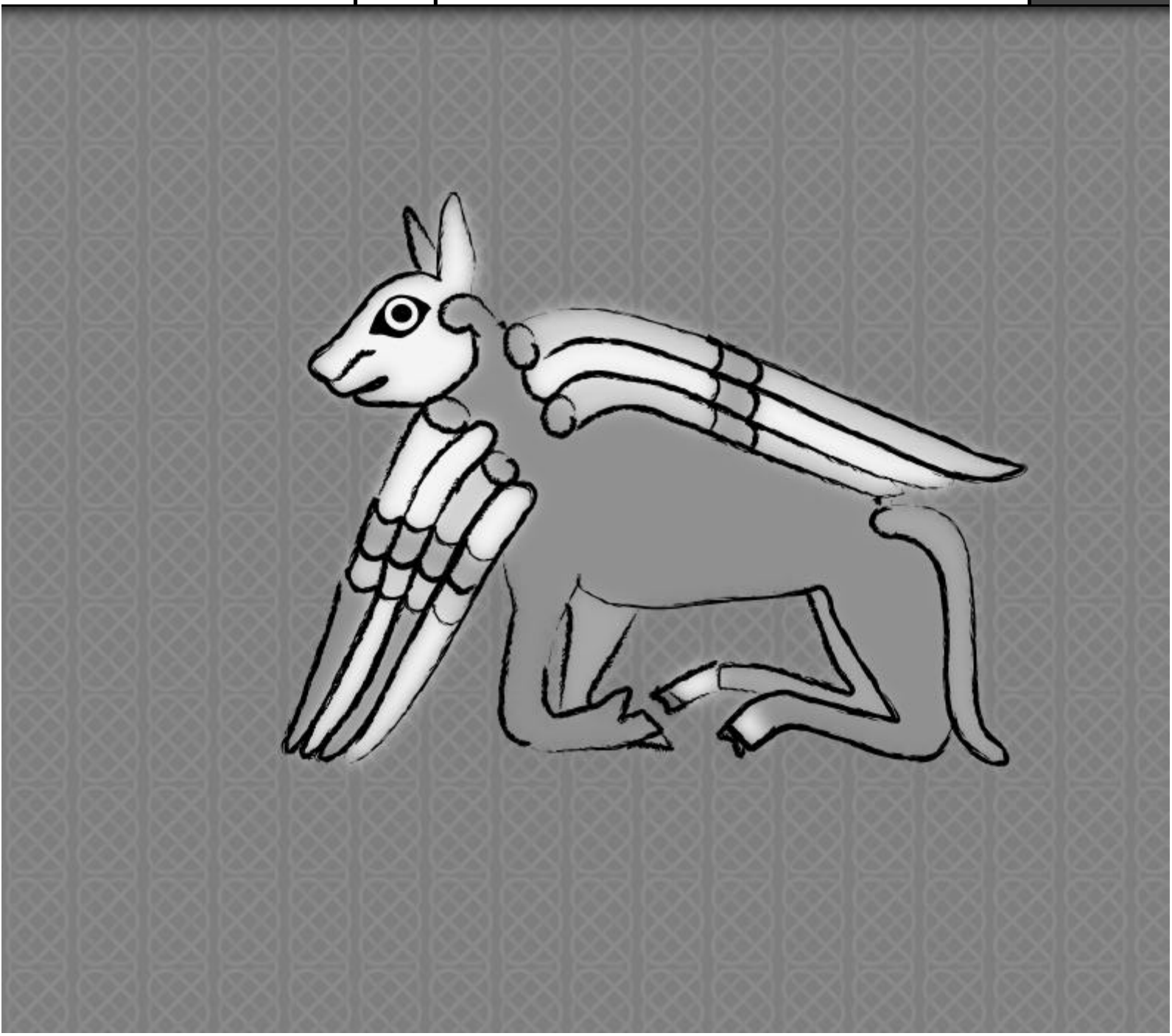


Objective and Audience

The overall objective of this series of Policy Briefs is to provide those in the policy system dealing with the design and implementation of emissions trading schemes with easy-to-read documents that allow them to understand some of the key issues, what theory and (especially) experience have to offer in clarifying choices and their implications. This Policy Brief provides a discussion of the issues involved in allocating allowances. The issues are generic to all kinds of trading schemes, but we focus on those that arise in implementing greenhouse gas allowance trading schemes.

