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# The EU Emission Trading Scheme: Prototype of a Global System?

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## **THE HARVARD PROJECT ON INTERNATIONAL CLIMATE AGREEMENTS**

The goal of the Harvard Project on International Climate Agreements is to help identify key design elements of a scientifically sound, economically rational, and politically pragmatic post-2012 international policy architecture for global climate change. It draws upon leading thinkers from academia, private industry, government, and non-governmental organizations from around the world to construct a small set of promising policy frameworks and then disseminate and discuss the design elements and frameworks with decision-makers. The Project is co-directed by Robert N. Stavins, Albert Pratt Professor of Business and Government, John F. Kennedy School of Government, Harvard University, and Joseph E. Aldy, Fellow, Resources for the Future. For more information, see the Project's website: <http://belfercenter.ksg.harvard.edu/climate>

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## Abstract

The European Union's Emission Trading Scheme (EU ETS) is the world's first multinational cap-and-trade system for greenhouse gases. As an agreement between sovereign nations with diverse historical, institutional, and economic circumstances, the EU ETS can be seen as a prototype of an architecture for an eventual global climate regime. Although any future global system is likely to be very different from the EU ETS, there are still many similarities that allow this pioneering policy experiment to be instructive for the larger and more difficult task ahead. Interestingly, the problems that are often seen as dooming a global trading system—international financial flows and institutional readiness—haven't appeared in the EU ETS, at least not yet. The more serious problems that emerge from the brief experience of the EU ETS are those of (1) developing a central coordinating organization, (2) devising side benefits to encourage participation, and (3) dealing with the interrelated issues of harmonization, differentiation, and stringency. The European experience suggests that over-arching agreements may not be enough for creating an effective limit on emissions and an accompanying trading system. A central institution that educates, coordinates, and facilitates would appear to be essential, and the commitment of at least some nations may need to be reinforced by some side benefit. The pre-existing organizational structure and membership benefits of the European Union provided convenient and almost accidental solutions to the need for a central institution and side benefits, but these solutions will not work on a global scale and there are no obvious pre-existing substitutes. Furthermore, the EU ETS is only beginning to test the real world practicality of harmonizing allocations within the trading system, differentiating responsibilities among participants, and increasing the stringency of emissions caps. The trial period of the EU ETS punted on these problems, as was perhaps appropriate for a trial period, but they are now being addressed seriously. From a global perspective, the answers that are being worked out in Europe will say a great deal about what will be feasible on a broader, global scale.



***The EU Emission Trading Scheme:  
Prototype of a Global System?***

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***Introduction***

The European Union's Emission Trading Scheme (EU ETS) can claim to be first in many respects. It is the world's first cap-and-trade system for greenhouse gases (GHG) and it is by far the largest emissions trading market yet created. These attributes alone make the EU ETS worthy of study, but it is another first that provides the motivation for this paper: The EU ETS is the world's first multinational cap-and-trade system. As such, it can be seen as a prototype of the multi-national GHG emissions trading system that is sometimes advanced as the most promising basic architecture for an eventual global climate regime. While the EU ETS is in only its fourth year of existence at the time of this writing, the experience to date does provide some insight into the problems that seem likely to appear in a broader global system, and of some that may not be such a problem after all. These problems and the solutions that are emerging from the EU ETS are the subject of this paper.

***Three Important Attributes***

When considering the EU ETS as global prototype, three attributes must be stressed. First, the European Union is not a strong federal union like the United States of America. The constituent member states are independent nations that display and exercise the principal attributes of sovereignty. While some authority in some domains has been ceded to central European institutions, such as the European Commission in Brussels, the basic European authority remains the European Council, which is a body of nation states with carefully negotiated voting rights. What is to be governed centrally and individually is a constantly evolving debate in Europe generally, as well as for the EU ETS.

Second, just as the European Union can mistakenly be seen as a stronger federal structure than what political realities allow, so can the common geography of Europe be thought to provide a greater degree of institutional and economic homogeneity than exists in fact. The demarcation between East and West reflects significantly different historical

experience and institutional development. Cap-and-trade systems operate through markets for emissions rights, which presume the existence of certain legal and commercial prerequisites. While such institutions can be readily recognized in Western Europe, the same is not true of the East. Participating in a market-based form of environmental regulation for the East European member states represents a leap in institution building that is qualitatively different from what would be required, for instance, of the United Kingdom or the Netherlands.

Third, and in part reflecting this difference in historical and institutional experience, the economic circumstances between East and West are large. The per capita income of Romania and Bulgaria is one-fifth that of Europe's most well-off European nation: Ireland.<sup>1</sup> The range in per capita income in the European Union spans a significant part of the differences that would exist among the major emitting countries in any eventual global regime. The per capita income of Ireland is five percent higher than that of the United States and that of Romania and Bulgaria is only a third higher than that of China, which is roughly twice that of India. While the East-West divide in Europe is not as marked as the global divide of North and South, it is sufficiently similar to make the EU ETS of more than passing interest in considering how to bridge the differences in historical, institutional and economic circumstance that would be involved in constructing a global climate regime.

### ***A Brief Recap of the EU ETS***

The EU ETS is a classic cap-and-trade system in that there is an absolute limit on covered emissions and rights to emit those emissions are conveyed by tradable permits, called European Union Allowances (EUAs), which are almost entirely distributed freely to affected installations that are obligated in turn to report their emissions and to surrender an equal number of allowances annually. The coverage of the EU ETS is partial in including only CO<sub>2</sub> and only electricity generation and most industrial activities. Notably,

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<sup>1</sup> In contrast, the difference between the US states with the lowest and highest gross state product (Mississippi and Connecticut) is a factor of two. Luxembourg is excluded in the EU comparison because of the high concentration of corporate and financial activity that causes that country's per capita GDP to be 75% higher than that of Ireland. Delaware is excluded from the US comparison for the same reason. These comparisons are based in IMF statistics for 2005 using purchasing power parity exchange rates.

transportation, buildings, the service sector, and agriculture are not included.<sup>2</sup> As such, it includes approximately half of the CO<sub>2</sub> emissions and a little above 40% of the GHG emissions of the EU.

The EU ETS was conceived in the late 1990s as a means of ensuring that the then fifteen members of the European Union could meet their commitments under the Kyoto Protocol in the First Commitment Period (2008-12). In surprisingly short time, this idea matured into a cap-and-trade system featuring a three-year “trial” period from 2005 through 2007 and a subsequent “real” five-year trading period that coincided with the First Commitment Period and that was to be followed by subsequent five-year trading periods.

More significantly, the EU ETS has grown from the original fifteen Member States to include thirty countries. This expansion was accomplished in three steps: the accession of ten mostly East European Member States to the European Union on May 1, 2004; the subsequent expansion of the EU to include Romania and Bulgaria at the beginning of 2007; and the inclusion of three of the four nations constituting the European Economic Area (Norway, Iceland, and Liechtenstein) beginning in 2008.

The choice of a cap-and-trade system in Europe and the particular structure that it assumed are the result of four factors. First, it came to be recognized in the late 1990s that something more would be needed if the EU15 were to meet their common Kyoto obligations and that this additional measure would need to be adopted at the European level to be effective. Second, an EU-wide carbon tax was off the table since the proposal to enact one had failed in the 1990s. Third, the early experience with the US SO<sub>2</sub> trading system and the embrace of trading in the Kyoto Protocol suggested such an approach. Fourth, the recognition of the lack of trading experience and the requisite trading infrastructure in Europe prompted the adoption of the trial period to provide these prerequisites.

There is now an abundant literature that reports, analyzes, evaluates, and criticizes the performance of the EU ETS.<sup>3</sup> For the purpose of this paper, the key results are that a

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<sup>2</sup> Any activity or building that uses electricity is implicitly included and any buildings or activities that combust energy to provide heat or electricity in a facility with a capacity greater than 20 MW<sup>th</sup> is explicitly included as a combustion installation regardless of the sector or use of the building.

uniform price for CO<sub>2</sub> exists across the system, that this price is taken into account in operating and investment decisions by most of the owners of affected facilities, and that the requisite registries and procedures for monitoring, reporting, and verification are in place. In short, a mechanism for limiting GHG emissions in the covered sectors is in place and that mechanism is being used to effect progressively more significant emission reductions.

