

Cross Border Trading and Borrowing in the EU ETS

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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 trading and inter-year borrowing during the first trading period (2005-2007). Cross-border flows were small in the aggregate but remarkably frequent in matching allowance deficits and surpluses at the installation level throughout the EU. These data also indicate that a novel feature of the EU ETS—the ability to borrow allowances from the forward allocation to satisfy current compliance requirements—was also used. These data provide evidence that the precondition of efficient abatement in a cap-and-trade system—widespread use of trading opportunities—was present in the first period of the EU ETS.

1. INTRODUCTION

Cross-border flows and borrowing are both controversial features of cap-and-trade design. The former can be seen as politically unacceptable in a multinational system and borrowing, unlike banking, has been rarely allowed because of a presumed inducement to deferred abatement and even non-compliance. Heretofore, the policy discussion has been largely theoretical with no empirical data concerning the extent or incidence of these phenomena. As the world's first multinational trading system, the European Union's CO₂ Emissions Trading Scheme (EU ETS) provides a much needed reference point for evaluating cross-border trading. The EU ETS also contains another novel feature, borrowing, that can be evaluated and which has affected the timing of the observed cross-border flows. With the first compliance period (2005-2007) of the EU ETS now concluded, data from the Community Independent Transaction Log (CITL) can be used to identify

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and analyze cross-border trading and borrowing. In addition, these data reveal the origin of the banked allowances that expired worthless at the end of the period.

The next section of this paper 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 flows strongly suggests borrowing and this is the subject of section 4. Section 5 discusses the use of excess or banked allowances and the distribution of and reasons for 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

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. Each member state maintains a national registry consisting of accounts for all covered installations in which are recorded the initial allocation of allowances to the installation, all transfers in and out of the account, and the annual surrender of EUAs against emissions. A copy of the national registry entries is maintained in the CITL, which is the central registry for the EU ETS. The CITL makes data publicly available concerning the annual allocation of allowances to installations, their emissions for each year, and the allowances surrendered in compliance. In addition, the national origin for every surrendered allowance is reported, although not the installation to which the allowance was initially issued or otherwise distributed through auctioning or from new entrant reserves. Complete information that would allow the tracking of allowance movements from initial issuance to final surrender will not be made publicly available until five years after the close of each compliance year.

When trading is used in this paper, it refers to a restricted definition, albeit that intended by the trade part of the expression, cap-and-trade. The trading discussed here is the transfer of an EUA from the registry in which it was initially issued, its registry of origin, to an installation account in another member state where it was surrendered. That allowance may have been traded several times, and crossed several borders in getting to its final destination, but the presently available data do not permit such tracking.¹ This definition of trading should be distinguished from that undertaken for purely financial reasons, such as for hedging price risk, which may not involve an actual transfer of any allowances.

1. Neither do the available data allow identification of EUAs that may have been traded across national boundaries but not surrendered, nor those traded among installations within the same Member State.

2.2 Presentation of the CITL Surrender Data

The CITL surrender data are publicly accessible, but not easily analyzed. 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. The appendix presents a summary presentation of these data. In this case, the surrender data are presented as a 26 x 26 matrix for the period as a whole.² The rows represent the registry of the member state in which allowances were surrendered for compliance and the columns indicate the registry of origin. The cells along the diagonal 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 650. The appendix clearly shows that most allowances are surrendered in the same registry in which they were issued since the largest entries for any country are those in the diagonal cells.

Table 1 provides a basic accounting of the EUAs authorized for issuance by member states (MSs) in a manner that identifies both the cross-border transfers (the sum of the off-diagonal cells in the appendix) and difference between the surrendered allowances (= verified emissions) and the total number of EUAs authorized and presumed issued.

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

Million EUAs	2005-07
Surrendered in MS where issued	5,791
Surrendered in another MS	354
Total Surrendered	6,145
Presumed issued but not surrendered	378
Total Authorized	6,523

It should not be surprising that 94% of the allowances surrendered originate in the member state in which they are issued. Most of the allowances initially allocated to an installation remain in that installation's holding account and are surrendered against that installation's emissions. What are traded are the expected or actual differences between emissions and allowance allocations. This "own al-

2. Similar tables can be developed for each year and for the net flows that result when EUAs are transferred in both directions between two member states. (See Trotignon and Ellerman, 2008, for a full set of tables.) Bulgaria and Romania became part of the EU ETS in 2007, when they became members of the European Union, and both had problems getting their registries operating in 2007. Romania's registry became operational only days before allowances had to be surrendered and Bulgaria's registry did not operate at all for 2007. Consequently, Bulgaria is not included in the matrix in the appendix. The few cross-border imports reported for Romania are included, although in most of the discussion in the text Romania is not included (when reference is made to EU25).

allowances first” behavior is a critical assumption in the analysis that follows.³ It is supported by anecdotal evidence, but it cannot be confirmed until the CITL data on the installation origin of surrendered allowances are made publicly available.

Table 2 presents an illustrative extract of CITL data for Germany, as also presented in the appendix. 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.

