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33. sz. Műhelytanulmány
HU ISSN 1786-3031

2003. április

Budapesti Közgazdaságtudományi és Államigazgatási Egyetem
Vállalatgazdaságtan Tanszék
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The ownership and allocation of tradable CO2 permits in Hungary

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First draft, April 2003

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Abstract

In view of the obligations undertaken by Hungary in the Kyoto Protocol, as well as the need to meet the requirements of the EU regulation intended to foster the implementation of reducing greenhouse gas emissions through an EU-wide cap-and-trade system, Hungarian authorities will soon have to decide on the highly sensitive question of how emission rights among regulated firms should be allocated. Because different distribution methods might result in substantially different outcomes on the financial situation of firms, how the ownership of allowances should be transferred to regulated companies is one of the most heavily discussed questions. Moreover, emission rights of different countries under the Protocol might be of high value for the governments of countries which are likely to become net sellers at the allowance market and possess extra amount of assigned emission units over their actual emissions (so called "hot air"), so the issue of who should benefit from the possible gains also arises. This paper suggests a theoretically desirable solution to the problem in view of the delineating EU regulation and the common arguments for and against the free allocation of ownership rights to firms. Given that the outcome of the proposed solution is difficult to reach through actual regulation, we also discuss the practical feasibility of the suggested way of allocation.

Keywords: Kyoto Protocol, carbon-dioxide emissions, emission trading, initial allocation, pollution rights, greenhouse gas effect

Összefoglalás

A kiotói vállalások teljesítésére irányuló európai szén-dioxid kibocsátási kvóta kereskedelmi rendszerben való részvételi kötelezettség miatt hamarosan döntenie kell a magyar hatóságoknak arról, hogyan történjen a szennyezési jogok kezdeti allokációja a szabályozás által érintett hazai vállalati körben. Mivel a különböző kiosztási módok igen eltérő hatással lehetnek a vállalatok anyagi helyzetére, a kezdeti allokáció kérdése a szabályozás igen kényes, sokat vitatott pontja. Mivel Magyarország a kiotói egyezményben meghatározott kibocsátási limithez képest jelenleg többlet emisszióval (un. forró levegő), valamint jelentős elhárítási potenciállal rendelkezik, nagy valószínűséggel nettó eladóként fog fellépni az egységes európai piacon. Felmerül tehát a kérdés: Ki részesüljön az emissziós jogok birtoklásából származó esetleges haszonból? A tanulmány egy elméleti megoldást javasol a kiosztás problémájára a formálódó EU szabályozás által megszabott keretek, valamint az ingyenes allokáció mellett és az ellen felhozott érvek figyelembevételével. Mivel az elméleti megoldás igen szigorú kezdeti feltevésekre épül, a dolgozat a javasolt módszer gyakorlati alkalmazhatóságának kérdésére is kitér.

Kulcsszavak: kiotói egyezmény, szén-dioxid kibocsátás, emisszió kereskedelem, kezdeti allokáció, szennyezési jogok, üvegházhatás,

Introduction

Under Article 3 of the Kyoto Protocol, governments, as Parties to the Protocol, made legally binding commitments to reduce their greenhouse gas (GHG) emissions in period 2008 – 2012 by an overall 5,2 percent compared to 1990[1]. The European Union seeks to achieve the targeted reduction by outlining a European cap-and-trade programme, in which large emitting sources of all member countries would be obliged to back up each ton of their carbon-dioxide emissions by freely tradable emission allowances. As Hungary is one of the newly joining members of the EU, it has to align its greenhouse gas regulation with that of the Union.

The latest, amended proposal for the EU Directive on emission allowance trading[2] prescribes that each member state has to develop a national plan regarding 1) the amount of allowances it intends to allocate for the emitting sources covered by the directive, and 2) the methodology to be used in the design of domestic allocation.[3] Annex III of the document lists some obligatory criteria concerning the allocation methods and states that the national allocation plans are subject to the approval of the Commission before their implementation. Thus, other member states and the Commission will have a chance to assess the distributional effects on the relative competitiveness of firms of the different allowance allocation regimes. ”Too generous” national allocation plans might be deemed as illegal state aid and be banned by the Commission.

