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Compliance Behavior in the EU-ETS:
Cross Border Trading, Banking and Borrowing

by
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COMPLIANCE BEHAVIOR IN THE EU-ETS: CROSS BORDER TRADING, BANKING AND BORROWING

R. Trotignon* and A. Denny Ellerman†

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Abstract

This paper exploits a little used data resource within the central registry of the European Union's Emissions Trading System (EU ETS) to analyze cross border flows of allowances for compliance purposes during the first trading period (2005-2007). The extent of cross border trading is small in the aggregate but remarkably frequent in matching allowance deficits and surpluses at the installation level throughout the EU. As such, these data provide evidence of the high and wide-spread market participation that is the precondition of efficient abatement in a cap-and-trade system. There is also remarkable little difference in the monetization of allowance surpluses between participants in the EU15 and those in the East European New Member States. Finally, comparison of these data with the more commonly reported data on allocations and verified emissions reveals considerable recourse to a novel feature of the EU ETS: borrowing from the next year's allocation to satisfy current compliance requirements.

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1 Introduction

The political acceptability of the cross-border flows in international allowance trading has figured importantly in the discussions of future global climate regimes, but to date there has been no empirical data upon which to base this discussion. As the world's first multi-national trading system, the European Union's CO_2 Emissions Trading Scheme (EU ETS) now provides a much needed reference point. The EU ETS also contains another novel feature, borrowing, that has not figured in these discussions and which has affected the timing of cross-border trading. With the first, trial period of the EU ETS now over, data from the Community Independent Transaction Log (CITL) can be used to identify and analyze cross-border trading and borrowing, as well as the origin of the banked allowances that expired worthless at the end of the trial period.

This paper presents and analyzes the CITL data on cross-border trades, borrowing and banking during the just-concluded first trading period of the EU ETS. The next section of this paper distinguishes compliance trading from financial trading, explains the CITL surrender data that provides the basis for this analysis, and discusses the trading implied by the net short and long positions of Member States. Section 3 presents and analyzes the actual cross-border flows. The time pattern of these trading strongly suggests borrowing and this is the subject of section 4. Section 5 addresses banking and the origin and potential causes of the allowances that expired worthless at the end of the first trading period. The final section concludes.

2 Definitional and data preliminaries

2.1 Compliance and financial trading

A distinction needs to be drawn between trading that is motivated by compliance needs and that motivated by financial or hedging considerations. Compliance trading is a fundamental underpinning of a cap-and-trade market and it is what is modeled and discussed in simulations of trading in a global system. However, compliance trading is not the only, or even the main, reason for participating in actual allowance markets. Most trades are motivated by financial considerations, such as hedging forward positions, instead of compliance. For instance, a power company wishing to lock in the price of carbon implied in a forward power contract will typically purchase a futures contract for allowances of the same maturity as the power contract. The distinguishing feature of financial trading is that typically a transfer of allowances does not take place. The power company will usually sell the futures contract before maturity and in so doing it will have effectively eliminated any loss or gain from a change in the carbon price between the time of the forward power contract and the actual delivery of the power with its embedded carbon and the associated allowance liability.

In the EU ETS, as in other cap-and-trade systems, compliance consists of surrendering tradable rights to emit, called European Union Allowances (EUAs), equal to emissions. Compliance is recorded in accounts associated with each emitting installation that are maintained in registries. These registries record the initial allocations to installation accounts, all transfers in and out of accounts, and the annual surrender of allowances for compliance. In the case of the CITL, which is the central registry for the EU ETS, data is provided for the holding account of every affected installation. These accounts record the annual allocation of allowances to the installation, its emissions for the year, and the number of allowances surrendered in compliance. In addition, the registry of origin for every surrendered allowance is reported, although not the identity of the installation to which the allowance was initially issued.

2.2 Presentation of the CITL surrender data

The CITL surrender data are publicly accessible, but not easily analyzed and for that reason few analysts have exploited this data resource.[1] Absent a specially designed data retrieval program, the analyst would need to consult and assemble data from over 10,000 separate installation holding accounts in the CITL. The results presented here are the result of a data retrieval program that has been developed by the Mission Climat of the French Caisse des Dépôts et des Consignations in Paris for the purpose of supporting a broader research project of which this paper is part.

Appendices one through eight present the surrender data as 25 x 25 matrices by year and for the period as a whole.[2] The first four tables present the gross flows, that is, all 625 possible combinations of the registries of issue and surrender. The cells along the diagonal in these matrices indicate the number of allowances that were issued by and surrendered in the same Member State. Cross-border flows are indicated by all the off-diagonal cells of which there are 600. The last four appendices present only the net cross-border flows, that is, after compensating imports or exports are netted out. In these appendices, positive entries indicate net export from the country indicated at the row heading, and negative entries are imports into that country. The entries in appendices five through eight are symmetric but of opposite sign with respect to the diagonal. For instance, the net flow between Austria and Belgium for the period as a whole (appendix 8) is 10,000 EUAs from Austria to Belgium. In Austria's row this flow is entered as a positive number under the column heading for Belgium and as a negative number in Belgium's row under the column heading for Austria.

1 A notable exception is Kerr (2007), which presented some surrender data for the 2005 and 2006 compliance years.

2 In order to focus on the 25 Member States who participated for all three years, Bulgaria and Romania are excluded. Both had problems getting their registries operating in 2007 and there are only a small amount of cross-border imports reported for Romania.

Appendices one through four clearly show that most allowances are surrendered in the same registry in which they were issued since the largest entries are those in the diagonal cells. When the diagonal cells are summed and compared with the total surrender for all the EU, the difference indicates the number of allowances that were involved in cross-border trades, as shown in Table 1.

Table 1 – Basic Allowance Accounting, 2005-07 Combined.

Million EUAs (% of total)	2005	2006	2007	2005-07
Surrendered in MS where issued	1,611 (97.9%)	2,300 (96.4%)	1,879 (88.9%)	5,791 (94.2%)
Surrendered in another MS	34 (2.1%)	85 (3.6%)	235 (11.1%)	354 (5.8%)
Total	1,645	2,385	2,114	6,145

Note: Registry problems in several Member States, mainly Italy, France, the Czech Republic, and Spain, caused many allowances for 2005 compliance to be surrendered after April 30, 2006, and thereby to be reported in 2006.

The percentage of allowances being transferred across borders for compliance increases in each year and is equal to 5.8% for the period as a whole.[3] That most of the allowances are surrendered in the Member State in which they are issued should not be surprising. Most of the allowances initially allocated to an installation remain in that installation's holding account and are surrendered against emissions from that installation. What are traded are the expected or actual differences between emissions and allowance allocations. This "own allowances first" behavior is a critical assumption in the analysis that follows. It is supported by anecdotal evidence, but it cannot be confirmed until the CITL data on the installation origin of surrendered allowances is made publicly available five years after the surrender date.

Table 2 presents an extract of data from appendix four, in this case, for Germany for the period as a whole with respect to both the origin of allowances surrendered against emissions in Germany and the registries in which allowances issued by Germany were surrendered against emissions throughout the EU ETS. Where another country is involved, the first column indicates allowance imports into Germany and the second column, exports from Germany. The net position for these trade flows is also shown.

3 An additional 378 million EUAs, constituting the surplus for the trial period, were authorized and for the most part issued, but never surrendered.

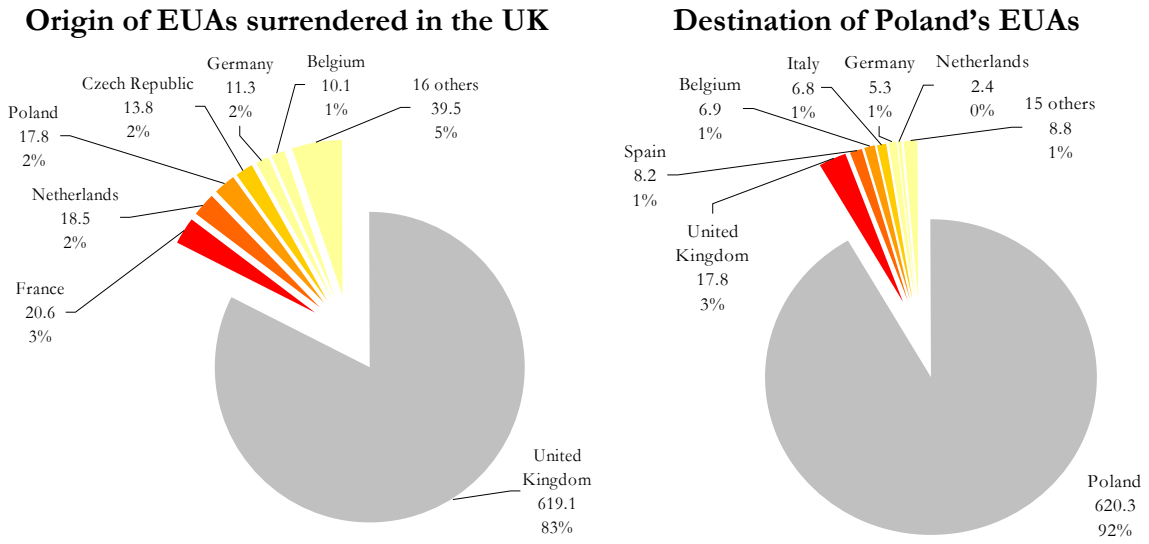
Table 2 – Example of CITL Surrender Data: Germany, 2005-07

Million EUAs	**Surrendered in Germany originating from …**	**Originating in Germany surrendered in …**	**Net import by Germany**
Germany	1391.2	1391.2	
Czech Republic	7.1	0.1	6.9
France	6.7	0.1	6.6
Poland	5.3	0.2	5.1
Netherlands	7.3	2.8	4.5
Belgium	4.0	0.8	3.2
⋮	⋮	⋮	⋮
Slovenia	0.0	0.4	(0.4)
Austria	0.5	1.0	(0.6)
Spain	1.0	3.5	(2.5)
United Kingdom	8.4	11.3	(2.9)
Italy	1.3	5.4	(4.2)
Grand Total	**1448.1**	**1418.4**	**29.7**

Several features stand out and these are generally true for all Member States. First, as previously noted, most of the allowances issued and surrendered do not cross a border. Second, for any given trading relationship, cross-border trading is usually characterized by flows in both directions. Finally, the net position with various trading partners is in both directions. For instance, Germany is a net importer over-all and in most of its trading relations with other Member States, but it is also a sizeable net exporter in its trading with the UK, Spain, and Italy.

Figure 1 presents two other examples of data extracts from appendix four. The first panel shows the origin of all the allowances surrendered in the UK, which was the largest importer of EUAs. The second panel shows the registry in which allowances issued by Poland, the largest exporter, were surrendered for compliance.

Figure 1 – Example of CITL Surrender Data: origin and destination of allowances



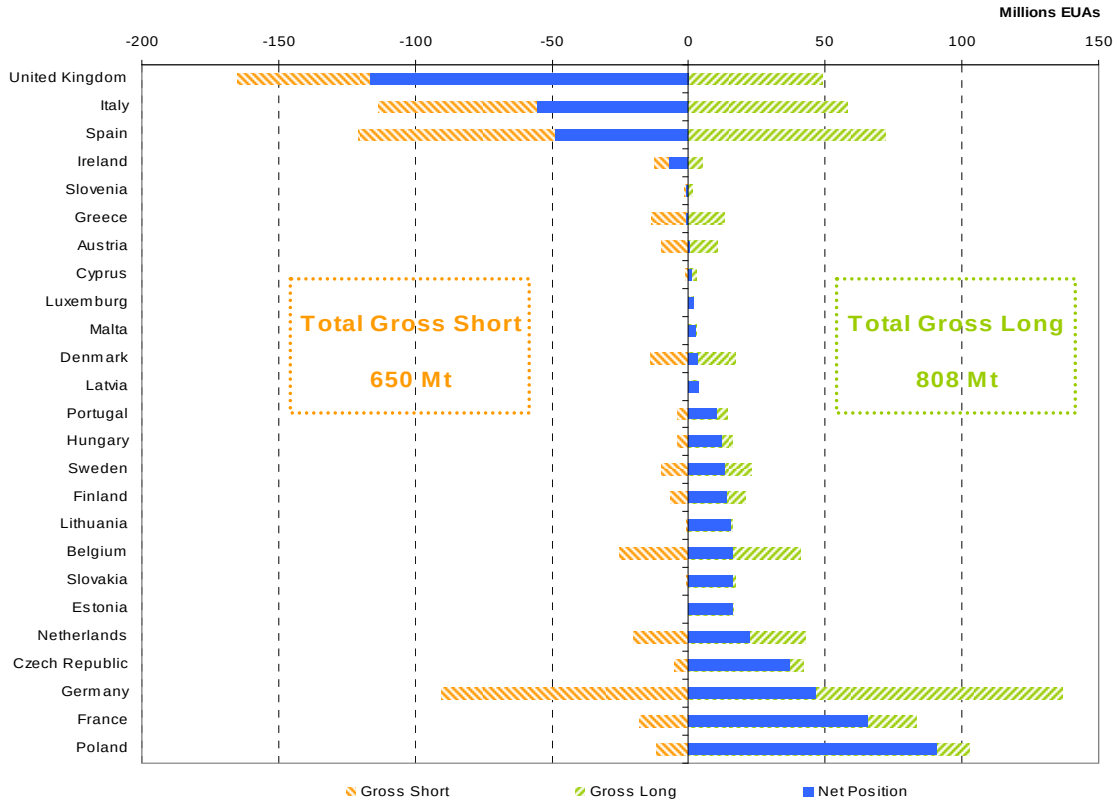
These diagrams show again that most allowances are not involved in cross-border trades. The percentages that are involved vary from country to country. For instance, for the period as a whole, the percentage imported ranges from 17% for the UK, to 0% for Malta, Cyprus, and Luxembourg. The export share ranges from 33% for Lithuania to 0% for Malta. Malta, with its two installations and a registry that was two years late in being established, was the only Member State that did not participate in any cross-border transfers.