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

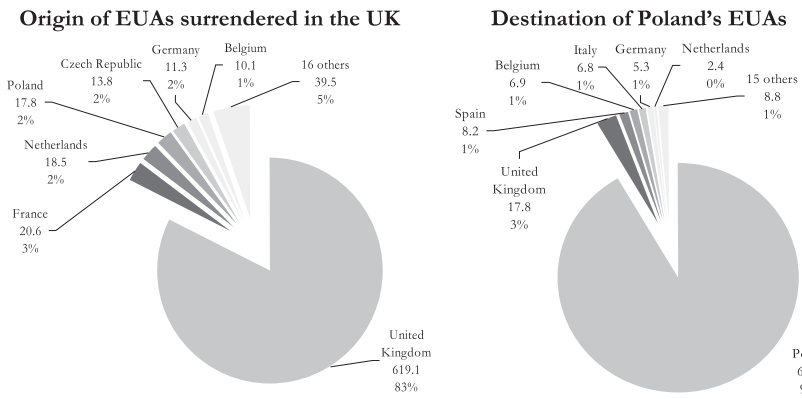
Several features stand out and these are generally true for all member states. First, as previously noted, most of the allowances issued and surrendered do not cross a border. Second, for any given trading relationship, cross-border trading is usually characterized by flows in both directions. Finally, the net position with various trading partners varies in direction. 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 the appendix. 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.

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

3. This behavior is an artifact of free allocation and the absence of financial arrangements that would allow recipients to monetize the allowance value between the time of issuance and when needed for compliance.

Figure 1. Example of CITL Surrender Data: Origin and Destination of Allowances



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, is the only member state in which covered installations did not participate in any cross-border transfers.

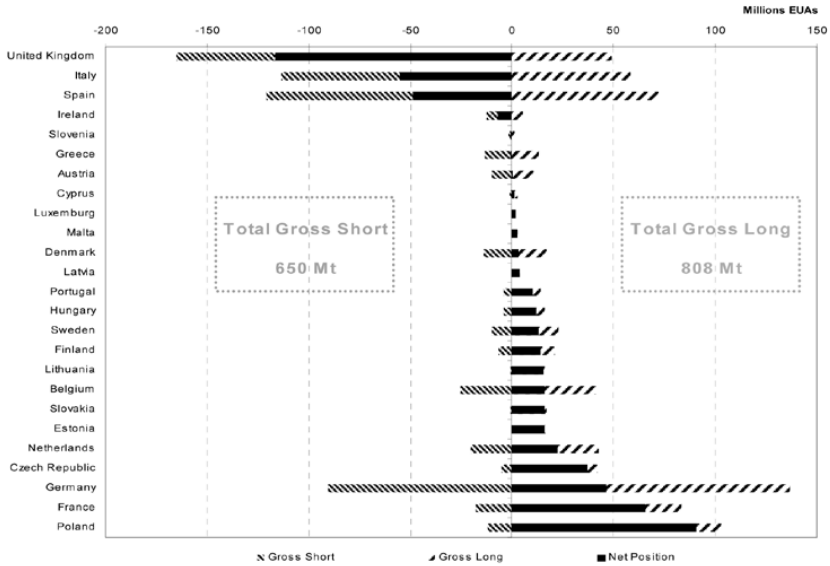
2.3 Installation Positions and Implied Cross-border Transfers

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 each installation’s emissions and its allocation indicate the extent of trading. Each long installation (allocation > emissions) is a potential seller; and each short installation (allocation < emissions) is a potential buyer.⁴ 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 with emissions exactly equal to the annual allocation.

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 presenta-

4. For compliance years within the first trading period, differences between allowances and emissions do not necessarily imply a transfer involving another installation. Installations can “bank” allowances not used in one year for use in a later year of the compliance period and they can “borrow” from the allocation for the next year within the compliance period to cover shortfalls in any given year. However, there is no banking or borrowing between the first and the subsequent compliance periods.

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



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

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tion of the data and the one of interest from the standpoint of cross-border trades is by member state as shown in Figure 2.⁵

The length of the bars to the left of the axis indicate the sum of the shorts (gross short), 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 length of the bars to the right of the axis reflect the sum of the longs (gross long), 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 solid parts of these bars indicate the net position of each member state, that is, 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.

5. Figure 2 and others similarly based on CITL data include only allowances initially allocated to installations. Allowances distributed to new entrants or for expansions of capacity are not shown. As explained in section 2.4, this omission can have a significant effect on the net position of some member states.

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. Moreover, the net positions of the member states also indicate that cross-border flows would have had to occur for all installations in the short member states to be in compliance. The surplus of unused allowances indicated by these data (158 Mt) is considerably less than the 378 million allowances that were presumed issued but not surrendered as derived in the basic accounting shown in Table 1. These numbers differ because the publicly available CITL data includes only initially allocated allowances and not EUAs issued from new entrant and other reserves.

2.4 New Entrant and Other Reserves

Many member states held back allowances from the totals authorized for member states to provide free allocations to new facilities (new entrant reserves) and four member states held back some allowances for auctioning.⁶ 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.⁷ 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 taken back and not redistributed as a result of closure.⁸ Finally, the presently available data on allowances surrendered do not distinguish between EUAs initially allocated to installations and those issued later or auctioned from the various reserves. Figure 3 below shows the effect of the various reserve provisions on the net positions of member states.

