Early crediting of emissions reduction a panacea or Pandora s box?

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TECHNICAL ABSTRACT

The Kyoto Protocol sets legally binding emission targets for industrialized countries without accounting for reductions carried out prior to 2008, the beginning of the first commitment period. There exists only one exception, the project-based Clean Development Mechanism where credits accrue from 2000. Two other possible ways to allow crediting for early reductions are discussed in this paper, a domestic scheme and early Joint Implementation. Part of the emission budget is allocated to entities that prove pre-2008 emission reduction. The implications of these concepts are analyzed on a macro as well as on a micro level taking the domestic and international commitments into account. They can lead to a strong redistribution and are prone to free riding. Credited reductions strongly depend on the choice of baseline-setting methodology. Moreover, compliance can be endangered as sectors that are less competitive and do not participate may be confronted with higher reduction commitments from 2008. We conclude that early crediting makes sense if it is built on conservative baselines, sets incentives for innovation and provides for institutional learning. The current bill discussed in the U.S. does not meet these criteria.

Keywords:

Early crediting, emissions trading, Joint Implementation, Clean Development Mechanism, climate change policy, Kyoto Protocol

JEL classification:

D61, K32, K33, Q25, Q28

NON-TECHNICAL ABSTRACT

Between today and 2008 there are no binding commitments for greenhouse gas reductions. The targets stipulated in the Kyoto Protocol only apply from 2008 onwards. Countries will hesitate to introduce regulations unilaterally due to the competitive disadvantage such regulation is thought to bring. Therefore, it has been argued to set incentives for emission reduction already now. One instrument of the Kyoto Protocol already allows such early crediting – the Clean Development Mechanism where emissions reductions from projects in developing countries already count from 2000. Early crediting in a domestic context would be possible by taking a part of the post-2008 emissions budget and allocating it to those actors who prove emission reductions before that date. The same would be possible in the case of Joint Implementation where projects in other industrialized countries could be credited through an allocation of the emission budget of the country where the project takes place. Whether this reduces the amount of "hot air", the unrealistically high emission budget of some countries in transition, remains a matter of definition.

Early crediting has been advocated by many actors, especially industry. In the U.S., legislation has been proposed. Proponents state that innovation and institutional learning would be spurred. Rigid sectors would already have an incentive to use replacement of capital stock to install low-emission equipment before 2008. The appeal of early crediting crucially depends on its effects on innovation. If there is no innovation, early crediting would lead to a rise of marginal cost after 2008. Another effect of early crediting is redistribution from the users of early credit to those who do not reduce anything as the part of the emissions budget allocated to the latter will shrink. This might lead to political pressure in the budget period not to reach the commitment.

A major risk of early crediting is free riding, i.e. participants claim reductions that they would have done anyway as they are profitable. A high share of free riders would drive up emissions reduction costs for the rest of the economy. Free riding can only be countered by strong rules for the calculation of baselines that simulate the situation if the emission reduction project had not taken place. The U.S. draft legislation does not provide such rules and even allows to claim credit for spurious past emission reductions. Besides free riding, there is also the risk of displacement of activities, the so-called leakage.

The following safeguards are necessary but not sufficient to guarantee an advantageous system of early crediting:

- strict baselines or proof of barrier removal
- incentives for innovation (e.g. discounting of low tech projects)
- incentives for rigid sectors to install climate-friendly capital replacement.

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1. Introduction

After long international negotiations, the Kyoto Protocol of 1997 - if it enters into force - sets legally binding emission targets for a basket of six greenhouse gases. These targets apply to most OECD countries and countries with economies in transition. A novel feature is the use of a commitment period that runs from 2008 to 2012 instead of a single target year. Moreover, the Protocol allows for the use of so-called flexible mechanisms: emissions trading (Art. 17), Joint Implementation (JI) (Art. 6) and projects of the "Clean Development Mechanism" (CDM) with countries without emission targets (Art. 12). All these instruments shall be "supplemental" to domestic measures[1]. Supplementarity has not been defined in the Protocol, though. If average emissions in the commitment period are lower than the emission target the difference can be banked for the next commitment period. In case of higher emissions the country will be in non-compliance.