2.3 Installations positions and implied cross-border transfers

If it is assumed that the owners of installations surrender the allowances allocated to them first before making any sales or purchases in the market, the differences between annual emissions and the allocation for that year would indicate the potential extent of trading. Each long installation (allocation > emissions) is a potential seller; and each short installation (allocation < emissions) is a potential buyer. These installation differences can be easily calculated and it can be readily verified that virtually all installations are either potential buyers or sellers. In fact, there are only 27 instances out of some 30,000 observations over the three-year period that have emissions exactly equal to the annual allocation. And, there were only three installations out of some 10,000 for which emissions and allowances were exactly the same for each of the three years.

These installation differences can be summed in any number of ways, and several articles have reported on these differences and the implications for trading (Ellerman and Buchner, 2007; Kettner et al., 2007). A common presentation of the data and the one of interest from the standpoint of cross-border trades is by Member State as shown in Figure 2 for the trial period as a whole.

Figure 2 – Gross and Net Positions of Member States (2005-07 Combined)



Note: calculations do not take the use of reserves into account

The orange bars indicate the sum of the shorts, that is, the extent to which the emissions exceeded allowances for all the installations that were short for 2005-07. As can be readily seen, there were short installations in virtually every Member State and the total across all the Member States was 650 million tons (Mt), about 11% of the EU-wide cap. The green bars reflect the sum of the longs, the corresponding figure for all the installations with emissions less than the allowance allocation for the period. Long installations are found in every Member State and the total for these surplus allowances is 808 Mt. The blue parts of these bars indicate the net position of each Member State, the extent to which it is on balance long or short. When the installation differences are aggregated to this level, the UK, Italy, Spain, Ireland, Slovenia and Greece are short for the period as a whole. All the other Member States are long.

These data indicate that at least 650 million EUAs were transferred from long installations to short installations for compliance over the course of the three years. This defines the minimum size of what can be called the compliance market. Moreover, the net positions of the Member States also indicate that there were cross-border flows.

2.4 New entrant and other reserves

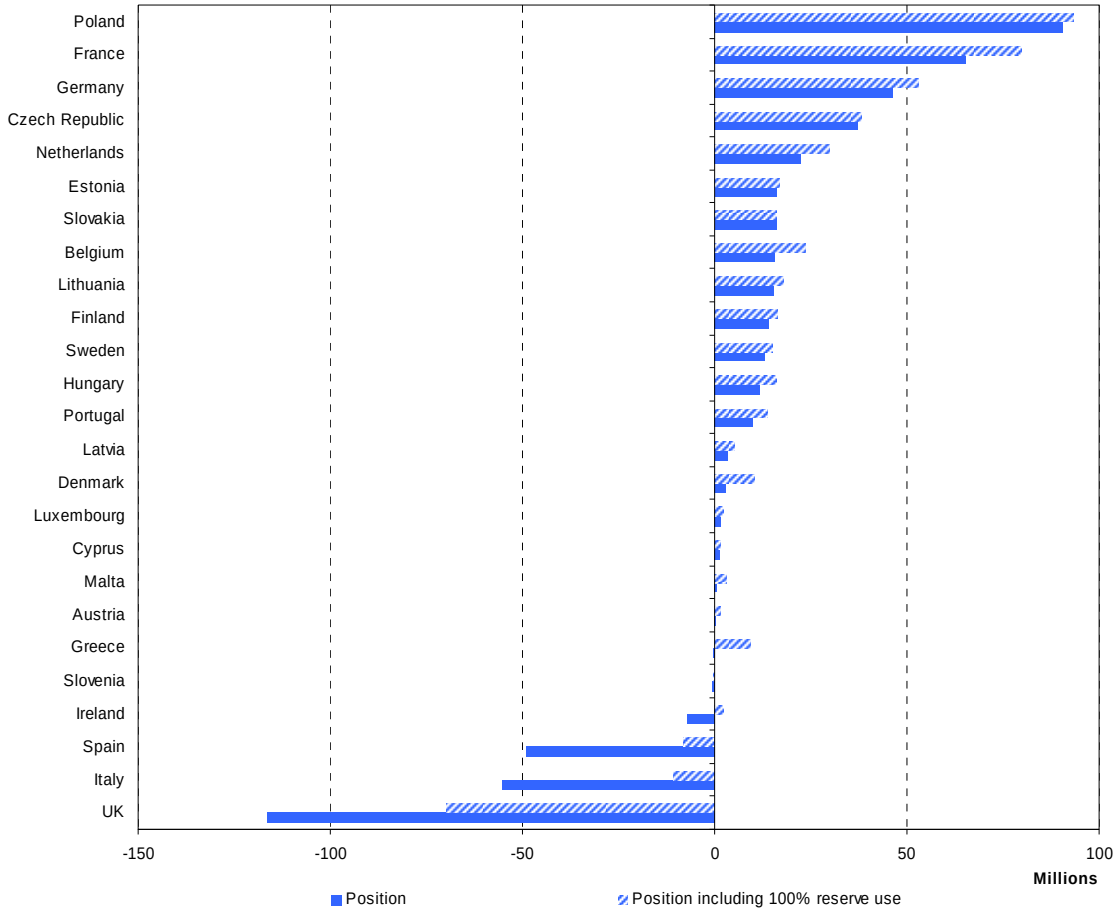
The data just presented reflect the initial allocations to existing installations, not the total number of allowances that Member States may have issued. Many Member States held back authorized allowances to provide free allocations to new facilities (new entrant reserves) and four Member States held back some allowances for auctioning (Fazekas, 2008a). Also, some Member States require installations that cease operations to forfeit post-closure allowance allocations. Thus, the allocations to installations reported in the CITL understate the total number of allowances allocated to the installations in some instances, and overstate the number in others.[4]

To make things a little more complicated, not all allowances as approved by the Commission were distributed. Installations in several Member States, especially in the UK, exercised the opt-out provision and the allowances authorized for them were cancelled. EUAs forfeited under the closure provisions, as well as any unclaimed in the new entrant reserves were annulled in some Member States, but sold in others. As a result, neither the approved Member State totals nor the sum of the allocations to installations as reported in the CITL reflects the total number of allowances available for compliance. If the true short or long position of Member States is to be calculated, account must be taken of the allowances distributed to new entrants or through auctions and other reserves, as well as any undistributed forfeitures for closure. Figure 3 below shows the effect of the various reserve provisions on the net positions of Member States[5].

4 Often these installations can be identified since all installations with allocations or emissions have accounts and report emissions. Installations that report emissions but no allocation are new entrants and invariably they have received allowances. Similarly, installations showing an allocation but no emissions are candidates for forfeiture, depending on the specific provisions of the Member State's National Allocation Plan. New entrant allowances were also awarded for expansions of existing facilities so that the initial allocation reported for an installation in the CITL is not necessarily the complete allocation to that installation in a given year. See McGuinness and Trotignon (2007) for a more complete discussion of this problem and examples from the UK, Spain, and France.

5 Data on forfeited allowances are generally not available and where they are the numbers are small.

Figure 3 – Potential Impact of Reserve Use on Member States Positions



The effect of including these additional reserves is two-fold. First, the net surplus of the EU ETS as a whole for 2005-2007 is increased from 158 Mt to 378 Mt. Second, the net positions of the Member States are changed. Two of the Member States that were short at the installation level, Ireland and Greece, switch from being net short to net long. Moreover, the need for cross-border transfers by the remaining Member States with net short positions, the UK, Italy, Spain, and Slovenia, are significantly reduced, from 229 Mt to 89 Mt. Since the net long or short positions of Member States are typically small percentages of the total allocation, reserves that are sometimes as much as five percent of the Member State allocation can have a big effect. The short Member States held back more allowances from the initial allocations to installations than other Member States and this accounts for the large effect that these reserves had on their net positions.

3 The extent of cross-border EU compliance trading

3.1 The density of compliance trading

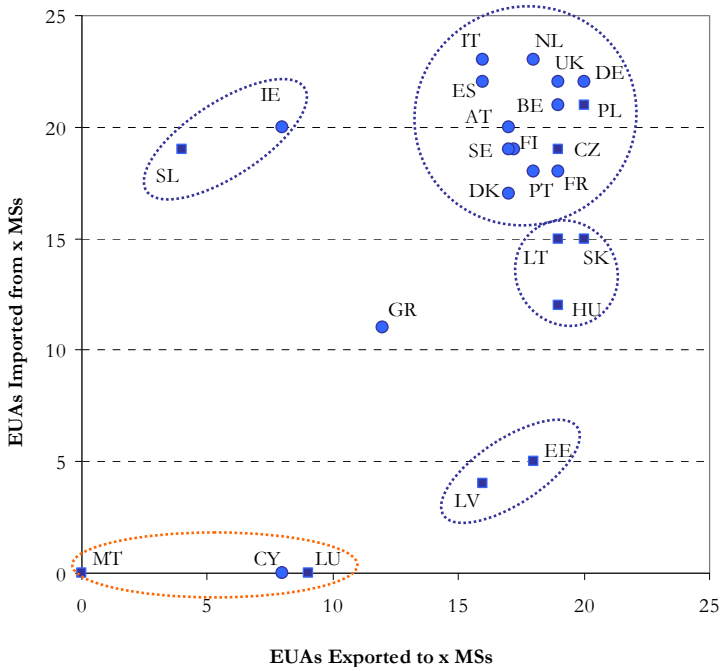
One of the most remarkable features of the matrices of flows in appendices one through four is what might be called the density of trading, that is, the number of possible trading relationship that occurred. Visually, the density of trading is reflected by the number of filled off-diagonal cells. Table 3 presents these data for trade among the EU15, between the EU15 and the EU10, and among the EU10 for each year and for the period as a whole.

Table 3 – Density of trades by region

	Possible	2005	2006	2007	2005-07
Intra EU15	210	102 (49%)	128 (61%)	160 (76%)	174 (83%)
EU15 w/EU10	300	54 (18%)	104 (35%)	149 (50%)	168 (56%)
Intra EU10	90	8 (9%)	19 (21%)	39 (43%)	43 (48%)
Total	600	164 (27%)	251 (42%)	348 (58%)	385 (64%)

The growth in these trading flows expanded steadily over the three years of the trial period. By the end of the period and for the period as a whole, more than half of the possible trade flows have been realized. The participation of different Member States in these trade flows also differs, as shown by Figure 4.

Figure 4 – Participation of Member States in EUA cross border flows

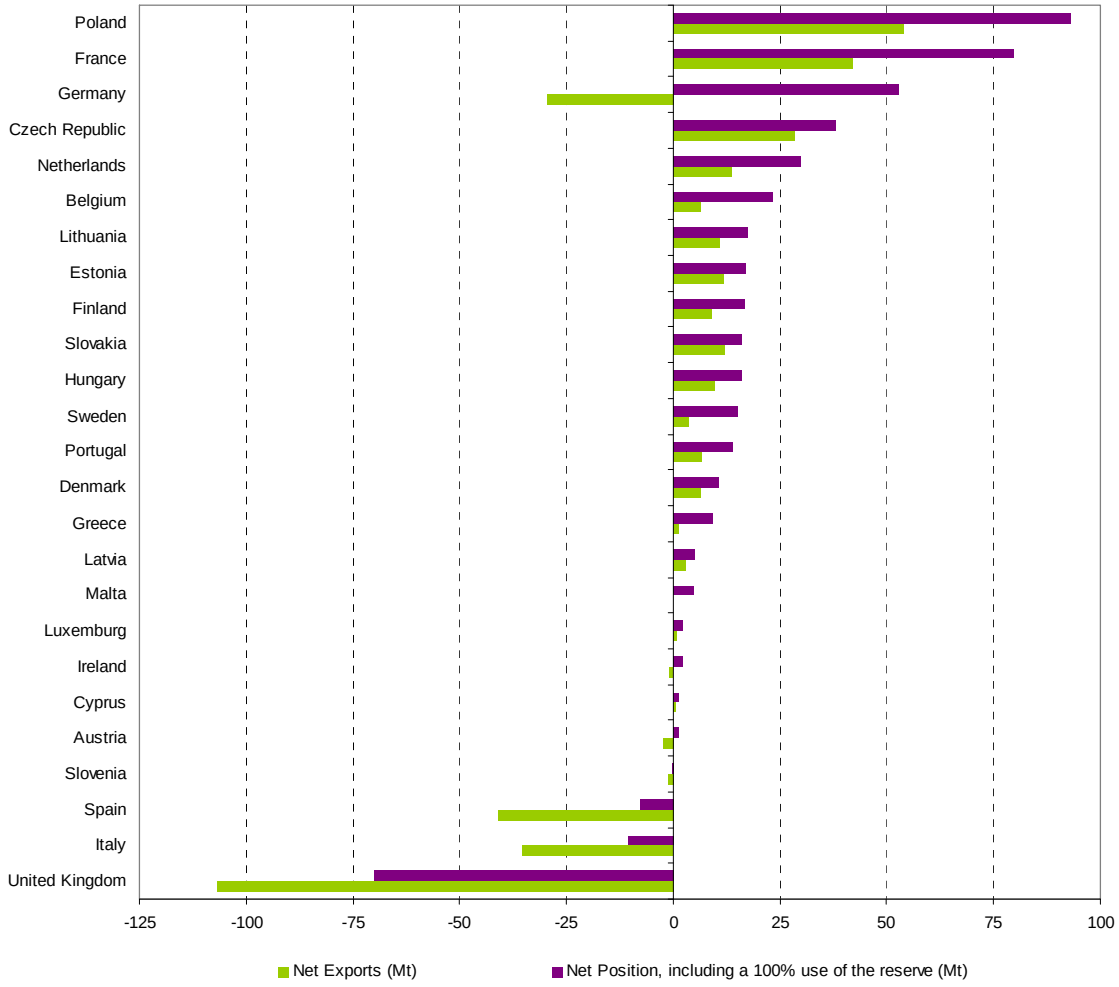


The axes in this diagram indicate the number of Member States for which a trade flow has occurred during the trial period, whether an export (horizontal axis) or an import (vertical axis). Thus, the maximum number of such flows for any Member State in either direction would be 24. No Member State has this number because Malta did not trade with anyone. Cyprus and Luxembourg did not import any allowances, but they exported allowances to eight and nine other Member States, respectively. For all other Member States, trade flows occurred in both directions. The most significant cluster is at the upper right-hand side of the graph where fourteen Member States, representing 90% of the EU-wide cap, experienced trade flows in both directions with more than 15 other Member States. Although these 14 high density traders are mostly EU15 states, the presence of Poland and the Czech Republic among them is notable. Another seven Member States had trade flows in one direction with more than fifteen partners, but not as many compensating flows. Slovenia and Ireland imported from most possible partners, but as countries with a net short position, their exports were more limited. Similarly, the five Member States directly below the large circle exported allowances to more than fifteen other partners, but as East European Member States with net long positions, their imports were less, especially for Latvia and Estonia. Greece stands alone with relatively balanced trading relationships, like most of the rest of the EU15, but with fewer such relationships than most of the others.