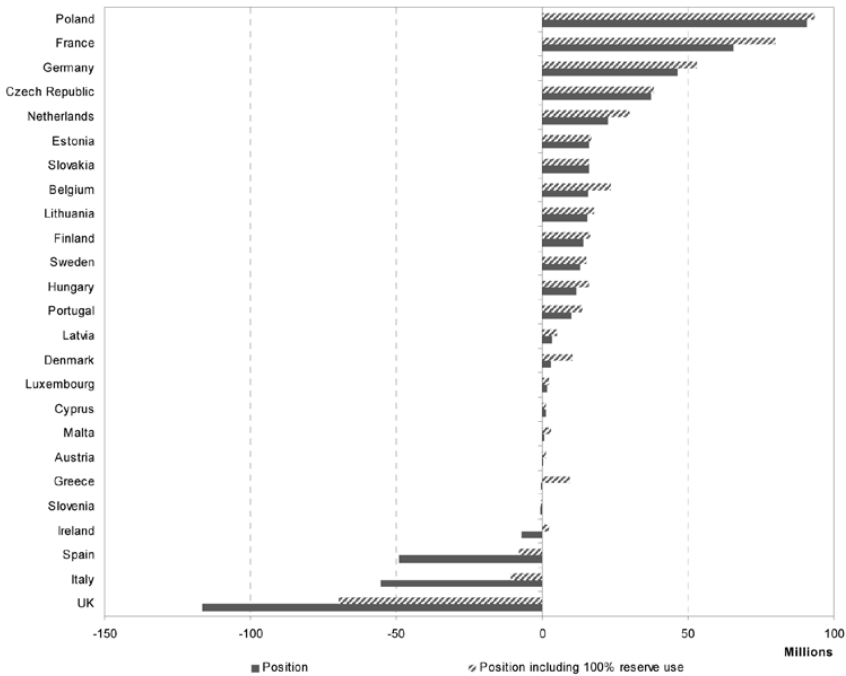
The effect of including these additional reserves is two-fold. First, the net surplus of the EU ETS as a whole for 2005-2007 increases from 158 Mt indicated in Figure 2 to the 378 Mt shown in Table 1. Second, the net positions of the member states are changed. Two of the member states that would be indicated as short based on the published CITL data, Ireland and Greece, switch from being net short to net long. Moreover, the need for cross-border transfers by the remain-

6. See Fazekas (2008a) for a discussion and analysis of the quantities distributed and manner of auctioning.

7. 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.

8. 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 State Positions



ing member states with net short positions, the UK, Italy, Spain, and Slovenia, is significantly reduced, from 229 Mt to 89 Mt. These member states held back proportionately more allowances in new entrant reserves than other member states and this circumstance accounts for the large effect on their net positions and the implied extent of EU-wide cross-border trading.

3. THE EXTENT OF CROSS-BORDER TRADING

3.1 The Density of Compliance Trading

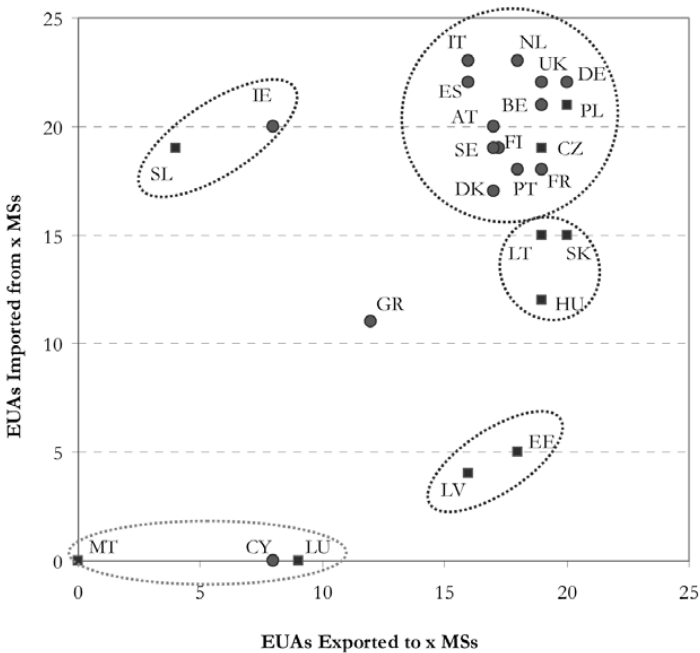
One of the most remarkable features of the matrix of flows in the appendix is the density of trading, that is, the number of observed trading relationships. Visually, the density of trading is reflected by the number of non-zero off-diagonal cells, each of which indicates the existence of a transfer from one member state to another. Table 3 presents data concerning the number of such bilateral relationships that were realized during the first period among the EU15, between the EU15 and the EU10, and among the EU10.

For the first 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.

Table 3. Density of Trades by Region (2005-07)

	Possible	Observed
Intra EU15	210	174 (83%)
EU15 w/EU10	300	168 (56%)
Intra EU10	90	43 (48%)
Total	600	385 (64%)

Figure 4. Participation of Member States in EUA Cross Border Flows



The x-axis indicates the number of member states to which EUAs were “exported,” that is, in which EUAs originating in the indicated member state were surrendered by installations in another member state. Similarly, the vertical axis states the number of member states from which EUAs were “imported,” that is, the number of member states from which allowances surrendered by installations in the indicated member state originated. The theoretical maximum count of such flows for any member state in either direction would be 24. No member state has this number because Malta did not trade at all. 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 in Figure 4 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. Most of these 14 high density traders are EU15 states, but Poland and the Czech Republic are also present. 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 their exports were more limited. Similarly, the five member states directly below the large circle exported allowances to more than fifteen other partners, but their imports were less, especially for Latvia and Estonia. Greece stands alone with an approximately equal number of member states with which cross-border trades were made, like most of the rest of the EU15, but with fewer such relationships than most of the other member states.

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, as indicated by the origin of EUAs surrendered for compliance, do not match exactly the net short and long positions, as indicated by the differences between installation-level emissions and allocations as illustrated by Figure 3. A Member State's net long or short position has a strong influence on its net import and export position, but it is far from determining. Figure 5 makes the comparison for each member state between these two data points.