Since the Kyoto Conference a growing number of interest groups and politicians has criticized that pre-2008 emission reductions are not accounted for in the Protocol. They argue for ways to credit such reductions either nationally or internationally. This is called "early crediting". One mechanism of the Kyoto Protocol already allows early crediting: emission credits from the CDM accrue already from 2000, not only for the commitment period 2008-2012.

After an explanation of three different possibilities for crediting early action – two on the international and one on the national level - we will consider the macroeconomic as well as the microeconomic implications of these concepts. The main focus will be on the domestic case.

2. Ways of early crediting

As the Kyoto emission targets only apply from the year 2008 on there are no strong incentives for countries to introduce regulations that would cover the time before the commitment period begins. This is due to the competitive disadvantage such unilateral regulation is thought to bring. In such a case, national actors, e.g. companies, have no incentives to reduce their emissions before 2008. To foster reductions prior to the first commitment period without risking a competitive disadvantage one could think of granting credits which can be used against future obligations. Within the Kyoto framework three possible starting points can be envisaged. As mentioned above the CDM already allows early crediting. There exist two further ways– domestically and via JI. While the former would not violate the Protocol, the latter would be contrary to the Protocol in its current form but is also discussed here. At first, a macroeconomic perspective is taken and no cost aspects will be considered.

[1] It should be mentioned that in case of the CDM wording of the Kyoto Protocol is slightly different.

CDM

Certified emissions reductions (CERs) from CDM projects can be banked by the project participants for use in the commitment period.

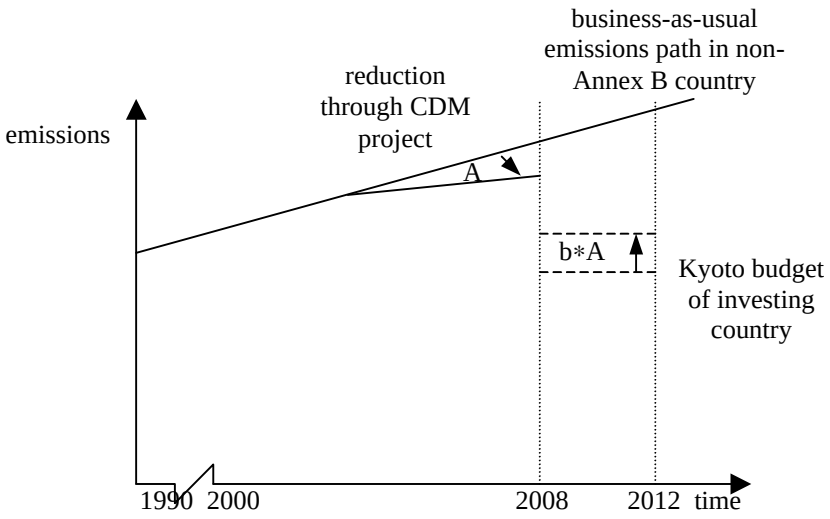
CDM projects create certified reductions from the business-as-usual emissions path of the non-Annex B country that enhance the Kyoto budget of the investing country if all credits accrue to the latter. Any form of credit sharing (b<100%) will reduce the budget increment (Dutschke/Michaelowa 1998).

A general formula in the case of linear business-as-usual growth would be:

$$y = bx\,\frac{z}{5}$$

with: y: enhancement of the Kyoto budget (GHG tons)
b: share of credits accruing to the investing country
x: reduction in business-as-usual growth (GHG tons per year)
z: number of years in which the CDM projects are active

