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ALLOWANCE TRADING PATTERNS DURING THE EU ETS TRIAL PERIOD:

WHAT DOES THE CITL REVEAL?

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The European Union Emissions Trading Scheme (EU ETS) was established in 2005 to help the European Union efficiently reduce CO_2 emissions from four main industrial sectors. To ensure and control the environmental integrity of the system, the European Commission put into place the Community Independent Transaction Log, or CITL. Its role is to gather information from national registries to facilitate allowance tracking and the assessment of installation compliance each year. Because the CITL publicly displays verified information on each European installation, it has become the informational anchor for market participants. Each year in April it gives the first reliable information on installation positions, allowing market participants to revise their supply and demand estimations.

Our study aims at analyzing the data for the first phase of EU-ETS (2005-2007) at several different levels. It includes an analysis of allowance flows across countries, sectors and companies, revealing interesting trade patterns between long and short installations and across borders. An in-depth look at the CITL reveals that (1) within the combustion sector, the electricity production sector is the only sector in a net short position over Phase I and (2) because just a few companies own the majority of installations, the allowance market is much more concentrated than it may appear at the first glance. Within this analysis we also identify several characteristics of the CITL that can be improved, including (1) a lack of transparency in regard to the use of New Entrant Reserves, (2) the difficulty of understanding an installation's precise activities, notably within the combustion sector, and (3) the inability to access company-level data which makes it more difficult to understand market participants' behaviour. The Commission's efforts in amending the way it works as early as in Phase II will help, as will other initiatives including the CITL viewer developed by the European Environmental Agency.

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SUMMARY

INTRODUCTION

The European Union Emissions Trading Scheme (EU ETS) was established in 2005 to help the European Union efficiently reduce CO_2 emissions from four main industrial sectors – energy production, production and processing of ferrous metals, the mineral industry (cement, ceramics and glass) and pulp and paper production. With more than 10,000 installations, the EU ETS covers about 50% of all European CO_2 emissions, a total which represents approximately 40% of all European greenhouse gases emissions. The EU ETS is not the first large-scale emissions trading scheme ever implemented as the United States successfully established a sulfur dioxide (SO_2) allowance market in the 1990s[1]. However, the EU ETS is the world's first multinational emissions trading program and the first CO_2 market. No other emissions trading scheme ever implemented is comparable in terms of asset value. Its original design provided for two trading phases: a trial phase (2005-2007) that would enable stakeholders to gain experience with emissions trading, and a second phase (2008-2012) that corresponds with the first Commitment Period of the Kyoto Protocol.

The first three years of the EU ETS were managed in a decentralized manner, with great autonomy given to Member States throughout the allowance allocation process. Large differences between Member States in terms of wealth, emissions reduction costs, industrial infrastructure and political views, as well as the then-weaker centralized power of the European Commission, made the implementation of the EU ETS similar to wider international negotiations on climate change. While some states (such as the United Kingdom) wanted strong constraints on emissions, others (including many Eastern European countries) saw constraints as a threat to their potential economic growth. We have now reached the end of the first phase of the EU ETS: industrial installations had until 30 April 2008 to surrender allowances to cover their 2007 emissions. Surrender data from 2005 to 2007 are available for analysis, thanks to the Community Independent Transaction Log (CITL). They provide some very interesting insights into the performance of the EU ETS. The first insight has already been widely discussed: Phase I of the EU ETS was long overall, meaning that more allowances were allocated in the first phase than were needed by covered installations. The situation led to a crash in the Phase I allowance price provoked by the combined effects of over-allocation and of the impossibility to carry over to Phase II the unused allowances.

However, the overall market surplus in Phase I is only part of the story. The CITL data enables us to undertake a deeper analysis and to see that, while the overall market was long, many installations were short on allowances and thus had to purchase surplus allowances from other players in order to meet their emissions obligations. This coexistence of short and long installations explains why the volume of the allowance market grew over the years and raises questions about exactly what types of transfers occurred between countries, sectors and companies. This report is aimed at answering these questions. Its observations may help us better understand the behavior of installations in future trading periods.

I. THE CITL: THE BACKBONE OF THE MARKET'S INFORMATION SYSTEM

A. From national registries to the Community Independent Transaction Log

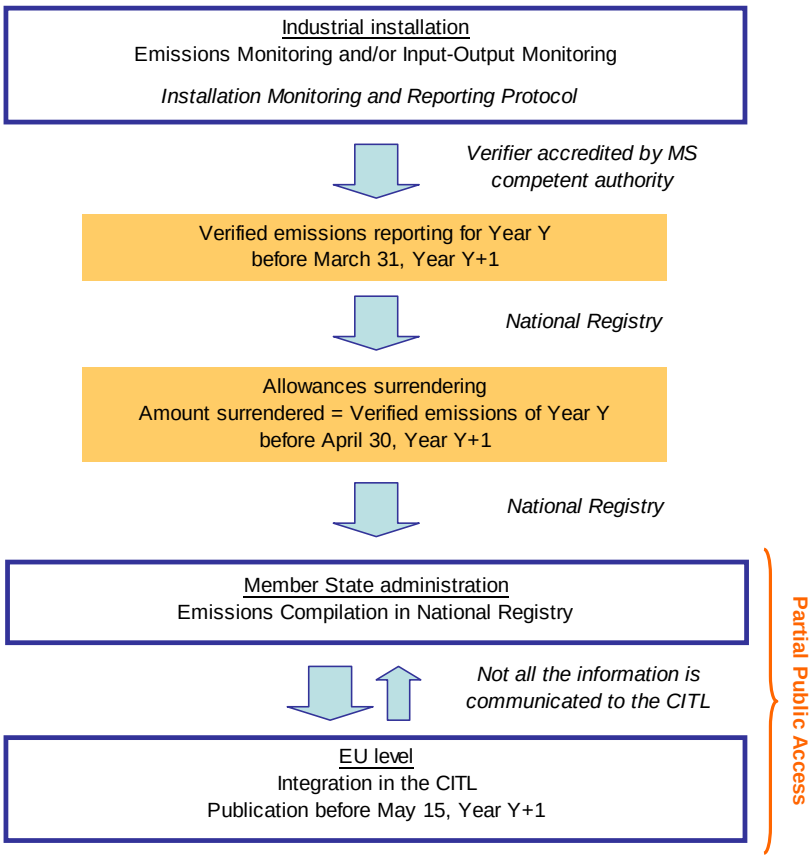
In a cap-and-trade system or an emissions trading scheme (ETS), a regulatory institution fixes, or "caps" the total emissions that may be released by a group of economic actors (installations, firms, etc.) over a specified time period. The actors then each receive an annual share of this total capped amount in the form of tradable permits. The underlying principle of cap-and-trade systems is that the actors who can reduce emissions at least cost will do so, and will sell their surplus allowances to actors with higher abatement costs.

[1] Other permits market have also been created to address other environmental issues like over-fishing (originally in New Zealand) or lead concentration in fuels (USA).

To assure the environmental integrity of a cap-and-trade scheme, it is absolutely necessary to assure that one allowance always corresponds to one ton of greenhouse gas (GHG) emissions emitted by a single actor. To keep track of allowances, issuance is recorded on a registry which also keeps track of all physical transfers of allowances – both sales and purchases. A registry thus serves as an accounting book: at a given date it specifies for each installation the details of allocated allowances, verified emissions and surrendered allowances.

In the European CO_2 market, each Member State is obligated to maintain a registry to track its covered installations. Anyone (non-capped installations, banks, brokers etc) is allowed to open accounts on national registries to participate in allowances trades. All national registries are connected to a central European registry maintained by the European Commission: the Community Independent Transaction Log (CITL). The CITL gathers in one place all the information from Member States' national registries, which is continually updated due to the constant dialogue between national registries and the CITL.

Figure 1 – Integration Process of Installation Data in the CITL



Source : Mission Climat of Caisse des Dépôts

The whole process is repeated each year. Note that if corrections are made to data reported in national registries, some of them may not be reflected in the CITL. Some corrections are only available in non-public sections; others may not appear before the next year's reporting.

If the CITL was originally designed as a compliance and control enforcement tool, it has become in practice a very useful source of verified information for all market players. Two kinds of data are publicly available for each installation registered on the CITL database: (1) the number of allowances the installation was allocated through the Member State's National Allocation Plan; and (2) what the installation's emissions were in previous years. This emissions data is collected through a monitoring, reporting and verification process which is operated by private accredited companies and then aggregated at the national level within national registries.

B. Data availability and reliability in the CITL: the main features

The CITL gives market participants access to non-biased information on installation compliance by showing the balance of allocations to verified emissions each year. Some information disclosure restrictions have been placed on the CITL, including a restriction on access to any allowance transaction information until five years after a transaction has taken place. Furthermore, the CITL does not record transaction prices.

The CITL remains a useful tool for ex-post assessments of the state of the carbon market. Nevertheless, it is not built as a commercial registry. Because it only tracks physical transfers, it does not reflect all transactions on the financial market, such as trades of financial derivatives like futures or options that do not necessarily lead to physical allowance exchanges. These kinds of exchanges are instead recorded by private operators such as carbon exchanges, brokers and carbon market news providers.

Several characteristics can nonetheless be improved and will be explored in this study:

- The transparency of the CITL in regard to the actual number of allowances allocated. Some adjustments made at the national level may not be integrated in the CITL, and second some information remains hidden. In particular, during EU ETS Phase I, the use of New Entrants Reserves was not available in the CITL's public area, leading to some bias in the assessment of installation positions;
- The difficulty of determining an installation's precise activity through the CITL. This is notably the case for installations classified within the combustion sector;
- The level of information. The CITL provides only installation-level data, which makes it very difficult to understand market actors' behaviour. Real market players are companies that may own many installations but which do not appear *per se* in the CITL;
- The information display is not user-friendly. This has been mainly addressed by the European Environmental Agency through its CITL viewer since the end of 2007.

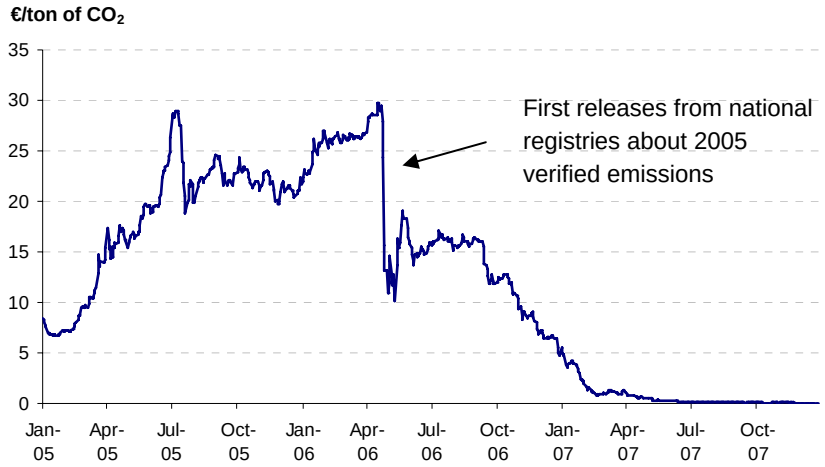
Despite these weaknesses, the CITL is functioning remarkably well considering the short time frame available to get it up and running. The Commission called for this totally new data collection and information system to be operational in 2005, approximately 18 months after the 2003 European directive creating the ETS. In addition, it is important to recall that 2005-2007 was the EU ETS's "warm-up" phase, aimed at building market infrastructure and understanding how best to implement an EU-wide cap-and-trade program in preparation for the first commitment period of the Kyoto Protocol (2008-2012). Many of the CITL's problems will likely be addressed by the current review of the Registry Regulation and the Monitoring and Reporting Guidelines for 2013 and subsequent years.

C. The impact of reliable information on the market

Accurate and reliable market information is essential to ensuring that market players pay the correct price for emissions allowances. In a perfectly informed market, the CO_2 price equals the lowest cost to reduce an extra ton of CO_2 emissions.

Figure 2 illustrates the importance of access to reliable information: at the beginning of the EU ETS, when little information on installation positions was available, many market players chose to hold on to their surplus allowances and allowance prices rose. However, when in April 2006 the first reliable information on real emissions was made public and revealed that most EU ETS installations were long on allowances, the market was flooded with allowances and the prices dropped by half – from 30 to 15 euros per ton – in less than five days. The CITL, being the means by which reported data is made public, provides an important reference point each year and may influence allowance price by allowing market players to adjust their trading strategies.

