The Distribution of European Union Allowances (EUAs): Windfall Profits, Free Allocation and Auctions

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A Microeconomic Analysis of a Proposed Change to

Phase III of the European Union's Emission Trading System

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Since its inception in 2005, the European Union's Emission Trading System (EU ETS) has been the world's largest cap-and-trade mechanism for carbon dioxide (CO_2) emissions. In January 2008, the European Commission proposed to amend the rules of the scheme "to strengthen, expand and improve the functioning of the ETS as one of the most important and cost-effective tools for achieving the EU's target for reducing greenhouse gas emissions." (EU, 2008) The main changes, which would take effect at the beginning of the scheme's Phase III (2013-2020), include:

> "- There will be one EU-wide cap on the number of emission allowances instead of 27 national caps. […]
> - A much larger share of allowances will be auctioned instead of allocated free of charge.
> - Harmonised rules governing free allocation will be introduced.
> - Part of the rights to auction allowances will be redistributed from the Member States with high per capita income to those with low per capita income in order to strengthen the financial capacity of the latter to invest in climate friendly technologies.
> - A number of new industries (e.g. aluminium and ammonia producers) will be included in the ETS; so will two further gases (nitrous oxide and perfluorocarbons).
> - Member States will be allowed to exclude small installations from the scope of the system, provided they are subject to equivalent emission reduction measures." (EU, 2008)

In this paper, I use the tools of microeconomics to analyze the effects of one of these proposed changes: the suggestion to auction off a much larger share of emission allowances. In the first half of the paper, I provide a brief overview of the EU ETS, and discuss how emission allowances have been allocated during the first two phases of the trading scheme. I then discuss the effects of auctioning off more emission allowances during Phase III of the EU ETS. I conclude that such a change would reduce the windfall profits of the initial allowance holders, and provide additional revenues that participating governments could use to support a variety of policies, some of which I discuss.

European Union's Emission Trading System: A Brief Overview

The European Union's Emission Trading System (EU ETS) was initiated on January 1st, 2005, pursuant to the European Commission's Directive 2003/87. Not only was it the first multi-country trading system (ECX, 2010), it was also the largest emission trading mechanism that has, as yet, been implemented: The World Bank estimates that, in 2008, global carbon markets were worth $126 billion (€68 billion). The EU ETS accounted for about 78 percent of the volume of CO_2 transactions, and for more than 73 percent of their value (The World Bank, 2009). According to a statement by the European Climate Exchange (ECX), a marketplace for European CO_2 emissions, the EU ETS now covers about 12,000 energy and industrial plants in the European Union's 27 member countries (ECX, 2010). Since the beginning of 2008, furthermore, the EU ETS also applies to three European countries that are not members of the European Union, but belong to the European Economic Area (EEA): Iceland, Norway and Liechtenstein (EU, 2008).

The scheme relies on the allocation and trading of "European Union Allowances" (EUAs), each of which allows its holder to emit one metric ton of carbon dioxide (ECX, 2010). EUAs are allocated to specific industrial sectors through National Allocation Plans (NAPs), drawn up by the participating countries' governments and approved by the European Commission. The NAPs cap the total amount of carbon emissions at levels that decrease over time (Carbon Positive, 2005). Each government, furthermore, establishes a national registry that connects to the registries of all other participating countries, as well as to the Community Independent Transaction Log (CITL), a system that "records the issuance, transfer, cancellation, retirement and banking of allowances." (EU, 2010)

The EU ETS does not have a scheduled expiration date, and has been designed to operate in at least three phases:

