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WEST-EAST TECHNOLOGY TRANSFER:
INTERNALIZING GLOBAL EXTERNAL EFFECTS

by
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CONTENT

A b s t r a c t

Environmental pollution is a serious problem in Middle and Eastern Europe. Although most Middle and Eastern European countries since long have established extensive legislation on environmental issues, they rarely have enforced these laws. Virtually, they did not persue any effective environmental policy. Only with beginning of political and economic reforms the dimension of environmental damages has begun to be recognized, yet awareness has risen rapidly. Due to the process of political and economic opening, new opportunities for international cooperation are arising. This paper proposes a policy of internalizing the negative external effects of environmental pollution as well as the positive external effects of environmental protection. It takes up the elements of both the Pigouvian and the Coasean solution to external effects. A tax-subsidy scheme shall be used in the national context while a bargaining procedure shall be employed in the context of international cooperation. Subsidized West-East technology transfer will contribute to both improving environmental quality in all over Europe and to effectively support the process of reforms in Central-East Europe.

1. Environmental Damage and the Tax-Subsidy Solution to External Effects

Environmental damages are a prime example for negative global technological externalities. Technolgical externalities, or for short just: externalities, are defined as effects of production or consumption, whether costs or benefits, which are unpaid, i.e. transmitted outside the market mechanism. They are not reflected by relative prices, thus causing allocative distortions: Activities with negative external effects are taking place on a level higher than socially optimal, while activities with positive external effects are taking place on a level lower than socially optimal.[1]

In the case of environmental damages, natural resource inputs of production like water, air, soil and energy are, underpriced - or oftenly not even priced at all - and therefore overused. The notion of using natural resources refers to reducing both quantity and quality: resources may be used up in the production process without affecting the quality of remaining quantities and resources may be used by lowering their quality, i.e. degrading them by emitting pollutants. Overusing natural resources thus equally refers to using higher quantities and to emitting more pollutants than would be socially optimal.

Externalities, both positive and negative, are considered to be global if many or all other economic agents are concerned. This applies to environmental damages as biophysical

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Remark: This paper was first presented at the workshop "East meets West: New Opportunities for Economic Cooperation", held by the Economic Institute of the Czechoslovak Academy of Sciences, Prague, and the Institute of World Economics, Kiel, in Kiel September 3rd-4th, 1991. I am grateful for discussion, comments and critique from the workshop participants.

[1] On the concept of external effects see Bohm, Peter (1988); Mishan, E. J. (1982); Luckenbach, Helga (1986) and Recktenwald, Horst Claus (1983).

mechanisms are transmitting them regardless of regional and national boundaries. Soil contamination though, may constitute an exception. Like other environmental damages, it represents a negative externality, but only in very rare cases, it will pass national boundaries and harm adjacent countries.

Correcting market failures i.e. allocative distortions resulting from external effects is a genuine concern of economic policy. Standard remedy in this case is the Pigouvian tax-subsidy solution: taxing, thus discouraging those activities which are persued on a level higher than socially optimal while subsidizing, thus stimulating activities persued on a level lower than socially optimal.[1] Tax-subsidy interventions into the market process on these grounds are justified by welfare economics and compatible with market-type economic systems. They are adequate policy instruments in the firmly established Western market economies and may equally be applied in the still to be established Eastern market economies.

A Pigouvian tax-subsidy scheme may be employed in the national context where governments are sovereign with respect to national economic agents such that they can levy taxes and pay subsidies. Internationally, where governments are on equal footing the contract solution as proposed by Ronald Coase (1960) may be feasible. Although property rights to environmental goods are not well defined as they lack to be codified - particularly in the international context - they are determined by the actual state of affairs. Pollutes who presently are degrading environmental quality can be considered as being endowed with the right to pollute and their status quo represents the initial distribution of poverty rights to environment. Against this background intergovernmental transfers can be negotiated for such that those coun-

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[1] Pigou, Arthur Cecil (1960).

tries interested in improving environmental quality have to compensate those which presently are enjoying the right to pollute.[1]

2. The Tax-Subsidy Solution Applied to Global External Effects: Subsidized Technology Transfer

a) The Economic Policy Proposal

A variant of of the above scetched tax-subsidy scheme may be suitable to tackle both environmental problems in Eastern European countries and to effectively support the process of their economic reforms. Both environmental damage and general economic backwardness have common structural causes, rooted in the system of socialist planning.[2] First, a weakness to implement advanced technologies which results in low rates of innovation and second, a pattern of investment which gives priority to expanding capacities rather than improving product quality or process efficiency.