Most choices involve tradeoffs, where more of something desirable can only be had at the loss of something less desirable. In policy, as in life, there are few unambiguous 'win-win' situations. We alert you the reader as to the issues and implications involved and we provide our own views as to what is likely to be most effective and useful.

The key audience will typically have little or no background in economics, but will be wise to the ways in which policy evolves and is shaped. The text limits the use of technical language, of graphs and equations, and any material that might intimidate the non-specialist. Boxes are used to highlight case studies or interesting examples.

It is informed by the research papers presented at the Concerted Action on Tradable Emissions Permits (CATEP) workshops — these are available on www.emissionstradingnetwork.com and have been synthesised in Convery *et al.* (2003), Haites (2003), Lefevere (2003) and Peterson (2003). They will also be published in synthesis form by the OECD in 2004.

The 5th Framework DG Research CATEP (Concerted Action on Tradeable Emissions Permits) network project has held a series of workshops over three years bringing together experts from policy, academic, research and industry fields to discuss the latest thinking, research and experience on Emissions Trading as the European Directive came closer to fruition. The Network consisted of eleven partners and this series of policy briefs reflects and synthesises the results of the workshops organised by the following topics:

1. Issues in Emissions Trading — an Introduction
2. Allocating Allowances in Greenhouse Gas Emissions Trading
3. Emissions Trading Regimes and Incentives to Participate in International Climate Agreements
4. Institutional Requirements
5. Linking Emissions Trading and Project-Based mechanisms
6. International Trade and Competitiveness Effects

A complete listing and links to all papers presented at the workshops and further details about the partners and the CATEP network can be found on the website: www.emissionstradingnetwork.com.

We gratefully acknowledge the European Commision's financial support of these Policy Briefs and the entire CATEP (EVK2-CT-2000-200003) project.

The Emissions Trading Concept

The emissions trading concept is disarmingly simple. Applying what is known as 'cap and trade', the authorities decide what emissions loading is to be permitted per unit time. Thus, say emissions in a coming year are expected to reach 100 units, and it has been decided that they should be reduced to 50. This is then allocated somehow as individual allowances to the polluters, so that the sum of the allowances does not exceed 50. Each polluter is required to hold sufficient allowances to 'cover' his or her emissions. But, if a polluter holds more allowances than they need, they can sell the surplus — the difference between their emissions and the permit volume they hold — to another emitter, who wishes to emit more than they hold allowances for. The price that emerges from the transactions between buyers and sellers signals that the assimilative capacity of the environment in question is scarce and valuable; money can be made from reducing emissions. (See Box 1).

Scope of this Policy Brief

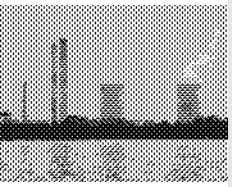
Policy Brief Number 1 addresses in summary form the key elements involved in designing and implementing an emissions trading scheme.[1] This Brief focuses in more detail on a critical topic, namely the issues involved in allocating the allowances.[2] There are two types of emissions trading scheme, 'cap and trade' described above, and a rate-based scheme, whereby a baseline is established — often an emissions allowance per unit of output — and any reductions achieved below this baseline can be sold to firms who are not achieving the baseline. The allocation issue moves to centre stage in cap-and-trade systems, because it issues explicit rights to emit (or pollute, if you will). In this policy brief, we confine our attention to the cap and trade case.

1 See also Grubb (2001), Klaassen (1997), OECD (1999), Stavins (2001), and Yamin and Lefevere (2000) for some general overviews.

2 Many emissions trading schemes refer to 'permits' as the units traded. However, the European Greenhouse Gas Emissions Trading Scheme uses the term 'allowance' instead, and we have adopted this convention.

Box 1. Emissions Trading: The Principles

Costs for reducing aggregate emissions per unit time to a politically determined level in a jurisdiction can be minimised by (a) allocating emissions allowances to emitters and (b) allowing them to trade permits with one another. If emitters have different marginal emissions abatement costs at their respective initial allowance levels, aggregate costs will obviously be reduced if emitters with high costs pay other emitters for shouldering part of their reduction assignment. Given that their marginal costs increase with the volume of emissions abatement, aggregate costs for all emitters are minimised when competitive trade has been extended to a level such that their marginal abatement costs are made equal. Profit maximising emitters would trade so as to establish a market price for allowances that generates this cost-effective outcome.