- Phase I: 2005-2007
    - The first phase has also been called the "trial period," as it was intended to provide the experience and infrastructure necessary for the EU ETS to work effectively during the First Commitment Period of the Kyoto Protocol (2008-2012). Its adoption was motivated, in part, by a perceived "performance gap" in the EU's ability to achieve its emissions reduction targets, but also by the Europeans' limited familiarity with market-based emission control mechanisms. While the United States had successfully implemented cap-and-trade programs (for instance, the SO_2 trading mechanism under the Clean Air Act of 1990), only Denmark and the United Kingdom, of all EU countries, had some experience with emissions trading (Ellerman and Joskow, 2008).
- Phase II: 2008-2012
    - This phase was designed to coincide with the First Commitment Period of the Kyoto Protocol, and to help European countries achieve their greenhouse gas reduction goals (Ellerman and Joskow, 2008). The Kyoto Protocol obliges the fifteen countries that made up the European Union before the 2004 and 2007 expansion rounds (also known as the EU-15) to reduce their greenhouse gas emissions by 8 percent.[†] Of the twelve countries that have joined the Union since 2004, ten have their own emission targets under the Kyoto Protocol that require similar reductions (EC, 2009).

[†] EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

- Phase III: 2013-2020
    - If the changes proposed by the European Commission in January 2008 are adopted, the third phase of the trading scheme will see many EUAs allocated through an auction, rather than freely handed out. Additionally, there will be a single EU-27 emissions cap, as well as harmonized rules for the free allocation of some allowances. The scheme, furthermore, will be expanded to cover NO_2 and perfluorocarbons, and will involve some redistribution to enable countries with lower per capita incomes to invest in clean technologies (EU, 2008).

A Rationale for Trading Emission Allowances: Coasean Bargaining

In "The Problem of Social Cost," a seminal paper published in 1960, Ronald Coase of the University of Chicago outlined what became known as the Coase Theorem (Coase, 1960): Even in the presence of externalities, affected parties can bargain towards an efficient outcome, as long as property rights are properly assigned and transaction costs are sufficiently low (Rosen and Gayer, 2008). Property rights, under this definition, are assigned "properly," when they are complete (that is, assigned over all relevant commodities) and enforceable (i.e., other parties cannot make use of the commodity without the consent of its owner). (Skaperdas, 1992) If these conditions are met, furthermore, the efficient outcome will be reached regardless of the initial assignment of property rights.

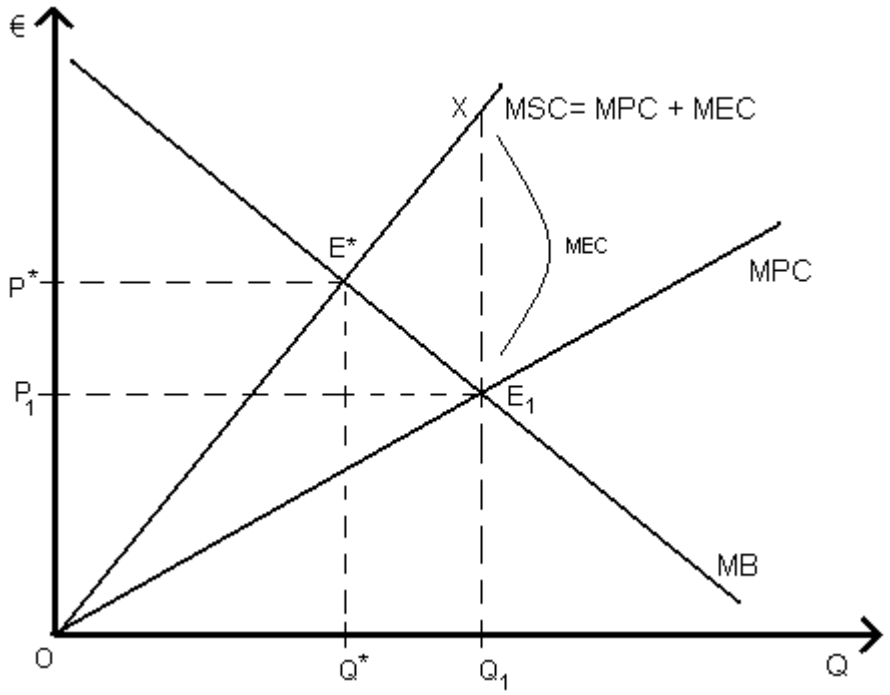
Consider the following classic example: Fishermen fish in a river that is being polluted by a nearby industrial plant. If no one owns the river, the plant's pollution will create a negative externality by poisoning the fish in the river, thus reducing the fishermen's catch. Suppose, however, that the fishermen were given property rights over the river. In this case,