Figure 1: CDM early crediting

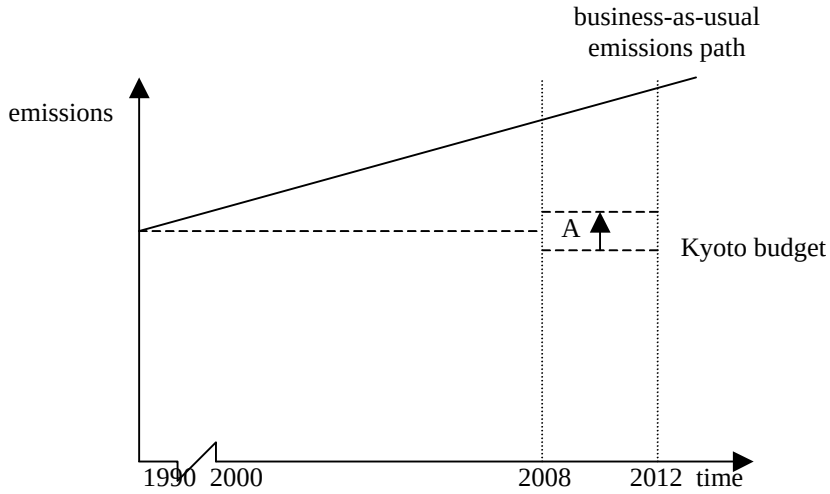


Parkinson et al. (1999) have criticized early crediting in the CDM context as this would lead to an implicit overvaluation of the CDM projects. This, however, is exactly the intent as CDM projects have to bear an adaptation and administration tax that shall be offset by the early crediting rule.

Joint Implementation

Early crediting through projects between Annex I countries would be quite similar to the just introduced case of CDM. Investor countries would also profit from early credit JI as it enhances their options (Center for Clean Air Policy 1998).

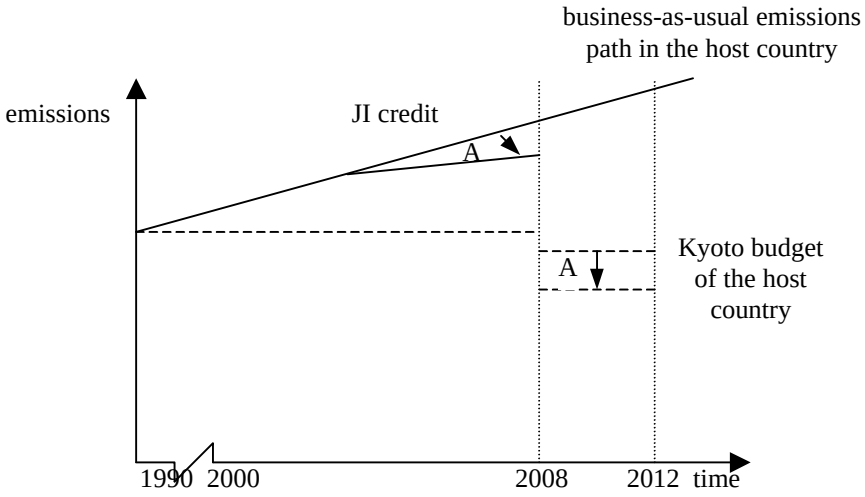
Figure 2: Early JI credits in the investor country



The difference exists in how the host country will be treated as it faces - in contrast to CDM – a reduction target. If early JI credits are handled in the same way as regular JI credits host countries will be obliged to subtract them from their budget. Otherwise host countries would have an incentive to maximize early JI that is not additional and thus the Annex B budget would be blown up. Therefore, without a corresponding subtraction early JI would be similar to the CDM and face the same problem of additionality (Michaelowa 1998).

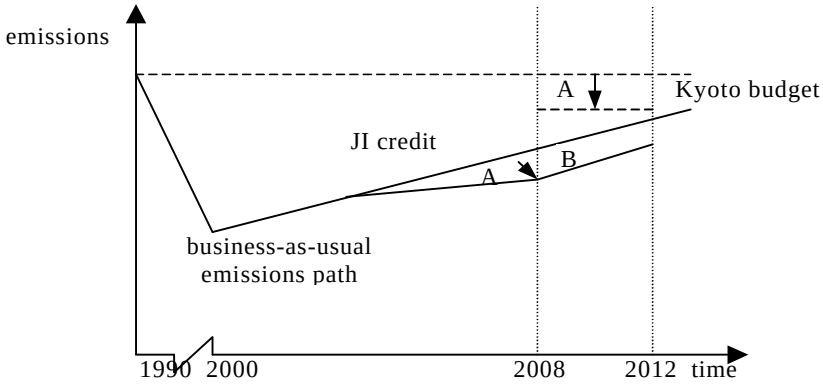
If JI leads to a reduction from business-as-usual by the amount A, the same amount has to be deducted from the Kyoto budget to avoid non-compliance. The same calculations apply as above.

