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FINANCING INTERNATIONAL ENVIRONMENTAL AGREEMENTS

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Financing International Environmental Agreements

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Summary *This paper seeks to establish the optimal format for environmental agreements, aimed at reduction of environmental damage resulting from export commodity production in developing countries. It is argued that for commodities with low elasticity of demand and few exporting countries agreements on norms and standards among producer countries are optimal, while for commodities with high elasticities of demand ICREA's funded by general taxes in importing countries are optimal. For commodities with low demand elasticity and many exporting countries either Standard ICREA's of general Taxes ICREA's might be optimal, depending on the type of projects to be financed.*

Environmental damage resulting from primary commodity production is an increasing concern in academic literature.[1] Several types of ecological damage can be distinguished:

- Abundant use of agrochemicals in cash crop production (soya, tobacco, cotton, tree crops). The most important type of agrochemical pollution is by pesticides, which may accumulate in the food chain, may be directly harmful to the labourers who cultivate the crops involved[2], and can eliminate natural enemies of pests, thereby causing what it is meant to prevent: pest outbreaks.

- Deforestation for agricultural purposes. In general, this will cause soil erosion, desertification, loss of top soil, and a climate change (local as well as global).

- Overfishing. This consists of two parts: Catching to much of the commercial fish itself, and fishing methods which result in a large "bycatch" of commercially uninteresting species.

- Environmental damage resulting from mining activities. Several types of ecological damage are caused by mining activities: Waste heaps from mining activities, pollution with chemicals used in the refinement of the mining products, soil erosion, demolition of vegetation.

- Depletion of the stock of tropical rainforest, resulting from exploitation for tropical hardwood production.

In this paper we will concentrate on ecological damage resulting from export

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[1] See, among others Van Amstel et al. (1986,1987), Barbier (1989), Pearce et al. (1990), and Kox and Stellinga (1992). A summary of the available evidence for various types of ecological damage and its respective causes is given in Kox et al. (1993)

[2] Several pest deaths have been reported, especially in cotton production.

commodity production in developing countries. This is not meant to imply that environmental damage from export commodity production in developed countries would be less severe (to the contrary). We focus on developing countries, because a) the importance of export earnings from export commodity production and b) severe competition in export commodity markets results in less freedom for developing countries to choose appropriate environmental policies to eliminate or reduce this environmental damage, relative to the freedom in developed countries. To be more concrete, we will argue that international agreements are necessary to enable developing countries to combat environmental damage from commodity production, while this is not necessary for developed countries.

We will subsequently treat the reasons why environmental problems are not yet treated by domestic environmental policy in the producer countries, argue that international environmental agreements will be necessary to enable domestic environmental policy to treat the problem of environmental damage from commodity production, describe the constraints for such an environmental agreement, and discuss various possibilities for these environmental agreements. Specifically, in the last section we will concentrate on three types of International Commodity Related Environmental Agreements (ICREA's)[3], which differ in the funding of environmental policy: The "standard" ICREA, which is funded by import taxes in rich consumer countries, a newly proposed type of General Taxes ICREA, which is funded from general tax receipts in import countries, which satisfy one condition: the tax revenues are not generated by levying an import tax on commodity imports[4], and a international environmental agreement among producer countries only.

I Why Remains Environmental Damage from Commodity Production Uncombatted?

We first want to investigate why environmental damage is not combatted by domestic environmental policy. The main arguments can be distinguished in political factors and economic factors.

political factors

In general environmental policy will result in losses for the producer's involved. Environmentally sounder production will generally be more expensive than tradi-

[3] The idea and name ICREA is due to Kox, who subsequently developed the idea in a series of papers (Kox (1991), (1992), (1993)). To be specific, the subsequent analysis in section I and II is for a large part a summary of Kox's research, as is the "standard" ICREA; the contribution of this paper is the idea of General Taxes ICREA, and the comparative analysis of the three types of environmental agreements.

[4] In general funding will therefore be based on a combination of income taxes, corporate taxes, etc.

tional, polluting production.[5] "Normal" environmental policy will therefore result in much higher costs and much lower profits for the producers.[6] Therefore it is likely that producers will mount a lobby to prevent environmental policy, to lower the standards applied, etc. In general, such a lobby might be quite effective, as the benefits of environmental policy are often spread out over a large population (Take as an example reduction of SO_2 emissions, saving of a forest, etc), who will receive small benefits each, so that they will not mount a lobby to get the environmental policy accepted. Especially farmers are often able to mount effective lobbies, as their number is quite large, and some political parties depend to a large extent on their votes and/or donations.

