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Abstract:

Climate change is the first truly global environmental problem facing the international community. It is a complex phenomenon that requires not only mitigation but also adaptation policies. Coordinating such policies raises numerous problems because it entails a new form of cooperation which, as always, clashes with various existing domestic and transnational interests. Given these oppositions, the development of a climate change regime is in and of itself a remarkable achievement. Unfortunately, this regime has encountered major obstacles in the form of refusals by major countries such as the United States or Australia to participate. This paper seeks to show that the conflicting positions of Europe and the United States correspond to their respective political economies and historical evolution of energy use. These aspects are also at the origin of very different strategies at the international level, cooperative and multilateral for the EU, bilateral and power driven for the US. It is argued here that it is an illusion to think that the US will join a multilateral regime unless some of its major industrial interests are satisfied or until the balance of business interests tilts toward participation. This will only happen if either a major technological breakthrough is suddenly made within objecting countries or if non participation leads to missed opportunities by important industries, thus making the climate change regime appear sufficiently attractive for them.

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Transatlantic Divergences on Climate Change

Transatlantic divergences on climate change have been rekindled ever since the Bush administrations announced its opposition to the Kyoto Protocol on March 6, 2001. Climate change has since then often been cited as one of the main contentious issues between the US and the European Union. Indeed, despite oppositions among Europeans on other aspects of policy (re. the Iraq war), both public opinion and governments in Western Europe have consistently pushed for strong climate mitigation measures despite the fact that developing or emerging countries such as India and China do not face any obligation to do the same. How can one explain this new transatlantic split? Is it just another aspect of the neo-conservative policies adopted by the Bush White House or does it have deeper roots? As I will try to show here, the origin of the split is both deeper and more fundamentally connected with the different natures of the political economies of both the United States and Europe. Bush's arrival in 2001 served to reveal strong forces that exist in the US and that are used to cheap energy policies. Theoretically this raises the interesting issue of domestic (in the largest sense of the term, since the EU is made of several domestic constituencies) versus interstate type explanations of disputes. Clearly, I situate the origin of the issue at the domestic level. In terms of a Principal Agent perspective, in the US, both the agent—the executive and the elites and lobbies that support it—and the principal—large segments of the American electorate—adhere to cheap energy policies, whereas in Europe due to a very different evolution since World War Two, higher energy prices are considered a minor nuisance and sometimes even desirable. However, I will also try to show that, although domestic differences might be at the origin of the split, this one nevertheless has important consequences at the international level: the strategy of the Bush administration has not only been to renounce the Kyoto Protocol but also to make it ineffective by promoting separate bilateral climate arrangements with various countries. Moreover, US diplomacy has tried to persuade important players, such as Russia, not to ratify the protocol. Conversely, the EU has thrown its diplomatic weight fully behind Kyoto and it is suggested, though not acknowledged, that EU support for Russia's WTO membership was contingent on the latter's ratification, which occurred at the end of 2004.¹

Understanding transatlantic differences about climate change policies is rendered more difficult by the complexities of the natural processes regulating climate and the scientific debate around the causes and consequences of projecting climate warming. Thus in order to discuss the political ramifications, it is first important to review some basic climate change questions.

Basic features of climate change

¹ Another widely acknowledged example of the relation between the need for cheap energy in the US and its foreign policy is its Middle East policy.

Climate change has been on the international agenda since the end of the 1980's. The issue gained some momentum with the creation in 1988 of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations Environmental Program (UNEP) and the World Meteorological Organization (WMO). The IPCC is primarily concerned with the establishment of a broad scientific consensus on the causes and the likely future evolution of climate change. Policy measures to address climate impacts are addressed within the United Nations Framework Convention on Climate Change (UNFCCC), first presented at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 and then turned into binding commitments through the drafting of the Kyoto Protocol to the UNFCCC in 1997. The enactment of the Kyoto Protocol was (according to its own rules) assured in 2004 with ratification by Russia. The Protocol went into force on February 16, 2005 even though some important industrial nations such as the United States and Australia have refused to ratify it. Despite this setback, however, the climate change issue has generated, in a relatively short time span, considerable international cooperation. There are parallels with the institutionalization of international trade relations beginning immediately after World War II. At that time, the United States Senate originally refused to ratify the International Trade Organization Treaty. Nearly 50 years passed between the signature of the General Agreement on Trade and Tariffs (GATT) in 1947 and the establishment of the World Trade Organization (WTO) in 1994. We can therefore say that the development of the international climate change regime, along with similar efforts to control the use of ozone depleting substances, constitutes an instance where scientific research had a relatively quick impact on international policy making. There are reasons for this, not the least of which are the links between climate change and several safety and security problems.

