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IS EUROPEAN CLIMATE POLICY THE NEW CAP?

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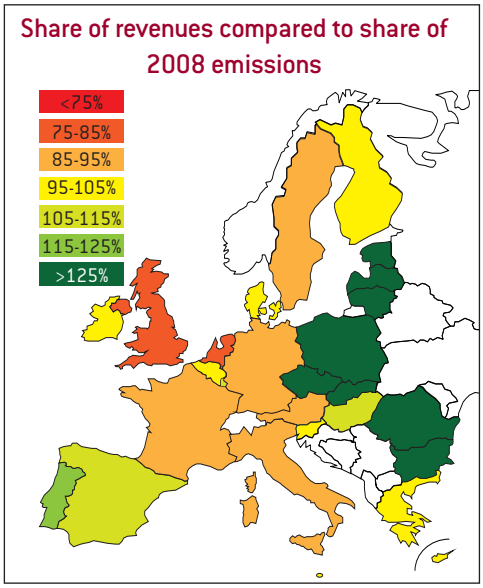
SUMMARY In its third phase (2013-20) the European Union's emissions trading system (ETS) will issue allowances for around two billion tonnes of CO2 equivalent each year. The emission rights are valued at around €30-35 billion at current prices, between one-half and two-thirds of the amount the EU spends on the Common Agricultural Policy. The redistributive effects of the allocation of emission allowances are therefore potentially significant. Quantitative indicators for the relative degree to which individual countries will be affected by the ETS suggest that economic consequences for the member states will be quite different. By comparing the indicators for each country with that country's initial allocation, we find, however, that countries with less favourable initial conditions are largely compensated.

POLICY CHALLENGE

The challenge for the ETS is that distributional concerns should not outweigh efficiency targets and the need for transparency. Our indicators suggest that countries with the highest abatement burden are already compensated through the allocation of free emission rights and revenues from the auctioning of allowances. Additional exceptions that would challenge the efficiency of the ETS are not generally justified. This is particularly true for free allowances. Thus, the shift from the allocation of free allowances towards the allocation of auction revenues should be speeded up. This implies reducing the high number of sectors entitled to free allowances.



Source: Bruegel.

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THE EUROPEAN UNION EMISSIONS TRADING SYSTEM (ETS) will enter its third phase (2013-20) in a significantly changed form compared to its first and second phases (2005-07 and 2008-12). The scheme requires about 13,000 industrial installations and power plants to surrender an allowance for each tonne of carbon dioxide they emit. The total number of allowances is capped. During the first two phases, installations were given free allowances on the basis of complex national rules. As some participants emit more than their initial allocation, while others emit less, a relatively liquid market for allowances has developed. In the third phase, the ETS will expand to cover new installations and greenhouse gases, and the method of allocating EU emission allowances (EUAs) will be modified. The debate on the technical details of the third phase is ongoing[1].

The ETS has significant economic effects. The European Commission (2010) argues that the implementation of climate legislation will cost 0.32 percent of GDP up to 2020. Because of differing initial conditions, member states feel the impact of the ETS differently. Some governments worry that their industries will have to shoulder more than their fair share of the burden. Compensation mechanisms have thus been introduced, relying to a certain degree on political discretion, such as the rules for allocating free allowances. As a result, the ETS is becoming one of the EU's policies with the greatest economic impact. By issuing allowances with an annual value of €30-35 billion the ETS will be on a scale comparable to the Common Agricultural Policy (about €60 billion) and the Structural and Cohesion Funds (€30-50 billion).

This Policy Brief summarises, in the next section, the main cost/benefit factors that will come into play on the national level in the third phase of the ETS. From these, we develop indicators for the relative degree to which individual countries will be affected by the ETS. We then compare our findings on the sharing of costs and benefits with the initial allocation of allowances and the division of auction revenues between countries, to see if the countries most affected by the ETS are appropriately compensated. We conclude with some policy lessons.