Figure 3: JI early crediting in the host country



The situation does not change in principle if the host country has "hot air", i.e. its baseline is below the Kyoto budget.

Figure 4: JI early crediting in the host country with hot air



In this case, one is led to think that JI reduces the amount of "hot air" by the credited emissions reduction. This was done by the Swiss delegation at the fourth Conference of the Parties in Buenos Aires which circulated a non-paper that argued for early crediting of JI exactly for this reason (Switzerland 1998). This argument holds generally if the baselines for the JI projects are set "correctly" without cheating. If, however, baseline control for JI is lax (and there are indications that this might be so due to the fact that both partners have an emissions

budget) JI in general and early JI in particular could lead to a "laundering" of "hot air". Moreover, if only domestic efforts are considered to determine the amount of "hot air" – what in our view is more appropriate - it could be defined as the amount of allocated permits exceeding the initially forecast emissions for the commitment period. Then, the business-as-usual emissions path would have to be adjusted due to JI activities since JI should be classified as a non-domestic effort - JI is carried out in the host country but financed by the investor country.

With this definition in mind, a reduction in "hot air" through early JI would require A>B in Figure 4. This depends on baseline setting, induced change in the future emissions path and especially on the start of the program. Therefore, we would argue that the amount of "hot air" is likely to increase (A<B) if early JI is truly additional as the business-as-usual path is shifted downwards. Furthermore, if the program starts before the year 2003 it runs longer than the first commitment period resulting in a longer period of time where early credits can be accumulated.

Only in case of non-additional JI the amount of "hot air" – taking our definition into consideration - seems to fall but this is only due to a "laundering" of the "hot air". Non-additional JI would not be attractive as it would reduce the saleable quantity of "hot air" by the same amount and presumably entail lower transfers.

Notwithstanding the design of such a program or whether the amount of "hot air" will decline or not - as long as there is a subtraction from host country's target, the total Annex B budget remains unchanged.

Domestically

A domestic system of early crediting would allow actors to create credits by emission reduction or sequestration compared to a baseline. These credits could be used by the actor to offset future emissions control obligations and would be guaranteed by a proportional set-aside of the country's emissions budget 2008 to 2012. Otherwise, the country would not be in compliance unless it would buy additional permits from other countries to cover the resulting shortfall.

If an early crediting program leads to a reduction from business-as-usual by the amount A, the same amount has to be deducted from the Kyoto budget to avoid non-compliance. The reduction of the budget can be quite substantial. If, for example business-as-usual growth is 27% from 1990 till 2008 (which is in the order of magnitude of the forecasts of U.S. emissions), and early action would be credited from 2000 the following values would result:

- if early action would reduce business-as-usual growth by 0.5 percentage points the Kyoto target would be strengthened by 0.8 percentage points (0.5 multiplied by 8 years of early crediting divided by 5 years of the budget period)

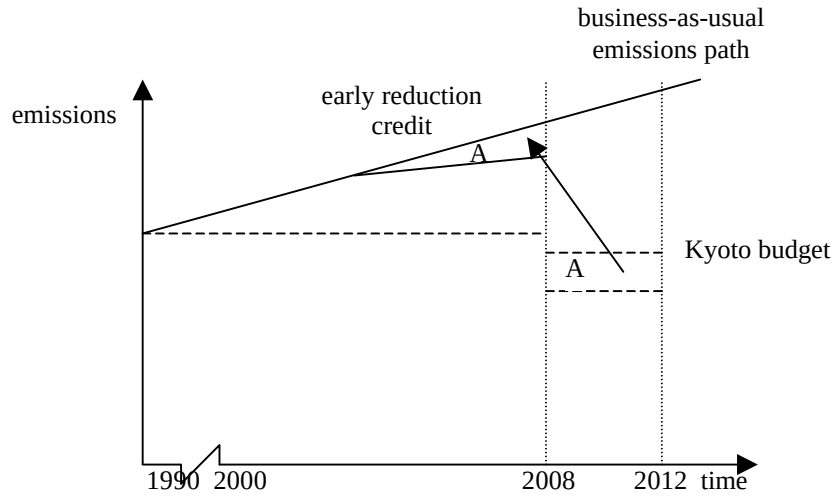
- in case of a reduction of business-as-usual-growth by 2 percentage points the Kyoto target would be strengthened by 3.2 percentage points.