As was already established by the Swedish scientist Svante Arrhenius in 1896, climate change is caused essentially by variations in solar energy reaching the Earth, slight changes in the orbit of the Earth around the sun, and from variations in the amount of so-called greenhouse gases in the atmosphere. These gases, like glass in a greenhouse, have the property to retain in the atmosphere some of the solar radiation hitting the planet. In this sense, a too small concentration of greenhouse gases leads to cooling, but excessive amounts of these lead to warming. One of the main greenhouse gases is carbon dioxide (CO₂) which is produced whenever fossil fuels are burned. Other gases are also important, such as water vapor², and methane (CH₄), which results from plant decomposition (especially in water), or cattle raising. Since the beginning of the industrial area, CO₂ concentrations in the atmosphere are estimated to have risen from about 280 to 368 parts per million and methane concentrations from about 700 to 750 parts per billion. Higher greenhouse gas concentrations have been accompanied by an increase of about 0.6% degree Celsius over the 20th century. Moreover, the 1990s are the warmest decade of the millennium. The consequences of such developments are ominous for safety and security: the sharp rise in temperatures (the scientist Michael Mann 2003a and 2003b compares the growth curve to a hockey stick, almost flat until the latter part of the 20th century, when a sharp increase occurs) will likely have an effect on climate instability and the frequency of extreme events such as storms, hurricanes, and tornadoes. Summers should get hotter and winters warmer. The hot summer of 2003 in Europe could be repeated many times with even higher temperatures. These rising temperatures are also likely to cause ocean waters to expand to which some melting from both glaciers and the Arctic and then eventually Antarctic ice sheets

² Water vapor is the most powerful greenhouse gas, but since it rises as evaporation and falls as rain or snow, its influence is considered more or less unchanging over time.

will also contribute. This sea level rise will threaten coastal zones and induce many of their inhabitants to leave.

The indirect effects of activities linked to the weather, such as agriculture, and human health could also be important. Developing countries are at a particular risk because their agricultural production is not as flexible as that in industrial countries and, moreover, a large portion of their populations is dependent on it. In addition, adverse weather conditions are expected to become more frequent in tropical and subtropical areas. The global health situation could also deteriorate as micro-organisms previously confined to tropical areas may expand into other geographical zones. Similar developments are likely for pests affecting agriculture.

In addition to being exposed to potentially more natural disasters, the international community may also be confronted with large scale population movements mostly from South to North in proportions unseen so far. Finally, the likelihood of some low probability global catastrophes such as a major reversal of present ocean currents (such as the Gulf Stream) and thus abrupt climatic changes for whole regions, or a sudden acceleration of the greenhouse effect due to the massive release of methane from previously frozen ground (permafrost) will also be enhanced.

Two conclusions emerge from this brief overview of climate change, its causes, and its likely consequences.

- 1) From a policy point of view it appears necessary to **mitigate** climate change, i.e. to take measures to diminish emissions of green house gases either by lowering consumption of fossil fuels or reducing methane by using different agricultural techniques or, in some regions, abandoning agricultural production all together. To count on natural balancing mechanisms such as CO₂ fertilization of plants favoring carbon sequestration is probably an illusion (Haering and Koerner 2004).
- 1) Current levels of greenhouse gas concentrations in the atmosphere have a strong long term momentum. Even if forceful mitigation measures are adopted, some increase in concentrations is inevitable. Therefore, some form of climate change will occur even if emission reductions were to begin immediately. **Adaptation strategies** will also be necessary.

These two forms of response have evolved differently, have different implications for policy choices, and will have different impacts on society of the future. An integrated strategy to confront climate change will necessarily address both types of response and it is important to discuss their histories, the measures proposed, and their likely effects. In addition, they are likely to affect the interest of important international actors such as the US and the EU in different ways, which also have to be analyzed.

Mitigation policies

Historical aspects

Mitigation policies against climate change have been debated at the international level since the beginning of the 1990s. The elaboration of the Kyoto Protocol in 1997 and its

aftermath was fraught with controversies. As is the case for many other international responses to problems, the 1992 Rio Framework Convention on Climate Change takes the form of a “framework convention”, i.e. a document that specifies general principles and recommendations but has practically no legally binding mitigation actions. Thus the FCCC goes no further than to oblige countries to report on their greenhouse gas emissions and to recommend that parties develop climate change policies that, for industrialized countries, would lead to a stabilization of emissions to their 1990 levels by 2000. Moreover, parties are encouraged to favor the dissemination of greenhouse gas emission reducing technologies to developing countries. The basic idea that industrialized countries should make the major initial effort toward reductions was confirmed in the (first) Berlin Conference of the parties to the FCCC in 1995. In 1996 in Geneva, it was agreed that industrialized countries (Annex I countries in UNFCCC texts) should work toward “quantified limitation and reduction objectives within specified time-frames, such as 2005, 2010 and 2020, for their anthropogenic emissions by sources and removals by sinks of greenhouse gases”. This statement, adopted in the form of a “Ministerial Declaration”, prepared the groundwork for the elaboration of the Kyoto Protocol in 1997. This document was elaborated after the US delegation through the words of then Undersecretary of State for Global affairs, Timothy Wirth strongly endorsed the idea of legally binding targets in exchange for the rejection of “‘harmonized’ policies and measures on developed countries, such as uniform Corporate Average Fuel Efficiency (CAFE) standards and energy taxes,” but rather would consider implementing more flexible, market based approaches, such as an emissions trading scheme similar to that found in the US Clean Air Act”. Without this American prodding and then approval, the very foundations of the Kyoto Protocol could have been quite different, a consideration that I will discuss further in examining the question of the “American paradox” with respect to climate change.