For many member states, the differences are not large, but in all cases they are different and in some instances, the net positions are reversed. The most prominent of the reversals concerns Germany, for which the CITL data indicate a net long position of slightly over 50 Mt and the surrender data show Germany as a net importer of almost 30 Mt. The explanation is the ex post adjustment of allowance allocations to installations by Germany of about 70 Mt.⁹ Otherwise for most countries, those with net long positions reveal a smaller net export position. The difference indicates the number of allowances authorized and presumably issued but not surrendered. A more surprising result is that short member states imported more EUAs than would seem to have been needed to cover their net short position. As was the case for the long member states, some allowances issued to installations in those member states were never surrendered. Any such hoarded or inactive allowances, probably at long installations, would have necessitated more imported EUAs to cover emissions at short installations in that member state. A more complete discussion of these unused allowances is the subject of the penultimate section of the paper.

9. Germany's National Allocation Plan for the first period contained a provision that would take back allowances shown to be over-allocated (emissions less than 60% of the free allocation to an installation). In keeping with its policy to reject provisions providing for ex post adjustments of allocations, the European Commission rejected this provision; however, Germany challenged the Commission's action in court and prevailed in a ruling that was issued in November 2007, at the end of the first period.

Figure 5. Net Flows and Net Position Comparison (Mt), 2005-07 Combined

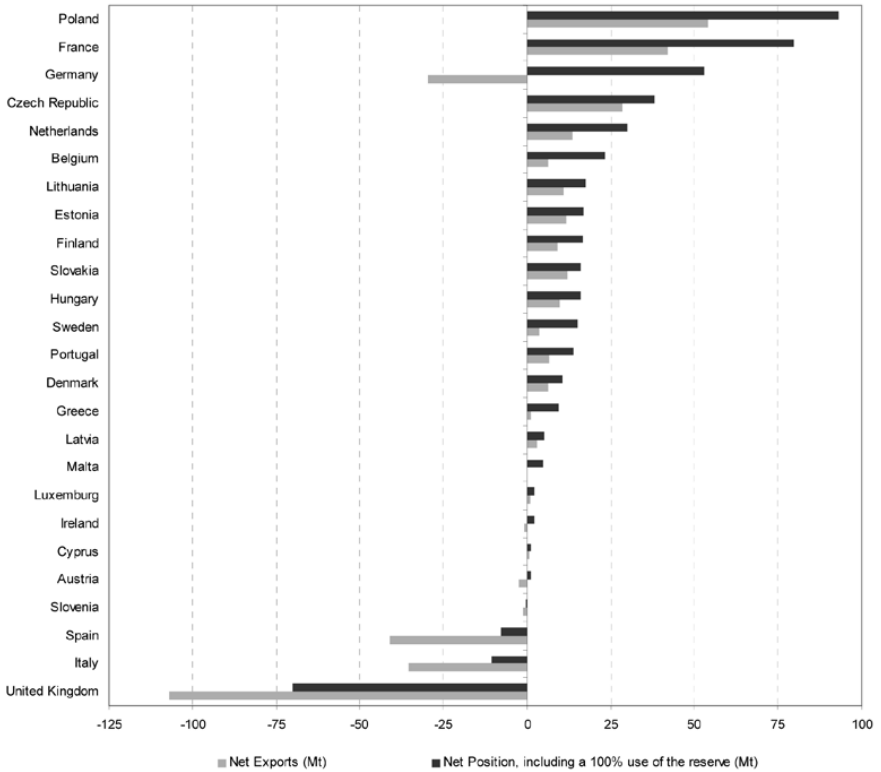


Table 4 shows the net export and import flows of Figure 5 in tabular form with net exporters (on the left) and importers (on the right) arranged according to whether they are part of the EU15 or a new member state and according to the year of the trading period.

There was a net transfer of 218 million allowances over the three years, although 65% of that 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,

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

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 those for 2007 emissions by April 30, 2008.

Figure 6. Price Development on CO₂ Spot Market during Phase 1



Source: Tendances Carbone, compiled from Point Carbon and BlueNext

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 preceding 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 those for 2007 between May 2007 and April 2008. It is unlikely that any firm 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.

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

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. For instance, 2007 accounts for 61% of the total quantity of cross-border flows, but only two percent of the total value of those flows.

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.

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

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 (2.55 Mt) were equal to only about 8% of its net imports in 2006 and 2007 (32.27 Mt), but the value of those first-year 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 emis-

sions in any given year of the compliance period. 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 include banking, the EU ETS is almost unique among cap-and-trade programs in allowing borrowing.¹⁰

In the legal parlance of the EU ETS, banking and borrowing refer to the use of EUAs from one multi-year compliance period in another. EUAs authorized for a compliance period can be used for compliance in any year of that period; however, the entire endowment for the period is not issued at the start of the period. Instead, the period total is split into annual allotments, which are placed in registry accounts no later than the end of February, two months prior to the date when EUAs must be surrendered for the prior year's emissions. As a result, each installation has a two-year allocation available for annual surrender, except the last year in each compliance period since borrowing is not allowed between periods.¹¹ Thus within any period, unlimited one-year-ahead borrowing is possible for all but the final year in the compliance period.

An important feature of the first compliance period of the EU ETS is that neither banking nor borrowing is allowed between this initial, trial period and the subsequent five-year Kyoto period. Thus, allowances issued for 2005 and 2006 and not used for compliance in those years could be banked for compliance in a later year, but any held beyond 2007 would be worthless. Similarly, borrowing was a compliance option for 2005 and 2006, although not for 2007, and any borrowing would have to be repaid by the end of the period.