3.2 Net Import and Export Positions by Member State

A significant feature of the surrender data is that the net import and export positions do not match the net short and long positions exactly. The latter have a strong influence but they are far from determining. Since supply exceeded demand, it is not surprising that Member States that were net long were not able to export all of their surplus allowances. What might be considered more remarkable is that Member States that were in a net short position imported more than what was needed for compliance. Also several countries that were in a net long position were net importers. The most important of these was Germany, which was long by 46 Mt including reserves but was a net importer of 30 million EUAs. Figure 5 makes the comparison between the net trading positions (green bars) and the net long/short positions (purple bars).

Figure 5 – Net flows and net position comparison (Mt), 2005-07 combined



An immediate question arises as to why more allowances than would be needed for compliance would be imported in Member States that are short. The short answer is that in every Member State there were some issued allowances that were never surrendered and that may never have left the holding accounts to which they were issued. Any such hoarded or inactive allowances issued by Member States that were short would have necessitated more imported EUAs to cover domestic emissions. A more complete discussion of this phenomenon is the subject of the penultimate section of the paper.

Table 4 shows the net export and import flows of Figure 5 in tabular form with net exporters and importers arranged according to whether they are part of the EU15 or a New Member State, as well as the flows for each year.

Table 4 - Net allowance export and import flows by country and year, 2005-07.

(Million EUAs)	2005-07	2005	2006	2007		2005-07	2005	2006	2007
EU15	**89,61**	**12,37**	**26,81**	**55,37**	**EU15**	**-216,52**	**-21,10**	**-59,97**	**-140,38**
France	41,89	5,38	9,50	27,01	UK	-106,98	-8,57	-28,71	-69,70
Netherlands	13,36		6,66	6,99	Spain	-41,17	-9,72	-8,34	-23,11
Finland	9,13	3,26	1,00	4,87	Italy	-35,32	-0,35	-16,63	-18,34
Portugal	6,81		2,47	5,09	Germany	-29,72		-4,01	-28,26
Belgium	6,48	0,91	3,00	2,57	Austria	-2,29	-0,76	-2,28	
Denmark	6,26		1,32	5,20	Ireland	-1,04	-0,41		-0,86
Sweden	3,50	0,27	1,07	2,16	Portugal		-0,75		
Greece	1,12	0,00	1,23		Netherlands		-0,28		
Luxembourg	1,06	0,00	0,33	0,72	Denmark		-0,26		
Germany		2,55			Greece				-0,11
Austria				0,76					
Ireland			0,23						
EU10	**128,07**	**8,73**	**33,36**	**85,98**	**EU10**	**-1,16**	**0,00**	**-0,20**	**-0,97**
Poland	52,65	0,08	8,92	43,65	Slovenia	-1,16		-0,20	-0,97
Czech Rep.	27,66	5,66	8,86	13,15					
Slovakia	12,03	1,32	3,99	6,72					
Estonia	11,69	1,00	5,71	4,98					
Lithuania	10,93	0,42	2,36	8,15					
Hungary	9,50	0,07	2,80	6,62					
Latvia	3,09	0,17	0,70	2,22					
Cyprus	0,52	0,00	0,02	0,49					
Slovenia		0,01							
EU25	**217,68**	**21,10**	**60,17**	**141,35**		**-217,68**	**-21,10**	**-60,17**	**-141,35**

Source: Compiled by the authors from the CITL data as of May 13, 2008

Malta, Romania and Bulgaria are not included in Table 4 because the latter two joined the system only in 2007 and Malta has not participated in trading at all. There was a transfer of 218 million allowances over the three years, although 65% of that net transfer occurred in 2007, the last year of the first trading period. Virtually all of the import demand was from the EU15 and the bulk of that from four large importers—the UK, Spain, Italy, and Germany. The suppliers of this demand were about evenly split between other EU15 countries (41%) and the New Member States (59%). Three countries—Poland, France, and the Czech Republic—were large exporters, accounting for 56% of all net exports. The share of the East in these net export flows increased markedly over the three years, from 41% in 2005, to 55% in 2006, and to 61% in 2007. Although most countries were either an exporter or importer in all years, this was not always the case. Germany, Austria, Ireland and Slovenia were net importers for the period as a whole, but all were net exporters in one of the three years. Similarly, the Netherlands, Portugal, Denmark and Greece

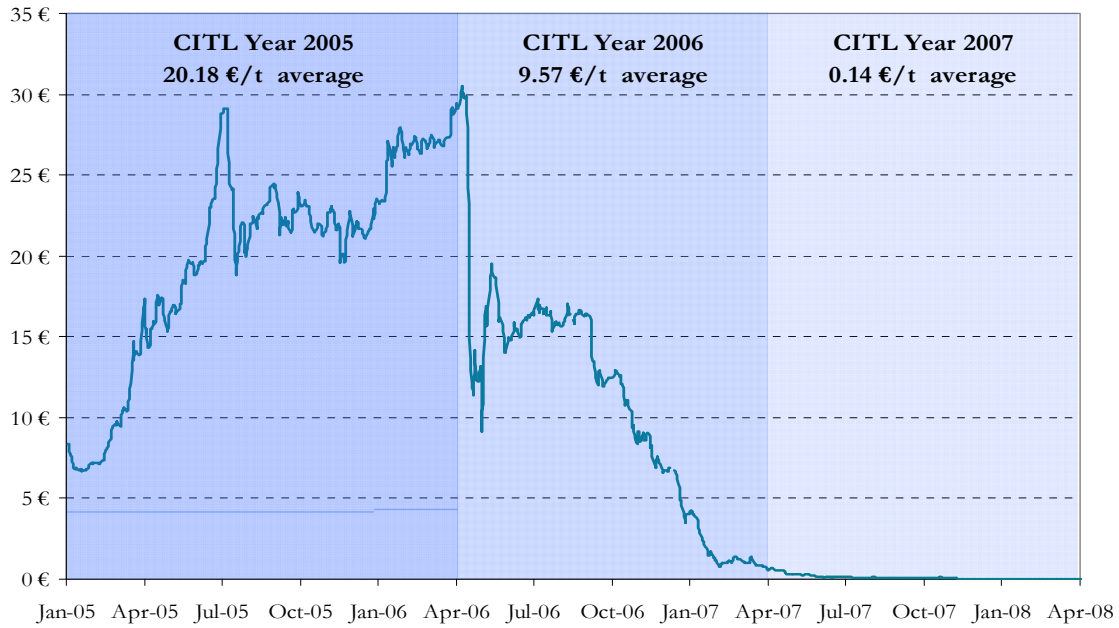
were net exporters for the period as a whole, but were net importers in one of the years.

3.3 Financial Dimensions

The net transfers of EUAs identified in Table 4 provide one component of what is needed to estimate the financial flows resulting from compliance trading. The other component, the price at which these transfers occurred, can only be estimated. Neither the value of a transaction nor the date of transfer is reported in the CITL data. The problem of estimation is made harder by the large fluctuations in price that occurred during the trial period. However, surrenders are reported annually so that allowances surrendered for 2005 emissions would have been acquired no later than April 30, 2006, those surrendered for 2006 emissions no later than April 30, 2007, and similarly for 2007 emissions.

One solution to this problem of valuation (and the one adopted in this paper) is to assume that surrendered allowances were acquired at the average price for the intervals before and between the end-of-April dates when allowances were to be surrendered. This solution is equivalent to assuming that the net imports and exports revealed by the 2005 data were transacted in equal amounts over the 16 months from January 2005 through April 2006, those for 2006 between May 2006 and April 2007, and similarly for the final year. It is unlikely that anyone did exactly this, but there is no entirely satisfactory solution to this problem. In any case, these "CITL years," and the price behavior and average price during each year are given in Figure 6.

Figure 6 – Price development on CO2 Spot market during Phase 1



Source: Tendances Carbone, compiled from Point Carbon and BlueNext

Table 5 provides the financial flows when these average price assumptions are multiplied by the quantity flows indicated in Table 4. In this table, export earnings are entered as positive numbers and payments for imports are negative numbers.

Table 5 - Estimated Financial Flows due to Compliance Trading

(Million €)	2005-07	2005	2006	2007		2005-07	2005	2006	2007
Ave Price		€ 20,18	€ 9,57	€ 0,14					
EU15	**€ 434,1**	**€ 249,6**	**€ 256,6**	**€ 7,8**	**EU15**	**(€ 939,6)**	**(€ 426)**	**(€ 574)**	**(€ 20)**
France	€ 203,3	€ 108,6	€ 90,9	€ 3,8	UK	(€ 457,5)	(€ 172,9)	(€ 274,8)	(€ 9,8)
Netherlands	€ 59,1		€ 63,7	€ 1,0	Spain	(€ 279,2)	(€ 196,1)	(€ 79,8)	(€ 3,2)
Finland	€ 76,0	€ 65,8	€ 9,6	€ 0,7	Italy	(€ 168,8)	(€ 7,1)	(€ 159,1)	(€ 2,6)
Portugal	€ 9,2		€ 23,6	€ 0,7	Germany	€ 9,1		(€ 38,4)	(€ 4,0)
Belgium	€ 47,4	€ 18,4	€ 28,7	€ 0,4	Austria	(€ 37,1)	(€ 15,3)	(€ 21,8)	
Denmark	€ 8,1		€ 12,6	€ 0,7	Ireland	(€ 6,2)	(€ 8,3)		(€ 0,1)
Sweden	€ 16,0	€ 5,4	€ 10,2	€ 0,3	Portugal		(€ 15,1)		
Greece	€ 11,8	€ 0,0	€ 11,8		Netherlands		(€ 5,7)		
Luxembourg	€ 3,3	€ 0,0	€ 3,2	€ 0,1	Denmark		(€ 5,2)		
Germany		€ 51,5			Greece				(€ 0,0)
Austria				€ 0,1					
Ireland			€ 2,2						
EU10	**€ 507**	**€ 176**	**€ 319**	**€ 12,0**	**EU10**	**(€ 1,8)**	**€ 0,0**	**(€ 1,9)**	**(€ 0,1)**
Poland	€ 93,1	€ 1,6	€ 85,4	€ 6,1	Slovenia	(€ 1,8)		(€ 1,9)	(€ 0,1)
Czech Rep	€ 200,9	€ 114,2	€ 84,8	€ 1,8					
Slovakia	€ 65,8	€ 26,6	€ 38,2	€ 0,9					
Estonia	€ 75,5	€ 20,2	€ 54,6	€ 0,7					
Lithuania	€ 32,2	€ 8,5	€ 22,6	€ 1,1					
Hungary	€ 29,1	€ 1,4	€ 26,8	€ 0,9					
Latvia	€ 10,4	€ 3,4	€ 6,7	€ 0,3					
Cyprus	€ 0,3	€ 0,0	€ 0,2	€ 0,1					
Slovenia		€ 0,2							
EU25	**€ 941,4**	**€ 425,8**	**€ 575,8**	**€ 19,8**		**(€ 941,4)**	**(€ 425,8)**	**(€ 575,8)**	**(€ 19,8)**

Source: Compiled by the authors from the CITL data as of May 13, 2008

The total value is a little under €1 billion for the period as a whole. However, as if to demonstrate the adage that timing is everything, the progressive collapse of the first period price after April 2006 imparts a very different time pattern to the financial flows from what is observed for the quantity flows. Only two percent of the total value is associated with the 2007, which account for 61% of the total quantity.

There are also some interesting changes in position. Poland, which was the largest net exporter of allowances, is third in value of exports, behind France and the Czech Republic, essentially because the bulk of Poland's exports occurred later in the

period due to the late activation of the Polish registry in July 2006. Equally interesting is that Germany, which was a net importer over the period, is a net beneficiary of the financial flows since EUA prices were high in the year in which it was a net exporter and very low in 2007 when it was a large net importer. Germany's net exports in 2005 offset only about 8% of its net imports in 2006 and 2007, but the value placed on those exports more than compensated for the cost of the later imports.

Aside from these sometimes significant shifts of Member State positions, the broad picture is roughly the same as it is for the quantity flows. Virtually all of the import payments are from the EU15 with the UK accounting for about half, and the export receipts are split about equally between the EU15 and the New Member States.

4 The use of borrowing during the first phase

Buying or selling EUAs is not the only alternative available to the owners of installations for dealing with the differences between allocations and emissions. Operators with installations that are long and decide not to sell the surplus in the market can bank allowances for use in a later year. Similarly, operators with installations that are short can borrow from the next year's allocation or used banked allowances. While many trading systems allow banking, the EU ETS is unique among cap-and-trade programs in allowing borrowing. However, there are several important limitations on banking and borrowing in the EU ETS.