The rest of this paper addresses five important aspects of the EU ETS when seen as a multinational system. In each section, the experience of the EU ETS is explained, lessons are drawn, and questions are raised concerning the implications for constructing a global trading system. The first aspect discusses a novel contribution of the EU ETS, the partial and time-limited, first or “trial” trading period from 2005-07. The second aspect concerns the role of a central coordinating entity. The third and fourth aspects concern the related issues of club benefits and appropriate differentiation especially in the face of increasing stringency. The fifth and last aspect concerns the problem that hasn’t appeared: cross-border financial flows. The final section of the paper concludes.

### ***The Trial Period Approach***

A trial period of the EU ETS is a novel feature of cap-and-trade programs and it is one that commends itself for a global system. The prospect of a trial period and its rationale was stated in the Green Paper on greenhouse gas trading within the EU, issued in March 2000 (European Commission, 2000).

“As emission trading is a new instrument for environmental protection within the EU, it is important to gain experience in its implementation before the international emissions trading scheme starts in 2008.”

Although formulated for the EU in the context of the Kyoto Protocol, this statement could apply equally to any nation that is adopting a cap-and-trade system as an instrument for limiting greenhouse gas emissions as part of a larger global system. Conversely, those already in a broader system might also consider it advantageous that new participants undergo a trial

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<sup>3</sup> For more comprehensive reports, the reader is referred to the Symposium on the EU ETS in the initial issue of the *Review of Environmental Economics and Policy* (Ellerman and Buchner, 2007; Convery and Redmond, 2007; and Kruger *et al.*, 2007); Convery, Ellerman and De Perthuis, 2008; and Ellerman and Joskow, 2008.

period to ensure that the requisite infrastructure and experience are in place before the acceding country becomes a fully participating member.

The trial period of the EU ETS is defined by two key characteristics. First, it precedes a more serious commitment and as the name suggests it is a rehearsal for the real thing. For the EU, the real thing was the First Commitment Period of the Kyoto Protocol, but in a broader context, the rehearsal could be for subsequent, full fledged participation in a global system. Second, the trial period was self-contained in that there could be no banking of allowances into the “real” period or borrowing of allowances from that period. The inability to bank or borrow between two periods virtually assures that the end of period price would be either zero, in the case that abatement that is greater than the trial period cap, or the penalty price in the opposite case.<sup>4</sup> Generally, such a feature would be considered a serious defect; however, if the goal is to gain experience and to put the requisite monitoring, reporting, and enforcement infrastructure in place, the absence of banking and borrowing is more understandable.

The problems that are likely to be encountered in setting up a cap-and-trade system should not be minimized. Institutionally, the Member States of the European Union must be considered more prepared and capable of implementing such a system than many of the prospective participants in a global system. Yet, there was no end of difficulties in setting up the system in Europe. The biggest problem was data at the installation level which was needed both for the allocation of allowances to covered installations and more importantly for setting an appropriate cap (Ellerman et al., 2007). For instance, the EU ETS turned out to be over-allocated in the trial period not so much because of errors in prediction as because the baseline from which projections of business-as-usual emissions were to be made was highly uncertain itself. Not the least of the benefits of the trial period was providing more reliable data on actual emissions for included installations. In the EU ETS, the verified emission reports for the first year, 2005, provided the baseline by which the Commission judged the acceptability of proposed caps for the ensuing 2008-12 period. By extension, participants in a global system would feel more comfortable about a new entrant to the

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<sup>4</sup> Recall that the final net position is known with certainty only after it is too late to correct any imbalance. The requirement to cover and the incentive to sell surpluses will ensure a price discovery process between the end of the compliance period and the surrender data that will reveal this binary outcome.

system based upon verified data and already operating procedures that would be required anyway for participation in a global system.

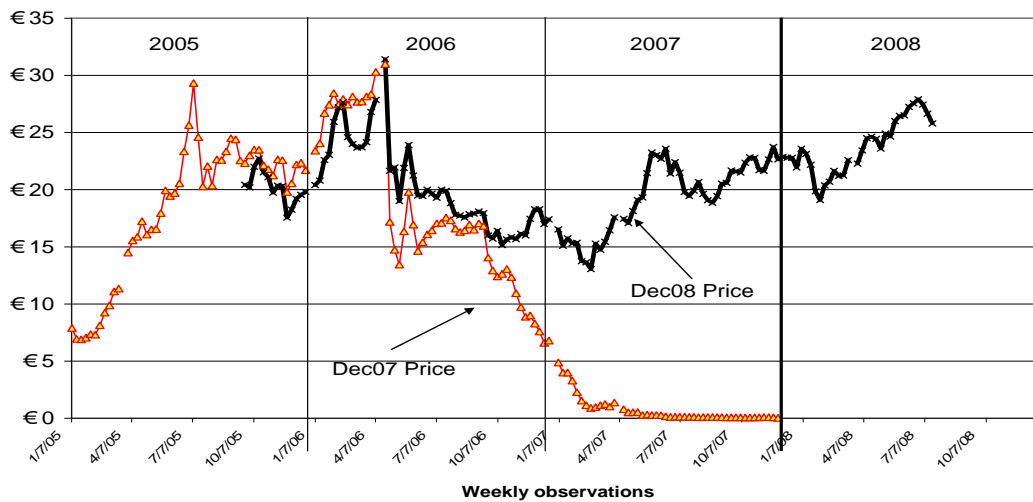
The trial period was of even greater importance for the new East European Member States where the institutional preparation was arguably not as complete as among the EU15. The data deficiencies for these Member States were even greater than they were for the EU15 and most of the governments required more time to set up the requisite infrastructure for trading and enforcement. Also, three years were needed to get it all right. For instance, the last registry to go online was Poland's, eighteen months after the start of the EU ETS. Romania and Bulgaria, who became participants in the trial period in its last year, provided more evidence that more than a year of preparation is advisable. Although installations in both countries monitored and reported emissions as required, surrendering allowances was a problem. Romania got its registry on line barely in time to go through the formality of surrendering allowances against emissions, and Bulgaria missed the end-of-April deadline for 2007 emissions. Technically, Bulgarian installations were out of compliance even though they had monitored and reported emissions and been issued enough allowances to cover those emissions. This problem was solved sensibly by re-allocating 2007 allowances to installations equal to their reported emissions and declaring them surrendered. This is not how the EU ETS is supposed to work, but in this case it was a reasonable clearing of the decks in order to start afresh with a newly functioning registry, experience in reporting and verifying emissions, and a new allocation for the just started second period.

One of the most encouraging aspects of the trial period has been the evidence that countries with less institutional capacity can acquire the requisite infrastructure and become full fledged participants in a few years. Lack of institutional preparedness has rightly been raised as an important issue in considering the feasibility of a global trading system (Kruger et al., 2007). The evidence from the EU ETS as concerns Eastern Europe is that participants and governments can master the necessary procedures and create the requisite institutions for emissions trading as surely as they do for other commodities and services that are globally traded. Trial periods would seem to be a good mechanism for assuring this result.

While the absence of banking and borrowing can be seen as a defect, there is a lesson to be drawn from this aspect of the EU ETS as well. The important price is not the

trial period price, but the price that will follow the trial period. As shown on the following graph, the price for the Dec08 forward contract in the EU ETS did not fall to zero as did the trial period price.

**Figure 1. European Union Allowance Prices, 2005-2008**



Source: Compiled by the author from Point Carbon quotations.

The zero price in 2007 would have occasioned little abatement, but the price that would obtain over the longer term and guided any investments in abatement was clearly signaled and never in doubt. In a global system, the equivalent long term price would be that of the global system. Also, the trial period need not be totally self-contained as it was in the EU ETS; a temporary gateway could be used to allow net flows only into the trial participant. Such a provision would provide a “price cap” while also protecting the larger system against cap inflation due to poor data or problems in reporting or enforcement on the part of the prospective participant in the global system.

A closely related issue is the sector coverage of a trial participant’s system. Ideally, it would be an economy-wide, comprehensive system that would include all sources, and this would make an upstream point of regulatory obligation virtually inevitable. The reality may be that the power sector and large industrial facilities may be the most promising candidates for early inclusion in a global system. The power sector is usually a major source of

emissions and inclusion of large industrial sources would be highly desirable to avoid leakage and to lessen competitive concerns on the part of nations already participating in the global system. An initial partial or hybrid approach need not preclude a later more comprehensive approach, although the issue here will be whether an initial partial approach makes it more difficult to arrive ultimately at comprehensive coverage.