1 INDICATORS

The economic effects of the ETS can be split into five main components: (1) the cost at which a country can abate carbon emissions; (2) the effect the carbon price has on the profits of carbon-intensive industry; (3) the effect the carbon price has on domestic and industrial users of carbon-intensive products (in particular electricity); (4) the effect the carbon price has on other production factors; and (5) the fiscal benefit a country can realise by generating additional revenues from the auctioning of emission allowances.

For most of the components, there are extensive models that calculate the individual or joint effects[2]. However, to the author's knowledge, no model explicitly includes all dimensions, with the objective of comparing the country-level costs and benefits of the ETS.

Our approach therefore assesses country-level effects using indicators derived from economic intuition. Each indicator compares a cost/benefit arising from the ETS in an individual country with the corresponding cost/benefit for the EU27. Thus, countries with lower than average costs in some areas and higher than average benefits in others are 'winners', while below-average benefit or above-average cost countries are relatively worse off ('losers'). We analyse the relative costs of the ETS for seven countries representing different regions and economic situations: France, Germany, Hungary, Italy, Poland, Spain and the United Kingdom.

1.1 Potential for exporting allowances

The amount by which an economy can reduce its greenhouse-gas emissions is a key factor in its tendency to import or export emission allowances. A country will likely reduce emissions overall as long as the cost for an additional reduced unit is below the carbon price. It will then either export allowances to maximise profits or import allowances in order to meet its target. Thus, the more an economy can abate, and the lower the reduction cost, the more net revenues it can generate from exporting (or not importing) allowances.

Depending on their industrial structure and development level, countries differ substantially in

1. Furthermore, the decision on whether or not to increase the EU's 2020 emissions reduction target from 20 percent to 30 percent is still on the political agenda.

2. A review of macro-models is to be found in Oberndorfer *et al* (2006) and Dannenberg *et al* (2008). One example is the the E3ME model of 42 industrial sectors with the disaggregation of energy and environment industries. This was used for the impact assessment for the 2009 Climate Package.

their potential for reducing emissions at low cost. Countries with a high share of industry that can cut its emissions inexpensively by improving production processes or substituting inputs can reduce emissions cheaply.

Indicator (Figure 1): The abatement potential, ie the volume of emissions in megatons (Mt) that a country could cut, depends on the carbon price. This abatement potential is notoriously difficult to assess, and making a bottom-up estimate of the abatement potential for different countries is beyond the scope of this Policy Brief[3]. Instead, we base our assessment on the marginal abatement-cost assumptions used in the POLES model that has been used for the ETS impact assessment (Commission, 2008)[4].

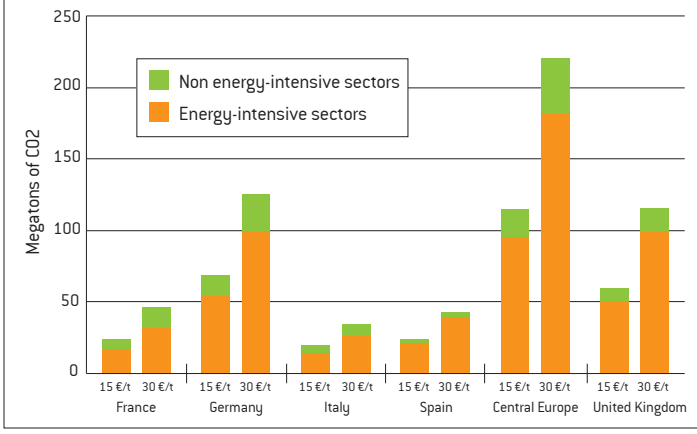
Result: French, Italian and Spanish abatement costs are among the highest, while those in central Europe are comparatively low. Thus, at a carbon price of 30 €/t, Germany, the UK and central Europe might profitably sell hundreds of millions of carbon permits to Spain, Italy and France.