Political factors are important both in developing and developed countries. It should be noted that the importance of political factors might depend on economic conditions of the market involved. With a high degree of market concentration and low elasticity of demand it might be possible to shift the burden of the environmental policy from producers to either consumers or producers of inputs, so that in those cases a lobby need not be to be expected.[7]

economic factors

Besides political factors, there are several economic factors which may result in absence of environmental policy: transboundary environmental damage, international competition, and timing of costs and benefits of environmental damage abatement. We will discuss each one briefly, after we have first discussed the necessary

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[5] Theoretically, with complete information environmentally sound production should be at least as expensive per unit product as the "old" production technique; if not, it would already have been used instead of the old, polluting technique. It is possible, however, that environmental policies will force producers to accept a new, unknown technology, which may result in lower costs per unit product. This seems to have happened with rice production in Indonesia, but is a clear exception to the rule that envrionmentally sound production is generally more expensive than the old production techniques.

[6] Of course, it is possible to conceive subsidy schemes, in which firms are paid for reduction of environmental pollution from a given base point level. Such a subsidy scheme may result in higher profits. However, several factors limit the use of such type of schemes:

- It should be possible to measure the amount of pollution from one source;
- It should be found politically acceptable to pay firms to reduce their pollution levels; in general, this type of policy is quite impopular with the general public (See Baumol and Oates (1990), Mitchell and Carson (1989));
- Even in those cases that profits are not reduced the producers might not like the environmental policy, as it will result in a change in competitiveness of various producers. Specifically, environmental policy for cotton production in the USA might favour small producers relative to big producers, resulting in protests of the latter, who have more political clout.

[7] As a notable example, environmental regulation of the palm oil refinement industry has been shown to result of income losses of 43% to the producers of palm oil bunches, while the refing industry remained quite unaffected. (Khalid and Braden, (1993))

preconditions for environmental policy to be desirable.

From a theoretical point of view, environmental damage should be combatted to the point that the benefits of a further reduction of environmental damage equal the extra cost of a further reduction of environmental damage. Global welfare is maximized when global marginal costs equal global marginal benefits, while national welfare is maximized when national marginal benefits equal national marginal benefits. Domestic environmental policy will be oriented to maximizing national welfare (given the restrictions mentioned above on lobbies); in general will domestic policies be suboptimal globally if any of the three cases mentioned above do apply:

- transboundary environmental damage

In this case the benefits of reduction of environmental are partially obtained outside the country where the reduction has happened. As domestic policy will only be based on national costs and benefits, the policy which maximizes national welfare will not maximize global welfare; more specifically, other countries (or its inhabitants) will be willing to pay for a further reduction of environmental damage.

- timing of costs and benefits of environmental policy.

As the costs of reduction of environmental damage is incurred instantaneously, while benefits will be incurred in future (at least in important cases like the greenhouse effect), no environmental measures will be taken if the time preference is too high, which may be the case for developing countries (because of a low basic welfare level) or myopic policies in general.

- international competition

Domestic environmental policies will increase costs of export commodity production, which, with highly competitive commodity markets[8] will result in a loss of market share,[9] and consequently, loss of government revenues from export taxes on commodity exports and foreign exchange earnings. Export earning from commodity exports are a major source of foreign exchange for many developing countries. Foreign exchange may be necessary to pay foreign debts, to get international finance and/or to finance import of necessary inputs; government revenues may be difficult to obtain in other ways than through taxing export commodities. We may conclude that commodity production has positive externalities, which increase the cost of *unilateral* domestic environmental policy, because of the loss in market share implied by severe competition.

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[8] See a.o. Islam and Subramanian (1989)

[9] The underlying idea is that it will not be possible to tax other parts of the economy to finance costs of environmentally sounder production, or to compensate for loss in government income from export taxes, etc. Again, this is quite plausible for developing countries.

The first and last economic factors behind the absence or inadequacy of domestic environmental policy strongly suggest that international agreements on domestic environmental policy are necessary to implement optimal global environmental policy. These international agreements should satisfy the precondition that it will be attractive for each participating country to sign the agreement; more specifically, it should at least provide positive benefits to the countries who will have to implement new domestic environmental policy. The type of international environmental agreements involved differ substantially, however:

Transboundary environmental damage should give rise to agreements between the damage producing country (countries) and the countries which are also affected by the environmental damage. In principle, the victims could agree to pay a certain amount to the polluting country to implement the domestic environmental policy.[10] Observe that with different sources of the environmental damage, it is not necessary for the polluting countries to coordinate their actions; it is only necessary for each polluting country to sign an agreement with each of the victim countries.