The initial scope of the EU ETS was limited for several reasons. In keeping with trial period thinking and the recognition of the problems involved in setting up a system, it was proposed from the beginning to start with those sectors where a trading system could be most easily implemented. The already existing Large Combustion Plant and Integrated Pollution Prevention and Control Directives provided a regulatory framework that could be used (European Commission, 2000) and those directives could be interpreted to imply control of GHGs and energy efficiency, albeit by other means.<sup>5</sup> Similarly, in developing countries power plants and large industrial facilities are invariably those first subject to pollution controls. Also, the sources included in the EU ETS are those which are by and large exempt from the high energy taxes for which Europe is famous. Thus, it could be and has been argued that the other sectors were already facing equivalent carbon charges (Convery and Redmond, 2007).

Expansion of coverage over time is clearly foreseen in the EU ETS and it has occurred. Opt-in provisions were included in the original Directive and a number of sources and even some other gases have been opted in, although the numbers are small. A more significant inclusion is aviation. As of this writing, the Commission's proposal of 2006 to include the aviation sector in the EU ETS has been substantively agreed between the European Parliament and the European Council so that as of 2012 the EU ETS will expand to include in-flight emissions for all flights originating or terminating in the EU, including those for which the origin or destination is a non-EU country. Also, the proposed post-2012 amendments to the ETS Directive would include chemicals and aluminum, two industrial sectors initially excluded, and there are provisions for domestic projects concerning non-ETS emissions within the EU, some of which could take on a sector aspect. Finally, the

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<sup>5</sup> The ETS Directive explicitly amends the LCPD to prohibit any Member State from establishing a GHG emission limit for any plant included in the EU ETS and it states that MS's are allowed to forego imposing energy efficiency requirements on plants included in the EU ETS.

proposed mandatory, separate national caps over non-ETS emissions have led to proposals for EU-wide trading in the non-ETS sectors (Carbon Market Europe, 2008).

The broader issue from the standpoint of a global system is whether a prospective participant should be discouraged if the proposed coverage is initially less than comprehensive in its coverage. The ideal may be a global system in which participating nations all have comprehensive, up-stream systems, but the reality is likely to be different, if not ultimately, then certainly along the way to an eventual nearly comprehensive global system.

### ***Defining the Center***

One of the most distinctive features of the EU ETS is the high degree of decentralization (Kruger et al., 2007). Allocation, monitoring, reporting, verification, maintaining a registry, and enforcement are all the responsibilities of the constituent member states, albeit with varying degrees of guidance, review and approval by the European Commission. This decentralization reflects the political reality of the European Union, but there is still a center, represented by the European Commission in Brussels. The Commission has played an important role not only as a result of the specific powers granted it by the ETS Directive, but also and perhaps more importantly by how it has exercised those powers.

In considering the role of the center in the EU ETS, it is important to avoid the caricature of the European Commission as the over-staffed and over-bearing bureaucracy that is slowly but surely snuffing out national prerogative and diversity. While the Commission enjoys considerable powers as a result of the treaties that have created the European Union as it now exists, the Commission is in the end the agent of the whole and its success depends on both the powers explicitly granted to it by the still sovereign Member States and the manner in which those powers are exercised. In this, the EU ETS is no exception, but a careful distinction must be made between the role of the Commission in the just completed trial period and the ongoing evolution of that role.

### *The Commission's Role in the Trial Period*

Although not usually described as such, EU Directives can be seen as specialized multi-national agreements within the broader framework of the Treaties that have established the European Union.<sup>6</sup> The ETS Directive (European Council 2003) gives the Commission specific and carefully circumscribed functions that are additional to its general powers as an executive agent under the European Treaties. These are to

1. Review and approve National Allocation Plans (article 9);
2. Issue guidelines for the monitoring and reporting of emissions (article 14);
3. Adopt a regulation concerning national registries (article 19);
4. Set up a central independent transaction log „, to allow automated checks for irregularities in (registries and to notify) Member States of such irregularities (article 20); and
5. Receive and disseminate various notifications and reports from Member States concerning various aspects of implementation and enforcement (article 21).

The two provisions that grant the most power to the Commission—the review of National Allocation Plans and the Registry Regulation—are arguably de minimus centralized powers for an effective system. There must be some check on Member States heedlessly inflating their caps or adopting allocation provisions that would frustrate the objective of the system. And common registry protocols would seem to be required for trading and enforcement. All the other functions are advisory or informational with the possible exception of the central independent transaction log, which allows the Commission ultimately to exercise its residual authority under the European Treaties to enforce EU directives.

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<sup>6</sup> For environmental matters, these Treaties establish a process known as co-decision that involves the Commission, the European Council, consisting of the Member States, and the EU Parliament. The European Parliament has the power to amend and to veto a proposed directive, but it cannot initiate or enact a measure independently of the European Council. Proposals are initiated by the European Commission usually on the instruction of the Council. For matters subject to co-decision, the power to enact a directive is reserved to the Council based on qualified majority voting of the constituent Member States. Thus, the European Council, representing the constituent governments, has the final say on whether a Directive shall exist and an adopted Directive is an instruction to the Member States reflecting that agreement. The Commission monitors compliance and it is empowered by the underlying European Treaties to bring suit in the European Court of Justice against Member States that are out of compliance with a directive.

While the Registry Regulation, which as a regulation takes the strongest form of EU administrative law, is largely technical and therefore relatively non-controversial, the Commission's power to review and to reject National Allocation Plans (NAPs) is another matter. Here the issues are intrinsically and unavoidably distributional at the levels of both the member states and individual facilities. As might be expected, the Commission's powers to review and approve NAPs are carefully circumscribed. The Commission must assess NAPs against various provisions and a set of criteria specified in the ETS Directive, that is, as agreed previously by the Member States meeting in Council. Moreover, in its assessment of NAPs, the Commission must involve a committee of Member State representatives, chaired by the Commission, and seek that committee's opinion on the Commission's proposed actions. This procedure provided a check on the discretion that the Commission enjoyed and a forum that let each Member State know how its NAP was viewed by other Member State and thereby made enabled the Commission to perform its role as agent of the whole more effectively (Zapfel, 2007).

While its powers of review and approval are limited, the Commission still enjoys considerable discretion. From the beginning, the Commission made it clear that some of the twelve criteria that were to be applied were more important than others and in practice it focused its attention on three: the list of installations, the level of the cap, and the absence of ex post adjustments. The first was necessary to ensure that the sectors specified in the Directive were being included. The second ensured against the natural tendency to inflate the cap. The third criterion guards against provisions that would allow Member States to adjust allocations at the end of the year to reflect actual emissions.<sup>7</sup> Equally important was what the Commission chose not to insist upon: any particular way of allocating allowances within Member States.

A further example of the Commission's judicious exercise of its power is the manner by which it required changes. An expedient of "conditional approval" was devised whereby the NAP was approved conditional on certain changes being made. This was a politically

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<sup>7</sup> What became the Commission's effective ban on ex post adjustments presents an interesting instance of the use of discretion. At best, this ban is implicit in the ETS Directive in that allocations were to be made once and for all. To have done otherwise would have frustrated the creation of an emissions market and the existence of a carbon price by inhibiting sales of surpluses and by providing an administrative alternative for compliance to those who would otherwise be buyers in the market.

astute approach that, when coupled with back-channel negotiation, avoided open confrontation while still obtaining the desired revisions of most NAPs. When the NAP process was over for the trial period, only two NAPs were formally rejected, those of France and Poland; all of the Commission's required changes were accepted; and only two member states, Germany and the UK, took the Commission to court both on relatively technical matters.

Reviewing and approving the National Allocation Plans of Member States was not the only role that the center has played. An equally important role has been educating, facilitating, and coordinating Member States actions. Zapfel (2007) describes the "active role" that the Commission took "to assist and guide" Member States in the preparation of their NAPs and in eliminating "know-how gaps" in order to make informed decisions on technical issues. This involved the commissioning of studies on various aspects of allocation, issuing a non-paper to elaborate in a practical manner the steps to be taken in preparing an allocation plan, and developing amplifying guidance on the review criteria. In addition, the Commission was constantly available and frequently sought after as a source of information, expertise, and informal guidance. The frequency and intensity of these bilateral contacts provided a means for sounding out various NAP features, narrowing differences, and facilitating final agreement without the need explicitly to reject certain provisions.