The **Kyoto Protocol (KP)**, enacted a year later, rests upon a dual foundation for climate change mitigation policies: 1) **Legally binding reduction targets of greenhouse gases** (six gases are enumerated in the KP) for each industrial country or country grouping (such as the EU) with respect to their 1990 levels by the end of the first time period 2008-2012. The Kyoto targets amount globally to a lowering of 5.2 % of industrial country emissions. 2) **The use of “flexible mechanisms” to achieve this goal.** These can take the form of emission reduction, trading, and joint implementation of these between industrialized countries. More important, reductions can be achieved through the Clean Development Mechanism (CDM). This arrangement allows firms from industrialized countries as well as the countries themselves to implement greenhouse gas reducing technologies in developing countries in order to share (with the given country) the credit for such reductions. In this way, developing countries will be incorporated into the “Kyoto” reduction process even before they are officially part of the agreement. The flexible mechanisms also define the only explicit exclusionary principle contained in the protocol, namely the prohibition of non-members or firms from non-member countries from participating. This exclusion may become important in the future by giving incentives to non members to join³.

The decision to choose 1990 as a benchmark year for reductions has had important consequences. In 1990, countries of Eastern Europe, particularly Russia and the Ukraine, were

³ For more information about Kyoto and the climate change regime refer to Luterbacher and Sprinz 2001.

still ruled by the Soviet political and economic system. The dismantling of Soviet style industry during the following years resulted in a tremendous reduction in greenhouse gas emissions (about 30%) for most Eastern block countries, a change that has little to do with any mitigation policy. Nevertheless, Russia and the Ukraine have now substantial margins to play with in developing their climate change policies. The "hot air" from emission reduction that occurred because of changing industrial practices can either be used as credit for their own reductions or sold to other countries. The 1990 baseline also means that countries, such as South Korea and Mexico, that joined the OECD after that date but were members by 1997, were still considered as non-industrialized.

All in all, and despite some obvious limitations, the Kyoto Protocol appears as a relatively reasonable compromise. Properly applied, it should both diminish industrialized countries' emissions and, through the Clean Development Mechanism, ultimately draw in developing countries as well. For the moment, it is difficult to say if it will ever succeed. A first and important step occurred with the Russian ratification and the Protocol's enactment in February 2005. Another important and crucial aspect of the development of Kyoto will be determined by the success or failure of the emission reduction trading market set up by the EU Commission, and yet another when rules for a CDM market will be final and transfers of clean technology working correctly under them.

Since its inception in 1997, and even before, however, the Kyoto Protocol has been subjected to a barrage of criticism. It comes mostly from the United States, both from politicians in the House and Senate and from business and intellectual circles. One example of strong suspicion was the Byrd-Hagel resolution passed by the US Senate in July 1997. It refused to commit the US to any binding reduction scheme without the participation of developing countries. The vote of the resolution was mostly intended to weigh on the negotiations that would occur later that year and result in the final draft of the Kyoto Protocol. Since no obligation for developing countries was introduced into the KP, its rejection by the Senate has been taken for granted ever since. Even though support for it continued within the Clinton administration, the Protocol was never sent to Congress for debate or ratification. The Bush administration declared its opposition to the KP in March 2001 and refused to send it for ratification. This remains the official US position.

Perhaps not surprisingly, this attitude characterizes not only the position of the Bush administration and of several key industrial groups in the US but the attitude of a number of economists and other influential thinkers who have characterized the Kyoto Protocol as fundamentally flawed. The objections against the Kyoto Protocol fall into four categories:

- 1) The Kyoto Protocol costs a lot and accomplishes little.
- 1) Developing countries do not have any obligations within it, therefore some of the main sources of future emissions are not even covered by it.
- 1) The protocol has no compliance mechanism
- 1) Emissions trading will not work because of the Eastern (mostly Russian) hot air.

The validity of some of these objections is highly questionable: The costs of the protocol are highly exaggerated, especially in the United States. Given the fact that the US is an exceedingly high emitter of greenhouse gases (twice the average European rate; almost three times the Swiss rate), its marginal costs of reduction should be relatively lower. This impression

is indeed confirmed in a study by Ellerman and Decaux (1998). US GDP percentage cost estimates vary widely, often in parallel with the political orientation of the organization doing the study. Thus, a study by Manne and Richels of 2001 puts the cost at 0.75 % of GDP by 2010, but, according to the National Center for Policy Analysis, the cost could be as high as 5.1 %. Such studies however often fail to take into account secondary benefits for US GDP via balance of payment improvements resulting from a lowering of energy imports. According to some of my own calculations these could reach 9% of GDP over a 25 year period⁴.

It is true that the Kyoto Protocol does not achieve much quantitatively, since a 5.2 % emission reduction (only about half of that if the US does not participate) will certainly not solve the climate change problem. However, a narrow quantitative assessment minimizes the important political signal sent both to industry and to non-industrialized countries as well as to international institutions by the enactment of the Kyoto Protocol. A clear sign that the world must reduce fossil fuel consumption, along with higher fossil fuel energy prices, would likely contribute to the development and dissemination of alternative technologies. So far, such a clear signal has been missing, as reflected by still relatively low levels (in real terms) of petroleum prices and the willingness to develop even more fossil fuel uses. Several coal firing electric generation plants and oil pipelines are still being constructed, sometimes with the support of international lending institutions.

