BACKGROUNDER

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Allowance Allocation

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Contents

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Overview of Discussion

This Backgrounder provides an overview of allocation concepts and issues under a cap-and-trade system. While there are many important features in such a system—and in market-based policies more generally—allocation has emerged as a critical challenge in the policy debate. This is unquestionably due to the enormity of the financial stakes: tens or perhaps a hundred billion dollars a year will be divided up and possibly given away under an emissions trading program. While this is first and foremost a distributional question (who gets what), there are a number of key economic concerns—first, the risk of unintended consequences from tying allocations to some change in behavior, and second (to a lesser extent), an interest in the likely distribution of impacts under an emissions trading program, onto which any allocation approach will be grafted.

Cap-and-Trade Systems Change Prices and Create Wealth and Obligations

Cap-and-trade systems simultaneously change prices and create assets and liabilities. Liabilities are assigned to those entities with emissions (or production/processing of fossil fuels) that are regulated under the cap (the "regulated entity") and come in the form of the obligation to surrender allowances. Matching those liabilities, assets are created in the form of emissions allowances that may be given to corporate entities or held by the government and auctioned. At the same time, energy prices downstream of regulated entities will typically adjust to reflect their carbon dioxide (CO_2) content.

The wealth embodied in allowances can be substantial. If a cap-and-trade program were instituted economywide in the United States and allowance prices were in the range of $10 per ton of CO_2e (carbon dioxide equivalent—that is, counting non-CO_2 greenhouse gases at their CO_2e in terms of global warming potential), the total value of allowances would be

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approximately $50 billion dollars annually. At higher prices on the order of $25/ton CO_2e (akin to expected 2008–2012 prices on the EU CO_2 market), the value of allowances would be more than $100 billion dollars annually, or slightly less than 1% of GDP.

The value of all allowances is not a measure of the economic cost of the regulatory program; rather, this value reflects a *transfer* from those paying higher energy or emissions costs to whoever initially receives the allowances. What, then, is the cost of the program? It is the sum of the cost associated with each ton that has to be reduced to meet the target. In turn, the price of allowances depends on the marginal—or last, most expensive—ton reduced. A quick numerical example may be helpful: Suppose there are 10 tons in the economy before we impose a cap of 7 tons. The 3 tons that must be reduced cost $1, $5, and $10, respectively. Here the *cost* of the program is $16 ($1 + $5 + $10). The *marginal* cost of the last, most expensive ton is $10; this sets the market price of allowances in our cap and trade. Finally, the total value of the 7 allowances will be $70: 7 tons x $10/ton. Generally, there is no simple relationship between program costs and the value of the allowances, though for CO_2 policies, costs are significantly smaller.

Allowance Allocation Options

In the case of the SO_2 trading program developed under the Clean Air Act, those entities with emissions that were regulated under the cap were provided allowances. This same model was used in the U.S. NO_x program and the EU ETS. Nonetheless, there is no economic reason why the allocation of allowances cannot be split from the assignment of liabilities—that is, allowances could be provided to entities other than those directly regulated or sold by the government. This might be motivated by changing energy prices shifting the burden away from the directly regulated entities.

An emissions allowance can be thought of as just another input—like capital or labor—that the regulated entity needs to produce its intended product. Regardless of how allocation occurs, the allowances must eventually find their way to the hands of the regulated entities.

In the simplest case, the government has two broad options for allocation: 1) give allowances free of charge (gratis) to regulated or unregulated entities, or 2) sell allowances to these same entities. The U.S. SO_2 and NO_x programs as well as the EU ETS allocated the allowances gratis to regulated entities. Yet economists regularly point out that selling allowances and using the revenue to cut other taxes (or avoid tax increases) can substantially lower program costs.

Interestingly, allowance allocation methods in place for Phase 2 of the EU ETS as well as those contained in current GHG cap-and-trade programs in the 110th Congress and considered by state-level GHG cap-and-trade programs such as the northeastern Regional Greenhouse Gas Initiative, rely on a mix of gratis allocation to different entities and allowance sales (auctions). Perhaps even more interestingly, some congressional proposals are considering gratis allocations to entities such as states and commercial enterprises that are heavy energy users, recognizing that regulated entities and those entities receiving allowances need not be the same. These entities will then sell the allowances in the allowance market to regulated entities, providing the sellers with added income.