### ***The Evolution of the Commission's Role***

While the formal aspects of the Commission's role were unchanged between the 1st and 2nd NAP rounds, the manner in which the Commission exercised its statutory role has changed. The first round of cap-setting could best be described as a negotiation between individual Member States and the Commission in which both sides were trying to agree on a mutually agreeable cap in the face of the large data uncertainties and some confusion over what installations met the definition for inclusion. Moreover, the trial period was just that: the absence of any international obligation to limit GHG emissions in these years allowed a more relaxed approach to cap-setting.

All of this would change in the second round of NAP submissions for the 2008-12 corresponding to the First Commitment Period under the Kyoto Protocol. Things were more serious with what the EU regarded as a legally binding obligation; and the definitional

issues concerning who was in and out had been largely resolved by the time the NAP submissions were due at the end of June 2006. But the most important factor in changing the Commission's approach was the release in May 2006 of the verified emissions data for 2005. These data revealed lower emissions than had previously been thought to be the case. In particular, it became evident that, for some Member States, mostly in Eastern Europe, the assigned NAP1 totals had involved significant errors in assumed baseline emissions.

The Commission's response to this development can be seen in the evolution of guidance from that issued in December 2005 to that accompanying the first NAP approvals in November 2006. The point of reference for Member State caps in the 2008-12 would no longer be the 1st period totals but 2005 verified emissions. And, in response to criticism of inconsistency and lack of transparency in the negotiation of Member State caps in the first round, the Commission adopted a single and carefully calibrated emissions model to project BAU emissions in 2010, the midpoint of the 2nd trading period, based on the 2005 verified emissions data and expected rates of economic growth and of improvement in energy efficiency. These estimates provided the Commission with a consistent set of predicted BAU emissions for those Member States, mostly in Eastern Europe, without a Kyoto problem, and a point of departure for the more complex calculations involved in cap-setting for Member States for which the Kyoto/BSA targets were constraining.

This new approach changed the nature of the interaction between the Commission and the Member States. Cap-setting was no longer a negotiation, as it had been during the trial period, but an evaluation of whether the totals proposed by Member States were consistent with the Commission's calculations based on the 2005 verified emissions and the model's projections.. If they were not, the totals were adjusted downward absent a good reason and evidence concerning an error in the Commission's calculations. In so doing, the Commission effectively determined Member State caps and thereby the EU-wide cap. Member States might challenge the Commission's estimate of what the cap should be, but success required a good argument. This approach did however yield more legal challenges to the Commission's NAP decisions. Nine of the ten East European countries have sued the Commission over the caps imposed on them, although one, Slovakia, has withdrawn its suit.

This tentative step towards greater centralization was taken a lot farther in the post-2012 amendments to the ETS Directive that were proposed in January 2008. The whole NAP process is to be abandoned and the Commission would determine the EU-wide cap. Auctioning would become the standard for distribution of the cap with 100% auctioning to occur for the electric utility sector (about half of emissions) starting in 2013 and free allocation to the industrial sources is to be phased out by 10% increments from 80% in 2013 to none in 2020. The only exception would be for sectors exposed to international trade that might receive a continuing free allocation if serious trade effects or leakage can be demonstrated. Since the Commission has no power to raise revenue in the EU, the auctions would be conducted by the Member States, which implies assignment of the auction rights to Member States.

### ***Questions for a Global System***

Two questions are raised by the role of the center and its evolution in the EU ETS. The first is concerns the trend to centralization that can be observed in the EU ETS and the second concerns the global entity that would provide the services that the Commission has provided, almost adventitiously, for the EU ETS.

The observed and proposed evolution of the role of the center in the EU ETS raises a question concerning the viability of the more limited role of the center observed during the trial period. Within Europe, the view is that the trial period was deeply flawed and that greater centralization is the remedy. In part this view reflects a vision of a more unitary state that could avoid the messiness of decentralized structures, but it also reflects some of the real problems of the trial period. The question, even in the EU where the proposed further centralization is not yet adopted, is not so much what degree of centralization is desirable, but what is feasible for the nations constituting a multinational trading system. What may be possible in the European Union will not necessarily be so for a broader global system. The balance in a global scheme might be somewhat different from whatever eventuates in Europe, but it seems clear that participating nations will retain significant discretion in deciding national emission caps albeit with some negotiation, that separate national registries will be maintained with some arrangement for international transfers, and that monitoring, reporting and verification procedures will be administered nationally although necessarily

subject to some common standard. In sum, an eventual global system will be characterized by a high degree of decentralization, not unlike that observed in the EU ETS during the trial period.

The more important question arising out of the experience of the EU ETS is what institution could assume the role of the center on a larger global stage. In many ways, the Commission's role in establishing the EU ETS was accidental. It was not set up for this specific role; yet it was there when the occasion demanded and it played the role brilliantly. It can do so for further accessions within Europe and it would likely represent the EU in any future negotiations with trading systems in the United States or elsewhere. Nevertheless, the European Commission cannot serve as the center for a system that extends beyond Europe.

A good argument can be made that the EU ETS would not exist without the role played by the Commission. The European experience suggests that over-arching treaties and agreements, such as the Kyoto Protocol and the European Burden-sharing Agreement, may not be enough. Assuming the political will or other motives supporting action, some entity must act as agent for the whole and educate, facilitate, and coordinate hopefully with the vision, ability and political realism that have characterized the Commission's role in the development of the EU ETS. Otherwise the result will be a far more disjointed and dysfunctional system than what the trial period of the EU ETS is sometimes portrayed as being, or none at all.

### ***Importance of Club Benefits***

It is not the case that all Member States of the EU were equally resolved to address climate change from the beginning and that all are happy with the resulting EU ETS. The UK and Germany, the two largest and arguably most important members of the EU, advocated a voluntary trading system for the trial period. Spain, Italy, and some other EU15 states committed to targets in the European Burden-sharing Agreement that they seem to have viewed as aspirations and not as hard numbers to be met in later climate policy developments. Finally, the East European Member States, who joined after the system had been designed, had other priorities. That the result should be a mandatory trial period with all Member States participating is surprising, not least in the European Union where "variable geometry" and various forms of exception are the rule.

The story behind this surprising result has been told elsewhere (Skaereth and Wettstad, 2008), but several elements are important from the standpoint of constructing a larger global system. The story is a little different for the EU15 and the New Member States. For the EU15, a longer experience of working together and a set of prior commitments were important in shaping the result. The EU had taken a prominent position in favor of action on climate change at the Rio Conference in 1992 and subsequently and a leadership position in global climate change policy had wide-spread public support. This sense of common endeavor was manifest in the European Burden-sharing Agreement as it was proposed before the finalization of the Kyoto Protocol and as formally agreed afterwards. The governments of the UK and Germany might advocate voluntary participation in the trial period, in large part due to the strong positions taken by their respective industries, but it is hard to imagine that either government would have been willing to scuttle the deal given their existing positions on climate change and their broader interests in the EU. As it was, agreement on mandatory free allocation (and additionally on pooling for Germany) made mandatory participation by industry more palatable and gave the governments the excuse they needed to drop their insistence on a voluntary trial period. Southern Member States (Spain, Portugal, Italy, and Greece) who could be best characterized earlier as going along with the climate policy advocacy of their more northern neighbors were by 2004 too enmeshed in the broad benefits of the EU to give serious consideration to ignoring the EU ETS Directive, although for a while it looked as if Greece and Italy might do so.

The situation was quite different for the New Member States. They were not part of the Burden Sharing Agreement and, with the exception of Slovenia, none faced any problems in meeting its Kyoto Protocol obligation. More importantly, they were not present at the table as voting members when the ETS was negotiated and agreed. Finally, their economic and historical circumstances gave them very different economic and environmental objectives from the EU15. When accession became a reality, the common East European reaction to the EU ETS was that it was designed by and for the EU15 and that its provisions did not really fit the special circumstances of the New Member States (Jankowski, 2007; Chmelik, 2007; Bart, 2007). The Directive was, as characterized by Jankowski, “an ill-fitting suit,” which all agreed nonetheless to wear amid much and continuing protest.

