the two instruments to converge.” In regard to carbon tax revenues, there are various uses depending on the economic and political context. “It all depends on the country’s priorities”, Jérémy Elbeze maintains. “If one wants to reduce a deficit, or improve the competitiveness of the economy, or if one has a very strong environmental objective, then the revenues can be used to attain these various objectives.” Nevertheless, their study shows that “countries generally adopt a mix between measures to compensate households, subsequent tax cuts and additional measures to finance emission reductions. The main pitfall to avoid is changing the carbon tax into a tax aimed at raising funds to augment national budgets.”

Economics subject to politics

The authors also draw on the experiences of pioneer countries in regard to the rate of the carbon tax. “More than the choice of the initial rate, which is often a political trade-off, it is the evolution of the rate that determines the effectiveness of the system,” they write. “The rate should increase over time and be dedicated to attaining the environmental objective.” Unfortunately, however, “the choice of the base, the rate and the evolution of the rate often deviate from the recommendations of economists.” As they emphasize, in general “the study of the European experience reveals the many economic, political and social decisions that are made during the introduction of a carbon tax.” But this in no way nullifies the advantages of a carbon tax, which they show has already resulted in other countries in not only in environmental benefits but also economic benefits, even if of small scale, as their study also reveals.

METHODOLOGY

After recalling the issues of carbon taxation in the context of the development of tax systems and the consolidation of public finances, the authors consider the right way to define the carbon tax base and to have it coexist with the area covered by the market.

They then discuss how to move towards the objective of a unified carbon price when there is a market for emissions allowances. Finally, they analyze the practical use of carbon tax revenues and examine the conditions for obtaining an economic benefit once a carbon tax is introduced.

Applications for the authorities

- Even though this is not its aim, this paper should make the French government more aware of the need for carbon taxation, and the most effective way of utilizing it (its base, the rate and its evolution, and the use of the revenues).
- The authors show that it is desirable that the question of introducing a carbon tax can again be addressed at the European level in view of the many economic, political and social decisions to be made when a carbon taxation system is introduced in each country.

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BIOGRAPHY

Raphaël Trotignon



Raphaël Trotignon is an engineer in environmental engineering at Mines de Nantes and holds a Master 2 in the economics of energy, the environment and sustainable development from AgroParisTech-ParisOuest. He was invited researcher at the MIT Center for Energy and Environmental Policy Research (CEEPR) in Boston. He worked for three years at CDC Climat Research, and since 2009 has been a doctoral student at Paris-Dauphine University and the Climate Economics Chair. His research focuses on the ex post analysis of the EU CO₂ emissions trading scheme and examines the compliance behaviour of participants.



The European carbon market

USES OF CARBON CREDITS

Based on an interview with Raphaël Trotignon and on his paper "Combining cap-and-trade with offsets: lessons from the EU ETS, Tracking CER use in the EU ETS for 2008 and 2009" (Cahier de la Chaire Economie du climat – Série Working Paper 2011).

KEY POINTS

- The use of carbon credits in the European allowances trading system has been both beneficial (through cost reduction) and put into practice.
- However, the use of these credits still remains concentrated, and is neither frequent nor greatly used compared to its potential.
- There are several possible impediments to the use of credits, such as high transaction costs for small businesses or the flexibility and differences in the rules between countries and sectors.

In 2005, the European Union adopted a carbon emissions cap-and-trade scheme to limit greenhouse gas emissions, which is partially related to the Kyoto Protocol carbon credits system. Although criticized in particular for altering the integrity of the system and for outsourcing CO₂ emissions reductions, the carbon credits (offsets) trading market will grow with arrival of Phase III of the EU ETS in 2013. Raphaël Trotignon reviews the first two years of the use of carbon credits in Europe.

The European Union Emissions Trading Scheme (EU ETS) is unique: as well as the 27 member States of the Union it also includes Liechtenstein, Iceland and Norway; it covers nearly 50% the EU's greenhouse gas emissions and links the Kyoto Protocol's Project Mechanism⁽¹⁾ to the cap-and-trade system. Thus, as well as the trading of CO₂ allowances – authorization to emit a certain quantity of CO₂ – it is also possible to trade carbon credits linked to economies made through an emissions reduction project. Depending on the original location of the

project, these credits are of two kinds: Certified Emissions Reductions (CERs) are issued to companies in a developed country whose investments in a developing country have led to a reduction in greenhouse gas emissions; Emission Reduction Units (ERUs) are issued to companies in a developed country which have made investments in another developed country. These credits are then traded and imported into the European market. Who uses them? And how often?

(1) Directive 2004/101/EC of the European Parliament and the Council of 27 October 2004 amending Directive 2003/87/EC

(2) By way of comparison, the largest industrial plant in Europe emits almost 30 million tonnes of CO₂ per year

(3) Germany, Spain, Italy, France, Poland, the United Kingdom and the Czech Republic

“ For reductions will in the first instance be made where they are least expensive. ”

An economically efficient market

The issuing of carbon credits in association with emissions reduction projects offers several advantages: it broadens the impact of reductions in greenhouse gas emissions by involving all countries; it diffuses reduction technology worldwide; and it reduces costs for participants in the ETS system, with which it is linked. The greater the scope for reducing emissions, the greater is the probability of finding emissions reduction projects at a lower cost. For reductions will in the first instance be made where they are least expensive. Moreover, the adding of the secondary credits trading market to the EU ETS has had two consequences.