Two trading periods are specified in the proposal: a trial period between 2005-2007, and the Kyoto commitment period 2008-2012. In the first period allowances have to be grandfathered (firms should get free access to the emission quotas), while in the second period maximum 10 percent of the allowances might be auctioned by national governments. This fact has to be taken for granted when designing the domestic allocation system, whereas the decision on how strict caps to set for the companies and what methodology to use for the distribution is left to the discretion of the national authorities.

The first part of the paper describes why allowances embody quite specific ownership rights, and why the ownership issue is a central question in designing the initial allocation. The second section provides a brief overview of the possible ways in which emission allowances can be assigned to individual plants, and overviews the most important criteria for national allocation plans set by the proposal for the EU directive. Next, our theoretical solution for quota allocation is presented. We assume a highly liquid European emission market, in which the firms and the government face a constant European allowance price. We also presume that marginal abatement cost curves of individual firms are perfectly envisaged and known to the regulatory authorities, and no transaction costs are present. Because the proposed allocation method relies on assumptions that obviously do not hold in reality, the last part of the paper examines whether regulating authorities can reach similar results and to what extent the proposition can contribute to policymaking. The last section includes a summary.

The ownership of emission allowances

The Kyoto Protocol has allowed post socialist countries to fix their GHG reduction commitments relative to the peak emissions of their foregone heavy industry, thus accounting for the substantial

[1] The benchmark years or periods (the “base periods”) set in the Protocol differ from country to country.
[2] Amended Proposal for the Directive of European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the community. COM(2002)680.
[3] COM(2002)680, Article 9/1

decrease in their emissions that resulted from the fall of production in the period of industrial restructuring. For Hungary the protocol sets the objective to mitigate CO2 emissions by 6 percent compared to the average amount released in years 1985-1987. Although emission projections made under different scenarios are dissimilar, it is obvious that the GHG emissions of the past years fell short of the level in the base period. According to the national inventory report to the UNFCCC[4] the total amount of GHG released by Hungary in the base period was 101.6 million tons in CO_2 equivalent while in 2000 the total emissions amounted only to 84.2 million tons. Although business-as-usual emissions might slightly overpass the assigned limit according to some projections[5], official estimates suggest that the country can meet its obligations without taking any actual domestic measures. (KvVM, 2002)

The structure of Hungarian GHG emissions indicates that the energy sector is responsible for over 42 percent of CO_2 released in the country, which highly exceeds the average proportion typical of this sector in the EU countries (30%) as well as in the OECD countries (33%) (KvVM, 2002). Indeed, the energy efficiency of power stations operating in Hungary lags much behind the average in developed countries (Szabó, Szabó, 2001), consequently, we can suppose that there is a substantial potential for adopting efficiency improving technologies.[6] The second largest GHG emitter sector is the agriculture, with a share larger than the contribution of total transportation.[7] It is likely that limitations of EU agricultural production quotas would eventuate in the withdrawal of a quarter to a third of the arable lands from cultivation (Ángyán et. al., 1997) contributing to substantial additional GHG abatement. Therefore, it seems reasonable to assert that Hungary is very likely to become a net seller on the market of allowances, and benefit from selling its AAUs (assigned amount units)[8].

As it was the government who took responsibility in the Kyoto Protocol for curbing GHG emissions, the question arises: Who shall own the allowances? The commitment made by the state might of course be shifted to individual firms under domestic regulation accompanied by relevant enforcement systems, the ultimate liability at the international level, however, falls on the state. Thus, the permits carry rather specific ownership rights.