the plant could negotiate to compensate the fishermen for the pollution it creates, as long as the marginal cost (including the marginal private cost) of doing so is lower than the marginal benefit gained from the extra production such pollution allows. Alternatively, the property rights could be assigned to the plant. The fishermen could then pay the plant to abate pollution, as long as their marginal gain from fishing in a cleaner river exceeds the marginal costs of paying the plant. In either case, according to the Coase Theorem, the final amount of pollution in the river will be the same. This outcome, moreover, will be "efficient" in the sense that social welfare (which includes both the well-being of the plant's owners and of the fishermen) will be maximized (Rosen and Gayer, 2008). For a graphical exposition of the bargaining process outlined in this example, see *Figure 1*.

The theoretical justification for the trading of emission allowances is based, in principle, on the potential for Coasean-type bargaining.[‡] Negative externalities are clearly present: Greenhouse gas emissions can contribute to global climate change, the costs of which are not borne in their entirety by the polluters (IPCC, 2007). The allocation of allowances, in effect, assigns property rights over greenhouse gas emissions: In the case of the EU ETS, one EUA entitles its holder to "own" one metric ton of CO_2 emissions. The use of a central, internationally recognized trading mechanism, furthermore, reduces transaction costs, and thus makes emissions trading feasible. The number of allowances that are issued puts a cap on the amount of greenhouse gas emissions.

[‡] The analogy, of course, is not perfect: Examples of "pure" Coasean bargaining usually describe a situation, in which there are no externally-imposed caps on the quantity of production. Instead, the parties bargain towards the efficient quantities on their own. In the case of greenhouse gas emissions, however, such a cap is often imposed: This allows policy-makers to set specific quantitative targets on emission reductions. The main lesson of Coasean bargaining, nevertheless, continues to hold: Trading between holders of property rights (here, emission allowances) will lead to the desired level of emissions at the lowest possible cost. (Rosen and Gayer, 2008)

FIGURE 1: COASEAN BARGAINING EXAMPLE (FISHERMEN AND THE PLANT)



The plant's production pollutes the river, and is therefore associated with negative externalities equal to MEC, the marginal external cost. When property rights over the river are not assigned, the market mechanism will, without intervention, achieve equilibrium at point E_1, where MPC=MB. The resulting quantity Q_1 of industrial production is higher than the socially optimal quantity Q*, which is achieved at point E*, where MSC=MPC+MEC=MB. After property rights over the river are assigned, the plant and the fishermen will bargain until they achieve the efficient outcome (Q*). This outcome will be achieved regardless of which party is initially assigned property rights.