The first is to enable operators to realize economies on the price difference between credits and allowances. Thus, over the two years studied, Raphaël Trotignon estimates that economies of about €280 million have been made by companies trading CERs rather than allowances.

The second consequence is the reduction of the equilibrium price of allowances, which indirectly benefits all operators. Furthermore, these credits answer to a demand: over 40% of credits issued before May 2010 have already returned to the European market. Despite the economic crisis and lower demand for carbon allowances, the use of credits by installations remained stable over the period 2008-2009.

Still underdeveloped usage

On average, over the years 2008 and 2009, 20% of industrial installations covered by the European system used CERs in at least one of the two years, and 10% for the two successive years. This means that nearly 70% of industrial installations concerned never used this type of credits. The figure rises to 81.7% for small industrial plants (emitting less than 25,000 tonnes of CO₂ per year⁽²⁾). The size of installations is indeed a determining factor. The smaller the ins-

tallation, the less likely it is to use CERs. Raphaël Trotignon offers two explanations for this:

■ The size of transaction costs obliges small installations to restrict the use of CERs. For although the transactions are less frequent, they are also more costly. It is in the interest of smaller installations to acquire and repay credits by using as few transactions as possible, in order to keep costs down.

■ Less proficiency in and knowledge of the European carbon market. Small plants, which are common in the ceramics, paper and cardboard sectors for example, may be independent or family businesses without the same ease of access to credit markets as multinationals.

Highly concentrated use

Raphaël Trotignon also shows that the import of credits is highly concentrated.

■ By sector: Fewer than 5% of installations import CERs into the European market. The main sectors using them are cement and refineries. Raphaël Trotignon notes that contrary to expectations, the combustion sector is not, in terms of intensity, a major importer of credits. Indeed, its structure is closer to the average since it contains a variety of installations.

■ By destination: In 2008, Germany and Spain together accounted for almost half the imports of credits in the European market. Seven countries⁽³⁾ among the thirty in the EU ETS accounted for 75% of the importable volume of credits.

Finally, the study finds that the sources of credits used in the European market are also highly concentrated. Most CERs traded in Europe come from projects based in China, India, South Korea and Brazil. 65% of CERs returned to the European market come from 10 large projects for reducing industrial gas emissions (HFC/N₂O) in developing countries.

METHODOLOGY

The author has combined data from the central register for monitoring emissions allowances – the Community Independent Transaction Log (CITL) – with data from the Kyoto Protocol Clean Development Mechanism (CDM). The study thus concerns nearly 12,000 European installations (about 5,000 companies) and 500 CDM projects. It covers the period 2008 and 2009, the first two years of Phase II of the implementation of the European Union Emissions Trading Scheme (EU ETS). The author concentrates on Certified Emissions Reductions (CERs), which represent 97% of the credits issued, distinguishing the main beneficiaries of these credits, and the intensity and frequency of their use.

Applications for the authorities

Raphaël Trotignon's study confirms that carbon credits are a source of greater economic efficiency in the EU ETS. By identifying barriers to wider and more regular use of credit, it offers suggestions for improvement such as:

- Working on transaction costs with a view to reducing these costs and enabling smaller installations make more frequent use of CERs.
- European harmonization of restrictions on importing credits. The levels vary by country from 0% in Estonia to 20% in Germany.
- Harmonization of the rules that provide time flexibility for using credits, which would lead to greater overall economic efficiency.

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Workshop: COMBINING CAP AND TRADE WITH OFFSETS
Paris-Dauphine University – 20/21st June 2011

9.15 - Registration & Welcome Coffee

09.45 Welcoming words
Christian de Perthuis (CEC)

➔ Session 1: Projects mechanisms at work

Chairman: Sam Fankhauser (London School of Economics - LSE)

10.00 A Global Assessment on Kyoto Project Based Mechanisms

Jorgen Fenhann (UNEP Risoe)

10.20 Top-down vs. bottom-up approaches to Project-Based Mechanisms (TBC)

Christina Hood (International Energy Agency)

10.40 Discussion

11.00 - Coffee Break

11.30 Projects Mechanisms in Agriculture and Forestry

Brian Murray (Duke University)

11.50 Project Mechanisms in Energy and Industry

Laurent Valiergue (Orbeo)

12.10 Discussion

12.30 - Lunch

➔ Session 2: The Double Challenge of Reducing Emissions Internally and Externally

Chairman: Frank Convery (University College Dublin)

14.00 The European Union Strategy with Offsets

European Commission (TBC)

14.20 The Japanese Strategy with Offsets

(TBC)

14.40 Discussion

15.00 - Coffee Break

15.30 Experiences with Domestic Offset Projects

German Federal Environment Agency (TBC)

15.50 The Californian Perspective on Domestic and Foreign Offsets Projects

Jan Mazurek (Duke University)

16.10 Discussion

16.30 – *Workshop End*

➔ **Dinner: invited speaker (TBC)**

➔ **Session 3: The Integration of Offsets in the EU ETS**

Chairman: Barbara Buchner (Climate Policy Initiative)