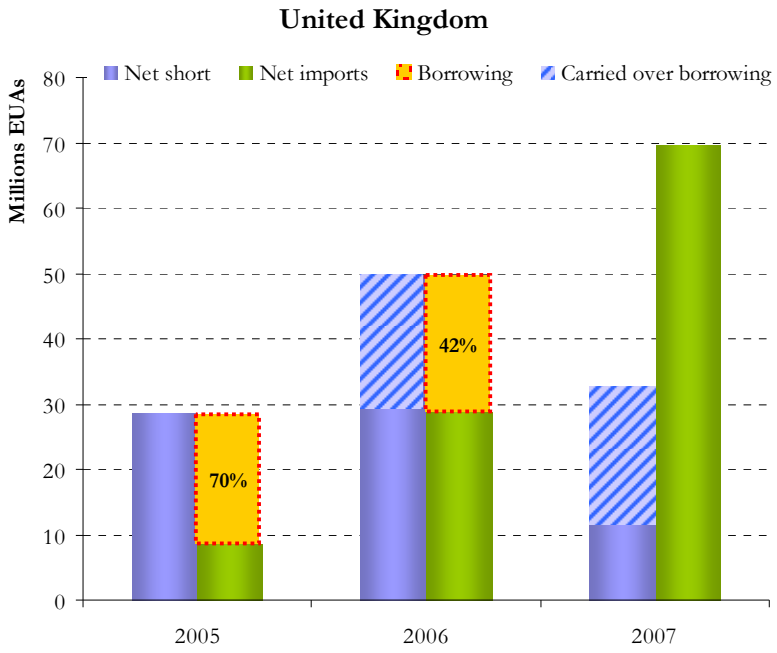
The most important is that between the three-year trial period, from 2005 through 2007, and the subsequent five-year Kyoto period, no inter-period banking or borrowing is allowed. Within the period, there is unlimited banking and borrowing, although both options are not available for all years. Since there is no initial bank, the use of banked allowances is not feasible for meeting compliance requirements for 2005. Banked allowances could be used for compliance in 2006 and 2007, but any held beyond 2007 would be worthless. Similarly, borrowing is not a compliance option for 2007 although it would be for 2005 and 2006 and any borrowing would have to be paid back by the end of the period. Also, borrowing can be made only from the next year's allocation since each year's endowment of allowances is placed in installation holding accounts at the end of February in each year, two months before the surrender of allowances for the past year's emissions is required.

Banking and borrowing have obvious effects on market participation. For installations that are short, borrowing from the next year's allocation or using banked allowances obviates the need to purchase allowances. Similarly for long installations, banked allowances are supply that is not available to the market. Operators might engage in such behavior to avoid the transaction costs of equivalent sequential buying and selling in the market if they expect alternate surpluses and deficits.

4.1 Evidence of borrowing by short Member States

The timing of the volume of compliance trading (see Tables 3 and 4) provides strong evidence that operators have engaged in borrowing. The clearest example of this behavior is observed in the UK, the Member State with the largest short position in all years, as illustrated in Figure 7 below.

Figure 7 –Imports and implied borrowing in the UK



The purple section of each left-hand column presents the net short position for the year, that is the extent to which emissions exceeded the allowances issued for that year. If all the surplus allowances at long installations had been used to cover deficits at short installations in the UK, this column represents the required imports to be in compliance. In 2005, for instance, the number of non-UK EUAs surrendered for compliance was only 30% of this requirement, as indicated by the green section of the right-hand column. Since all installations were in compliance, the only explanation is borrowing from the 2006 allocation to cover a 70% of the net national deficit, as indicated by the tan portion of the column.

In 2006, the net short position was about the same as in 2005, but the previously borrowed allowances, indicated by the hatched section made the cumulative short position and need for covering imports larger. The number of non-UK allowances surrendered was almost equal to the net short position, but it did not cover 42% of the cumulative short position, which implied that the 2005 deficit plus the slight additional deficit for 2006 was rolled over to 2007. In 2007 the net short position was significantly lower (12 Mt instead of 28.7 Mt and 29.6 Mt in 2005 and 2006), but the

carried-over borrowing of 21 Mt brought the cumulative short position to 33 Mt. However, in this year when borrowing was not possible, the net import level was more than twice this level, that is, what was needed to cover the 2007 short position and the earlier borrowing.

The explanation is that there was more borrowing by short installations than what is indicated by Figure 7. Alternatively, the assumption that all the surplus allowances at long installations in the UK were made available to the market to cover short positions is not correct. Since it is unlikely that short installations left any initially allocated allowances unused, any non-surrendered UK allowances likely belonged to long installations in the UK. The excess of non-UK-issued EUAs surrendered in 2007 to the cumulative short indicates the extent of these unused or "hoarded" allowances at UK installations. The absence of these allowances in the market required short installations to purchase more allowances for compliance from other Member States. The 37 Mt apparent excess of imports also indicates the extent to which borrowing was greater in 2005 and 2006 than shown in Figure 7 since all imports are already taken into account. As will be discussed more fully in section 5 of this paper, the existence of these unused allowances exists in all Member States, whether they were short or long. The effect was to reduce EUAs available for export in Member States that were long and increase imports for those that were short.

In interpreting these data for the UK and other Member States, it must be remembered that there is no Member State control of these flows. They are the result of decentralized actions by operators which are aggregated to Member State level to illustrate cross-border flows. Accordingly, the numbers that emerge from this level of analysis are minimums. It is unlikely that borrowing was restricted to operators in Member States that were short and it is likely that some operators of short installations resorted to borrowing, wherever they were located.

4.2 Borrowing at the installation level

In fact, surrender patterns that are consistent with borrowing at the installation level are not hard to find. The following result for a generating unit in the Netherlands, a Member State that was long in all three years, provides an example.

Table 6 – Example of surrender pattern

PermitNumber	*Country*	*Name*	*Sector*	
200400007	NL	Essent Energie Productie Clauscentrale	1-Combustion	
		2005		
Alloc	*Emis*	*Surr*	*From NL*	*Foreign*
980,550	1,261,844	1,261,844	1,261,844	-
		2006		
Alloc	*Emis*	*Surr*	*From NL*	*Foreign*
980,550	1,434,684	1,434,684	1,434,684	-
		2007		
Alloc	*Emis*	*Surr*	*From NL*	*Foreign*
980,550	1,715,051	1,715,051	-	1,715,051

		Surrendered Units		
Year	*Holding Reg*	*Originating Reg*	*Quantity*	
2005	Netherlands	Netherlands	1,261,844	
2006	Netherlands	Netherlands	1,434,684	
2007	Netherlands	Austria		43,106
2007	Netherlands	Belgium		24,600
2007	Netherlands	Czech Republic		105,440
2007	Netherlands	Estonia		188,269
2007	Netherlands	France		5,193
2007	Netherlands	Germany		30,353
2007	Netherlands	Hungary		103,010
2007	Netherlands	Italy		20,000
2007	Netherlands	Latvia		71,990
2007	Netherlands	Lithuania		141,095
2007	Netherlands	Poland		688,587
2007	Netherlands	Slovakia		56,971
2007	Netherlands	Spain		12,118
2007	Netherlands	United Kingdom		224,319

In every year emissions at Essent's Clauscentrale were higher than the allocation to the installation for that year; and for the period as a whole emissions were about 1.47 billion tons (about 50%) more than the allocation to Clauscentrale. How Essent used the allowances allocated to this unit for these three years cannot be determined; however, if they had used each year's allocation only for compliance in that year, there would not have been 1.72 million EUAs from other Member States surrendered in 2007. It is possible that Essent covered the 2005 and 2006 deficits with EUAs purchased or transferred from other Dutch units and sold the 2007 allocation, but this seems unlikely. The pattern of use is consistent with borrowing against the year-ahead allocation for meeting 2005 and 2006 requirements and then resorting to the market to cover emissions in the last year. There is still a question of what happened to the 245 million EUAs of Clauscentrale allocation for 2007 that would have been

left after borrowing to meet compliance requirements in 2005 and 2006. The appearance is that they had been sold before the 2007 surrender date and replaced with allowances purchased or transferred from other Member States.

This is not an isolated case. There are 69 other installations that have this exact pattern of surrenders: all domestic EUAs for 2005 and 2006 and all non-domestic EUAs in 2007. If the criteria for apparent borrowing is loosened to include installations that surrendered more domestic allowances than their allocation in 2005 and 2006 and fewer domestic allowances in 2007 (instead of none), the list includes 475 installations in 19 Member States. Table 7 presents the aggregate data for these 475 installations.

Table 7 – Aggregate results of installations verifying the criteria for apparent borrowing

Unit: Mt	Allocations	Verified Emissions	Domestic EUAs Surrendered	Non-domestic EUAs Surrendered	Borrowing (Domestic EUAs less Allocations)
2005 Compliance Year	158.02	195.91	191.04	4.91	33.02
2006 Compliance Year	156.62	195.55	186.60	9.03	29.98
2007 Compliance Year	158.48	188.36	105.98	83.13	(52.50)
Entire Period	473.12	579.82	483.62	97.07	10.50

Note: Since some units surrender more allowances than required, the sum of surrendered allowances is in all years slightly greater at these installations than verified emissions.

Again, the time pattern is what suggests borrowing. If none of these installations had borrowed, the distribution of domestic surrenders over the three years would have been more even instead of falling sharply in 2007. The 10.5 Mt excess of domestic surrenders over the allocation indicates simply that some of the domestic EUAs surrendered were acquired from other installations in the same Member State.

What distinguishes all of these instances is the surrender of fewer domestic EUAs than the installation allocation in the last year of a period in which there could be no further borrowing. A greater surrender of domestic EUAs in 2005 and 2006 alone would not necessarily indicate borrowing since installations could have purchased domestic EUAs or transferred them from another installation in the Member State. However, it is unusual to find a short installation for which the

domestic allowances surrendered are less than the allocation to that installation. Such a pattern implies either prior use or sale.

It is not possible to form more than a minimum estimate of the magnitude of borrowing in 2005 and 2006. It was not a requirement to pay back borrowing with non-domestic EUAs. Borrowing paid back with EUAs obtained from other domestic installations surely occurred, but it would not show up with the data that is now publicly available. Still, even on the basis of this limited data, it is evident that borrowing provided another option for compliance and that a number of installations availed themselves of it. The amount of borrowing suggested by Table 7 is small in the aggregate, but it is more significant when placed in the context of the short installations' who are the ones that would be interested in this option. The 475 installations that meet the borrowing criteria used to form Table 7 above constituted 16% of the 3000 installations that were short in 2005 and 2006 on average; and their two-year borrowing of 63 Mt is 15% of the 409 Mt cumulative short positions for these two years.

Whether intended or not, borrowing to meet 2005 and 2006 compliance requirements turned out to be a very profitable move by those engaging in it. It was nevertheless a speculation on future EUA prices, especially for the 2005 compliance year when EUA prices were hitting all time highs shortly before the April 2006 surrender deadline and at least some analysts were predicting still higher prices to come. With no inter-period banking or borrowing, the price at the compliance deadline for 2007 emissions would have been either zero or the penalty price of €40 plus the value of the next period's allowances (Parsons and Ellerman, 2006). That prospect probably explains why borrowing was and would remain limited.

5 Banking and the use of excess allowances

There is an inescapable asymmetry in compliance that makes banking less interesting than borrowing. Operators of installations that are short must take some action to cover emissions, either acquire allowances from other installations or borrow. Operators that are long do not need to do anything. What may appear to be banked allowances may reflect inertia instead of a conscious decision not to sell or to save them for later use. There is an opportunity cost for failing to sell unused allowances when future prices are expected to be lower, but the motivation to do something is not the same as that facing the operator of a short installation.

Still, the surrender data do reveal something about banking behavior, again not at the installation level, but at the Member State level. Cross-border flows represent transfers or sales and therefore they do indicate the share of a Member State's long position that was sold. As such, these data provide some indication of how the surplus was used by installations in Member States that were in a net long position.

5.1 Utilization of the surplus

The values given earlier in Table 5 provide one estimate of the value of EUA exports, but that table does not indicate the extent to which long positions were monetized. This number can be estimated and it is presented in Figure 8 for Member States with aggregate net long positions.

Figure 8 – Share of the surplus exported (Net Exports/Net Position), by Member State

Note: includes 100% use of reserves

The most striking features of this graph are the wide variation in the monetization of the surplus and the predominance of East European Member States among those with the highest *shares* monetized among long Member States. The range is from almost seventy-five percent for Slovakia and the Czech Republic to twenty-five percent for Sweden. The highest ranking EU15 Member State, Denmark, appears only seventh in place at about 60%, slightly ahead of Poland. To the extent that this indicator can be taken as a measure of alertness to market opportunities and that East European countries would be thought to be less commercially oriented, this is a surprising result.

