Stringency and Distribution in the EU Emissions Trading Scheme –The 2005 Evidence

Claudia Kettner, Angela Köppl,
Stefan P. Schleicher and Gregor Thenius

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Claudia Kettner, *Wegener Center for Climate and Global Change and Austrian Institute of Economic Research*
Angela Köppl, *Austrian Institute of Economic Research*
Stefan P. Schleicher, *Wegener Center of Climate and Global Change and Economics Department University of Graz*
Gregor Thenius, *Austrian Institute of Economic Research*

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Summary

With the release of the verified emissions for installations covered by the EU Emissions Trading Scheme for the first trading year 2005 we are able to compare actual emissions and allowances for each installation. Based on data available for 24 Member States as of January 2007, this paper uses a thorough data analysis for about 9,900 installations to investigate evidence on three issues: first, the stringency of the total allocation cap and allocation differences both among the Member States and a selection of emission intensive sectors; second, the distribution of the size of installations; and third, the spread of allocation discrepancies and possible allocation biases regarding the size of installations.

Keywords: Emission Trading, EU Emissions Trading Scheme, Climate Policy

JEL Classification: D61, O1, Q51, Q54

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Address for correspondence:

Stefan P. Schleicher
Austrian Institute of Economic Research
Arsenal, Objekt 20
A-1030 Vienna
Austria
Phone: +43 676 591 3150
Fax: +43 1 798 9386
E-mail: Stefan.Schleicher@wifo.at

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1 Motivation

The EU Emissions Trading System (EU ETS) that covers about 40% of total EU CO_2 emissions is the biggest implementation worldwide of a cap-and-trade mechanism to curb emissions. This innovative policy instrument is both a milestone and a strong incentive for starting similar activities in other regions of the world. Since May 2006 the results for 2005 verified CO_2 emissions on installation level are thus providing indications about short and long positions for the first trading period 2005-2007 of the EU ETS.

Based on data available for 24 Member States by January 2007, this paper uses a thorough data analysis for about 9,900 installations to investigate evidence on three issues: First, the stringency of the total allocation cap and differences both among the Member States and a selection of emission intensive sectors by identifying patterns of allocation discrepancies, the difference between allocated emission allowances and actual emissions; second, the distribution of the size of installations which is in particular relevant for dealing with very small and very large installations; and third, the spread of allocation discrepancies and possible allocation biases which might point both to successful abatement activities but also to distorting distributional impacts.

By focusing on evidence about distortions created by differences in the behaviour of Member States in their allocation policies and the distributional aspects of the EU ETS, this paper complements work presented by Ellermann and Buchner (2006) which emphasizes evidence on abatement activities.

The structure of the paper is as follows. After highlighting the main features of the EU ETS, the principles for preparing the National Allocation Plans 2005-2007 are discussed. Subsequently, we present the methodology for the data analysis and indicators for stringency and distributional characteristics of installations and allocations. After providing some caveats as to the interpretation of the first year trading results in the context of competitiveness and abatement issues we draw conclusions that may be relevant for the EU ETS review.

2 Main features of the EU ETS

The Directive 2003/87/EC (EC, 2003a) established a scheme for greenhouse gas emission allowance trading within the Community. The EU Emissions Trading Scheme (EU ETS) started in January 2005. Since May 2006 results for 2005 on verified emissions on an installation level and thus indications about short and long positions on country, sectoral and installation level have become available. Missing or incomplete data have since been added continuously.

The EU ETS has a surprisingly short history. Following the Kyoto Protocol in 1997, which aimed to set quantitative, binding reduction targets for greenhouse gas emissions in the industrialised and transition countries, the EU started an internal process of analysing policies and measures in order to reach the set emission reduction targets. As one of the policy instruments, an emission trading scheme for industry was discussed. In the year 2000 the Green Paper on greenhouse gas emissions trading within the European Union (EC, 2000) was issued and several design issues for such a system were analysed (Stewart and Sands, 2000). The decision making process led to a proposal for a framework Directive for green-

house gas emissions trading within the European Community in 2001 (EC, 2001), and after the subsequent discussion process to the adoption of "Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC" (EC, 2003a), which defines the benchmarks and criteria used to operate the system and identifies the framework governing national legislation. It is considered the cornerstone of EU climate policy for achieving the reduction targets of the Kyoto Protocol.

Since the beginning of 2005 the European Union has regulated CO_2 emissions from energy intensive industries in the framework of the EU ETS with the following key design elements:

Limitation to four industrial sectors

- Energy activities (combustion installations with a rated thermal input exceeding 20 MW, mineral oil refineries, coke ovens),
- Production and processing of ferrous metals (metal ore sintering or roasting, production of pig iron and steel),
- Mineral industry (cement clinker, glass, ceramic products),
- Other activities (pulp and paper).

A cap and trade system

Using guidelines provided by the Commission, each Member State decides on the total national emission allowances to be allocated to the installations involved. These EU Allowances (EUAs), which were issued for Phase 1 (the pre-Kyoto phase 2005-2007), are tradable. The allocation for Phase 2, congruent with the Kyoto compliance period 2008-2012, is currently under preparation. At least 95% of allowances in Phase 1 and 90% in Phase 2 are allocated free of charge in accordance with the installations' historical emissions ("grandfathering").

National Allocation Plans

In Annex III of the Directive, criteria for the design of the National Allocation Plans are provided. These include consistency with the Member State's emission target and projected progress towards fulfilling the target, considerations regarding the activities' (technical) potential for reducing emissions, consistency with other Community legislation and policy instruments, avoidance of unduly favouring certain undertakings (related to State aid provisions), required information on the treatment of new entrants, and early action.

Linking with the Kyoto Mechanisms

Certified Emission Reductions (CERs) from the Clean Development Mechanism (CDM) have been acknowledged in the EU ETS since 2005, and Emission Reduction Units (ERUs) from the Joint Implementation (JI) mechanism for offsetting domestic emissions will be acknowledged starting in 2008, with Member States determining the limit on the linkage.

Compliance provisions

Emissions are strictly monitored and must be verified. Penalties for non-compliance are €40 per ton of CO_2 in Phase 1 and €100 per ton of CO_2 in Phase 2.

The Member States are responsible for allocating emission allowances to sectors and installations in a National Allocation Plan. The EU provides guidelines" (EC, 2003b) for the allocation process, but leaves the allocation details up to Member States. Nevertheless, National Allocation Plans must be approved by the Commission, which sets criteria in Directive 2003/87/EC with respect to the allocated quantities of allowances.

3 The National Allocation Plans 2005 - 2007

By setting emission caps, the Member States' National Allocation Plans define the market for CO_2 allowances. For a detailed elaboration on the Member States' National Allocation Plans of the first trading period see e.g. Betz et al. (2004) and German Emissions Trading Authority (2005).

In general, emission trading under the EU ETS covers 30-50% of the total national greenhouse gas emissions in each of the member states, including a minimum of 19 installations in Luxembourg and a maximum of over 1,800 installations in Germany.

In six countries, the National Allocation Plans contain provisions for opt-ins (additional inclusion of installations not captured by the Directive) and opt-outs (exclusion of installations captured by the Directive). Opt-ins play a major role in Finland and Sweden, where small combined heat and power plants are included. Opt-outs are most important for the Netherlands, where 142 smaller installations are instead covered by a voluntary agreement, and the UK, where 59 installations were included in the National Emissions Trading System until 2006 and another 329 installations are covered by other climate change agreements.

When designing the allocation process, most Member States started with a total cap for the ETS sectors before allocating the allowances to the different installations. According to the guidelines of the European Commission, the total cap of each country has to be consistent with the Kyoto target. While most of the new Member States have already substantially "over-fulfilled" their Kyoto targets, only four countries of the former EU-15 (France, Greece, Sweden and the UK) have met their reduction targets so far, while the other countries still exceed 1990 emissions, some by as much as 24%.

All of the 25 Member States allocated the allowances to incumbent installations based on their historical emissions in a certain base period (grandfathering) to which in some cases a sectoral benchmark or a sector-specific growth factor were applied. The base periods cover 1 to 10 years; in some countries the year with the lowest emissions could be excluded. In some countries, process-related emissions and energy related emissions were treated differently in the allocation process.

In general, all Member States allocated allowances free of charge in the first emissions trading period, but Denmark will auction 5% of its total allocation, Hungary 2.5%, Lithuania 1.5% and Ireland 0.75%.

Allowances to new entrants are also allocated free of charge in all countries generally using some kind of sector benchmark. Some Member States differentiate between known and unknown new entrants where known new entrants are included in the National Allocation Plan, while unknown new entrants are allocated from the reserve. For the overall ETS, the countries' new entrants reserves add up to 102 million tons of CO_2 per year, which equals 4.7% of the total volume of allowances.

4 Method of the data analysis

Installations covered by the EU ETS need to have an account with their national registries, which record the verified emissions per installation and every transaction between installations. Data collected by national registries are transferred to the European registry, the so-called Community Independent Transaction Log (CITL).

Since May, 2006 data on verified emissions for installations have been published by the CITL. As of January, 2007 the database includes 10,145 installations for 25 EU Member States. From all Member States except Malta, verified emissions are available for 9,867 installations. Using information from National Allocation Plans, these installations were assigned to sectors.

The data analysis is performed on different levels of aggregation with indicators for the stringency of allocation, the distribution of the size of installations and the spread of allocation discrepancies.

Levels of aggregation

The analysis of the installation data is based on indicators for three levels of aggregation:

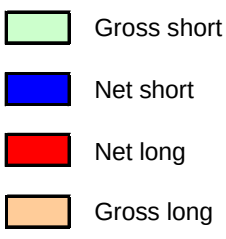
- the total of all EU Member States
- the individual Member States and
- a cross-country selection of emission-intensive sectors

Indicators for the stringency of allocations

The following indicators are calculated for the stringency of the allocations:

- the *short* or *long position of an installation* as the difference between allocated and verified emissions of an installation
- the *gross long position* of a country or a sector as the sum of all long positions of installations for a country or a sector
- the *gross short position* of a country or a sector as the sum of all short positions of installations for a country or a sector
- the *net long position* of a country or a sector as the difference of gross long positions and gross short positions of a country or a sector if this difference is positive
- the *net short position* of a country or a sector as the difference of gross long positions and gross short positions of a country or a sector if this difference is negative

With these four indicators (gross long, gross short, net short and net long) the differences between allocated allowances and actual emissions – the allocation discrepancy – are calculated in tons or as a percentage of allowances. In the figures these indicators are marked by the following colour scheme:



Indicators for the size distribution of installations

Both for countries and sectors we rank the installations according to their allocated emissions as a percentage of the country and sector totals as an indicator of the size distribution, respectively.

Indicators for the spread of allocation discrepancy

Allocation discrepancies – the difference between allocated allowances and actual emissions – vary considerably between countries and sectors. Besides the net position of a sector or a country expressed by net long or net short positions, we analyse the spread of these discrepancies. We normalize the standard deviation of allocation discrepancies of a country or a sector by the corresponding mean allocation discrepancies in order to obtain a rescaled and thus comparable cross-country or cross-sector indicator.

5 Stringency of the allocation caps

5.1 The overall evidence

The Commission guidelines for preparing the National Allocation Plans were aimed at setting a unified framework for the EU Member States in their preparation of the first National Allocation Plans. Assuming that all countries had a similar interpretation of the EU guidelines, one would anticipate more or less congruent National Allocation Plans that exhibit similar stringencies of the allocation caps. One could therefore expect that allocation discrepancies, the difference between allocated EU Allowances (EUAs) and verified emissions, would not show large differences between countries. This hypothesis is not supported by our analysis, as we find large variations with respect to allocated EUAs and verified emissions.

As indicated in Table 1, in 2005 EU allowances for 2,029 million tons CO_2 were allocated, but only 1,932 million tons verified. The market was long with 93 million tons (based on installations where data both on allocated EUAs and verified emissions were available) corresponding to 4.6% of the allocated allowances. This net long position is the balance of a 13.0% gross long position, the relative amount of allowances allocated to installations above their verified emissions, and an 8.4% gross short position, the relative amount of allowances below their verified emissions. Obviously, in addition to the net position the spread of allocation positions also deserves attention.

At this stage, a first caveat for the interpretation of these numbers is appropriate. We deliberately do not use the terms “over-“ or “under-allocation” since this might suggest faulty allocations by the authorities responsible for the Allocation Plans. It is conceivable that the observed allocation discrepancies - the difference between allocated EUAs and the verified emissions - result from abatement efforts. The extent to which this is plausible will be discussed in section 7.

5.2 The Member States evidence

Table 1 in addition exhibits a summary of the allocation discrepancies by Member States. Differences as to the size of the Member States and their emissions intensity can be depicted from Figure 1, which ranks the Member States according to their emission allowances.

An outstanding position with a share of more than 25% of EU-allocated allowances accrues to Germany, which together with Italy and the UK accounts for almost half of the emissions covered by the EU ETS.

Table 1: Short and long positions by countries (2005)

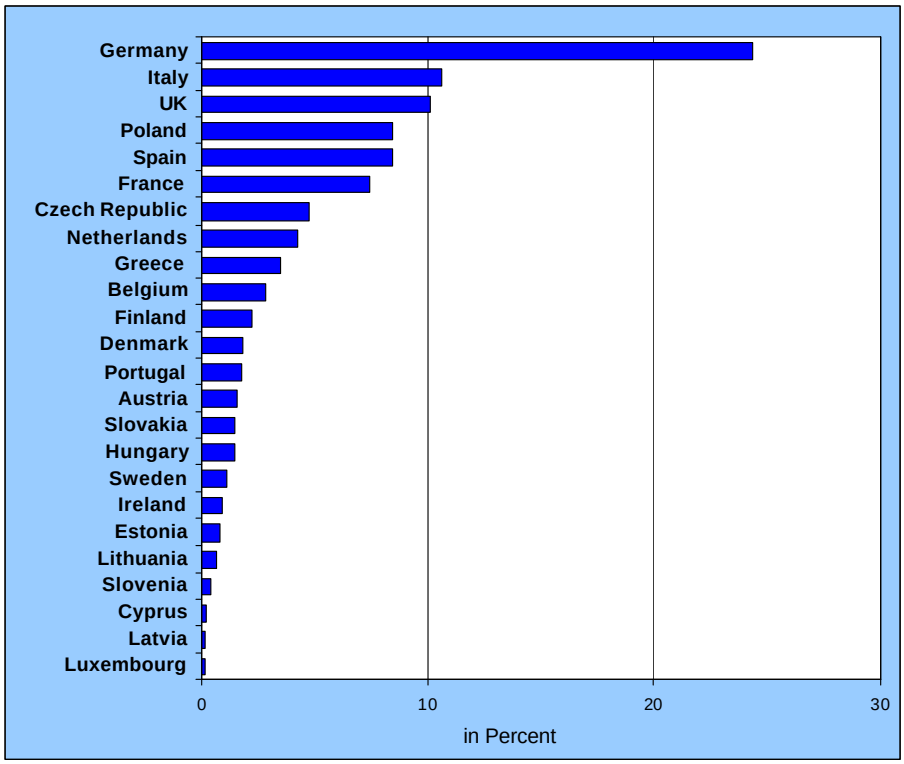
	Allocation	Verified emissions	Short		Long		Net	
	2005 t CO2	2005 t CO2	Absolute t CO2	Relative Percent	Absolute t CO2	Relative Percent	Absolute t CO2	Relative Percent
EU	**2,029,934,739**	**1,932,613,313**	**170,447,411**	**8.4**	**263,591,040**	**13.0**	**93,233,642**	**4.6**
Austria	32,414,872	33,372,841	3,311,430	10.2	2,351,243	7.3	-960,187	-3.0
Belgium	58,311,087	55,355,164	9,987,450	17.1	12,943,373	22.2	2,955,923	5.1
Cyprus	5,471,353	5,078,877	408,077	7.5	800,553	14.6	392,476	7.2
Czech Republic	96,910,587	82,454,636	99,513	0.1	14,621,924	15.1	14,521,211	15.0
Denmark	37,303,720	26,470,128	125,549	0.3	10,960,607	29.4	10,835,058	29.0
Estonia	16,747,054	12,621,824	14,832	0.1	4,135,473	24.7	4,120,641	24.6
Finland	44,614,146	33,051,851	435,223	1.0	11,997,518	26.9	11,562,295	25.9
France	150,393,692	131,257,908	4,220,529	2.8	23,340,426	15.5	19,119,897	12.7
Germany	494,988,690	469,360,766	20,598,548	4.2	46,116,676	9.3	25,518,128	5.2
Greece	71,135,034	71,250,370	5,324,854	7.5	5,139,364	7.2	-185,490	-0.3
Hungary	30,236,166	25,954,360	1,105,683	3.7	5,384,891	17.8	4,281,806	14.2
Ireland	19,236,747	22,366,765	4,200,654	21.8	1,070,636	5.6	-3,130,018	-16.3
Italy	215,843,610	224,857,053	27,889,810	12.9	18,606,822	8.6	-9,282,988	-4.3
Latvia	4,070,078	2,852,578	21,988	0.5	1,239,488	30.5	1,217,500	29.9
Lithuania	13,503,454	6,603,869	7,046	0.1	6,902,575	51.1	6,899,585	51.1
Luxembourg	3,229,321	2,603,349	0	0.0	625,972	19.4	625,972	19.4
Netherlands	86,452,491	80,351,292	6,151,089	7.1	12,252,288	14.2	6,101,199	7.1
Poland	172,278,400	136,802,817	639,891	0.4	32,480,474	18.9	31,840,583	18.5
Portugal	36,896,041	36,424,737	1,771,813	4.8	2,243,117	6.1	471,304	1.3
Slovakia	30,470,677	25,231,769	131,348	0.4	5,285,697	17.3	5,238,908	17.2
Slovenia	9,138,064	8,703,921	137,055	1.5	571,198	6.3	434,143	4.8
Spain	171,976,163	182,893,568	34,461,507	20.0	23,609,628	13.7	-10,851,879	-6.3
Sweden	22,281,227	19,315,482	3,557,277	16.0	6,410,175	28.8	2,852,898	12.8
UK	206,032,065	237,377,388	45,846,245	22.3	14,500,922	7.0	-31,345,323	-15.2