It is also true that developing countries are not subject to legally binding reduction targets within the Kyoto framework. Does this mean that they stay untouched by it? Two important factors suggest otherwise. 1) Even though some developing countries have become important industrial producers (such as India, China, and Brazil), their development depends largely, at least for some time to come, on their ability to export to wealthy regions of the world and thus also to import technologically advanced equipment. This means that such emerging countries will have to adapt to industrial and transportation standards elaborated in the developed countries and therefore also, implicitly, to their environmental components. Moreover, if one observes what has happened in the past in emerging economies, one notices that these have always tended to adopt the more advanced, more efficient technologies because it is in their interest to do so to insure competitiveness. Automatic adaptations of this sort are probably already at work in emerging countries⁵. 2) The Kyoto framework does include ways in which to involve developing countries by providing them with incentives to control their emissions. This can be achieved via the Clean Development Mechanism, which allows individual firms to achieve emission reduction credits by exporting cleaner, i.e. less greenhouse gas producing technologies, to emerging countries. This particular aspect of the Kyoto Protocol enhances the tendencies emphasized in the first consideration. As I will try to show later, this aspect of the Protocol could become one of its major attractions if it is linked to an efficient emission reduction certificate market.

The above observations also lead me to question the assertion that the Protocol does not have a compliance mechanism. First, this assertion is incorrect *stricto sensu* since the Protocol

⁴ This result was achieved with the HEI Geneva International Socio-Economic Energy Model.

⁵ Japanese and Korean, steel plants, more modern than those in the US, are an example of such trends. This automatic adaptation phenomenon must also be at work in China where CO₂ emissions have diminished in absolute levels since 1998. They may be currently increasing again, but at a much lower rate than anticipated.

envisages fines in the form of additional commitments in a second period if reduction targets are not met. However, this is relatively secondary compared to the “policing” that an efficient certificate market could realize on its own. If certificates, like financial instruments such as bonds for instance, are rated systematically by a rating agency, industries and business should refuse to buy those that are devalued due to systematic non-compliance or cheating by the state that vouches for them. Like non-performing bonds, such certificates, and thus the states that stand behind them, should be shunned by the market.

The case of the Eastern “hot air” seems like a stronger blow to the proper working of the Kyoto Protocol. Without US participation, it could lead to artificially low prices of reduction certificates and thus slow down real emission reductions. This argument however, does not take into account the possibility of emission reduction “banking” by Ukraine and especially Russia. It is doubtful that these countries will be able to participate in an emissions reduction market outside of the one that has been set up by the European Commission. This is especially true for the Ukraine who wants to enter the EU, but also for Russia which will have trouble marketing its “hot air” otherwise since the US does not participate in the Kyoto process. It will then be up to the European Commission to define the terms of the exchange of Russian certificates. Given these limitations, Russia might decide to save or “bank” these emissions reductions for its own future use. For the moment at least, no plans to sell hot air have been coming from these eastern countries.

This analysis suggests that complaints about the Kyoto Protocol have little merit. In this context, the real question is why the US opposition against it is so strong. In some ways, this attitude is reminiscent of the hostility that surrounded the launching of the Euro. The European common currency was declared to be unworkable and inefficient, a position that partially masked the not unfounded fear that the Euro could in some ways diminish the role of the dollar as an international reserve currency, with the negative consequence that the US would be forced to confront its own indebtedness. The acceptance of the Kyoto Protocol might have similar negative effects on key US industrial actors or even significant portions of US consumers. This could occur even though the current structure of the Kyoto Protocol largely reflects US efforts and incorporates essentially a US design. This “American paradox” is worth further discussion.

The American Paradox

The disputes and controversies around the Kyoto Protocol are an American paradox that has parallels in earlier periods. In early 1980s, a Republican administration (under Gerald Ford) began negotiating international governance of the seabed. Several clauses of the agreement were opposed by European countries but were included under pressure from American negotiators. These negotiations were then completed as the Law of the Sea Treaty by the (Democratic) Carter administration, which encouraged ratification. But then the treaty was repudiated by the subsequent (Republican) Reagan administration. Opposition came from powerful US business interests who felt they would miss the possibility to exploit the seabed freely if an international institution were to control it. These interests had more influence in the Reagan administration than they had under Carter. During the same period, however, the Reagan administration negotiated and pushed for the ratification of the Montreal Protocol to ban ozone depleting substances (1987). This can also be explained in terms of business interests, but ones that went the other way. In this case, the firm DuPont, one of the biggest US chemical enterprises, was then the producer of the only known substitutes of the CFCs, the refrigerant gases that were

mostly responsible for the depletion. The adoption of the protocol gave it a literal monopoly over these substitutes, a position which was consolidated in the treaty by prohibition of trade in the substances banned by the protocol.

In several ways, the history of the Kyoto Protocol follows previous patterns in which economic interests ultimately lead to a hard US position, even after efforts have been made to accommodate them during the negotiation process. In fact, to add to the paradox, one notices that in addition to being US designed and driven in the beginning, the Kyoto Protocol also seems to have the support of US public opinion, according to answers to a June 2004 poll. The following question was asked in a June 2004 poll organized by the Program on International Policy Attitudes. To the question "Based on what you know, would you want your Congressional representative to vote for or against the United States participating in the Kyoto agreement to reduce global warming?", 64 % of the respondents answered that they would ask their congressional representative to vote for US participation and only 20 % would ask to vote against (with 16 % giving no answer). According to other similar polls, most of the public seems to understand the special position of developing countries concerning the Protocol and certainly does not approve the official US argument that it is unfair that developing countries are not involved in obligations specified in the Protocol. The public responds consistently when asked if car manufacturers should produce more fuel efficient engines or systematically develop hybrid cars. Based on these indicators, the attitude of the US public seems to be much more oriented toward active climate policies than the official attitudes of the administration and Congress would let us believe. But, even though polls may reflect the opinion of the US population as a whole, important segments of both population (especially in certain regions) and industry⁶ are obviously against Kyoto. As the example of the Law of the Sea shows, coalitions of important industries are often sufficient to derail the ratification of international treaties even when they have been negotiated by administrations with relatively conservative ideologies (like the Ford administration). Which industries and which portions of the US population are hostile to Kyoto and to climate change policies, what are their motivations, and where does their power originate? Exploring these questions leads us quite naturally into an inquiry into the political economy of the anti Kyoto movement in the United States.