1.2 Direct vulnerability

Putting a price on carbon implies higher production costs for goods and services whose production involves emitting greenhouse gases. Consequently, the *first* component of carbon competitiveness is the amount of carbon needed to produce one unit of added value in a sector or country. The more carbon-intensive an industry, the more it will be affected by the carbon price. The *second* component is the ability of a country to pass through cost shocks to trading partners. If carbon prices rise, some sectors with low demand elasticity (eg electricity) will be able to pass through the cost to their customers, while sectors with higher demand elasticity (eg short-haul aviation) will have to accept decreasing turnover and/or margins.

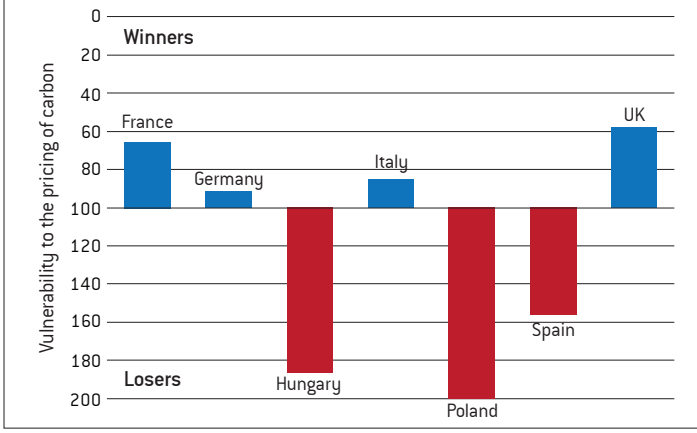
Indicators (Figure 2): To assess how vulnerable an economy is to the pricing of carbon, we estimate the gross added value that is at stake. To compute this indicator, we multiply each sector's share of a country's added value by the added value at stake in the sector. The added value at stake is an estimate of the reduction in the price-cost margin in a given sector due to a carbon price of 20€/t. The corresponding values for each sector are taken from estimates by *Umweltbundesamt* (2008) for Germany. To give one example: in Germany, the added value of the textiles finishing sector in 2007 was €429 million. This represented 0.02 percent of German added value. According to *Umweltbundesamt* (2008), the maximum direct effect of a 20€/t carbon price would be a loss of about 1.6 percent of added value in this sec-

Figure 1: Marginal abatement potential at 15€/t and 30€/t



Source: Anger (2009) and author's calculations.

Figure 2: Vulnerability indicator



Source: Eurostat, Umweltbundesamt (2008) and author's calculations.

3. For interested readers we for example refer to the work of McKinsey (2010) for Poland.

4. As the raw data are publicly unavailable we rely on the polynomial approximation of the cost curves used by Anger (2009).

tor. Thus, from the textiles finishing sector, Germany would lose 0.0003 percent of its added value (0.02 percent times 1.6 percent). We sum up these losses for the 20 most-affected sectors for each country. This gives a loss of 0.15 percent of added value for Germany and 0.25 percent for Spain. Then we divide the individual country's loss by the mean loss of added value to see which countries are more and which are less affected due to their industrial structure. This constitutes our *vulnerability* indicator.

Result: Due to their industrial structures, Hungary, Poland and Spain could lose a higher share of their added value than France, Italy or the UK. In Poland and Spain, this is in part due to a high share of cement production in the added value. This may in part be a consequence of our 2007 data coinciding with a construction boom in both countries. However, even when ignoring the cement sector, the ordering of countries remains constant.

1.3 Indirect vulnerability

The cost of emission allowances for producing intermediate goods (such as electricity) are passed through to the next stage of the value chain (such as aluminium smelting). Consequently, countries generating a lot of added value by processing non-substitutable carbon-intensive intermediate goods will be worse off. It is widely agreed that the main pass-through effect happens with electricity[5]. In distributional terms, one can distinguish two effects: low-carbon electricity producers will gain windfall profits from higher electricity prices (France), while industries consuming high levels of electricity (Poland) will lose out.