In this way, allowances are wealth—perhaps a considerable amount of wealth. How that wealth is distributed via the allowance allocation method will certainly alter individual well being. However, it can also alter the behavior of the aggregate economy and pattern of GHG emissions *if* the allocation is dependent on current or future behavior (in contrast to allocation based entirely on historic behavior), thereby incentivizing action. It is imperative that the incentive properties of any allocation method be well thought through.

Consider a simple example in the EU ETS, where allowances were distributed gratis to regulated entities. Part of the allocation rules state that any entity that ceases business operation in the future loses its allocation of allowances—its allocation of wealth. While on its face this makes sense—if an entity is no longer emitting GHGs it should not need permits—this rule sets up incentives to keep facilities operating so the parent firm can lay claim to the allowances. In some cases, where the firm might shift these operations to a foreign, unregulated country, such incentives might make sense. In others, where the firm might shut down so a new, more efficient facility can take its place domestically, such incentives make less sense.

Using Gratis Allocation to Mitigate the Costs of the Emissions Reduction Program

Several objectives can be achieved through the allocation of allowances. However, as noted above, these objectives must be pursued with an eye toward the impact any particular allocation method will have on incentives the method establishes within the economy.

Certainly, one of the most obvious objectives is to use gratis allocation to mitigate, in whole or in part, the costs of the emissions reduction program to various sectors of the U.S. economy. When designing the allocation method to achieve this objective, it is important to have

good information describing the actual distribution of costs and to determine how much cost will be absorbed by each economic sector.

The bill sponsored by Senators Bingaman and Specter seems to have something like this in mind. In this bill, the gratis allocation is divided into several categories with the following percentage allocation of allowances: 1) regulated entities, coal mines, petroleum refiners, and natural gas processors—13%; 2) the power sector and other industry—42%; and 3) states—29%. Here, the assumption would seem to be that the regulated entities will absorb only a fraction of the cost associated with acquiring allowances.

Using Allocation to Achieve Other Goals

Allowance allocation can be used to achieve other goals. For example, a House bill considered by Representatives Udall and Petri uses allowance allocation to foster CO_2 sequestration in agriculture, provide adaptation assistance, subsidize energy costs in low-income housing via allocation to states, and establish a source of funding for low-carbon technology R&D and commercialization activities. Similarly, the current Lieberman-McCain bill in the Senate allocates allowances to the "Climate Change Credit Corporation" to be used to fund technology programs and to mitigate economic costs of the regulation.

Gratis Allocation: Grandfathering Based on Emissions

Suppose a decision has been made to allocate allowances to a particular sector. How might we allocate within that sector? Until now gratis allocation to regulated entities has been the norm, and the simplest method uses the concept of "grandfathering." Consider this example: A base year, say 2000, is chosen to establish a baseline level of annual emissions for each regulated entity. The ratio of total annual emissions defined by the cap to the total baseline emissions among regulated entities is formed. The baseline emissions of each regulated entity are then multiplied by this ratio to obtain the number of allowances each entity will receive.

Gratis Allocation: Grandfathering Based on Output

Grandfathering is a straightforward allocation method, but it relies on past emitting behavior, thereby granting the greatest number of allowance to entities with the greatest emissions. Grandfathering can also be applied to an allocation method that does not reward past emissions but rather is based on past output. This method allocates allowances not on the basis of base year *emissions*, but on the basis of *output*. That is, you create a ratio of total emissions

under the cap to the total historic output of regulated sources in a given base year. Multiplying this ratio by each entity's output determines allocation. Thus, the greatest portion of allowances goes to the entity with the greatest output, not necessarily the greatest emissions.

In both grandfathering examples, allowances are allocations to regulated entities, but the concept can be applied more broadly. For example, allowances could be allocated using grandfathering to unregulated entities that are large energy consumers to lessen the costs of higher energy prices on these entities. The allowances might be allocated on the basis of historical output or labor input or some other metric related to the entity's ability to pass along higher energy costs.

Gratis Allocation: Output-Based Updating

Grandfathering-based allocation is based on past behavior and therefore generally does not take into account any changes in the sector over time. A method that does take change into account is output-based updating, which is the dynamic analog to grandfathering based on output. In the updating case, output shares are recalculated over time, and each successive allocation is based on the revised shares.