Kyoto and the US Political Economy

Economists and political scientists have long been interested in the motivations and strategies of movements opposed to legislation and treaties that seek to maintain or improve international social welfare. There are two puzzles in this context. The first is why such movements want to influence the political process and the second is why they are often

⁶ The opposition of industrial groups to climate change policies and to Kyoto is exemplified by the Global Climate Coalition whose major member organizations included the Chemical Manufacturers Association, the American Forest and Paper Association, the Edison Electric Institute, the American Petroleum Institute, Atlantic Richfield Coal Co., Bethlehem Steel, Chrysler, Dow Chemical, DuPont, Exxon, GM, Goodyear Tire and Rubber, Ford Motor Corporation, Mobil, Shell Oil, Southern Co. However, this organization lost its major European member, Shell Oil, already in 1997 and subsequently Ford and Du Pont also dropped their membership. In 2002, the coalition stopped its activities because Bush administration withdrew from the Kyoto process altogether.

successful. Several studies show how protectionist barriers that benefit small groups but harm society as a whole are established (for example, Grossman and Helpman 1994). The story that emerges is one of companies who are threatened by liberalization or regulations preferring to invest in the political process to extract protective measures from legislation rather than improve their own competitiveness or conform to rules. While trade agreements differ fundamentally from environmental agreements, in the sense that in the latter case first mover advantage in the form of refusal to cooperate presents immediate benefits for individual states,⁷ consequences are similar. In both cases, some industries or some segments of the population are more affected by the obligations stemming from the treaty than others. Thus similar incentives exist to fight the ratification of particular agreements. So even though the costs of implementing an environmental agreement might be low for the society at large (as they seem to be for the United States) and offer tangible long-term advantages, the immediate impact upon some segments and industries might be extremely large.

In order to examine this situation and to understand the reactions to Kyoto, some considerations about the structure of the United States economy are at hand. The United States has an economy that is both more energy intensive and in some ways more labor intensive than that of the European Union. This also makes the United States a much bigger per capita consumer of energy and emitter of greenhouse gases. This is the case not only for transportation, on which usually too much attention is focused, but also in industry and, especially, in electricity production. To illustrate these assertions, it is useful to notice that even though the United States is often considered to be the growth powerhouse of the last decade compared to Europe, this performance appears much weaker if one controls for the size of the labor forces. So, although the average US GDP growth rate is indeed 2.91 % for the period 1991-2002 compared to an average of only 2.08% for the EU, this US advantage vanishes when growth rates are computed with respect to hours worked. Under this condition, the EU has a growth rate for the same period of 1.96% in comparison to a US rate of only 1.81%⁸. One should also note that the famous decade of growth for the United States coincides with relatively low oil prices. From about 1986 to the middle of 2000, oil prices stayed below \$30 and often below \$20 a barrel (with some exceptions, notably during the first Gulf war). Quite clearly, the US economy was advantaged by these circumstances as it is a much more energy intensive economy than those in the European Union and Europe in general. Indeed, the energy intensity of the US economy is 0.25 (purchasing power parity adjusted) and just 0.18 for the EU (again ppp adjusted). Similarly, US industry is much more energy intensive: 0.45 to the EU's 0.38. This disparity is also reflected in CO₂ emissions per unit of GDP which are almost twice in the United States as compared to the EU, 0.63 to 0.38. Per capita emissions of CO₂ are more than twice the value of the EU in the United States 8.46 tons versus 19.84⁹.

⁷ In this way somebody else is either taking care of the problem or can be blamed for it: the Global Climate Change Coalition's main argument was that supposedly large polluters such as China and India would be exempt of obligations.

⁸ The sources for these numbers are: OECD economic outlook with calculations made by the CREA Institute For Macroeconomic Analysis at the University of Lausanne. Other sources are the International Energy Agency or the Energy Information Agency of the US. Unless otherwise stated, data are for 2001.

⁹ Some European countries like Switzerland produce almost three times fewer CO₂ emissions per capita than the US!