Source: CITL; own calculations

As indicated in Figure 2, in 2005 only six out of the 24 countries were in a short position up to 31.3 million tons (United Kingdom). The remaining 18 countries were long up to 31.8 million tons (Poland). A similar ranking according to the relative allocation discrepancy, the percentage of net long or net short positions relative to the amount of allowances, is contained in Figure 3. We realize that all new Member States allocated more allowances to their installations than needed in the first trading year. In the Czech Republic, Estonia, Lithuania and Slovakia, each installation received more allowances than needed, so that no gross short position is observed in these countries.

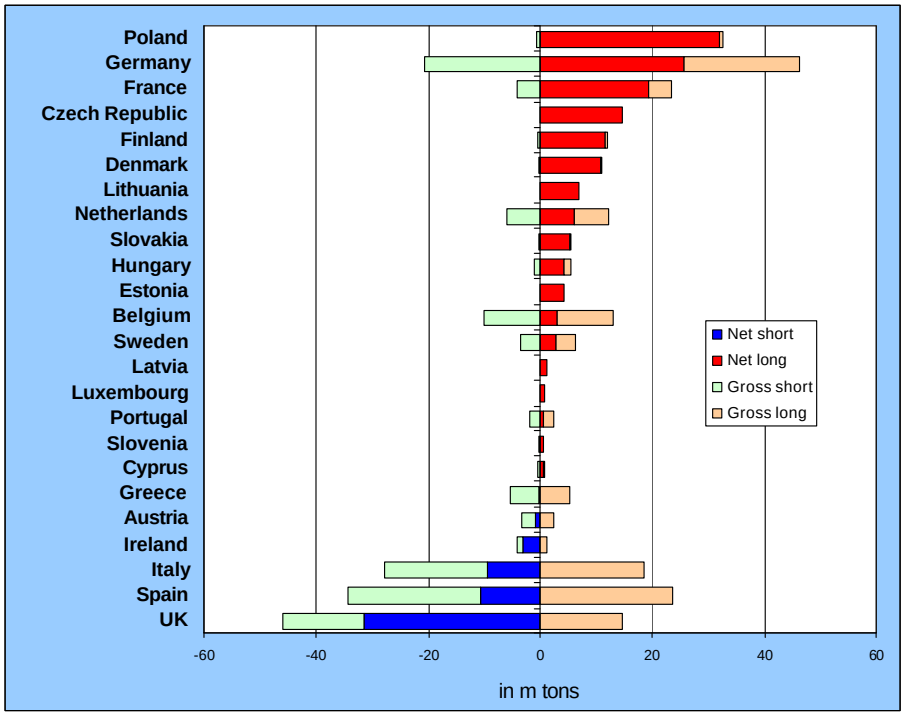
Figures 2 and 3 also visualize the extent to which the net long or the net short position is influenced by the gross long and gross short positions of the countries. The rather small net short positions in countries like Austria, Greece and Italy stems from the balance of roughly equal-sized gross long and short positions at the installation level. For Portugal and Belgium, the balance of the gross long and short positions results is a small overall net long position.

Figure 1: Country's share in total EU ETS allowances (2005)



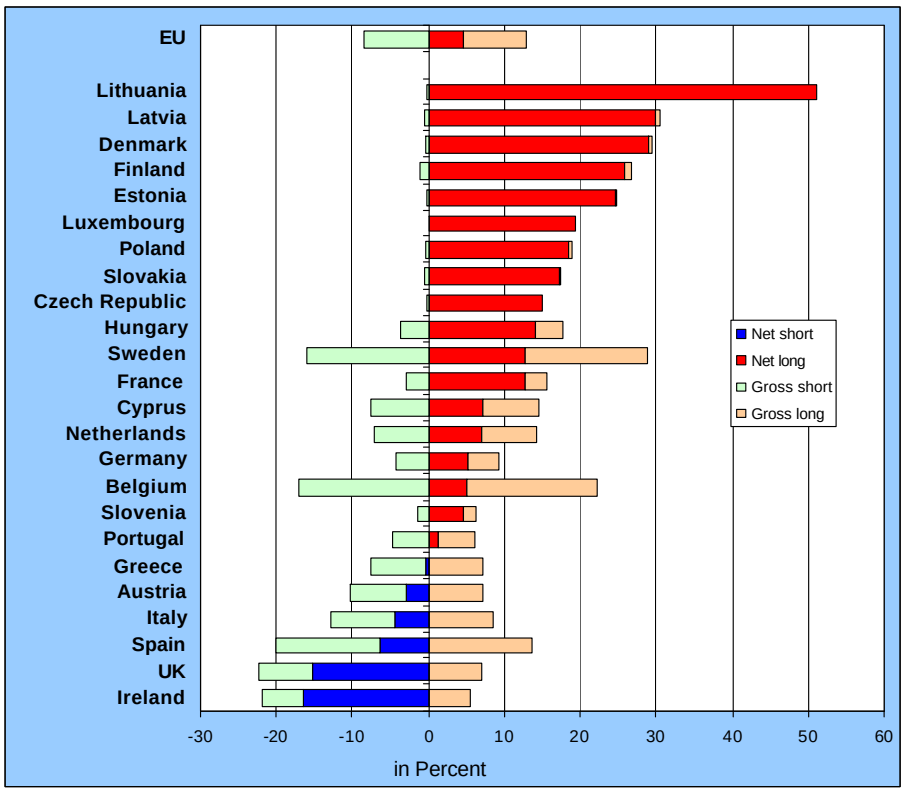
Source: CITL; own calculations

Figure 2: Short and long positions by countries in million tons (2005)



Source: CITL; own calculations

Figure 3: Short and long positions by countries in percent of allowances (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Evidence presented so far suggests that National Allocation Plans create substantial inequalities as to the allocation positions between Member States on country aggregates, but also within Member States between individual installations. Information on production activities and abatement efforts on installation level would make it possible to single out the role of the allocation authorities in explaining the observed discrepancies between allocated EAUs and verified emissions.

Nevertheless the Member States can be grouped according to the observed allocation positions into the following groups:

- EU-15 countries that exhibit sectors both with net long and net short positions, such as Austria, Belgium, Finland, Greece, Ireland, Italy, Spain and the UK.
- EU-15 countries that show a pronounced net short position in the heat and power sector but are long in all other sectors, as the Netherlands, Portugal and Sweden.
- EU-15 countries with only net long positions in their sectors, as Denmark, Germany, France and Luxemburg.
- New Member States that are long in all sectors, as Cyprus, Estonia, Lithuania, Poland, Slovakia and the Czech Republic.
- New Member States that have in total a long position but are short at least in a few sectors, as Hungary, Latvia and Slovenia.

5.3 The sectoral evidence

While we would expect rather small allocation discrepancies on country level, this would not necessarily be anticipated on the sectoral level since Criterion 11 of Annex III of Directive 2003/87/EC states that the Member States' National Allocation Plans "…may contain information on the manner in which the existence of competition from countries or entities outside the Union will be taken into account."

Kolshus and Torvanger (2005), e.g., show sectoral differences in the generosity of allocation motivated by competitiveness assumptions. As to the vulnerability of distorted allocations it is common to distinguish between

- sectors not exposed to international competition (electricity, district heating, energy, cogeneration, power, heat, and steam), and
- sectors exposed to international competition (refineries, iron and steel, cement, glass, lime, ceramics, pulp and paper and others).

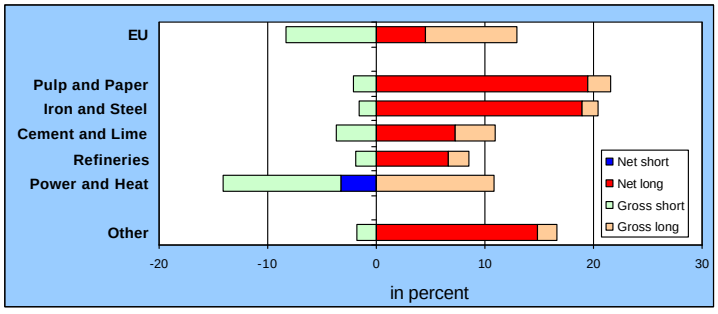
The overall evidence for the sectoral breakdown of the 2005 allocation position signals a rather pronounced long position for all sectors except for power and heat, as indicated in Table 2 and Figure 4. An obvious explanation is the strong exposure of the energy and emission intensive sectors to international competition which might have induced generous allocations to these sectors. The reason for the short position of the power and heat sector is less evident and may be linked to the observation that wholesale electricity prices echo the fluctuations of prices for EUAs because of the ability to pass on additional costs due to market power.

Table 2: Short and long positions by sectors (2005)

	Allocation	Verified emissions	Short		Long		Net	
	2005 t CO2	2005 t CO2	Absolute t CO2	Relative Percent	Absolute t CO2	Relative Percent	Absolute t CO2	Relative Percent
EU	**2.029.934.739**	**1.932.613.313**	**170.447.411**	**8,4**	**263.591.040**	**13,0**	**93.233.642**	**4,6**
Cement and Lime	185.402.470	169.669.335	6.858.430	3,7	20.350.857	11,0	13.492.427	7,3
Iron and Steel	203.287.222	164.726.260	3.151.684	1,6	41.688.551	20,5	38.539.465	19,0
Power and Heat	1.064.720.324	1.099.731.109	149.886.189	14,1	114.802.071	10,8	-35.085.318	-3,3
Pulp and Paper	41.949.703	33.618.117	885.637	2,1	9.085.577	21,7	8.199.940	19,5
Refineries	144.932.746	135.334.317	2.689.288	1,9	12.249.639	8,5	9.584.911	6,6
Other	389.642.274	329.534.175	6.976.183	1,8	65.414.345	16,8	58.502.217	15,0

Source: CITL, National Allocation Plans and List of Installations; own calculations

Figure 4: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and List of Installations; own calculations

6 Distribution of installations and allocations

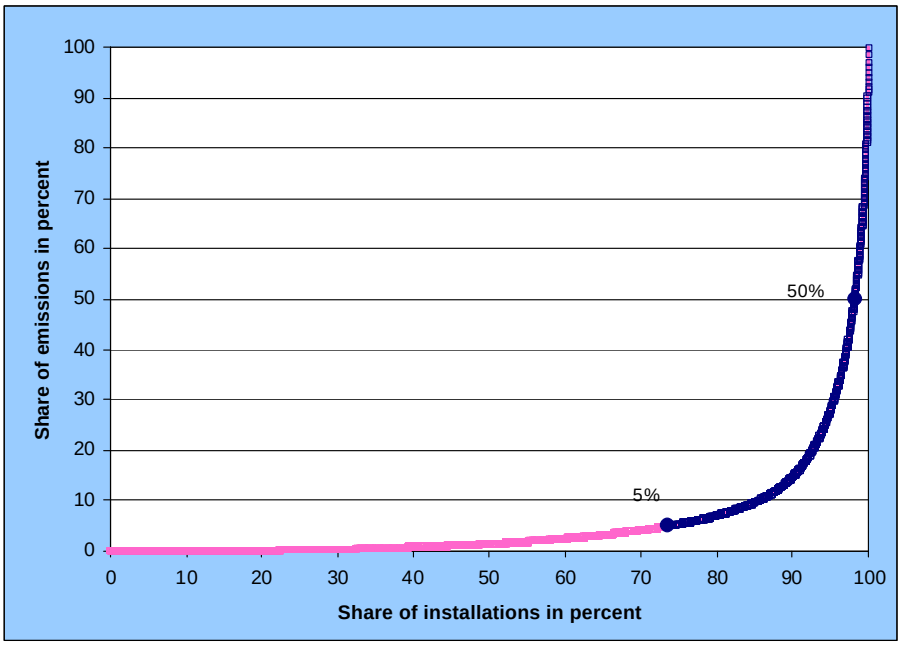
6.1 Distribution of the size of installations

An outstanding characteristic of the EU ETS is the inclusion of a large number of small installations. Figure 5 ranks the almost 9,900 installations according to their allocated emissions and reveals striking insights about the extreme inequality of the size of installations included in the EU ETS:

- The smallest three quarters of all installations contribute only about 5% of the allocated emissions.
- The biggest 1.8% of all installations account, however, for 50% of the emissions.
- The biggest 500 installations emit 72% of all emissions.
- The 1,000 biggest installations (approximately one tenth of all installations) are responsible for 85% of the EU ETS emissions.

This extreme inequality in the size distribution of installations suggests a need to differentiate between the large and small installations in the framework of the EU ETS. Currently, small installations complain about excessive transaction costs for reporting, monitoring and the registry account. In addition, the large number of small installations clogs the capacities of the administration. Big installations, on the other hand, often express concern about unequal treatment in the allocation procedures of different Member States.

Figure 5: Distribution of size of installations (2005)

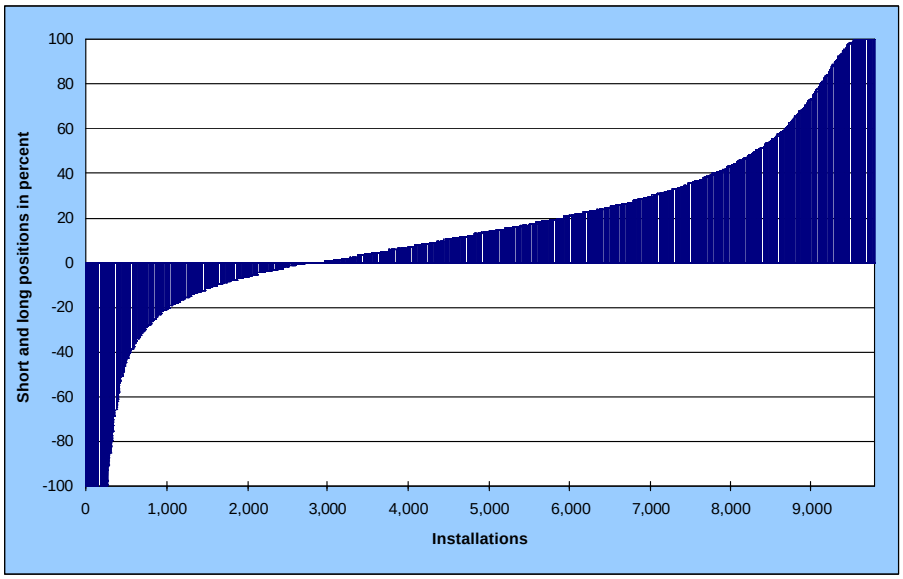


Source: CITL; own calculations

6.2 Distribution of the allocation discrepancies

The surprisingly wide dispersion of allocation discrepancies, the difference between allocated and verified allowances, has been rather neglected in the evaluation of the first trading year of the EU ETS. Obviously these discrepancies reflect the actions of the allocation authorities and abatement activities by the installations. Figure 6 indicates that out of the approximately 9,900 installations analyzed, 2,747 were short and the remaining long. The tails in this figure with 100% long positions refer to installations that got an allocation that was not used and those with 100% short positions to installations that did not obtain an allocation of allowances.