Additional to these causes common to both problems, environmental damage is specifically resulting from former socialist growth strategy and price policies. The strategy of extensive growth, supported by subsidized energy prices, has led to resource and energy intensive modes of production and to overexpansion of heavy industry. Finally, neglecting the environmental issue for decades despite of existing legal provisions, together with relevant data either lacking or being concealed, have aggravated the problem.[3]

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[1] Mäler, Karl-Göran (1990).

[2] Gomulka, Stanislaw (1986); Kaser, Michael (1988); Winiecki, Jan (1986).

[3] Botos, Katalin (1990); Hardi, Péter (1989); Nötzold, Jürgen (1988); Weißenburger, Ulrich (1991); Welfens, Maria (1986).

For these reasons, all routed in the system of socialist planning,[1] environmental damage in Eastern Europe has occurred on a much larger scale than in the West. The resulting structural differences in environmental quality may be labelled the "environmental gap".[1] General economic backwardness resulting from socialist planning is reflected by poor innovation performance and has been called the "technological gap".[2] As both the environmental and the technological gap have common structural causes, it should be possible to design an approach of economic policy which simultaneously allows to close, at least to narrow both gaps.

Such an approach fully obeys Tinbergen's theorem of effective economic policy which states that each policy target needs to be persued by means of one specific policy instrument. Both the technological gap and the environmental gap between market economies and former socialist economies are emanating from the same systemic features. Combatting common causes of - seemingly - two problems constitutes just one single target of economic policy. Thus closing or narrowing both gaps can simultaneously be persued by employing the same or more specifically: by the same number of policy instruments.

The Western Contribution

An adequate economic policy, based on international cooperation and designed to tackle the causes of both technological and ecological problems should envisage Western govern-

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1 A striking example, by the way, that the social planner does not properly account for external, hence social cost as Oskar Lange (1938) supposed him to do.

2 The environmental gap is reported for SO2-emissions by Welfens, Maria (1986) and for CO2-emmissions by Gattinger, Matthias, et. al. (1990).

3 Though the technological gap is not a problem in itself, rather the underlying lack of international competitiveness is the matter of concern.

ments to subsidize Western enterprises which are willing to transfer environment-improving technology to the East i.e. to install and to employ it there. These subsidies will stimulate activities which actually are persued on a level lower than socially optimal.[1] Granting subsidies shall be made conditional on positive and measurable environmental effects which have to be realized by each subsidized project. Generally, environmental improvements can be achieved by either

- repairing environmental damage and/or by

- preventing further damages to occur via

  -- installing security technology into existing equipment,

  -- replacing old by new equipment which operates less resource and energy intensive (process innovation), or by

  -- establishing new lines of production using technologies which are fulfilling advanced environmental standards (product innovation).

The subsidy program should not include all these activities. It should only be directed to the users of more environmental friendly technologies but should exclude their producers. Producers of environment-protecting technologies are operating in a specific market, where the benefits of environmental improvements are not external but fully internal to market participants. Any subsidy here would introduce distortions rather than correcting them. The subsidy program

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[1] Paying subsidies involves the problem of free-rider effects. Though free-riding cannot be ruled out, it may be minimized by an adequate design of the subsidy program. Anyway, it may be negligible given the low level on which environment-improving technology transfer actually takes place.

should be targeted to those activities to which environmental effects virtually are unpaid side-effects, i.e. externalities. This mostly refers to activities of process innovation, i.e. replacing old machinery by new equipment and to activities of product innovation, i.e. establishing new lines of production based on advanced technologies.

As the scope of the program will be restricted by available funds, the criteria of eligibility have to be defined and to be applied rather strictly in order to prevent that nearly all activities of Western enterprises in the East will be eligible. Defining operational criteria and evaluating specific projects with respect to them are tasks which could be assigned to existing institutions with the necessary know-how already at their disposal, e.g. to the ECE (the United Nations Economic Commission for Europe). An institutional set-up in which a special agency is involved in the provision of public goods, especially in elaborating a social cost-benefit analyses and to calculate prices according to individual agents' marginal benefits corresponds to the Lindahl mechanism for determining the supply of public goods and to the related Lindahl equilibrium concept.[1]

Though strict on environmental eligibility criteria, the program should be open to all modes and channels of technology transfer which private investors will consider to be appropriate, i.e. profitable with respect to their individual economic rationale. Thus, the task to choose or to explore the most profitable mode of transfer will be left to enterprises, i.e. to the market mechanism. Suitable modes of transferring technology may be foreign direct investments as well as joint-ventures, both licensing and leasing contracts, transferring technology embodied in modern equipment as well as rendering consultant services, technical assistance and educational training.[2]

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[1] Mäler, Karl-Göran (1985); Siebert, Horst (1987).