The government could appear in the allowance market as a seller or buyer, and could retain the ownership of the permits, without transferring the ownership rights of emission quotas to firms.[9] However, in order to achieve the cost effectiveness the tradable quota system offers, it is desirable to involve as many firms as possible in trading. One of the most important effects of regulation through marketable permits (similarly to emission taxation) is that it induces firms to invest in abatement technologies. As the theory suggests, when firms need to hold allowances equal to their emissions resulting from their operations, they are impelled to reduce their emissions by investing in new technology as long as their marginal abatement costs are lower than the price of allowances, under conditions of perfect competition. (Pearce, Turner, 1990) In view of this fact it is obvious that the more investment happens in the country, the more benefits can be achieved, as further abatement means more quotas available for sale to other countries where additional abatements can

[4] United Nations Framework Convention on Climate Change (www.unfccc.org)
[5] See for example the database of UNECE/EMEP (http://www.emep.int/emis_tables/tab7.html).
[6] For an examination of the energy efficiency and possible impacts of GHG regulation on the Hungarian industry see Ürge-Vorsatz and Szeszler (1999), Zilahy (1999) and Zilahy and Zsóka (1998).
[7] The cultivation of agricultural land results in the emission of N_2O, a gas with 310 times higher global warming potential than CO_2.
[8] The unit of the targeted amount of emissions set in the Kyoto Protocol for each participating country.
[9] Although, under some emission scenarios there is a need for some measures to be taken to meet the Kyoto requirement, which means that the government may need to impose emission taxation upon companies or include them in the cap-and-trade regime.

be realized only at higher costs. Besides this, of course we should not dispense of the fact that the environmental quality of production improves significantly in the country.[10]

According to the ownership theory of the firm, when the right to residual returns remains with the same agent who has the residual rights of control, and all contractual payment obligations are fix amounts or fix proportions of the income, maximizing the value for the owner means maximizing the value for all the partners involved.[11] When one has both the residual right to return and residual right of control, pursuing its own goals and maximizing its own income will lead to an efficient solution. (Grossman and Hart, 1986, Hart and Moore, 1990. Milgrom, Roberts, 1992) As we saw, one of the most important factors that determine the possible costs/benefits of emission trading is how firms will decide about investing in abatement technologies. Firms, themselves, have the private information on their own technologies, and having the residual claim over their pollution rights would encourage them to utilize their abatement opportunities to the largest extent possible. Thus, the ownership rights should be definitely delegated to the firms, but whether the rights are given to them free or for a fixed amount, would not alter the nature of their decisions, given that they do not face substantial transaction costs. (However, the regulation can trigger liquidations in case the permit system places too big burden on firms.[12])

Several studies deal with the idea that environmental regulation induces innovation and can help to narrow the so called "energy efficiency gap"[13] (e.g. Jaffe, Stavins 1994a, 1994b, Newell et. al. 1998; Jaffe et. al. 2000), as environmental regulation changes firms' cost structure, what in turn impels them to save on their costs related to pollution. Much of the literature argues that Hicks' theory of production factor efficiency applies to CO_2 emission allowance as a newly emerging production factor. Porter suggests, in his famous hypothesis, that through this induced innovation and technology adoption regulated firms can actually gain competitive advantage over their unregulated competitors. (Porter, Linde, 1995) Others argue specifically that auctioning the pollution permits causes better incentives for innovation and new technology adoption than free allocation (Milliman, Prince, 1989; Cramton, Kerr, 2002).

According to the Coase theorem (Coase, 1960) the initial distribution of the ownership rights does not alter the efficient outcome of the internalization of negative environmental externalities if certain assumptions hold (well defined property rights, zero transaction costs and no wealth effect). It does, however, have a huge wealth distribution effect that manifests itself in the financial situation of the parties involved. In view of the fact that whoever has the allowances might realize gains by selling them, the question arises: should the firms or the government receive the benefits that the allowances embody? In case the allowances are given to the firms free of charge, they might realize substantial gains by implementing investments in abatement technologies and selling allowances afterwards with a net profit, while if the government auctions the emission quotas for them, they might either need to incur costs of abatement or to purchase additional allowances. Theoretically, their investment decisions are not altered, as they perceive either the real or the opportunity cost of emission rights.

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[10] Improving energy efficiency means that less primary energy input is needed for the same volume of production, an option very much favoured by environmental policy. Moreover, switching to less carbon intesive fuels (e.g. from coal to natural gas) tend to decrease the amount of other non-climate related environmental damages.

[11] Residual right to return refers to the income that the owner of a given asset receives after all contractual payment obligations were met. Residual control means that the owner can make decisions related to the asset and have bargaining power over the asset in situations not covered by any contract.