Figure 2 – The 2005 compliance data release; impact on the spot price of the European allowance

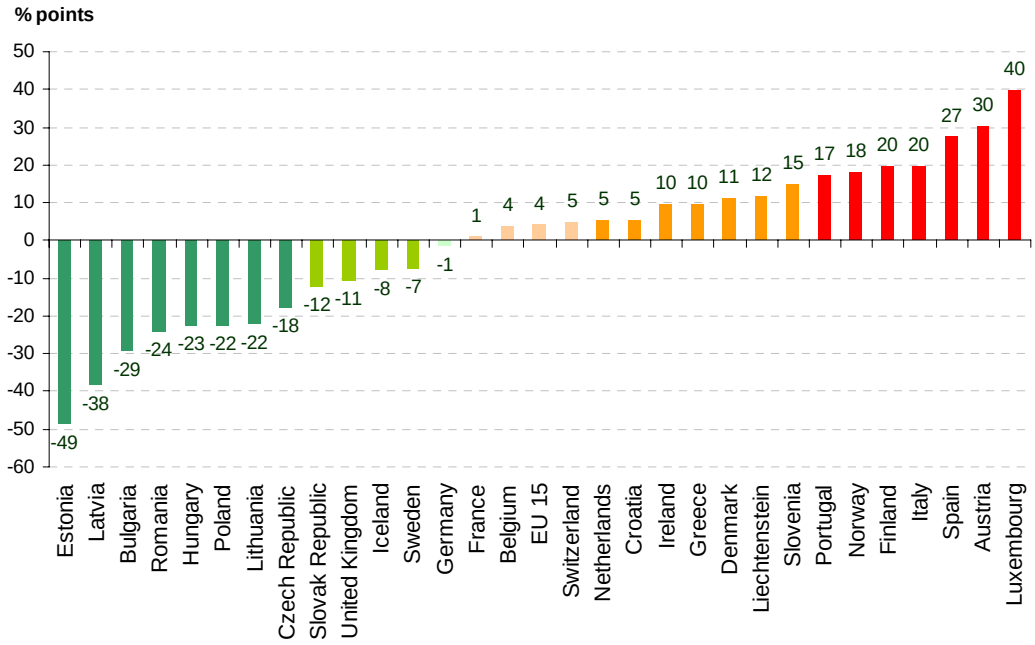


Source: BlueNext, PointCarbon.

II. THE DIVERSITY OF CARBON CONSTRAINTS AMONG MEMBER STATES

The European CO_2 market was established to help Member States reduce their greenhouse gas emissions efficiently and to reach their Kyoto targets. At the beginning of 2008, Member States entered into Phase II of the EU ETS, which coincides with the first Kyoto compliance period (2008-2012). Figure 3 specifies for each Member State the forecast distance to its Kyoto targets, i.e. the difference between its predicted emissions level compared to its Kyoto target. The more negative the difference, the more probable that the Member State will comply with its Kyoto requirements.

Figure 3 – Distance of EU 27 Member States to their Kyoto Targets (in % points)



Source: European Environment Agency, projections for 2010 with existing measures.

Member State emission reduction targets established by the Kyoto Protocol range from 50% below to 40% above their reference year (generally 1990) emissions levels. While heavily-industrialized Western European States (Spain, Austria, Italy, etc.) have ambitious emissions reduction targets, the less-developed Eastern European Member States are allowed to increase their emissions as their economies grow.

A. Assessing the stringency of national carbon caps through emissions data

The average level of constraint faced by a country's industries can be assessed by observing the difference between allocations and emissions over 2005-2007. As explained above, allocations stringency is strongly dependent on Kyoto targets. It is important to keep in mind that emissions variability can also participate in the stringency of caps. While allocations are based on emissions projections, actual emissions are driven by four main factors:

- Meteorological conditions: low winter temperatures increase building heat demand and thus affect fuel consumption by district heating facilities and power generation plants; high summer temperatures increase demand for air-conditioning and may reduce the possibility of using nuclear power stations due to elevated cooling water temperatures. Precipitation impacts the fill rate of hydraulic reservoirs (a CO_2 free alternative to fossil fuel-based electricity production) which are used for hydropower generation, especially in Northern Europe. In practice, mild and wet climate conditions during the winter 2006 and summer 2007 led to lower electricity consumption and thus lowered CO_2 emissions in Europe.

- Economic activity: CO_2 emissions from industry are closely linked with economic output. Economic growth over the 2005-2007 period resulted in increased emissions, both from industrial processes and from fuel consumption.

- Energy prices: energy producers impact CO_2 emissions as they shift production between different types of facilities (coal, natural gas, nuclear) due to changing fuel and CO_2 prices. In particular, substituting natural gas for coal in power generation saves approximately 1.7 tons of CO_2 per ton of oil equivalent electricity production[1]. Using hard coal instead of brown coal also decreases CO_2 emissions. Rising oil prices during 2005-06 winter and at the end of EU ETS Phase I drove up natural gas prices, increasing the economic incentive to use a cheaper coal.

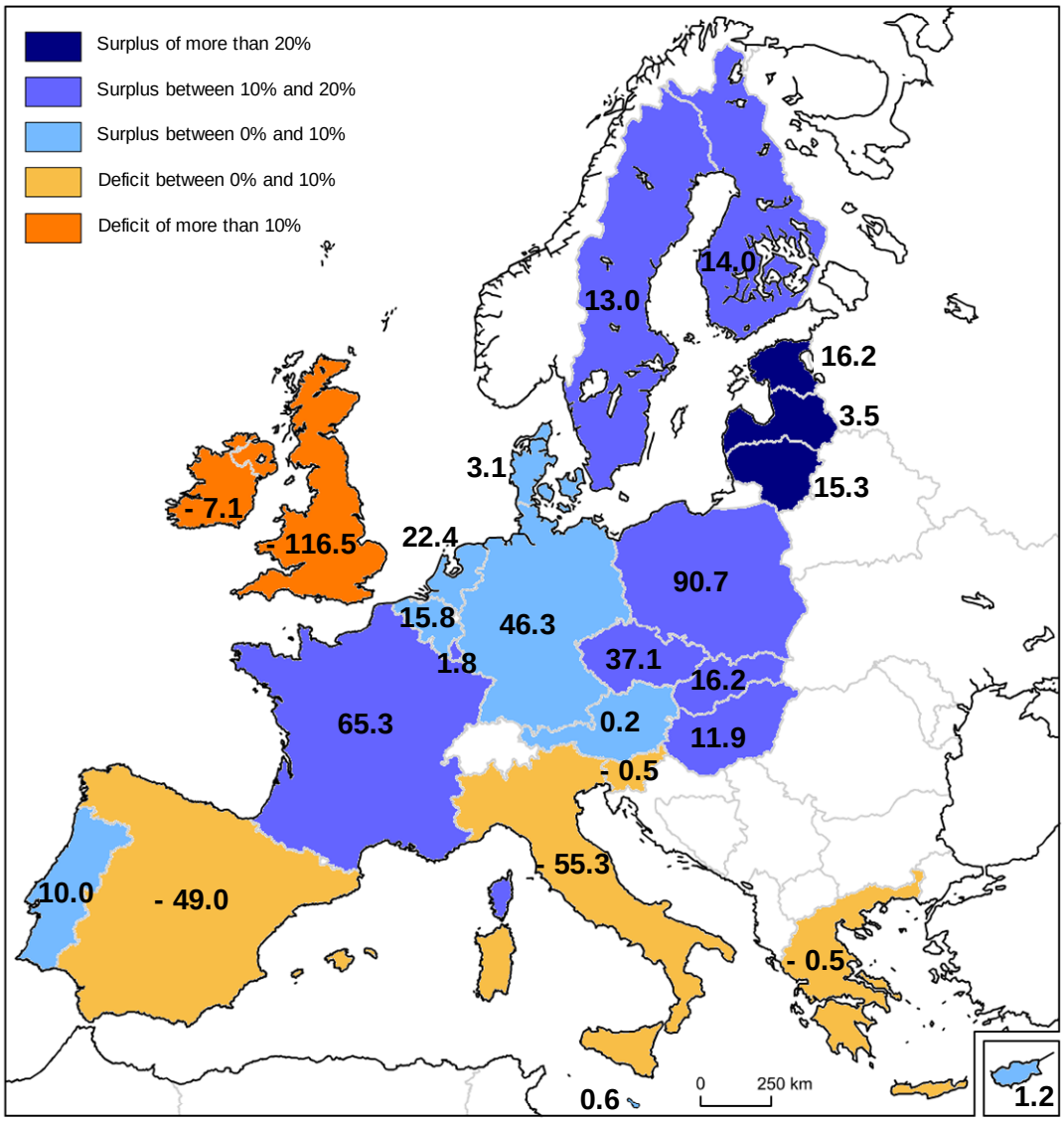
- Emissions abatement: players can take short-term emissions abatement measures, such as switching to less carbon-intensive fuels (switch to biomass, from coal to gas or from brown coal to hard coal) in the power sector, or increasing energy efficiency. Other abatement measures, which may involve costly investments in technologies or capacities, may only be measurable in the medium and long term.

During the first Phase, EU 25 installations emitted 6,091 Mt CO_2 which, when compared with the original allowance allocation of 6,247 Mt, led to an allowance surplus of 155.7 Mt (equal to 2.5% of the three-year allocation). Short installations faced an under-allocation of 651 Mt (the equivalent of 10.4% of the total allocation) and long installations were over-allocated by 806 Mt (12.9% of the total allocation).

Figure 4 shows the allowance positions of Member States across Europe: the difference between their original allocation and their actual emissions from 2005-2007. The result is very heterogeneous, with net positions ranging from -117 Mt for the UK to 91 Mt for Poland. Ireland, the UK, Spain, Italy, Slovenia, and Greece had a net national deficit of allowances. On the other hand, France, Portugal and the Eastern and Northern European Member States were allocated more allowances than their actual national emissions from 2005-2007. Note that these positions do not include allocations to new market entrants from the New Entrants Reserves (see section II-D).

[1] IPCC, guidelines for national greenhouse gas inventories, 2006.

Figure 4 – Net allowance position by country over 2005-2007, in volume (Mt) and as a percentage of national allocation (coloured areas)



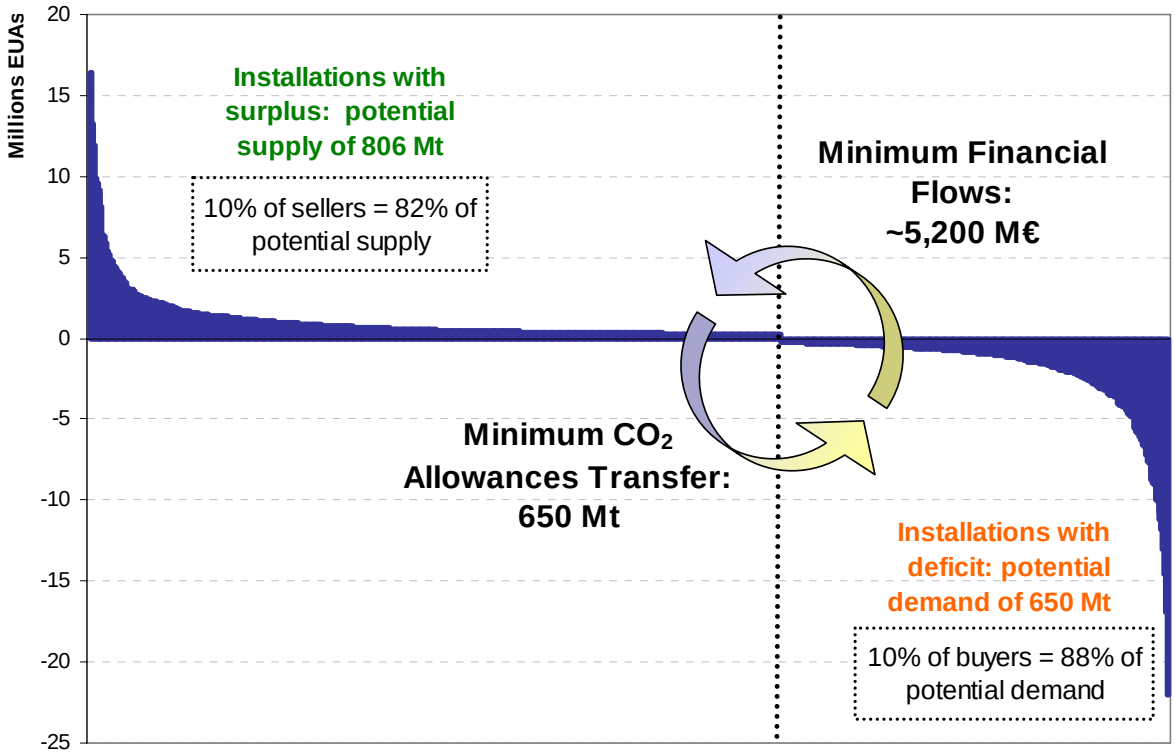
Notes: Since emissions data from Romania and Bulgaria were not available at the date of publication, no results have been calculated for these newest members of the EU ETS. Malta 2007 emissions were not yet reported at the time of writing and have been approximated by the average 05-06.

Source: CITL, cumulated results 2005 - 2007.

B. *Allowance transfers from "long" to "short" installations*

What matters for the carbon market is not a country's net position but the demand and supply by installations at the European level. Installations with more allowances than actual emissions ("long" installations) are potential sellers; installations with fewer allowances than actual emissions ("short" installations) are potential buyers. The EU ETS facilitates the transfers of allowances from "long" to "short" installations, which are necessary even in the case of an overall allowance surplus. While this "compliance trading" forms the foundation of the market, it is not the only type of trading on the market. Firms, banks and brokers are also engaged in "financial trading" of allowances, which do not typically involve actual allowance transfers.