10.00 Offsets and Compliance in the EU ETS

Raphaël Trotignon (CEC)

10.20 The Nature and Use of Project-Based Credits in the EU ETS: The German Experience

Andreas Loeschel (ZEW)

10.40 Discussion

11.00 - *Coffee Break*

11.30 The Impact of Offsets on EU ETS Carbon Price Equilibrium

Suzanne Shaw and Stephen Lecourt (CEC)

11.50 Experiences with Offsets in the EU ETS

Jean-Yves Caneill (EdF) and Alexandre Marty (EdF Trading)

12.10 Discussion

12.30 - *Lunch*

➔ **Session 4: The Integration of Offsets in Other Schemes**

Chairman: Denny Ellerman (European University Institute - MIT)

14.00 Hosting Offset Projects as a National Policy

Benoit Leguet (CDC Climat Research, JISC)

14.20 The Future Generation of Projects

Axel Michaelowa (Perspectives) (TBC)

14.40 Discussion

15.00 - *Coffee Break*

15.30 Linking Cap and Trades with Offsets

Rob Dellink (OECD)

15.50 Hybrid Schemes

L. Taschini (LSE)

16.10 Cap and Trade, Tax, and Offsets: How to Combine them Efficiently?

Christian de Perthuis (CEC)

16.30 Discussion

16.10 Closing Remarks

Pierre André Jouve (CEC)

17.00 *Workshop end*

BIOGRAPHY

Pierre-André Jovet



Professor Pierre-André Jovet holds a doctorate in economics. He teaches and researches at Paris Ovest, Nanterre - La Défense University, and heads the Economics of Sustainable Development Masters and the Environment and Territory Development Masters. Pierre-André Jovet has been scientific director of the Climate Economics Chair since 1 January. His research is concerned mainly with environmental economics (environmental policy, regulatory instruments, innovation, etc.), and the impact of risk on agents' behaviour and more generally on public economics.



Tradable pollution permits

SOLUTIONS FOR A MORE EQUITABLE DISTRIBUTION

Based on an interview with Pierre-André Jovet and on his paper “Competitive Markets for Pollution Permits: Impact on Factor Income and International Equilibrium” (Environmental Modelling and Assessment, vol. 15, n°1 - 2010), co-authored with Philippe Michel⁽¹⁾ and Gilles Rotillon⁽²⁾.

KEY POINTS

- The different ways of allocating permits have an impact on capital flows, production and income distribution.
- Free allocation of permits to companies advantages shareholders to the detriment of employees.
- Auctioning permits would potentially allow the objectives of efficiency and equity to be met, but companies are opposed to it.
- All the factors of production contribute to pollution and should be allocated permits as a result.

The different ways of allocating tradable pollution permits have economic consequences on profits and wages, and thus the overall equilibrium of the market, argues the study by Pierre-Andre Jovet, Philippe Michel and Gilles Rotillon. The authors also suggest ways of sharing wealth more equitably, whether with employees or developing countries.

Pierre-André Jovet and his co-authors have sought to fill a gap left by their colleagues by focusing on the effects of a pollution permits market on the remuneration of production factors – capital, but also labour – and global equilibrium, i.e. by including the developing countries. “This question is particularly relevant in a North-South context, where developing countries, expecting that the costs of a reduction policy will outweigh the benefits, have refused to participate in the actions entailed by the Kyoto Protocol. However, many studies trying to assess these costs do not take these countries into account. It seems clear, though, that

such a question can only be studied within a general equilibrium framework and cannot be limited solely to examining how the cost of reduction efforts is shared. In particular it should take into account the likely effects on the reallocation of capital, caused by changes in interest rates following the distribution of permits.

Motivating the developing countries

Pollution permits are, by definition, a form of environmental regulation which involves setting emissions quotas (the number of permits) and letting the market determine their distribution. But the

(1) EconomiX, Paris Ovest, Nanterre - La Défense University

(2) EconomiX, Paris Ovest, Nanterre - La Défense University

“ The auctioning of permits potentially better meets the objectives of efficiency and equity. ”

market does not solve everything: capital flows, production and income distribution depend on the way permits are allocated. Their distribution has an influence on equilibrium. “In terms of the equilibrium among companies or among countries in the distribution of permits, the mode of allocation can, if it is not proportional to the factors of production, cause capital flows from one country to another, a redistribution that can result in a loss of production globally”, Pierre-André Jouvet explains. “If almost all the permits are given to a very poor country and few to a rich country, the latter will invest capital in the former by purchasing permits. There will be a net gain for the developing countries at the cost of an overall loss of efficiency in terms of capital utilization.”

Permits are good for profits

To analyze the impact of the mode of allocation, the authors assumed that a proportion of the pollution permits were allocated free of charge to companies, with the rest being auctioned. Although in theory any allocation system is possible, the authors make clear that the free initial distribution of permits to polluting firms on the basis of past emissions – the grandparenting rule – is generally considered inevitable. “The main reason for this practice derives from the fact that with this system, companies only pay for additional permits, whereas they pay for all of them with an auction system. Consequently, they view grandparenting as much more acceptable than any other distribution system, even though it only produces a small additional revenue

for the government.” But their study shows that giving permits to companies favours the shareholders, hence the capital factor, to the detriment of employees (the labour factor). “It is even possible that profits are higher in an economy with a permits market than in an economy without environmental regulation (when emissions constraints are low)”, they say. The auctioning of permits potentially better meets the objectives of efficiency and equity.