[12] On the relationship of carbon regulation and the shut down decision of firms and the desirable government policy in case of information asymmetry between the firm and the authorities see Jejberg, Lando, 1997 and Hagem, 2001.

[13] The energy efficiency gap refers to the fact that in spite new energy saving technologies that would enable firms to realize negative cost efficiency improvements are available in the economy, much of these stay unexploited.

There are several arguments for the state to receive benefits from selling the AAUs the country possesses. First of all, (as we pointed out earlier) by ratifying the Kyoto Protocol it is the government that undertook the legally binding obligation, so the final liability of meeting the country's commitment remains with the state. Also, the country possesses an excess amount of emission rights that was achieved through the negotiations carried out by the government representatives under the UN Framework Convention. Moreover, the non-avoidable effects of past GHG emissions on the climate will call for adaptation measures in the country that will need substantial financing in the future (e.g. irrigation of drought smitten lands or flood prevention). To create the institutional background for implementing the regulation of tradable emission allowances, a number of administrative tasks will have to be completed, which will also require resources from the state budget. The state administration can largely contribute to the mitigation of the transaction costs faced by companies that engage in trading by spreading relevant information and working out transparent rules.[14] For all these reasons, it seems reasonable that the government should retrieve some funds from the allowances available for sale.

The economic argument for such an allocation is that, by doing so, the government can not only trigger abatement technology investment and emission reduction, but also can raise income for the state budget. If this is designed to be fiscally neutral by means of revenue recycling or offsetting through tax reductions the government can decrease overall tax distortions in the economy. There is an ongoing dispute among economists on the possibility of turning government revenues from environmental regulation to the alleviation of distorting tax burden. On the so-called "double-dividend" issue see for example Oates, 1995, Goulder, 1995, 1997.[15]

The common argument for the free allocation of pollution rights to firms is that as a result of the introduced carbon regulation they will be obliged to submit an amount of allowances equal to their total emissions in every period, although they did not take this extra cost into consideration when deciding on investments in their present technologies. Therefore, the emitting firms will have to incur some sunk costs, or stranded costs for which they might justly demand compensation. (Harrison, Radov, 2002).

The allocation of rights

As it turns out from discussion above, regulation through allowance trading represents theoretically the least cost approach to mitigate CO2 emissions, the initial allocation of emission rights, however, can have significant effect on how the burden of paying for the externality is shared among the different actors. The design of initial allocation of emission permits is indeed one of the most heavily discussed and debated issues.[16]

Harrison and Radov (2002) provide a detailed discussion of the available allocation options, including the description of the major allocation alternatives and the most important valuation criteria for the various mechanisms. They distinguish three basic alternatives for the initial allocation:

1. Auction (selling quotas to firms through a properly designed auction)
2. Grandfathering (free allocation to firms based on their historical emission information)
3. Updating (free allocation to firms based on periodically reviewed information over time)

[14] Although we must note, that state administration also entails transaction costs, which as to be taken into consideration (Coase, 1960, Szakadat, 1995, Svejnar, 1998).

[15] Several studies have suggested recently that even a stronger interpretation of the double dividend may hold. On the case of tax-preferred consumption being present in the economy see Parry et al., 1997.

[16] Among others, Woerdman (2000) argues that the issue of permit allocation will induce heavy political debates, and might retard the implementation of GHG emissions trading.

They also list the basic metrics that can be used for allocations (input-based, output-based, emission-based), and draw attention to the importance of choosing the proper time period for computing the relevant measures. The paper includes an in-depth comparison of the different methods according to all criteria[17].