Two factors explain such discrepancies. On the one hand, the United States uses about the twice the amount of energy of the EU for transportation, on the other, the United States uses coal to produce 51 % of its electricity whereas the EU only 27%. This suggests that, if the United States were to adjust to its obligations under the Kyoto Protocol, both the transportation sector (essentially the car industry) and electricity would have to bear the brunt of the adjustment directly. Indirectly, however, coal and particularly marginal oil producers would also be particularly touched. This means that industries mostly already threatened by international competition, such as automobiles or parts of the energy sector because of high production costs, would have to face the additional problems due to climate change mitigation. The same can be said for industries such as steel, whose only competitive advantage is low energy costs.¹⁰ It is thus the traditional US industries, which already face competitive pressures from abroad, that would be particularly threatened by Kyoto. They appear in large numbers among the members of the now defunct Global Climate Coalition. However, clearly not only parts of industry but also some of the poorest segments of the US population would also be affected even more than they are now by tighter energy policies. A recent Gallup-CNN poll (April 4, 2005) reveals that “Gas prices are causing financial hardship for a majority of Americans” (58% of respondents). This shows that increases in gas prices, because of their immediate impact upon the cost of automobile driving, influence the income of the population and especially its lower strata. A further increase in gas prices would be inevitable under more serious climate change mitigation policies. Even though the increase would be considered small by Europeans used to much higher prices, American lower class budgets would be strained due to the low availability of public transportation. Thus plenty of reasons exist within the US political economic system to oppose participation in a climate change agreement. We can expect that emphasis will rather be on continued or improved access to energy sources both at home and abroad in order to assure cheap energy availability¹¹. The United States has thus an incentive to rely on a relatively aggressive foreign policy to control oil supply sources. The only industry support for a multilateral cooperative climate accord rests with advanced service sectors such as insurance or energy trading, which do not fear competitive pressures and thus have less of an incentive to invest in the political process. One of the only firms known to lobby actively in favor of the Kyoto Protocol was ENRON, of now infamous memory, because it could have benefited from emissions trading activities. Hence, unless some fundamental aspects of US industry or infrastructure change, such as the development in the United States of a new breakthrough in energy technology, incentives to oppose any meaningful international emission reduction effort will subsist. Is then any meaningful participation in an international climate mitigation process on the part of the United States a hopeless cause? Without undue optimism, there are some reasons for hope which I will now examine.

The Necessary Components of an Effective Climate Mitigation Process

The Kyoto Protocol entered into force on February 16, 2005 and, with it, all the flexible mechanisms for emission reduction trading. Among those, the Clean Development Mechanism (CDM) has the particular advantage of directly involving industry from industrialized countries

¹⁰ The Bush administration has already taken protectionist measures in favor of the steel industry getting thereby in trouble with the WTO.

¹¹ Witness debates in the US Congress to open wilderness areas to oil exploration and drilling.

and of pushing developing countries into adopting voluntarily emission reduction measures. The CDM has the additional benefit of providing incentives for firms from non-participating countries (who do not have the same advantages than those taking part in the Kyoto Protocol) to try to profit from the new investment possibilities offered by developing countries. Since such advantages can only be achieved by firms from Kyoto ratifying countries, it gives outsiders reasons to pressure their own countries for ratification. For such incentives to be created, a market for emission reduction certificates has to be working properly, which means first that a sufficient number of participants have to take part in it and that no cheating is possible either by countries benefiting from the CDMs or firms providing the technologies. The first condition implies the existence and proper functioning of a wider emissions trading market¹². Such a market has now been put in place by the European Commission. If successful, it will create a demonstration effect, particularly providing an example for firms in non-participating countries. Ever since the discussions around the Kyoto Protocol and the notion of mandatory reduction targets started, voices, especially in Europe, have been very critical of emissions trading. The argument that I make here is that one of the only hopes to enlarge the Kyoto Protocol is precisely to engage in trading in a systematic way and not to try to achieve the targets on the basis of purely domestic measures. Within this context, however, it is essential that the CDM creation and exchange are properly monitored in order to avoid fraudulent claims. Is this possible within the framework of the Kyoto Protocol? This question is related to the problem of how markets can be organized efficiently within a minimal institutional framework. A parallel can be found here with the organization of markets in the Middle Ages. A puzzle that historians have had trouble explaining was the steady resurgence of trade in Western Europe after the year 1000 AD. Trading patterns encompassed a multitude of regions and areas in Western Europe, which at the time had an extremely fragmented political system with multiple and complex sovereignties. In famous papers, Milgrom, North and Weingast (1990) and Greif, Milgrom and Weingast (1994), show that control and monitoring mechanisms maintained by the merchants themselves organized in guilds were sufficiently effective to 1) deter rulers from outrageously discriminating practices and 2) discourage merchants from cheating and renegeing on their credit obligations. Systematic boycotts of discriminators and shunning and denial of credit to cheaters and renegeing merchants were enough to enforce such a system.

A similar mechanism can be used for a CDM market. It could establish of a surveillance board capable of rating certificates from different countries according to their effectiveness in reducing greenhouse gases and of denouncing cheaters. To help enforce this surveillance scheme, the existence of a relatively important coalition of “honest” countries will go a long way to serve as this implicit compliance mechanism for the rules of a CDM market. Given the experience that will be accumulated with the emissions market in Europe, the European Commission would be ideally placed to design the rules of such a surveillance scheme that could downgrade certificates associated with dubious accomplishments and upgrade the ones linked to significant reductions. If the theoretical arguments by Greif, Milgrom, North and Weingast are correct, this should be sufficient to establish an efficient certificate reduction market involving

¹² There is still a lot of room within Europe for emission reduction trading given the fact that 50% of German electricity is still generated by coal, a proportion almost as important as in the US.

the CDM and eventually create incentives for firms in non participating countries to seek involvement¹³.