Figure 5 – Installations' net positions over 2005-2007 and potential net financial flows from long to short installations



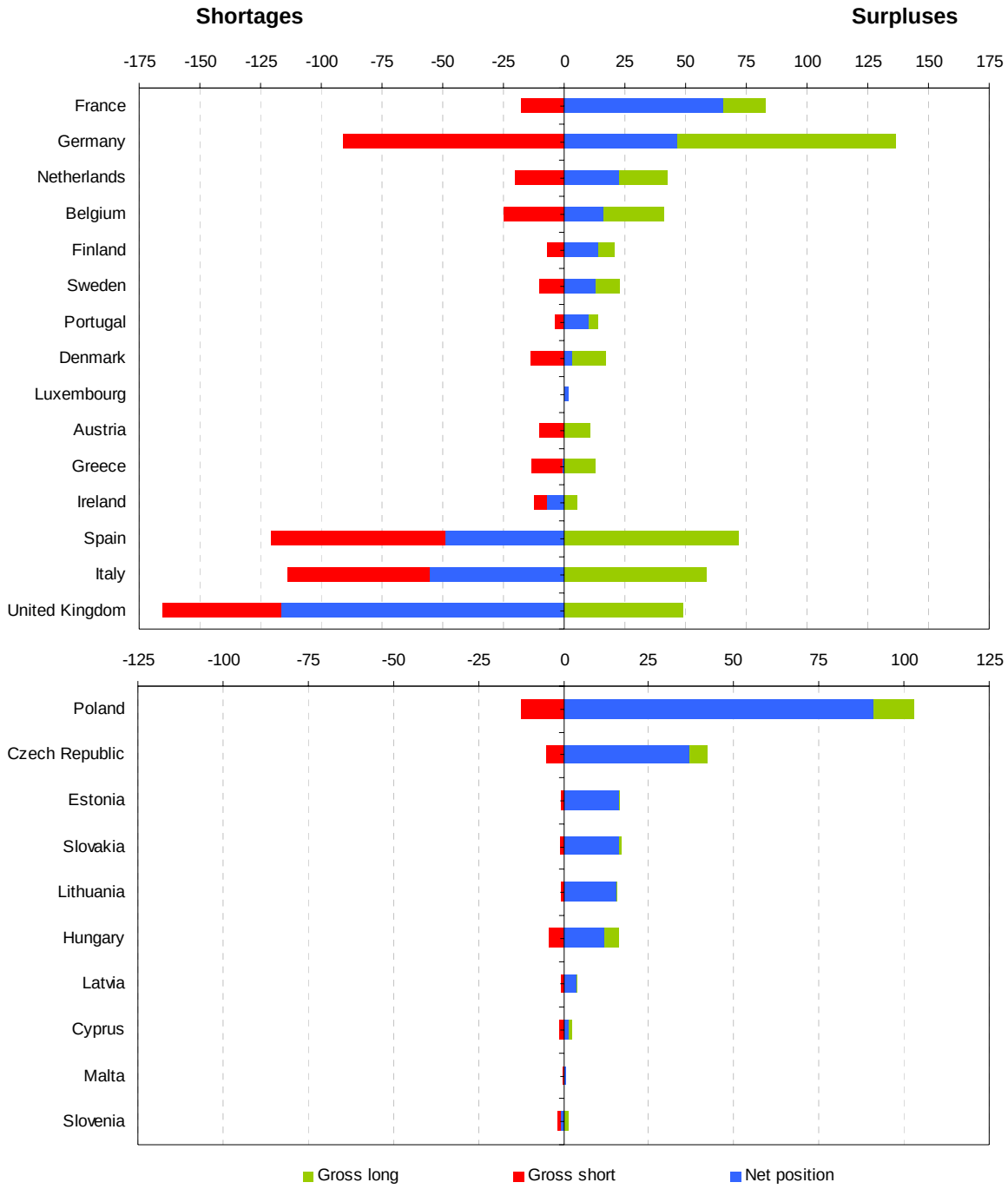
Source: CITL, authors' calculations.

This first look at transfers within Europe can be enriched with an analysis of the gross and net allowance positions within countries. The allowance position of a country as a whole results from the balance of the positions of short and long installations within its borders. The sum of gross short and long volumes and the resulting net national positions are presented in Figure 6. Countries have been split into two groups: the Western countries of the EU 15, and the EU 10 which gathers the newest Eastern entrants to the European Union.

- In the EU 15, ten countries including France, Germany and the Netherlands had smaller shortages than surpluses, which made them net long. Although the UK, Spain and Italy had gross surpluses similar to France, they were net short because they had much larger gross allowance deficits. On the contrary, Germany, with nearly as large a shortage as Italy, was net long with the biggest gross allowance surplus in Europe (137 Mt).

- In comparison, the Eastern European countries had very small shortages and large surpluses, and were thus net long. The general allowance surplus in Eastern countries was first due to the fact that these nations have been undergoing structural transformations that made their business-as-usual emissions difficult to estimate, and second to the poor quality of past emissions data. The allowance surplus in Eastern Member States will not jeopardize their ability to reach their Kyoto targets, which were negotiated so as not to threaten their economic development.

Figure 6 – EU 15 and EU 10 Countries' Gross and Net positions (Mt), 2005-2007



Source: CITL.

C. CO_2 allowances are circulating around Europe

Thanks to the European carbon market, short and long installations could trade allowances, either on marketplaces or on a bilateral basis, with any other European installation. Data on these physical transactions is not publicly available until five years after a transaction has been completed. However, the CITL does provide information on allowances surrendered each year by installations for compliance purposes; specifically, it specifies the Member State in which each allowance was initially allocated. This enables a partial reconstruction of past allowance flows between countries. As only the originating national registry and the final holding registry are known, it is impossible to detect how allowances have traveled between these two endpoints or to differentiate allowances which remained in a country for the whole period from those which were traded abroad but were surrendered back in their country of origin.

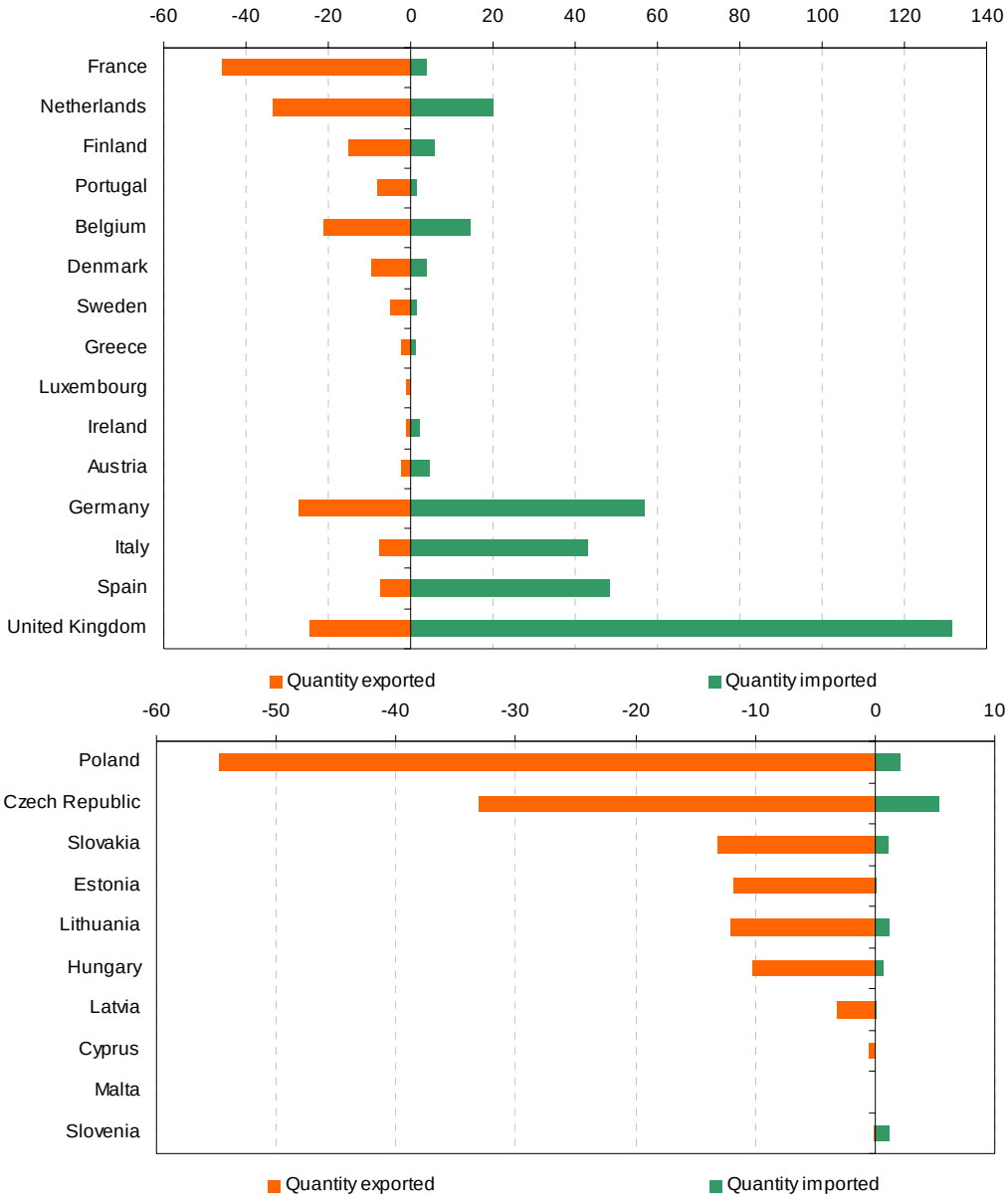
Despite this fact, we will use the number of "foreign" allowances surrendered to reconstruct the market trading patterns during phase I. One should keep in mind that this analysis is an approximation of these patterns as no direct information is available for exchanges within individual countries.

From now on, "exported allowances" will refer to allowances issued by a given country and surrendered in other Member States. Conversely, "imported allowances" will refer to allowances issued in other Member States and surrendered in a given country). Note that this distinction is only for the purposes of our analysis: in reality, allowances are a single and homogenous commodity with a value independent of the country in which they are issued.

An estimation of cross-border exchanges

Over the first phase of the EU ETS, the total quantity of allowances exported (or imported) by European countries equaled 350 Mt, the equivalent of 5.6% of distributed allowances. At the national level, allowance imports and exports were correlated to the gross short or long volumes.

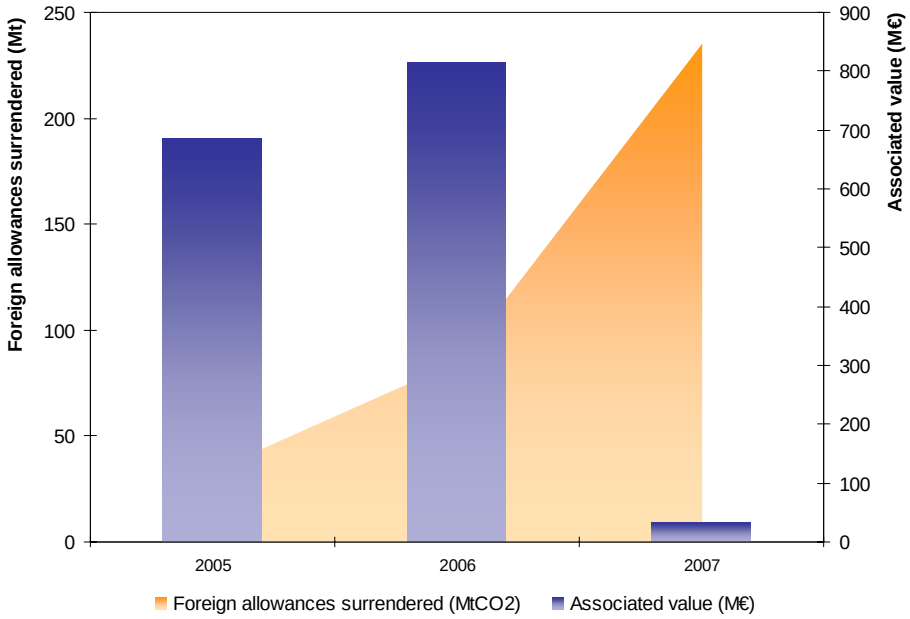
Figure 7 – EU 15 and EU 10 Gross Allowance Exports/Imports in Phase I (Mt)



Source: CITL, authors' calculations.

Almost all countries, even those with small allowance deficits or surpluses, both imported and exported allowances from and to other EU Member States. This reflected both the existence of short and long installations in all countries and also the fact that installations effectively exercised their opportunity to access the European-wide market. The learning pathway is particularly striking when yearly figures are observed: apparent cross-border trading more than doubled in 2007, from 116 Mt in the first two years of the scheme to 234 Mt in the single year 2007.

Figure 8 – Foreign allowances exchanged: volumes and implied value by year



Note: Market value was computed for each compliance year (i.e. from April to April) by multiplying the cross-border allowance exchanges by the average price for Phase I allowances (spot price).

Source: CITL, authors' calculations.