A general formula in the case of linear business-as-usual growth would be:

$$y = x \frac{z}{5}$$

with: y: strengthening of the Kyoto target (percentage points)
x: reduction in business-as-usual growth (percentage points per year)
z: number of years in which early crediting applies

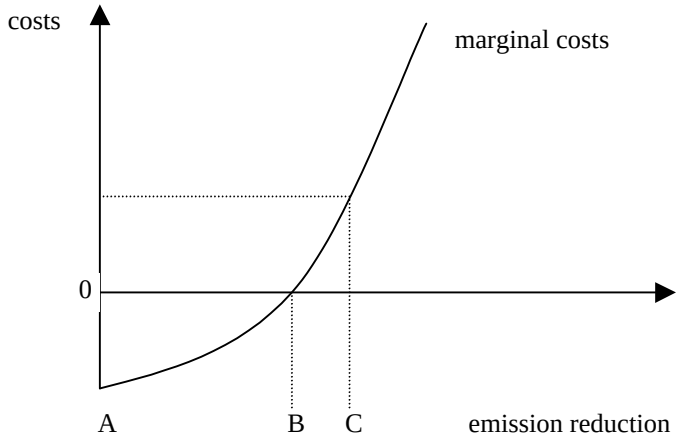
Figure 5: Domestic early crediting



3. Macroeconomic implications of early crediting

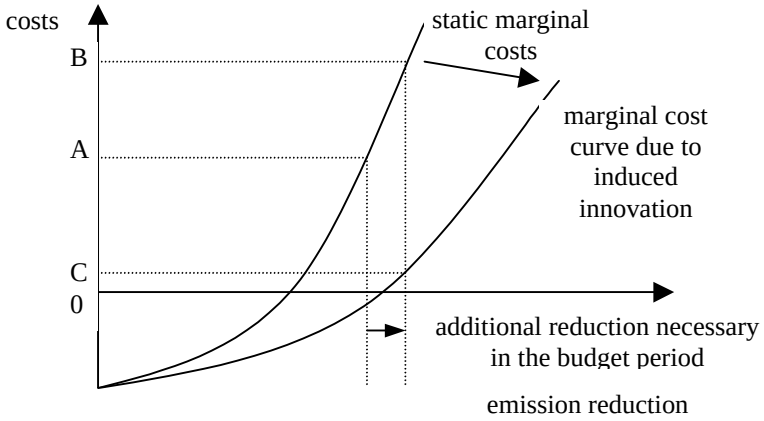
Proponents of early crediting argue that it would smoothen emission reduction requirements as rigid sectors would already have an incentive to use replacement of capital stock to install low-emission equipment prior to the first commitment period. Without early crediting the actors would follow the business-as-usual scenario because of a lack in reduction incentives with a corresponding growth in emissions. Assumed the Kyoto Protocol will be ratified the country faces binding emission targets from the year 2008 on. This would impose an abrupt reduction obligation with potentially serious adverse impacts on the economy. Moreover, in case of early crediting the implicit price of carbon – if not only no-regret options are realized - would be above zero before the budget period and thus induce innovation.
Are these arguments sufficient to pave the way for early crediting? We discuss them in the framework of macroeconomic costs.

Figure 6: Early crediting and macroeconomic abatement cost before the budget period



Point A is chosen under business-as-usual. Point B will be attained if barriers to no-regret measures are removed. Point C will be reached if early crediting is allowed as companies hedge for the budget period. Note that even in the absence of domestic early crediting companies would invest in CDM projects if the advantages exceed the costs.