Thus, cost minimisation is feasible, but certain requirements must be fulfilled for it to actually come about. Specifically, it may be required that there is at least a certain minimum number of traders on both sides of the market, to avoid, say, monopolistic behavior, which would tend to increase aggregate costs. Furthermore, all bids and asks on the market must be transparent, which requires a market institution like that of a stock exchange. Such an institution would, in addition, tend to keep the costs of doing business to a minimum.

In other respects, emissions trading is flexible. Allowances can initially be distributed for free or sold to those who are permit-liable (to be discussed later). The total volume of allowances can refer to total emissions in a local area like an airshed or to a nation, region or the globe as a whole. In the case of international emissions trading, it makes more sense to talk about nations' emissions quotas — instead of allowances — while noting that the quotas are initially determined in negotiations and not sold. Later, when trading starts, quota units may be sold (or bought).

Allowances (or quota units) can refer to emissions during a period of time or emissions per period for a series of periods. In the text, we discuss only allowances for a nation's emissions — of greenhouse gases or CO_2 emissions — during one period.

Allocation Options

There are two broad categories of allocation that may also be used in combination.

A. Auctioning

There are very few examples where allowances have been auctioned; free allocation is the preferred allocation method. This experience may be influenced by the fact that the emissions trading practise is predominantly drawn from the US, where proposing additional government revenue from auctioning as well as taxation may make it more difficult to get political support for implementation of the scheme than in some other jurisdictions. Auctioning allows a given volume of allowances to be allocated to those who value them most. Two examples: (1) Individual Transferable Quotas assigned for certain fish species in Chile have been allocated by auction (Borregaard et al, 2001). (2) A small share of permits have been auctioned, e.g., in the US SO_2 programmes.

In some cases, a hybrid scheme is envisaged, where some of the allowances are auctioned, and the balance is allocated free. In such situations, a decision must be made as to the fraction of permits that will be allocated free of charge versus the fraction to be auctioned. Then a decision must be made as to how to organise the auction. Choices to be addressed include: whether to use sealed bid (single round or multiple round); government versus private operation; and how to use auction revenues, which could be a) recycled back to bidders, b) used to reduce specific taxes, c) put into general revenues or d) some combination of these. The equivalent to recycling back to bidders is characteristic of the NOx tax in Sweden, where the revenues therefrom are returned to the firms paying the tax, on the basis of their energy efficiency. In this model, a very high — and therefore very environmentally successful — tax is politically acceptable to the firms involved, because they get the money back, with the most energy efficient firms getting the most (Sterner, 2003).

B. Free Allocation

There are a variety of overlapping means of achieving this, including: historic basis, projected sectoral emissions, benchmarking, and marginal cost — with the opinion as to which is best typically representing what firms would find most beneficial.

Box 2. The Allocation Mechanism for the Regional Clean Air Incentives Market (RECLAIM) in Southern California

The allocating authority considered dozens of alternative allocation formulas. The final allocations were based upon complicated formulas in which each facility received three sets of allocations of tons of NOx and/or SO_2; a starting allocation for 1994: a mid-point allocation for 2000; and an ending allocation for 2003. The basic ton allocations are based upon multiplying an appropriate emissions factor, i.e., pounds per million Btu of energy input for each of the three years by a single value for historic throughput or usage that is determined by each facility's peak activity over the period from 1989 to 1992. The emission rates for each of the allocation years are based upon adopted rules, as of December 1993, for each facility. The 1994 allocations are supplemented by the offsets which facilities had obtained to comply with new source review requirements. In addition, facilities were given non-tradable credits for the first three years of the program if they reported 1987, 1988 or 1993 emissions that were greater than their starting emissions.