Don't forget the workers

The auctioning of pollution permits presupposes that governments know how to apportion the proceeds. A satisfactory solution would be to “distribute permits to each factor in proportion to its contribution to production (in general, one third to capital, two thirds to labour). In fact, grandparenting does not necessarily create windfall profits for shareholders when they are allocated wisely to all factors of production.” This allocation method would have the advantage of being more equitable. “A priori, at present, when companies are granted permits, this ultimately means giving them capital, since it falls within the profits, which are the return on the capital. Yet there is no reason to give this benefit solely to capital, since emissions result from production as a whole,” says Pierre-André Jouvet. “If one wanted to do something rather fairer, we should give permits to all factors of production, including labour. In this way company employees could benefit from a permit-related bonus system, for example.”

METHODOLOGY

The authors studied the economic consequences of different methods of allocating pollution permits (free allocation or auction) on general equilibrium in a simple theoretical model (two countries, with one company producing the same good with the same technology in each). They clarify the role of production factors (capital and labour) in Stokey's (1998) formulation by implementing a static analysis.

Applications for the authorities

- For an efficient and fair system, permits should be distributed to each factor of production in proportion to its contribution to production: one third to capital (shareholders), two thirds to labour (employees).
- In the context of development aid or North-South redistribution, more permits should be allocated to developing countries, even though they pollute less, so that they can obtain revenues from the developed countries.

Further reading

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BIOGRAPHY

Suzanne Shaw



Suzanne Shaw is currently project leader at the Climate Economics Chair and a doctoral student at Paris-Dauphine University. Of Jamaican origin, she studied engineering at the University of the West Indies (Trinidad and Tobago), then went on to take a Masters 2 in the Economics of Sustainable Development, Energy and the Environment at the Ecole Polytechnique and a Masters in Sustainable Development at the University of Edinburgh. Suzanne Shaw has also been a scientific officer at the European Commission (Energy Institute of the Joint Research Centre) and has worked on various projects in the energy sector as an engineer and consultant. Her research for the Chair concerns CO₂ price formation and modelling in the European emissions trading market.



The European carbon market

A MODEL FOR A BETTER UNDERSTANDING OF ITS VARIOUS ASPECTS

Based on an interview with Suzanne Shaw and on her paper "EU ETS electricity sector emissions and compliance to 2012: preliminary results from the Zephyr model" (forthcoming), co-authored with Stephen Lecourt⁽¹⁾.

KEY POINTS

- The Zephyr model was designed to understand and analyze the behavior of different companies in relation to the European emissions allowances market and the impact of this market on the price system.
- The model is distinctive in focussing on the European market and the medium term.
- The preliminary results provide a reasonable fit with existing numerical data.
- The model predicts that greenhouse gas emissions will be lower than allowances between 2008 and 2012.

The carbon market is in its infancy and the mechanisms that govern it are still poorly understood. That is why Suzanne Shaw and Stephen Lecourt have designed a model the first results of which are promising: it should help the different actors in the EU ETS make better informed decisions.

In the framework of the EU Emissions Trading Scheme, European manufacturers must ensure that every year they have a number of CO₂ emissions allowances equivalent to their actual emissions. To achieve compliance, companies can, in addition to the allowances allocated to them, buy carbon credits (EUAs or Kyoto CERs) from other companies that have invested to reduce their emissions.

Suzanne Shaw and Stephen Lecourt have elaborated the so-called Zephyr model to determine the equilibrium between supply and demand for these allowances in the European carbon market, the largest system of its kind in the world.

Their paper presents the model and draws some preliminary conclusions from the results obtained for electricity generation, the model's most detailed sector to date. "This research allows me to profit from my experience in the energy sector, renewable energy, and what I am studying for my thesis, namely carbon markets and climate policy, specifically its impact on the energy sector", says Suzanne Shaw.

Stephen Lecourt for his part is concerned more particularly with the non-energy sector and participates in programming the model.

(1) Researcher at the Climate Economics Chair and IHS-CERA, PhD student in economics at Paris-Dauphine University

“ The Zephyr model reflects what is happening in the market and provides a first empirical analysis of what should be expected.” ”

A niche model

In view of the liquidity problems arising from the 2008 economic crisis, which played a role in the flooding of the European allowances market, the Zephyr model was designed to understand and analyze corporate behavior in relation to this market, and its potential impact on determining the price of allowances. Suzanne Shaw says that at this stage “Zephyr combines the approaches of different types of model to provide a detailed representation of the electricity sector”. The fact that it focuses solely on the medium term and the dynamics of the European market also fills a gap left by existing studies, which are concerned with either the short term (econometric models) or the long term (general or partial equilibrium models) and with a larger geographical area. For, Suzanne Shaw says, “actors base their decisions on what they see now and on their expectations for the coming years, and tend not to have a very long-term view given uncertainty about the evolution of climate policy.”

A clearer view of the European market

More specifically, the model aims to provide a representation of the strategic operations and investment decisions (and the resulting emissions) of the various actors in the EU ETS. For European industry, for example, the price of allowances is an opportunity cost and it has an influence on the technologies used in production and on investment.