Figure 6: Distribution of allocation discrepancies of installations (2005)



Source: CITL; own calculations

In the following we compare the dispersion of allocation discrepancies both in the dimension of countries and the dimension of sectors in order to obtain evidence of differences. As a measure for the dispersion we normalize the standard deviations of the allocation discrepancies by the mean size of the corresponding installations. The results of this analysis are summarized in Table 3 for countries and in Table 4 for sectors. For both dimensions we diagnose substantial differences in the dispersion of the allocation discrepancies.

As Table 3 indicates, for the total EU ETS we observe a dispersion of the differences between allocated EUAs and verified emissions of 119% of the mean size of all installations, which is measured by the allocated allowances. This dispersion indicator varies substantially over the Member States. Slovenia shows the lowest dispersion with only 18%, in contrast to Sweden with 434%. Assuming that in the short run the installations have only limited ability for abatement actions, a high dispersion indicator is a reason for concern for the installations, since it points to an allocation procedure that failed to take into account specific information relevant for the emissions of an installation. The resulting wide dispersion of allocation discrepancies creates distributional distortions.

Table 4 reports the dispersion of allocation discrepancies over the sectors and exhibits lower values for power and heat in comparison with the remaining sectors.

Table 3: Allocation discrepancies by countries (2005)

	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
European Union	**9,867**	**93,233,642**	**4.6**	**119**	**7,270**	**2.5**	**461**	**2,412**	**4.4**	**52**	**185**	**-2.2**	**29**
Austria	199	-960,187	-3.0	65	129	1.3	100	62	-0.5	23	8	-3.7	26
Belgium	310	2,955,923	5.1	205	194	1.2	41	103	8.7	60	13	-4.8	95
Cyprus	13	392,476	7.2	45	8	0.6	6	3	5.6	51	2	1.0	42
Czech Republic	376	14,521,211	15.0	47	288	2.1	66	77	8.1	23	11	4.8	10
Denmark	377	10,835,058	29.0	123	291	3.3	92	79	17.1	90	7	8.6	14
Estonia	42	4,120,641	24.6	85	31	2.9	62	10	10.9	65	1	10.8	0
Finland	533	11,562,295	25.9	115	434	3.9	583	87	15.5	72	12	6.5	10
France	1,078	19,119,897	12.7	71	603	2.3	70	450	6.5	38	25	3.9	20
Germany	1,828	25,518,128	5.2	52	1,403	2.2	166	398	3.5	29	27	-0.5	11
Greece	134	-185,490	-0.3	45	103	0.7	58	25	0.4	38	6	-1.4	12
Hungary	229	4,281,806	14.2	84	136	2.6	187	87	6.7	46	6	4.9	25
Ireland	106	-3,130,018	-16.3	103	79	1.2	103	22	-10.0	68	5	-7.5	34
Italy	919	-9,282,988	-4.3	98	627	0.2	54	263	1.2	63	29	-5.7	28
Latvia	89	1,217,500	29.9	127	46	6.6	139	39	12.9	37	4	10.4	34
Lituania	93	6,899,585	51.1	186	60	4.2	94	30	20.5	99	3	26.4	40
Luxembourg	15	625,972	19.4	15	4	1.9	12	9	9.8	86	2	7.7	2
Netherlands	207	6,101,199	7.1	91	119	1.1	46	79	1.4	49	9	4.6	34
Poland	657	31,840,583	18.9	115	416	1.7	55	227	8.9	42	14	8.3	29
Portugal	243	471,304	1.3	43	188	1.6	54	50	2.1	16	5	-2.4	-49
Slovakia	175	5,238,908	17.2	42	134	4.3	136	38	10.8	31	3	2.1	5
Slovenia	94	434,143	4.8	18	62	1.3	39	31	2.2	18	1	1.3	0
Spain	783	-10,851,879	-6.3	177	516	7.4	499	244	-0.6	42	23	-13.1	58
Sweden	683	2,852,898	12.9	434	570	6.1	422	106	1.7	58	7	5.1	94
United Kingdom	673	-31,345,323	-15.2	142	549	1.3	75	109	-1.2	41	15	-15.3	15

*Net position in percent of allocated allowances.
**Standard deviation of allocation discrepancies normalized by the mean size of installations.

Source: CITL, National Allocation Plans and List of Installations; own calculations

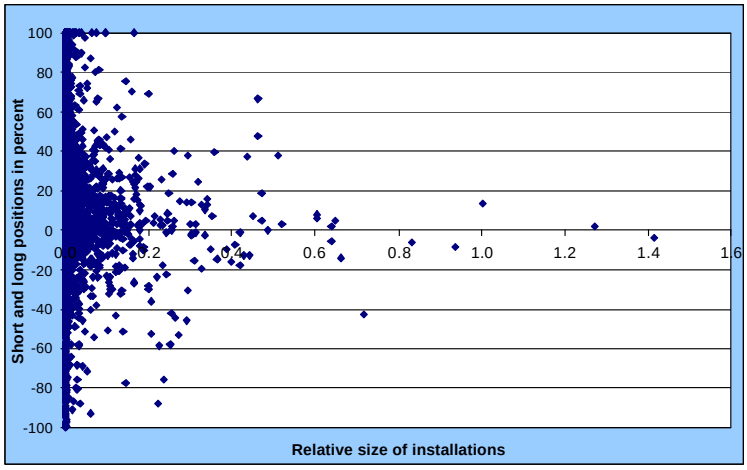
Table 4: Allocation discrepancies by sectors (2005)

EU Total	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**9,867**	**93,233,642**	**4.6**	**119**	**7,270**	**2.5**	**461**	**2,412**	**4.4**	**52**	**185**	**-2.2**	**29**
Power and Heat	2,944	-35,085,318	-1.7	98	2,434	1.6	469	439	0.4	43	71	-3.7	21
Other	6,076	90,613,497	4.5	109	3,614	0.7	201	2,308	1.9	41	154	1.9	31

*Net position in percent of allocated allowances.
**Standard deviation of allocation discrepancies normalized by the mean size of installations.

Source: CITL, National Allocation Plans and List of Installations; own calculations

Figure 7: Allocation discrepancy and size of installations (2005)



Source: CITL; own calculations

6.3 Installation size and allocation discrepancies

Given the pronounced inequality of the size of installations we finally want to investigate whether there is a significant relationship between the mean and the spread of allocation discrepancies on the one hand and the size of an installation on the other. The scatter diagram of Figure 7 exhibits this relationship for all installations in the EU ETS. A first look suggests that installations with a smaller size of emissions have a higher dispersion of the allocation discrepancy in contrast to big installations. We may also presume from this graph that smaller installations are biased to long positions and big installations to short position.

We approach this issue by dividing the installations into three groups as to their size: the first group with installations that have accumulated emissions up to 5% of the total, the second group with installations that belong to the accumulated emissions between 5% und 50%, and the third group that comprises the largest installations responsible for 50% of the emissions. The results are reported in Table 3 for the countries and in Table 4 for the sectors.

For the total EU ETS we diagnose a net position of 2.5% for the smallest and of -2.2% of the largest installations. The matching measures of dispersion are 461% and 29%, respectively. This means that our presumption from the visual inspection of Figure 7 is confirmed: Small installations tend to be long but with a high dispersion, but large installations are expected to be short with a small dispersion.

This overall result becomes more transparent if we look at the sector dimension of this grouping of installations according to their size. We notice in Table 4 that it is the heat and power sector that shifts from long to short positions the larger the installation, accompanied by a sharp reduction of the dispersion of allocation discrepancies. In contrast the installations of the remaining sectors increase their long position the larger the installation, again accompanied by lower dispersions.

This leads to the conclusion that it was the stringency of allocations to the big installations in the heat and power sector that made them short and reduced the overall long position of the EU ETS. The lower dispersion of the allocation discrepancies of big installations may be an indicator that the allocation authorities considered information specifically related to these installations.

7 The issues of competitiveness and abatement

Since it is tempting to draw conclusions as to abatement efforts and competitiveness impacts from observed allocation discrepancies, the difference between allocated and verified emissions, we add a few caveats to these issues.

The analysis of the verified emissions for the year 2005 merely reveals which countries and sectors show a tendency to a short or long position in the first trading period 2005 - 2007. Final conclusions about short and long positions on country, sector and installation level will, however, only be possible in the year 2008, when verified emission data for 2006 and 2007 will be available. When interpreting the currently available data, it is important to keep in mind that there might be other reasons for long or short positions of installations than generous or very stringent allocations. For example, long or short positions can reflect an unexpected rise or fall in production, abnormal weather conditions, specific situations in the availability of raw materials and fuels, or changes in production processes.

Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community emphasizes the avoidance of distortions in competition as a requirement in the allocation procedures of individual Member States and the European Union as a whole. In the world market, the introduction of the EU ETS might lead to competitive disadvantages of European installations in comparison to installations in countries not covered by the EU ETS. On the European level, competitive distortions can arise from differences in the "generosity" of the Member States' National Allocation Plans which might result from differences in the individual Kyoto targets as specified by the EU's Burden Sharing Agreement.

The concept of competitiveness comprises many different dimensions like input costs, market prices or the quality of the product. Decreasing competitiveness thus can result from an increase in the firms' production costs which might occur due to the inclusion of the costs of CO_2. Effectively, the level of these impacts crucially depends on factors such as

- the degree to which an industry is subject to (international) competition,
- the industry's emissions reduction costs,
- the share of CO_2 costs in total production costs and
- the possibility for passing on additional costs to consumers.

An evaluation of the effects of the EU ETS on competitiveness would thus require a more detailed analysis on installation, sector and country level with respect to the above mentioned factors.

Related to the competitiveness issue is the choice of different allocation methods, in particular grandfathering with or instead of auctioning. This has been already discussed extensively, e.g. by Woerdman (2001) and Grubb and Neuhoff (2006). This issue is of limited relevance for the first trading phase 2005 – 2007, as only four countries have adopted auctioning in their National Allocation Plans in the first ETS period, and even in the second EU ETS period countries can only auction up to 10% of their total allowances according to the Emissions Trading Directive.

Another caveat holds true for conclusions about abatement activities induced by the EU ETS. A first attempt to estimate their extent for 2005 was made by Ellerman and Buchner (2006). In general the following abatement options are available to installations:

- Reducing production if the marginal costs for additional emission allowances are not covered by marginal revenues.
- A fuel shift if this option is technically available and the fuel with the lower carbon content creates lower marginal costs than the marginal costs for emission allowances.
- Improved operating of the existing equipment if this involves lower costs than buying additional emission allowances.
- Finally, investments that change processes, e.g. by switching to combined heat and power generation, and improve factor productivity in general. Such decisions will hardly be justified only by the price for emission allowances.

Looking at this spectrum of abatement options it is rather unlikely that the EU ETS has already created incentives for abatement investments in its first trading year. Given the rather low carbon prices it is also extremely unlikely that industries with a heavy CO_2 cost component, such as cement and lime, have reduced their production levels because of the stringency of allowances. In a few installations the option for a fuel shift may have been used. Most probably the only reduction option that was widely used was the improved operation of existing equipment. The reduction potential of this option is, however, rather limited.

8 Conclusions

The data analysis performed on the allocated and verified emissions for 2005, the first year of the EU ETS, suggests a number of conclusions, some being more obvious and some less.

A first set of conclusions deals with the discrepancy between allocated and verified emission allowances. Obviously, in the first trading year the whole system was in a long position with 4.6% more emission allowances available than actually needed. As soon as this became known to the market in May 2006, the spot prices for EUAs plummeted. This long position for the EU total is the balance between a 13.0% long and an 8.4% short position of the total emissions. Out of the 9,867 installations reported up to January, 2007 only 2,747 were short. This allocation differences vary, however, between Member States and sectors. Out of the 24 Member States only 6 countries were short in the range of 0.3% (Greece) and 16.3% (Ireland) but the remaining 18 countries were long up to 51.1% (Lithuania). Looking at sectors, only power and heat was short with 3.3%.

A second set of conclusions refers to the pronounced inequality of the distribution of the size of installations when ordered according to their emissions. The smallest three quarters of all installations contribute only about 5% of all emissions whereas the biggest 1.8% of all installations account for half of the emissions. The 1,000 biggest installations, or one tenth of all installations, cover 85% of the EU ETS emissions.

A third set of conclusions deals with the hitherto neglected issue of the distribution of the allocation discrepancies both in countries and in sectors. This measure of the dispersion of allocation discrepancies reflects the treatment of individual installations by the authority responsible for the National Allocation Plan and the resulting impacts on the profits of installations and potential abatement activities. Remarkably, we observe variations in the spread of the allocation discrepancies both by country and by sector. With regard to the countries, we observe a range for the standard deviation (with the mean installation size normalized) between 18% for Slovenia and 434% for Sweden, compared to the EU total of 119%. As to the sectors, the power and heat sector exhibits a lower dispersion than the remaining sectors.

A fourth set of conclusions suggests a correlation between the size of an installation and both the dispersion of the allocation discrepancies and their size. For the smallest installations which accumulate only 5% of the emissions, the normalized standard deviation of the allocation discrepancies is 461%, compared to 29% for the biggest installations, which emit 50% of the EU ETS emissions. This means the larger an installation is, the smaller the expected allocation discrepancy. As to the size of the allocation discrepancy, we observe a higher short position the bigger the installation, but a reverse relationship for the remaining sectors.

These conclusions may have some significance for the review of the EU ETS. They strongly suggest treating small installations differently than big ones. Three quarters of those small installations, which accumulate only 5% of all emissions, seem to be prone to a very large dispersion of allocation discrepancies. This might on the one hand indicate that the allocation authorities are less prone to use information that is specific for a smaller installation because of administrative bottlenecks. On the other hand the biggest tenth of all installations, which contributes 85% of all emissions, is particularly interested in equal treatment in the allocation procedures among Member States.

Conclusions about competitiveness impacts and abatement effects are rather premature because, after only one year of operation, it is extremely difficult to disentangle the net position

of an installation, a sector or a country, and the interwoven impacts of changes in output and technologies. Nevertheless, the surprisingly high spread of allocation discrepancies in particular with regard to small installations creates uncertainty and distributional distortions.

The responsibility of Member States for allocating emission allowances to sectors and installations in the National Allocation Plans creates inherent incentives to allow for generous allocations. Incomplete information concerning the allocations of other Member States and the impact of lobbying groups can be traced in the performance of the 2005 results of the EU ETS.