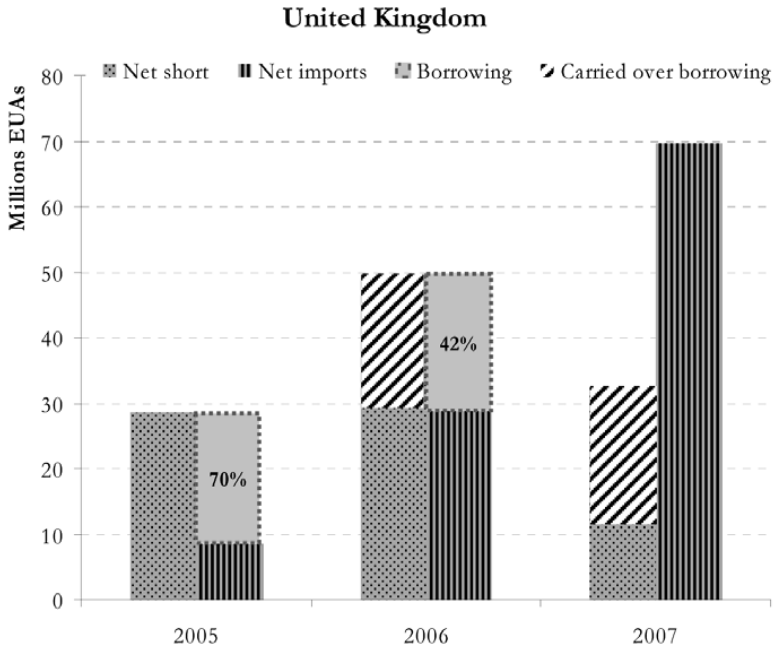
Banking and borrowing have obvious effects on market participation. For installations that are short, borrowing from the next year's allocation or using banked allowances obviates the need to purchase allowances in the market. Similarly for long installations, banked allowances are supply that is not 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 Installations in the UK

The steadily increasing annual volume of cross border flows shown in Table 4 suggests that borrowing is occurring since the net long or short positions of most member states are relatively constant. The clearest example is observed in the UK, the member state with the largest short position in all years, as illustrated in Figure 7 below.

10. De facto borrowing can occur in the RECLAIM trading programs in the Los Angeles Basin as a result of splitting affected facilities into two groups with temporally different compliance periods (Jan-Dec and July-June) and allowing trading between the overlapping compliance cycles.

11. In contrast, unlimited banking between periods is allowed except for the first period.

Figure 7. Imports and Implied Borrowing in the UK

The stippled section of each left-hand column presents the net short position for the year, that is, the extent to which emissions exceeded the allowances, *assuming* all the surplus allowances at long installations were used to cover deficits at short installations in the UK. As shown by the vertically striped section of the right-hand column for 2005, the number of non-UK EUAs surrendered for compliance was only 30% of this requirement. Since all installations were in compliance, the only explanation is borrowing from the 2006 allocation to cover the remaining 70% of the net national deficit, as indicated by the lighter portion of the column.

In 2006, the net short position of UK installations was about the same as in 2005. The number of non-UK allowances surrendered was almost equal to the net short position, but it did not make up for the previous year's borrowing (indicated by the hatched section of the left-hand column), which was rolled over to 2007. In 2007 the net short position was significantly lower (12 Mt), 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 what was needed to cover both the 2007 short position and the earlier borrowing.

The explanation involves the assumption that all the surplus allowances at long UK installations were available to cover emissions at short UK installa-

tions. To the extent that these surplus allowances were not available for compliance, more borrowing from the year-ahead allocation would have been required in 2005 and 2006, and more imports of non-UK allowances in 2007. The excess of non-UK EUAs surrendered in 2007 relative to the cumulative short (37 Mt) indicates the extent of these unused allowances at UK installations and the additional borrowing that was thereby required.

Finally, there is no reason to believe that borrowing took place only in the several member states that were short on balance. Whether the member state in which an installation was located was long or short would have had no particular meaning to the installation's operator. Borrowing was a compliance option for short installations wherever located, regardless of the member state's net position, as illustrated and discussed in the next section.

4.2 Borrowing at the Installation Level Throughout the EU ETS

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

In every year, emissions at Essent's Clauscentrale were higher than its allocation and, for the period as a whole, emissions exceeded the allocation by about 1.47 billion tons (about 50%). The striking feature of Table 6 is that only EUAs originating in the Netherlands were surrendered in 2005 and 2006 and no Dutch-originated EUAs were surrendered in 2007.

How Essent used the allowances allocated to this unit for these three years cannot be determined with the presently available data; however, if they had apportioned the three-year allocation to each year equally and used each year's share only for compliance in that year, Dutch-originated EUAs would have been surrendered in 2007 and non-Dutch EUAs would have been surrendered in 2005 and 2006. It is possible that Essent covered the 2005 and 2006 deficits with EUAs purchased or transferred from other Dutch units and then sold the 2007 allocation and covered the 2007 compliance needs entirely with imported EUAs, but this sequence 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 245 million EUAs of Clauscentrale's 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 same pattern of surrendered allowances: 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

Table 6. Example of Surrender Pattern

PermitNumber	Country	Name	Sector	
200400007	NL	Essent Energie Productie Clauscentrale	1-Combustion	
<i>2005</i>				
<i>Allocation</i>	<i>Emissions</i>	<i>Surrendered</i>	<i>Domestic</i>	<i>Foreign</i>
980,550	1,261,844	1,261,844	1,261,844	-
<i>2006</i>				
<i>Allocation</i>	<i>Emissions</i>	<i>Surrendered</i>	<i>Domestic</i>	<i>Foreign</i>
980,550	1,434,684	1,434,684	1,434,684	-
<i>2007</i>				
<i>Allocation</i>	<i>Emissions</i>	<i>Surrendered</i>	<i>Domestic</i>	<i>Foreign</i>
980,550	1,715,051	1,715,051	-	1,715,051
Surrendered Units				
Year	Registry of Surrender	Registry of Origin	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	

none as was the case for Clauscentrale and 69 other installations), the list includes 475 installations in 19 member states. Table 7 presents the aggregate data for these 475 short installations.