The price is also an indicator, for the authorities, of the importance of the environment in polluters’ economic decision-making. The model should give them a better understanding of the costs and opportunities related to this market, and it should also provide input to discussion as to its evolution.

Encouraging results

Although the authors recognize that it needs to be refined (taking into account additional data, further analysis) and to be more detailed in its representation of the non-electricity sector, the preliminary results obtained with the Zephyr model are, in their opinion, “satisfactory when compared to real data.” Moreover, they indicate that in phase II of the EU ETS (2008-2012), emissions will be lower than the available quotas if the configuration of conventional electric power generation is maintained (constant percentage for each non-renewable energy technology). “The results show what the model can do, including the price needed to obtain equilibrium between supply and demand”, says Suzanne Shaw. “It reflects what is happening in the market and provides a first empirical analysis of what should be expected.”

METHODOLOGY

The authors present the Zephyr model, constructed to represent CO₂ emissions and the formation of CO₂ emissions allowance prices in the medium term under the EU ETS. After outlining its advantages compared to existing models, Suzanne Shaw and Stephen Lecourt detail its structure and its state of development, then compare the results obtained with real data from the second phase of the EU ETS (2008-2012), especially in regard to electric power generation. Finally, they indicate in what respects it could be improved (for example, calibration and the introduction of uncertainty) or extended (in particular to the non-electricity sector).

Applications

- European companies will be able to use the model to determine:
 - ♦ the strategies they would enable them to achieve compliance at the least cost.
 - ♦ where opportunities may be found, as for example investing in some technologies rather than others.
 - ♦ whether they should make provision for greenhouse gas emissions allowances by purchasing or borrowing
- The authorities can use this model to analyze the impact of changes in climate policy on the European allowances market and CO₂ emissions.

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European allowances and Kyoto credits

PRICE SPREADS THAT CAN BRING LARGE RETURNS

Based on an interview with Maria Mansanet-Bataller and on her paper "EUA and sCER Phase II Price Drivers: Unveiling the reasons for the existence of the EUA-sCER spread" (to be published in Energy Policy in 2011), co-authored with Julien Chevallier⁽¹⁾, Morgan Hervé-Mignucci⁽²⁾ and Emilie Alberola⁽³⁾.

KEY POINTS

- The Kyoto credit price depends mainly on the European allowance price, since most of the demand for CERs comes from the European carbon market.
- The price spread between Kyoto credits and European allowances arises because EUAs can only be partially replaced by CERs (13.5% until the end of 2012).
- It is likely that some European companies are not sufficiently using this spread in order to make substantial economies.

BIOGRAPHY

Maria Mansanet-Bataller



Maria Mansanet-Bataller obtained a double doctorate from Valence University and Paris-Dauphine University following jointly supervised graduate studies, and she has a European PhD in quantitative finance awarded by the Spanish government. She is assistant professor at Valence University and an invited researcher at the Climate Economics Chair (an initiative of CDC Climat, in turn a subsidiary of the Caisse des Dépôts et Consignations, which is dedicated to combating climate change) and at Paris-Dauphine University under the auspices of the Fondation Institut Europlace de Finance. Her research is concerned with carbon markets and adaptation to climate change.

How do we explain the price discrepancy between different types of "carbon credit", whose purpose is nonetheless identical, namely to reduce CO₂ emissions? Maria Mansanet-Bataller and her co-authors explain this phenomenon by the intrinsic characteristics of the carbon market and show that, far from harming its operation, this price spread can be profitable for actors who are able to take advantage of it.

European Union CO₂ allowance units (EUA) and Kyoto certified emission reduction (CER) credits both represent a "right to pollute" allowing industries to emit one tonne of CO₂ into the atmosphere. They may be bought or sold, the one (CER) on any international carbon market, the other (EUA) solely on the European market. To attain the emissions reduction objectives of the Kyoto Protocol, the European Union launched the European emissions trading scheme (ETS). Under this system, installations that have exceeded their emission

greenhouse gas emissions caps are penalized according to the polluter-pays principle, and are obliged to purchase greenhouse gas credits or emission allowances from installations that have invested to reduce their emissions. The latter thus see their environmental efforts rewarded. "We started this econometric analysis of the CO₂ market because we wanted to understand why there is a spread between these two prices and how you can explain its evolution", says Maria Mansanet-Bataller, who carried out this work when she was project

(1) Paris-Dauphine University (CGEMP/LEDA)

(2) CDC Climat Research and Paris-Dauphine University (CGEMP/LEDA)

(3) Climate Economics and HEC

(4) Manzoni, K., (2002), "Modeling credit spreads: An application to the sterling Eurobond market", *International Review of Financial Analysis*, 11: 183-218

(5) Ramchander, S., Simpson, M.W., and Chaudhry, M.K., (2005), "The influence of macroeconomic news on term and quality spreads", *The Quarterly Review of Economics and Finance*, 45: 84-102

(6) "Quota européen et crédit Kyoto: vrais ou faux jumeaux?", *Tendances Carbone*, monthly bulletin of the European carbonmarket, 40, 1

“ The EUA-sCER price spread is not determined by physical factors ”

leader at CDC Climat Recherche, a research centre on the economics of climate change and the subsidiary of the Caisse des Dépôts et Consignations responsible for activities related to carbon finance.

