ENVIRONMENTAL POLICY IN A TRANSITION ECONOMY

DESIGNING TRADEABLE PERMITS FOR POLAND

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ABSTRACT

The former centrally planned economies of Central and Eastern Europe and the Soviet Union were chronically poor performers not only economically, but environmentally as well. These emerging market economies could now benefit from application of market-based environmental instruments because of their potential cost effectiveness. Since it is unlikely that pollution charges could be raised to levels necessary to have desired incentive effects, systems of emissions trading could be a promising alternative. We examine the design of such systems for the special conditions of a transition economy.

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Robert N. Stavins and Tomasz ÒyliczÓ*

1. INTRODUCTION

By now it is well known that the centrally planned economies of Central and Eastern Europe and the former Soviet Union were chronically poor performers not only economically, but environmentally as well. Although the political revolutions of 1989 that began the transition to free-market democracies in these nations initiated a process that may inevitably ease pressure on the environment by reducing excessive use of energy and raw materials, new environmental problems continue to emerge as a result of renewed economic freedom, exposure to global markets, and consequent structural adjustment.[1] Additionally, transition economies will continue to face a range of "conventional" environmental problems, similar in character but often greater in magnitude than those typically encountered in western industrialized nations.

This paper focuses on environmental policy in one particular transition economy, Poland, and in so doing picks up where some previous analyses have left off. Toman, CofaÓa, and Bates (1994) examined alternative policy instruments to combat air pollution in Poland, and found that market-based environmental instruments could have significant cost-effectiveness advantages, compared with conventional command-and-control instruments. Since Poland already has a system of pollutant emission charges in place, it would seem natural to consider the possibility of increasing these charges as a means to achieving desired reductions in pollution. But it is highly unlikely, for political reasons, that charges could be raised to levels necessary to have desired incentive effects. Hence, Toman, CofaÓa, and Bates -- as well as others before them -- concluded that some system of "emissions trading patterned after (and profiting from the experience with) emissions trading in the U.S. seems useful" (p. 401). As a logical next step, we examine the design of systems of tradeable permits for the special conditions of transition economies such as Poland, and to do so we draw upon lessons learned from successes and failures with these systems in the United States.

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[1]Industrial restructuring can result in increases, as well as decreases, in pollutant emissions (Csermely, Kaderják, and Lehoczki 1994). One example of new environmental problems that policy makers encounter in times of economic transition is provided by the private importation of hazardous wastes into Poland from Western European countries (Bernstorff and Kruszewska 1994), a direct consequence of the liberated spirit of Polish entrepreneurship and the mature entrepreneurship of that nation's neighbors. Another difficulty is presented by the liability problem associated with privatizing government enterprises at already contaminated sites (Bell and Kolaja 1993).

Poland's environmental predicament has received particularly extensive international media coverage since the early 1980's, and the country has become somewhat of a symbol of environmental degradation (Timberlake 1981).[2] The country's major environmental problems include water and air pollution, soil contamination, fresh-water deficits, forest decline, species extinction, landscape degradation, and urban noise. While industry-related pollution tends to be concentrated in several hot spots, air and water pollution originating from households (many of which burn coal in small furnaces and do not have access to proper sewage treatment) affect virtually all regions. Although some regions in Poland still enjoy a high degree of environmental quality, fully one third of the Polish population lives in regions that have been officially designated as areas of "ecological hazard."[3]

Industrial emissions and discharges are the major source of Polish environmental problems. Indeed, until recently industry was responsible for 70 percent of water withdrawals, more than 80 percent of wastewater discharges, and 60 to 70 percent of air pollution.[4] Since 1989, however, this share has been declining due to economic restructuring and improved enforcement. Overall, the level of pollution has decreased by more than 30 percent beyond what can be explained solely by declining economic activity (Ochrona 1994).