Notwithstanding this discontent, none of the unhappy New Member States has pursued their differences to the point of withdrawing from the EU ETS. The first period cuts were accepted without more than complaint; and, while the second period cuts have been followed by serious legal challenges to the Commission, the appeal for equitable treatment is being pursued through common European institutions and the unhappy members are participating in the trading scheme on the Commission's terms pending the outcome of their legal challenges.

How these challenges will play out is anyone's guess, but it is hard to imagine any of the plaintiffs leaving the trading system in the event of an adverse decision. Too much would be called into question by any such action. After being the first to sue the Commission over the NAP2 cuts, Slovakia, quietly withdrew its challenge in late 2007. It is also possible that the continuing Eastern discontent will have some influence on the proposed amendments for the post-2012 system. The new Member States are now voting members and a solid phalanx of Eastern opposition would complicate obtaining a qualified majority in the European Council. But even here, the options are not exiting the system or seeing it collapse since the failure of the January 2008 amendments would mean only that the existing Directive continues without amendment.

The dissonance between the official positions of the governments of the New Member States and their actions can only be explained by the broader benefits of belonging to the European Union. Whatever the perceived disadvantages of mandatory participation in the EU ETS, they pale in significance when compared to the benefits of free flows of labor and capital and the broader markets that came with being a member of the club called the European Union. As stated perceptively by Bart (2007), the EU ETS was "just another obligation in the long march to the EU." The club benefits of the EU cannot be extended to the world, but something similar is likely to be needed to induce and to maintain participation.

### ***Stringency, Differentiation & Harmonization***

Club benefits largely explain how the EU ETS has grown from the fifteen member states who devised it to the thirty that now participate. The continuing challenge will be to keep everyone in the system with the increasing stringency of the cap that would characterize

any global system that attempts to deal with climate change. The evolution of the EU ETS from the trial period, to the present 2008-12 trading period, and to what is proposed for the post-2012 period provides a preview of the problems and solutions that are likely to be encountered in a global system.

### ***Differentiation and Harmonization Defined***

These related issues have emerged after the start of the trial period and as of this writing they have not been resolved, although a solution to both is contained in the set of amendments proposed for the post-2012 operation of the EU ETS. Differentiation is a well-established concept in climate policy originating with the reference to the “common but differentiated responsibilities” of nations in the UN Framework Convention on Climate Change. In essence, it refers to the distribution of responsibilities for reducing GHG emissions among countries of widely differing economic and historical circumstances. In a multinational trading system, differentiation would be expressed by the “cap” that each nation accepts. Since the price of GHG emissions would (ideally) be the same for all participants, nations accepting less demanding responsibilities would likely reduce emissions below their caps and sell allowances to countries accepting more demanding responsibilities, who would buy these allowances to bring their emissions above their more demanding caps into compliance.

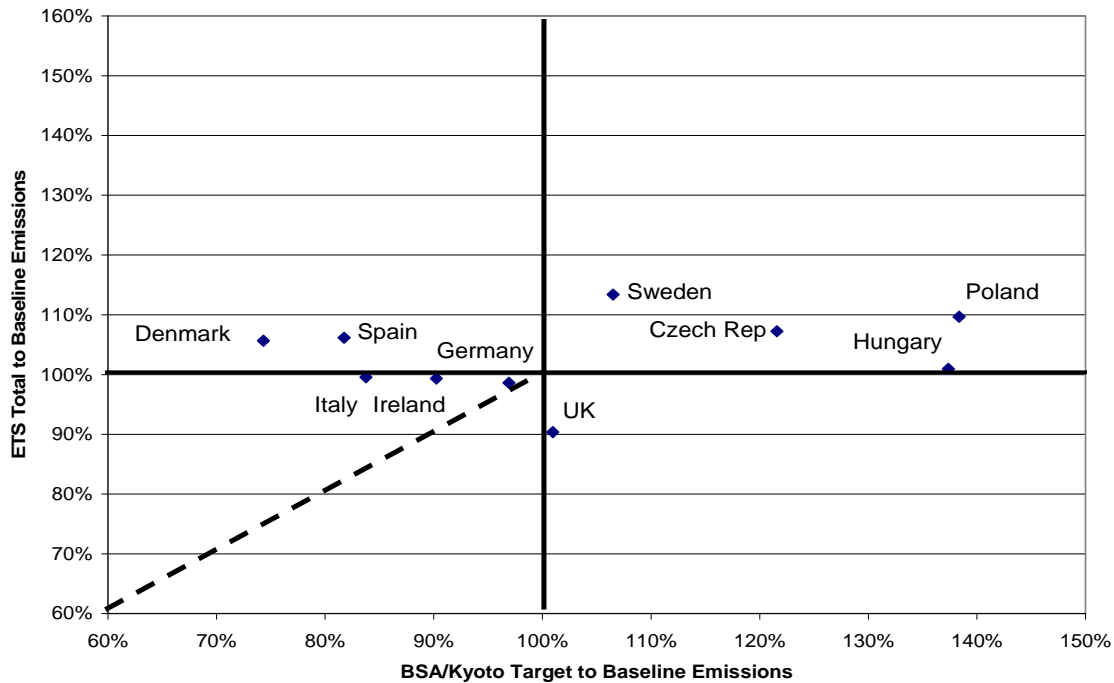
Harmonization has entered the climate policy lexicon only with the implementation of the EU ETS. It probably remains more used in Europe than globally, but the issue raised is one that will occur in any global system. Harmonization is the proposed remedy for what is perceived as the unequal treatment of like facilities as the result of the decentralized free allocation of allowances. The allegation is that the award of more allowances to an installation in one country than to an identical installation in another is at least unfair and that it may create a competitive distortion, especially when the free allocation is given to new facilities. Benchmarking, a method of allocation whereby allowances are allocated proportional to past output instead of past emissions, is often advanced as the solution, but agreement upon benchmarks has proved elusive in the face of product and process heterogeneity. More fundamentally, the call for harmonization, which implicitly presumes equality of treatment, calls the whole concept of differentiation into question. If all facilities

are to be treated equally, how can various countries be differentiated? And, even if harmonization could be achieved for some particular sector, as several industries argue should be done in a global system, the burden of differentiation would then fall more heavily on the non-harmonized sectors.

### ***The Current and Proposed Evolution in the EU ETS***

The EU ETS is evolving from a trial period that could be characterized as little stringency, no differentiation and no harmonization to a post-2012 system that would feature increasing stringency, significant differentiation, and near complete harmonization. The lack of stringency in the over-allocated trial period is well-known but the lack of differentiation is not. In theory, the trial period caps were to reflect the lesser of predicted business-as-usual emissions or a “Path to Kyoto” level that was consistent with the Member State’s achievement of its emissions commitment under the European Burden-sharing Agreement. In reality, the absence of relevant data, the inherent difficulties of prediction, and the pressing deadlines for implementation frustrated any differentiation as shown by the following graph of the caps of 10 representative Member States in relation to their Kyoto obligations and to baseline emissions that largely reflected recent historical emissions.

**Figure 2. Relation of NAP1 Totals to Baseline Emissions and the Kyoto/BSA Targets**



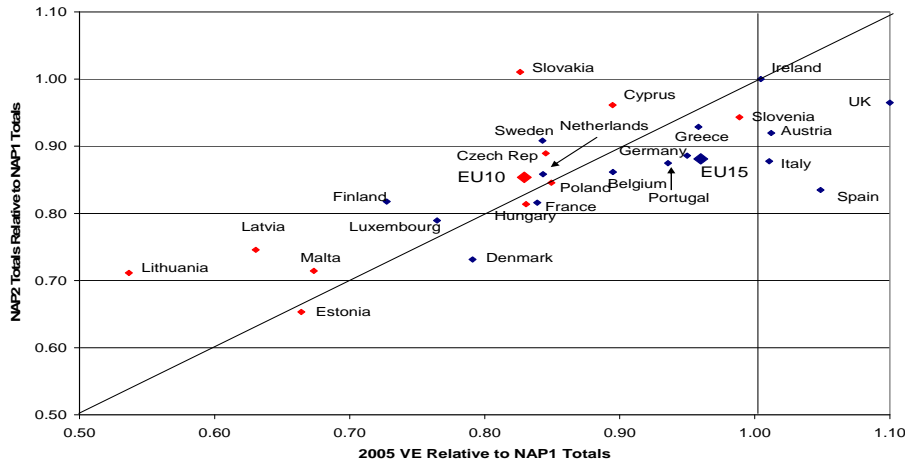
Source: Ellerman, Buchner, and Carraro (2007)

The horizontal axis presents the BSA/Kyoto commitment of the Member State as a percentage of the Member State’s recent emissions. The vertical axis gives the Member State’s first period ETS cap as a percentage of the baseline emissions for the ETS sectors, which were also largely recent emissions. Countries to the left of the vertical axis, that is, those with a constraining Kyoto/BSA target, might be expected to have a “Path to Kyoto” cap under the EU ETS that would place them in the lower left-hand quadrant along the dashed diagonal. Conversely, those to the right of the vertical axis face no evident Kyoto problem and with the important exception of the UK, all had EU ETS caps that were at or above recent emissions. Recent emissions were in fact a more important determinant of cap levels for the trial period of the EU ETS than Kyoto or BSA considerations.