[2] Boguslawskij, Mark M. et.al. (1990).

The program may be funded either directly out of Western government budgets or indirectly via public securities especially issued for this purpose. Thus only interests would have to be paid out of the budget. The interest rate then would be the crucial variable in order to calibrate the size of the program and to - at least roughly - reflect the expected value of environmental benefits accruing to Western taxpayers.[1] The interest rate may be the higher the larger and the more tangible expected improvements of environmental quality, hence taxpayers' assumed willingness to pay will be. That is, the rate may be the higher the worse actual environmental damages are and the closer Eastern and Western regions are linked by biophysical transmission mechanisms.

Once the program's total volume of funds has been determined, funds have to be allocated among the enterprises which want to participate. As far as possible, this should be done by employing devices compatible with market mechanisms. The first-best device is to auction off the subsidy volume. The program then would have to be divided into subprograms suitable to target specific environmental problems and bids would have to be invited for these sub-programs. Given that informational requirements are not prohibitive, enterprises would have to compete in terms of measurable, prospective environmental improvement. The most attractive bids would be awarded with subsidy payments, either in equal amounts or on a degressive scale.

Particular Eastern and Western regions are differently linked by biophysical transmission mechanisms, thus differently concerned by specific environmental problems. For this reason, environmental East-West cooperation should not be

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[1] The device of indirectly financing the subsidy programm illustrates how the Coasean solution to environmental problems - derived in the context of external economies - can coincide with the Lindahl solution in the public-good approach. Siebert (1987) explicitly points out that personalized, i.e. Lindahl prices cannot only be set by a public environmental agency but also by an auctioneer which means by a market-type mechanism.

relying on large supra-national organizations like the European Community, the European Free Trade Area (EFTA) or the United Nations. Rather, cooperation partners should be choosen according to the spatial dimension of environmental problems and cooperation should be based on specific bilateral or multilateral agreements, depending on which Western country or countries are affected by environmental damages emanating from Eastern neighbour countries. Thus, the partners' incentives to cooperate are stronger than in groups whose members are quite differently affected.[1] Transfrontier environmental externalities can best be internalized through bilateral cooperation, while international externalities affecting more than two countries should be adressed by means of multilateral cooperation.

Suitable partnerships e.g. may be established by Austria and Hungary which jointly are concerned with the Danube water quality; Germany may cooperate with Poland and Czechoslovakia in order to reduce air pollution and countries bordering the Baltic may cooperate effectively with the Scandinavian countries as they can assumed to be rather equally interested in improving the Baltic water quality. For the former Soviet Union though, it will be difficult to establish bilateral or multilateral partnerships because due to her mere geographic size she has "internalized" a great part of all domestically caused environmental damages in the sense that mostly only the Soviet economy itself has been affected. In her case therefore, it seems necessary to directly involve the large international organizations in order to achieve any cooperation agreement. Global cooperation particularly will be required with respect to the problems of nuclear energy. Radiation security represents a global, at least an international environmental good and the Tschernobyl disaster has shown that consequences of nuclear accidents are - although with different intensity - almost worldwide felt. The recent accident in Sosnowy Bor again has proven the nuclear perils' acuteness.

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[1] Bethkenhagen, Jochen (1988); Hardi, Péter (1989).

The Eastern Contribution

Programs of Western subsidies for environment-improving technology transfer shall be made contingent on an adequate Eastern contribution which has to comprise two elements. In the first instance, Eastern governments should be committed to design liberal regulations conducive to foreign investors, to define quality and security standards and to vigorously enforce them. Secondly, as a counterpart to Western subsidies, Eastern governments should set up a corresponding tax program. Taxes should be imposed on Eastern enterprises which are continuing to overuse natural resources. Their activities shall be discouraged in order to diminish further environmental damages. Taxing can be effected either by imposing new, environment-specific taxes or by cutting still existing subsidies for energy and natural resource inputs.[1]

Though calling for environment-specific taxes is uncontroversial from the perspective of welfare economics, in Eastern governments' political reality their possibilities to abolish subsidies granted to and/or to impose additional taxes on enterprises whose profitability is already low or even negative, will be restricted by the degree in which additional unemployment is socially and politically tolerable. Thus tax rates would have to be choosen very deliberately in order to give tangible incentives for reducing environmental damage on the one hand without causing unduly high unemployment on the other hand. Recognising this dilemma, the first element of Eastern contribution, namely to design liberal regulations conducive to Western investors, may be dominating the second one. Foreign investors and the inflow of foreign capital are urgently needed in nearly all sectors of the Eastern economies. Nevertheless it seems to be necessary and possible to give preferential treatment to

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[1] Comprehensive tax reform is a necessary component of transforming the economic system. On this occasion, the aspect of environmental taxes should be included into the reform discussion.