What distinguishes these 475 installations is the surrender of fewer domestic EUAs in 2007 than each installation's allocation for that year. A greater surrender of domestic EUAs in 2005 and 2006 alone does not indicate borrowing since installations could have purchased or transferred domestic EUAs from another installation in the home member state. However, it is unusual to find a short installation for which the domestic allowances surrendered are less than that year's allocation to the installation. Such a pattern implies borrowing either for prior use or sale.

The final column of this table is the difference between the allocations to these installations for the year and the number of domestic EUAs surrendered for that year's emissions. These EUAs could be either borrowed from the installa-

Table 7. Aggregate Results of Installations Meeting the Criteria for Apparent Borrowing

<i>Unit: Mt</i>	Allocations to the 475 installations	Their Verified Emissions	Domestic EUAs Surrendered	Non-domestic EUAs Surrendered	Borrowing or purchase of domestic EUAs (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: The careful reader may notice that the sum of surrendered allowances is 0.87 million EUAs greater than verified emissions. Nearly all of this excess surrender occurred in 2007 when the remaining allowance value was zero.

tion's year-ahead allocation or purchased or transferred from other installations in the same member state. The negative entry for 2007 indicates both the prior use of the 2007 allocation and the cumulative borrowing in the two preceding years that had to be made up in 2007 by purchases of non-domestic EUAs. The positive 10.5 Mt entry for the period as a whole reveals the domestic EUAs purchased to cover the deficits at these units assuming that all EUAs allocated to these units were surrendered against these units' emissions. For these 475 installations, roughly five-sixths of the allowance deficits in 2005 and 2006 were covered by borrowing.

These 475 short installations were not selected at random and they cannot be considered representative. They do show that some installations borrowed quite a lot. This sub-set can also be used to form a minimum estimate of the magnitude of borrowing for the system as a whole in 2005 and 2006. 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 that would be interested in this compliance option. The 475 installations that meet the borrowing criteria used to form Table 7 constituted 16% of the 3000 or so installations that were short in 2005 and 2006; and their minimum two-year borrowing of 53 Mt is 13% of the 409 Mt cumulative short positions for all installations in the first two years of the EU ETS. Thus, short installations borrowed at least one-eighth of their compliance requirement in these years. Since borrowing could be paid back with purchased domestic EUAs that would not show up with the data that is now publicly available, the actual percentage use of borrowing is certainly higher.

Whether intended or not by those engaging in it, borrowing to meet 2005 and 2006 compliance requirements turned out to be a profitable and cost-reducing move. 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 when at least some analysts were predict-

ing still higher prices to come.¹² That prospect and the uncertainty concerning the balance between allowances and emissions that existed prior to the first release of verified emissions data explain why the resort to borrowing was not greater in 2005. As it was, the borrowing in 2005 and 2006 significantly reduced compliance costs for the first trading period.

An example of the cost savings for the UK can be developed using the quantities indicated in Figure 7 and the “CITL year” prices in Table 5. As indicated in Table 5, the UK’s estimated total expenditure for imported EUAs was €458 million. Had short UK installations not engaged in borrowing and covered each year’s minimum deficit (assuming full use of all UK allowances) by imports, the expenditure would have been at least €864 million, almost twice as much. The circumstances creating high initial prices and near-zero prices at the end of the compliance period are not likely to be replicated in other cap-and-trade systems, but the general point remains: the ability to borrow reduces compliance cost.

5. THE ALLOWANCES THAT EXPIRED UNUSED AND WORTHLESS

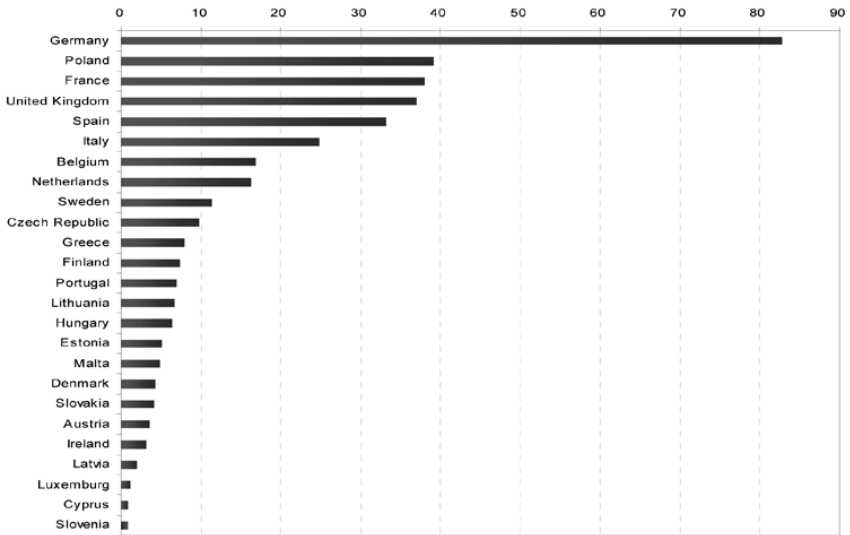
Just as the surrender data provide information on borrowing, they also reveal something about banking behavior. The difference between the number of allowances issued and those surrendered is the number of allowances either banked or sold to other installations; and the difference for the trial period as a whole is the number expiring worthless. As noted in Table 1, this sum is 378 million EUAs assuming full distribution of all reserves, or about 5.8% of the total cap. These allowances may have been traded, that is, sold out of the original account but never surrendered, although many probably remained in the original accounts. The distribution of these EUAs by issuing registry can be readily determined and is given in Figures 8 and 9, which present the distribution of unused, expiring allowances in absolute terms and relative to the member state’s authorized total, respectively.