Source: Harrison (1999), p. 71

Based on Past Emissions (Historic Basis)

This is sometimes called 'grandfathering'. An example of uniform grandfathering is as follows: if emissions were 100 for a recent year (the base year) and the policy is to reduce emissions to 50, each emitter under this allocation rule would get a volume of allowances corresponding to 50 per cent of their base-year emissions. Equity issues arise with this as well as other forms of free allocations; for example, those who have abated least in the past may get rewarded for their lack of effort by securing a larger volume of allowances than those who have abated more. To accommodate such considerations and agree on the choice of a base year or period can be very complicated and time consuming (see Box 2). This method of the simplest form of grandfathered allocation was used in the particulate emissions trading scheme in Santiago, Chile. (Borregaard et al, 2001).

Projected Emissions

These are based on an estimate of what firms expect their emissions to be in the future. Such an allocation model is favoured by those firms that expect to grow relatively rapidly in the future, and wish to minimise their purchase of allowances as they expand.

Benchmarked Emissions

An allocation of permits that is based on a performance standard or benchmark as regards emissions efficiency can be judged as fairer than grandfathering, in the sense that those who have made an effort that exceeded what was financially profitable in the past to reduce emissions are rewarded. An example of this is provided by the allocation of allowances in the acid rain trading programme in the US.

In phase I, each of the 263 large generating units were annually issued allowances, approximately equal to the average 1985-1987 heat input times a target emission rate of 2.5 pounds of SO_2 per million Btu. The Phase 2 plants get an allocation at a rate of 1.2 pounds of SO_2 per million Btu. (Ellerman et al., 1999).[3]

Equi-marginal Costs

This approach is especially germane where some emissions are to be included in a trading sector, while others are not. This is the situation in the European Greenhouse Gas (GHG) Emissions trading scheme, where the trading sectors comprise power station installations in excess of 20 MW (except incinerators), oil refineries, smelters, manufacture of cement (> 500 tonnes per day), ceramics including brick, glass, and pulp, paper and board (> 20 tonnes per day). All other industry, households, transport and commercial are excluded. In this situation, the marginal costs of abatement in ascending order are estimated — cheapest first — and the principle of equi-marginal returns applied. That is, at the margin, the costs of abating a tonne of CO_2 equivalent in the non-trading sectors and the trading sectors should be equal. This then becomes the basis of the 'split' of greenhouse gas allowances between the trading and the non-trading sectors.

3 However, Ellerman et al. (2000) also note that there was considerable political negotiation addressed to meeting specific needs of interests and regions, with representation on the relevant House or Senate committee being relevant in deciding which interests were accommodated.

This will ensure that the non-trading sectors don't get stuck with abatement obligations that are more expensive than those in the trading sector, and vice versa. The potential damage to the economy and the citizenry will be minimised. Once the envelope going to the trading group of sectors is decided, the same principle of equimarginal returns are applied to the allocation of this envelope to each of the trading sectors. This reduces the transactions costs involved in agreeing the allocation to sectors. Then, within each sector, the allocation of allowances to installations can be based on share of output within the sector over the past 3 years.

In general, free allocation is likely to involve considerable negotiation and dispute between the potential beneficiaries. Where there is a wide variety of sources as regards scale, stage of development and sector, it can prove difficult to arrive at any consensus as regards rules for free allocation. Applying the marginal cost principle can help reduce some of these costs.
The issues that arise when free allocation is proposed are crystallised in the allocation modalities outlined in the EU GHG Trading Scheme (Box 3).

Box 3. Allocation under the European Union Greenhouse Gas Allowance Trading Scheme

Each Member State shall develop a national plan stating the total quantity of permits that it intends to allocate for that period and how it proposes to allocate them, based on 'objective and transparent criteria.' For the three-year period beginning 1 January 2005, Member States shall allocate at least 95% of the allowances free of charge. For the five-year period beginning January 1 1998, at least 90% of allowances will be allocated free of charge.

The Commission shall specify a harmonised method of allocation for the five-year period beginning 1 January 2008. The criteria specified for the implementation of National Allocation Plans include: consistency with Member State obligations, and with assessments of actual and projected progress towards fulfilling Member State contributions to meeting overall EU targets; non discrimination between sectors or companies 'in such a way as to unduly favour certain undertakings or activities'; information on the manner in which new entrants will be able to begin participating in greenhouse gas emission trading; the manner in which clean technology, including energy efficient technologies, is taken into account; a list of installations covered by the Directive; provision for comments to be expressed by the public and taken account of in the plan.