This sharp increase in trading is also due to technical problems and the evolution of market participants' behaviors:

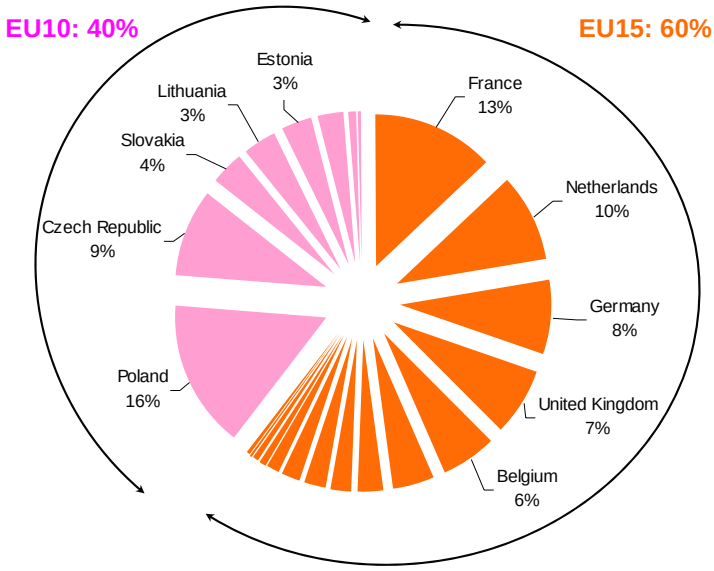
- The possibility of intra-phase borrowing allowed short installations to comply without immediately having to buy on the market when prices were high in 2005 and in 2006. Preliminary results of a study conducted by MIT and the Mission Climat show that borrowing was extensively used, at least in countries with a large deficit of allowances;
- A few Member States' registries became operational late. The most striking example was Poland, whose registry was connected to the European market only in 2006, preventing its installations from trading allowances in the meantime;
- The inability to bank allowances from the first to the second phase led long installations to sell their surpluses on the market in 2007.

Despite the rise in the volumes exchanged from 2006 to 2007, most of the value was exchanged in 2005 and 2006. The drop in the carbon price in mid 2006 resulted in much smaller value transfers during allowance trading in 2007.

Gross exporters and importers of allowances

As Figure 9 shows, almost all Member States were gross allowance exporters. Some of them nevertheless represented only a small part of European countries' exports: for example installations in Slovenia, Ireland, Greece, Austria and Latvia exported less than 1% of European total gross exports. On the contrary, installations in Poland, France, the Netherlands, the Czech Republic and Germany were the biggest allowance exporters, responsible for 55% of all exported allowances.

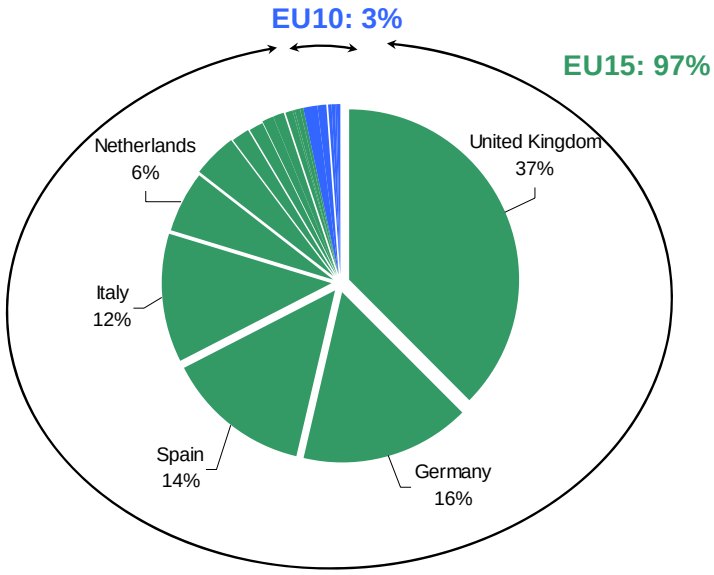
Figure 9 – Distribution of total exported allowances among EU 25 countries



Source: CITL, authors' calculations.

The situation was quite different for allowance importations. Installations in new Member States imported very few allowances issued in other countries (only 2% of total allowance imports), which is logical given that allowance demand for compliance was very limited in these countries. Thus, almost all allowances surrendered in a different country were surrendered in the EU 15 (97%). Nearly 80% of them were surrendered in the UK, Spain, Italy and Germany, the Member States with the largest gross allowance deficits. Installations in the UK alone accounted for more than 37% of total allowance imports.

Figure 10 – Distribution of total imported allowances among EU 25 countries



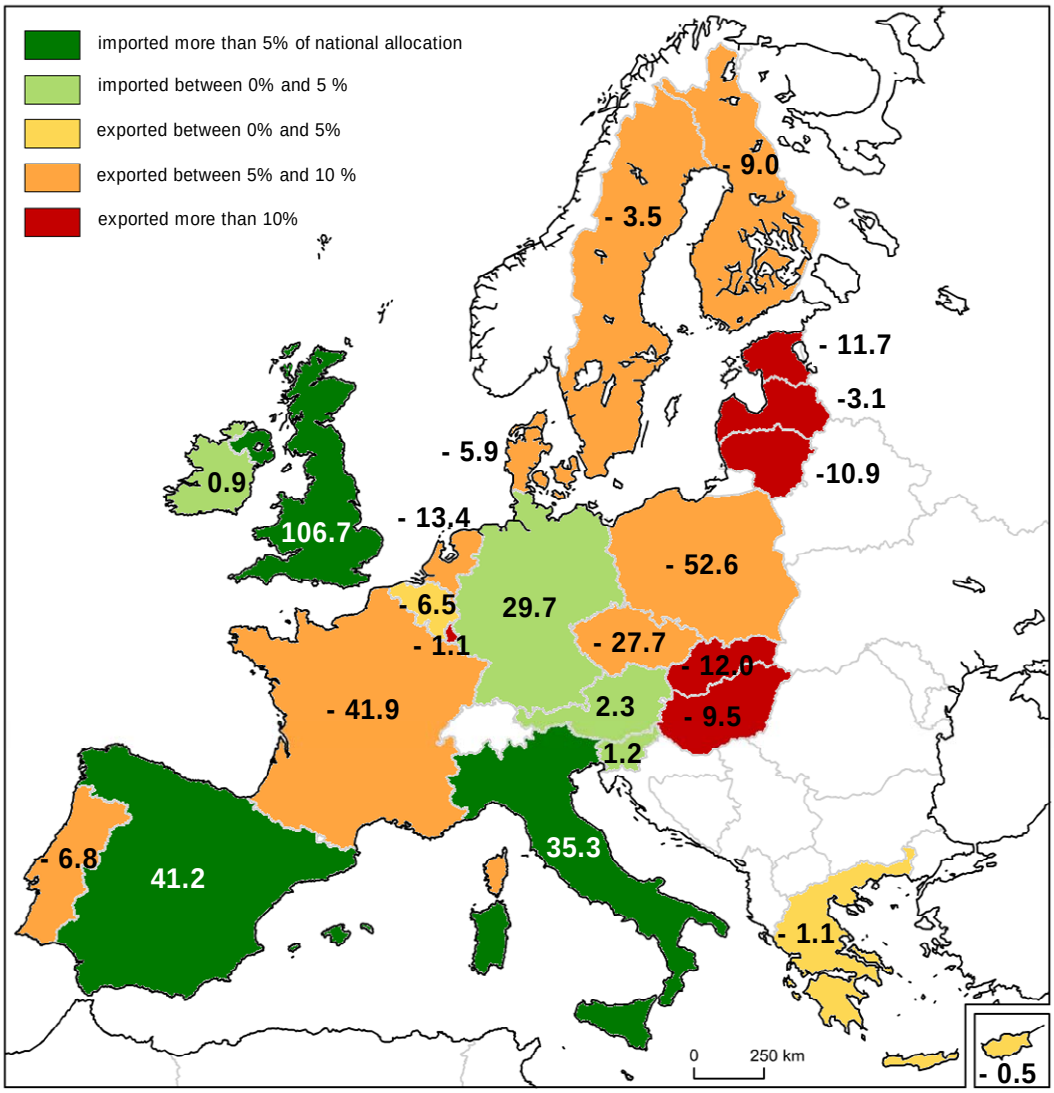
Source: CITL, authors' calculations.

Net allowance transfers between Member States and estimation of financial counterflows

Allowance imports and exports at the national level represented significant money transfers. Figure 11 shows the net allowance flow of each Member State (imports minus exports of allowances) in volume (Mt) and as a percentage of national allocation over 2005 to 2007 (colored area). The figure overlaps a great deal with Figure 4, leading us to conclude that installations in countries with allowance deficits relied greatly on European allowance imports for compliance purposes.

In terms of imports as a percentage of total national allocation, British, Spanish and Italian installations were the largest net importers of allowances in Europe. Installations from the Baltic Member States, Hungary and Slovakia were the largest net exporters of allowances. In terms of allowance volume (Mt), the UK, Spain and Italy were also the top buyers. France, the Czech Republic and Poland were the top net sellers.

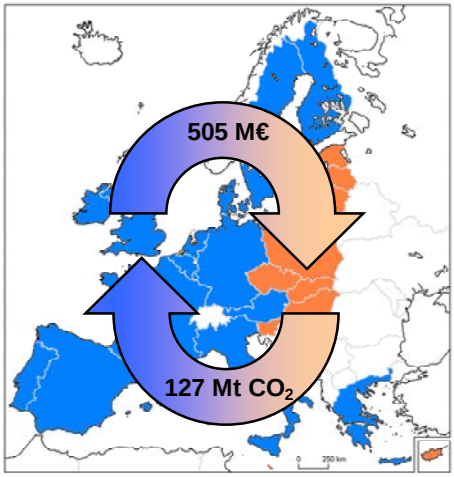
Figure 11 – Net allowance flows balance by country over 2005-2007
(in Mt and as a percentage of national allocation totals - coloured areas)



Source: CITL, authors' calculations.

The balance between EU 15 and EU 10 countries in terms of apparent allowance purchases and sales had a direct financial impact. Indeed the physical flows of allowances were compensated by reverse money flows. The value of the net allowance flow from EU 10 to EU 15 is estimated to have been approximately 505 M€ over Phase I, based on price averages computed for each compliance year (from April to April).

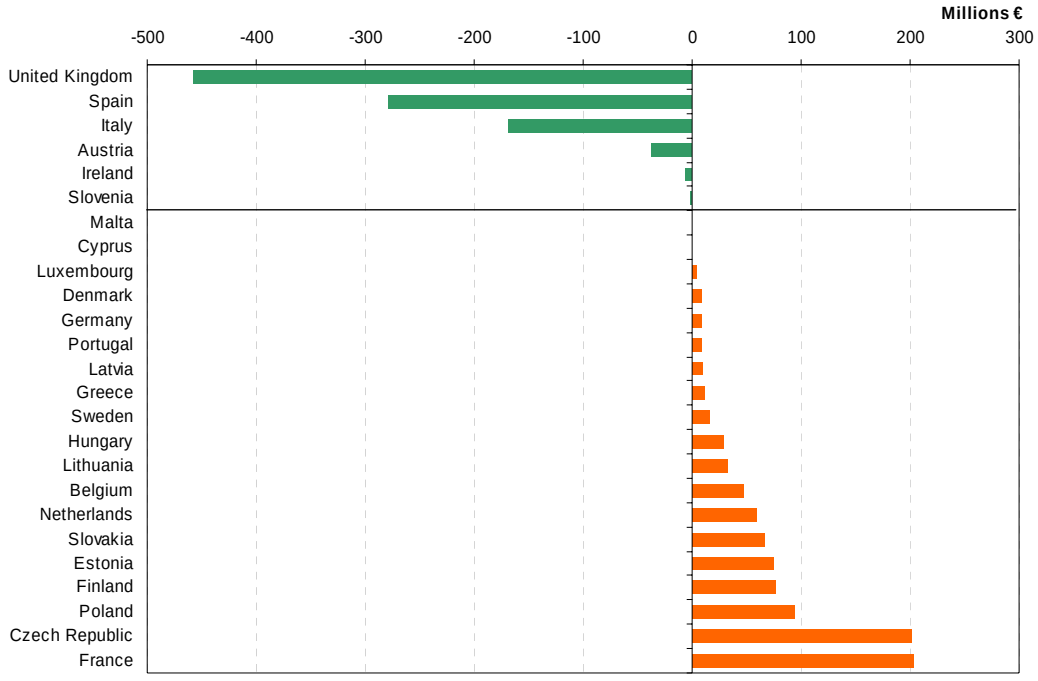
Figure 12 – EU 15 and EU 10 net allowance and financial flows over 2005-2007



Source: CITL, authors' calculations.

The range of financial flows by individual country varies from – 460 M€ for the UK to + 203 M€ for France. Among the 25 Member States, six were net buyers and 19 were net sellers. Surprisingly, Austrian installations were net importers of allowances, although there was not a net national allowance deficit (unlike the UK, Italy, Ireland, and Spain). On the other hand German installations bought more than they sold but did not appear as net buyers because the price was high when they were selling and low when they were buying. The examples of Austria and Germany show that installations bought some allowances from outside the country, even though there was an excess of distributed allowances in the country itself. Thus national position is not indicative of the level of constraint faced by all country's installations.

Figure 13 – Net financial flows by country over Phase I



Note: Financial flows are computed for each year using the average yearly price of Phase I spot allowances weighted by yearly net flows of allowances.

Source: CITL, authors' calculations.

The map in Annex 2 shows the 15 largest flows across Europe. Among these flows, six point to the UK, four to Germany, two to Italy and Spain. Those four Member States faced the greatest gross shortage of allowances and clearly appeared as the best examples of countries where installations used allowances issued in other Member States for compliance needs.

D. Still a trial phase: data reliability

The results presented show that the market played its role in transferring allowances from places where they were not needed to places where they were. Despite those positive results, some imperfections exist and have introduced uncertainty to our analysis of installation positions and trades between market actors during the first phase. They have no implication on the environmental integrity or on the effectiveness of verification and control processes.