International competition combined with a high importance of export earnings and/or tax earnings for the government require agreements between the environmental damage producing countries to implement environmental domestic policy. This will increase costs of commodity production in each of the producer countries involved, so that implementation of domestic policy will not result in a loss in market share.[11] Observe that here an agreement among the producers countries only is required, which contrast sharply with the type of environmental agreements mentioned above. However, each of the countries involved will have a high incentive to "free ride"; therefore, participation of commodity importing countries may be desirable to provide mechanisms to discourage free-ridership.

In the rest of the paper we will focus on international environmental agreements which are necessary because of high international competition on the commodity market involved.

II Preconditions for International Environmental Agreements.

Obviously international environmental agreements are no easily attained. Specifically, some preconditions with respect to potential agreements has to be met. What are

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[10] This is an implemetation of the idea of a Pareto improvement: the victims value the reduction in environmental damage higher than the costs involved, while the polluting country (countries) is (are) more than compensated for the extra costs implied by the environmental policy.

[11] However, total exports may decline as a result of general price increases. The main difference with unilateral action is that in the latter case the demand for the commodity export of a country implementing environmental policy is influenced by the *unilateral demand elasticity* (as supply curves of the other countries do not alter), while in the former case demand is influenced by the *global demand elasticity*.

these necessary preconditions which should be satisfied for international environmental agreements to be realizable?

A. The agreement should satisfy the foreign exchange constraint of developing countries.

Commodity exports account to a large extent for the foreign exchange income of developing countries. For low income countries commodity exports accounted for 73% of all merchandise exports; for lower middle income countries these percentage equals 61%.[12] It is not uncommon to find export of one commodity account for 50% of total exports, so that it is clear that commodity export earning are an important source for foreign exchange, necessary to import inputs. Given the crucial importance of commodity export earning, it is important that an international environmental agreement should not violate the constraint that export earning should not be negatively affected.

B. The governments of the commodity producing countries should commit themselves to reduce environmental damage from commodity production.

The analysis above shows that international environmental agreements are necessary to enable domestic environmental policy. However, the national governments should implement the environmental policy, so that it is necessary that these are, in principle, willing to set environmental goals and standards, and enforce compliance.

C. No international free-ridership.

As abatement of pollution and other environmental problems and measures to reduce environmental problems resulting from commodity production normally have their costs, each producing country has a strong incentive to free ride; i.e. to profit from environmental measures taken in other countries by increasing its market share (while its environmental damage remains unabated). Free riding may take two possible forms: Producing countries may not want to sign the agreement, or they may not fulfil their obligations under the agreement. The agreement must be robust against both types of free riding.

III International Environmental Agreements

From the analysis above, we see that environmental problems in export commodity production is difficult to combat because of high international competition, which will penalize unilateral domestic environmental policy regarding export commodity production in a producing country. We established the need for international environmental agreements to coordinate environmental policy. We will discuss three

[12] See Kox (1992)

types of international environmental agreements:

International Agreements on Environmental Norms

It is conceivable that producer countries will sign an agreement to apply some environmental norms on commodity production, like the amount and type of pesticides used, waste treatment from mining, BOD of palm oil mill effluents, etc. If all producer countries sign this agreement and the agreement is strictly enforced. the price of the commodity will rise to compensate for the extra production costs. This internalization is important, because prices should reflect the true opportunity costs of scarce resources, providing right incentive structures to consumers. Therefore, internalization of environmental costs is one of the objectives agreed upon in Rio de Janeiro:

> *"National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment."*
> (UN (1992), principle 16)

In this type of international environmental agreement, no intervention of consumer countries is needed. However, observe:

- It will be difficult to negotiate an international environmental agreement with difference in costs of satisfying specific environmental standards. For example, use of pesticides depends on the occurrence of pests in the production area. Depending on climatic and other factors, some production areas are favoured by relatively few pests, while in others the number of pests outbreaks is much larger, given same use of pesticides. So the environmental costs of satisfying agreed standards may differ greatly between different production areas/countries, so that even with international agreements domestic environmental policies may result in loss of market share for countries with higher costs of complying with the environmental norm.

This suggests that this type of environmental agreements may be better implemented by setting standards on costs of environmental sounder production, e.g. an agreement that each country will spend $0.20 per kg coffee to reduce the use of pesticides in coffee production.
However, this may also be difficult to negotiate, as the environmental quality in some countries will be substantially better than in others. Specifically, the countries whose environmental quality is much better than the others will have no incentive to sign the agreement; while their competitive position has not deteriorated as a consequence of signing the agreement, they could argue that the other production countries would have had to apply a more stringent environment policy (based on national costs and benefits of environmental policy) in near future, causing a decline

in the competitive position of the latter.[13]

Some compromise has to be found between those two extreme types of international agreements on environmental standards, with less stringent norms for countries in which the costs of satisfying environmental standards is higher, without making these costs completely equal over all producer countries. It should be pointed out that this problem is general to all the international environmental agreements discussed, and does not depend on the particular type of international environmental agreement under consideration.