Consequently, we propose **two indicators (Figure 3):** (1) electricity intensity of industry (industry electricity consumption divided by industrial GDP); and (2) carbon intensity of the power sector.

Result: German and Polish electricity generation is particularly 'dirty'. That is, it generates less electricity per tonne of CO2 than the EU average. In addition, the Polish and Spanish economies are more vulnerable to higher electricity costs, because they need more electricity to produce a unit of added value in their industrial sectors.

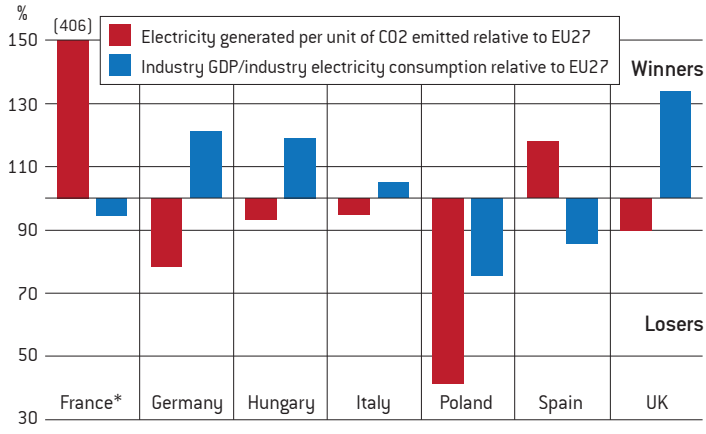
1.4 Write-down of domestic assets

Member states are endowed with natural resources to different degrees. Due to emission caps, demand will fall in Europe for resources that generate high emissions when processed. The price of these resources can be expected to fall if they cannot easily be exported. This is particularly true for coal. By contrast, natural gas demand in Europe will increase as a consequence of a modest carbon price. Thus, European natural-gas producers will be able to charge higher prices. Finally, the value of a highly skilled workforce is increasing, because skilled employees have more capability to invent, implement and adapt to less carbon-intensive production processes.

Our **three indicators (Table 1 and Figure 4)** are the self-sufficiency rates for natural gas, coal import dependency compared to the EU average, and the share of population with tertiary education.

Result: The increasing value of natural gas is good news for the gas-exporting UK, while the decreasing value of coal will result in a deterioration of the external position of coal-exporting Poland. The below-average share of the population with tertiary education in Hungary, Italy and Poland indicates a below-average ability to cope with the

Figure 3: Pass-through effect



Source: IEA, Eurostat and author's calculations. * France needs four times less CO2 to produce a unit of electricity than the EU average. For presentational purposes we capped the figure.

5. As electricity is responsible for about half of ETS emissions.

sectoral change induced by limiting carbon emissions.

1.5 Double dividend

A double dividend might occur as other taxes are replaced by carbon-related revenues that are less distorting than the previous taxes (Goulder, 1995). In general, higher tax revenues imply more distorting taxes. Thus, the higher the state share, the more helpful revenues from carbon taxes (or the auctioning of emission rights) are for limiting distortions. We therefore use the 2008 state share compared to the EU average as the indicator.

Result (Figure 5): In France the additional income from auctioning of allowances might help most to reduce distorting taxes.

1.6 Summary

By its very nature this indicator exercise is incomplete. Many micro- and macro-level effects had to be ignored and it is not possible to assess the relative importance of the individual effects. Nevertheless, we can conclude that some countries are more adversely affected than others. In Table 2 we compile the indicators for the countries under consideration. It is striking that the EU's largest 'mature' economies – France, Germany and the UK – have higher benefits and lower costs than the EU average, while Hungary, Poland, and Spain face above-average costs and below-average benefits from ETS participation. This echoes the conventional wisdom that the more advanced an economy, the less energy and carbon it requires to generate added value, and highlights the potential need to compensate some economies for their participation.