In absolute numbers, most of the expiring allowances were issued by the large member states but some came from every country in the EU. In the case of Germany, 70 million tons of the excess were taken back by the regulator and the remaining number of EUAs expiring worthless in installation accounts in Germany or elsewhere was relatively small. A more meaningful member state comparison is presented in Figure 9, which presents these excess allowances, as well as other compliance data, as a percentage of the total authorized to be issued by each member state.

In this figure, allowances issued and surrendered in the member state are expressed by the long lightly shaded section of each bar as a percentage of the member state’s authorized issuance of EUAs. The remaining sections of each bar indicate, from left to right, the share of “net exports” (hatched section), the share expiring worthless (dark section to the left of the 100% line), and the share

12. One salient example is provided by the lead article to *Carbon Market Europe* the week before the price collapse for which the headline was “CO₂ Price Still Too Low” (Lekander, 2006).

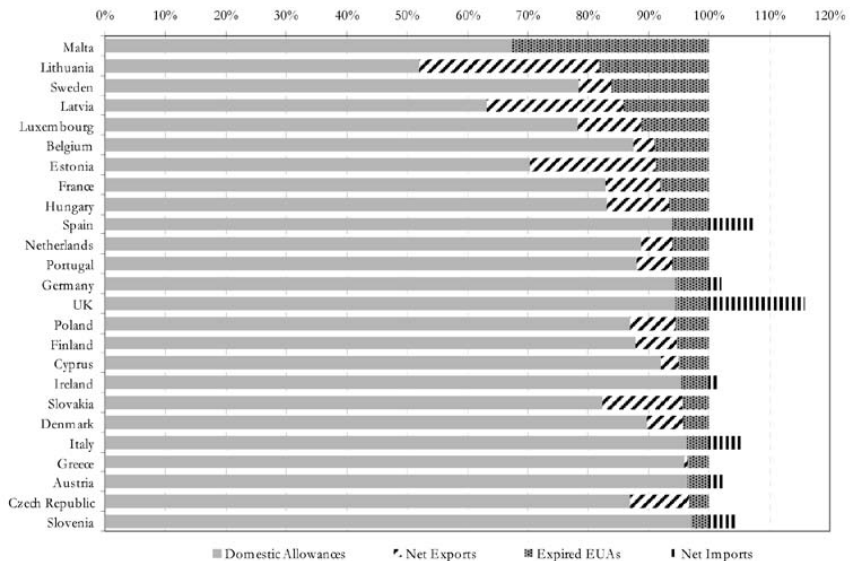
Figure 8. EUAs Expiring Worthless by Issuing Member State, in Volume



Note: includes 100% use of reserves

Note: includes 100% use of reserves

Figure 9. EUAs expiring worthless by member state, % relative to total EUAs issued



Legend: Domestic Allowances, Net Exports, Expired EUAs, Net Imports

of “net imports” (vertically striped sections always to the right of the 100% line). For both net exports and net imports, the “net” is the balance between member state EUAs surrendered in other member states and EUAs originally issued in other member states surrendered in that member state. For instance, net imports to the UK were equal to 15.9% of the number of EUAs issued by the UK, but its emissions were only 10.4% higher than the UK’s authorized total issuance of EUAs. The difference, 5.5%, shown by the dark section, is the share of UK-issued EUAs that expired worthless. In the case of a member state that was in a net long position, such as Poland (immediately below the UK), the initial lightly shaded section is equal to verified emissions, the hatched section indicates net exports as a share of total authorized allowances, and the final dark section reflects the allowances expiring worthless. This unused share is what caused three member states—Germany, Ireland and Austria—that were net long when all reserves are taken into account (and ignoring the ex post adjustment in Germany) to be net importers.

It is readily evident from the way the member states are arrayed in Figure 9 that net importers tend to have a smaller share of their allowance total expiring worthless than member states in a net long position. 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 lower proportion of long 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 purposely 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 considered. Similar installations would probably be found in every member state.¹³

At least some of the allowances expiring worthless 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 that permit some quantification of these transfers. 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 by Hungarian installations. 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 exported but expired worthless in accounts in other member states and that 850,000 EUAs issued in other member states expired worthless in accounts in the Hungarian registry.

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

6. CONCLUSION

The extent of cross-border trading in the EU ETS is remarkable, not so much for its absolute size and value, both of which are relatively small, but for its frequency and density. With the exception of Malta, all EU25 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 trading that was required to bring all installations into compliance and it was many times greater than the minimum cross-border flows needed to assure compliance in 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 in which borders do not seem to have mattered. Such widespread participation in redistributing allowances between longs and shorts is a precondition for efficient, least-cost compliance and there seems little doubt that this prerequisite exists in the EU ETS.