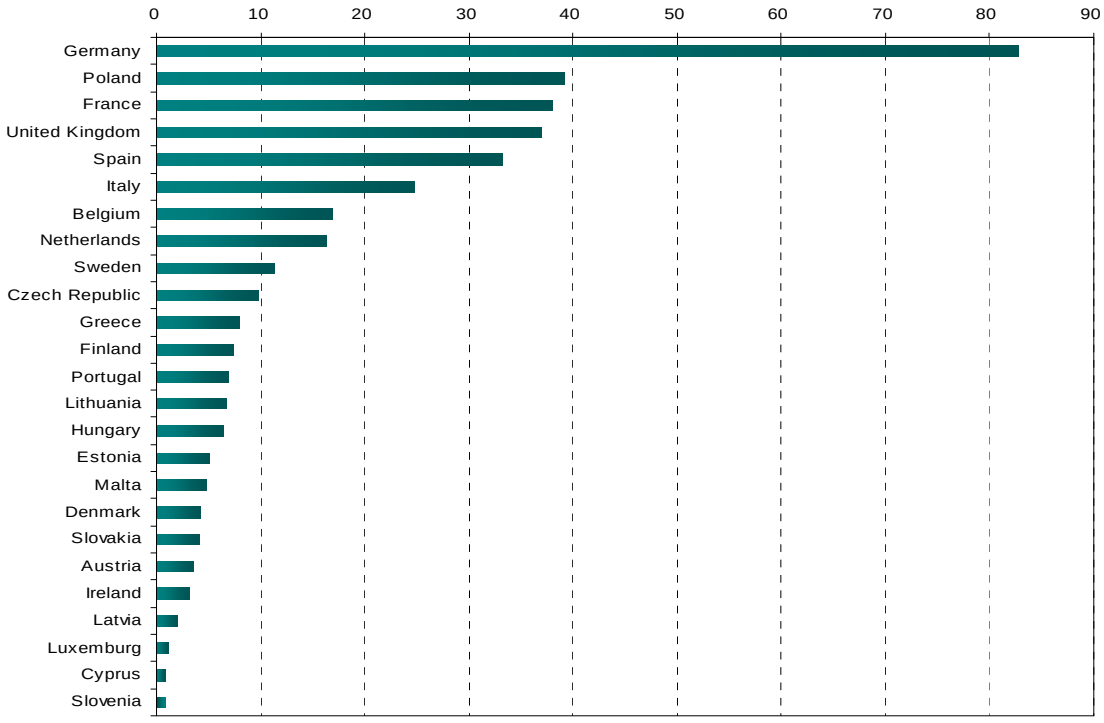
There is also a group of four Member States—Malta, Germany, Austria, and Ireland—that were in a net long position for the period as a whole but were not net exporters. Malta was simply not a participant in the market. The other three were all

participants and all exported some allowances in every year although for the period as a whole, they were net importers. The negative entries to the left of the axis in Figure 8 above reflect the net imports as a percentage of their net long position.[6] The phenomenon of being in a net long position and still being a net importer reflects a circumstance to which we now turn, namely, that at least some of the allowances at long installations may never have entered the market.

5.2 The EUAs that expired worthless

The difference between the number of allowances issued and those surrendered is the number of allowances expiring worthless at the end of the period. The distribution of these EUAs by issuing registry can be readily determined and is given in Figures 9 and 10, which present the distribution of expiring allowances in absolute terms and relative to the Member State's total allocation, respectively.

Figure 9 – EUAs expiring worthless by Member State, in volume



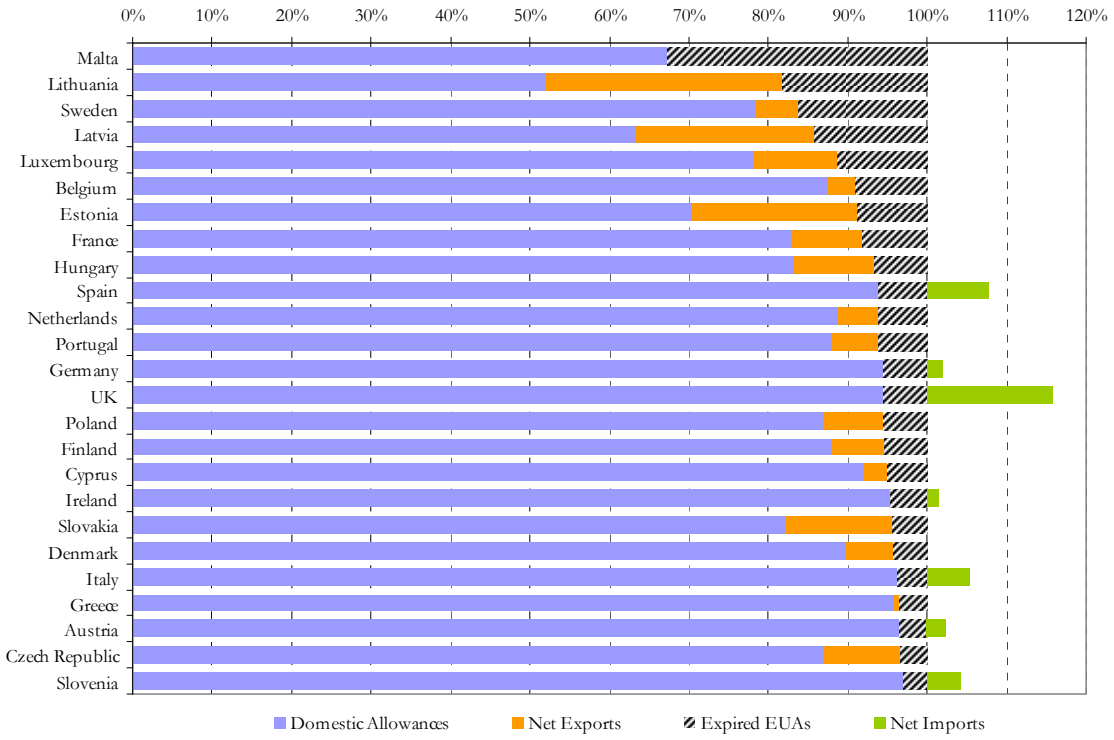
Note: includes 100% use of reserves

The total number of EUAs expiring unused was 378 Mt. In absolute numbers, most of the expiring allowances were issued by the large Member States but some came from every country in the EU. A more meaningful Member State comparison is

6 Austria's percentage is so high only because its net long position was very small.

presented in Figure 10, which presents this surplus, as well as other compliance data, as a percentage of the Member State's allocation.

Figure 10 – EUAs expiring worthless by Member State, %



The orange and green sections of each bar indicate the share of that Member State's total allowance issue that is accounted for by net export (orange) or net imports (green). Verified emissions are represented by the blue sections for the Member States with net exports and by the blue plus the green sections for Member States that are net importers. In all instances, the hatched black sections shows the share of that Member State's total that was not surrendered in any Member State and therefore expired worthless. The UK's net imports were equal to 15.9% of the allocation, but its emissions were only 10.4% higher than the total number of EUAs issued. The difference, 5.5%, shown by the black section, is the share of UK-issued EUAs that were not surrendered anywhere, as mentioned before in the discussion of the UK's "excess" import of EUAs from other Member States. In the case of Germany, emissions were 3.5% less than total allowances issued, but net imports were equal to 2.0% of the allocation. Again, the difference, 5.5% (coincidentally the same as for the UK), reflects the share of domestically issued EUAs that were not surrendered anywhere and which expired worthless. This unused share is what caused three Member States--Germany, Ireland and Austria—that were net long to be net importers.

It is readily evident from the way the Member States are arrayed in Figure 10 that net importers tend to have a smaller share of their allowance total expiring worthless than Member States in a net long position. This phenomenon probably reflects the asymmetry in compliance that was mentioned earlier. The owners of short installations can be expected to use every allowance allocated to them, while the owners of long installations are under no compulsion to sell. Since Member States that are in a net short position will tend to have a higher proportion of short installations, there will be less likelihood of unneeded EUAs being left in accounts. Also, it is not hard to imagine that for many who had accumulated banks in 2005 and 2006, whether consciously or not, the motivation to sell evaporated as EUA prices collapsed in late 2006 and approached zero for most of 2007. Finally, there were probably firms like the two in Malta for which participation in the market seems never to have been an option. Similar installations would probably be found in every Member State.[7]

It is also likely that some of the allowances indicated by the hatched sections had been sold and were held in other accounts, perhaps but not necessarily in the same country. Fazekas (2008b) provides data on the transfers in and out of the Hungarian registry which permit some quantification of this effect. Over the first period, 10.66 million EUAs were transferred from accounts in the Hungarian registry to accounts in other Member States and the reverse flow was 1.52 million EUAs. The CITL surrender data show 10.42 Hungarian EUAs surrendered in other Member States and 0.67 million EUAs issued by other Member States surrendered in Hungarian accounts. Assuming that all transfers out of Hungary were Hungarian EUAs and that none were re-imported, the comparison of these two sets of data indicate that about 240,000 Hungarian EUAs were traded but expired worthless in accounts in other Member States and that 850,000 EUAs issued in other Member States expired worthless in Hungarian accounts.

Conclusion

The extent of cross-border trading for compliance in the EU ETS is remarkable, not so much for its absolute size and value, both of which are small, but for its frequency and density. With the exception of Malta, all twenty-five member states participated in some cross border trading and for most Member States trading occurred with most of the other Member States, usually in both directions. In fact, cross-border trading accounts for more than half of the compliance trading that was required to bring all installations into compliance and it was many times greater than what would have been needed to assure compliance for the installations in the four

7 This may explain the curious behavior of 38 installations that surrendered in one year or several the exact number of allowances issued to them even though their emissions were less. The total excess surrender for these units is 322,000 EUAs.

Member States that were in a net short position. The explanation for both of these features is that trading for compliance purposes was conducted in a decentralized manner in an EU-wide market. There were no mercantilist entities within Member States directing trade to ensure that all domestic trades were completed before any cross-border transfers took place and traders evidently showed no national preference for their counter-parties. A market with such high participation is a precondition for efficient, least-cost compliance and there seems little doubt that this prerequisite exists in the EU ETS.

A particularly noteworthy feature of these data is the lack of any perceptible difference in the participation in trading between operators of installations in the EU15 and in the new East European Member States. The latter were as active in trading, usually in selling their surpluses, as operators with long positions in EU15 Member States, and in some cases, it would appear more active. For instance, the percentage of the surplus sold by operators of installations in Eastern Europe is generally higher than the share of allowances sold out of similar surpluses among EU15 Member States. The absence of a clear difference between East and West is simply one more reflection of the high rate of participation in trading and a highly unified allowance market.

The sharply increasing rate of trading for compliance purposes in each of the years of the first trading period indicates that a unique feature of the EU ETS, the ability to borrow against the next year's allocation, was used by many participants. For the several Member States that were in a net short position in 2005 and 2006, net imports were not enough to cover all emissions. Since installations generally surrendered allowances equal to emissions, it is evident that borrowing from the next year's allocation occurred. This behavior is also strongly suggested by examination of installation level data where a significant number of installations appear to have borrowed for compliance in 2005 and 2006 and paid the borrowing back in 2007 with large imports of non-domestic EUAs. Given the evolution of EUA prices during the trial period, this was a profitable move. The greater significance of this new alternative for compliance is that it was used and that it served to dampen price volatility by redistributing demand within the period in a manner that reduced demand when prices were high and increased demand when prices were low.

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Appendix 1: Matrix of gross allowance flows (Mt), 2005

2005	Originating from …																											
Surrendered in …	AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	SK	SI	Total		Imports	% of total
AT	32.53	0.03	0.03		0.16	0.32					0.15		0.00	0.01	0.06		0.03			0.01	0.00			0.03	0.01	33.36		0.84	2%
BE		54.75	0.10		0.08	0.38									0.03		0.04									55.39		0.64	2%
DK	0.00	0.15	30.74	0.08	0.07	0.60			0.01		0.71	0.11	0.15	0.09	0.21		0.39		0.06		0.02		0.07	0.09		33.55		2.81	8%
FI				33.02	0.00	0.00								0.00	0.00			0.02								33.04		0.02	0%
FR		0.01	0.01	0.02	19.51	0.01					0.02			0.01	0.03		0.02				0.02			0.06		19.71		0.20	1%
DE	0.02	0.08	0.01	0.09	0.36	469.53			0.01		0.24	0.03	0.01	0.05	0.46		0.65	0.01			0.02		0.01	0.27		471.82		2.30	7%
GR							71.32																			71.32		0.00	0%
IE		0.01	0.04	0.17	0.10	0.01		21.94			0.01				0.06		0.00	0.05						0.01		22.40		0.46	1%
IT	0.00				0.21	0.13			89.97				0.01				0.01				0.00			0.00		90.34		0.37	1%
LU										2.60																2.60		0.00	0%
NL	0.00	0.20	0.05		0.21	0.35					77.49	0.00	0.01	0.04	1.22		0.72			0.00				0.06		80.35		2.86	8%
PT		0.15	0.00	0.01	0.02	0.05					0.04	35.48	0.06		0.46		0.22			0.01	0.00			0.01		36.51		1.03	3%
ES	0.04	0.04	1.61	2.29	1.29	1.19		0.02			0.55	0.14	155.19	0.33	0.73		0.80	0.03	0.02	0.03	0.19			0.69		165.18		9.99	29%
SE	0.01	0.02	0.03	0.21	0.01	0.02								19.05	0.02			0.02								19.38		0.33	1%
GB	0.01	0.85	0.69	0.42	3.02	1.75		0.04			0.86	0.01	0.01	0.04	230.57		2.73	0.90		0.17	0.17			0.22		242.45		11.88	35%
CY																										0.00		0.00	0%
CZ															0.00		6.34							0.00		6.35		0.01	0%
EE														0.02				12.59								12.61		0.02	0%
HU																			25.45							25.45		0.00	0%
LV																	0.03			2.79	0.03			0.00		2.85		0.06	0%
LT				0.00																0.02	6.60			0.01		6.63		0.03	0%
MT																										0.00		0.00	0%
PL																							204.76			204.76		0.00	0%
SK		0.01		0.00	0.05	0.02								0.01	0.00		0.03				0.00			0.47		0.60		0.13	0%
SI																									8.73	8.73		0.00	0%
Total	32.60	56.30	33.30	36.30	25.10	474.37	71.32	21.99	89.99	2.60	80.07	35.76	155.46	19.65	233.87	0.00	12.00	13.61	25.52	3.03	7.05	0.00	204.84	1.92	8.74	1645.39		33.98	100%
Exports	0.07	1.55	2.56	3.29	5.59	4.84	0.00	0.06	0.02	0.00	2.58	0.29	0.26	0.60	3.30	0.00	5.67	1.02	0.07	0.24	0.45	0.00	0.08	1.45	0.01	33.98			
% of total	0%	5%	8%	10%	16%	14%	0%	0%	0%	0%	8%	1%	1%	2%	10%	0%	17%	3%	0%	1%	1%	0%	0%	4%	0%	100%			