Specific characteristics of carbon trading

“If the CO₂ market is efficient, the only possible explanation of a price spread between the EUA and the secondary (resale) CER is that market actors consider that these two assets are not fungible, despite the fact that they both allow one tonne of CO₂ to be emitted”. But the carbon market is not like other financial markets. The study conducted by Maria Mansanet-Bataller and her co-authors on the determinants of allowance prices and of Kyoto secondary (resale) credit prices brought to light certain characteristics which explain why they are different. The EUA price mainly and logically depends on the level of CO₂ emissions from European installations, which evolve according to economic growth, primary energy prices and climatic conditions in Europe. The same does not apply to the CER price, which even if it is directly correlated with the EUA price – since the greatest demand for CERs comes from the EU ETS, the largest emissions rights market in the world – it also depends on the level of supply and on factors having an impact on international demand for CERs (such as the development of other markets). The EUA remains “the most widely recognized currency in the greenhouse gas emissions market”, according to these authors. “In the last analysis, uncertainty in the CER market is much greater than in the EUA market”, they wrote in *Tendances Carbone* in October 2009⁽⁶⁾.

Kyoto credits: better than the lottery

“Indeed, participants do not have accurate information on the amount of credits that will actually be delivered to the market, aggregate demand expected by 2012, and the future of Kyoto project mechanisms beyond 2012. In addition, there is the restriction on the use of CERs in Europe, which has been extended to 2020.” From 2008 to 2012, the most CO₂-emitting European industries can only use CERs for compliance up to 13.5% of their EUA allocation. It is, moreover, this partial fungibility that explains, according to the paper, the price spread between the European allowance and the Kyoto secondary credit (sCER). “They cannot be used interchangeably. They are two different assets, so it is natural that their prices are not identical”, Maria Mansanet-Bataller explains. “But that does not mean that the market is not efficient.” According to these authors, the evolution of the spread depends on the prices of the EUA and the sCER, and especially market microstructure variables, suggesting that it is used for arbitrage operations (replacement of EUAs by CERs to obtain a risk-free profit).

A new bubble forming?

“The EUA-sCER price spread is not determined by physical factors”, they make clear in *Tendances Carbone*. “It evolves with the changing price of the EUA, regulatory information concerning the use of CERs and EUAs and also the technical trading conditions: some market operators take advantage of this price differential without having compliance targets”. sCER use is, however, restricted at present (3.9%, or 96% of the EUA in 2008), and the authors point out that unlike what can be seen in pure finance, opportunities for arbitrage are not systematically exploited. “Arbitrage between EUAs and sCERs calls for specialist knowledge that only banks with a carbon emissions trading department, the largest energy traders and specialist brokers are currently able to offer”, they write. “But as the scale of carbon markets expands worldwide, we can expect to see this type of business growing rapidly.”

METHODOLOGY

The authors analyzed the determinant factors of European Union CO₂ allowance unit (EUA) prices, of Kyoto secondary (resale) Certified Emission Reduction (CER) credit prices and of the spread between the two of them during first two years of the compliance period of the Kyoto Protocol (2008-2012), using the methodology adopted by Katuscia Manzoni⁽⁴⁾ and Sanjay Ramchander⁽⁵⁾ for studying financial security spreads. They set out to determine whether there is a direct relationship between EUA and CER prices, subsequently analyzing their determinants and those of the spread by means of GARCH models.

Applications for the authorities

- Companies could use Kyoto credits more extensively and make substantial economies by replacing more EUAs by CERs for being in compliance when the price differential is high. They should consider having a department specializing in greenhouse gas emissions trading, or finding financial actors (banks, specialist brokers) to serve as intermediaries.

Further reading

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BIOGRAPHY

Guillaume Bouculat



Guillaume Bouculat is head of agriculture-forests-food research for the Climate Economics Chair, an initiative of CDC Climat (a subsidiary of the Caisse des Dépôts et Consignations, dedicated to combating climate change) and Paris-Dauphine University under the auspices of the Fondation Institut Europlace de Finance. He wrote this paper as project leader at ONF International⁽²⁾. A graduate in finance from ESCP-Europe, he has held various posts in the financial sector and has recently specialized in climate economics, after obtaining a Masters in energy and carbon economics at Paris-Dauphine University.



Forestry investment

FOR A BETTER GRASP OF CARBON-LINKED RISKS

Based on an interview with Guillaume Bouculat and on his paper “Le risque carbone dans les investissements forestiers” (Cahiers de Recherche de la Chaire Economie du Climat, Informations et Débats, n°7 – septembre 2010), co-authored by Clément Chenost⁽¹⁾.

KEY POINTS

- The forest system has significant potential for mitigating greenhouse emissions and thus global warming, but its use for this purpose is still in its infancy.
- Forestry projects present particularly high risks, some of which are specific, but project developers are not always clearly aware of them.
- Some risks may be managed, but for others no satisfactory solutions are available.

Guillaume Bouculat and Clément Chenost are interested in the substantial risks facing forestry projects with a carbon component. They show that while some of these risks can be mitigated by good project management, others have still not found a satisfactory solution and may be a major constraint on investment.