Annex III of the proposed directive lists some criteria for the national allocation plans, to which member states have to conform. Among others it is stipulated that the "Quantities of allowances to be allocated shall be consistent with the potential, including the technological potential, of activities covered by this scheme to reduce emissions." (COM(2002)680, Annex III/(3)) the plan is required to be conform with the existing EC legislation, should take "early action" into consideration (investment in abatement technologies prior to the period used to measure historical emissions), and should make it possible for new entrants into the regulated industries to get access to the amount of quotas they might need.[18]

One additional point shall be considered regarding the often-cited argument for 'accounting for early action'. The concept suggests that if a firm has 'voluntarily' abated some of its emissions before the initial allowance allocation occurs, the government should reward that by providing emission allowances to cover the original pre-abatement emission volume. Any stricter allowance limitation would 'penalize' firms that have made environmental investments. However, post socialist governments implementing this concept to their regulation may open the Pandora's Box of never ending claims by firms that had to cut down on their production throughout the 90's.

A theoretical solution for the initial quota allocation

Our question is now the following: How can we implement an allocation in a way that *a)* companies are induced to abate emissions up to the theoretical optimum point, *b)* companies receive their claimed compensation for the stranded costs that result from the regulating measures, c) the government retrieves as much benefit as possible?

In the first period of the proposed EU emission-trading scheme, the allocation has to happen through "grandfathering". This means that the government cannot receive income from firms by auctioning them the quotas, therefore, it cannot benefit from the AAUs of the country unless it keeps the ownership of some of the rights. Because the directive leaves the decision open on how many allowances to distribute to the companies, the state would have the incentive to distribute less permits to the companies than their projected emissions, and offer the rest for sale.

Because firms in Hungary seem to have the potential to mitigate emissions at a low marginal cost, providing them with all their required pollution rights for free might mean notable rents for them in the form of windfall profits, which one can perceive as a kind of free transfer from the government to the firms, what opposes the polluter pays principle[19].

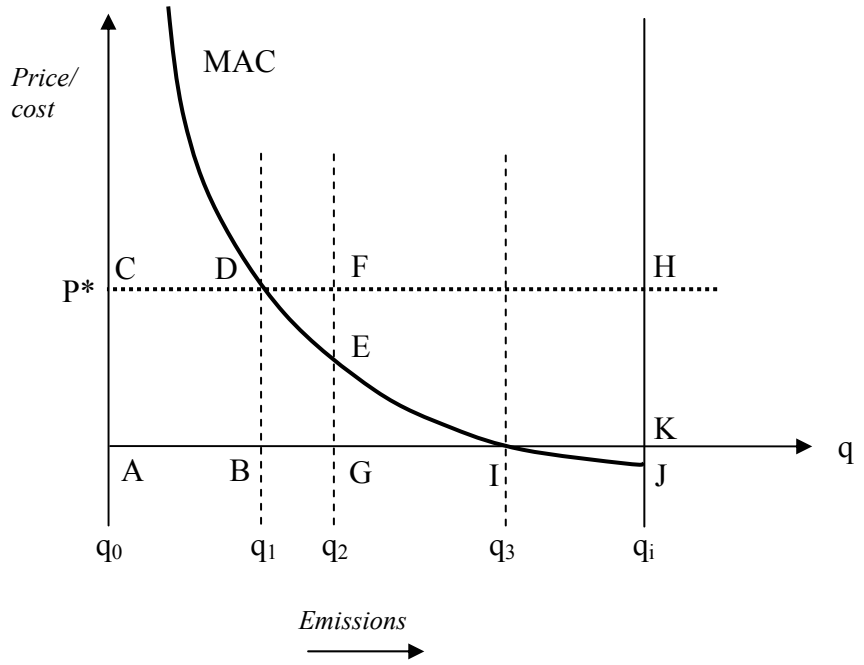
We can presume that imposing a somewhat stricter cap on the GHG emissions of companies would not mean extra financial burden on them, in fact they may still realize positive returns. Estimating the marginal abatement cost (MAC) curves of the individual power plants could

[17] Their paper also overviews the existing and proposed marketable permit systems in the world, and can serve as a good guide for the allocation design process.
[18] This is one of the reasons why states will need to hold some allowances on reserves.

help the authorities to identify how the strictness of the cap set for the firms would effect their financial situation.[20]

The figure below shows a hypothetical marginal abatement cost curve for a set of firms with some negative cost abatement opportunity as a function of emissions (or decreasing abatement)[21]. Given that Hungary is a small state, with a relatively small amount of assigned amount units, we assume that the emitting firms as well as the government are price takers in a relatively huge, highly liquid European allowance market. We assume that there is no information asymmetry between the individual firms and the regulating authorities, and companies do not face any transaction costs related to their abatement technology investments and allowance trading. We also presume that the set of technology options available for the companies and the related costs do not change during the relevant compliance period.