2 COMPENSATION THROUGH INITIAL ALLOCATION?

The costs and benefits that we have discussed are the first aspect of the ETS's distributional effects. The second is linked to the way emission allowances are allocated to ETS participants. As

Table 1: Share of high skilled relative to EU27 average

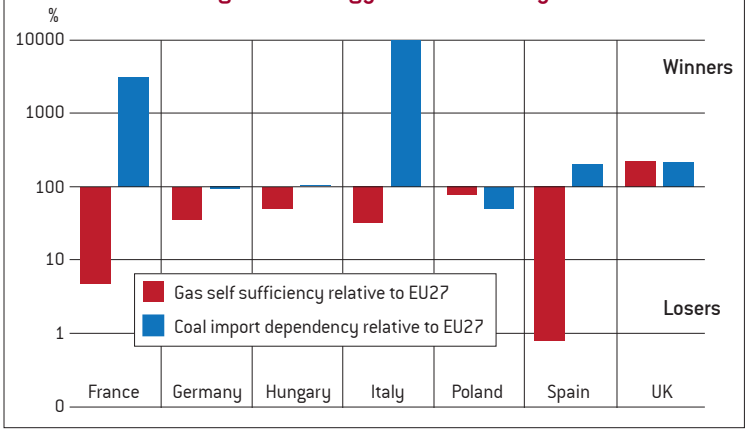
France	114%
Germany	105%
Hungary	79%
Italy	58%
Poland	118%
Spain	84%
United Kingdom	133%

Source: Eurostat and author's calculations.

Table 2: Indicative table for indicators

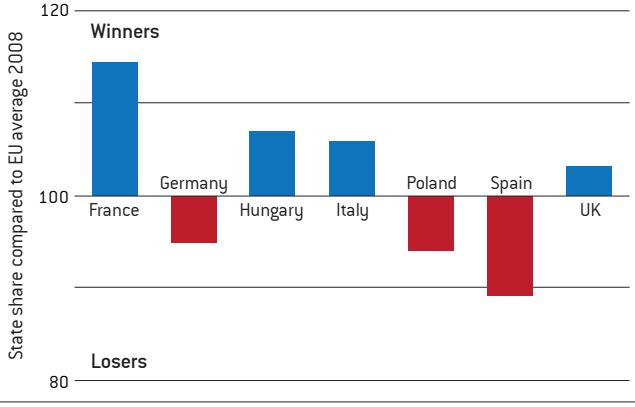
	FR	DE	HU	IT	PL	ES	UK
Allowance export potential	–	+	+	–	+	–	+
Direct vulnerability	+		–	+	–		+
Indirect vulnerability	+				–		+
Write-down of domestic assets			–		–		+
Double dividend	+						

Figure 4: Energy self sufficiency



Source: Eurostat and author's calculations.

Figure 5: State share compared to EU average (2008)



Source: OECD and author's calculations.

tradable EUAs can be sold at market prices, they are an exportable good. The approximately two billion EUAs issued each year have a value of €32 billion at current prices[6]. Thus, the allocation of allowances could compensate the most affected economies.

For the third phase of the ETS, there are three allocation principles: (1) selling a contingent of allowances to the highest bidder (auctioning), (2) free allocation of some allowances to certain emitters and (3) carry-over of unused allowances from the previous trading phase. Furthermore, new EUA's might be created by converting international emission permits into European allowances.

2.1 Sharing of auction revenues

At the start of the third phase, about 60 percent of the allowances distributed to participants will be auctioned[7]. The remainder will be handed out for free (see next section). Thus, at a price of €16, the auction value in 2013 will be about €20 billion.