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Appendix

Appendix 1: Data Availability

Table A-1: Installations and sectors covered

	Installations NAP1 (1)	Installations CITL (2)	(1) - (2)	Sectors	Data availability			
					Sector non-specified	No verified emissions	No allocated allowances	Neither
EU TOTAL	10,804	10,324	480					
Austria	205	199	6	16	0	0	0	0
Belgium	363	310	53	16	5	0	0	0
Cyprus	13	13	0	3	0	0	0	0
Czech Republic	426	403	23	12	12	0	7	1
Denmark	380	383	-3	8	62	0	3	4
Estonia	43	42	1	4	1	1	1	0
Finland	533	533	0	16	0	0	39	12
France	1,172	1,080	92	18	2	2	0	0
Germany	1,849	1,835	14	13	7	13	9	2
Greece	141	140	1	10	0	5	0	0
Hungary	261	234	27	15	32	0	5	0
Ireland	143	106	37	7	0	3	0	0
Italy	1,240	947	293	9	0	47	0	1
Latvia	91	89	2	15	0	0	1	4
Lithuania	93	98	-5	5	0	0	0	5
Luxembourg	19	15	4	5	0	0	0	0
Netherlands	206	208	-2	10	4	0	3	0
Poland	876	668*	208	9	0	10	0	0
Portugal	239	243	-4	9	0	0	0	0
Slovakia	209	347	-138	11	5	0	0	0
Slovenia	98	94	4	10	0	0	1	3
Spain	819	816	3	14	0	24	0	12
Sweden	711	723	-12	7	202	1	0	0
UK	674	798	-124	30	4	0	31	0

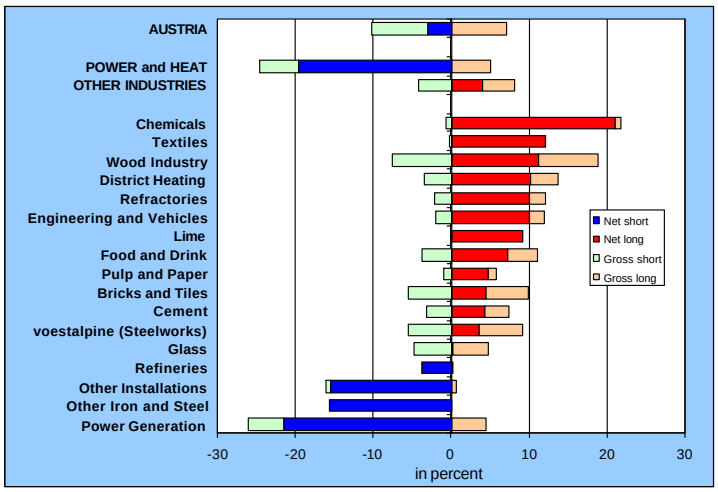
* data as available on 28 January 2007

Source: CITL, National Allocation Plans and List of Installations

Appendix 2: Member State Details

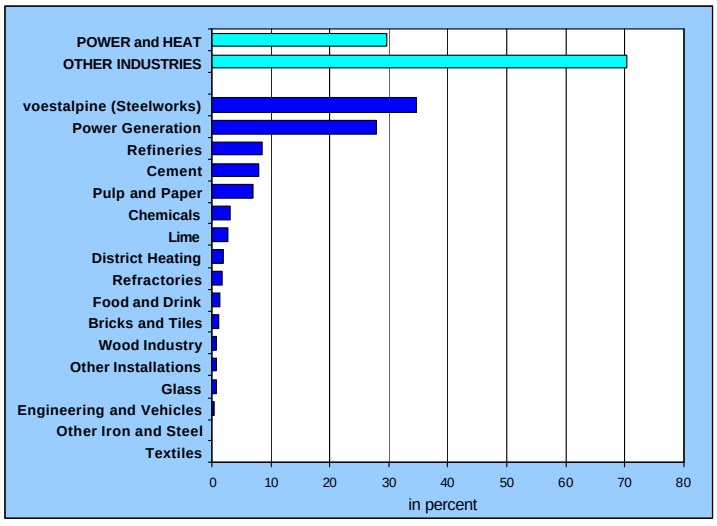
Austria

Figure AT-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure AT-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

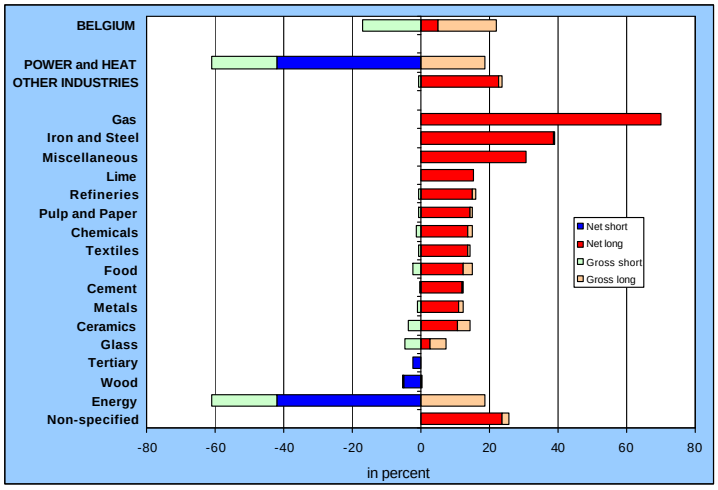
Table AT: Allocation discrepancies by sectors (2005)

Austria	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**199**	**-960,187**	**-3.0**	**65**	**129**	**1.3**	**100**	**62**	**-0.5**	**23**	**8**	**-3.7**	**26**
Power and Heat	56	-1,872,307	-5.8	75	39	0.8	136	13	-2.5	20	4	-4.0	35
Other	143	912,120	2.8	60	87	0.4	44	52	1.6	14	4	0.8	22

Source: CITL, National Allocation Plans and lists of installations; own calculations

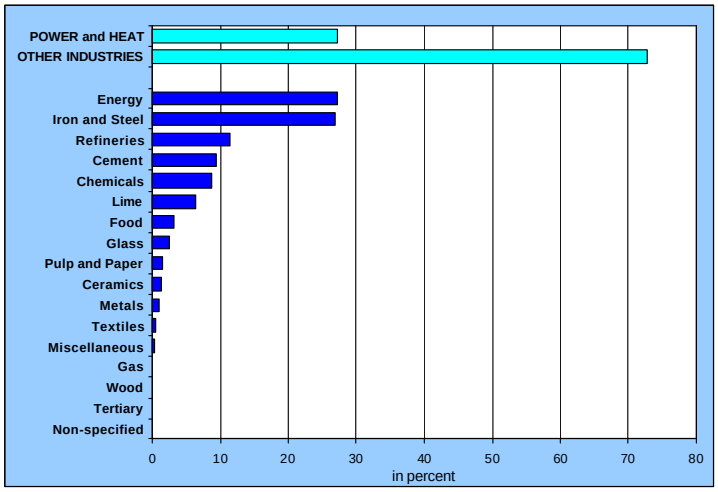
Belgium

Figure BE-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure BE-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

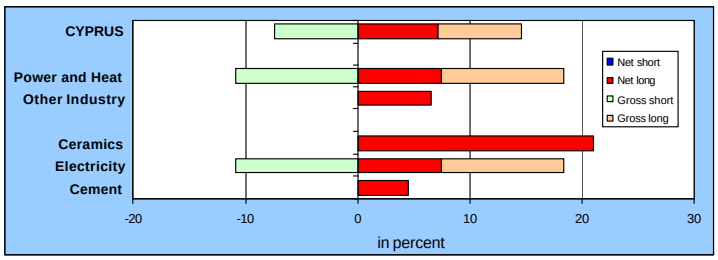
Table BE: Allocation discrepancies by sectors (2005)

Belgium	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**310**	**2,955,923**	**5.1**	**205**	**194**	**1.2**	**41**	**103**	**8.7**	**60**	**13**	**-4.8**	**95**
Power and Heat	45	-6,705,337	-11.5	111	26	0.3	45	14	2.7	57	5	-14.5	185
Other	265	9,661,260	16.6	48	140	0.9	48	116	5.1	32	9	10.6	9

Source: CITL, National Allocation Plans and lists of installations; own calculations

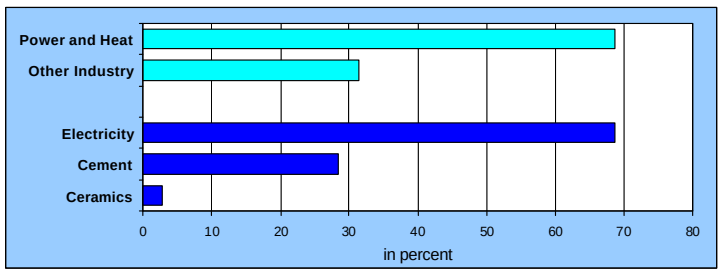
Cyprus

Figure CY-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure CY-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

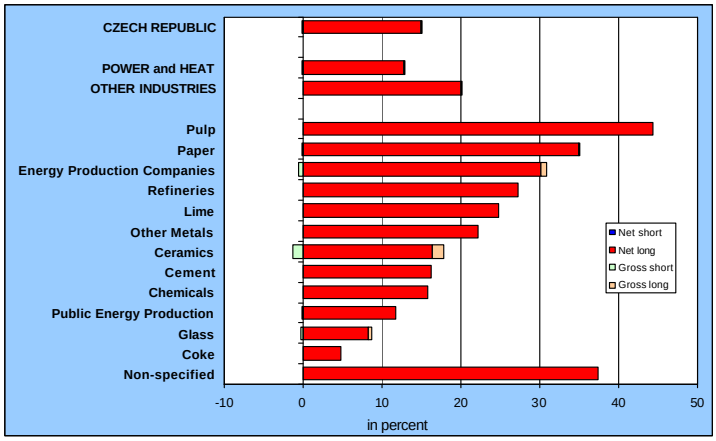
Table CY: Allocation discrepancies by sectors (2005)

Cyprus	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**13**	**392,476**	**7.2**	**45**	**8**	**0.6**	**6**	**3**	**5.6**	**51**	**2**	**1.0**	**42**
Power and Heat	3	280,396	5.1	36									
Other Industry	10	112,080	2.0	10									

Source: CITL, National Allocation Plans and lists of installations; own calculations

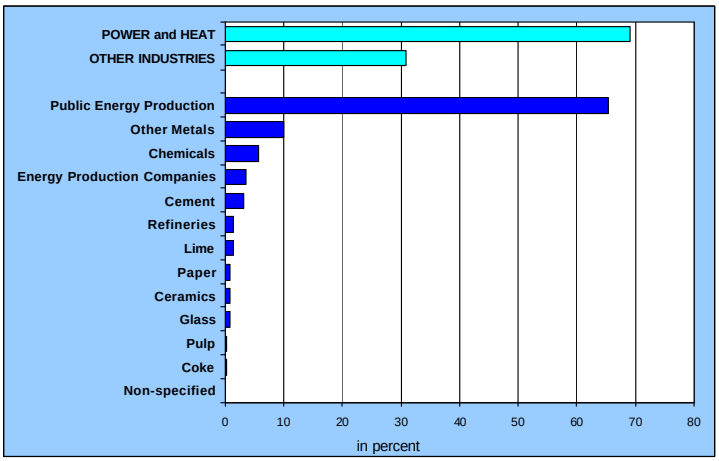
Czech Republic

Figure CZ-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure CZ-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

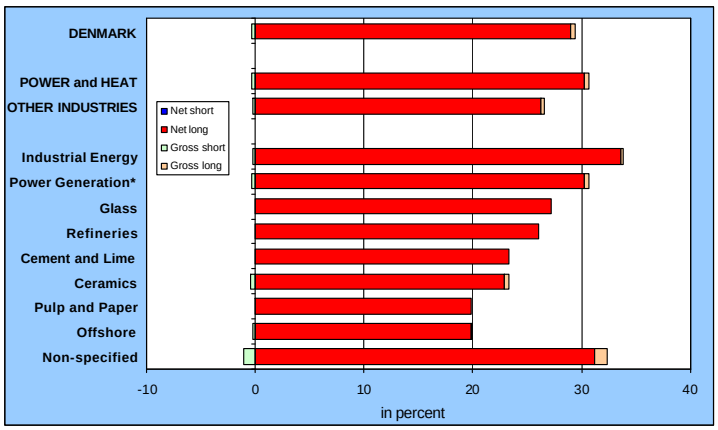
Table CZ: Allocation discrepancies by sectors (2005)

Czech Republic	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**376**	**14,521,211**	**15.0**	**47**	**288**	**2.1**	**66**	**77**	**8.1**	**23**	**11**	**4.8**	**10**
Power and Heat	232	8,529,280	8.8	70	186	1.6	70	39	5.0	20	7	2.1	5
Other	144	5,991,931	6.2	74	97	0.5	61	42	2.5	21	5	3.2	17

Source: CITL, National Allocation Plans and lists of installations; own calculations

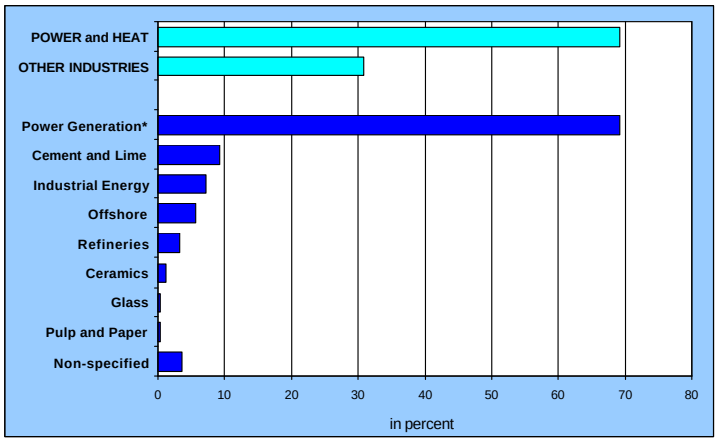
Denmark

Figure DK-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure DK-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

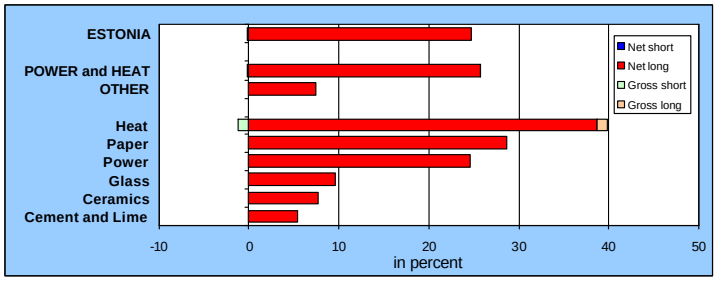
Table DK: Allocation discrepancies by sectors (2005)

Denmark	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**377**	**10,835,058**	**29.0**	**123**	**291**	**3.3**	**92**	**79**	**17.1**	**90**	**7**	**8.6**	**14**
Power and Heat	195	7,803,751	20.9	394	170	2.7	114	20	13.9	63	5	4.3	13
Other	182	3,031,307	8.1	101	112	1.3	120	66	3.3	40	4	3.5	21

Source: CITL, National Allocation Plans and lists of installations; own calculations

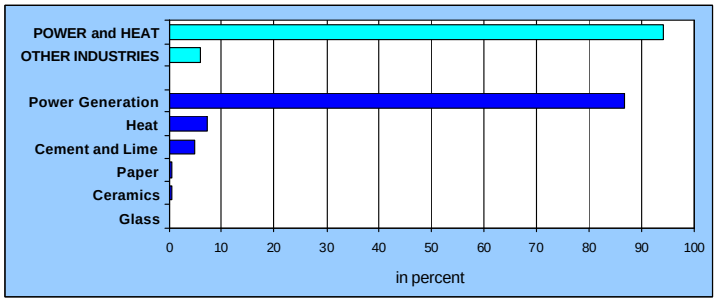
Estonia

Figure EE-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure EE-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

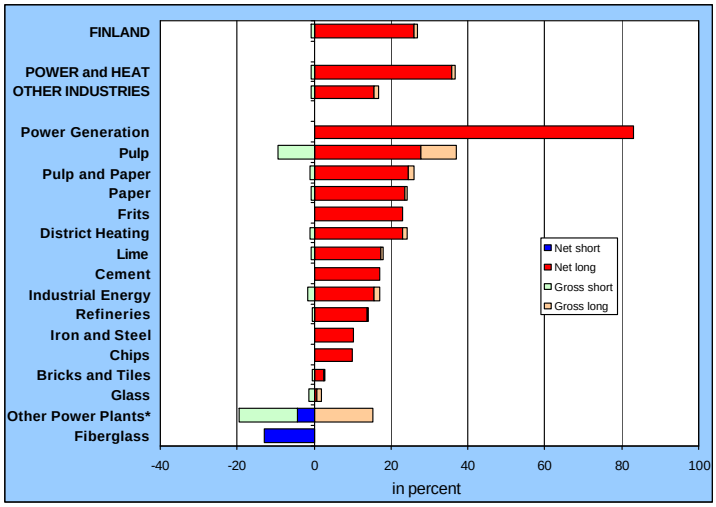
Table EE: Allocation discrepancies by sectors (2005)