The steadily increasing volume of cross-border transfers in each of the three 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. This feature provided the owners of short installations with an additional compliance option that allowed them to redistribute demand during the compliance period and thereby to avoid going to the market when prices seemed high, albeit having to do so later on the expectation that prices would be lower. As such, this novel feature undoubtedly dampened price volatility and reduced compliance costs.

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Appendix. Matrix of Gross Allowance Flows (Mt), 2005-07 Combined

Phase 1		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	0.05	0.80	0.05	0.83	0.01	0.03	0.05	0.26	0.30	0.00	0.03	0.30	0.00	0.03	0.14	0.13	0.42	0.31	0.02	95.27	4.64	1%	
	BE	0.21	148.38	0.17	0.12	0.96	0.80	0.01	0.94	0.95	0.38	0.23	0.08	0.75	0.03	0.08	0.46	0.17	1.49	0.01	0.66	0.89	0.89	0.07	0.07	0.07	162.92	14.54	4%	
	DK	0.00	0.15	72.62	0.15	0.10	0.65	0.01	0.01	0.01	0.85	0.11	0.15	0.21	0.37	0.43	0.02	0.06	0.02	0.08	0.11	0.08	0.11	0.10	0.10	75.09	3.47	1%		
	FI	0.20	0.11	0.06	114.34	0.87	0.22	0.25	0.07	0.07	0.15	0.14	0.03	0.34	0.78	0.93	0.26	0.02	0.06	0.21	1.09	0.18	0.11	0.13	0.13	120.24	5.90	2%		
	FR	0.01	0.07	0.04	0.29	379.71	0.15	0.12	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	1.73	0.43	363.67	3.96	1%		
	DE	0.48	4.02	0.87	2.83	6.72	1331.19	0.08	0.86	4.26	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	1.67	1448.08	56.89	16%		
	GR	0.02	0.01	0.01	0.06	0.06	0.00	212.91	0.04	0.01	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.06	0.56	0.04	0.04	0.01	0.01	0.84	0.02	213.93	1.03	0%		
	IE	0.08	0.02	0.06	0.29	0.42	0.06	0.06	0.04	0.04	0.19	0.01	0.09	0.18	0.02	0.00	0.43	0.02	0.06	0.56	0.04	0.04	0.01	0.06	0.03	66.38	2.33	1%		
	IT	0.46	1.18	0.66	1.07	6.46	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	1.44	6.83	2.84	2.84	672.06	42.94	12%		
	LU	0.12	2.38	0.27	0.79	2.36	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	0.83	0.83	0.00	235.94	20.14	6%	
	NL	0.01	0.15	0.01	0.01	0.05	0.06	0.06	0.06	0.06	0.04	59.44	0.28	0.00	0.46	0.22	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.02	100.84	1.40	0%		
	PT	0.27	1.68	2.47	3.77	5.92	3.47	0.13	0.13	1.05	0.10	3.74	3.32	659.67	0.91	4.69	0.01	3.54	1.06	1.13	0.56	0.74	8.21	1.64	1.64	548.22	48.55	14%		
	ES	0.01	0.03	0.07	0.36	0.09	0.19	0.01	0.01	0.01	0.01	0.01	0.00	57.05	0.48	0.08	0.15	0.08	0.15	0.08	0.01	0.08	0.12	0.01	0.01	58.46	1.41	0%		
	SE	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	4.33	750.72	131.62	37%		
	GB	0.00	0.08	0.07	0.04	0.07	0.12	0.12	0.12	0.12	0.26	0.23	0.03	0.07	0.96	0.01	247.05	0.11	0.48	0.01	0.10	2.02	2.02	0.81	0.81	252.42	5.39	2%		
	CZ	0.02	0.02	0.00	0.00	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	40.05	0.11	0%		
	EE	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	79.30	0.67	0%		
	HU	0.03	0.05	0.00	0.39	0.18	0.00	0.00	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	6.64	0.09	0%		
	LV	0.03	0.05	0.00	0.39	0.18	0.00	0.00	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	19.13	1.15	0%		
	LT	0.03	0.05	0.00	0.39	0.18	0.00	0.00	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	19.13	1.15	0%		
	MT	0.04	0.18	0.10	0.00	0.26	0.20	0.02	0.00	0.05	0.02	0.02	0.02	0.09	0.01	0.62	0.01	0.17	0.00	0.08	0.04	0.02	660.34	0.25	0.25	622.53	2.19	1%		
	PL	0.01	0.03	0.05	0.04	0.18	0.13	0.13	0.13	0.13	0.23	0.01	0.18	0.01	0.18	0.01	0.74	0.04	0.25	0.07	0.07	1.37	55.24	0.03	0.03	59.65	3.41	1%		
	RO	0.00	0.03	0.00	0.22	0.02	0.02	0.08	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.05	0.07	0.10	0.04	0.11	0.20	0.17	74.30	0.17	0.17	75.37	1.07	0%		
	SK	0.04	0.02	0.00	0.02	0.40	0.00	0.02	0.02	0.02	0.09	0.02	0.02	0.04	0.19	0.02	0.07	0.01	0.04	0.02	0.19	0.19	0.19	0.19	0.19	0.00	25.37	2.61	0%	
	SI	93.99	169.42	82.36	129.40	425.61	1418.40	215.23	85.47	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%
	Total	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		
	Exports	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%		

Summended in ...