Empty: 0; **Green**: less than 1Mt; **Orange**: less than 5Mt; **Red**: more than 5Mt

Appendix 2: Matrix of gross allowance flows (Mt), 2006

2006		Originating from ...																												
		AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	SK	SI	Total		Imports	% of total
Surrendered in ...	AT	29.84	0.17	0.08	0.16	0.22	0.41		0.00	0.04		0.55	0.00	0.03	0.02	0.12		0.16			0.10	0.10		0.15	0.26		32.39		2.55	3%
	BE		53.46	0.06	0.01	0.23	0.19			0.12		0.00		0.16		0.00		0.27	0.16	0.02		0.04		0.05	0.00		54.75		1.30	2%
	DK			33.84	0.01	0.02	0.03					0.12			0.05	0.14		0.04	0.02					0.01	0.01		34.28		0.44	1%
	FI	0.03	0.02		42.61	0.26	0.07	0.04		0.07		0.10		0.02	0.08	0.25		0.35	0.10		0.03	0.08		0.60			44.72		2.11	2%
	FR					238.33	0.05	0.10		0.01		0.01		0.00		0.02		0.06		0.00				0.11	0.01		238.70		0.37	0%
	DE	0.03	0.87	0.34	0.27	0.72	473.08	0.04	0.68	0.22		1.23	0.11	0.19	0.17	1.39	0.01	1.05	0.52	0.46	0.09	0.99		1.29	0.37		484.13		11.05	13%
	GR					0.02		69.84					0.02			0.02				0.00				0.03			69.94		0.09	0%
	IE	0.00	0.01				0.01		21.13	0.07	0.00	0.07	0.00			0.12		0.04	0.22					0.03			21.72		0.59	1%
	IT	0.04	0.65	0.18	0.77	2.81	2.53	0.18	0.03	330.42		0.62	0.32	0.47	0.31	2.09	0.01	2.54	0.26	0.74	0.08	0.23		2.31	0.43		348.03		17.61	21%
	LU										2.71																2.71		0.00	0%
	NL	0.02	0.05			0.17	0.05		0.01			75.60		0.03	0.01	0.44		0.02	0.01	0.01		0.15		0.13	0.03	0.00	76.73		1.13	1%
	PT			0.00		0.02				0.02		0.00	33.02	0.00	0.00						0.00			0.01	0.01		33.08		0.06	0%
	ES	0.01	0.33	0.15	0.42	0.88	1.02	0.11	0.05	0.07	0.07	0.90	1.29	187.83	0.14	1.86		0.51	0.39	0.52		0.10		1.56	0.20		198.41		10.58	12%
	SE	0.00		0.02	0.01	0.04	0.02	0.01							18.63	0.04		0.00	0.10					0.01	0.00		18.88		0.25	0%
	GB	0.11	2.17	0.88	1.46	4.00	2.47	0.84	0.04	0.35	0.26	4.18	0.78	1.34	0.52	216.23		3.74	3.80	1.06	0.28	1.29		2.52	3.15		251.47		35.24	41%
	CY																10.34										10.34		0.00	0%
	CZ	0.00			0.00	0.01				0.00					0.00	0.01		159.74	0.00					0.00	0.02		159.79		0.05	0%
	EE																		2.43								2.43		0.00	0%
	HU					0.01	0.00						0.00			0.00			0.01	26.10				0.01			26.13		0.03	0%
	LV																				2.94						2.94		0.00	0%
	LT		0.03	0.05		0.39	0.17	0.00								0.01		0.00		0.01		5.61		0.11			6.40		0.78	1%
	MT																										0.00		0.00	0%
	PL					0.00				0.02		0.00				0.01		0.10		0.01				208.02			208.15		0.14	0%
	SK		0.01			0.08				0.01		0.00				0.00		0.01	0.10		0.11	0.15		0.03	49.91		50.40		0.50	1%
	SI	0.02		0.01		0.01	0.03					0.01				0.01		0.01	0.02		0.00			0.10		8.51	8.71		0.20	0%
	Total	30.11	57.75	35.60	45.72	248.19	480.12	71.16	21.95	331.41	3.05	83.38	35.55	190.07	19.95	222.76	10.36	168.64	8.14	28.93	3.64	8.75	0.00	217.08	54.39	8.51	2385.23		85.07	100%
	Exports	0.27	4.30	1.76	3.11	9.87	7.04	1.32	0.82	0.99	0.33	7.79	2.53	2.25	1.32	6.53	0.02	8.90	5.71	2.83	0.70	3.14	0.00	9.06	4.48	0.00	85.07			
	% of total	0%	5%	2%	4%	12%	8%	2%	1%	1%	0%	9%	3%	3%	2%	8%	0%	10%	7%	3%	1%	4%	0%	11%	5%	0%	100%			

Empty: 0; **Green**: less than 1Mt; **Orange**: less than 5Mt; **Red**: more than 5Mt

Appendix 3: Matrix of gross allowance flows (Mt), 2007

2007	Originating from …																													
Surrendered in …	AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	RO	SK	SI	Total		Imports	% of total
AT	29.27	0.00		0.04	0.14	0.31			0.01		0.13	0.01	0.01	0.01	0.08		0.11	0.00	0.03	0.04	0.03		0.27		0.03	0.01	30.52		1.25	1%
BE	0.21	40.18	0.01	0.12	0.65	0.23	0.01	0.04	0.83	0.38	0.23	0.08	0.59	0.03	0.04		0.14	0.01	1.47	0.01	0.62		6.84		0.07		52.78		12.60	5%
DK			8.04	0.06	0.01	0.02					0.02			0.07	0.02						0.00				0.00		8.26		0.22	0%
FI	0.17	0.09	0.06	38.71	0.62	0.15	0.21				0.04	0.14	0.01	0.25	0.53		0.57	0.15	0.02	0.04	0.13		0.50		0.10		42.48		3.77	2%
FR	0.01	0.06	0.04	0.27	121.87	0.09	0.02		0.06		0.10	0.07	0.43	0.01	0.22	0.04	0.17		0.02		0.09		1.62		0.06		125.26		3.39	1%
DE	0.44	3.06	0.52	2.47	5.64	448.58	0.05	0.18	1.04	0.27	5.87	0.82	0.76	0.99	6.56		5.36	0.83	2.07	0.18	1.38		4.01		1.04		492.13		43.55	19%
GR	0.02	0.01			0.03	0.00	71.75				0.01	0.00			0.01				0.01		0.01		0.82		0.02		72.68		0.93	0%
IE	0.07		0.02	0.12	0.02	0.04		20.97	0.12	0.00	0.01	0.17	0.02	0.00	0.24	0.02	0.02	0.29		0.04	0.03		0.02		0.02		22.26		1.28	1%
IT	0.41	0.53	0.48	0.30	3.43	2.75	0.07	0.06	208.72	0.01	0.54	0.88	1.05	0.26	2.04	0.21	1.13	1.79	0.34	0.77	0.90		4.52		2.41	0.05	233.68		24.96	11%
LU										2.57																	2.57		0.00	0%
NL	0.10	2.73	0.22	0.79	1.91	2.44	0.08	0.01	0.15	0.02	63.72	0.07	0.34	0.17	1.06	0.05	1.06	0.56	0.38	0.23	0.60		2.31		0.85	0.00	79.86		16.14	7%
PT	0.01		0.00		0.02	0.01			0.05			30.95	0.21	0.00	0.00			0.00	0.00				0.00				31.25		0.31	0%
ES	0.23	1.31	0.72	1.07	3.75	1.25	0.03	0.06	0.99	0.03	2.29	1.88	156.65	0.43	2.09	0.01	2.23	0.64	0.59	0.54	0.45		6.65		0.75		184.63		27.98	12%
SE	0.00	0.01	0.03	0.14	0.04	0.16				0.01	0.01	0.01	0.00	19.37	0.12		0.08	0.03	0.00	0.01	0.08		0.11		0.01		20.20		0.83	0%
GB	0.28	7.07	3.13	3.23	13.57	7.07	0.33	0.08	3.09		13.49	0.99	1.25	0.63	172.30	0.14	7.36	0.59	1.75	0.30	3.95		15.24		0.96		256.80		84.50	36%
CY																5.40											5.40		0.00	0%
CZ	0.00	0.08	0.07	0.04	0.06	0.12			0.12		0.26	0.23	0.03	0.07	0.95	0.01	80.96	0.11	0.48	0.01	0.10		2.02		0.59		86.29		5.34	2%
EE		0.02	0.00			0.03												24.92					0.04				25.02		0.09	0%
HU		0.01			0.13	0.03					0.02		0.02		0.01		0.15	0.03	27.08				0.23		0.02	0.00	27.73		0.65	0%
LV																			0.00	2.82	0.03						2.85		0.03	0%
LT				0.00		0.00			0.03			0.01						0.00	0.02	0.00	5.76		0.27		0.00		6.10		0.34	0%
MT																						3.96					3.96		0.00	0%
PL	0.04	0.18	0.10	0.00	0.26	0.20	0.02	0.00	0.03		0.02	0.02	0.09	0.01	0.61	0.01	0.07	0.00	0.07	0.04	0.02		207.56		0.25		209.62		2.06	1%
RO		0.01		0.03	0.05	0.04	0.18	0.13			0.23		0.01	0.18	0.01		0.74	0.04	0.25		0.07		1.37	55.24	0.03	0.03	58.65		3.41	1%
SK	0.00	0.01			0.08				0.07		0.01				0.05		0.02	0.00	0.01		0.05		0.14		23.92		24.37		0.45	0%
SI	0.02		0.01	0.00	0.02	0.37	0.00		0.02		0.09	0.02	0.06	0.04	0.18		0.01	0.05	0.01	0.04	0.02		0.09		0.00	8.14	9.18		1.04	0%
Total	31.28	55.36	13.45	47.38	152.32	463.91	72.75	21.52	215.34	3.29	87.08	36.34	161.53	22.54	187.12	5.89	100.18	30.03	34.60	5.07	14.32	3.96	254.64	55.24	31.12	8.24	2114.50		235.11	100%
Exports	2.01	15.19	5.42	8.67	30.45	15.33	1.00	0.55	6.62	0.72	23.36	5.40	4.88	3.17	14.82	0.49	19.22	5.11	7.52	2.25	8.56	0.00	47.08	0.00	7.20	0.10	235.11			
% of total	1%	6%	2%	4%	13%	7%	0%	0%	3%	0%	10%	2%	2%	1%	6%	0%	8%	2%	3%	1%	4%	0%	20%	0%	3%	0%	100%			

Empty: 0; **Green**: less than 1Mt; **Orange**: less than 5Mt; **Red**: more than 5Mt