The difficulty of assessing the use of New Entrants Reserves

The CITL is updated daily to reflect the changes that occur on national registries. Nevertheless, it does not take into account some modifications to national allocations. In particular, New Entrants Reserves (NERs) are not integrated into the CITL. Those reserves are set aside by Member States in their allocation plans to be redistributed to new capacities (being new installations, or more often, extensions of existing installations). Not including these reserves leads to a biased image of installation compliance: installations' deficits may in reality be smaller that indicated on the CITL. In addition, allocation transfers or ex-post corrections made at the national level are not reflected in the CITL's public data.

A few countries display data on their NERs or their use of other reserves (some allowances may be set aside for auctioning for example). In the UK, official data indicated in February 2007 that approximately 79% of NERs had been used. While the cumulated deficit calculated from CITL data for the UK in 2005 and 2006 amounted to approximately 82.8 Mt, had NERs been included it would have dropped by 23.6 Mt to 59.2 Mt. Spain also used NERs during 2005 and 2006. Had this been accounted for in the CITL, Spain's deficit would have dropped by 10.4 Mt, from 25.3 Mt to 14.9 Mt.

Table 1 – Impacts of NER integration on 2005-2006 allocation in the UK and Spain

	UK			Spain		
Sector	**CITL Allocation (Mt)**	**CITL Allocation + NER (Mt)**	**% Change**	**CITL Allocation (Mt)**	**CITL Allocation + NER (Mt)**	**% Change**
Power Sector Combustion	259.5	265.5	**2%**	160.3	167.6	**5%**
Other Combustion	58.3	66.7	**15%**	38.4	39.3	**2%**
Refineries	39.2	39.7	**1%**	30.1	30.1	**0%**
Coke Ovens	26.6	31.8	**20%**	0.1	0.1	**0%**
Iron and Steel	13.2	13.4	**2%**	22.4	22.9	**2%**
Cement and Lime	13.1	15.9	**22%**	59.6	60.7	**2%**
Glass	0.8	1.1	**36%**	5.9	5.9	**0%**
Pulp and Paper	0.5	0.5	**0%**	9.4	9.7	**4%**
Ceramics, Bricks, and Tiles	0.3	0.4	**9%**	11.5	11.7	**2%**
Metal Ore	-	-	**-**	0.4	0.4	**-2%**
Total	411.5	435.1	**6%**	337.9	348.3	**3%**

Source: McGuiness and Trotignon, MIT, December 2007.

Due to these discrepancies between the CITL and national registries, we are unable today to estimate the exact position for each installation, and thus for each country. For the UK and Spain, the inclusion of NER allocations implies major changes to national and sectoral positions. Other allocation decisions, like the withdrawal of allowances after installation closure, also need to be taken into account in order to draw an exact picture of the overall position of European installations.

From 2008 on, the CITL will provide full information on incumbent and new entrant allocations, allowances withdrawn due to closures, and the current balance of the new entrants' reserve. The only missing information will remain the current balance of the auctioning reserve.

The ghost of double counting

In December 2007, the consultancy group E3 announced that some blocks of allowances, uniquely identified by their ID numbers, had been used for compliance purposes by multiple installations. Our own analysis of these allowances led us to conclude that approximately 160 Mt were "double-counted" over 2005 and 2006. While this finding could have jeopardized the environmental integrity of the EU ETS, it was soon explained by the European Commission and the different registry developers.

First, the design of one of the existing registry, Greta, allows the allowances to be re-allocated once they are surrendered. The apparent double-counting results from its "last in – first out" working principle, and by the fact that the holding account into which EUAs were surrendered was also used to hold EUAs for allocations (new entrant reserve etc.). Some previously surrendered units were reallocated, but an equivalent number of allowances set aside for the new entrant reserve remained untouched and were subsequently cancelled by the UK. This mechanism is perfectly compatible with the Registry Regulation, as a unique ID is still associated to only one unique allowance (even though it may be used many times). A second explanation was that some corrections had been made at the national level and were not totally integrated in the CITL. Some installation owners who were not yet accustomed to the new system made mistakes in surrendering allowances on-line, in particular on the Seringas software. Registry managers decided to give them a second chance and cancelled the first operation. This cancellation seems to have been incompletely reflected in the CITL: only the number of surrendered allowances was erased, not the information related to the ID numbers of allowance blocks. Registry managers confirmed that no actual double-counting had occurred: no allowances were "cloned".

Thus, no double-counting actually occurred in national registries or in the CITL but allowance recycling did occur. The complete environmental integrity of the EU-ETS remains intact.

III. EMISSIONS TRADING BETWEEN SECTORS

A. The nine EU-ETS sectors and their characteristics

The list of CO_2 emitting activities is very long. For the sake of harmonization and simplicity, the European Commission required that installations be classified into nine sectors.

Table 2 – Description of CITL sectors

UNFCCC Sector	CITL Sectors
Energy	**1.Combustion installations** with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations) 2.Mineral oil **refineries** **3.Coke ovens**
Production and processing of ferrous metals	**4.Metal ore** (including sulphide ore) roasting or sintering installations 5.Installations for the production of pig **iron or steel** (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
Mineral industry	6.Installations for the production of **cement clinker** in rotary kilns with a production capacity exceeding 500 tonnes per day ; or **lime** in rotary kilns with a production capacity exceeding 50 tonnes per day ; or in other furnaces with a production capacity exceeding 50 tonnes per day 7.Installations for the manufacture of **glass** including glass fiber with a melting capacity exceeding 20 tonnes per day 8.Installations for the manufacture of **ceramic products** by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m³ and with a setting density per kiln exceeding 300 kg/m³
Other activities	9.Industrial plants for the production of (a) pulp from timber or other fibrous materials (b) **paper and board** with a production capacity exceeding 20 tonnes per day

Note: Sector 99 (opted-in installations) is not studied here because of its heterogeneity and its small share in allocation (0.5 Mt/yr).

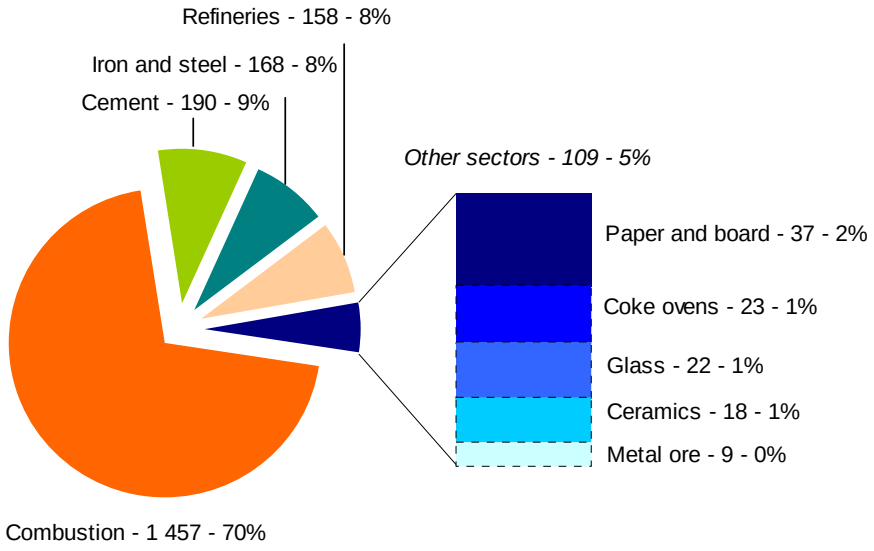
Source: Directive 2003/87/CE, Annex I.

This classification system has three main limitations in regard to our analysis:

- Classification is related to the main activity of the installation, a situation which is problematic for installations in which multiple activities take place. In these installations, all monitored emissions are inaccurately associated with only one activity.
- One sector can refer to somewhat disparate activities. For example, the combustion sector covers the production of heat and electricity, cogeneration, and combustion activities by industries such as food production, etc.
- The CITL does not provide technological details; for example it is impossible to separate steel making factories by the type of process used.

A large majority of EU ETS emissions come from the combustion sector. The entire energy sector (including combustion, refineries and coke ovens) represents almost 80% of total allowances allocated and 67% of installations. After the combustion sector, the refining, cement and iron and steel sectors together receive a little less than 10% of total annual allocations. The five remaining sectors make up 27% of the installations, but receive only 5% of total allocations.

Figure 14 – EU ETS sectors allocations in 2006: in volume (Mt) and percentage (%)



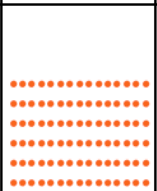
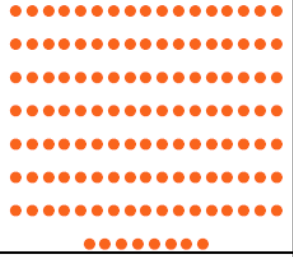
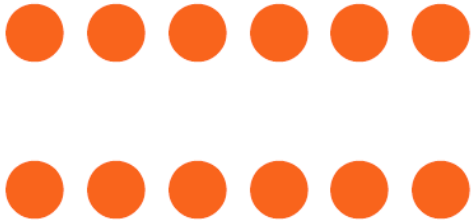
Source: CITL.

The situation within sectors is very diverse in terms of installation size and activity.

Chart 1 shows the sector typology. Coloured balls represent the 10,000+ installations covered by the EU ETS. Each cell contains a number of balls equivalent to 1/25 of the real number of installations in a given sector and a given size (so one ball represents 25 installations). To give a better understanding of the size difference between smallest and largest installations, the volume of each ball is proportional to its emissions.

There is great heterogeneity among the size of the installations covered by the EU ETS: the biggest installations can emit more than 3,000 times as much as the smallest installations, which is a very large spread when “only” 10,000 installations are concerned. Thus small installations do not seem to really count as they only represent 1% of total allocation. But they are still important from the market point of view, because they represent a much larger share of total market actors in number. Installation size may also vary greatly within a single sector, especially in the combustion and cement sectors.

Chart 1 – Sector typology of installations

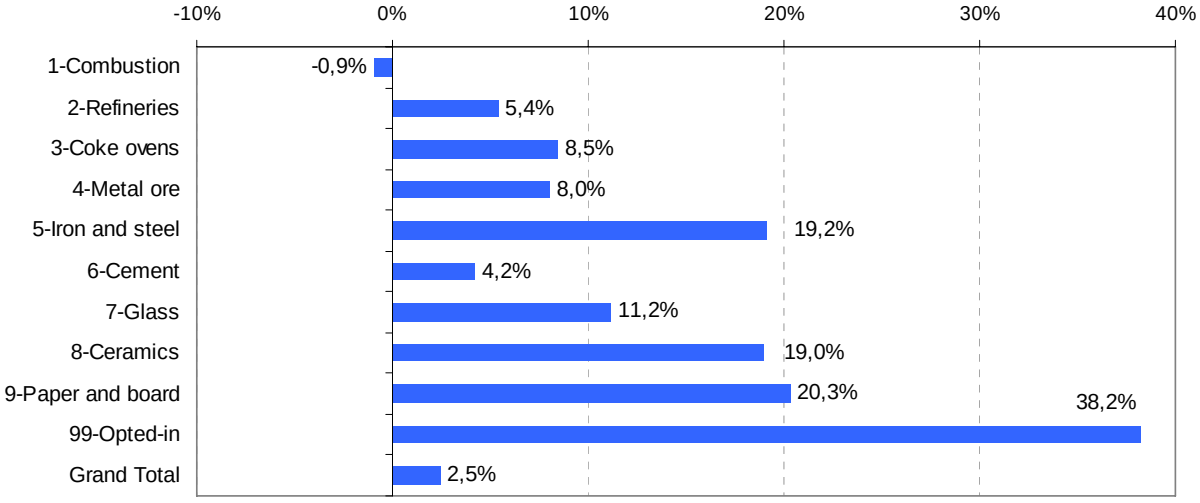
Representative sample (400 installations = 1/25 of the perimeter)						
	< 10 000 t	< 100 000 t	< 500 000 t	< 1 000 000 t	> 1 000 000 t	% of sector's emissions in sample's total emissions
1-Combustion						70%
2-Refineries						8%
5-Iron and steel						8%
6-Cement						9%
7-Glass						1%
8-Ceramics						1%
9-Paper						2%
% of size category's emissions in sample's total emissions	1%	7%	12%	12%	68%	

Source: CITL, authors' calculations.

The positions of CITL sectors: where is the constraint?

The sectors covered by the EU ETS in Phase I differed not only in terms of installation size and activity but also in terms of allowance allocations and actual emissions. The combustion sector was the only sector with a net allowance deficit (-0.9%). Since the combustion sector, primarily composed of power and heat producers, is less exposed to international competition than other CITL sectors (heat and electricity are difficult to transmit over long distances), it was often chosen by Member States to carry most of the emissions reduction burden. Conversely, the least constrained sectors (i.e. having emitted far less CO_2 than their allocation) were iron and steel (+19%), paper (+18%) and ceramics (+17%) which are more exposed to international competition.