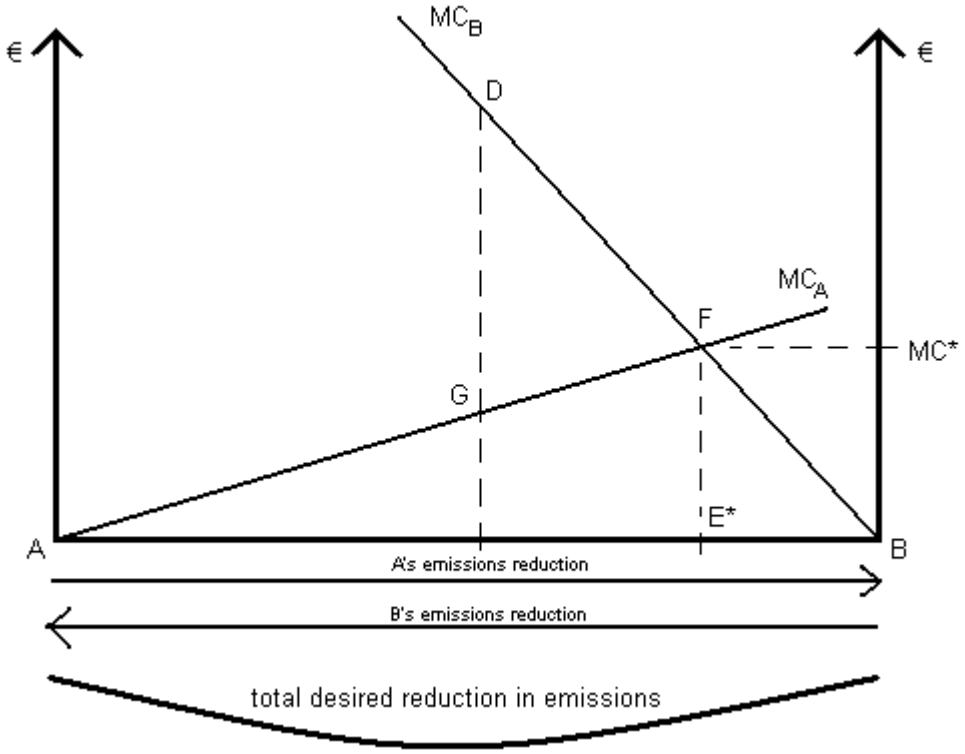
Once emission allowances are allocated, their holders can trade them. In this way, facilities that can abate greenhouse gas emissions relatively cheaply can sell their emission allowances to ones that face a higher marginal cost of abatement. This process of buying and selling will continue until the marginal cost of abatement is equal across all emitting facilities, and an optimal ("efficient") outcome is achieved: The cap-and-trade scheme will achieve the desired level of greenhouse gas emissions, determined by the number of allowances issued, at the lowest possible cost (Rosen and Gayer, 2008; Gruber, 2005). Such a "market-based" system of emissions reduction can thus reduce greenhouse gas emissions much more efficiently than "command-and-control" regulation, which imposes specific limits on each source of emissions (McCormick, 2007). *Figure 2* illustrates how the trading of allowances can lead to cost-effective emissions reductions.

The Value of Property Rights Assignments

The Coase Theorem states that, if transaction costs are low and property rights are properly assigned, bargaining between involved parties will yield an efficient outcome, regardless of the initial allocation of property rights. The allocation of property rights, however, does have important distributional effects: The party that is initially assigned these rights can benefit by selling them to others.

In the previously discussed example of fishing in a polluted river, the initial assignment of property rights determines the direction in which payments flow between the parties: If the fishermen own the river, the plant will compensate them. If, on the other hand, the river belongs to the plant, fishermen will pay the plant to reduce its pollution. Clearly, then, property rights are of monetary value to their holder. (See *Figure 3* for an illustrative

FIGURE 2: TRADING OF EMISSION ALLOWANCES



This diagram depicts how two industrial facilities, A and B, can reduce emissions by the desired amount at the lowest possible cost. The distance AB represents the total desired amount of emissions reduction. The MC_A and MC_B schedules depict the rising marginal costs of emissions abatement for facilities A and B, respectively. Starting from any initial distribution of emissions reductions across the two firms (such as that depicted by points D and G), facilities A and B will trade allowances until their marginal costs of abatement are equal (MC*). This happens at point F: In equilibrium, facility A reduced emissions by AE*, while facility B abates by BE*. At this point, emissions have been reduced by the desired amount at the lowest possible cost.

comparison of the distributional consequences of assigning property rights to either party in this example.)