For the five-year period beginning January 2008 and for each subsequent five-year period, each Member State shall decide upon the total quantity of permits it will allocate for that period. Within three months of notification of a national allocation plan by a Member State, the Commission may 'reject that plan, or any aspect thereof, on the basis that it is incompatible with the criteria.'

Source: Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowances trading within the Community and amending Council Directive 96/61/EC. This text incorporates the amendments adopted by the European Parliament at its second reading on 2 July 2003 and accepted by the Council at its meeting of 22 July 2003.

1. Auctioning, Efficiency and the Double Dividend

Auctioning permits provides government revenue (= permit wealth) that the government in question may want to use for a reduction of pre-existing distortionary taxes. This is sometimes characterised as a 'double dividend' on the basis that both the environment benefits from the introduction of a price signal that encourages conservation, and the economy benefits where the revenues are used to reduce distortionary taxes; the auction price reflects the environmental concern and emerges as a corrective rather than distortionary levy. Other things being equal, auctioning and the use of the revenue generated to cut pre-existing distortionary taxes is the most cost effective way to allocate permits, see, e.g., Bohm (1999), Boemare and Quirion (2001) as well as general equilibrium work by Goulder, *et al.,* (1999) and Fullerton and Metcalf (2001). Burtraw (2001) and Burtraw, *et al.,* (2001) investigated the cost effectiveness (economic cost minimisation) of different approaches to distributing carbon emission allowances under a hypothetical emissions trading programme directed at the electricity sector in the US. They tested three allocation methods — auction (with revenues assumed to be returned directly to households), free allocation based on historic emissions, and allocations based on share of electricity output. They concluded that auctioning was dramatically more cost effective than the other allocation methods.

In a special case (with insignificant negotiation costs and income effects), following Coase (1960), permits tend to end up with those who can use them most efficiently, i.e., the target level of abatement is achieved at minimum cost, regardless as to how or to whom the permits are allocated. Tietenberg (2001) puts this in an emissions trading context as follows: Whatever the initial allocation, the transferability of the permits allows them to ultimately flow to their highest valued uses. Since those uses do not depend on the initial allocation, all initial allocations result in the same outcome and that outcome is cost-effective…Thus, under the given conditions, if permits are auctioned off they provide the additional efficiency-enhancing option of a reduction of pre-existing distortionary taxes.

The case for auctioning and revenue re-cycling depends on the absence of significant government failure. Distrust of what government would do with the money would of course make the auction alternative less palatable. Specifying the full policy implications of this alternative including tax changes as well as possible additional government transfers and investments might be necessary to make auctioning politically acceptable.

2. Productivity Effects

Free allocation to existing firms is likely to be economically inefficient because it slows productivity growth by, in effect, favouring 'incumbents' over new entrants. In the European Union, where there is a strong policy against provision of competition-distorting 'state aids', auctioning avoids having to address potential asymmetries between incumbents and new entrants. In addition, free allocation allows benefiting firms to remain in business, when, in the absence of the free endowment of permits, a firm would have gone out of business. The increase in the wealth of benefiting firms also allows them, relative to other firms, more self-financing of, e.g., R&D activities and/or cheaper access to bank loans and capital markets.

3. Distribution

While the distribution of wealth may have efficiency implications, as discussed above, it is also necessary to address the distributional implications of the free-allocation approach, in particular between those who get allowances for free and those who do not. The latter group includes all those who are affected, directly or indirectly, by the existence of an allowance price. Emission trading puts a price tag on emissions regardless of whether or not the initial allocation is free. In both cases the incentive effect is the same; one additional unit of emissions meaning that an additional allowance has to be bought or cannot be sold. Thus, the choice between free allocation and auctioning is not a question of free versus costly emissions, but one of permit wealth distribution. Free allocation can be combined with the use of other policy instruments, e.g., taxes on the profits of those who get permits for free or transfers to those who have to buy permits, to change the distributional outcome. This was done with respect to the CFCs in the US (see Box 4).

Prices of commodities for the production of which permits are directly or indirectly required will rise on account of the cost of permits. If the permits are given away for free to other than end users, there is no fund available to compensate end users for such price rises, while auctioning does provide some (e.g., wholly or partly through the choice of what pre-existing taxes to eliminate).