Estonia	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**42**	**4,120,641**	**24.6**	**85**	**31**	**2.9**	**62**	**10**	**10.9**	**65**	**1**	**10.8**	
Power and Heat	35	4,045,647	24.2	82	27	3.4	64	7	9.9	66	1	10.8	
Other	7	74,994	0.4	8	3	0.0	12	3	0.3	19	1	0.2	

Source: CITL, National Allocation Plans and lists of installations; own calculations

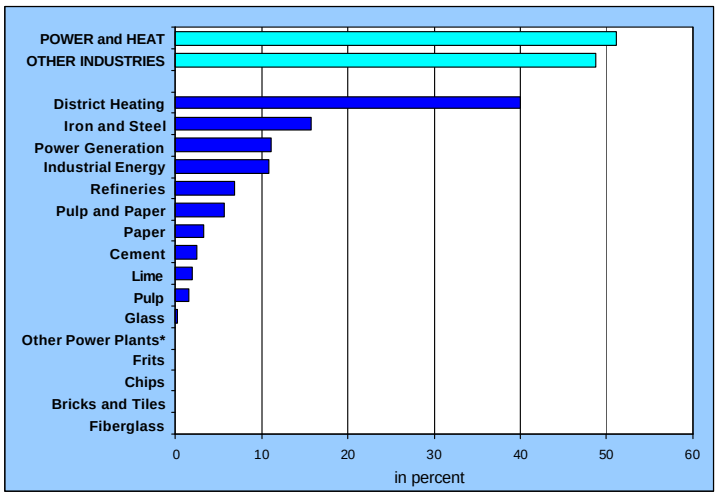
Finland

Figure FI-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure FI-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

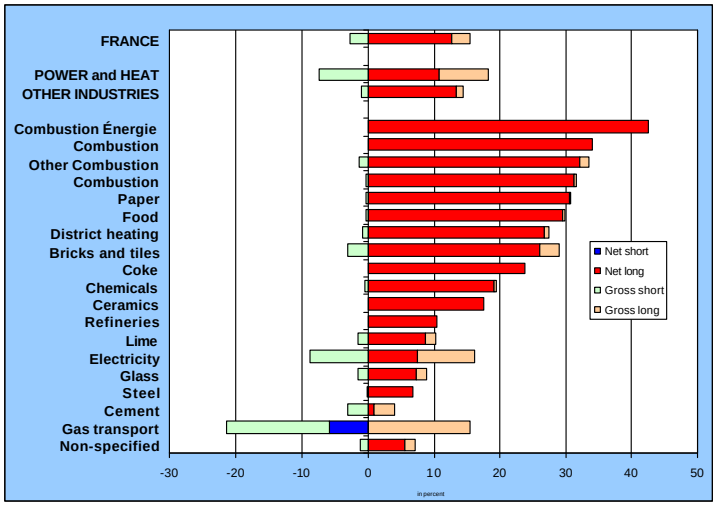
Table FI: Allocation discrepancies by sectors (2005)

Finland	All installations				Accumulated verified emissions: less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**533**	**11,562,295**	**25.9**	**115**	**434**	**3.9**	**583**	**87**	**15.5**	**72**	**12**	**6.5**	**10**
Power and Heat	397	8,188,871	18.4	184	352	1.4	280	37	12.7	90	8	4.2	16
Other	136	3,373,424	7.6	38	79	0.6	62	52	4.1	27	5	2.9	5

Source: CITL, National Allocation Plans and lists of installations; own calculations

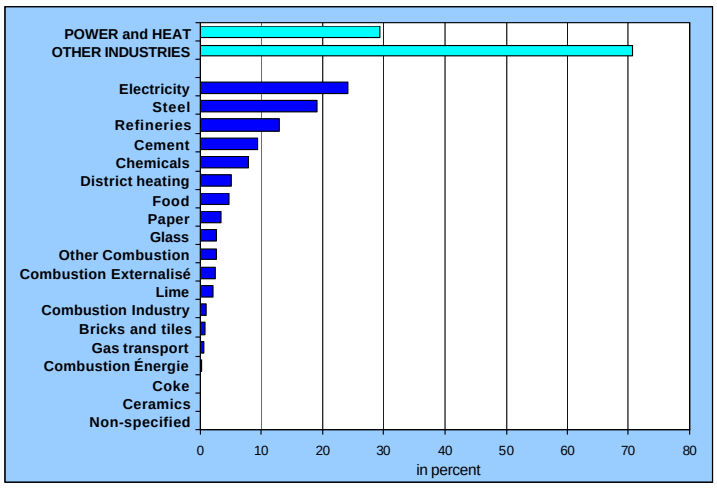
France

Figure FR-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure FR-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

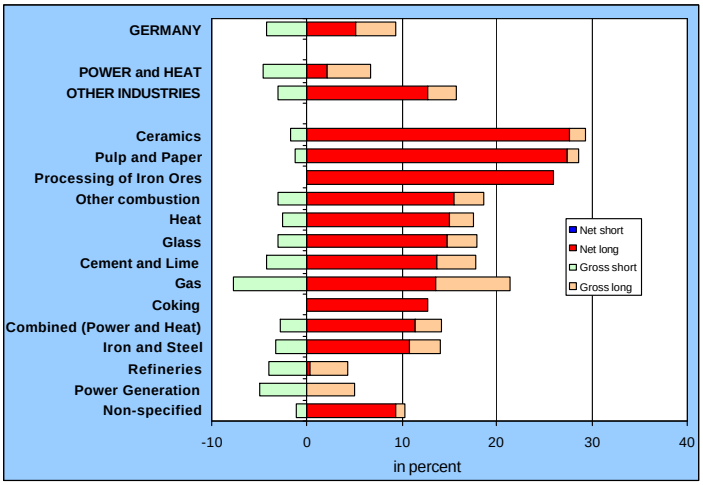
Table FR: Allocation discrepancies by sectors (2005)

France	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**1,078**	**19,119,897**	**12.7**	**71**	**603**	**2.3**	**70**	**450**	**6.5**	**38**	**25**	**3.9**	**20**
Power and Heat	251	4,813,225	3.2	102	160	0.5	63	84	0.6	71	7	2.1	26
Other	827	14,306,672	9.5	42	441	1.8	73	366	5.4	34	20	2.3	9

Source: CITL, National Allocation Plans and lists of installations; own calculations

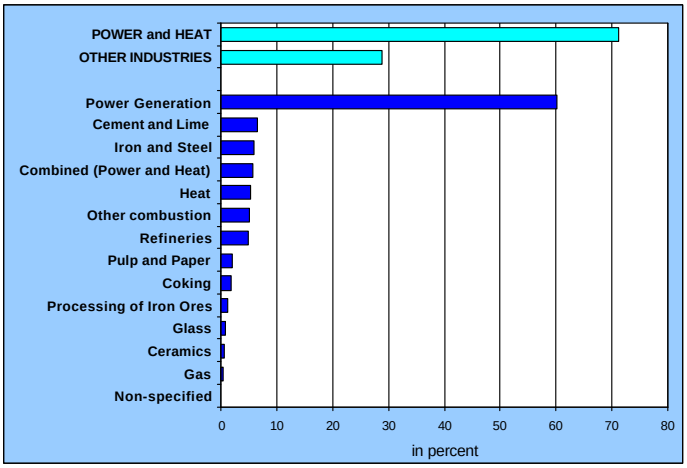
Germany

Figure DE-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure DE-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

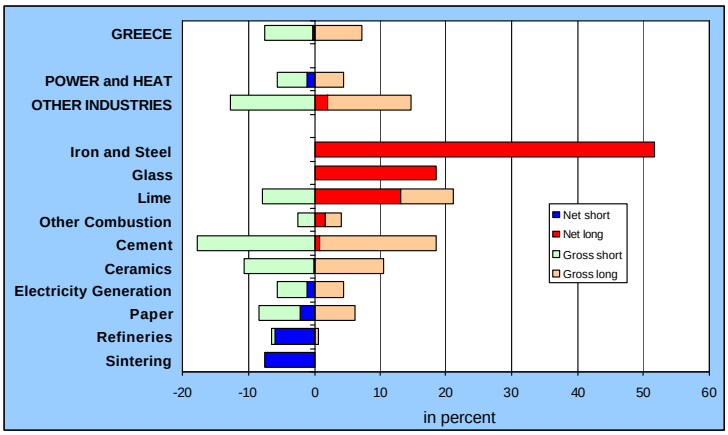
Table DE: Allocation discrepancies by sectors (2005)

Germany	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**1,828**	**25,518,128**	**5.2**	**52**	**1,403**	**2.2**	**166**	**398**	**3.5**	**29**	**27**	**-0.5**	**11**
Power and Heat	774	7,390,507	1.5	41	636	1.3	121	126	0.8	19	12	-0.7	9
Other	1,054	18,127,621	3.7	71	639	0.9	0	388	1.5	42	27	1.2	19

Source: CITL, National Allocation Plans and lists of installations; own calculations

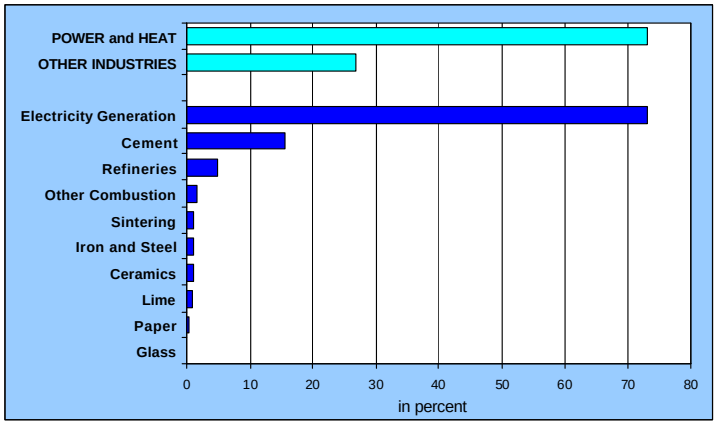
Greece

Figure GR-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure GR-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

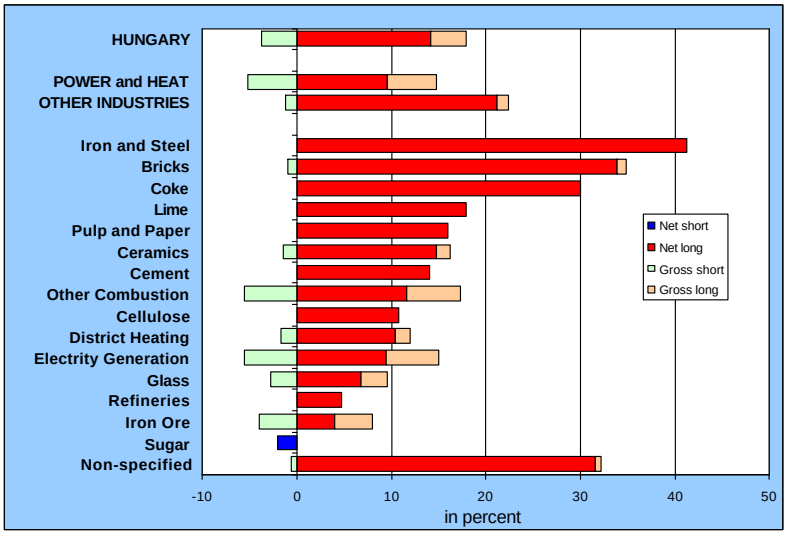
Table GR: Allocation discrepancies by sectors (2005)

Greece	All installations				Accumulated verified emissions: less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**134**	**-185,490**	**-0.3**	**45**	**103**	**0.7**	**58**	**25**	**0.4**	**38**	**6**	**-1.4**	**12**
Power and Heat	30	-561,403	-0.8	21	17	-0.3	28	10	2.0	21	3	-2.4	-95
Other	104	375,913	0.5	103	64	0.1	63	35	1.9	111	5	-1.5	19

Source: CITL, National Allocation Plans and lists of installations; own calculations

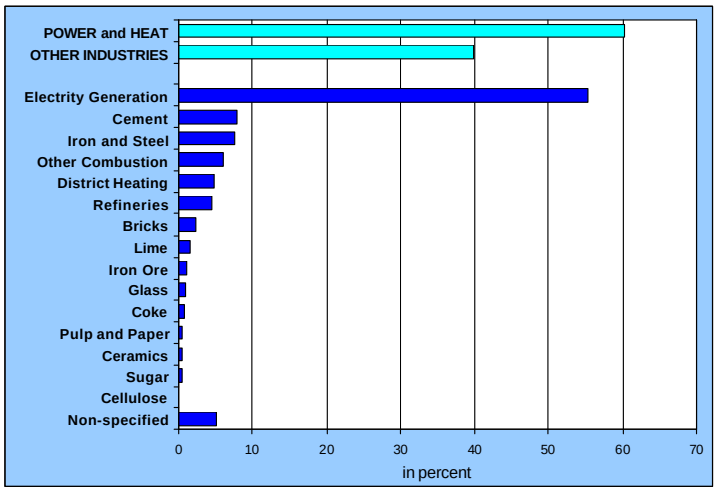
Hungary

Figure HU-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure HU-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

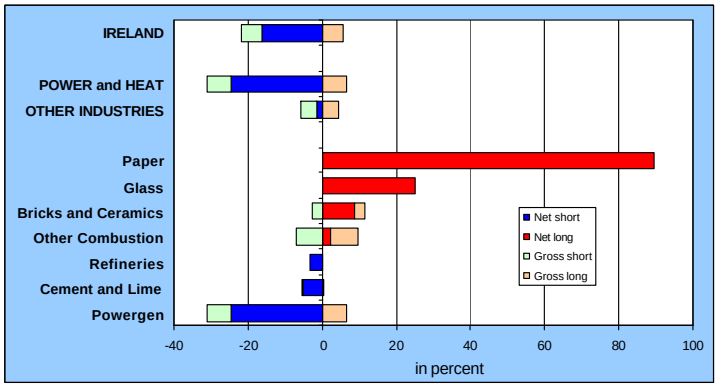
Table HU: Allocation discrepancies by sectors (2005)

Hungary	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**229**	**4,281,806**	**14.2**	**84**	**136**	**2.6**	**187**	**87**	**6.7**	**46**	**6**	**4.9**	**25**
Power and Heat	55	1,731,191	5.7	58	36	0.4	24	16	0.7	70	3	4.6	10
Other	174	2,550,615	8.4	99	82	1.0	47	85	3.4	63	7	4.0	33

Source: CITL, National Allocation Plans and lists of installations; own calculations

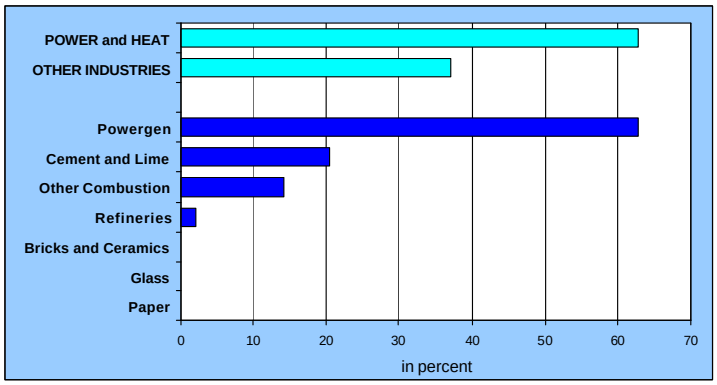
Ireland

Figure IE-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure IE-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