While updating sounds like an improvement over static allocation, it brings with it new issues. Since regulated entities know their future allowance allocation will be tied to output, and allowances are valuable, output-based updating provides incentives for firms to increase their share of output so they can increase their share of allowances. Incentives to increase output have two implications. First, as firms compete to increase output and get a larger share of the allocation, output prices fall (with the allocation acting like a subsidy on output). Second, as prices fall, consumers have a smaller incentive to reduce consumption of the goods and services produced by the regulated sector. While lower prices may be good thing for consumers, the fact that conservation is not fully incentivized increases the overall cost of the cap-and-trade program.

Gratis Allocation: Changing Incentives

There are as many forms of gratis allocation to regulated entities as one has the time and inclination to dream up. Many forms have been and will be designed to achieve some economic and/or political objectives. From the standpoint of economic efficiency and environmental effectiveness, however, what matters most is the effect the allocation method has on the future behavior of the regulated entities—and this may not be immediately apparent.

Consider the earlier example where, under the EU ETS, a regulated entity loses its allocation if it closes a regulated facility. This seems like a reasonable rule—no emissions, no allocation. But consider the forward-looking incentives that act to keep inefficient and perhaps highly emitting facilities operating just so they can claim the allowances. This outcome is likely something one might want to avoid in the power sector, but conversely may be just the type of incentive one wants for sectors subject to external competitive pressures; in this case, keeping facilities from closing and moving abroad is a good thing.

Allocation to New and Retiring Sources

This brings us to one of the more challenging allocation questions. As the economy evolves over time, new sources will appear, and some existing sources will retire. The question then naturally arises, where will new sources get allowances and what happens to the allowances given to retiring sources that no longer need them? If allowances are allocated via an auction, new entrants and retiring sources pose no special problems—new entrants buy allowances like all existing sources, while retiring sources should be holding no excess allowances.

The problem of new- and retiring-source allocation comes about when some or all allowances are allocated gratis. Under this circumstance, allowances are wealth transferred from the government to the private sector. If new entrants are not afforded the same wealth transfer as existing sources, they may be disadvantaged. Similarly, retiring sources benefit if they are able to retain their allocations after ceasing operation.

There is no single view on how to treat this issue. The EU ETS sets aside allowances for future allocation to new entrants and reclaims allowances from retiring sources. In contrast, the current U.S. SO_2 program has a very limited new-entrant set aside and allows retiring entities to retain their allowances. Recent climate proposals in the United States have proposed tying new entrant allocation to achievement of certain performance standards—for example, new coal-fired power plants might be required to meet integrated gasification combined cycle standards to qualify for a new entrant reserve.

As noted, the problem with set-aside rules for new entrants and allowances reclaimed from retirees is the incentives these rules establish for future business behavior. New entrant allowances that are tied to technology benchmarks can unknowingly favor technology on grounds other than GHG emissions, and reclaimed allowances from retirees will incentivize firms to keep sources operating beyond their economically useful lives. There may be good reason, however, to reclaim allowances from some entities, such as those who, due to

competitive pressures, may cease U.S. operation and move overseas. In the case of entities like power generation that are unlikely to move, it may be best to allow them to keep allowances once allocated. Obviously, a program that gradually shifts to an auction, such as the recent proposal by the U.S. Climate Action Partnership, gradually avoids this problem as well.

Summary

Allocation of emissions allowances amounts to a question of tens if not a hundred billion dollars a year. It is a hard distributional question that in some sense begs a legislative answer—Congress has typically been the authority best equipped to answer such questions. At the same time, analysis can inform important economic questions. First, the impact of a cap-and-trade program is not as obvious as it might seem: regulated businesses do not necessarily bear the brunt of program costs. More to the point, regulated entities need not be the only entities receiving free allocations. Second, auctions are receiving more attention for a variety of reasons; one rationale is that using auction revenue to cut other taxes (or to avoid tax increases) can substantially reduce the cost of the climate policy. Finally, it is particularly important to consider how allocation rules can incentivize behavior in possibly unintended ways. Such incentives and changes in behavior have the potential to significantly raise the cost of the climate program.