Figure 7: Costs during the budget period



The evaluation of early crediting depends crucially on its influence on innovation. If there is no innovation, early crediting would lead to a rise of marginal cost in the budget period from point A to B due to the additional reduction necessary. If induced innovation leads to a shift in the cost curve, point C would be reached and thus marginal costs could fall depending on the magnitude of the shift.

Thus, it is critical whether early crediting leads

- to a utilization of the no-regret potential or
- to a shift of the marginal cost curve due to induced innovation

If neither happens, early crediting will lead to a rise in abatement cost!
Domestic early crediting ceteris paribus would lead to a lower demand for CDM reduction prior to the budget period. In the budget period, demand for CDM and JI would rise if the cost curve has not shifted sufficiently to lower marginal abatement costs. In the other case, it would still fall.

4. Microeconomic implications of domestic early crediting

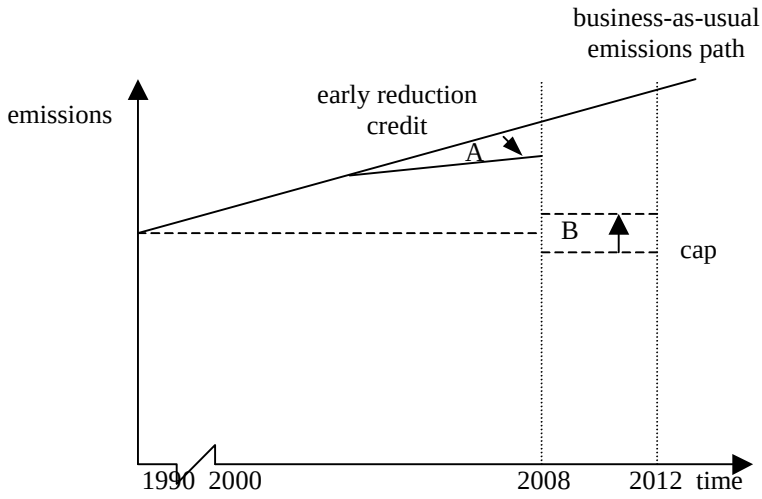
As we have seen in chapter 2 early crediting through JI or CDM is quite similar to the regular use of these instruments. Therefore, only domestic early crediting will be discussed in higher detail.

Domestic redistribution

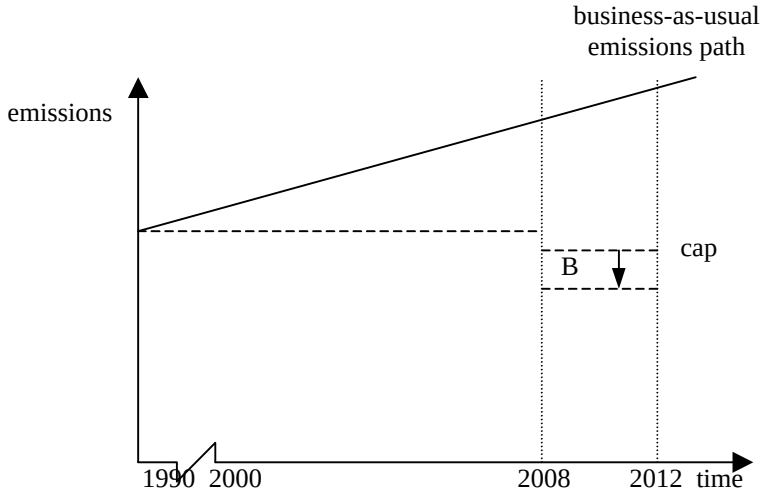
To simplify the analysis we discuss an economy consisting of two companies X and Y. X participates in domestic early crediting, Y does not. The Kyoto budget is translated in caps for the companies during the budget period.