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those investment projects which would perceptibly improve environmental quality.

Foreign investors are not only needed for the investments they bring but also for the market-know how they possess. Their knowledge and their experiences of how to operate under market conditions will virtually support the process of marketization in the Eastern economies. The benefits of market-know how are internalized by foreign investors only as far as they translate into their profits. But they are external to them as far as their knowledge can successfully be transferred to and applied by Eastern entrepreneurs - an externality which again makes the case for subsidizing foreign investors' activities, this time though on part of the Eastern governments. Tax holidays may be considered as the adequate policy instrument.

b) The Economic Policy Rationale

The proposed tax-subsidy scheme combines both

- cooperation on the government level with cooperation on the enterprise level and

- the "polluter-pays principle" with a restricted form of "beneficiary-pays principle".[1]

Cooperation on the government level shall ensure that market failure resulting from externalities is corrected by internalizing external benefits via subsidies and external costs

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[1] For a general discussion of payment principles in the context of international environmental problems see Mäler, Karl-Göran (1990). On the relevance of different payment principles in the specific context of Eastern European environmental damages see Bethkenhagen, Jochen (1988); Christie, Ian (1988) and Weißenburger, Ulrich (1991).

via taxes. National governments are cooperating as to negotiate the basic agreements. Payments then are taking place within each national economy; either out of the state budget towards domestic enterprises in the case of subsidies or vice versa, from enterprises to their national authorities in the case of taxes. Cooperation on the enterprise level shall ensure that resources will be allocated by market mechanisms towards the most profitable business opportunities.

The proposed distribution of financial burden adheres partly to the "polluter-pays principle" and partly to the "beneficiary-pays principle".[1] Eastern polluters causing global external costs shall be forced to pay by Eastern governments, either in terms of abolished subsidies or in terms of levied taxes. Western enterprises whose activities are yielding external benefits shall be subsidized and Western citizens benefitting from environmental improvements shall be taxed by Western governments in order to collect the funds necessary to endow the subsidy program. Eastern citizens, though equally benefitting from improved environmental quality are not obliged to make payment contributions. This may be justified by applying welfare economics to the international, especially to the political dimension of Eastern transformation processes. The success of Eastern transformation has to be considered as an event offering positive external effects to Western nations not only in terms of economic and ecological improvement, but also in terms of political stability. Successful economic reforms are of first order importance to ensure internal political stability in the East and Eastern political stability then will spill over to the West, or

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[1] The "beneficiary-pays principle" is identical with the "victim-pays principle", but for reasons of symmetry the term "beneficiary-pays principle" appears to be more appropriate. According to the "polluter-pays principle" polluters shall pay for the pollution they are causing. The opposite principle then would demand that beneficiaries shall pay for the benefits they are receiving. The "victim pays principle" though does not demand that victims shall pay for being victimized, rather they shall pay for <u>not</u> being victimized any longer.

rather: political instability prevented to emerge via lending economic support will not spill over to the Western countries.

3. Welfare Implications

Environmental East-West cooperation based on subsidized technology transfer, given that it can be successfully realized, will yield mutual environmental, economical and political benefits. First, environmental benefits will accrue if eligibility criteria for granting subsidies are adequately defined and applied. Due to the same biophysical mechanisms which are transmitting environmental deterioration across borders, environmental improvements will materialize both in the East and in the West.

Equally, economic benefits will accrue both to the East and to the West. In the Eastern economies, benefits will accrue, firstly in terms of increasing marketization and secondly in terms of improved economic performance resulting from successful marketization. Economic performance will increase as the transferred technology improves the industrial structure, may create new profitable employment, modernizes the capital stock, increases efficiency of production and enhances export capacities via improved competitiveness on international markets. Better export performance then allows to reduce trade deficits and hard currency debt. Abolishing subsidies and/or levying environmental taxes contributes to reduce budgetary deficits. Increasing marketization will result from the market-know how foreign investors are bringing in. In the West, economic benefits will accrue via additional profitable investment and business opportunities which are opened up by the subsidy program. Technological cooperation designed to improve environmental quality, like any kind of international division of labour, will yield mutual economic benefits.

Finally, mutual benefits also will accrue in political terms. In the West, success of Eastern reforms has increasingly been acknowledged as a matter of own concern: The degree of stability reforming Eastern countries can maintain represents one of the factors influencing internal stability in Western countries. Discussions on large-scale East-West migration are revealing the Westeners concerns. In the East, economic improvement constitutes one of the primary objectives of reforms and its realization is of utmost importance in order to ensure actual political stability as well as further internal and external support for the reform process.

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