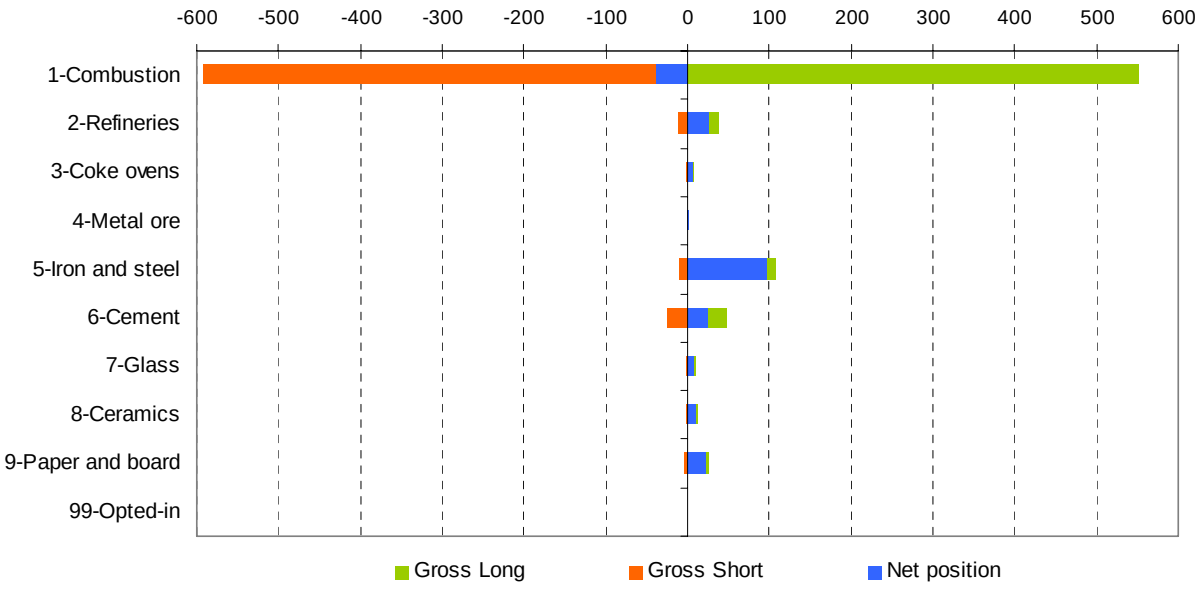
Figure 15 – Net position by sector as a percentage of sector allocation, 2005-2007



Source: CITL.

From the market perspective, what matters is how much installations were long or short on allowances. The position of the combustion sector was crucial as it was the main sector in the EU ETS allocation but also because it claimed over 91% of the EU-wide allowance shortage (591 Mt gross shortage). The surplus position of the European market was mainly due to large surpluses in the iron and steel sector.

Figure 16 – Sector gross and net positions in volumes (Mt), 2005-2007



Source: CITL.

B. The Combustion Sector through the X-ray

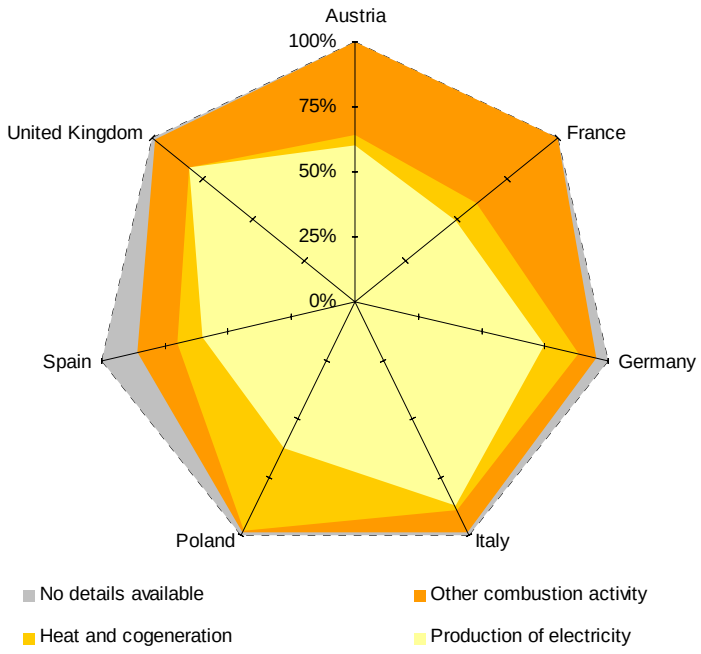
Because the combustion sector received the most allowances, it has had a remarkable influence on the CO_2 market. Understanding its position is necessary for an accurate overall assessment of the performance of the EU ETS.

Heterogeneity of activities within the combustion sector

The CITL data does not provide information on the exact activities of combustion installations, which can differ greatly from one installation to another. Thus, to determine the breakdown of activities within the combustion sector we supplemented the information available on the CITL with information contained in public reports on national registries, reports from environment ministries and National Allocation Plan (NAP) annexes. This analysis was conducted for seven countries: Germany, Poland, the UK, Italy, Spain, France and Austria. Their installations account for 70% of combustion sector emissions and 65% of the total number of combustion installations.

We chose to split combustion activities into three categories: (1) large electricity production plants, (2) district heating facilities (and cogeneration when details are available) and (3) other installations.

Figure 17 – Phase I allocations within the combustion sector for seven EU Member States

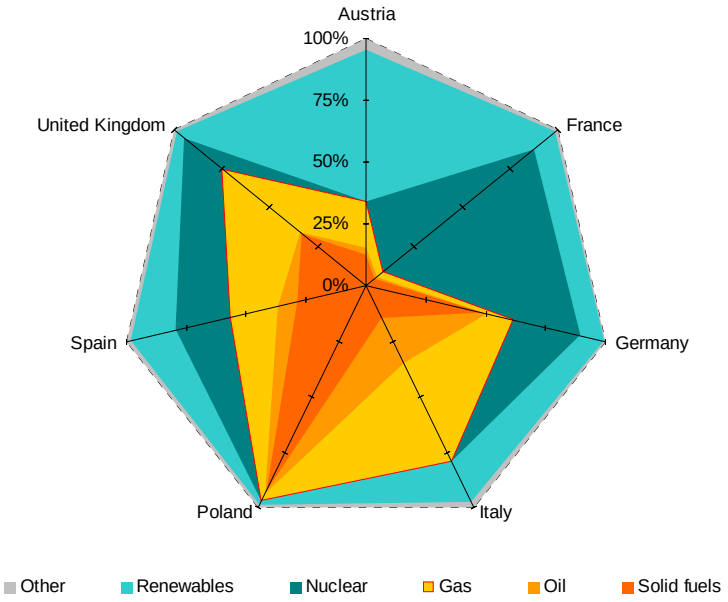


Note: The source document used for Spain did not contain details for each installation because it was edited in 2005 and many new installations entered the system in 2006.

Source: CITL, authors' calculations.

Once allowances are divided by activity, they appear to be mainly attributed to power plants. Power plant allocations represented more than 50% of the total combustion sector allocation (from 50% in France to more than 80% in Italy and the UK). District heating was more difficult to identify but its share in combustion allocation was usually around 10%. Other combustion activities represented around 15% of combustion allocations. Austria and France were two exceptions, with other installations receiving a relatively important share of the combustion sector allocation. This is because electricity production in these nations is less CO_2 intensive, with a greater reliance on hydro and nuclear power, respectively.

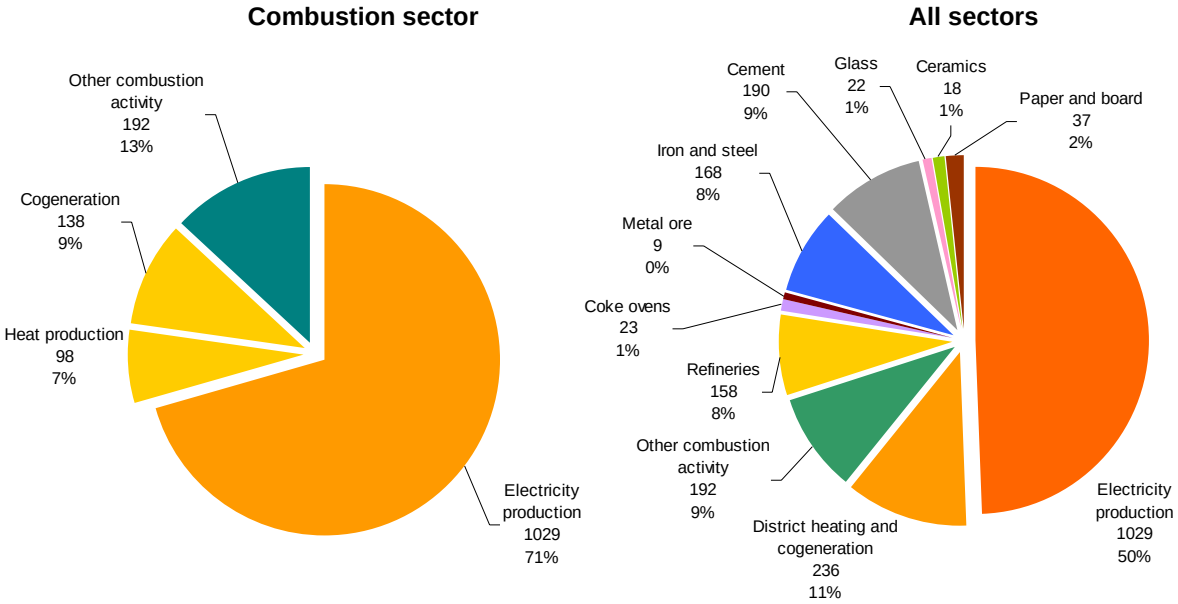
Figure 18 – Electricity production energy mix for seven countries



Source: European Commission.

Those results obtained at a seven-country level have been extended to the EU 25 level, using lists of electricity production capacities and assuming that unidentified installations follow the same pattern. It provides a gross estimation for a share of electricity production in allocation of approximately 75%. Heat and cogeneration reached around 15% of allocation and industrial production 10%.

Figure 19 – Phase I allocation: assessment of combustion sector split at the EU-level



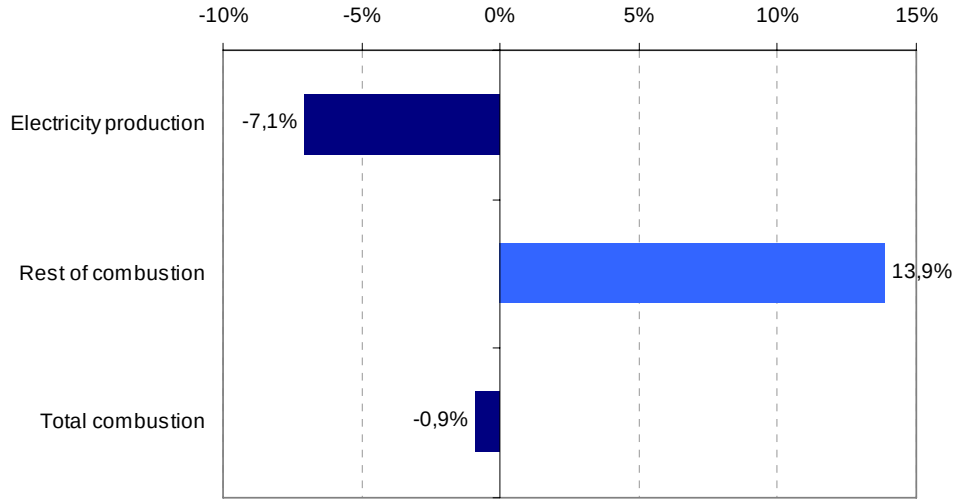
Source: CITL, authors' calculations.

Allocation versus emissions in the combustion sub-sectors

The diversity of the activities in the combustion sector is extraordinarily wide and is reflected in both positions and compliance strategies of combustion sub-sectors. Among aggregated sub activities, electricity production was by far the one that received the fewest allowances in proportion to its emissions (-7% on average).

The scarcity of allowances in the whole combustion sector (around -1%) is mainly explained by a deficit in the electricity production sector (-7%), a scarcity that was not entirely compensated by the excess of allowances (around 14%) in the other combustion sub-sectors. Electricity production was thus the only sub-sector among all CITL sectors that was globally in demand position. We will focus most of our attention on those installations, especially in the following analysis of surrendered allowances and trade patterns.

Figure 20 – Combustion sub-sectors net position, as a percentage of allocation (for the seven countries studied representing 70% of combustion allocation)



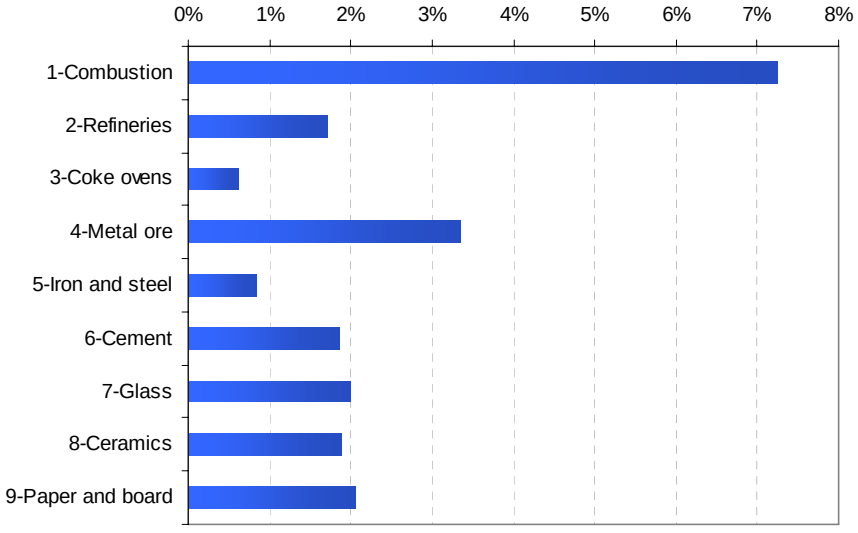
Note: "Rest of combustion" may include some electricity production facilities that were not identified.