Appendix 4: Matrix of gross allowance flows (Mt), 2005-07 combined

Phase 1	Originating from …																													
Surrendered in …	AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	RO	SK	SI	Total		Imports	%
AT	91.63	0.20	0.11	0.20	0.52	1.03		0.00	0.05		0.83	0.01	0.03	0.05	0.26		0.30	0.00	0.03	0.14	0.13		0.42		0.31	0.02	96.27		4.64	1%
BE	0.21	148.38	0.17	0.12	0.96	0.80	0.01	0.04	0.95	0.38	0.23	0.08	0.75	0.03	0.08		0.46	0.17	1.49	0.01	0.66		6.89		0.07		162.92		14.54	4%
DK	0.00	0.15	72.62	0.15	0.10	0.65			0.01		0.85	0.11	0.15	0.21	0.37		0.43	0.02	0.06		0.02		0.08		0.11		76.09		3.47	1%
FI	0.20	0.11	0.06	114.34	0.87	0.22	0.25		0.07		0.15	0.14	0.03	0.34	0.78		0.93	0.26	0.02	0.06	0.21		1.09		0.10		120.24		5.90	2%
FR	0.01	0.07	0.04	0.29	379.71	0.15	0.12		0.07		0.13	0.07	0.43	0.02	0.26	0.04	0.25		0.02		0.12		1.73		0.13		383.67		3.96	1%
DE	0.48	4.02	0.87	2.83	6.72	1391.19	0.08	0.86	1.26	0.27	7.34	0.96	0.96	1.21	8.40	0.01	7.06	1.35	2.53	0.28	2.39		5.31		1.67		1448.08		56.89	16%
GR	0.02	0.01			0.06	0.00	212.91				0.01	0.02			0.03				0.01		0.01		0.84		0.02		213.93		1.03	0%
IE	0.08	0.02	0.06	0.29	0.12	0.06		64.04	0.19	0.01	0.09	0.18	0.02	0.00	0.43	0.02	0.06	0.56		0.04	0.03		0.06		0.03		66.38		2.33	1%
IT	0.46	1.18	0.66	1.07	6.45	5.42	0.26	0.09	629.12	0.01	1.16	1.19	1.54	0.57	4.13	0.23	3.68	2.05	1.08	0.85	1.14		6.83		2.84	0.05	672.06		42.94	12%
LU										7.88																	7.88		0.00	0%
NL	0.12	2.98	0.27	0.79	2.30	2.84	0.08	0.02	0.15	0.02	216.80	0.08	0.38	0.23	2.72	0.05	1.79	0.58	0.38	0.23	0.75		2.44		0.93	0.00	236.94		20.14	6%
PT	0.01	0.15	0.01	0.01	0.05	0.06			0.06		0.04	99.44	0.28	0.00	0.46		0.22	0.00	0.00	0.01	0.00		0.01		0.02		100.84		1.40	0%
ES	0.27	1.68	2.47	3.77	5.92	3.47	0.13	0.13	1.05	0.10	3.74	3.32	499.67	0.91	4.69	0.01	3.54	1.06	1.13	0.56	0.74		8.21		1.64		548.22		48.55	14%
SE	0.01	0.03	0.07	0.36	0.09	0.19	0.01			0.01	0.01	0.01	0.00	57.05	0.18		0.08	0.15	0.00	0.01	0.08		0.12		0.01		58.46		1.41	0%
GB	0.41	10.09	4.69	5.11	20.59	11.29	1.17	0.16	3.45	0.26	18.52	1.78	2.60	1.20	619.10	0.14	13.83	5.29	2.81	0.75	5.40		17.76		4.33		750.72		131.62	37%
CY																15.73											15.73		0.00	0%
CZ	0.00	0.08	0.07	0.04	0.07	0.12			0.12		0.26	0.23	0.03	0.07	0.96	0.01	247.03	0.11	0.48	0.01	0.10		2.02		0.61		252.42		5.39	2%
EE		0.02	0.00			0.03								0.02				39.94					0.04				40.05		0.11	0%
HU		0.01			0.14	0.03					0.02	0.00	0.02		0.01		0.15	0.04	78.63				0.24		0.02	0.00	79.30		0.67	0%
LV																	0.03		0.00	8.55	0.06				0.00		8.64		0.09	0%
LT		0.03	0.05	0.00	0.39	0.18	0.00		0.03			0.01			0.01		0.00	0.00	0.03	0.02	17.98		0.39		0.01		19.13		1.15	0%
MT																						3.96					3.96		0.00	0%
PL	0.04	0.18	0.10	0.00	0.26	0.20	0.02	0.00	0.05		0.02	0.02	0.09	0.01	0.62	0.01	0.17	0.00	0.08	0.04	0.02		620.34		0.25		622.53		2.19	1%
RO		0.01		0.03	0.05	0.04	0.18	0.13			0.23		0.01	0.18	0.01		0.74	0.04	0.25		0.07		1.37	55.24	0.03	0.03	58.65		3.41	1%
SK	0.00	0.03		0.00	0.22	0.02			0.08		0.01			0.01	0.05		0.07	0.10	0.01	0.11	0.20		0.17		74.30		75.37		1.07	0%
SI	0.04		0.02	0.00	0.02	0.40	0.00		0.02		0.09	0.02	0.06	0.04	0.19		0.02	0.07	0.01	0.04	0.02		0.19		0.00	25.37	26.61		1.24	0%
Total	93.99	169.42	82.36	129.40	425.61	1418.40	215.23	65.47	636.74	8.94	250.53	107.66	507.06	62.14	643.75	16.25	280.83	51.78	89.05	11.73	30.13	3.96	676.55	55.24	87.44	25.49	6145.13		354.16	100%
Exports	2.36	21.03	9.74	15.07	45.90	27.21	2.32	1.42	7.62	1.06	33.73	8.21	7.39	5.09	24.65	0.52	33.79	11.84	10.42	3.18	12.15	0.00	56.22	0.00	13.14	0.11	354.16			
%	1%	6%	3%	4%	13%	8%	1%	0%	2%	0%	10%	2%	2%	1%	7%	0%	10%	3%	3%	1%	3%	0%	16%	0%	4%	0%	100%			

Empty: 0; **Green**: less than 1Mt; **Orange**: less than 5Mt; **Red**: more than 5Mt

Appendix 5: Matrix of net allowance flows (Mt), 2005

Note: All figures in the matrix stand for a net transfer from country A to country B. A negative figure (into parentheses) implies a positive transfer from country B to country A. The matrix is thus skew-symmetric.

2005		Country B																									
		AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	SK	SI	Country A-->EU25
Country A	AT		(0.03)	(0.03)		(0.16)	(0.30)			0.00		(0.15)		0.03	(0.00)	(0.05)		(0.03)			(0.01)	(0.00)			(0.03)	(0.01)	(0.76)
	BE	0.03		0.05		(0.08)	(0.30)		0.01			0.20	0.15	0.04	0.02	0.81		(0.04)							0.01		0.91
	DK	0.03	(0.05)		(0.08)	(0.06)	(0.59)		0.04	(0.01)		(0.66)	(0.10)	1.46	(0.06)	0.47		(0.39)		(0.06)		(0.02)		(0.07)	(0.09)		(0.26)
	FI			0.08		0.02	0.09		0.17				0.01	2.29	0.21	0.42			(0.02)			0.00			0.00		3.26
	FR	0.16	0.08	0.06	(0.02)		0.35		0.10	0.21		0.19	0.02	1.29	0.00	2.99		(0.02)				(0.02)			(0.01)		5.38
	DE	0.30	0.30	0.59	(0.09)	(0.35)			0.01	0.12		0.11	0.03	1.18	(0.03)	1.29		(0.65)	(0.01)			(0.02)		(0.01)	(0.24)		2.54
	GR																										
	IE		(0.01)	(0.04)	(0.17)	(0.10)	(0.01)					(0.01)		0.02		(0.02)		(0.00)	(0.05)						(0.01)		(0.41)
	IT	(0.00)		0.01		(0.21)	(0.12)							(0.01)				(0.01)				(0.00)			(0.00)		(0.35)
	LU																										
	NL	0.15	(0.20)	0.66		(0.19)	(0.11)		0.01				0.04	0.54	(0.04)	(0.36)		(0.72)			(0.00)				(0.06)		(0.28)
	PT		(0.15)	0.10	(0.01)	(0.02)	(0.03)					(0.04)		0.08		(0.45)		(0.22)			(0.01)	(0.00)			(0.01)		(0.75)
	ES	(0.03)	(0.04)	(1.46)	(2.29)	(1.29)	(1.18)		(0.02)	0.01		(0.54)	(0.08)		(0.33)	(0.72)		(0.80)	(0.03)	(0.02)	(0.03)	(0.19)			(0.69)		(9.73)
	SE	0.00	(0.02)	0.06	(0.21)	(0.00)	0.03					0.04		0.33		0.02			0.00						0.01		0.27
	GB	0.05	(0.81)	(0.47)	(0.42)	(2.99)	(1.29)		0.02			0.36	0.45	0.72	(0.02)			(2.73)	(0.90)		(0.17)	(0.17)			(0.22)		(8.58)
	CY																										
	CZ	0.03	0.04	0.39		0.02	0.65		0.00	0.01		0.72	0.22	0.80		2.73					0.03				0.03		5.66
	EE				0.02		0.01		0.05					0.03	(0.00)	0.90											1.00
	HU			0.06										0.02													0.07
	LV	0.01										0.00	0.01	0.03		0.17		(0.03)				(0.01)			(0.00)		0.17
	LT	0.00		0.02	(0.00)	0.02	0.02			0.00			0.00	0.19		0.17					0.01				(0.01)		0.42
	MT																										
	PL			0.07			0.01																				0.08
	SK	0.03	(0.01)	0.09	(0.00)	0.01	0.24		0.01	0.00		0.06	0.01	0.69	(0.01)	0.22		(0.03)			0.00	0.01					1.32
	SI	0.01																									0.01
EU25-->Country B		0.76	(0.91)	0.26	(3.26)	(5.38)	(2.54)		0.41	0.35		0.28	0.75	9.73	(0.27)	8.58		(5.66)	(1.00)	(0.07)	(0.17)	(0.42)		(0.08)	(1.32)	(0.01)	

Appendix 6: Matrix of net allowance flows (Mt), 2006

Note: All figures in the matrix stand for a net transfer from country A to country B. A negative figure (into parentheses) implies a positive transfer from country B to country A. The matrix is thus skew-symmetric.

2006		Country B																									
		AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	SK	SI	Country A --> EU25
Country A	AT		(0.17)	(0.08)	(0.13)	(0.22)	(0.37)		0.00	0.00		(0.53)	(0.00)	(0.02)	(0.02)	(0.01)		(0.16)			(0.10)	(0.10)		(0.15)	(0.26)	0.02	(2.28)
	BE	0.17		(0.06)	0.01	(0.23)	0.69		0.01	0.53		0.05		0.17		2.17		(0.27)	(0.16)	(0.02)		(0.01)		(0.05)	0.00		3.00
	DK	0.08	0.06		(0.01)	(0.02)	0.31			0.18		(0.12)	0.00	0.15	(0.03)	0.74		(0.04)	(0.02)			0.05		(0.01)	(0.01)	0.01	1.32
	FI	0.13	(0.01)	0.01		(0.26)	0.20	(0.04)		0.70		(0.10)		0.40	(0.08)	1.21		(0.35)	(0.10)		(0.03)	(0.08)		(0.60)			1.00
	FR	0.22	0.23	0.02	0.26		0.67	(0.08)		2.80		0.16	0.02	0.87	0.04	3.98		(0.05)		0.01		0.39		(0.11)	0.08	0.01	9.50
	DE	0.37	(0.69)	(0.31)	(0.20)	(0.67)		(0.04)	(0.68)	2.32		(1.18)	(0.11)	0.83	(0.15)	1.08	(0.01)	(1.05)	(0.52)	(0.46)	(0.09)	(0.82)		(1.29)	(0.37)	0.03	(4.01)
	GR				0.04	0.08	0.04			0.18			(0.02)	0.11	0.01	0.82				(0.00)		0.00		(0.03)			1.23
	IE	(0.00)	(0.01)				0.68			(0.04)	(0.00)	(0.06)	(0.00)	0.05		(0.08)		(0.04)	(0.22)					(0.03)			0.23
	IT	(0.00)	(0.53)	(0.18)	(0.70)	(2.80)	(2.32)	(0.18)	0.04			(0.62)	(0.30)	(0.41)	(0.31)	(1.74)	(0.01)	(2.54)	(0.26)	(0.74)	(0.08)	(0.23)		(2.30)	(0.42)		(16.63)
	LU								0.00					0.07		0.26											0.33
	NL	0.53	(0.05)	0.12	0.10	(0.16)	1.18		0.06	0.62			0.00	0.87	(0.01)	3.74		(0.02)	(0.01)	(0.01)		(0.15)		(0.13)	(0.02)	0.00	6.66
	PT	0.00		(0.00)		(0.02)	0.11	0.02	0.00	0.30		(0.00)		1.29	(0.00)	0.78				0.00	(0.00)			(0.01)	(0.01)		2.47
	ES	0.02	(0.17)	(0.15)	(0.40)	(0.87)	(0.83)	(0.11)	(0.05)	0.41	(0.07)	(0.87)	(1.29)		(0.14)	(0.52)		(0.51)	(0.39)	(0.52)		(0.10)		(1.56)	(0.20)		(8.34)
	SE	0.02		0.03	0.08	(0.04)	0.15	(0.01)		0.31		0.01	0.00	0.14		0.49		0.00	(0.10)					(0.01)	(0.00)		1.07
	GB	0.01	(2.17)	(0.74)	(1.21)	(3.98)	(1.08)	(0.82)	0.08	1.74	(0.26)	(3.74)	(0.78)	0.52	(0.49)			(3.73)	(3.80)	(1.05)	(0.28)	(1.28)		(2.51)	(3.15)	0.01	(28.71)
	CY						0.01			0.01																	0.02
	CZ	0.16	0.27	0.04	0.35	0.05	1.05		0.04	2.54		0.02		0.51	(0.00)	3.73			(0.00)			0.00		0.10	(0.01)	0.01	8.86
	EE		0.16	0.02	0.10		0.52		0.22	0.26		0.01		0.39	0.10	3.80		0.00		0.01					0.10	0.02	5.71
	HU		0.02			(0.01)	0.46	0.00		0.74		0.01	(0.00)	0.52		1.05			(0.01)			0.01		0.00			2.80
	LV	0.10			0.03		0.09			0.08			0.00			0.28									0.11	0.00	0.70
	LT	0.10	0.01	(0.05)	0.08	(0.39)	0.82	(0.00)		0.23		0.15		0.10		1.28		(0.00)		(0.01)				(0.11)	0.15		2.36
	MT																										
	PL	0.15	0.05	0.01	0.60	0.11	1.29	0.03	0.03	2.30		0.13	0.01	1.56	0.01	2.51		(0.10)		(0.00)		0.11			0.03	0.10	8.92
	SK	0.26	(0.00)	0.01		(0.08)	0.37			0.42		0.02	0.01	0.20	0.00	3.15		0.01	(0.10)		(0.11)	(0.15)		(0.03)			3.99
	SI	(0.02)		(0.01)		(0.01)	(0.03)					(0.00)				(0.01)		(0.01)	(0.02)		(0.00)			(0.10)			(0.20)
EU25-->Country B		2.28	(3.00)	(1.32)	(1.00)	(9.50)	4.01	(1.23)	(0.23)	16.63	(0.33)	(6.66)	(2.47)	8.34	(1.07)	28.71	(0.02)	(8.86)	(5.71)	(2.80)	(0.70)	(2.36)		(8.92)	(3.99)	0.20	

Appendix 7: Matrix of net allowance flows (Mt), 2007

Note: All figures in the matrix stand for a net transfer from country A to country B. A negative figure (into parentheses) implies a positive transfer from country B to country A. The matrix is thus skew-symmetric.