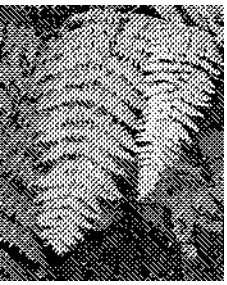
Box 4. Taxing Windfall Gains—the case of CFCs

The Montreal Protocol on Substances that Deplete the Ozone Layer called for a cap on chlorofluorocarbon (CFC) and halon consumption at 1986 levels, with reductions in the cap scheduled for 1993 and 1998. Consumption was defined as production plus imports minus exports. In the US, the EPA distributed permits to companies that produced or imported CFCs and halons, based on 1986 market shares, and they were allowed to trade. The latter provision produced substantial savings, relative to the costs that would have been incurred with command and control regulation. Congress coupled the marketable permit scheme with excise taxes on CFC production designed to capture the ensuing 'windfall gains.' The revenues were not earmarked to compensate households or other affected parties.

Source: National Center for Environmental Economics, 2002

While auctioning means that permit wealth is transferred to government (allowing for compensations, tax substitution, etc.), free allocations means that permit wealth is transferred to the recipients of permits.

The enthusiasm of industry for free allocation is not surprising. Several studies have shown that free allocation of CO_2 permits to fossil fuel producers and importers in the US would leave them better off (Bovenberg and Goulder, 2000, and US Congressional Budget Office, 2000, Burtraw *et al.,* 2001).



However, not all firms favour free allocation. In contrast to auctioning, free allocation discriminates against some of those affected by the policy. For example, as already indicated, if allowances are allocated to firms that produce or import fossil fuel, those who use fossil fuel will be confronted by higher fossil-fuel prices (including the permit price) but without any compensation just as in the case of auctioning. If permits are allocated to end users, the fossil fuel producers and importers will be hit by reduced demand and be uncompensated. The equity effects of auctioning are heavily influenced by how the proceeds are distributed. If they were to be used to cut taxes pro rata, so that those who pay most tax would get most of the reduction, then it would probably favour the better off, as in most jurisdictions such households pay more tax. If distribution were skewed so as to give low income tax payers the greatest reduction, this might be regarded as more equitable. If the proceeds are transferred to households as a uniform lump sum transfer, this would benefit those who pay no tax, and would have different and probably more equitable results. But the latter policy — lump sum distribution — would not have the effect of reducing distorting taxes, and so there would be no 'double dividend.'

4. Transactions Costs

Free allocation is likely to incur considerably more negotiating and other transactions costs than auctioning. The greenhouse gas emissions trading scheme being implemented by the European Commission requires free allocation of at least 95 per cent of allowances for the first three year pilot period (2005-2007) and at least 90 per cent in the first commitment period (2008-2012). It requires that each Member State prepare a 'national allocation plan' to allocate the permits. This adds a layer of complexity and probable delay in implementing the scheme, because of the difficulties in implementation that such a plan engenders. See Box 3.

Transactions costs are further increased where two systems — cap and trade, and baseline and credit operate in parallel. Such schemes have been simultaneously implemented in the UK. Those in the cap and trade group are able to trade internationally, and between themselves. The operators in the baseline and credit system — called the 'unit' system in the UK — can trade freely amongst themselves, but trade between the two systems is only allowed if there is no net flow from the cap and trade to the baseline and credit system.

A 'gateway' has been provided to ensure that such flows do not happen. According to simulations undertaken to model such a system, it adds considerably to transactions costs relative to a cap and trade scheme on its own (PriceWaterhouseCoopers, 2000).

5. Upstream v. Downstream Permit Liability

In the case of carbon dioxide, 'upstream' is typically taken to refer to the producers and importers of fossil fuels, while 'downstream' normally refers to the users of same, i.e., electricity producers, smelters, steel works, distributors of petrol and heating oil etc. The extreme version of downstream is where the final consumers, i.e., households or motorists are required to hold permits, implying high transaction costs.