This circumstance would change with the second NAP round (NAP2) that set caps for the 2008-12 period. As already explained, the Commission adopted the recently available and more reliable 2005 data as the standard against which to judge caps for the second period. It is also important to note that the stringency of the cap was increased. The over-all

annual EU cap for 2008-12 was set at a level for the EU25 that was 5% lower than 2005 verified emissions and 12% lower than the 1st period cap. The relation between the first phase caps, 2005 verified emissions and the 2nd phase caps is depicted in the following graph.

**Figure 3. NAP2 Caps in relation to NAP1 caps and 2005 emissions**



Source: Compiled by the author.

Each diamond represents a Member State and expresses the relation of its NAP2 cap (vertically) and 2005 emissions (horizontally) to its NAP1 total. All but five Member States had 2005 verified emissions less than their average 1st phase cap and all but Slovakia and Ireland have 2nd period caps lower than the 1st period caps. The effect of 2005 verified emissions on the 2nd period caps is evident by the diagonal which is almost a least square fit of the Member State positions along these axes. In general, the lower a Member State's 2005 verified emissions were from its 1st phase cap the lower its 2nd phase cap would be.

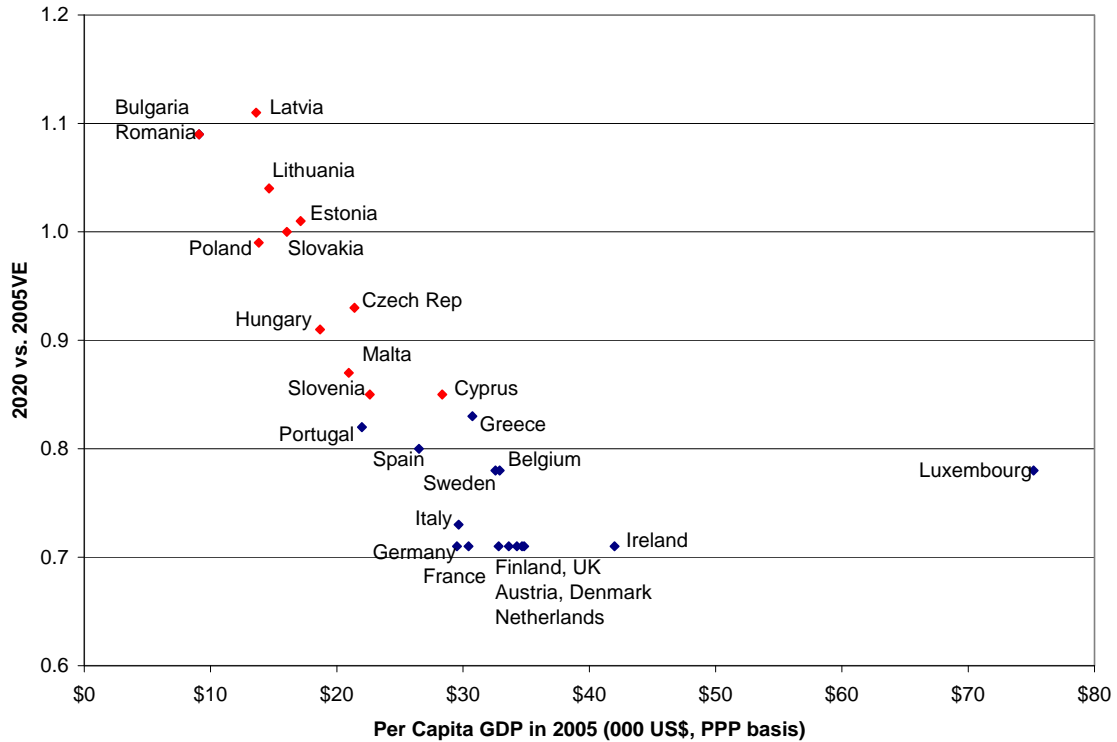
However, differentiation is starting to appear. If 2005 verified emissions were the only basis of the 2nd period caps, then all Member States would line up along the diagonal. The perpendicular distance from this diagonal indicates the degree of differentiation. Spain, with 2005 emissions 6% above and its NAP2 total 17% below its NAP1 total, has the most demanding cap. Slovakia and Lithuania are those with the least demanding caps. More generally, New Member States are mostly to the northwest of this line, indicating more favorable treatment, while EU15 member states are to the southeast indicating less favorable

treatment relative to 2005 emissions. The separation between the two groups is not complete; however, there is differentiation as indicated by the larger diamonds marking the positions of the 10 new member states and the EU15, each taken as a whole. The 2nd period caps for the EU10 are on average 3% higher than 2005 emissions, while those for the EU15 are 7% less.

Still greater stringency and greater differentiation is foreseen by the proposed post-2012 amendments (European Commission, 2008). Starting in 2013 the cap is to be set at a level that it would decline by 1.73% annually indefinitely and such that by 2020, it would be 21% below 2005 verified emissions. At the same time, greater differentiation would be achieved by the apportionment of auction rights to participating Member State governments according to a formula that is specified in an annex. Ninety percent of the EU-wide cap is to be allocated to Member States in proportion to their 2005 verified emissions. The remaining 10% is to be distributed for the purpose of “solidarity and growth within the Community” to certain Member States in amounts that would increase the allocation of auction rights by percentages that range from 2% for Italy to 56% for Latvia.

The basis for this differentiation is not stated, but it correlates closely with per capita income on a purchasing power parity basis as illustrated by the following graph which plots per capita GDP against the proposed allocation of auction rights in 2020 in relation to 2005 verified emissions.

**Figure 4. 2020 auction rights in relation to 2005 emissions and per capita GDP**



Source: Compiled by the author.

The poorer East European countries—Bulgaria, Romania, Latvia, Lithuania, Estonia, Slovakia and Poland—would receive an allocation of auction rights that would be equal to or greater than their level of 2005 emissions. In effect, the cap—now in the form of auction rights—would be little changed from the current 2008-12 cap. Relatively better off New Member States would receive fewer auction rights relative to their 2005 emissions, but still more than any EU15 member state. Among the EU15, Luxembourg must be set aside because of the tax advantaged activity and that gives it an artificially high per capita GDP figure. Otherwise, a clear leader group among the EU15 is evident: relatively high-income Member States would receive auction rights equal to 71% of their 2005 emissions (90% of their share of a 2020 cap that would be 21% below the 2005 level).

The post-2012 amendments also present a coherent attempt to deal with harmonization. It is to be achieved by 100% auctioning, which when completely phased in by 2020 will treat all alike with zero free allocation. This is not the benchmark that those

advocating harmonization had in mind, but it is an easy and obvious one to administer. In this case, the auction advocates won the day and among the benefits they could claim is the elimination of the alleged competitive distortions due to free allocations to existing and new installations.