Auction revenues will be distributed to member states according to a key defined in the emission trading directive (Directive 2009/29/EC). Most (88 percent) revenues will be distributed among member states on the basis of their share of verified emissions from ETS installations in 2005. Of the remainder, 10 percent will be distributed to the least-wealthy states, and two percent will be distributed as a 'Kyoto bonus' to states that by 2005 had already reduced their greenhouse gas emissions by at least 20 percent compared to their Kyoto protocol base year.

Indicator (Figure 6): We propose four criteria to measure the fairness of the allocation of auction revenues: the revenue share of each country with that country's share of EU27 GDP in 2008, expected GDP in 2020, 2008 emissions and the population in 2008.

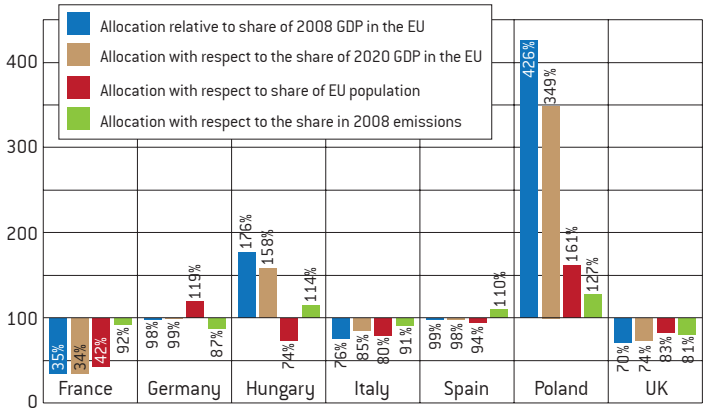
Result: Poland and Hungary receive relatively more auction revenues than the EU27 average while France, Italy and the UK receive relatively low shares.

2.2 Distribution of free allowances

Except for electricity generators, all ETS participants receive a number of free allowances. Free allocation is based on sector-specific benchmarks designed to reward the most efficient operators in each sector[8]. The Commission defined three different categories: (1) aviation will receive 85 percent of its benchmark for free; (2) sectors exposed to carbon leakage obtain 100 percent of their benchmark for free. This category includes about 150 sectors, representing about 77 percent of manufacturing emissions, that might shift production outside the EU in response to carbon pricing; and (3) all other installations will obtain a linearly shrinking share (2013: 80 percent to 2020: 30 percent) of the benchmark for free.

Thus, we propose **two indicators (Figure 7)**. The first approximates the share of required allowances a country might obtain for free. Based on sectoral emission data from 2008 (European Environment Agency) we analyse the structure of emissions on a country level and estimate the emissions falling under each of the four categories: carbon leakage sectors (>0 percent auctioning), aviation (>15 percent auctioning), non-leakage sectors (>20 percent auctioning in 2013) and electricity production (100 percent auctioning). We find that in 2013, about 40 percent of allowances in the EU27 will be handed out for free[9].

Figure 6: Under/overallocation with respect to share of GDP, population and emissions (2008 and 2020)



Source: Eurostat: GDP 2008, Population 2008; Economist Intelligence Unit: GDP 2020; Directive 2009/29/EC: share of auction revenues; CITL: historic emission.

6. The price for a 2014 EUA Future at the ECX in December 2010 was €16.

7. As the electricity sector is responsible for approximately half of the emissions that fall under the ETS, and as its allowances are to be fully auctioned (together with 15 percent of the allowances from aviation and 20 percent of the allowances from the non-leakage sector) it is likely that more than one billion EUAs will be auctioned.

8. For each sector, a value is established for how much greenhouse gas the 10 percent best-performing installations emit on average. The number of free allowances per installation is calculated from this benchmark value, the historic production volume and a sector-specific allocation factor. Thus, in 2013 an installation producing 1000 units of a product not subject to carbon leakage, and whose 10 percent most carbon-efficient producers emit on average 1 tonne of CO2 per unit, will obtain 800 allowances (1000 x 80 percent) for free, regardless of whether this particular producer will actually emit 500 or 5000 tonnes of CO2.