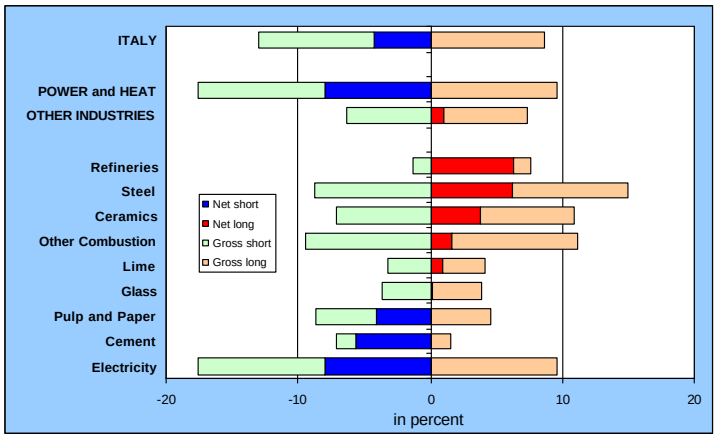
Table IE: Allocation discrepancies by sectors (2005)

Ireland	All installations				Accumulated verified emissions: less than 5 %			Accumulated verified emissions: between 5 % and 50 %			Accumulated verified emissions: more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**106**	**-3,130,018**	**-16.3**	**103**	**79**	**1.2**	**103**	**22**	**-10.0**	**68**	**5**	**-7.5**	**34**
Power and Heat	15	-3,011,620	-15.7	58	5	2.1	49	8	-9.5	58	2	-8.2	33
Other	91	-118,398	-0.6	27	52	0.8	97	36	0.0	12	3	-1.4	5

Source: CITL, National Allocation Plans and lists of installations; own calculations

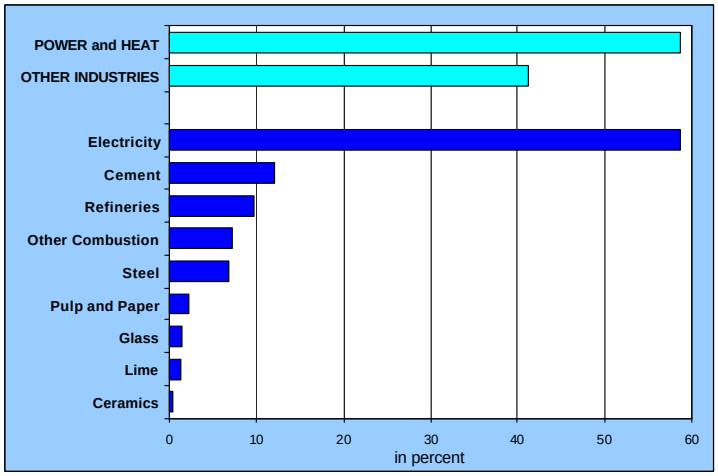
Italy

Figure IT-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure IT-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

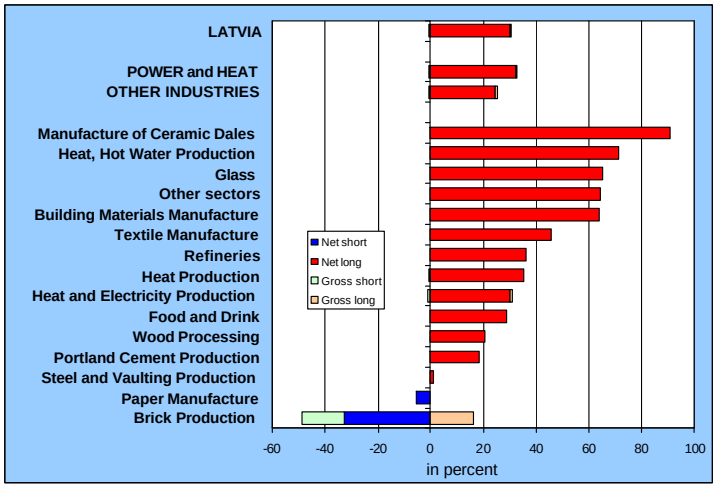
Table IT: Allocation discrepancies by sectors (2005)

Italy	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**919**	**-9,282,988**	**-4.3**	**98**	**627**	**0.2**	**54**	**263**	**1.2**	**63**	**29**	**-5.7**	**28**
Power and Heat	140	-10,190,067	-4.7	62	76	-0.1	42	51	0.6	51	13	-5.2	25
Other	779	907,079	0.4	65	428	0.3	71	320	-0.3	33	31	0.4	24

Source: CITL, National Allocation Plans and lists of installations; own calculations

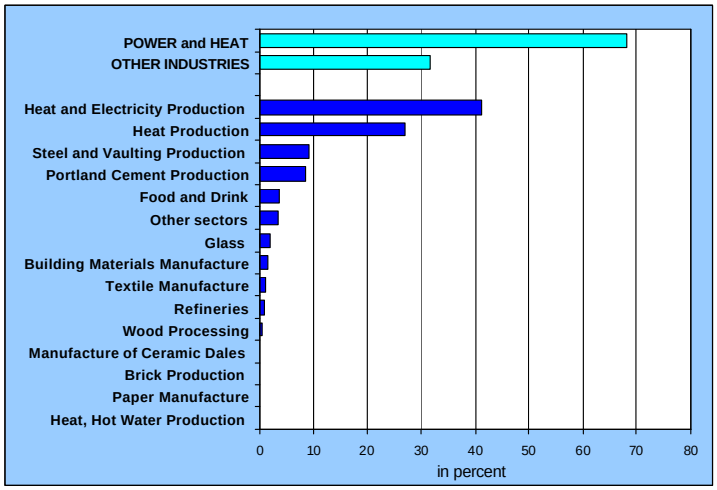
Latvia

Figure LV-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure LV-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

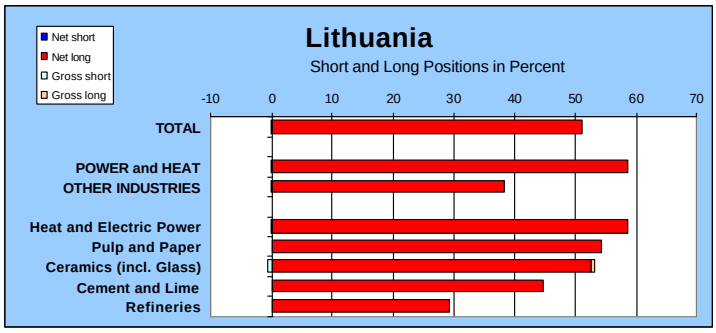
Table LV: Allocation discrepancies by sectors (2005)

Latvia	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**89**	**1,217,500**	**29.9**	**127**	**46**	**6.6**	**139**	**39**	**12.9**	**37**	**4**	**10.4**	**34**
Power and Heat	56	897,135	22.0	101	31	3.9	127	23	9.4	34	2	8.7	40
Other	33	320,365	7.9	41	13	3.1	129	18	3.1	42	2	1.7	12

Source: CITL, National Allocation Plans and lists of installations; own calculations

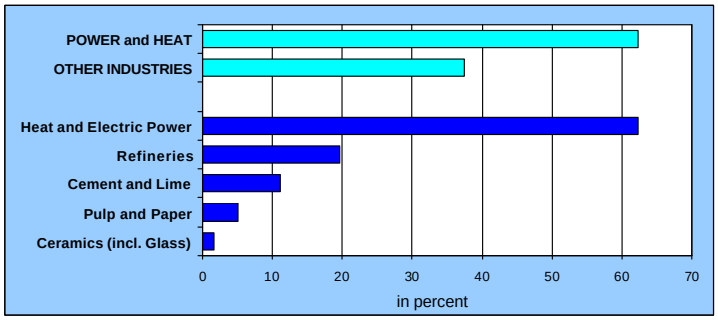
Lithuania

Figure LT-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure LT-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

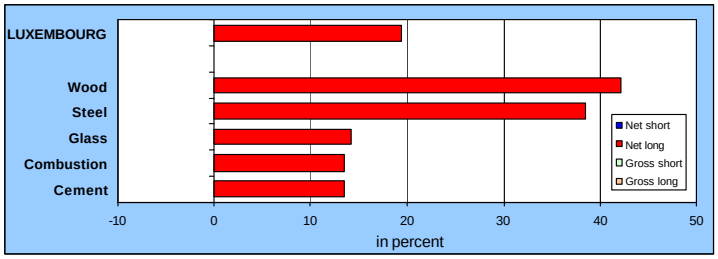
Table LT: Allocation discrepancies by sectors (2005)

Lithuania	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**93**	**6,899,585**	**51.1**	**186**	**60**	**4.2**	**94**	**30**	**20.5**	**99**	**3**	**26.4**	**40**
Power and Heat	58	4,951,275	36.7	511	33	2.4	109	22	10.7	132	3	23.6	61
Other	35	1,948,310	14.4	108	26	1.8	67	8	6.9	71	1	5.8	

Source: CITL, National Allocation Plans and lists of installations; own calculations

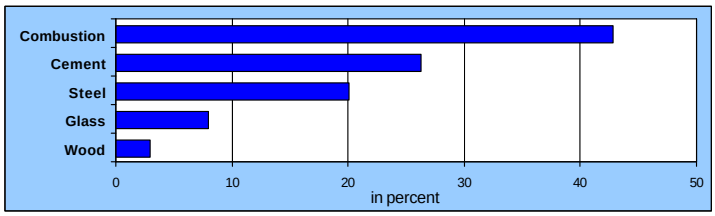
Luxembourg

Figure LU-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure LU-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

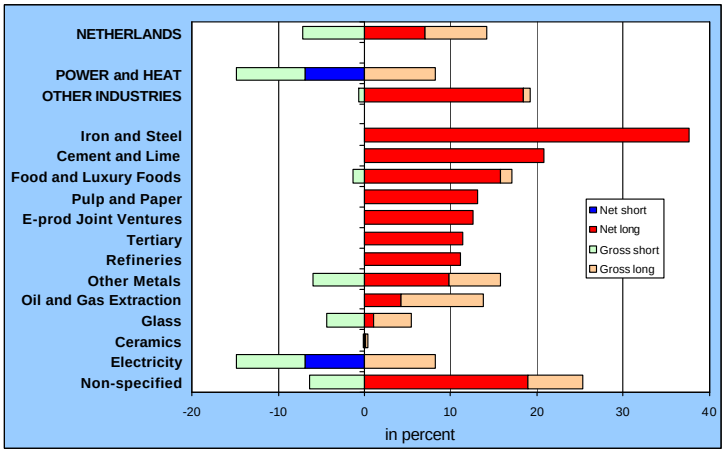
Table LU: Allocation discrepancies by sectors (2005)

Luxembourg	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**15**	**625,972**	**19.4**	**15**	**4**	**1.9**	**12**	**9**	**9.8**	**86**	**2**	**7.7**	**2**

Source: CITL, National Allocation Plans and lists of installations; own calculations

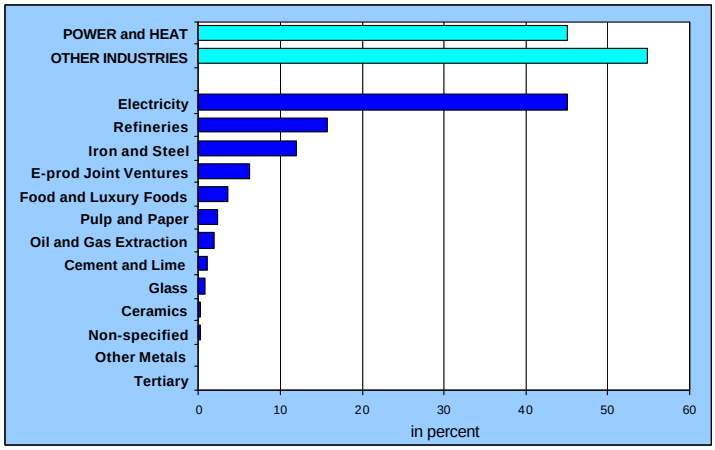
Netherlands

Figure NL-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure NL-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

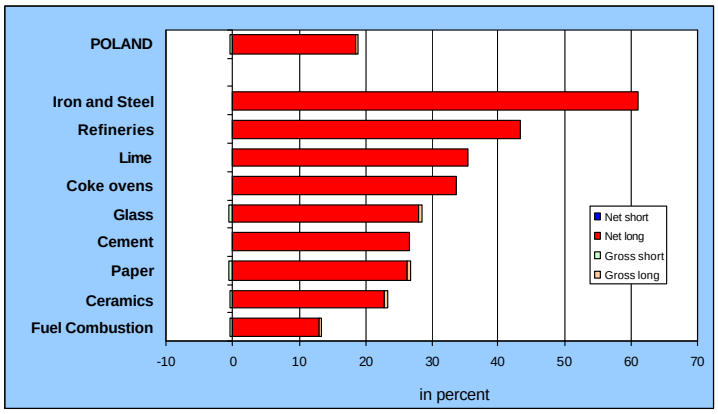
Table NL: Allocation discrepancies by sectors (2005)

Netherlands	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**207**	**6,101,199**	**7.1**	**91**	**119**	**1.1**	**46**	**79**	**1.4**	**49**	**9**	**4.6**	**34**
Power and Heat	41	-2,680,864	-3.1	59	23	0.2	58	13	-1.7	49	5	-1.6	33
Other	166	8,782,063	10.2	110	74	0.6	40	86	2.6	25	6	7.0	32

Source: CITL, National Allocation Plans and lists of installations; own calculations

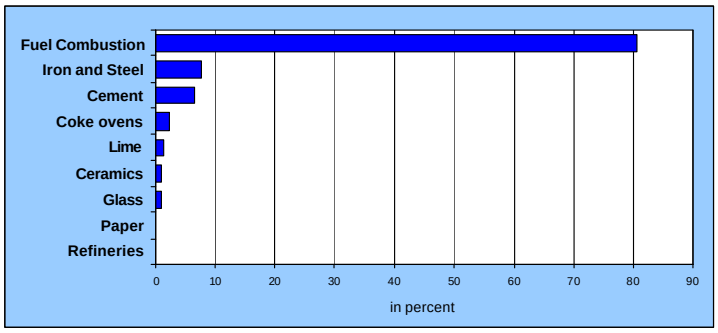
Poland

Figure PL-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure PL-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

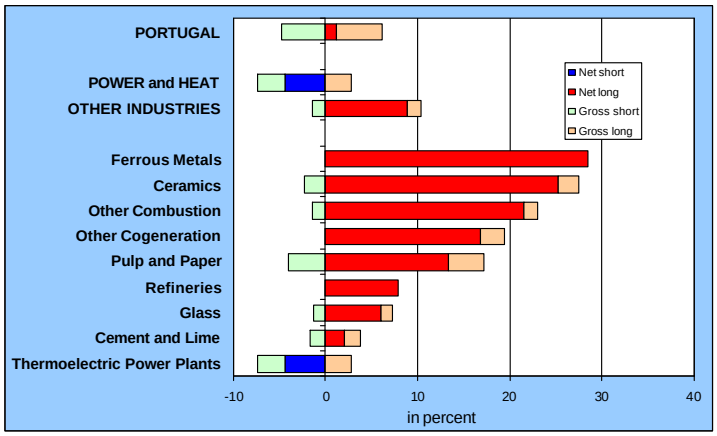
Table PL: Allocation discrepancies by sectors (2005)

Poland	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**657**	**31,840,583**	**18.9**	**115**	**416**	**1.7**	**55**	**227**	**8.9**	**42**	**14**	**8.3**	**29**

Source: CITL, National Allocation Plans and lists of installations; own calculations

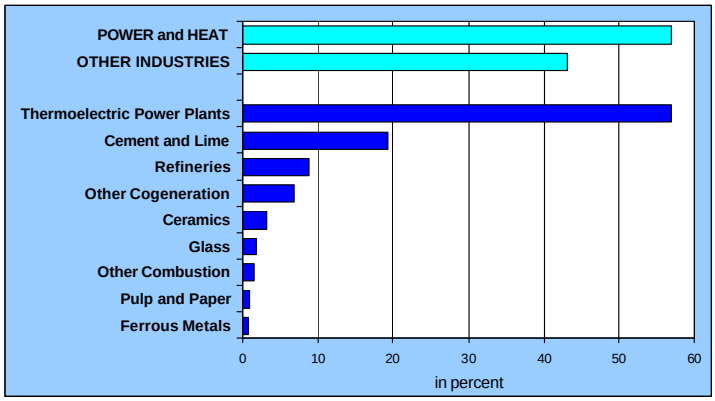
Portugal

Figure PT-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure PT-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