- Even with equal costs of complying with the environmental norms, each country will have a strong incentive to free ride, to obtain a better competitive position. Retaliation by other producer countries is difficult in practice, as their only possibility to punish the deserter is to break the agreement, and start to produce pollutingly again. Quite surprisingly, it is easier for the less important export countries to free ride, as their behaviour will have less influence on the other producer countries than free riding by the more important producer countries, so that the costs for the "non-free riders" of breaking the conflict to punish the free rider will be relatively higher (relative to the gain of getting the free rider to comply with the agreement once again) for small producer countries, than for big producer countries.

- The agreement will result in higher prices for the commodity involved. Depending on the elasticity of demand, this will result in a more or less severe reduction in world demand for the commodity involved. With high demand elasticity, the producer will incur a relatively high loss in profits, which will result in political resistance by the producers. Furthermore, with an elasticity of demand higher than 1 (in absolute value), the increase in price will result in a reduction in export earnings. This will reduce the likelihood that an environmental agreement on environmental norms will be reached among the producer countries; the more so the higher the elasticity of demand.

Summarizing, we find that international agreements on environmental standards are a possible format for international environmental agreements for commodities with low elasticity of demand, and few producing countries which are of comparable size, and will be easier to reach if the costs of complying with a given environmental norm are relatively uniform.

Standard International Commodity Related Environmental Agreements (Standard-ICREAs)

The idea of what we have labelled here as "standard-ICREAs" is due to Kox (1991,

[13] It is necessary to point out that this is a problem for all types of ICREA's discussed in this paper, and is not specific for the type of ICREA under consideration.

1992). Basically, the structure of a standard-ICREA is as follows: (OECD)[14] importing countries levy an import tax on the specific commodity, which is subsequently transferred to an ICREA-Fund. The exporting countries have a right to draw funds from the ICREA-Fund depending on the share in total net exports of the commodity. However, the right to draw funds is subject to an important condition: It should be demonstrated that the funds drawn from the fund will be used to abate environmental damage and/or alter production techniques in order to reduce environmental damage resulting from commodity production; specifically this will take the form of funds falling free as specific projects are accepted by the direction of the ICREA-Fund.

Before we continue to discuss the pros and cons of this proposal, I want first to emphasize a few critical points in the proposal:

- The proposed ICREA differs fundamentally from the International Commodity Agreements in that it does not contain any price support and/or price stabilisation components;

- The ICREA is commodity specific; for example funds from a coffee-ICREA will be used to reduce environmental problems from coffee production, while it may not be used to reduce environmental damage from cocoa production.

- The exporting member countries are free in the kind of projects they want to implement. In this way the standard-ICREA proposal respects the sovereignty of each of the member countries to implement those environmental policies they deem best. Some possible candidate projects to be financed from the ICREA-Fund are:

  - Afforestation projects
  - Command and control type of policy measures; the funds may be used to compensate the producers within the country for extra costs incurred in order to comply with the environmental standards (if this is not done, the price will be above the price of a non-member exporter)
  - Financing extra costs for producers when market-conform policies like emission trading, Pigovian taxes etc. are implemented.
  - Setting up of extension agencies which should provide information on alternative, environmentally sounder production techniques.

- The ICREA-funds will be available only to those member countries whose projects are accepted; this is a powerful deterrent for breaking out of a ICREA of the standard type.

[14] Only rich, developed countries would likely be able and willing to pay the transfers implied by this and the following proposal.

Although the description may seem quite clear, several difficult decisions have to be made before a standard-ICREA can be made operational:

- What norms for environmental conduct should be specified?

- More important, if a member country has drawn the maximum amount available to him from the Fund, but has not yet reached the environmental norms, should its government be expected to supply the balance necessary to attain the environmental goals?[15]

- At what moment should the Funds be made available? At the moment the project is approved by the Fund, or at the moment its results become clear and satisfy a certain minimum level? The latter option would require the developing countries to finance their environmental programme (and only later be payed back), making it less attractive to them, taking into account the scarcity of capital in developing countries.

- How do we prevent the scheme from becoming to bureaucratic? As a large range of possible projects can be submitted to the Fund for approval, approval procedures may take a long time, preventing effective action.