The second indicator measures the importance of the leakage sector relative to total manufacturing.

Results: Due to their less carbon-intensive electricity generation, France, Italy and Spain will receive a much higher share of free allowances than Germany or Poland. In most countries in our sample (especially Spain) the leakage sector has a lower share in total manufacturing than in the EU27 average (42 percent in turnover and 40 percent in employment). Only Italy, which has an above-average share in the leakage sector (47 percent in turnover and 47 percent in employment), benefits from a potentially disproportionate entitlement to free allocations.

2.3 Banking of allowances

Excess EUAs from the ETS second phase can be carried over to the third phase, in contrast to the transition from the first to the second phase, where this so-called 'banking' was precluded. Countries with extraordinarily high over-allocations in the second phase can benefit from their excess allowances in the third phase.

Consequently our **indicator (Figure 8)** measures the allocation factor (allowances allocated divided by allowances used) in each country relative to the allocation factor in the ETS in 2008-09.

Result: Phase II allowances were significantly over-allocated to France, Italy and Poland, but not to Germany and the UK. Thus, the former countries have a greater chance of carrying allowances over to the third phase.

2.4 Summary

The ETS has disproportionate adverse economic effects on Hungary and Poland. These countries are, however, also able to secure a higher share of revenues from the auctioning of allowances. By contrast, France and the UK, which were relatively less affected economically by the ETS than the EU27 average, will receive a lower share of auction revenues. This suggests that countries seem to be somewhat compensated for their initial economic conditions.

The only significant exception might be Spain, which has been adversely affected by the broad definition of the carbon leakage sector because it has a disproportionately low share of employment

Figure 7(a): Share of free allowances in total relative to EU27

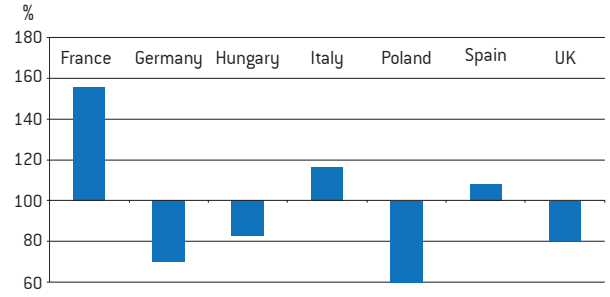
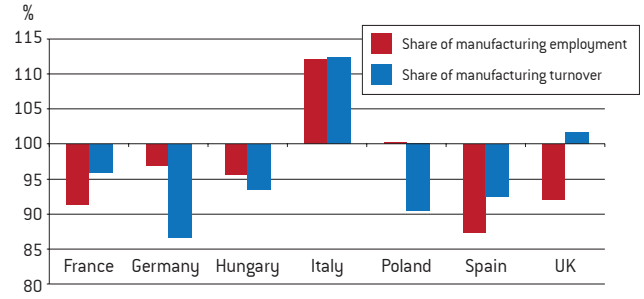
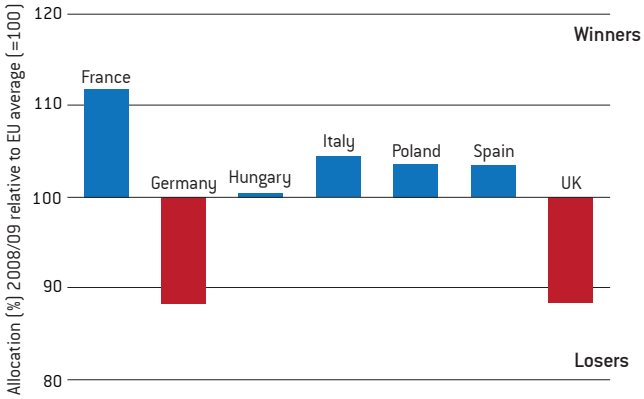


Figure 7(b): Importance of the leakage sector relative to EU27



Source: EEA, list of leakage sectors, Eurostat and author's calculations.