Although pollution is severe in the former centrally planned economies, the problem is not historically unique. Pollution levels and expected clean-up costs do not differ greatly from what some Organization of Economic Co-operation and Development (OECD) countries[5] have faced in the past (Hughes 1991). A more striking difference is associated with respective levels of economic efficiency of the societies. The notorious inefficiency of the non-market economies has led to low real incomes, but this inefficiency also has provided a relative abundance of low-cost

[2]In 1989, the most recent year for which statistics are available, pollutant emission intensity for sulfur dioxide in Poland -- measured as a ratio of tons of emissions to dollars of gross domestic product -- was fifteen times as great as in the U.S. and twenty-two times that of the European Community (World Resources Institute 1992). Although Polish environmental pollution is severe, it is hardly unique among the transition economies. The extensive media coverage Polish environmental problems have received has resulted, in part, from the relative openness of domestic authorities. Until recently, information that was easily accessible in Poland was fairly difficult to obtain elsewhere in Eastern Europe.

[3]Five of these regions -- Gda½sk Bay, Kraków, Legnica-G»ogów, Rybnik, and Katowice -- have experienced environmental degradation so severe that they have been designated "areas of ecological catastrophe" (Grzesiak 1992). Areas where public health is at serious risk due to environmental disruption are significantly smaller, however.

[4]Heavy industry -- including steel and non-ferrous metals, cement, chemicals and power generation -- is largely responsible for this pollution and for the high level of energy demand, a situation typical of former centrally planned economies (World Bank 1992).

[5]Member countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

potential environmental improvements.[6] Indeed, some no-cost improvements may be available by removing price distortions and other perverse incentives that lead to resource waste.[7] In general, however, fixing price distortions is easier said than done.

In addition to identifying appropriate environmental goals, governments must select types of policy instruments -- for example, standards, taxes, or tradeable permits -- to achieve those goals, and must design specific variants of chosen instruments that can be implemented successfully. In this paper, we touch briefly upon questions of policy instrument choice, but our main focus is on subsequent questions of instrument *design*. The experience of thirty years of environmental policy -- in the OECD countries as well as in the newly emerging market economies -- unfortunately suggests that governments can be rather inept when it comes to the design and implementation of policy instruments that seem nearly ideal when conceived in general terms.[8] Hence, there is a real need for serious attention to policy instrument design in the special context of transition economies.

In the next part of the paper we describe the portfolio of environmental policy instruments that are available to transition economies, and we identify tradeable permit systems as an approach with much promise. Then, in Section 3, we examine the appropriate design of tradeable permit systems in the Polish context by considering the implications of salient characteristics for a set of important design elements. In Section 4, we draw some conclusions.

2. INSTRUMENT CHOICE IN A TRANSITION ECONOMY

Among available conventional command-and-control regulatory methods, two policy mechanisms stand out: uniform technology-based standards and performance standards. While technology-based standards identify particular equipment that must be used to comply with a regulation, performance standards focus on achieving a specific goal, but do not specify the means. Although technology and emission standards may be effective in achieving established environmental goals and standards, they often do so at relatively high costs. This is because these standards tend to lead to outcomes where many firms use unduly expensive means of controlling pollution.

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[6]Much could be accomplished, for example, "simply" by raising the energy efficiency of the economy toward levels more typical of OECD countries. The energy intensity of the Polish economy, measured as a ratio of total energy consumption to gross domestic product, was nearly five times that of the United State and twelve times that of Japan as recently as 1989 (Toman, Cofa»a, and Bates 1994).

[7]For example, a decrease in fertilizer consumption from 164 to 62 kg of NPK per hectare between 1989 and 1991 without any significant loss of crops (at least until 1994) followed removal of price subsidies (*Ochrona* 1994).

[8]See, for example: Dudek and Palmisano 1988.

It is generally acknowledged that, in theory, environmental targets can be reached cost effectively by employing market-based policy mechanisms that encourage firms to undertake pollution-control efforts up to the point where the marginal costs of control are equated among sources. Under *charge systems* (Baumol and Oates 1988), firms face the same incentive to control at the margin, and so marginal control costs are equated, and aggregate costs of pollution control can, in theory, be minimized.[9] Charges, along with other market-based mechanisms, also provide ongoing incentives for firms to develop and adopt newer, better pollution-control technologies (Milliman and Price 1989; Jaffe and Stavins 1995). Examples of pollution charges are found in several European nations, including France, the Netherlands, and West Germany (Opschoor and Vos 1989).[10]