2007		Country B																										
		AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	RO	SK	SI	Country A-->EU26
Country A	AT		0.21		0.13	(0.13)	0.13	0.02	0.07	0.40		(0.03)	(0.00)	0.22	(0.01)	0.20		(0.10)	(0.00)	(0.03)	(0.04)	(0.03)		(0.23)		(0.03)	0.01	0.76
	BE	(0.21)		(0.01)	(0.02)	(0.59)	2.83	(0.00)	(0.04)	(0.31)	(0.38)	2.51	(0.08)	0.72	(0.02)	7.03		(0.07)	0.01	(1.46)	(0.01)	(0.62)		(6.66)	0.01	(0.06)		2.58
	DK		0.01		(0.00)	0.02	0.50		0.02	0.48		0.20	0.00	0.72	(0.05)	3.10		0.07	0.00			(0.00)		0.10		(0.00)	0.01	5.20
	FI	(0.13)	0.02	0.00		(0.35)	2.32	(0.21)	0.12	0.30		0.74	(0.14)	1.06	(0.11)	2.69		(0.54)	(0.15)	(0.02)	(0.04)	(0.13)		(0.49)	0.03	(0.10)	0.00	4.90
	FR	0.13	0.59	(0.02)	0.35		5.55	0.01	0.02	3.37		1.81	(0.05)	3.32	0.03	13.35	(0.04)	(0.11)		0.11		(0.09)		(1.36)	0.05	0.03	0.02	27.06
	DE	(0.13)	(2.83)	(0.50)	(2.32)	(5.55)		(0.04)	(0.14)	1.71	(0.27)	(3.43)	(0.82)	0.50	(0.83)	0.51		(5.24)	(0.79)	(2.04)	(0.18)	(1.37)		(3.81)	0.04	(1.04)	0.37	(28.22)
	GR	(0.02)	0.00		0.21	(0.01)	0.04			0.07		0.07	(0.00)	0.03		0.32				(0.01)		(0.01)		(0.80)	0.18	(0.02)	0.00	0.07
	IE	(0.07)	0.04	(0.02)	(0.12)	(0.02)	0.14			(0.07)	(0.00)	(0.00)	(0.17)	0.04	(0.00)	(0.16)	(0.02)	(0.02)	(0.29)		(0.04)	(0.03)		(0.02)	0.13	(0.02)		(0.73)
	IT	(0.40)	0.31	(0.48)	(0.30)	(3.37)	(1.71)	(0.07)	0.07		(0.01)	(0.39)	(0.83)	(0.06)	(0.26)	1.05	(0.21)	(1.01)	(1.79)	(0.34)	(0.77)	(0.88)		(4.49)		(2.34)	(0.04)	(18.34)
	LU		0.38				0.27		0.00	0.01		0.02		0.03	0.01													0.72
	NL	0.03	(2.51)	(0.20)	(0.74)	(1.81)	3.43	(0.07)	0.00	0.39	(0.02)		(0.07)	1.95	(0.16)	12.43	(0.05)	(0.80)	(0.56)	(0.36)	(0.23)	(0.60)		(2.29)	0.23	(0.84)	0.08	7.22
	PT	0.00	0.08	(0.00)	0.14	0.05	0.82	0.00	0.17	0.83		0.07		1.67	0.01	0.99		0.23	(0.00)	(0.00)		0.01		0.02			0.02	5.09
	ES	(0.22)	(0.72)	(0.72)	(1.06)	(3.32)	(0.50)	(0.03)	(0.04)	0.06	(0.03)	(1.95)	(1.67)		(0.43)	(0.84)	(0.01)	(2.20)	(0.64)	(0.57)	(0.54)	(0.45)		(6.56)	0.01	(0.75)	0.06	(23.10)
	SE	0.01	0.02	0.05	0.11	(0.03)	0.83		0.00	0.26	(0.01)	0.16	(0.01)	0.43		0.52		(0.01)	(0.03)	(0.00)	(0.01)	(0.08)		(0.10)	0.18	(0.01)	0.04	2.34
	GB	(0.20)	(7.03)	(3.10)	(2.69)	(13.35)	(0.51)	(0.32)	0.16	(1.05)		(12.43)	(0.99)	0.84	(0.52)		(0.14)	(6.41)	(0.59)	(1.74)	(0.30)	(3.95)		(14.63)	0.01	(0.91)	0.18	(69.69)
	CY					0.04			0.02	0.21		0.05		0.01		0.14		0.01						0.01				0.49
	CZ	0.10	0.07	(0.07)	0.54	0.11	5.24		0.02	1.01		0.80	(0.23)	2.20	0.01	6.41	(0.01)		(0.11)	(0.33)	(0.01)	(0.10)		(1.95)	0.74	(0.56)	0.01	13.89
	EE	0.00	(0.01)	(0.00)	0.15		0.79		0.29	1.79		0.56	0.00	0.64	0.03	0.59		0.11		0.03		0.00		(0.03)	0.04	0.00	0.05	5.02
	HU	0.03	1.46		0.02	(0.11)	2.04	0.01		0.34		0.36	0.00	0.57	0.00	1.74		0.33	(0.03)		0.00	0.02		(0.16)	0.25	(0.01)	0.00	6.87
	LV	0.04	0.01		0.04		0.18		0.04	0.77		0.23		0.54	0.01	0.30		0.01		(0.00)		(0.03)		0.04			0.04	2.22
	LT	0.03	0.62	0.00	0.13	0.09	1.37	0.01	0.03	0.88		0.60	(0.01)	0.45	0.08	3.95		0.10	(0.00)	(0.02)	0.03			(0.25)	0.07	0.05	0.02	8.22
	MT																											
	PL	0.23	6.66	(0.10)	0.49	1.36	3.81	0.80	0.02	4.49		2.29	(0.02)	6.56	0.10	14.63	(0.01)	1.95	0.03	0.16	(0.04)	0.25			1.37	(0.11)	0.09	45.02
	RO		(0.01)		(0.03)	(0.05)	(0.04)	(0.18)	(0.13)			(0.23)		(0.01)	(0.18)	(0.01)		(0.74)	(0.04)	(0.25)		(0.07)		(1.37)		(0.03)	(0.03)	(3.41)
	SK	0.03	0.06	0.00	0.10	(0.03)	1.04	0.02	0.02	2.34		0.84		0.75	0.01	0.91		0.56	(0.00)	0.01		(0.05)		0.11	0.03		0.00	6.75
	SI	(0.01)		(0.01)	(0.00)	(0.02)	(0.37)	(0.00)		0.04		(0.08)	(0.02)	(0.06)	(0.04)	(0.18)		(0.01)	(0.05)	(0.00)	(0.04)	(0.02)		(0.09)	0.03	(0.00)		(0.94)
EU26-->Country B		(0.76)	(2.58)	(5.20)	(4.90)	(27.06)	28.22	(0.07)	0.73	18.34	(0.72)	(7.22)	(5.09)	23.10	(2.34)	69.69	(0.49)	(13.89)	(5.02)	(6.87)	(2.22)	(8.22)		(45.02)	3.41	(6.75)	0.94	

Appendix 8: Matrix of net allowance flows (Mt), 2005-07 combined

Note: All figures in the matrix stand for a net transfer from country A to country B. A negative figure (into parentheses) implies a positive transfer from country B to country A. The matrix is thus skew-symmetric.

Phase1		Country B																										CountryA
		AT	BE	DK	FI	FR	DE	GR	IE	IT	LU	NL	PT	ES	SE	GB	CY	CZ	EE	HU	LV	LT	MT	PL	RO	SK	SI	-->EU26
Country A	AT		0.01	(0.10)	(0.00)	(0.51)	(0.55)	0.02	0.07	0.41		(0.71)	(0.01)	0.24	(0.04)	0.15		(0.29)	(0.00)	(0.03)	(0.14)	(0.13)		(0.38)		(0.31)	0.02	(2.29)
	BE	(0.01)		(0.02)	(0.01)	(0.89)	3.22	(0.00)	(0.02)	0.22	(0.38)	2.75	0.08	0.93	(0.00)	10.01		(0.38)	(0.15)	(1.48)	(0.01)	(0.63)		(6.71)	0.01	(0.04)		6.49
	DK	0.10	0.02		(0.09)	(0.05)	0.23		0.06	0.65		(0.58)	(0.10)	2.32	(0.14)	4.31		(0.36)	(0.02)	(0.06)		0.03		0.02		(0.11)	0.02	6.26
	FI	0.00	0.01	0.09		(0.59)	2.61	(0.25)	0.29	1.00		0.64	(0.13)	3.74	0.02	4.32		(0.89)	(0.26)	(0.02)	(0.06)	(0.21)		(1.09)	0.03	(0.09)	0.00	9.16
	FR	0.51	0.89	0.05	0.59		6.57	(0.07)	0.12	6.38		2.16	(0.01)	5.49	0.07	20.33	(0.04)	(0.18)		0.11		0.28		(1.47)	0.05	0.09	0.02	41.94
	DE	0.55	(3.22)	(0.23)	(2.61)	(6.57)		(0.08)	(0.81)	4.16	(0.27)	(4.50)	(0.90)	2.51	(1.02)	2.88	(0.01)	(6.94)	(1.32)	(2.50)	(0.28)	(2.21)		(5.11)	0.04	(1.65)	0.40	(29.68)
	GR	(0.02)	0.00		0.25	0.07	0.08			0.26		0.07	(0.02)	0.13	0.01	1.14				(0.01)		(0.01)		(0.83)	0.18	(0.02)	0.00	1.30
	IE	(0.07)	0.02	(0.06)	(0.29)	(0.12)	0.81			(0.11)	(0.01)	(0.07)	(0.18)	0.11	(0.00)	(0.27)	(0.02)	(0.06)	(0.56)		(0.04)	(0.03)		(0.06)	0.13	(0.03)		(0.91)
	IT	(0.41)	(0.22)	(0.65)	(1.00)	(6.38)	(4.16)	(0.26)	0.11		(0.01)	(1.01)	(1.13)	(0.48)	(0.57)	(0.69)	(0.23)	(3.56)	(2.05)	(1.08)	(0.85)	(1.11)		(6.79)		(2.76)	(0.04)	(35.32)
	LU		0.38				0.27		0.01	0.01		0.02		0.10	0.01	0.26												1.06
	NL	0.71	(2.75)	0.58	(0.64)	(2.16)	4.50	(0.07)	0.07	1.01	(0.02)		(0.04)	3.35	(0.22)	15.81	(0.05)	(1.53)	(0.58)	(0.36)	(0.23)	(0.75)		(2.42)	0.23	(0.92)	0.09	13.59
	PT	0.01	(0.08)	0.10	0.13	0.01	0.90	0.02	0.18	1.13		0.04		3.04	0.00	1.32		0.01	(0.00)	0.00	(0.01)	0.00		0.01		(0.02)	0.02	6.81
	ES	(0.24)	(0.93)	(2.32)	(3.74)	(5.49)	(2.51)	(0.13)	(0.11)	0.48	(0.10)	(3.35)	(3.04)		(0.91)	(2.09)	(0.01)	(3.51)	(1.06)	(1.11)	(0.56)	(0.74)		(8.12)	0.01	(1.64)	0.06	(41.16)
	SE	0.04	0.00	0.14	(0.02)	(0.07)	1.02	(0.01)	0.00	0.57	(0.01)	0.22	(0.00)	0.91		1.02		(0.01)	(0.13)	(0.00)	(0.01)	(0.08)		(0.11)	0.18	0.00	0.04	3.68
	GB	(0.15)	(10.01)	(4.31)	(4.32)	(20.33)	(2.88)	(1.14)	0.27	0.69	(0.26)	(15.81)	(1.32)	2.09	(1.02)		(0.14)	(12.87)	(5.29)	(2.80)	(0.75)	(5.39)		(17.14)	0.01	(4.28)	0.19	(106.97)
	CY					0.04	0.01		0.02	0.23		0.05		0.01		0.14		0.01						0.01				0.52
	CZ	0.29	0.38	0.36	0.89	0.18	6.94		0.06	3.56		1.53	(0.01)	3.51	0.01	12.87	(0.01)		(0.11)	(0.33)	0.02	(0.10)		(1.85)	0.74	(0.55)	0.02	28.40
	EE	0.00	0.15	0.02	0.26		1.32		0.56	2.05		0.58	0.00	1.06	0.13	5.29		0.11		0.04		0.00		(0.03)	0.04	0.10	0.07	11.73
	HU	0.03	1.48	0.06	0.02	(0.11)	2.50	0.01		1.08		0.36	(0.00)	1.11	0.00	2.80		0.33	(0.04)		0.00	0.03		(0.16)	0.25	(0.01)	0.00	9.75
	LV	0.14	0.01		0.06		0.28		0.04	0.85		0.23	0.01	0.56	0.01	0.75		(0.02)		(0.00)		(0.04)		0.04		0.11	0.04	3.09
	LT	0.13	0.63	(0.03)	0.21	(0.28)	2.21	0.01	0.03	1.11		0.75	(0.00)	0.74	0.08	5.39		0.10	(0.00)	(0.03)	0.04			(0.36)	0.07	0.19	0.02	11.00
	MT																											0.00
	PL	0.38	6.71	(0.02)	1.09	1.47	5.11	0.83	0.06	6.79		2.42	(0.01)	8.12	0.11	17.14	(0.01)	1.85	0.03	0.16	(0.04)	0.36			1.37	(0.08)	0.19	54.02
	RO		(0.01)		(0.03)	(0.05)	(0.04)	(0.18)	(0.13)			(0.23)		(0.01)	(0.18)	(0.01)		(0.74)	(0.04)	(0.25)		(0.07)		(1.37)		(0.03)	(0.03)	(3.41)
	SK	0.31	0.04	0.11	0.09	(0.09)	1.65	0.02	0.03	2.76		0.92	0.02	1.64	(0.00)	4.28		0.55	(0.10)	0.01	(0.11)	(0.19)		0.08	0.03		0.00	12.06
	SI	(0.02)		(0.02)	(0.00)	(0.02)	(0.40)	(0.00)		0.04		(0.09)	(0.02)	(0.06)	(0.04)	(0.19)		(0.02)	(0.07)	(0.00)	(0.04)	(0.02)		(0.19)	0.03	(0.00)		(1.13)
EU26-->CountryB		2.29	(6.49)	(6.26)	(9.16)	(41.94)	29.68	(1.30)	0.91	35.32	(1.06)	(13.59)	(6.81)	41.16	(3.68)	106.97	(0.52)	(28.40)	(11.73)	(9.75)	(3.09)	(11.00)		(54.02)	3.41	(12.06)	1.13	

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