Figure 8: Relative over allocation, 2008-09



Source: CITL and author's calculations.

9. It is likely that the real number will be somewhat different, as most installations are likely to emit more than their respective benchmark value and we are unable to distinguish sectors within which some subsectors are subject to carbon leakage, while others are not.

and turnover in carbon-leakage industries. Consequently, other countries with disproportionately high shares in these industries will receive higher shares of free allowances. At the same time, the total number of allowances to be auctioned shrinks and Spain will obtain lower allowance auction revenues.

3. POLICY IMPLICATIONS

The cost of pricing carbon differs substantially throughout Europe. Some countries, such as France, have significantly below-average costs; others such as Poland seem worse off. However, decisions on the allocation of free allowances, though formally linked to the sectoral or product level, also have implications for the distribution of benefits to member states. We find that, although countries are affected to very different degrees by the ETS, the most-affected countries are largely compensated by the allocation of free allowances and auction revenues.

The complexity of the economic effects make perfect compensation at the member-state level impossible. Consequently, decisions with a distributional dimension have been influenced by redistribution (and possibly transfer) motives. Thus, the ETS, which can distribute allowances worth €30-35 billion per year, is now one of the largest redistribution machines in the EU, and could become an even bigger redistribution machine if a decision is made to tighten the cap in order to reduce emissions by 30 percent by 2020[10]. The big policy challenge will be to speed up the shift from the allocation of free allowances towards the allocation of auction revenues[11]. The latter is essential to ensure the transparency of transfers and to increase the efficiency of the ETS[12] in the decades to come.

Table 3: Indicative table for allocation

	FR	DE	HU	IT	PL	ES	UK
Auction revenues	–		+	–	+		–
Free allowances	+			+			
Banking	+	–					–

Research assistance by Anta Ndoye and Hendrik Worschech is gratefully acknowledged.

10. In this case, several analysts predict a doubling of the carbon price which might bring the value of the annual allocation to about €60 billion, the same level as current CAP spending.

11. For example, the requirement to re-evaluate in 2014 the vulnerability of sectors deemed to be at risk of carbon leakage should be taken seriously.

12. Auctioning allowances is typically more efficient and transparent than allocating free allowances. First, double dividends might arise (see section 1.5). Second, in systems with continued free allocation, companies typically have incentives to delay emission reduction decisions in order to increase their future allocation of valuable allowances.

REFERENCES:

Anger, N. (2009) 'Political Economy and Economic Impacts of Climate Policy A Quantitative Analysis of International Emissions Trading and Environmental Taxation', PhD thesis, University of Oldenburg, Germany

Goulder, L. (1995) 'Environmental taxation and the double dividend: a reader's guide', *International Tax and Public Finance*, vol 2, no 2, pp 157-183

Dannenberg, A., Mennel, T. and Moslener, U. (2008) 'What does Europe pay for clean energy? - review of macroeconomic simulation studies', *Energy Policy* vol 36, no 4, pp 1318-1330

European Commission (2008) 'Impact assessment accompanying the package of implementation measures for the EU's objectives on climate change and renewable energy for 2020', Brussels, 23 January, SEC(2008) 85/3

European Commission (2010) 'Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage', Brussels, 26 May, COM(2010) 265 final

McKinsey (2009) *Assessment of Greenhouse gas abatement potentials in Poland by 2030*, McKinsey, Warsaw

Oberndorfer, U., Rennings, K. and Sahin, B. (2006) *The Impacts of the European Emissions Trading Scheme on Competitiveness and Employment in Europe – a Literature Review*, WWF, Mannheim

Umweltbundesamt (2008) *Impacts of the EU Emissions Trading Scheme on the industrial competitiveness in Germany*, Umweltbundesamt, Dessau-Roßlau

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