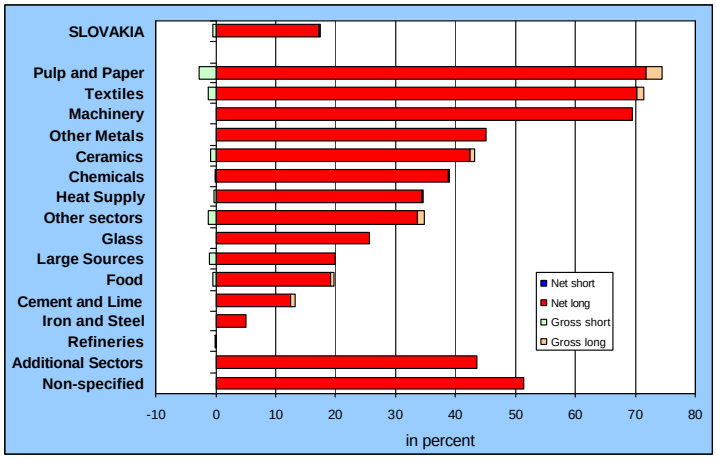
Table PT: Allocation discrepancies by sectors (2005)

Portugal	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**243**	**471,304**	**1.3**	**43**	**188**	**1.6**	**54**	**50**	**2.1**	**16**	**5**	**-2.4**	**-49**
Power and Heat	16	-943,214	-2.6	18	9	-0.3	36	5	0.8	11	2	-3.1	5
Other	227	1,414,518	3.8	34	137	0.9	46	85	2.1	26	5	0.8	8

Source: CITL, National Allocation Plans and lists of installations; own calculations

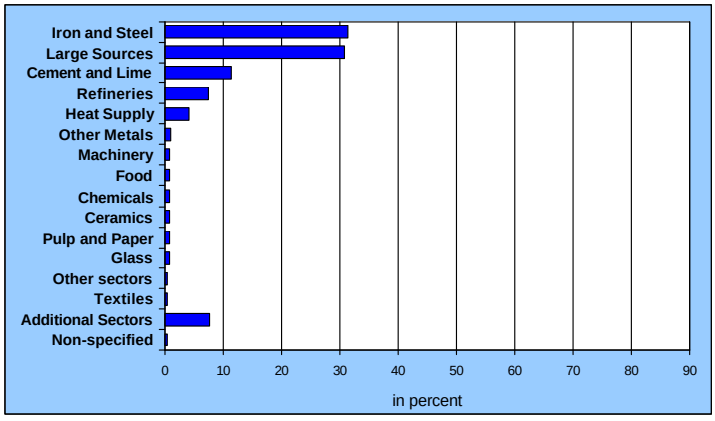
Slovakia

Figure SK-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure SK-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

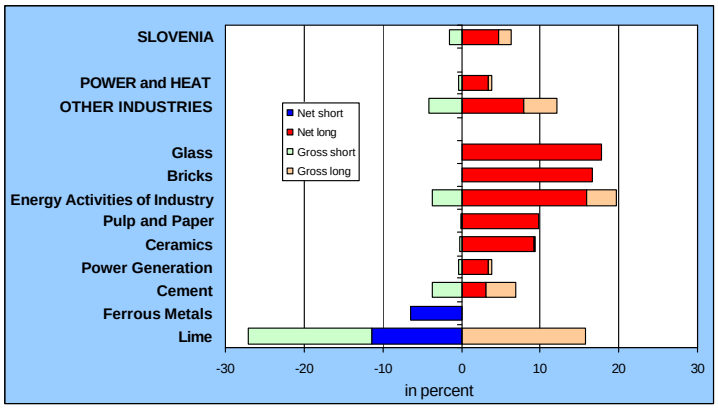
Table SK: Allocation discrepancies by sectors (2005)

Slovakia	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**175**	**5,238,908**	**17.2**	**42**	**134**	**4.3**	**136**	**38**	**10.8**	**31**	**3**	**2.1**	**5**

Source: CITL, National Allocation Plans and lists of installations; own calculations

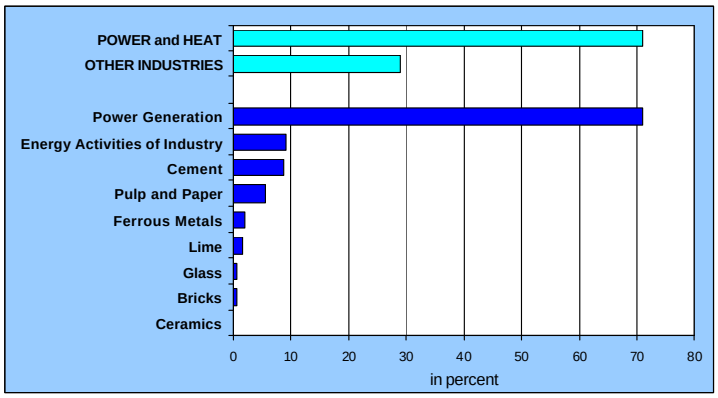
Slovenia

Figure SI-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure SI-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

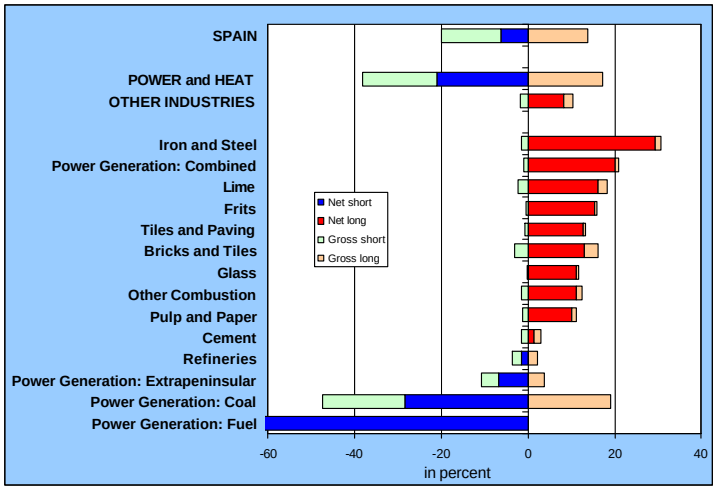
Table SI: Allocation discrepancies by sectors (2005)

Slovenia	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**94**	**434,143**	**4.8**	**18**	**62**	**1.3**	**39**	**31**	**2.2**	**18**	**1**	**1.3**	
Power and Heat	6	226,012	2.5	5	3	0.6	60	2	0.6	8	1	1.3	
Other	88	208,131	2.3	33	36	0.8	52	46	1.3	25	6	0.1	17

Source: CITL, National Allocation Plans and lists of installations; own calculations

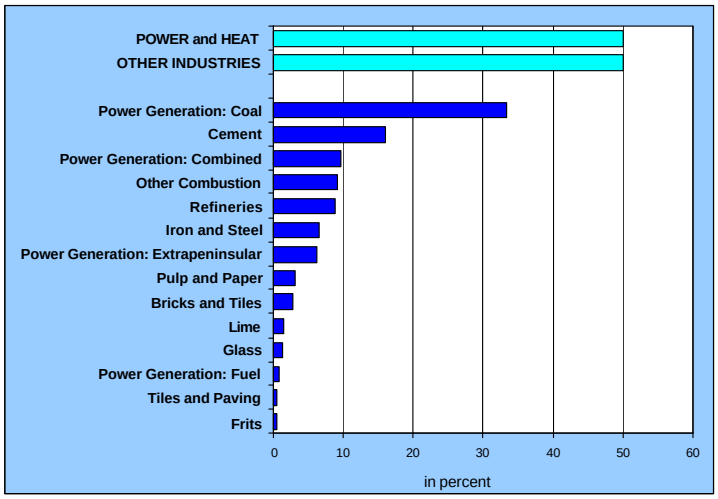
Spain

Figure ES-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure ES-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

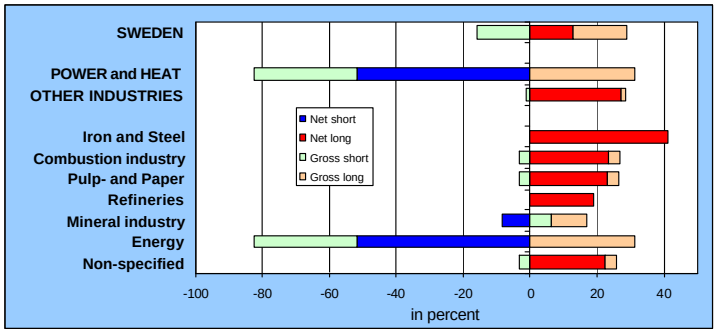
Table ES: Allocation discrepancies by sectors (2005)

Spain	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**783**	**-10,851,879**	**-6.3**	**177**	**516**	**7.4**	**499**	**244**	**-0.6**	**42**	**23**	**-13.1**	**58**
Power and Heat	77	-18,052,419	-10.5	104	34	6.1	174	35	-5.7	63	8	-11.0	41
Other	706	7,200,540	4.2	104	354	0.5	42	326	2.0	19	26	1.7	40

Source: CITL, National Allocation Plans and lists of installations; own calculations

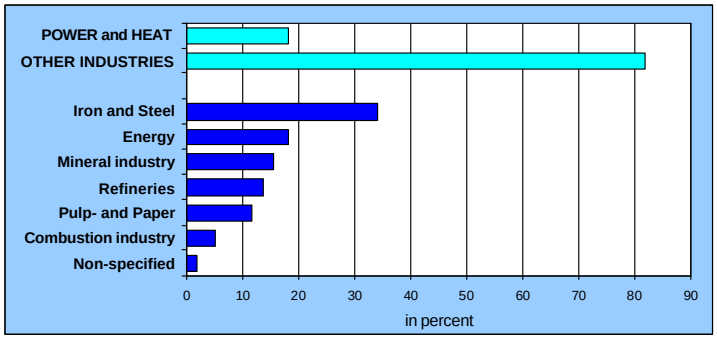
Sweden

Figure SE-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure SE-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

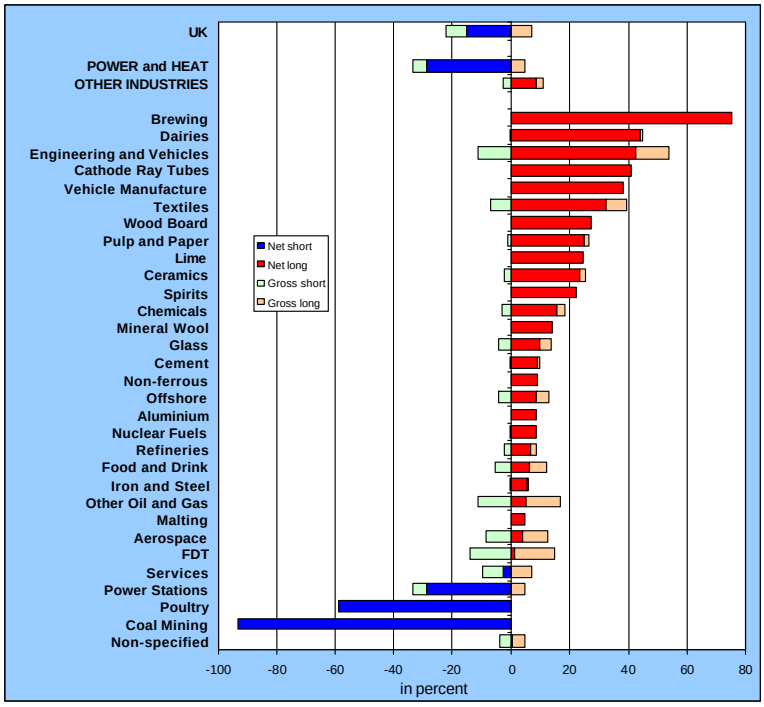
Table SE: Allocation discrepancies by sectors (2005)

Sweden	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**683**	**2,852,898**	**12.9**	**434**	**570**	**6.1**	**422**	**106**	**1.7**	**58**	**7**	**5.1**	**94**
Power and Heat	336	-2,090,056	-9.4	1080	279	3.5	614	54	0.2	50	3	-13.2	672
Other	347	4,942,954	22.3	289	275	2.3	128	67	3.7	21	5	16.3	55

Source: CITL, National Allocation Plans and lists of installations; own calculations

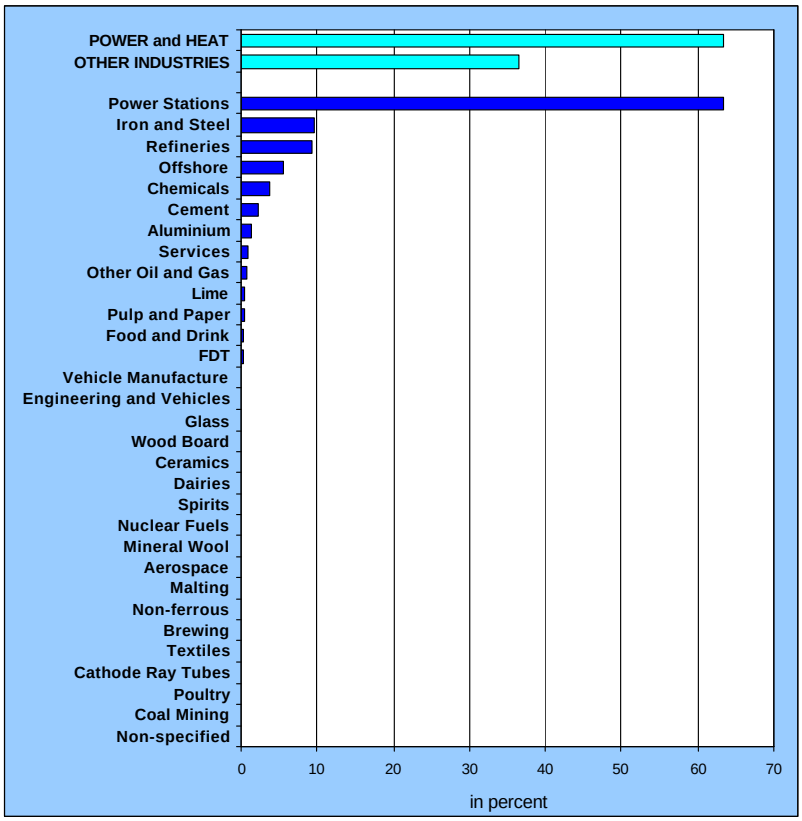
UK

Figure UK-1: Short and long positions by sectors (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure UK-2: Sectoral shares in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Table UK: Allocation discrepancies by sectors (2005)

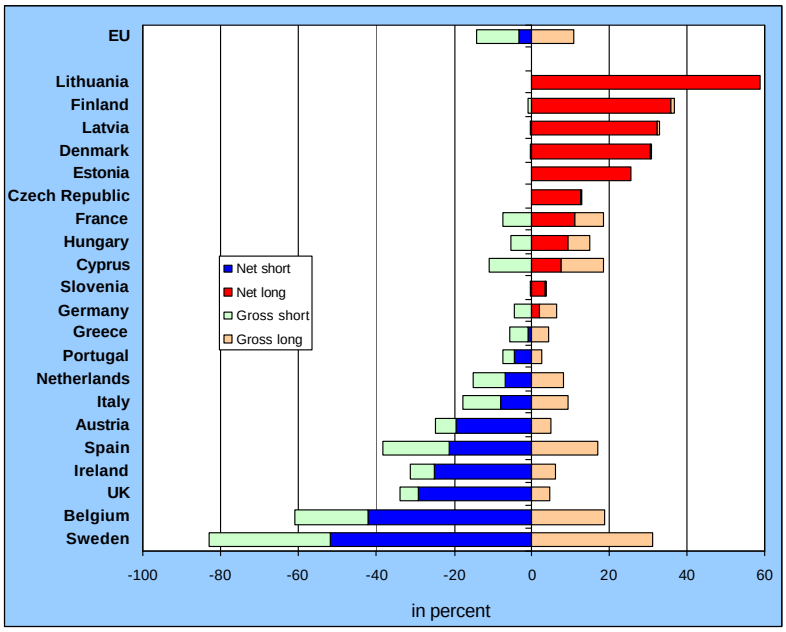
UK	All installations				Accumulated verified emissions								
					less than 5 %			between 5 % and 50 %			more than 50 %		
	Number of installations	Net position in tons	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**	Number of installations	Net position in %*	Normalized stand. dev. in %**
Total	**673**	**-31,345,323**	**-15.2**	**142**	**549**	**1.3**	**75**	**109**	**-1.2**	**41**	**15**	**-15.3**	**15**
Power and Heat	126	-37,835,321	-18.4	92	88	1.0	140	29	-5.8	34	9	-13.6	23
Other	547	6,489,998	3.1	49	370	0.5	75	167	1.4	29	10	1.3	8