Whether this approach will prevail is yet to be seen since the post-2012 amendments are still in the co-decision process with a package of other energy and environmental proposals. Still, the direction is clear. Perhaps there will not be 100% auctioning by 2020, or 100% in the power sector in 2013, but there will be significantly more from 2013 on and the share will likely continue to increase. The vision is also clear. Harmonization will be achieved by doing away with free allocation and the inherent conflict between harmonization and differentiation resolved by giving more auction rights to those countries that will benefit by differentiation. In effect, French, German, or British installations will be buying some allowances from Bulgaria and Romania, but the transfer will be well hidden by the intermediary of the market. This could work, even on a global scale, since all Member States would be auctioning a quantity of allowances reasonably close to their emissions. The real issues are whether 100% auctioning is politically feasible and if so, whether the better-off countries, which will be disadvantaged by differentiation, are willing to give up the source of additional revenue.

An equally important feature of the proposed change and of what has occurred to date is the coupling of increasing differentiation with increasing stringency. All proposals for global architecture anticipate increasing stringency and some form of differentiation, but the relation of stringency to differentiation is not developed. The short experience of the EU ETS and its proposed further evolution suggest that these two are inherently linked. For a system that started out with caps that were not binding, or at best gently so, increasing differentiation could be seen as the necessary concomitant of increasing stringency. Just as the EU ETS has not dealt with stringency and differentiation in one fell swoop, so is it likely that a global system will experience the same evolutionary course. Moreover, if a global approach is to be “broad then deep” (Schmalensee, 1998), the participants may find themselves in a situation not unlike that of the EU Member States during the trial period.

### *Financial Flows*

Before concluding, note should be taken of the absence of a problem that is commonly thought to be one in a global trading regime. A trading system implies trade among participating entities and accompanying financial flows. And these flows are likely to be larger to the extent that differentiation creates differences in the apportionment of the system-wide cap that go in the same direction as comparative advantage in abatement. For instance, modeling exercises commonly predict that the cheapest abatement will be found in the same developing countries that most analyses assume will be the beneficiaries of global differentiation. These two factors would combine to create large international flows the feasibility of which is often doubted. A remarkable feature of the EU ETS is that there has been virtually no comment or notice concerning these international flows.

Despite all the birthing problems of the EU ETS, there was a very liquid market for EUAs and there were cross-border transfers among the participating Member States. The 25 x25 matrix at Figure 5 provides a table of the country of origin of all the EUAs surrendered during the three years of the trial period. The size of the matrix prevents its being easily read, but it is the general image and impression that is important.

**Figure 5. Origin and disposition of EU allowances, 2005-07**

		Originating Registry																											
		EHS													EU10								EU25						
		Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxembourg	Netherlands	Portugal	Spain	Sweden	UK	Cyprus	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Malta	Poland	Slovakia	Slovenia	Grand Total	% Import	
Holding Registry	<b>Total 2005-07</b>	91,630,706	185,302	108,771	201,301	518,886	1,031,478		2,000	59,530	830,997	11,440	30,156	46,041	259,490		295,804	2,093	34,703	144,189	133,212		420,639	308,193	20,500	96,274,400	4.82%		
	Belgium	209,895	148,391,247	168,263	120,916	983,219	787,114	12,593	35,112	952,895	380,243	231,386	75,000	749,653	32,589	77,880		461,004	165,000	1,495,513	7,024	656,974		6,891,680	69,907	162,924,127	8.83%		
	Denmark	4,000	151,349	72,620,283	148,733	97,310	648,186			8,663	848,944	106,015	152,754	210,009	374,922		430,267	22,000	58,827					81,186	107,740		76,091,413	4.56%	
	Finland	200,120	112,846	57,691	114,337,962	874,478	221,849	247,334		74,706	148,090	138,000	31,788	336,444	784,574		925,459	264,876	19,490		64,187	214,333		1,093,092	95,000		120,242,359	4.91%	
	France	10,742	88,612	44,859	306,534	379,709,660	146,321	122,538		74,716	134,425	89,230	434,514	15,000	264,551	44,680	249,824		21,456		117,895			1,729,965	127,168		383,670,736	1.03%	
	Germany	481,425	4,018,103	874,506	2,632,459	6,718,845	1,391,488,328	83,189	884,472	1,263,673	273,230	7,338,286	963,029	961,783	1,214,308	8,404,231	10,000	7,058,705	1,348,882	2,538,348	278,296	2,386,979		5,314,035	1,672,314		1,448,079,598	3.83%	
	Greece	18,100	10,000		55,922	851	212,907,223					5,989	24,146			32,074									842,191	15,000		213,933,676	0.48%
	EHS Ireland	76,105	20,000	60,401	292,106	118,695	56,793		64,043,407	192,793	5,000	91,365	175,062	18,182	4,160	425,168	21,800	61,695	559,807		43,000	25,000		59,000	27,000		66,237,309	3.52%	
	Italy	496,607	1,175,025	660,972	1,070,468	6,449,878	5,420,161	258,488	86,523	626,117,882	14,242	1,159,202	1,193,178	1,535,075	995,821	4,133,184	226,720	3,684,137	2,048,519	1,080,673	654,577	1,136,978		6,834,159	2,841,634	52,910	672,056,272	6.38%	
	Luxembourg									7,883,552																		7,883,552	0.00%
	Netherlands	121,265	2,983,176	268,395	787,289	2,298,321	2,841,830	77,400	20,000	153,796	18,500	216,803,363	78,812	380,377	225,931	2,718,377	52,000	1,789,554	578,100	381,461	233,506	754,182		2,443,312	933,599	4,287	236,940,623	8.50%	
	Portugal	5,000	151,000	9,069	8,133	54,434	60,795			84,965		41,310	98,447,729	275,136	4,555	480,838		215,387	1,000	1,111	13,493	2,624		13,431	17,529		100,944,338	1.38%	
	Spain	289,592	1,682,075	2,473,651	3,774,421	5,924,072	3,468,461	134,728	126,000	1,052,707	96,118	3,735,217	3,318,834	499,670,987	910,812	4,686,266	5,079	3,542,854	1,381,087	1,131,910	563,311	741,469		8,210,412	1,642,501		548,221,594	8.66%	
	Sweden	10,152	32,511	72,571	359,459	85,822	183,800	10,000		10,995	7,716	8,500	3,000	57,847,595	177,367		75,870	148,342	14	5,113	81,130		121,492	6,318		58,457,267	2.41%		
	United Kingdom	406,286	10,085,574	4,888,980	5,108,551	10,590,987	11,286,574	1,171,926	159,801	3,445,193	259,800	18,524,824	1,780,065	2,598,636	1,189,537	619,100,376	141,599	13,829,842	5,292,371	2,812,386	751,094	5,387,709		17,755,943	4,324,242		750,720,686	17.53%	
	Cyprus																15,734,314											15,734,314	0.01%
	Czech Republic	4,000	78,829	74,135	35,750	71,283	121,138			121,347		266,093	228,726	33,388	68,717	983,025	6,225	247,031,889	107,630	478,242	11,062	100,680		2,020,444	611,845	4,287	252,422,559	2.14%	
	Estonia		20,000	4,384			34,500								19,591		30,930,482							35,500				40,053,377	0.28%
	Hungary		7,443			135,616	28,700						18,434	1,274	24,000	14,389		145,737	38,692	78,631,267				95,000		900	79,304,923	0.85%	
	EU10 Latvia																	30,000		224	8,552,278	58,937			2,948			8,644,387	1.07%
	Lithuania		25,000	60,000	2	383,917	178,755	3,663		25,000				5,529		11,236		739	1,916	34,500	19,722	17,978,529		386,323	14,884		19,129,609	6.02%	
	Malta																						3,957,023					3,957,023	0.00%
	Poland	41,000	182,171	103,500	4,000	258,145	204,214	16,437	771	47,175	22,748	18,784	89,493	8,500	616,405	9,000	171,247	3,887	78,818	40,000	23,665		620,335,643	250,923		622,526,426	0.25%		
	Slovakia	393	25,500		1,000	211,357	24,540			77,000		10,182		7,800	50,710		66,598	98,100	10,000	114,000	204,000		196,372	74,290,748			75,374,240	1.43%	
	Slovenia	42,282		16,000	2,115	24,400	389,657	4,000		17,000		91,136	20,000	60,000	36,100	187,864		17,349	65,000	5,000	40,000	15,000		189,300	4,331	25,374,824	26,611,388	4.65%	
	Grand Total	93,889,770	189,418,156	82,356,321	129,404,360	425,608,173	1,418,397,620	215,229,417	65,486,377	636,740,241	8,941,780	250,530,288	107,658,153	507,059,416	621,136,408	843,749,474	16,251,417	280,826,046	51,783,171	89,052,006	11,734,812	30,125,841	3,957,023	676,550,666	87,437,873	25,486,117	6,086,476,525	5.76%	
% Export	2.51%	12.41%	11.82%	11.62%	10.77%	1.92%	1.00%	1.98%	1.20%	11.83%	13.38%	7.63%	1.45%	7.92%	3.83%	3.18%	11.90%	22.82%	11.46%	27.12%	40.19%	0.00%	8.12%	14.99%	0.31%	5.76%			

Source: Compiled by the author and Raphael Trotignon from CITL data.