One problem with charge systems is that governments do not know in advance what levels of clean-up will result from any given charge. *Marketable permit systems* eliminate this particular problem by allocating among firms permits to emit pollution; firms that keep emission levels below their allotted level may sell or lease their surplus permits to other firms (Hahn and Noll 1982).[11] The primary application of such mechanisms has been in the United States, under the U.S. Environmental Protection Agency's (EPA) Emissions Trading Program, the nationwide leaded gasoline phasedown, and the recently enacted marketable permit system for control of acid rain.[12]

In some cases, substantial gains can be made in environmental protection simply by *removing existing, government-mandated barriers to market activity*. And, finally, *subsidies* -- the mirror image of various kinds of taxes[13] -- can provide important economic incentives to address environmental problems. In practice, however, many subsidies promote inefficient and environmentally unsound development. Such subsidies exist in all nations, but examples are particularly abundant in the former centrally planned economies.

Nations with economies in transition are likely to exhibit certain characteristics that are relevant to the choice of environmental policy instruments. First of all, the emerging market economies cannot afford the luxury of spending any more than necessary on environmental-protection measures if they are simultaneously to achieve their broader economic and social goals. This makes the identification of *cost-effective* policy instruments particularly important. One

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[9]A variant of an environmental tax is a *deposit-refund system*, under which surcharges are paid when potentially polluting products are purchased, and the deposit is refunded when the product's consumers/users return the product to an approved center for recycling or proper disposal (Bohm 1981).

[10]For reviews of the use of environmental taxation in transition economies, see: Organization for Economic Co-operation and Development 1994a, 1994b; and Markandya 1994.

[11]Differences in source location and seasonal factors mean that not all emissions reductions are of equal value in terms of improving air quality, a problem which also applies to other instruments. While it is theoretically desirable to take account of such differences, it may not always be practical to do so (Tietenberg 1980).

[12]There has also been some limited use in Denmark, the Netherlands, and Germany (Klaassen 1994).

[13]Subsidies and taxes provide different incentives for entry into a business, and thus can have different effects on the long-run equilibrium of an industry. See, for example: Page 1973.

approach, theoretically, would be for governments to allocate individual source targets in such a way that all sources would experience the same marginal control cost. It is not an exaggeration, however, to suggest that a fundamental cause of the ultimate collapse of the centrally planned economies was the inability of centralized governments to assess properly the relative costs of alternatives throughout their economies. Least-cost solutions are more likely the consequence of individual entrepreneurship and competitive markets than of centralized command and control. Therefore, particular consideration should be given to potentially cost-effective, market-based environmental policy instruments.

Poland already has a pollution charge/tax system in place, but its usefulness for achieving a cost-effective allocation of abatement is questionable (òylicz 1994b). For one thing, the fees are far below the theoretically efficient level. It has been estimated that the marginal cost of abating SO_2 emissions to meet current policy objectives are on the order of $500 to $600 per ton (International Institute for Applied Systems Analysis 1993). At the same time, the Polish fee -- which probably ranks third in the world, after the Swedish and Norwegian ones -- is at a level of $60 to $80 per ton. Thus, the fee serves as a revenue-raising instrument, but one with little incentive effect.[14]

Further increases in pollution fee rates face virtually insurmountable political constraints.[15] In principle, revenue-neutral pollution charge systems could be designed that would return revenues to taxed firms through lump-sum redistribution and thus maintain their incentive effects (Bohm 1994; Farrow 1994) while addressing political resistance to increased costs. Such systems, however, remain politically infeasible and have never been implemented. Hence, Poland has begun to explore tradeable permits as a cost-effective alternative.[16]

An additional issue that has focused attention on tradeable permits has been the need to balance national interests with regional and sectoral concerns. Although overt "discretionalism" must be avoided if there is to be any real change in the attitudes of industrial managers in the former centrally planned economies, some flexibility is necessary. Since the beginning of the

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[14]Such sub-Pigouvian taxes provide some incentives, however, for a cost-effective allocation of abatement activities. In the Polish SO_2 case, the fees have led to growing demand for low-sulfur coal and a resulting decrease in production from high-sulfur coal mines. However, such low-cost options are clearly insufficient for the required level of emission reductions. For discussions of the use of economic instruments to raise revenues for highly constrained government budgets in transition economies, see: Organization of Economic Cooperation and Development 1994b; and òylicz 1994d.