The main advantages of this type of environmental agreement are:

- Sovereignty with respect to the environmental policy measures adopted; this may be an important factor in negotiations about several possible forms of international environmental agreements. Although favourable from the viewpoint of negotiability one should realize that this advantage is bought at the cost of economic efficiency; see below.

- Internalization in the price of environmental costs.[16] This is potentially an impor-

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[15] I think that should be required, in order to promote efficient use of the Funds made available by the ICREA, and to prevent Funds being transferred to other goals. However, one should realize thatthis requirement may adversely affect the producers, as the government may want to compensate itself by increasing taxes on the commodity producers.

[16] In fact, the extra costs are not really internalized, as the import tax is only levied in the importing member countries. So the extra costs are internalized only in part of the importing countries, while in the producing country end non-member importing countries the extra costs are not internalized. As the price increase in those countries should compensate for all extra costs incurred in the production of the commodity the price increase in the importing member countries will be too high. We can conclude that the prices do not reflect true scarcity of the resources employed in the production of the commodity. How much efficiency is lost because of this effect depend on the share consumed outside importing member countries and the demand elasticities (both of importing member countries and all other consumers).

Second, true internalization would call for a price increase compensating costs incurred to decrease environmental damage, and for a price increase reflecting actual environmental damage levels, while in the proposal only the first may be internalized, depending on the exact format

tant plus of this type of environmental agreement, and in correspondence with the RIO-Declaration cited above. Accordingly, one can imagine that this type of environmental agreement will be not to difficult to negotiate. However, whether or not internalization will be right taking a purely economic view depends on the type of projects implemented; see below.

- Another significant plus: this type of environmental agreement is quite robust against free rider behaviour of member countries (not complying to the agreement), as the benefits (payments out of the Fund) are only obtained when specific projects are accepted by the Fund.

However, the scheme proposed has a number of drawbacks:

Reduction in demand for the commodity involved.

As extra costs are internalized in the commodity price, the demand for the commodity will decline. How much demand will decline depends critically on the demand elasticity. With a demand elasticity higher than 1, export income will decrease, which is disadvantageous to the developing countries. With demand elasticities below 1, export income will rise. The latter does not necessarily imply that developing countries will be enthusiastic about the agreement proposed; though export income increases, government income from export taxes will decrease as long as demand is not completely inelastic to (global) price increases. Therefore, we may expect resistance to the proposed agreement for high demand elasticities, and perhaps some resistance to the agreement with demand elasticities between 0 and 1. In case of demand elasticities between 0 and 1, the amount of resistance will depend on the importance of export taxes on the commodity involved for government finance.

Internalization of extra costs is not always desirable.

Apart from the above mentioned drawback of a loss of export income, another possible drawback of internalization of extra costs is associated with different type of projects which could be financed out of the ICREA-Fund. To see this more clearly, we can distinguish between different types of projects to be sponsored by the ICREA-Fund:

- Reparation projects, in which damage done to the environment in the past is reduced/eliminated, for example by afforestation of deforested areas, cleaning of polluted soils, etc.

- Establishment of extension agencies, which should inform about possible cleaner production techniques, which may be as cost-

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of the policy implemented.

effective as polluting production techniques, but are yet unknown to the producers.

- Credit programmes in those cases that environmentally suboptimal techniques are used because of lack of credit to buy sufficient inputs, as may be the case with soil depletion.

- Command and order types of policy measures or input taxes (in which certain types of inputs are taxed to reduce the amount used)-,[17] in which restrictions are put on the range of possible production techniques used. This may take the form of e.g. prohibiting certain type of pesticides, or establishing maximum amounts of pesticides per ha. The ICREA-Funds are used to compensate for the extra costs incurred by the producers.

- Market conform types of policy measures, in which a price is put on pollution (Pigovian taxes, emission trading, subsidies for reduction of pollution with respect to certain base levels). The ICREA-Funds are used to compensate for the extra costs incurred by the producers.

From an efficiency viewpoint, it is only desirable that extra costs incurred because of projects which implement market conform measures are internalized, because only this type of costs represent the true cost of using scarce resources.[18]
To see this more clearly we investigate each type of projects to be sponsored in turn.

- Reparation projects. The costs incurred in this type of projects do not represent true opportunity costs of the commodity production, because

a) reparation of damage done is in general more expensive than preventing damage to happen in the first place;

b) the damage is done in the past, so that extra costs should be internalized in prices of the past (may be by firms to set up a "provision environmental damage repairment costs"), rather than in current prices.