Source: CITL, NAPs, public registries reports, authors' calculations.

C. Allowance flows between sectors: a first assessment

The calculation of gross and net transfers between sectors is impossible because no CITL information exists on where surrendered allowances originated. We only have installation-level data on where allowances were ultimately surrendered. We chose to estimate allowance transfers by looking at the number of foreign allowances surrendered by each sector, i.e. the allowances issued in another Member State.

Figure 21 – Percentage of foreign allowances in total surrendered by each sector over 2005-2007

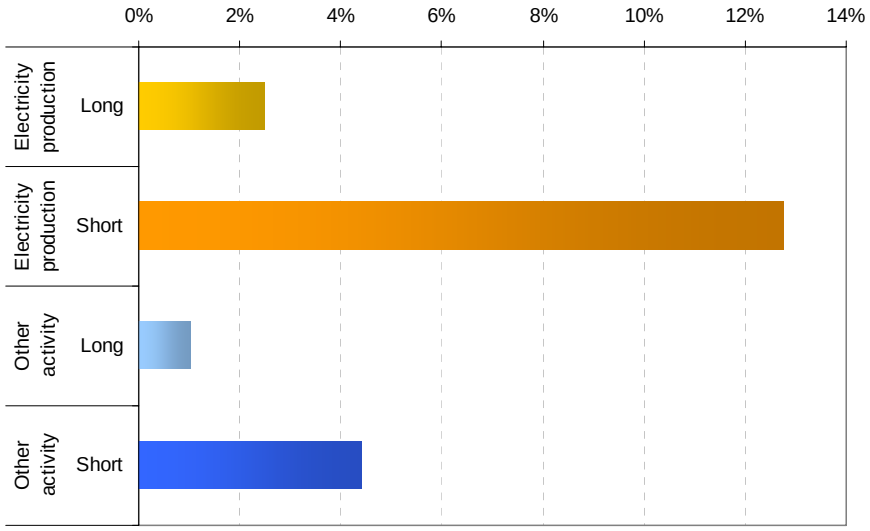


Source: CITL.

In volume, combustion installations surrendered 93% of all foreign allowances; cement 3%; refineries 2%; iron and steel 1%. This is a direct consequence of the sector level of carbon constraint: short sectors had to buy on the European market. Long sectors essentially used their allocation to comply with their obligation and did not buy as many allowances on the market.

Within the combustion sector, 13% of allowances surrendered by short electricity production plants were issued in another Member State; three times more than for short installations from all other activities. This may be explained by the fact that (1) utilities experience more shortage than other sectors and thus may have to obtain allowances from elsewhere. (2) Most utilities operate in multiple Member States and intra-company transfers are cheaper than trades on the market, and (3) actors in the electricity sector have more experience with and/or more confidence in the European market.

Figure 22 – Share of foreign allowances in total surrendered in the combustion sector: comparison of installations in electricity production and in other sub-sectors



Notes: Long (resp. short) installations received more (resp. less) allowances than their actual emissions level. "Other activity" may include some electricity production facilities that were not identified.

Source: CITL, NAPs, Member States public reports, authors' calculations.

Interestingly, long installations also surrendered allowances that were originally issued to installations operating in other Member States (2.5% of all foreign allowances), despite the fact that they did not need them for compliance. This may be explained by the fact that we considered the first Phase as a whole and that a few installations were alternatively short and then long during that period. Two other explanations may be suggested: incorrect anticipations in the management of allowances; and possible speculation on the carbon market (speculation seems unlikely on a spot market).

IV. REAL MARKET PLAYERS ARE NOT INSTALLATIONS BUT FIRMS

Market participants as they appear in the CITL are 10,000+ independent installations. To these potential players must be added any other entities eager to participate in carbon trading, as anybody can buy and sell EUAs. However, this picture is too simplistic to reflect how the market really functions: among installations, some belong to the same company. Individual market players have an economic incentive to get the highest price possible when they are selling and the lowest if there are buying.

For the same reason that agricultural producers have a common interest in aggregating their production, installations in the EU-ETS have an incentive to manage their carbon assets in common at the corporate level for example. This facilitates long term strategies, limits risks for individual installations and allows a more efficient use of the limited expertise on such a new market. This possibility is offered in the EU Directive and is known as "pooling".

The pooling option created by the European Directive allows companies in the same Member State to pool their allowances and requires installations to request the European Commission's approval. This option has not been used much during the first Phase: the European Environment Agency reports that only 16 pools formed in 2005, mostly in France. In Finland, the Netherlands and Sweden, pooling is not possible under national law. Nevertheless some firms used the opportunity to manage their allowances at the corporate level through simple joint management arrangements, including carbon desks that managed all the allowances received by a group of installations.

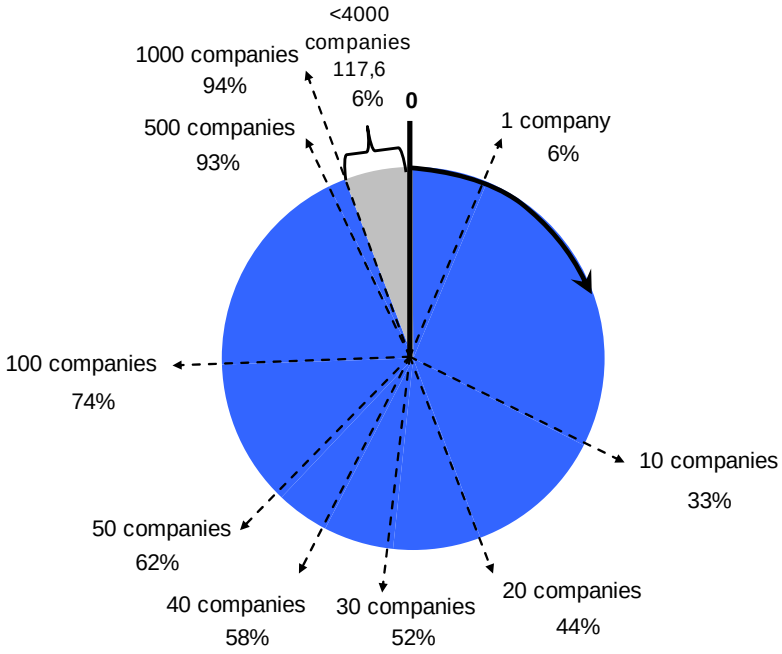
Real actors on the market are thus probably less than 10,000. The next section attempts to quantify the number of significant actors on the market and the potential impact on the market's concentration.

A. From installations to companies: impact on allowance concentration

We performed an in-depth analysis of the CITL accounts and tried to match the allowances with the companies that originally owned them. This information is not provided by the CITL data. Group consolidation was conducted by affecting subsidiaries' emissions to the holding company when its share was more than 50% in the subsidiary. Results are thus indicative.

Figure 23 below is a visual representation of the allowances market and of the cumulative share received by company. Only 6% of the allocations could not be attributed to a given identified company. This corresponds to 4,000 installations, mostly very small installations from the ceramic sector.

Figure 23 – The concentration of market actors: a few companies hold most of the allowances

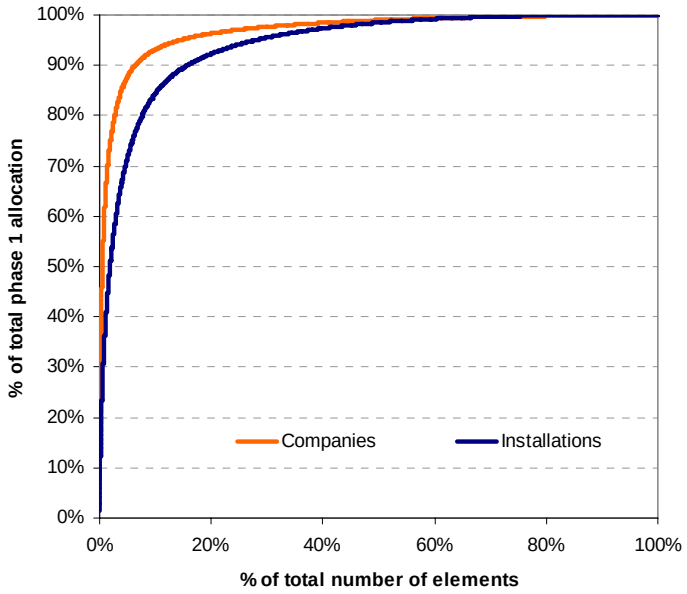


Source: CITL, authors' calculations.

The first company in terms of allocation received 6% of total allowances, a total equal to that received by the 4,000 unidentified installations. The 10 first companies own a third of the allowances market; the 30 first companies own half of the allowances; the 100 first have three quarters of the allowances; the 500 first have 93% of the allowances. Adding 500 more companies changes almost nothing.

Figure 24 shows the effect of company aggregation on the concentration of allowances among market actors. The blue line shows the "initial" allowance concentration at the installation level; the red line shows what the real concentration is when the results for companies holding multiple installations on the CITL are aggregated.

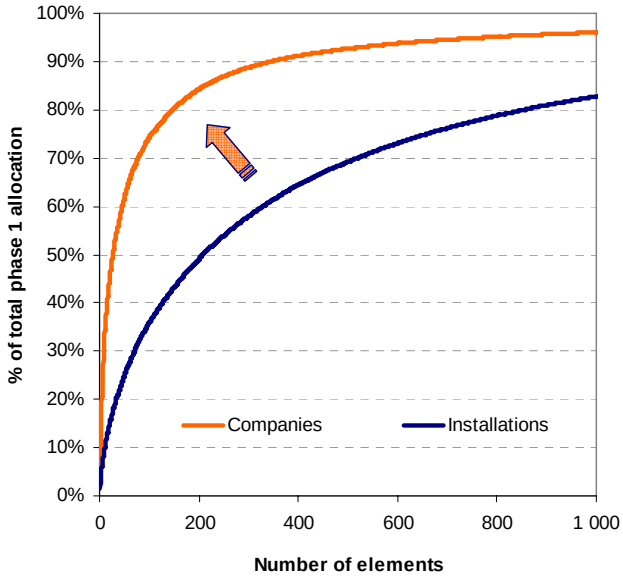
Figure 24 – Effect of company aggregation on allocation concentration in Phase I



Source: CITL, authors' calculations.

Actual allowance concentration is in reality higher by 10% to 40% (thus supporting our hypothesis of joint allowance management at the company level). Naturally, it is particularly important for the largest companies, which is not surprising given the inclusion of the electricity sector where the installations are large and companies typically own a number of plants. This is also true in other sectors, in particular iron and steel.

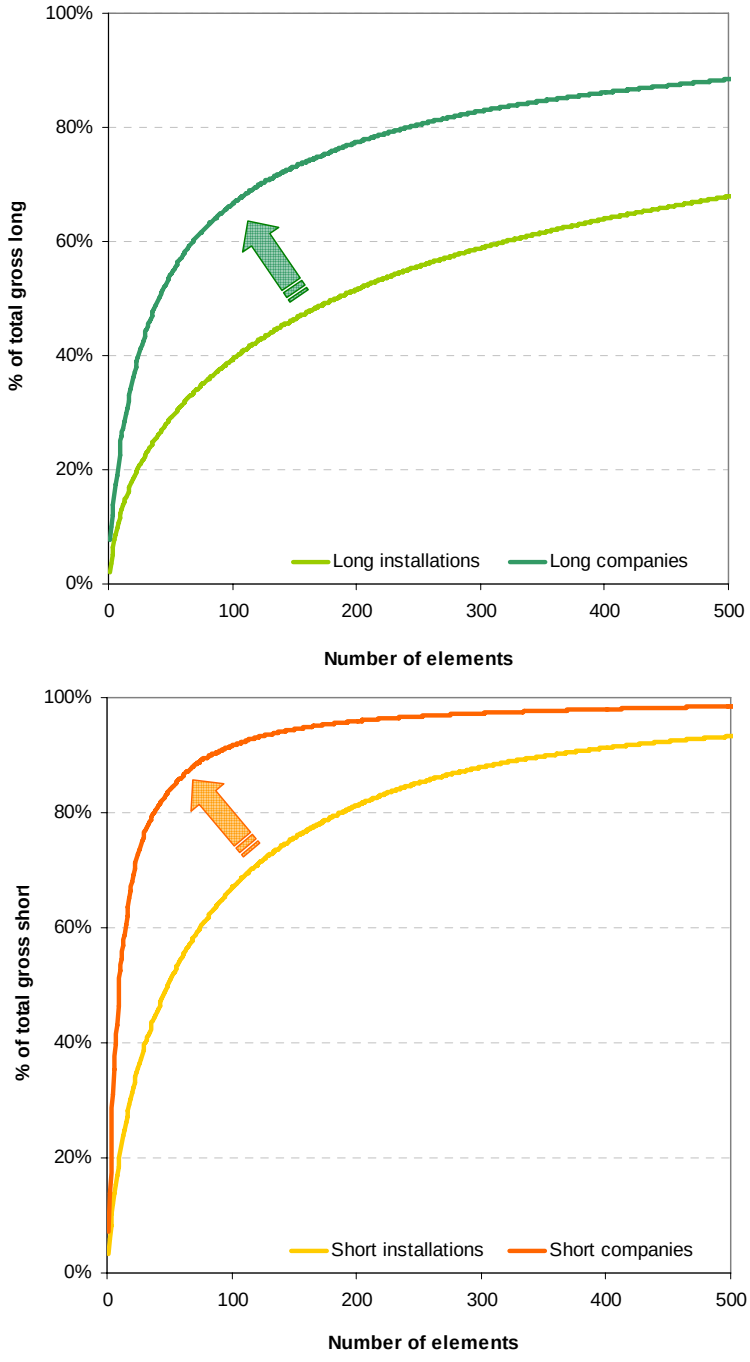
Figure 25 – Allocation concentration for the 1,000 largest companies and installations in Phase I



Source: CITL, authors' calculations.