Source: CITL, National Allocation Plans and lists of installations; own calculations

Appendix 3: Sectoral Details

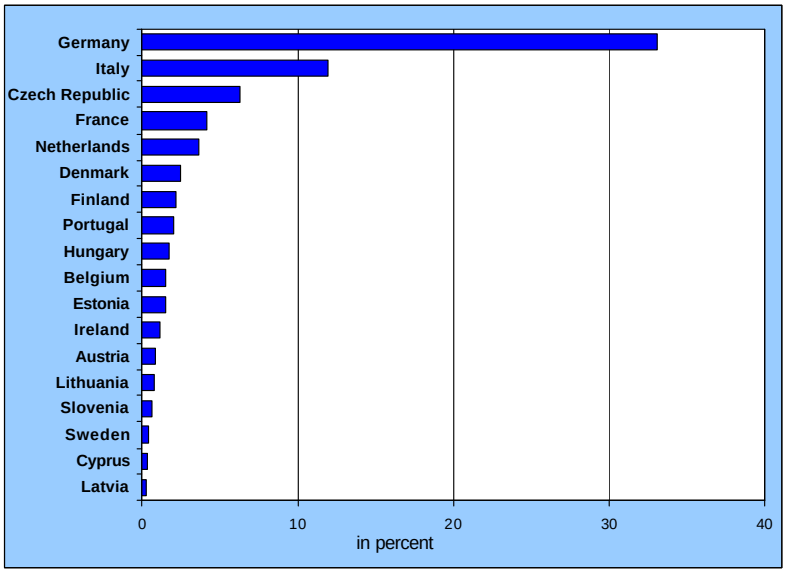
Power and Heat

Figure E-1: Short and long positions per country (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

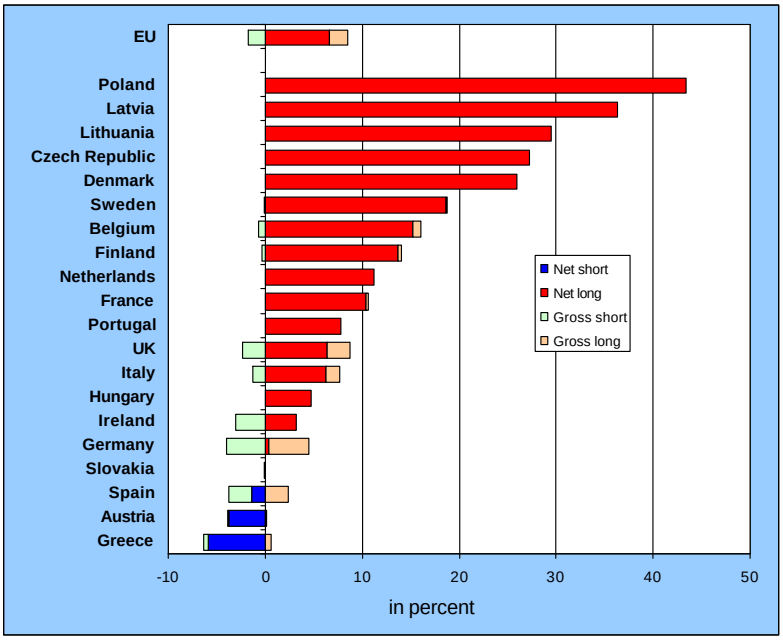
Figure E-2: Country's share in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

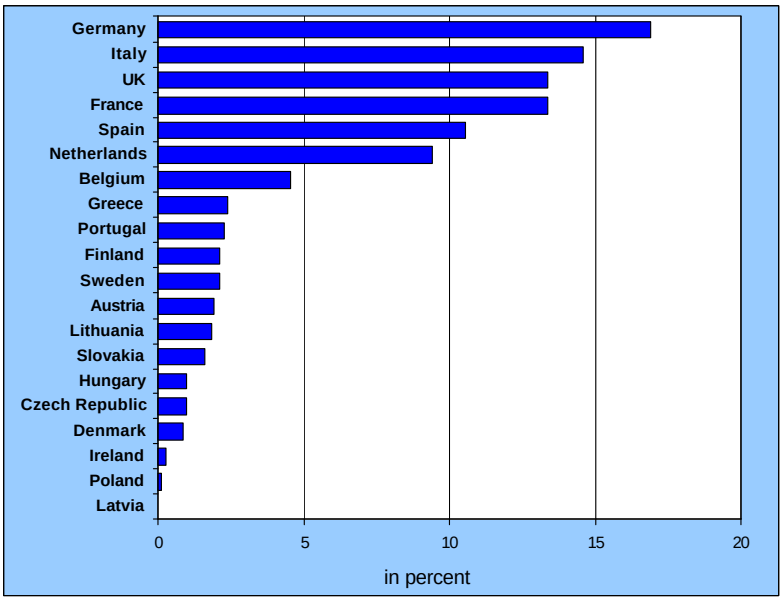
Refineries

Figure R-1: Short and long positions per country (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

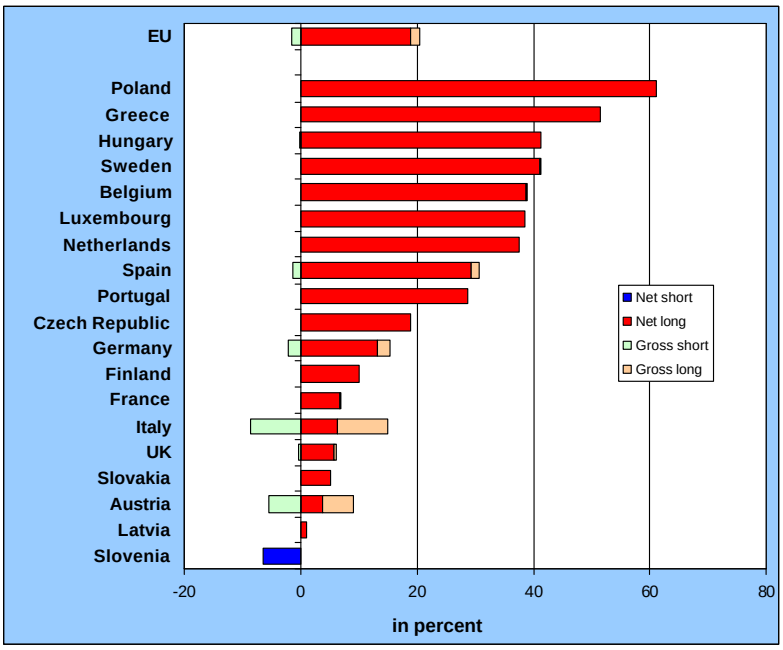
Figure R-2: Country's share in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

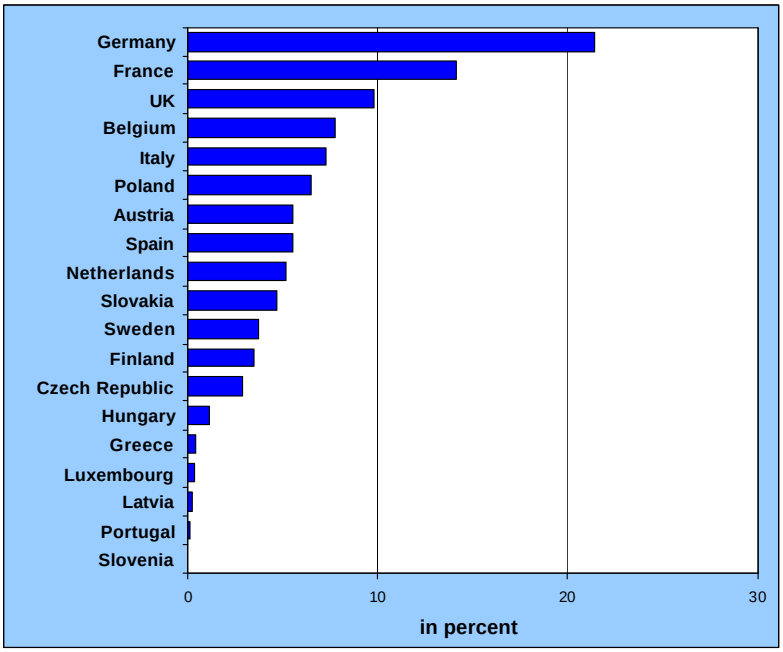
Iron and Steel

Figure S-1: Short and long positions per country (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

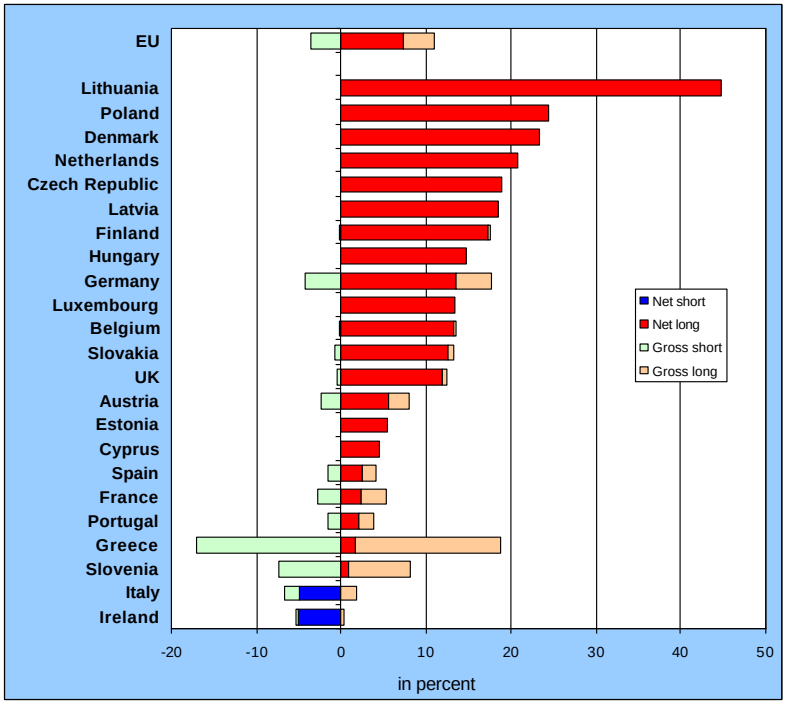
Figure S-2: Country's share in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

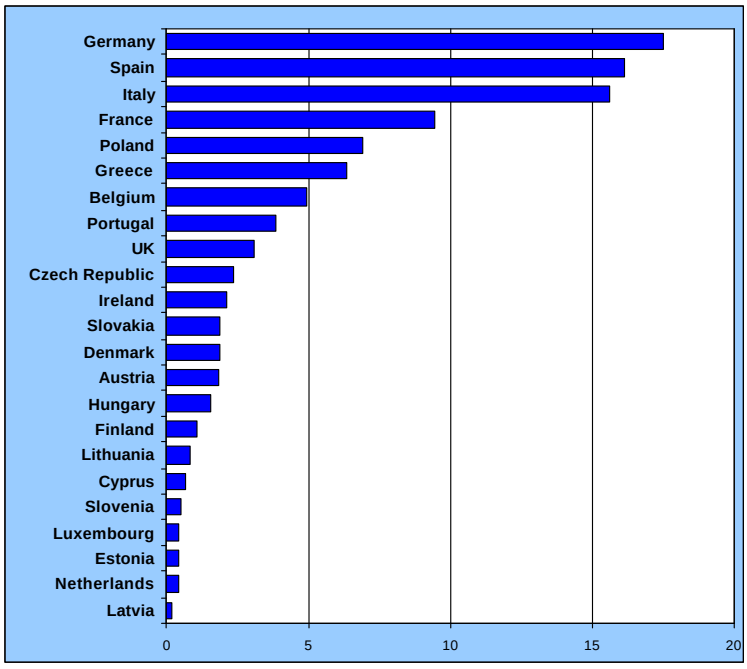
Cement and Lime

Figure C-1: Short and long positions per country (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

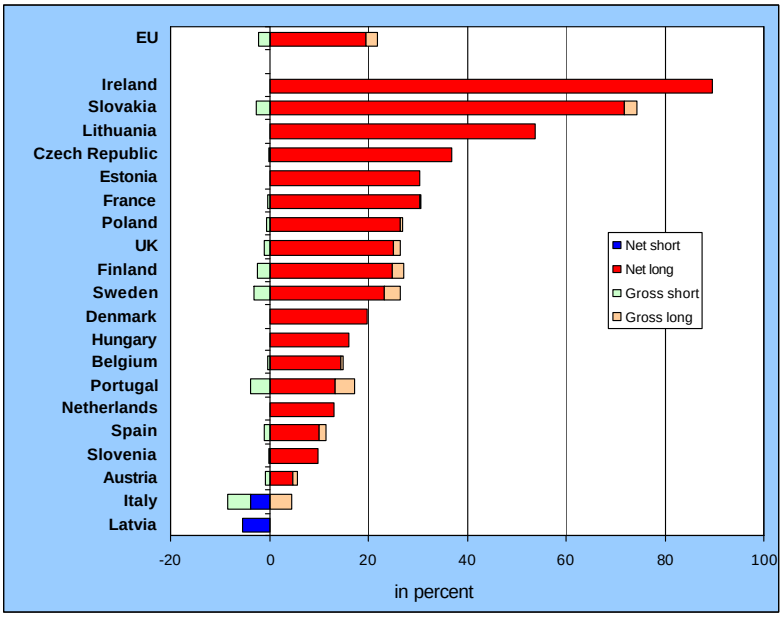
Figure C-2: Country's share in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

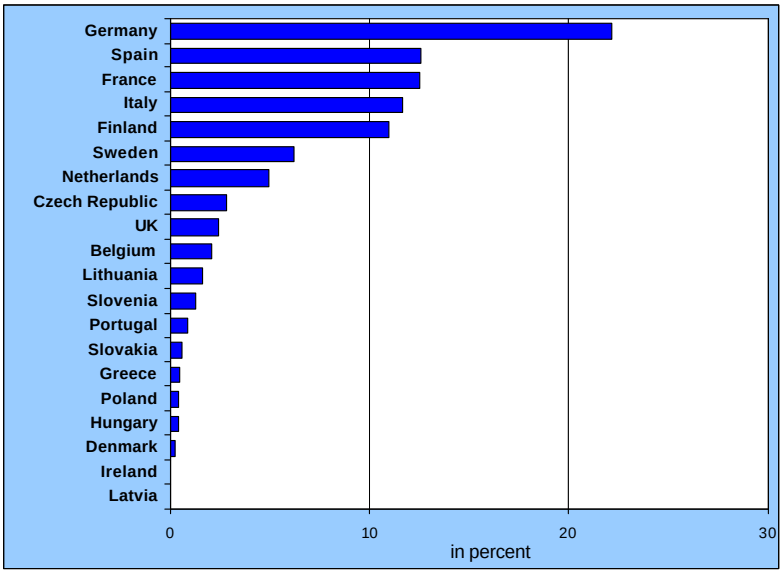
Pulp and Paper

Figure P-1: Short and long positions per country (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

Figure P-2: Country's share in total allocation (2005)



Source: CITL, National Allocation Plans and lists of installations; own calculations

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