- Establishment of extension agencies. As in the case above, the relation between expenses on extension agencies and opportunity costs of resources is rather loose. From a theoretical viewpoint it is difficult to analyze this type of projects, as "information" or "knowledge of production techniques" is normally not seen as a

[17] Or more general, all policy measures which do not use optimal economic instruments.

[18] However, see the comments in fn. 16.

resource or production factor. Therefore, there is no theory about its opportunity price. However, it is not too difficult to envisage situations in which extension agencies developed with funds from the ICREA-Fund are only partly involved with extension activities on the specific commodity.

- Establishment of credit programmes. This is a special case, in that the optimal production decision would imply less environmental damage than actually occurs. Specifically, this type of projects might be proposed in cases where not enough inputs are used (e.g. soil depletion), because of financial constraints. Both net income and environmental quality might be higher with higher input use, but this level can not be attained because the producer lacks the necessary funds. In those cases, ICREA-Funds might be used to set up credit programmes. which enable the optimum production decision in absence of financial constraints to be reached. Observe that (as profit increases) the true opportunity costs of the commodity have been overestimated, so that internalization in the price should imply a price decrease. However, the ICREA induces a price increase, which is subsequently used to set up a credit institution, providing the wrong incentives to the consumer.

- Compensation for extra costs of command and order type policy measures (and other, non-optimal economic instruments).

As pointed out in economic literature (See e.g. Baumol and Oates (1988)) only a limited number of economic instruments achieve a certain environmental goal at minimal costs. These optimal instruments are Pigovian taxes, subsidies on environmental damage reduction from a specified base level, Coasian Bargaining, and emission trading.[19]

A corollary of this theorem states that other instruments will generally achieve the environmental goal at too high cost.[20] Like in the situations above, internalization in prices of too high environmental costs will provide wrong incentives too consumers.

- Compensation for economic efficient implemented policies. Only when the policies

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[19] This does not imply, however, that thse instruments can always be used. The reader is referred to Baumol and Oates (1990) for an elaborate discussion on the feasibility of various economic instruments under different circumstances.

[20] Again, some reservation is necessary, as it is possible to achieve environmental goals at minimum costs by e.g. command and order, if different reduction levels for each firm are established. In practice, however the information requirements for the government would be an insurmountable obstacle to an optimal command and control policy; furthermore, it is not likely that firms would accept differentiated environmental targets. So in practice, we might expect that command and control policy measures will achieve specified environmental goals only at excessive costs.
Note that the additional costs (relative to optimally efficient instruments) associated with taxing of inputs might be quite low if reduction of emission levels is too a large extent correlated with the input use, as is the case with e.g. use of pesticides.

are economic optimally implemented will internalization of extra costs in prices be called for, with all the reservation made in the footnotes above still valid.

Timing of payments and bureaucratic procedures.

Another potential drawback is the bureaucratic procedure involved in the approval of the project. First, it may cost time to get approval for a project, which may make efficient and timely action difficult in cases of emergencies; second, some deadweight costs are involved in the bureaucracy of the fund; third, it may be difficult to assess projects for the ICREA-Fund; fourth, payments may be deferred until the results of the project are known.

Efficiency and the use of norms; payment by government.

In the standard-ICREA the implementation of environmental policy is not specified, in that the use of various instruments is free. As discussed above, the same environmental goal may be achieved with different instruments at different costs. The danger looms that some countries may try to achieve environmental goals with suboptimal instruments.[21] For some countries this may imply that this country will not be able to achieve the environmental goals it was supposed to achieve, using its funds in the ICREA-Fund to the maximum; this may induce this country to ask for either:

a) higher drawing rights in the Fund; or
b) weaker norms.

More strongly, this may suggest that countries might implement suboptimal policies, in order to achieve either:

a) higher payments from the Fund; or
b) a better competitive position.

To prevent this type of strategic behaviour, we think a necessary condition in the ICREA should be that every country needs to satisfy the specified environmental goals in order to draw funds from the ICREA-Fund; this implies that in case of insufficient drawing rights in the Fund, a country should contribute the balance.

Observe that in order to make this feasible, environmental norms should be specified; furthermore for some countries uniform environmental norms might be easy to satisfy, so that they could make use of less efficient instruments.

[21] For example, they may set up extension agencies which are not only used to promote new technologies for the commodity involved, but are also with production of other commodities.