Guillaume Bouculat and Clément Chenost's paper begins with this observation: “Forestry projects are today reduced to tiny proportion of the tools for fighting climate change”. Nevertheless, as the authors remind us, “the forestry system has considerable mitigation potential” for greenhouse gas emissions. Unfortunately, some initiatives such as the REDD⁽³⁾ forestry carbon projects, aimed at reducing greenhouse gas emissions in the forestry sector by allowing developed countries to offset their own emissions by investing in developing countries, are still excluded from the field of application

of the Kyoto Protocol and are non-fun-gible in the major compliance markets. “The practical and operational aspects of such projects are still very poorly understood,” says William Bouculat. Two main reasons arise, the paper explains, from the “accountancy challenge” in regard to forestry credits, and the difficulty of making accurate measurements of the state of forest cover and its carbon content. The risks of investing in forestry projects are ultimately greater than those found in most traditional industrial activities, even when these projects have a carbon component.

(1) Development director at ONF International, associate professor at Ecole des Mines de Paris (ENSM, ParisTech) in environmental projects management, and co-founder of the NGO Green Synergie.

(2) An international environmental consulting and expertise bureau specializing in sustainable ecosystem management (notably forest related) and the fight against climate change

(3) Reducing Emissions from Deforestation and Forest Degradation

(4) REDD and improvement of carbon stocks

(5) Afforestation and Reforestation

“ The forestry system has considerable mitigation potential. ”

“We listed twenty risks so as to understand them better and counter them more effectively”, says William Bouculat. “Many people work on these projects without being aware of what can go wrong.”

Specific risks

Among the risks identified and explained in the paper, there are some that are particularly high and specific to “forestry carbon” – starting with the permanence risk. “Consider a more conventional carbon project, such as a coal-fired electricity generating plant that permanently reduces its greenhouse gas emissions by 50% by switching to gas. Compare this to a REDD project that would allow the forest to be degraded and deforested at a rate of 5% per year instead of 10% in the absence of the project. That would also reduce emissions by 50%, but this does not mean that the trees will not be later destroyed due to fire or agricultural clearance.”

The same goes for the so-called carbon leakage risk: “If you protect a forest that could be cleared to grow soybeans, the demand for which is inelastic and tending to increase globally, nothing ensures that farmers will not clear a nearby forest or even one elsewhere in the world in order to meet demand, which will not decrease and needs to be satisfied anyway.”

Solutions for some risks

In the case of non-permanence risks, solutions exist through the provisioning system or even, in the long term, coverage against the risk by specialist insurers. Provisioning, says William Bouculat, involves “setting aside part of the carbon credits generated to cover potential future deterioration in the carbon stock.”

Some other risks are unfortunately more problematic, such as the risk of leakage, which Guillaume Bouculat views as “practically unmanageable in the short term.” He explains, “It depends on the cause of the leakage. If people cut wood for heating, the risk is reduced. Fast-growing trees can be planted on already degraded land to meet their needs. But if it is a matter of growing soybeans, the risk of leakage is greatest. The only way to manage it well is in the long term to apply the REDD system on a very large scale, so that all major forests are protected.”

How to mitigate other risks

This system is rightly being expanded, with the inclusion of the REDD+⁽⁴⁾ programme within the framework of the United Nations Framework Convention on Climate Change at the Cancún climate summit. “Much remains to be decided”, William Bouculat says, “but there are positive initiatives like the coming California carbon market, which will accept forestry credits from a number of countries, or the growth of voluntary markets. In Paris, four investment funds are being organized to mobilize public and private funding and invest in the conservation and enhancement of tropical forests.” According to the paper, the three main types of forestry carbon project – REDD, REDD+ and A/R⁽⁵⁾ – “offer different risk profiles.” As the market does not yet provide an adequate historical perspective on these three, the authors advocate a diversified portfolio investment approach: technology, country, standards, etc. “But the project owner should nevertheless still thoroughly analyze the various risks we have mentioned, within the specific context of each project.”

METHODOLOGY

The paper summarizes the main lessons learned from the preparation by the authors of a risk indicator for the generation of forestry carbon credits at the project level (degree of confidence in the project's capacity to deliver the carbon credits in the quantity and time frame envisaged). The study draws on bibliographical research and on many interviews with professionals in the sector, and explains the various risks associated with investing in forestry projects with carbon components, followed by an outline of proposals for dealing with them.

Applications

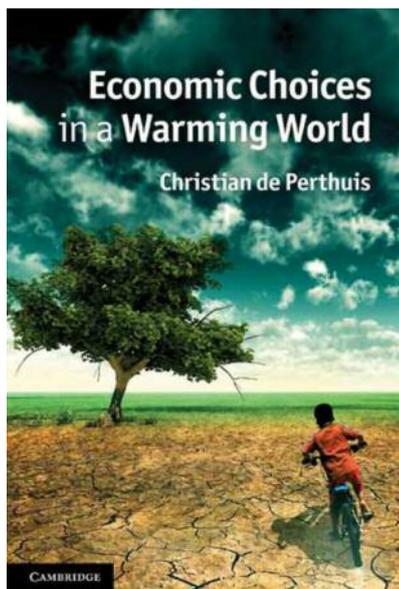
The paper is instructive for various types of actor:

- For potential investors and the sector's professionals: a better understanding of the risks run and clearer decision-making.
- For insurers: an introduction to issues of insuring against permanence risk in relation to forestry credits.
- For governments: clarification for their forestry cover conservation policy.