[15]In addition to the political asymmetry between charges and tradeable permits, there is the well-known difference between these instruments under conditions of uncertainty (Weitzman 1974). When marginal-cost uncertainty and threshold environmental damage functions are present, there is an argument for reliance on quantity instruments, such as permits. Furthermore, if there is a positive correlation between marginal benefits (damages) and marginal costs of control, quantity instruments become even more attractive than otherwise (Stavins 1994).

[16]The potential importance of this instrument has been recognized by the Polish Ministry of Environment since 1989 (Ministry of Environment 1990a, 1990b). Note that permits, if auctioned, can be used to raise revenues for government (Bohm 1994). The Appendix to the present paper provides a review of research and experience with permit systems.

reforms, industrial managers have continually sought subsidies, exemptions, and tariff protection. To yield to such demands would subvert the incipient market system, but exclusive reliance on financial measures -- in the absence of well established markets and entrepreneurial behavior -- could lead to severe economic recession (Ðleszy½ski 1992).

How can the need for sectorally and regionally customized policies be reconciled with the need to stick to firm financial standards? One possible approach is to integrate market realities gradually into sectoral and regional physical plans. This option could in fact, be provided by tradeable permits, which can be applied both at regional and sectoral levels. Examples of successful regional implementations in the industrialized nations are provided by the "bubbles" used to meet ambient standards in some areas in the United States. A successful sectoral program was the phasedown of lead additives in gasoline by American refineries.

An institutional framework for the use of tradeable permits in Poland is evolving. The *Environmental Protection Act* (1991) provides that "the terms of a pollution permit for a plant can be transferred to another plant, either entirely or in part, subject to the approval of the authority who issued the original permit." Because of political instability, however, the act has been pending for more than three years. In the absence of a fully satisfactory legal framework, a pilot project of "emissions trading" was carried out in the town of Chorzów in southern Poland, following a 1991 agreement between the Minister of Environment and regional authorities (Dudek, Kulczy½ski, and òylicz 1992). The essence of the project was to let several polluters in one of the most contaminated areas of Poland comply jointly with emissions standards. The result was that the regional recovery process was accelerated by more than two years, compared with an already optimistic scenario that did not assume tradeable permits (Beblo 1993; òylicz 1994c). Simultaneously, multi-million-dollar savings were achieved.

3. DESIGN OF TRADEABLE PERMIT SYSTEMS IN A TRANSITION ECONOMY

If tradeable permit systems are to be used successfully and broadly as a significant feature of Polish environmental policy, it is essential that instrument design take into account the special conditions that characterize transition economies. Eight elements of permit design are particularly important: (1) aggregate control target; (2) permit currency; (3) allocation mechanisms; (4) market definition; (5) market operation; (6) monitoring and enforcement; (7) distributional and political issues; and (8) integration with the existing legal and institutional structure. For each of these elements of instrument design, we consider the implications of salient characteristics of transition economies, in general, and Poland, in particular, as illustrated in Table 1. Some of these characteristics may be said to refer essentially to the previous states of these societies as centrally planned economies, while some of the characteristics refer more directly to the transition phase *per se* (Godard 1994). For our purposes, all can be viewed as characteristics of the emerging market economies.

3.1 Aggregate Control Target

As indicated above, centrally planned economies have been notorious for their poor environmental performance. Pollutant emissions and energy use per unit of GDP were several times higher than in the OECD countries. The situation has improved somewhat, but the gap remains striking. For example, in 1991, Poland emitted 11 kilograms (kg) of particulate matter per $1000 of GDP, while the rate in the European Community was less than 10 percent of this. The picture is similar for other pollutants, including both air emissions and discharges of untreated sewage. Virtually all of the European pollution hot spots are found in Central and Eastern Europe, including Saxony in Germany, Silesia in Poland, and Doneck in the Ukraine.