Gatt

Wether ICREA's would be compatible with the GATT rules is not yet completely clear. The GATT rules provide some exceptions, which may be used to justify ICREA's (to be specific: GATT does contain some exceptions for commodity agreements, and exceptions for measures which should protect health and the environment), but whether these exceptions can be used for environmental agreements implying import taxes is open to some contention.[22]

Political acceptability

Standard-ICREA's call for import levies on commodity imports in importing member countries. Apart from the question whether this requirement is compatible with existing GATT rules (see above), this requirement tends to reduce the political acceptability in "free trade" oriented countries, which tend to view the import taxes as an impediment to trade. Although they miss the point that the import taxes (in the standard-ICREA context) would be necessary to obtain trade patterns based on true comparative advantage[23] (and therefore augmenting trade!), this aversion should be counted with.

Furthermore, it is quite possible that developing countries would that ICREA's will function as an instrument for protectionism in the rich countries against cheap imports from developing countries.

Conclusion

The discussion above suggests that standard-ICREAs are a very suitable type of agreement under the following conditions:

a) low demand elasticity;
b) most (preferably all) production is consumed in the importing member countries;
c) the policy instruments used are of the efficient type;
d) payments are made to compensate extra costs incurred because of the implemented policy (e.g. in the form of Pigovian taxes, or costs of emission trading) on a ongoing basis as long as the environmental goal is achieved; this implies that the policy, once implemented, is continued in principal to perpetuity, thereby reducing

[22] See Jackson (1989) for an extensive description of GATT and its rules. In this book, some attention is payed to the exception rules whithin the GATT framework, and its potential use for e.g. environmental agreements. From the discussion it is clear that possibilities to set up an environmental agreement with import levies to alarge extent depend on interpretation of the existing rules; without further jurisdiction it is not possible to tell whether the ICREA framework would be compatible with the GATT framework.

[23] Obviously, this is only true when the standard-ICREA is used to implement use of economic efficient environmental policy instruments)

bureaucratic costs of approval procedures;
e) payments start at announcement of the policy satisfying c) and d), and is con tinued as long as the environmental norms are satisfied (with a start-up period i which the goal not yet need to be satisfied)

General Taxes ICREAs

The discussion above of standard-ICREAS suggests that an agreement in which ICREA-Fund is financed from the proceeds of an import levy might not be a attractive option if demand elasticity for the commodity is high and/or the type o projects sponsored are economically suboptimal. This suggests strongly that ICREA funded out of general taxes in the importing member countries.

The type of projects to be sponsored are the same as with the standard-ICREAs; bu we will argue in this section that the General Taxes ICREAs are best suited t sponsor projects which (need to) make use of suboptimal economic instruments.[24] With high demand elasticity, all type of projects may be sponsored by the ICREA Fund.

How do we propose to relate the funds to imports and exports of the commodity? T answer this question, we may first ask the question why any importing countr would be interested in participating in the ICREA. First, participation in an ICRE might be explained by charity; sedond, participation in an ICREA might be expla ned from self interest. This may take two forms: Either it may ask for compensatio for its participation in an ICREA in another context (e.g. political); or, mor importantly, the importing country might expect the environmental situation t deteriorate further (without active countermeasures), resulting in an situation i which counter measures will have to be taken, but at substantially higher cost. B participation in an ICREA, it might be possible to pay a little bit now, in order t prevent much higher cost in future. We will concentrate our analysis on the latte explanation.

As importing countries participate in an ICREA to prevent paying more for th commodity in the future, it should be clear that the benefits of participation for a importing country is directly related with future consumption of the commodity. we assume static shares in import patterns (each country will have the same share i total import in the future as in the present), total benefits of ICREA participation ((all importing countries) will be split among the importing countries on basis (relative shares in imports. As shares in benefits are based on shares in total impor costs should also be shared on basis of total imports; therefore, each country shoul contribute to the ICREA-Fund based on its share in imports, resulting in the sam

[24] Suboptimal instruments may be used in those cases that efficient economic instruments can n be used, e.g. because of lack of knowledge by the producers of alternative production technique metering problems to determine emission levels, absent markets for inputs and/or credit, restoratic of damage inflicted on the environment in the past, etc.

Return on Investment (ROI) on ICREA participation.

In the analysis above we have abstracted from the difficulties resulting from re-exports. Taking account of re-exports, the proposed from of a General Taxes ICREA is as follows:

First, the total yearly contribution to the FUND is determined. Each importing member country pays contribution to the FUND, based on its share in total net imports of the member countries. Contributions are therefore based on net imports, and not gross imports. Net imports are determined on basis of gross imports and exports (translated in a raw commodity equivalent if necessary). It is important to realize that price increases on imports which are subsequently re-exported do not represent a cost to the importing country, so that countries should not pay to prevent a future increase in price of the re-exported commodity.[25]

Drawing rights are distributed on basis of either total exports (in case of developing countries, which, as importers, would not be member of the ICREA) or net exports (in case of developed countries, which would be member as importer).