Figure 8: Redistributional consequences of early crediting

Company X participating in early crediting



Company Y not participating



Company X gets credits for early mitigation at the amount of A. This amount has to be subtracted from the overall country budget in the first commitment period. Therefore, the initial allocations of permits to companies have to be tightened by a certain amount summing up to A. The distribution of this additional reduction is an issue of equity. One possible way would be a reduction by a same percentage for each actor determined by the share of A in the overall budget. For company X this would result in a rise in emission permits by B (A minus cap adjustment). Since only two companies are considered, Y faces a corresponding reduction by B (cap adjustment). Thus Y will find it more difficult to reach the cap. Early action leads to a redistribution from company Y to X. Obviously, in a real economy the number of participating companies will be much lower than of non-participants, thus diluting the effect.

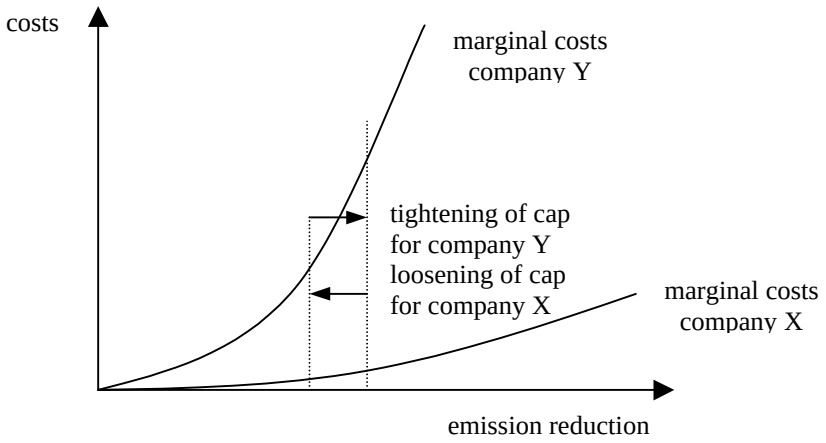
Such a design helps to overcome one major disadvantage of common emission trading schemes. These schemes usually allocate emission permits to emitters on the basis of historic emissions in some historic baseline year. This means that an emitter might receive a lower emission limit because of taking action prior to the baseline year. Facing the possibility of a future regulatory system using such historic allocation emitters have a strong disincentive to carry out emission reductions prior to the baseline year. Early crediting removes this disincentive by adjusting the baseline to a level that would have existed if the emitter had not taken qualifying action. Therefore, early crediting could serve as a means of baseline protection (Rolfe 1999).

The above explained redistribution only occurs in case of domestic early crediting. The benefits of getting early credits accrue exclusively to the participant while the costs of cap adjustment are spread between all actors. JI and CDM early crediting are accompanied by a corre-

sponding rise in the overall budget. There is no need for placing a burden on participants through cap adjustments.

The economic rationale whether to participate in an early credit scheme or not depends on the shape of the cost curves of the companies. As it is likely that participants will have lower costs than non-participants, the following situation will occur in a static setting:

Figure 9: Costs of reaching the cap



It is obvious that the difference in marginal costs widens through early crediting. If early crediting led to a shift of the cost curve of company X due to induced innovation the difference even widens further.

Redistribution could also become an issue of interest if an early crediting regime will be implemented within a bubble according to Art. 4 of the Kyoto Protocol. Since such a scheme could be seen as being similar to the domestic case (overall budget for the bubble) this could lead (within the EU) to a new round of negotiations of burden sharing. Member states that do not want to participate in early crediting would certainly argue that their share of the Kyoto budget would not be reduced due to the early crediting in other member states.

Baseline considerations

Many proponents of early crediting state that it might lower the resistance of interest groups against the ratification of the Kyoto Protocol. This can be especially seen in the U.S. where a staunch opponent of climate policy (Senator Mack) is a sponsor of the early credit bill introduced in the Senate in March 1999[2]. His line of argument was that one never knew whether a future Congress might introduce emission caps so it would be important to allow companies to hedge against this eventuality – that would hurt nobody. This strongly suggests that compa-

[2] The bill was introduced by Democratic Senator Joseph I. Lieberman together with the two Republican Senators John Chafee and Connie Mack, supported by further nine Senators as "Credit for Voluntary Reductions Act" (S.547). It is a slightly modified version of the bill introduced in October 1998 as 105th Congress' "Credit for Voluntary Early Action Act" (S.2617).