Pollution reduction targets are ambitious throughout Central and Eastern Europe. Most countries are signatories of the Helsinki Protocol (to the Convention of Long-Range Transboundary Air Pollution), requiring 30 percent SO_2 emission reductions (with respect to a 1980 baseline) by 1993. Most countries have met this target, although largely as a consequence of production declines. Permanent reductions by larger amounts, will require additional effort. Furthermore, the social impact of pollution levels in Central and Eastern Europe is exacerbated by the highly uneven spatial distribution of emissions and ambient concentrations.[17]

We usually think of the aggregate control target as being set independently from the choice and design of a specific policy instrument. Programs in Poland and other transition economies, however, will inevitably be intended to *reduce* pollution levels over time (not simply to achieve current levels cost effectively). Hence, the aggregate control target will be a relevant element of instrument design. This is because there are good ways and bad ways of incorporating a falling emission cap in a tradeable permit system.

The right way to do it is to employ multi-year permits that represent a declining schedule of allowed emissions over time or to employ single-year permits, the total number of which continually declines until the steady-state target is reached. The wrong way to do it is exemplified by one approach taken in the United States, where EPA's Emissions Trading Program has included a so-called "20-percent rule," whereby the quantity of emissions allowed by a permit is reduced by 20 percent each time it is traded. This, of course, provides a strong disincentive for trading activity and hence drives up the aggregate cost of pollution control (Hahn 1990).

3.2 Permit Currency

A permit system, like any instrument, can be designed to intervene at one of several points in the "product cycle." The simplest systems focus on *inputs* to the production process, such as the lead content of gasoline or the carbon content of fossil fuels. One step toward greater sophistication but also substantially greater administrative complexity and transaction costs is

[17]In the presence of the non-linear damage functions that characterize the health impacts of numerous hazardous substances, uneven spatial distributions mean greater aggregate damages.

represented by *emissions* permit trading. Further in the same direction is *ambient* or *concentration* permit trading. And further still would be *exposure* trading (Roumasset and Smith 1990) and finally *risk* trading (Portney 1988). As we move along this path, each system may come closer to a theoretical ideal, but each system is also likely to bring greater public costs associated with monitoring and enforcement and greater private transaction costs.[18]

This suggests that we need to consider carefully the state of monitoring and enforcement of environmental laws and regulations. The system of environmental monitoring in Central and Eastern Europe is in its early stages of development. In Poland, water quality in rivers is now periodically monitored, but the system is not consistently applied. Ambient air quality is also monitored regularly, but only a very limited number of pollutants are tracked. Enforcement of environmental laws and regulations is chronically lax.[19]

The problematic state of monitoring and enforcement of environmental compliance in Poland suggests that substantial consideration might be given to using an *input* to the pollution-production process as the permit currency. This can be limiting, however, as in the case of using the sulfur content of fossil fuels as the currency in a trading scheme intended to control SO_2 emissions. This is because there would be no incentive for firms to adopt economically feasible alternatives such as flue-gas scrubbing or clean coal technologies. Hence, in such situations, the next step -- emissions trading -- is the reasonable candidate currency.

3.3 Allocation Mechanism

Three major methods of initially allocating permits are available: free distribution (endowment); auction; and sale at a fixed price. For any tradeable permit system, political feasibility can be established or destroyed over this single aspect of design. Because of the necessity of establishing a constituency for a proposed system, the route that has inevitably been chosen in the United States for distributing permits has been free distribution.[20]

This politically attractive route enables all sorts of initial allocations to be devised in order to win support for a program. Typically, economists have been quite agnostic about these alternative allocations, because they have considered them to have only distributional implications,

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[18]Indeed, these practical considerations provide one explanation of why, contrary to the models going back to Montgomery (1972), only input and emissions trading have actually been adopted by public authorities. The new Los Angeles RECLAIM trading program for SO_x and NO_x provides a partial exception, in the sense that due to concerns about the nonuniformly-mixed nature of the pollutants in the airshed, additional constraints have been placed upon emissions trading.

[19]One reason for this is the low level of environmental awareness in society overall. Environmental inspectors try to enforce pollution standards, acting more or less alone, in the absence of public pressure or support.