Allowance shortages and surpluses are also concentrated among a few companies. The analysis of the cumulated gross surplus at the company level increases the concentration by maximum 25%. 50% of the potential supply of allowances is provided by 150 installations representing 30 companies. For the cumulated gross shortage concentration, we found it higher by a maximum of 40% when considered at the company level: 50% of the potential demand is represented by 50 installations and 10 companies. Again those results should be taken with caution as they assume companies employ complete joint management of all their installations' allowances.

Figure 26 – Effect of company aggregation on long and short installations



Source: CITL, authors' calculations.

The concentration appears to be asymmetric: it is more important on the demand side of the market, whereas the offer seems mainly constituted of small installations owned by small companies which have smaller surpluses.

B. The fundamental role of utilities

Apart from direct abatement, companies had multiple other ways to satisfy their need of carbon allowances. They may have:

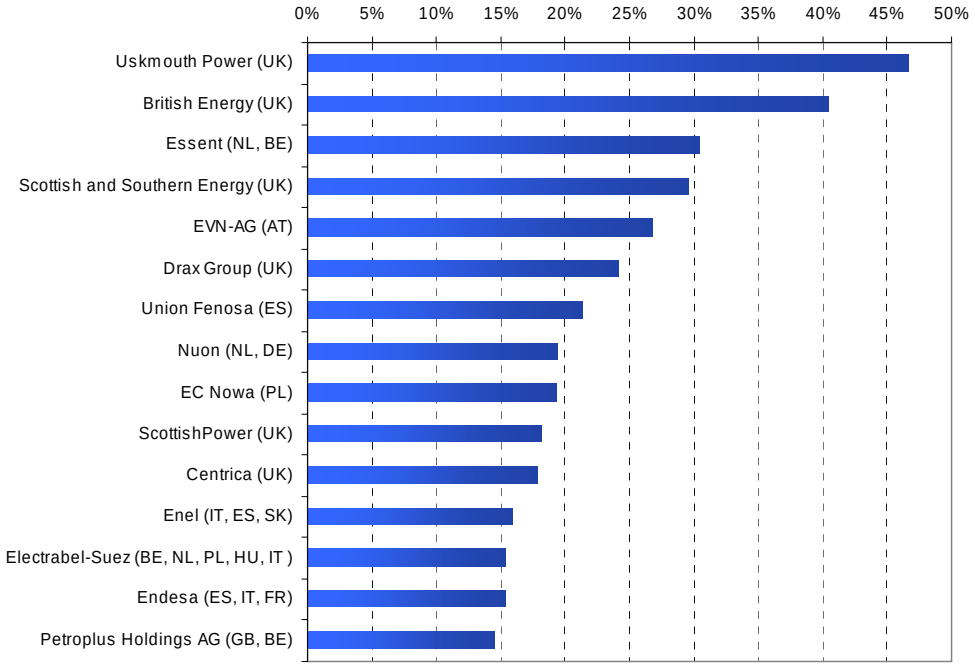
- Used pooling or joint management of their installations' allowances at the national level if the same company owned multiple installations in the same country;
- Used joint management of their installations' allowances at the European level if the same company owned multiple installations in different countries;
- Purchased allowances on the market (national or cross-border transactions, by OTC contracts or on market places)

The CITL only gives access to the number of foreign allowances surrendered, and does not display the distinction between allowances coming from a pooling account or from another account. We thus evaluated the potential carbon management strategies used by companies with their use of international allowances.

Reducing the cost of compliance: the most active companies

Most companies that surrendered a large share of allowances issued in another Member State were located in countries with net deficit of allowances (especially in the UK), and belonged to the Electricity production sector. Uskmouth Power (Welch Power), British Energy, Essent, Scottish and Southern Energy and EVN-AG all surrendered more than 25% of allowances issued in another Member State.

Figure 27 – Top 15 companies having surrendered for their compliance the largest share of allowances issued in another Member State in Phase I
(among those who surrendered more than one million allowances issued in another country)

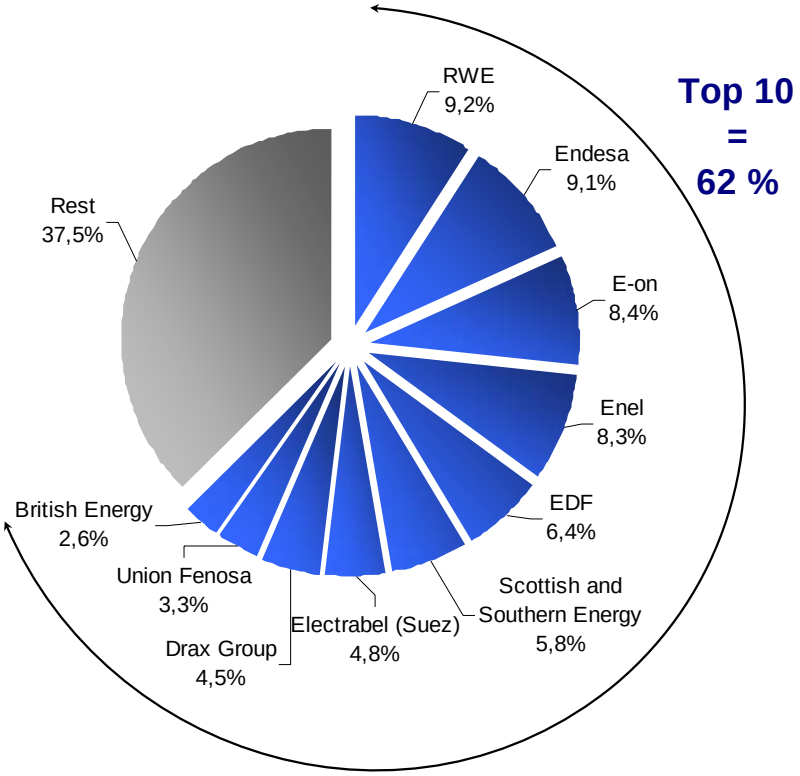


Note: in parentheses are the main countries in which EU-ETS installations of companies are located. It does not indicate headquarters location or an exhaustive list of countries in which they operate.

Source: CITL, authors' calculations.

At the European level, ten companies surrendered 62% of the total surrendered amount of allowances issued in another Member State. All of them were electricity producers, which confirms their importance as active actors on the international market during the first phase.

Figure 28 – Companies share in the total foreign allowances surrendered



Source: CITL, authors' calculations.

Many of these companies had operations in several Member States. Again, it would be reasonable on a transaction cost basis to expect these companies to transfer allowances from surplus in one country to installations with a deficit in another Member State. Those would be internal transfers but they would show up as cross borders flows in these data.

ANNEX I - METHODOLOGY USED TO DETERMINE INSTALLATION ACTIVITIES AND THE FIRMS THAT OWN EACH INSTALLATION

Methodology used to determine the activities of combustion sector installations

Details on installations activities were extracted from the following official Member States sources (NAPs, national registries public reports, ministries of the environment etc.), and merged with existing CITL data using installations permit number as a key:

- *http://umwelt.lebensministerium.at/filemanager/download/8755/*
- *http://www.dehst.de/cln_006/nn_76410/SharedDocs/Downloads/DE/Anlagen__dl/Anlagenliste_20_28PDF_29,templateId=raw,property=publicationFile.pdf/Anlagenliste%20(PDF)*
- *http://www.mma.es/secciones/cambio_climatico/pdf/ley_1_2005_inf_cump.pdf*
- *http://www.ecologie.gouv.fr/IMG/pdf/liste_declaration-verifiees_validees_MEDD29052006.pdf*
- *http://www2.minambiente.it/Sito/settori_azione/pia/att/pna_c02/docs/schema_PNA2.pdf*
- *http://www.defra.gov.uk/environment/climatechange/trading/eu/phase2/pdf/nap-annex-1-list-installation-level-allocations.xls*

Methodology used to identify companies

Every CITL account is associated to three persons: the account holder (a company or the name of a person) and two authorized representatives of the account holder. Details are given on these three people which allow more investigation on the account holder. For the installation where no information is available from the account's details, a quick look at the account's representatives email address facilitates the identification.

To identify as quickly as possible the largest share of EU-ETS allocation, we follow the process for installations in a decreasing allocation order. The matching process was stopped when the share of identified 2006 allowances reached around 95% (from 37% to 100% depending on the sector). This corresponds to 60% of the total number of installations.

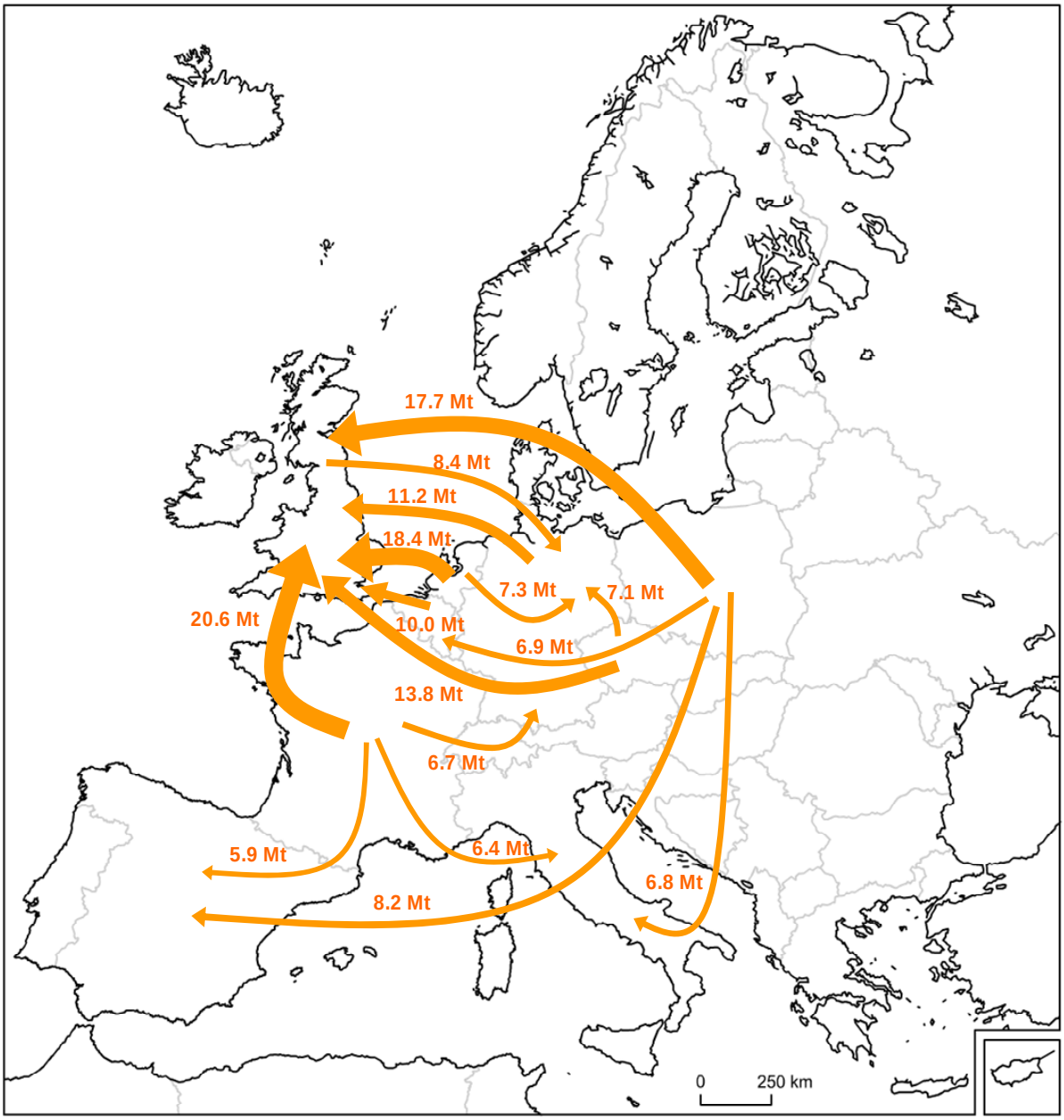
Table 3 - Scope of identified installations by sector

Sector	Identified share of allowance (2006)	Identified share of the number of installations
1-Combustion	93,9%	59,8%
2-Refineries	99,8%	98,0%
3-Coke ovens	100,0%	100,0%
4-Metal ore	99,1%	91,7%
5-Iron and steel	99,6%	96,9%
6-Cement	98,8%	91,9%
7-Glass	76,3%	61,0%
8-Ceramics	37,0%	29,6%
9-Paper	69,8%	50,6%
All sectors	94,3%	60,5%

Source: CITL, authors' calculations.

The aim of the study is not to build an exhaustive list of all the companies and their exact footprint in the CITL, but to quantify the concentration of real actors on the market by estimating the weight of the biggest companies.

ANNEX 2 – THE 15 BIGGEST EX-POST FLOWS BETWEEN MEMBER STATES



Source: CITL (2007), authors' calculations.

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