nies using early crediting should incur no costs, i.e. use only no-regret measures. Thus baselines would have to be chosen in a lax way.
This assumption is confirmed through the design of the early credit bill (U.S. Senate 1999). The proposal not only allows crediting for future domestic emission reductions but also for past actions identified under §1605(b) of Energy Policy Act of 1992 (EPAct) as well as for projects under the U.S. Initiative on Joint Implementation (USIJI).
EPAct §1605(b) is part of the Climate Wise Program of the Clinton Administration introduced in 1993. Companies can voluntarily report mitigation activities which will then be registered. Though, the guidelines are extremely flexible. No verification process exists and in some cases the same reductions are reported by different entities (double counting) (Nordhaus et al. 1998, p.14).
Furthermore, reductions achieved abroad are taken into account, although the program is designed as a domestic scheme. USIJI is the institutional frame for U.S. activities under the JI pilot phase, the so-called Activities Implemented Jointly (AIJ). As AIJ serves only as a means to collect experiences with the project-based instrument there is a lack of sufficient verification. Reported reductions cannot be used to fulfil the international obligations imposed through the Kyoto Protocol. Therefore, the overall country budget remains unchanged while the individual cap will be increased.
Both options, EPAct §1605(b) and USIJI, put an unnecessary burden on non-participants.
But what are the effects of lax early crediting? It would widen the cost differentials shown in Figure 9. Free riders would capture rents while the other economic actors would face higher costs (Palmisano 1999). This might – paradoxically – lead to higher political pressures in the budget period not to comply.
For these reasons, the bill was criticized quite harshly by the U.S.-based think-tank Resources for the Future (RFF). Kopp et al. (1999, p.1) conclude that it involves the risk of “distributing too many credits for questionable early reductions”.

Leakage

An early crediting program will certainly cover only a subset of actors. If a company owns sources participating in the program as well as sources staying outside displacing emissions from inside to sources not covered by the program could be a valuable option. An energy supplier, for example, could easily reduce emissions of a participating power plant – and being credited - through dispatching electricity to a non-participating plant. If the latter is less energy-efficient or uses a more carbon-intensive fuel the net environmental effect would be negative.
This leakage problem exactly arose in the case of the U.S. Acid Rain Program (ARP). Since it is designed to be implemented in two phases some energy suppliers used the option of reduced utilization to cut back sulfur emissions of sources already regulated in the first phase.

Whether leakage will turn out to become a big issue depends crucially on coverage of relevant actors as well as on substitution options of a single company. In case of the ARP the problem was dealt with through an adjustment in program design. Sources used for displacement of emissions were subsequently included in the first phase. Though, this raised development and implementation costs of the program quite substantially since new calculations had to be made not only for the number of allocated permits, but also for the impacts on air quality (McLean 1996). Moreover, quite a large number of excess allowances were created (Rico 1995), similar to the phenomenon of "hot air" in climate negotiations.

It should be noticed that leakage is not a unique issue of domestic early crediting. Generally, it arises if a program does not cover all potential actors. Therefore, leakage is also an issue of concern within the debate of the design of an international regime of flexible mechanisms (Botteon/Carraro 1997).

5. Conclusions

Early crediting has been hailed by many to be a perfect solution to the fact that Kyoto targets are only binding from 2008. It indeed offers the possibility to reduce compliance costs as capital turnover can be used to install more greenhouse gas-efficient options. We, however, find a number of risks in the concepts of early action, especially in the domestic case, that might lead to heavy distortions and even higher abatement costs. Early crediting clearly has a redistributionary implication. The following safeguards are necessary but not sufficient to guarantee an advantageous system of early crediting:

- strict baselines or proof of barrier removal
- incentives for innovation (e.g. discounting of low tech projects)
- incentives for rigid sectors to install climate-friendly capital replacement.

But there exists one advantage of an early crediting scheme which could turn out to become a major benefit: it builds up a framework in which practical experiences with the flexible mechanisms can be collected. Since experiences with market-based instruments are quite low such a regime would enable institutional learning with lowering transaction costs.

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