[20]As Zeckhauser (1981) has noted, the distribution of gains and losses arising from a policy is likely to have greater effects on whether that policy is adopted (in a democratic society) than the magnitude (or even the sign) of net benefits.

since it has been assumed that aggregate abatement costs would be unaffected. This may not be true, however, when significant transaction costs are present (Stavins 1995).[21] Thus, a successful attempt to establish a politically viable program through specific permit allocations can actually result in a program that will be far more costly than promised. This may argue for the economist's favorite permit-allocation mechanism -- auctions, an approach that becomes even more attractive in the presence of transaction costs. On the other hand, political barriers against permit auctions and political incentives in favor of all sorts of free distributions are powerful.

One key to identifying an appropriate allocation mechanism for a permit system in a transition economy is found by considering the special conditions of economic growth that characterize these economies. After a period of economic decline caused by the collapse of their command-and-control economic systems, several of the Central and Eastern European economies have begun to grow again. In fact, Poland has now become the fastest growing economy in Europe. Other countries in the region are likely to embark on high growth rates once recovery from initial perturbations has occurred and they have adjusted to new circumstances.[22]

Under such conditions, there is a legitimate concern about allowing a "safety valve" for new entrants and prospective economic growth in new environmental policies. Given the high rate of economic growth experienced currently and anticipated for a nation such as Poland, this is a significant issue indeed. One way to accommodate this concern in a tradeable permit system is to use auctions to allocate additional permits on a periodic basis (subsequent to an initial -- possibly free -- allocation), an approach which has been used in the U.S. acid rain program for precisely this reason.

An additional argument for the use of auctions to distribute permits on a periodic basis is provided by the potential barriers to entry that may be present in the highly concentrated industrial sectors that are frequently found in transition economies. The transition economies inherited some highly concentrated industries from the communist era. Although this pattern is being transformed through expansion of the private sector, some industries remain dominated by a small number of exceptionally large firms.[23]

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[21]In particular, fixed transaction costs in combination with increasing marginal transaction costs or decreasing marginal transaction costs on their own, both a real possibility, result in situations in which the equilibrium allocation is sensitive to the initial allocation. It might seem that the implication of this is that we would want to set the initial allocation as close as possible to the final equilibrium allocation, but this requires information on the marginal control costs of the firms. Government does not have information on these control costs, which is, of course, the justification for a tradeable permit system in the first place.

[22]Poland was the first post-Soviet economy to receive "shock therapy," followed by an 18 percent decline in GDP, and the first to reap its benefits. GDP grew by 1.5 percent in real terms in 1992, and by 3.8 percent in 1993. It should also be noted that two or three-digit inflation is common in transition economies. Although this can affect the choice of instrument, it does not bear upon the design of permit systems.

[23]For example, electricity supply in all of Poland is provided by 70 plants, one of which contributes 25 percent of the total. Likewise, oil refining, steel, pulp and paper, and fertilizer production are concentrated in large plants that are frequently the major local polluter, as well as the major local employer.

It is difficult to judge at present whether significant barriers to entry will slow the deconcentration process. The mushrooming of private businesses benefitting from generous tax exemptions for newcomers suggests that there are powerful forces acting against established enterprises. On the other hand, this process would be much faster if newcomers had better access to capital markets. The latter are highly imperfect. To counteract strategic behavior, such as hoarding of permits to reduce the threat of competition (Hahn 1984), authorities can auction off additional permits periodically to facilitate entry by new firms.

3.4 Market Definition

How should trading be restricted in geographic and other dimensions? First, it is important not to differentially regulate new versus existing sources, since "new source performance standards" provide exceptionally strong incentives against technological improvement. This is always important, but it is particularly so in the context of emerging market economies where turnover of the capital stock can be a fundamental engine of economic renewal *and* environmental protection. Empirical research on several industries in the United States has indicated that pollution was actually greater than it otherwise would have been because of the presence of new source performance standards (Maloney and Brady 1988).

Another relevant question in defining the market is whether to provide for intertemporal trading. Such "banking" is necessary to provide incentives for appropriate investment strategies. Hence, provision for banking stands out as an essential element in the transition economy context. Provision for intertemporal trading by establishing permits of relatively brief duration (such as one year) -- instead of perpetuities -- is also a potentially effective approach to addressing concerns about sectoral concentration, market barriers, and strategic behavior.