What are the advantages and disadvantages of this approach relative to the Standard-ICREA? First, on the political level the General Taxes ICREA has some advantages over the Standard-ICREA.

GATT-Compatibility

The General Taxes ICREA is certainly GATT compatible, as it does not contain any impediments to trade or provide domestic producers with unfair competitive advantages. This factor is a significant advantage over Standard-ICREA's, of which the GATT compatibility is open to contention.

Impediments to trade

Above, we discussed the political resistance against standard-ICREA's resulting from the observed barriers to trade implied by the proposal. Although the anti-free trade argument is not always valid depending on the type of projects sponsored, it is a factor which should be taken account of. Again, the fact that General Taxes ICREAs do not contain barriers to trade works in its advantages.

Elasticity of demand

[25] This may not be completely true, as re-exports are often in processed form. Higher prices imply a decline in demand (also for the processed re-exports), so that an importing country may lose some of its benefits from processing as the price of the commodity increases. Therefore, importing countries will generally obtain a small benefit from preventing a large future price increase, which however, will be dwarfed by the other benefits obtained.

With high elasticity of demand, the price increase and resulting loss of deman (implying loss of foreign exchange income and government receipts to the exportin countries) may be an obstacle for a Standard-ICREA. With a General Taxes ICRE/ this problem is absent.

Focusing on allocative efficiency, it is not completely clear which proposal shoul be preferred. A lot depends on the type of projects to be financed by the Fund. I cases that the instruments used are efficient (Coasian bargaining, Pigovian taxes emission trading, subsidies for pollution reduction from base levels) the internali zation in the commodity prizes of extra costs[26] is desirable. In cases of other pro jects the situation is not clear; if the costs of the used instrument departs significant ly from the costs implied by economic efficient instruments the General Taxe ICREA might be desirable; otherwise a Standard ICREA might be appropriate.

Conclusion

General Taxes ICREA's might be appropriate in either of the following situations:

- Commodities with high demand elasticities.
- Commodities with low demand elasticities, for which use of environmental policie implemented by non-efficient instruments is necessary.

Furthermore, General Taxes ICREA's might be a good alternative to Standard ICREA's if the latter might prove either:

a) politically unacceptable;
b) GATT-incompatible.

Conclusion

In this paper we have dealt with three types of International Environmental Agree ments to reduce environmental damage resulting from commodity production. W have argued that *agreements on environmental norms and standards* might b optimal if the commodity involved has a *low demand elasticity and is produced b only a few producer countries.*

Environmental agreements providing for transfers of Funds an requiring participation of importing countries might be necessary if the commodity i produced in many countries or is characterised by high demand elasticity. In gener these type of ICREA's require establishment of a ICREA-Fund, from which variou types of projects can be financed. However, the way the Fund is financed differs: i the Standard-ICREA the Fund is financed by import levies in the importing cour

[26] Again, it should be emphasized that true internalization of all relevant costs (costs of abateme of environmental damage as well as costs of remaining environmental damage) will only be achieve with specially designed instruments.

tries, while in the General Taxes ICREA the Fund is established from general government income in importing countries. The *General Taxes ICREA's* were argued to be preferable for commodities with *high demand elasticity*.

The arguments are mixed for commodities produced in many countries characterised by low demand elasticity. It was argued that *political factors and GATT compatibility* might favour *General Taxes ICREA's* over Standard-ICREA's. The allocative (economic) efficiency favours putting restrictions on the type of projects to be financed by the ICREA-Fund. *Standard ICREA's* are best set up when the projects sponsored will consist of establishing *economic efficient or nearly efficient instruments* to attain specified environmental norms and standards. *General Taxes ICREA's* are favoured when the projects sponsored do *not make use of economic efficient instruments*. Observe, by the way, that both types of agreements are not mutually exclusive; it is entirely conceivable that for one commodity simultaneously a Standard-ICREA and General Taxes ICREA is set up.

How does this translate in practice when we want to design an environmental agreement for a specific commodity?

First, establish the demand elasticity of the commodity. With a high demand elasticity, the General Taxes ICREA should be chosen.

Second, with low demand elasticities establish the number of producing countries exporting the commodity. If the number of commodity exporting countries is low, we should focus on agreements on norms and standards (without intervention of importing countries).

Third, with low demand elasticity and many exporting countries we should establish the type of projects to be sponsored. In general, we would like to make use of efficient economic instruments, but several factors (information, reparation of damage done in the past, absent markets, etc.) may prohibit the use of these instruments. If we are forced to make use of inefficient instruments, General Taxes Icreas are called for; otherwise Standard-ICREA's are most attractive.

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