The marginal abatement cost curve *MAC(q)* depicted on the picture is a continuous, monotonically decreasing function of the level of emissions *q*. Less emissions (or more abatement) entail higher marginal costs at an increasing rate, when one graphs abatement costs as a function of abatement, thus more emissions are associated with lower marginal costs in our graph, so we assume that $MAC'(q) < 0$ and $MAC\ (q)'' < 0$. We use this curve shape in our figure to facilitate graphical exposition, but we have to note that the actual MAC curves companies will face are step functions with unique shape for each firm with different technological features. The step functions experienced by the firms or authorities are presumed to be of similar characteristic in the sense that at higher additional abatement levels additional costs raise at an increasing rate, and higher emission rates mean lower marginal abatement costs, correspondingly.



Point q_0 denotes the zero emission point (ously not included in the domain of the marginal abatement cost function), q_i represents the emission level before the regulation comes into effect (initial emission level), and P^* is the level of constant European allowance price. Points q_1,

[20] One important thing, however, that has to be taken account of is that limiting the possible gains achievable by the Hungarian firms might effect their relative competitiveness compared to foreign firms, in case other member states turn out to be more generous towards their companies.

[21] The fact of negative cost abatement option is not necessary for finding the solution.

q_2, q_3 are various levels of post-abatement emissions arising after the new CO2 allowance trading regulation is implemented and emission allowances are allocated to the firms.

In case firms receive the amount of allowances equal to their historic or predicted BAU[22] emissions, they would receive quotas of value AJHC from the government. Because of their perceived opportunity costs, they would abate up to the point where $MAC(q) = P^*$ (point q_1 in the figure), what would cost them money equal to the difference in areas BID – IJK[23]. They would submit q_1 amount of allowances to the authority to back up their remaining emissions, and by selling $(q_i - q_1)$ amount they could earn revenues equal to the area of the square BKHD. Thus, they would benefit the area DHJ, which might be regarded as a free transfer from the state, and one can argue that this is not in conformity with the polluter pays principle.

Since both the government and the firms face the same European price, whether the firms or the government sell the allowances does not make difference in terms of the revenue receivable. Finding the appropriate allocation cap, therefore, means an amount of freely provided allowances at which firms are neither suffering a stranded cost, nor gaining a windfall profit. This solution would be the point, where firms receive just the amount of allowances which leaves them with exactly zero costs (or zero profits). Because firms need to submit allowances for each ton of CO_2 they release, and they perceive both the cost of purchasing additional allowances and the opportunity cost of not selling allowances, they would in any case choose to abate up to the optimal amount q_1.

The amount of freely distributed allowances to the firm would be at a point like q_2 on the graph. If this is the point determining desired cap on the firm's emissions (not considering the amount of allowances at point q_1 that they receive and then surrender) the firm receives the value corresponding to area BGFD for free, while it has to incur the cost equal to the area under the MAC curve (BGED+EGI-IJK), and can sell allowances of value DEF. So, we are looking for a point q_2, where

(BGFD – BGED) – EGI + IJK = 0, or

DEF – EGI + IJK = 0

Technically,

$$(q_2 - q_1) * P^* - \int_{q1}^{q2} MAC(q)dq - \int_{q2}^{q3} MAC(q)dq - \int_{q3}^{qi} MAC(q)dq = 0,$$ (where the last term is negative)

so, we have the condition $(q_2 - q_1) * P^* = \int_{q1}^{qi} MAC(q)dq$.

q_2 can be expressed as: $$q_2 = \frac{\int_{q1}^{qi} MAC(q)dq}{P^*} + q_1$$

[22] Business as usual

[23] If no cost-effective abatement options are available IJK=0, non-existent, a case which would not effect our basic argument.