3.5 Market Operation

In the long run, the "natural selection" of competitive market pressures favors firms that keep costs low and profits high, but enterprises operating in transition economies should not be expected to perform "optimally" in response to such pressures. Private enterprises from the communist era were typically exempted from competition, and hence did not develop organizations or procedures that favor cost-minimizing behavior. They often coexisted with state-owned enterprises with a lack of budget constraints. After 1989, this configuration began to change, exposing both partners to market stimuli that were previously unknown, but most entrepreneurs have yet to learn how to operate in a truly competitive environment.

What mechanisms or institutions are provided to facilitate trading in the permit market? Based upon the U.S. experience, we know that private brokers and government agencies can play important roles. Stock exchanges can be particularly important in the case of standardized trade, while brokers can play an important role where contracts need to be customized to individual

needs.[24] Another possibility, is for proprietary traders, or resellers. In this case, institutions may purchase allowances, package them in various ways, and then resell them.[25]

Some of the disparate institutions that can support market activity have only begun to emerge in the transition economies. The Warsaw Stock Exchange, reestablished in 1991,[26] relies on a network of private brokerage firms, but most of these are simply not up to the task. Transaction costs remain exceptionally high, and the pricing of industrial assets -- a key element in the privatization process -- is problematic. Numerous consulting firms operate in the Polish market, but because of a scarcity of well-trained business analysts, the average quality of services is low. The level of expertise among multinational consultancies is substantially greater, but language barriers and rapid structural changes have limited their effectiveness. The weakness of financial institutions is another important factor. Most banks have excessive shares of non-performing loans, and some have gone bankrupt, as have some insurance companies. Again, the problem appears to be an inadequate supply of skills of business analysis.

3.6 Monitoring and Enforcement

Monitoring and enforcement is essential for any environmental policy to be successful, but there is a potential trade-off in permit systems between adequate compliance and unintentional imposition of market barriers. It is important to contrast the use of *ex ante* government approvals with *ex post* verification requirements. The former tend to discourage trading, as seen in the case of the EPA water quality trading program. The contrary experience is the exceptionally successful leaded gasoline phase down in the United States. Here the rules were flexible, and monitoring and enforcement were limited.

While it should be the case, in general, that a marketable permit system requires no more nor less monitoring and enforcement than a performance standard (although more than a technology standard), in practice, such concerns have been much greater when tradeable permit systems have been considered. The consequence has been that adopted tradeable permit systems have often included provision for higher levels of monitoring and enforcement.[27] Although economists have generally viewed this as a political "problem," it could also be viewed as an advantage from an environmentalist perspective.

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[24]In the United States, AER*X, Cantor Fitzgerald, Inc., Kidder Peabody, and Clean Air Capital Markets, have all been active brokers in the tradeable permit area.

[25]An example here is the Enron Corporation, a large U.S. natural gas concern, and the Emissions Exchange Corporation, a wholly owned subsidiary.

[26]We cannot resist mentioning the irony that the new stock exchange was established in the massive former headquarters of the Central Committee of the Polish Communist Party.

[27]For example, with the new SO_2 trading program, continuous emission monitoring is being implemented in the United States for the first time.

3.7 Distributional and Political Design Issues

Tradeable permit systems can provide cost savings in the *aggregate*, but distributional concerns may be more important politically, particularly in representative democracies. In the U.S. acid rain trading program, where high sulfur-coal regions would have been disadvantaged, bonus allowances were included in the legislation, resulting in a decrease in the overall cost-effectiveness of the program. Likewise, legitimate equity arguments in favor of compensating particularly disadvantaged groups (as with high-sulfur coal miners in the acid rain program) can also raise overall costs. The lesson is that we need not sacrifice all cost-effectiveness gains to achieve some distributional goals as well (Burtraw and Portney 1991). Programs can be designed to be relatively efficient *and* politically feasible.