As national entities, countries like the United States have refused to participate in the Kyoto Protocol. However, that does not mean that sub-national entities in particular American states are not interested in climate change mitigation. Movements to organize policies aimed at reducing greenhouse gas emissions have been started in the states in eastern and northwestern United States, such as the northeast Regional Greenhouse Gas Initiative or proposals by Oregon, Washington, and California. In these regions, the organization of emissions trading in Europe has met with particular interest. Thus the suggestion was made by Benito Muller of the Oxford Energy Institute (Mueller 2005) to try to include sub-national authorities into participation to the mechanisms of the Kyoto Protocol. If this proposal were to be followed it might enhance the demonstration effect of an efficient emission reduction market. It would however, require the acceptance by these sub-national entities of specific reduction targets for their territories. Given the example of the pioneering role of American states such as California in setting cleaner automobile emission standards, such sub-national efforts could eventually result in a de facto imposition of reduction targets for the country as a whole.

What about the EU?

In terms of energy policy, European states have a very different history from the United States. In the aftermath of World War II, driving was still largely considered a luxury. This resulted in high gas taxes all over Europe and, in some significant cases, in extensive state control over oil companies especially in France, Italy, and Spain. These policies were facilitated by the persistence of a much more concentrated housing pattern than in the United States and in the protection of large and dense railroad and other public transportation networks which were for the most part also nationalized (largely for other reasons, mostly related to national defense). Immediately after World War II, electricity production largely relied on coal, which was also produced in nationalized or at least state controlled and subsidized mines. Remnants of these original conditions subsist to this day in Germany but also Italy, Spain, and Denmark, where coal contributes significantly to making electric current (51 % of electricity in Germany is generated with coal). This historical evolution guaranteed strong state control over energy production and prevented the creation, and thus the accompanying political influence, of big oil companies at the European level. It also guaranteed that European industry did not become accustomed to cheap energy prices for their productive processes. It was therefore much easier for European governments to support strong climate change mitigation efforts and the high energy prices that accompany them. Two additional factors facilitated the European position: 1) The absorption of East Germany by the Federal Republic meant that 1990 emission figures included the vastly inefficient East German industrial sector, which was then almost completely scrapped. Since Germany is the most important European industrial country, adopting reduction targets appeared to be a relatively easy task. 2) Liberalization efforts within the electricity sector in both Britain and Scandinavia meant that overcapacity in that area was reduced. Moreover, cheaper and cleaner production technologies were introduced in some places. In Britain, coal plants were largely changed into natural gas electricity generating facilities. And France in the 1970's had

¹³ Alternative designs with many of the same features have been proposed elsewhere. See for instance Chichilnisky (1996).

decided to construct a great number of nuclear electricity plants to avoid the consequences of another oil shock. This resulted in overcapacity, which allowed France to export relatively cheap electric current produced without fossil fuels all over Europe. All these aspects explain that Europe was ready and even eager to embark on climate change mitigation policies that could have the additional advantage of bringing in more tax revenues to European governments.

It was thus easy for the European Union to commit to reducing its total emissions by 8% with respect to their 1990 level in Kyoto (the EU had even initially proposed 15%). This reduction target concerns only the 15 countries who were EU members in 1997 when Kyoto was negotiated. Greenhouse gas emissions from the 10 countries that joined the EU in 2004 (EU 25) will not count towards the EU reduction target. The new members are keeping their own reduction targets within the Kyoto Protocol of 6% or 8%, to be met by 2008-2012. The following table summarizes commitments for the EU 15 and their relation to current emissions (source Eurostat):

Greenhouse gas emission in CO₂-equivalents and Kyoto Protocol targets for 2008-2012

	GHG emissions for base year (Mt CO₂)	Reduction target ^[1]	GHG emissions 2002 (Mt CO₂)	Change 2002 relative to base year (in %)	Change 2002 relative to 2001 (in %)
Austria	78.0	-13.0 %	84.6	+8.5 %	+0.3 %
Belgium	146.8	-7.5 %	150.0	+2.1 %	+0.5 %
Denmark	69.0	-21.0 %	68.5	-0.8 %	-1.2 %
Finland	76.8	0.0 %	82.0	+6.8 %	+1.7 %
France	564.7	0.0 %	553.9	-1.9 %	-1.4 %
Germany	1253.3	-21.0 %	1016.0	-18.9 %	-1.1 %
Greece	107.0	+25.0 %	135.4	+26.5 %	+0.3 %
Ireland	53.4	+13.0 %	68.9	+28.9 %	-1.6 %
Italy	508.0	-6.5 %	553.8	+9.0 %	-0.1 %
Luxembourg	12.7	-28.0 %	10.8	-15.1 %	+10.4 %
Netherlands	212.5	-6.0 %	213.8	+0.6 %	-1.1 %
Portugal	57.9	+27.0 %	81.6	+41.0 %	+4.1 %
Spain	286.8	+15.0 %	399.7	+39.4 %	+4.2 %
Sweden	72.3	+4.0 %	69.6	-3.7 %	+2.0 %
United Kingdom	746.0	-12.5 %	634.8	-14.9 %	-3.3 %
Total EC	4245.2	-8.0 %	4123.3	-2.9 %	-0.5 %

¹ EU-15 = burden sharing target

It can be seen from reading this table that in 2002, the EU was still relatively far from its reduction target. This is primarily because major southern European countries such as Italy, Spain, Portugal, and Greece largely overshot their targets, notwithstanding that these had even allowed increases. This is also the case for Ireland. If this overshooting continues, the EU will have some problems meeting its overall target. Indeed, it had only achieved -2.9% in 2002, still far from the necessary -8% . However, even if correcting for this will prove to be difficult, three factors lead to optimism.