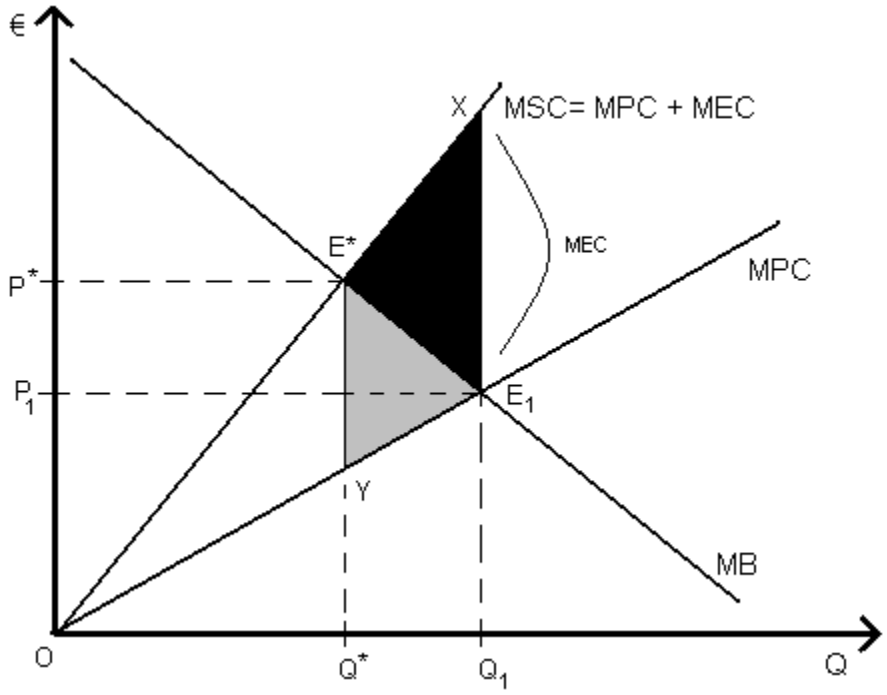
The Allocation of EUAs: Free Allocation

As in our stylized example of Coasean bargaining, the initial allocation of emission allowances can have significant distributional effects in a cap-and-trade scheme such as the EU ETS, where bargaining takes the form of trading emission allowances. If, in the European scheme, EUAs are distributed across industrial facilities for free, their initial holders will enjoy a windfall gain (Deutsche Bank, 2006): Compared to a scenario in which they did not receive any EUAs, these facilities now do not need to buy as many allowances. If, furthermore, they are allotted more allowances than they need, they can sell the excess EUAs to facilities with a higher marginal cost of emissions abatement.[§] Free allocation of EUAs, then, represents a one-time transfer of wealth to the facilities that received them from the government that issued the allowances (Kruger et al., 2007). *Figure 4* depicts how a facility can benefit from being the initial holder of freely distributed emission allowances.

The windfall profits arising from the free allocation of EUAs appear to be significant. A study by Point Carbon, an emissions markets consulting firm, assessed the scale of windfall profits in five large European countries – the United Kingdom, Germany, Spain, Italy and Poland – during Phase II (2008-2012) of the EU ETS, and estimated them to be between 23 and 71 billion euros (Point Carbon, 2008).

[§] Some of these windfall profits will be moderated by the costs of rent-seeking. As becoming an initial holder of EUAs has considerable economic value, one could expect facilities that are covered by the EU ETS to expend some effort in order to secure allowances "for free." If the owners/managers of a facility have political clout and connections, their plant may be more likely to secure an initial assignment of emission allowances (Markussen and Svendsen, 2005).