This way of allocation does not put companies that took early measures to mitigate their emissions at a disadvantage, albeit it does not reward them either for their early action, given that each company faces the same costs (zero costs).

Practical feasibility

Of course, the authorities will never have perfect information on the MAC curves of individual firms, but trying to approach this point could result in valuable revenue for the government. Therefore, besides the equity considerations of the applicable allocation method, the question of feasibility is also important to examine. In reality, emission trading systems are diverted from the theoretically efficient outcome by a number of factors, of which the most important ones are: 1) concentration on the market of products, 2) concentration on the market of pollution rights, 3) pursuing goals other than profit maximization, 4) effect of existing regulatory environment, 5) degree of control and enforcement, 6) transaction costs (Stavins, 1995). A detailed discussion of these factors would reach beyond the topic of this paper, so we confine ourselves only to the question of how to implement an allowance distribution to have an outcome that approaches the ideal situation.

Under the influence of the above-mentioned diverting factors the government would find it impossible to identify the single optimum distribution solution, but still has a good chance of keeping the feasible distribution in the range of outcomes that can result in a second best solution. A second-best allocation would keep the costs of companies at zero while allowing for some windfall profit to emerge over zero at the expense of allowances retained by the state. Such a solution would be feasible because firms are easier to involve under such terms compared to the optimum conditions. By the symbols of the above figure, the range of second-best solutions is between points q_2 and q_i, (or more strictly q_3) the closer to point q_2 the better.

Getting access to the intrinsic knowledge of firms is not only impossible, but even firms themselves may lack perfect information regarding their actual abatement options prior to regulation. However, authorities will possess some information on the firms covered by the system. The proposed EU directive sets out the rules for applying for "greenhouse gas emissions permits"[24] as well as monitoring and verification, which require firms to submit detailed information on their operations, technical data regarding their installations, and the inputs they use. The general principles of verification listed in Annex V of the provision states that emissions from different sources are going to be subject to verification, carried out by a verifier expert on site. These reporting obligations will decrease the information gap between the companies and the authorities.

One possible way of determining an appropriate cap for the firms could be to ask firms themselves to provide data on their own expenses (allowing for a reasonable level of transaction costs) what could be reviewed by the regulator using the available data on firms. In this way the administrative expenditures would not increase significantly, and some deviation from the true values in the direction of the firm's advantage would not mean a big tort for the society, as firms would still be impelled to exhaust as much of their abatement opportunities as possible.

Summary

[24] It is important to note here that "permits" defined in the proposed EU directive (a licence that entitles its licensee to release GHG into the atmosphere) are not analogous to the "allowances" (tradable quotas allowing their owner to emit one tonne of carbon-dioxide).

Our paper investigated the problem of initial quota allocation of greenhouse gas emission rights in case of a country that is likely to become a net seller at the market of a unified European allowance market. The basic question of the study is how to transfer ownership rights of emission allowances to firms in a way that 1) it is in the interest of firms to invest in abatement technologies, 2) they do not incur stranded costs as a consequence of the regulation 3) they do not gain high profits resulting from the regulation that can be regarded as undue state support and opposes the "polluter pays" principle, 4) the government can receive as much revenues as possible from the assigned amount units possessed by the country. The benefits raised by the government can then cover the administrative expenses related to the regulation, can be turned to managing the future environmental effects of unavoidable climate change and might be used to reduce tax distortions. Under the assumptions of well-known static marginal abatement cost curves for the relevant compliance period, no information asymmetry between firms and the regulation authorities, no transaction costs, and treating the firms as well as the government as price takers in a relatively huge European market, we suggest that the authorities should allocate an amount of free allowances to firms that they incur zero costs (or don't realize windfall profits) as a result of the cap-and-trade program. Given that the government does not have access to the private information of firms on their abatement opportunities, we propose a way of determining a cap that is close to this solution based on the self-acknowledgment of companies that would be subject to control by the authorities based on the accessible information on firms. A solution that is between the amounts of projected emissions and the abatement level corresponding to zero costs (as close to the latter as possible) could already mean valuable fiscal revenue for the government, while still ensuring investments in abatement technologies and the subsequent improvement of the environment.

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