The location of allowance liability has little importance for the final location of abatement costs. The emissions cost implied by the allowance price tends to be shifted forward to downstream units, if any, and backward to upstream units if any, via shifts in demand and supply. The real cost that is placed on the economy as a result of a reduction in emissions is ultimately borne by consumers, labour and the owners of capital. The real effects of a given permit volume, hence of a given aggregate emissions reduction, tends to be the same regardless of the location of permit liability.

As already noted, with free allocation, a decision must be made also as to where to allocate the permits. In principle, the permits can be allocated to other than permit-liable entities. One way of partially reconciling free allocation and equity is to assign liability upstream, to fossil fuel producers and importers in the case of CO_2, and to give the permits away free to downstream firms or households. The latter will sell to the former, and will thereby benefit from the sale, and this will compensate for the subsequent price rises.

6. Implications for international competitiveness and firm migration

It is often argued that, in the context of an international agreement to introduce emissions quotas as in the Kyoto Protocol, if large countries use free allocation of allowances, competing countries cannot use auctioning without overly hurting their industry. However, as already pointed out, allowance prices tend to be the same in the two cases (disregarding indirect effects) making it equally costly to increase emissions. Allowance prices are what determine output prices and technology choice of emitting industries in the two cases. The difference between the options is in the wealth distribution and indirectly on efficiency (as shown above) and possibly also on competitiveness.

The choice of allowance allocation method may affect international migration of firms as well as the location of new firms. This is relevant in the case where some countries have decided not to comply with a quantitative cap on greenhouse gas emissions, or the cap is so large that it is not a binding constraint. Firms in those Annex 1 countries that have a cap such that they have to buy allowances in order to expand will be competing with firms in countries where there is no need to buy allowances. This then becomes a competitive wedge that could influence the location of new investment, or even trigger a move by existing capacity from 'Kyoto capped' jurisdictions to those that are not so constrained. Even within the European Union, this could become an issue. If the relatively well allowance-endowed accession countries, e.g., Poland, were to provide free allowances to new foreign direct investment, this would provide some competitive edge over those countries, such as Ireland, Spain and Portugal, that have no surplus allowances to provide free of charge. It is unlikely that allowance prices will be so high, and therefore so burdensome on firms, that it will prove pivotal in making decisions about where to locate, and there is the fact that jurisdictions not now in 'Kyoto cap country' may join and these liabilities are incurred anyway in the new location. Nevertheless, at the margin, so long as some comply and others do not, there could be 'carbon leakage.'

Conclusion

When it has been decided to introduce a cap and trade regime, those in the policy process have to decide how to allocate the allowances. There are three broad options, auction, give them away for free (if the latter, it has to be determined how much and to whom), or a combination of both.

If the decision is made to auction, it is clear that there are important gains relative to free allocation. First, there are very low transactions costs involved in making the allocations — whoever pays the most gets the allocations. Second, the competitive process should ensure that who can best use the allowances get them, i.e., productivity should be enhanced. Thirdly, there is a pool of funds available which can be used to — in some combination: compensate 'losers' who will suffer from higher prices because of the scheme; reduce distorting taxes, e.g., labour taxes, elsewhere in the economy, thereby yielding a possible 'double dividend'; recycle back to those who paid for the allowances, to help address competitiveness or other concerns of industry, in ways that further incentivises positive environmental performance.

If free allocation is used, this has the advantage that support for the scheme from key sectoral interests is likely to be forthcoming, and therefore its prospects of implementation are enhanced. In the event — as is the case with emissions trading and greenhouse gasses — that some jurisdictions do not accept caps and the associated cap and trade emissions trading — free allocation helps firms in Kyoto cap land to compete with such firms in the short run. In the longer run, the real opportunity costs of the allowances get factored into the cost base. With free allocation, higher prices will be passed onto some consumers. In the case of regulated industries such as electric utilities, the regulator should require that utilities provide demand side measures that help consumers reduce their bills. As regards implementing free allocation, when deciding on how much to allocate to the trading sectors, ranking the abatement opportunities in terms of marginal costs can help arrive at a split that is economically efficient, and can reduce the transactions costs of achieving an outcome.

A combination has the advantage that the portion that is allocated free helps generate the necessary political support, while the allowances that are auctioned get the market going, and generate funds that can be used to achieve other objectives.

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Authors

Peter Bohm
University of Stockholm, Sweden

Frank Convery
Environmental Institute, University College Dublin

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