FIGURE 3: DISTRIBUTIONAL CONSEQUENCES OF PROPERTY RIGHTS ASSIGNMENTS (FISHERMEN AND THE PLANT)



If the plant is assigned property rights over the river, fishermen will pay the plant to reduce its production: At any given point, the fishermen are willing to pay up to the amount of damage caused (equal to MEC), whereas the plant is willing to accept a payment at least as large as the difference between the marginal benefit (MB) of additional production and the marginal private cost (MPC). The plant and the fishermen will engage in Coasean bargaining, as long as MEC > MB - MPC. The net gain of the plant will be between the area of the triangle XE^*E_1 and of the trapezoid E^*YE_1X, and its exact amount will depend on the parties' relative bargaining power.

If the fishermen, on the other hand, are assigned property rights over the river, the plant will have to compensate them for polluting the river (at least by the amount of the damage caused, equal to MEC): It will do so as long as the marginal benefit of additional production exceeds the marginal cost (which, now, consists of both the private and external cost). In this scenario, it will be the fishermen who benefit from having been assigned property rights over the river.

An additional concern about the distributional consequences of the free allocation of EUAs includes its effects on the income distribution in society as a whole. To the extent that the owners and shareholders of facilities that receive free allowances are wealthier than the population in general, the free allocation of EUAs can worsen income inequality (Hepburn et al., 2006).

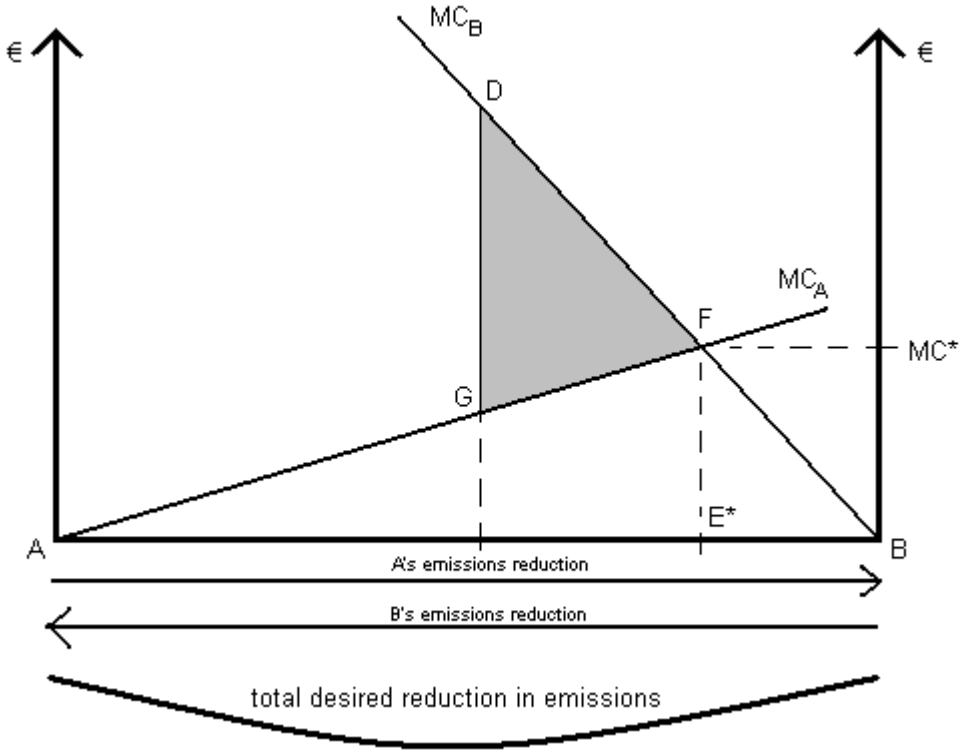
The Allocation of EUAs: Auctions

One way to mitigate the uneven distributional effects of EUA allocations is to use auctions. In fact, the European Commission's January 2008 proposal to amend the EU ETS includes a suggestion to expand the use of auctions in allocating allowances: During the scheme's Phase III, which is scheduled to take place from 2013 until 2020, the power sector should rely exclusively on auctions for the allocation of EUAs.[**] In other industries, the European Commission proposes that the use of auctions increase gradually: The use of free allocation should decrease linearly to 30 percent by the end of the third phase in 2020, and to zero by 2027 (Parker, 2010). These auctions would be conducted by the governments of participating countries (although cooperative auctions between countries are also allowed), and must be open to all potential buyers (Parker, 2010).