- 1) Energy sectors, especially coal based ones, are usually closely associated with the state and thus the same politico-economic incentives found in the United States do not exist. Moreover, the population depending on coal for their revenues constitutes a small minority. Even in Germany, which is the highest user of coal for electricity production, a sizeable quantity of it is imported.
- 2) Creation of the EU emissions trading market by the Commission should accelerate reductions.
- 3) Even if it proves difficult to reduce emissions in Southern Europe (especially in Spain, one of the major target over-shooters), great reduction potentials still exist in the major European emitter, Germany. Germany uses proportionally as much coal as the United States to generate electricity (51% of total electric generation).

The message is clear. Within the EU, reducing coal consumption would be particularly effective and Germany is well placed to contribute substantially to the overall European emission reduction. German CO₂ emissions originating from electricity generation were almost twice the amount resulting from the transportation sector in 1999 (37% versus 21 %). If we imagine that all of Germany's coal-fired electricity generating plants had been transformed into gas plants by 2002, this would have meant a reduction of -6% for Europe as a whole, very close to the reduction commitment of -8% with respect to 1990 levels. Not only German coal use but also that in Spain and Italy could also be targeted.

Adaptation Policies

As emphasized earlier in this paper, substantial climate change will result from currently already accumulated concentrations of greenhouse gases in the atmosphere. Even if concentrations would be stabilized right now, global coupled climate models show that a further global warming commitment of about another half degree and an additional 320% sea level rise caused by thermal expansion is unavoidable by the end of the 21st century (Wigley 2005 and Meehl et al. 2005). Therefore, especially given that such stabilization is not likely to occur soon, the elaboration and planning of adaptation strategies become essential. Unfortunately, very little so far has been done in terms of international cooperation and coordination of adaptation policies. Adaptation measures are only considered vaguely in the UNFCCC and the Kyoto Protocol. These references have to do with use of a fund the Global Environmental Facility (GEF) which is created and financed by industrialized nations for the purpose of sponsoring adaptation measures destined to help least developed countries. Mueller (2003, 2005) shows that

only a small fraction of the language in the Marrakech accords that finalized the interpretation of the Kyoto Protocol is devoted to adaptation.

As mentioned before, since climate change will be with us whether we want it or not, some of the problems it generates will have to be managed at the international level. Among those, agricultural problems due to new weather patterns in developing countries (mostly sub-Saharan Africa, Latin America and East Asia) will likely be the most serious, along with threats to coastal regions due to sea-level rise. In addition, likely extreme weather events and natural catastrophes could add to these problems. These developments will, in all likelihood, generate population movements toward the industrialized North which could be even more difficult to control than they are now. Policies that maintain agriculture and thereby provide decent revenues to populations in the southern hemisphere are therefore a necessity. Better aid policies are of course important in this context. However, the liberalization of trade as well as the progressive end of protectionist measures in agriculture in the industrialized North and in the EU in particular should be envisaged. Studies by Rosenzweig et al (1993) have shown that world wide trade liberalization would go a long way to alleviate potential climate change problems in agriculture. In addition, liberalization of agricultural policies in the EU would certainly result in a smaller size of the cattle population which would contribute to a reduction in methane emissions. In this case, liberalization policies would have a double adaptation and mitigation effect, a clearly desirable outcome. However, the political difficulties associated with such adaptation strategies cannot be underestimated. What is perhaps more important is that the obvious linkages between trade, agricultural policies, population movements and adaptation and mitigation policies to climate change should be made much more explicit and become part of the international debate.

Conclusions

Climate change is the first truly global environmental problem facing the international community. It is a complex phenomenon that requires not only mitigation but also adaptation policies. Coordinating such policies raises serious problems because as is always the case with new forms of cooperation, there will be clashes among various domestic and transnational interests. Given inevitable oppositions, the development of the existing climate change regime is in and of itself a remarkable achievement. Unfortunately, this regime has encountered major obstacles in the form of refusals by major countries such as the United States or Australia to participate. I have tried to show that these positions are deeply rooted in the very different political economies and the historical patterns of energy use of Europe and the United States. These structures and their evolution also explain the very different strategies adopted at the international level: cooperative and multilateral for the EU, bilateral and power-driven for the United States. I argue that it is an illusion to think that the United States will join a multilateral regime if some of its major industrial interests are not satisfied or if the balance of business interests does not tilt toward participation. Such changes will occur if major technological breakthrough is suddenly introduced within objecting countries or if non-participation leads to missed opportunities by important industries, making the climate change regime appear sufficiently attractive for them. There are ways, outlined above, to design the climate change regime and the Kyoto flexible mechanisms in such a way that this outcome obtains. Achieving such a result requires a well functioning emission reduction market largely involving developing and emerging countries, especially China and India. However, mitigation policies are not the only answer to climate change, given that some of these effects will be with us no matter what

we do now in terms of cutting emissions. Therefore, larger efforts at better integrating developing economies, and particularly their agricultural sectors, into the world economy are a desirable, even essential, requirement. More coordination between countries of the developed world to manage potentially large population movements also has to be instituted. It is only under these conditions that climate change and some of its potentially harmful economic and, especially, security consequences will be controlled.

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