Reading across a row indicates the quantity and origin (by column headings) of all the allowances surrendered in the country listed at the row heading. The row sums indicate the total number of allowances surrendered, or equivalently emissions for that country during the three-year trial period and the percentage following indicates the number of EUAs surrendered in fulfillment of compliance obligations that were issued by another Member State. Reading down columns indicates the final destination of surrendered allowances by Member States as listed at the column heading. Column totals indicate the number of EUAs issued by a Member State that were surrendered for compliance. The percentages below each sum indicate the proportion of the total that was surrendered outside of the issuing Member State. The diagonal entries indicate the number of allowances issued and surrendered in the same Member State. They are by far the largest entries of all cells for every Member State.

Several points are immediately obvious. First, most of the allowances issued and surrendered were not involved in trade among Member States. Of the total 6.09 billion EUAs surrendered, 5.74 billion (94%) were surrendered in the issuing Member State. International flows accounted for only 351 million EUAs or 5.76% of the total. Much of the

explanation of this phenomenon reflects what could be expected and is readily observed with free allocation. Most of the allowances issued freely are kept in the installation's account for later surrender against emissions. Typically, only the difference between the unit allocation and emissions is traded. These differences can now be measured. The sum of the shorts for all installations for the entire trial period was 650 million EUAs and the sum of the longs at installations with surplus EUAs was 810 million. At a minimum, 650 million allowances were redistributed from longs to shorts. This figure, slightly more than 10% of the total allowance issue, largely explains the relatively small scale of the international transfers.

While the scale of international transfers is very modest in relation to total allowance issue, the scale is large compared to what would have been required to ensure the compliance of the four Member States that were short for the period as a whole: the UK, Italy, Spain, and Slovenia. As a group, the emissions of these four Member States were 88 million tons greater than their combined caps. If there had been some sort of national preference operating for the origin of allowances to be used for compliance by short installations, 88 million tons would have defined the level of international flows. The actual level was four times higher. Even if off-setting flows between some pairs are eliminated, the sum of net flows is 217 million, some two and a half times the minimum required international transfer. Moreover, if national preferences had been operative, there would have been only four Member States importing allowances. In fact, 22 of the 25 Member States were importers of EUAs in some amount, although only seven were net importers and seventeen were net exporters.<sup>8</sup>

Another way of looking at this phenomenon is counting how many of off-diagonal cells in Figure 5 are filled. There are 600 such cells; 470 (78%) are occupied indicating a cross border transfer. For most pairings, trade goes both ways and for many Member States the net flows with different trading partners go both ways. For instance, Germany is a net importer in the aggregate and in trading with most partners but it is a net exporter to the UK, Italy, and Spain.

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<sup>8</sup> The net importers were the UK, Spain, Italy, Germany, Austria, Ireland, and Slovenia. The two installations in Malta did not participate in any cross-border transfers despite being long.

Market intermediaries and the lack of national preference largely explain this abundance of cross-border relationships. Installations with a deficit or a surplus looked to market intermediaries to obtain needed EUAs or to dispose of excess EUAs and these intermediaries operated at a European scale. A UK firm that had a surplus would sell to a broker or at an exchange and that surplus was as likely to be sold to a firm that was short in Spain as it was to a firm that was short in the UK. With EUAs good for compliance regardless of origin, zero transportation costs, and no evident national preference on the part of sellers or buyers, the surpluses and deficits were as likely to be a part of cross-border trade as not.

The absence of any concern about international flows can be largely attributed to their small scale relative to the total number of allowances and to the indifference that buyers and sellers exhibited concerning national origin. The UK was by far the largest importer of EUAs with a net import of 107 million for the period as a whole, which was equal to 14% of verified emissions. Placing a value on these imports is difficult given the variability in EUA prices and the observed timing of imports, but the year of greatest import in value terms was 2006 when EUA imports would seem to have created a £350 million pound ( $\approx$  €500 million) outflow of funds from the UK. While this might be seen as a large amount, it pales in comparison to the payments for imported goods and services by the UK in 2006 which were about £415 billion.<sup>9</sup> Payments to foreigners for allowances were less than one-tenth of one percent of the total imported goods and services. The amount in future years could be larger due to higher EUA prices and perhaps higher levels of imports, but allowances would still be a small part of total payments abroad for goods and services. So far in the UK, one euro-skeptic organization, Open Europe, has consistently criticized the transfers to the rest of the EU that are implied by the UK's over-all short position, but this complaint failed to find any traction either with the public or the government. Several other aspects of the EU ETS have caught the attention of the public and governments—windfall profits, over-allocation, high initial prices—but not international flows.

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<sup>9</sup> Given as US\$768 billion in IMF Statistics.

## ***Conclusion***

The EU ETS departs in some way from almost everyone's ideal, but it is a multinational trading system with a common price of carbon that is being internalized in the production and consumption decisions of a significant segment of the economies of the participating nations.. As such, the EU ETS provides a test of the extent to which a ideal can be translated into practice in an imperfect world in which imperfection is measured in varying national commitment to a shared goal and uncertain capabilities to pursue that goal. The ideal in this instance is a global GHG trading system in which largely sovereign nations agree on a common emission limit, apportion the rights to emit that are implicit in any such limit in an equitable manner, and implement and enforce a set of rules for compliance that would the least cost achievement of the common goal. Although the European Union is unique and the life of the EU ETS just beginning, the brief experience to date provides a preview of the problems that will be encountered and the potential solutions.

Interestingly, the problems that are often seen as dooming a global trading system—international financial flows and institutional readiness—haven't appeared, at least not yet. The UK has been a bigger importer of allowances than any other Member State but aside from a euro-skeptic organization in the UK for whom the EU ETS is emblematic of all that it dislikes about Brussels, no notice has been taken of the corresponding outflow of funds across the Channel. The East European New Member States could certainly be considered as countries without the requisite legal and commercial institutions for full fledged participation in a trading system. The great merit of the trial period was that it provided the time and experience to remedy such deficiencies, and not least among some of the original EU15. In the theatre, opening nights are preceded by dress rehearsals and trial periods may provide the functional equivalent in a global system, especially as concerns new participants of uncertain institutional readiness.

The more serious problems that emerge from the brief experience of the EU ETS are those of developing a coordinating center, devising side benefits, and dealing with the interrelated problems of stringency, differentiation, and harmonization. The European experience suggests that over-arching agreements may not be enough for creating an effective limit on emissions and an accompanying trading system. A central institution that

educates, coordinates and facilitates would appear to be essential. And the commitment of at least some may need to be reinforced by some side benefit. The pre-existing structure of the European Union provided a convenient and almost accidental solution to these problems for the EU ETS, but this solution will not work on a global scale and there is no obvious substitute, either for the central institution or the side benefits. Both can be imagined, but the experience with the EU ETS suggests that both will need to be created.

The increasing stringency in caps and differentiation of responsibilities among participants are well recognized problems in global climate policy, but the real world practicality of these requirements is only beginning to be tested. And, as if these problems were not enough, harmonization of allocations within the trading system has appeared as a new problem. The trial period of the EU ETS punted on these problems, as was perhaps appropriate for a trial period, but they are now being addressed seriously. From a global perspective, the answers that are being worked out in Europe will say a great deal about what will be feasible on a broader, global scale.

Any future global system will likely be very different from the EU ETS, if for no other reason than the fact that Europe is not the world. Yet, the EU ETS is the world's first multinational emissions trading system and the problems in constructing it will be present on the larger stage. In studying this experience and in drawing lessons from it, one must always keep in mind the uniquely European aspects that will not transfer beyond Europe. That being said, there are still many similarities that allow this pioneering policy experiment to be instructive for the larger and more difficult task that faces the nations of the world.

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