Such a dramatic shift from free allocation towards the use of actions would represent a major change from the first two phases of the EU ETS: During Phases I (2005-2007) and II (2008-2012), participating governments could only auction up to five and ten percent of EUAs, respectively (Hepburn et al., 2006).

[**] In a concession to some EU member states in Central and Eastern Europe, however, the EU ETS provides an optional and temporary derogation from the no-free-allocation for power plants requirement to countries that meet specific energy and economic criteria (Parker, 2010).

FIGURE 4: GAINS FROM BEING AN INITIAL ALLOWANCE HOLDER



This diagram illustrates the distributional effects associated with becoming an initial holder of freely allocated emission allowances.

If facility A is the initial holder of allowances, it will be willing to sell them, at any point along AB, for at least $MC_{A,}$, to be compensated for the abatement that it will have to undertake. Facility B will be willing to pay up to MC_B for the allowances. Suppose that, before trading begins, we find ourselves at point D and G. Trading between A and B will, eventually, yield the efficient outcome at point F, where $MC_A = MC_B = MC^*$. Depending on the relative bargaining powers of the two facilities, facility A's net gain ("windfall profit") from trading the allowances will be between zero (if it sells all of them at price MC_A) and the area of the triangle DFG (if it sells all allowances at price MC_B). Clearly, then, facility A can benefit from having secured an initial assignment of emission allowances.

With auctions, governments could sell EUAs to the highest bidder, rather than give them out for free. Facilities that face the highest marginal costs of greenhouse gas emissions abatement could, then, bid up the price of EUAs. As they now have to pay for their initial batch of allowances, the windfall profits from the initial allocation of EUAs are reduced.

In addition to decreasing the profits that accrue to initial allowance holders, the auctioning off of EUAs would yield revenues for the government. These revenues can be used for a variety of purposes. In order to fully understand the impact of auctioning off a larger share of emission allowances, then, one ought to examine how the auction revenue would be used.

The proposed EU Directive provides some basic guidelines for the allocation of auction revenues (Article 10(3)): At least half of the money raised will fund activities related to the mitigation of climate change. These include emission reductions, climate change adaptation measures, carbon capture and storage, and forestation assistance to low-income countries (Parker, 2010). To the extent that auction revenues are used to facilitate further climate change-related measures, Phase III of the EU ETS could, if the proposal is adopted, be more effective at mitigating climate change than it would have been with the free allocation of allowances. In addition, governments can decide to use the auction revenues to reduce taxes, invest in selected industries, or fund other public programs: In such cases, the overall distributional effects of using more auctions in allocating EUAs will, in part, depend on the specific policies that the revenues are used for (Hepburn et al., 2006).

In light of the reduction in windfall profits and the additional government revenues that auctions can produce, it should come as no surprise that economists, almost universally, prefer auctions to the free allocation of emission allowances (Parker, 2010). Industrial

businesses, on the other hand, have tended to oppose auctions, and favor free allocation, especially if they have political clout that allows them to secure EUAs for free (Markussen and Svendsen, 2005; Hepburn et al., 2006).

Conclusion

From an economist's perspective, the European Commission's proposal to use auctions, rather than free allocation, more extensively in distributing emission allowances during Phase III of the EU ETS makes good sense: In addition to reducing windfall profits enjoyed by the initial holders of EUAs, the auctions would provide additional revenue for the governments of participating countries. This revenue could be used to fund further climate change-related activities, reduce the tax burden, invest in selected industries, or to finance other government programs. Although the reduction of windfall profits can contribute to a narrowing of the income distribution, the overall distributional effects of the proposed changes depend on the specific uses to which governments put auction revenues.

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