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Economie du climat : une actualité brûlante !



“Economic choices in a warming world”

par Christian de Perthuis

L'incertitude est le maître mot des scientifiques lorsqu'on leur demande d'évaluer l'exposition de nos sociétés au risque climatique. Or, celle-ci est parfois utilisée dans le débat public pour justifier l'inaction face au changement climatique. Cet ouvrage montre que les risques de l'action face au risque climatique sont sans commune mesure avec ceux, dramatiques, qui résulteraient de l'inaction. La démonstration se fonde sur une connaissance exceptionnelle de la négociation climatique internationale et des instruments comme les marchés de permis d'émission dont le fonctionnement est expliqué avec rigueur et illustré par de nombreux exemples. Se démarquant des visions catastrophistes, l'auteur aborde sans détour les grandes questions posées aux décideurs. Un livre passionnant et engagé, véritable plaidoyer pour l'action.

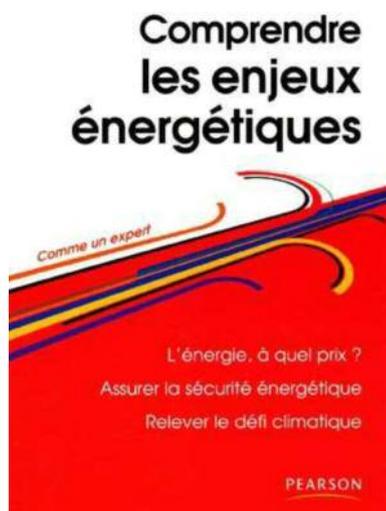
Cambridge University Press

240 pages

ISBN : 978-0521175685

Version française disponible sous le titre “Et pour quelques degrés de plus... Changement climatique : incertitudes et choix économiques” chez Pearson

Boris Solier
Raphaël Trotignon



“Comprendre les enjeux énergétiques”

par Boris Solier et Raphaël Trotignon

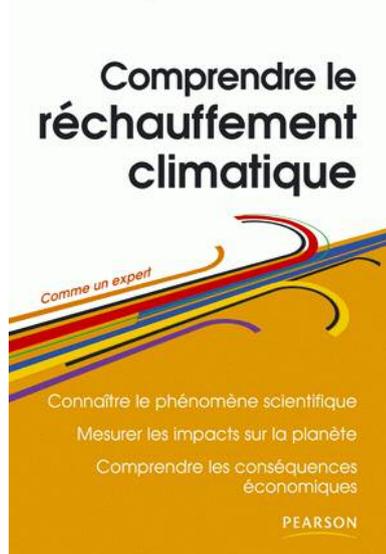
C'est un fait : la prospérité de nos sociétés repose sur une utilisation massive d'énergie. Aujourd'hui, 80 % de nos besoins sont couverts par le pétrole, le gaz et le charbon. Ce modèle ne peut pas être étendu aux pays en développement sans risque d'épuisement des ressources et de dérèglement du climat. C'est pourquoi le système énergétique devra opérer de nombreuses mutations : améliorer les sources d'approvisionnement existantes, développer les énergies de demain, réduire la pauvreté énergétique, diminuer fortement les émissions de gaz à effet de serre... Ces changements ne concernent pas uniquement les décideurs politiques et économiques : chacun a également son rôle à jouer dans cette mutation qui va bouleverser notre univers quotidien. Comment produire et acheminer l'énergie ? Où l'échange-t-on et à quel prix ? Comment prendre en compte le changement climatique ? Que faire à l'échelle individuelle ? À l'aide d'exemples pédagogiques et chiffres à l'appui, les auteurs nous offrent ici les clés essentielles à la compréhension des enjeux énergétiques, qui sont au cœur de l'actualité.

Pearson

110 pages

ISBN : 978-2-7440-6455-5

Raphaël Trotignon



“Comprendre le réchauffement climatique”

par Raphaël Trotignon

-19°C : c'est la température moyenne qu'il ferait sur Terre en l'absence de tout effet de serre. 2 tonnes de pétrole : c'est l'équivalent de la quantité d'énergie produite en moyenne en un an pour chaque habitant dans le monde. 70 mètres : c'est l'élévation attendue du niveau de la mer si l'intégralité des glaces présentes sur Terre venait à fondre... Dans ce livre résolument pédagogique, l'auteur aborde les multiples facettes du réchauffement climatique en partant à chaque fois d'un ordre de grandeur clé. Puis il propose un exposé clair et didactique du thème en s'appuyant sur des chiffres percutants. L'auteur détaille les mécanismes physiques qui animent la machine climatique, l'impact de nos activités sur l'atmosphère et les conséquences potentielles sur la vie et les organisations humaines. Il informe également le lecteur sur les outils économiques comme les systèmes de quotas et les taxes qui donnent un prix aux émissions, et analyse l'effet de ce prix sur l'ensemble de nos sociétés. Autant de sujets controversés à l'heure du débat sur l'après Kyoto. Un petit livre passionnant, qui regorge d'informations et dresse un état des lieux objectif du problème climatique.

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