3.8 Integration with Existing Legal and Institutional Structures

The existing regulatory context is exceptionally important for the performance of a permit system. In the Western context, it is recognized that highly regulated firms are not simple cost minimizers. Regulated electrical utilities, for example, may not be allowed to capture the gains of permit trading (Bohi and Burtraw 1992). Instead, state level regulatory bodies may seek to make technological solutions more attractive than financial (trading) solutions, and regional jurisdictions may seek to protect local interests and hence restrict trading. In transition economies, these concerns should be paramount. Virtually by definition, all of the transition economies began with very large shares of economic activity in their state-owned sectors. Even in Poland, where the private sector was the largest in Central and Eastern Europe, state-owned enterprises employed more than half of the labor force and provided more than 70 percent of GDP. By 1992, these shares had decreased to 46 percent and 53 percent, respectively, but state-owned enterprises remain the single most important employer, and, for historical reasons, their political power is proportionately greater than their contribution to GDP.

The process of transition from central planning to a mixed market economy brings with it changes of the most fundamental character. In 1990-93 in Poland, some four thousand state-owned firms (fully 45 percent of the total number registered in 1990), entered the privatization process, at the same time as the Soviet bloc was itself collapsing. Under the previous political regime, Central and Eastern European economies, unable to compete in international markets, developed extensive trade relationships with one another. Quality requirements were minimal, and the sectoral composition of trade largely reflected demands for military purposes. But with the end of the cold-war era, the demand for "defense goods" fell, and imports of non-military goods into the Soviet Union also fell as a result of deep economic recession. Both phenomena led to significant realignment of trade patterns.[28] Integration with evolving legal and institutional

[28]Prior to 1988, more than 30 percent of Polish exports were flowing directly to the Soviet Union, and more than 50 percent to centrally planned economies. By 1993, 63 percent of exports went to the European Community (36 percent to Germany alone) and less than 5 percent to Russia (and 13 percent to Central and Eastern Europe, including the former Soviet republics).

structures means designing policy instruments that are responsive to the relatively rapid structural changes that are underway in the transition economies.

6. CONCLUSIONS

Reflecting on the experience with tradeable permit programs in the United States and the special conditions that characterize transition economies, it is reasonable to anticipate that environmental goals can be achieved with either a permit system or a commensurate command-and-control program. At the very least, there is no reason to fear that the use of tradeable permit systems in the transition economies will lead to lesser environmental gains than would otherwise be achieved. On the other hand, the success of tradeable permit systems in achieving cost-effectiveness goals in the U.S. has been mixed. What this suggests is that only properly designed permit trading systems can meet both environmental and economic objectives. Inevitably, case by case analysis and design will be necessary.

Several critical factors can prevent a tradeable permit system from reaching a cost effective outcome. First, as regulatory restrictions or uncertainty regarding trading increase, trading activity will inevitably decrease. Second, higher transaction costs due to administrative requirements, informational burdens, or other factors will lower trading levels. An initial allocation that takes account of this reality could potentially increase the cost-effectiveness of the resulting trading equilibrium. Third, market concentration can be a serious problem if markets are not contestable. Fourth, technological factors that increase the difficulty of monitoring can make the measurement and allocation of property rights difficult, controversial, and expensive. If this results in more legal requirements, particularly for prior approval of trading, then the program will suffer and aggregate costs of control will be driven upward. Fifth, and finally, the existing legal and institutional structure can profoundly affect the design and implementation of a marketable permit system. Market-based approaches are more likely to be successful if associated with newly addressed environmental problems or existing programs that are relatively simple.

The presence of various positive and negative attributes in the design of specific permit systems is largely a function of the preferences and power of the interest groups that play a role in design and implementation, including regulators, private industry groups, and environmental organizations. This is not to suggest that the participation of these groups is anything less than desirable. Indeed, the U.S. experience has shown that a system that commands support from the various sectors will more likely succeed because pressures will be minimized later for complex restrictions on trading and controversy over property rights. If everyone is involved from the beginning of the process, the emerging system will have the greatest chance for real success. In this sense, tradeable permit systems for environmental protection can be part of both the processes of economic reform and of democratization that are occurring so rapidly in the transition economies of Central and Eastern Europe.

TABLE 1:
TRADEABLE PERMITS FOR TRANSITION ECONOMIES:
SALIENT CHARACTERISTICS AND DESIGN ELEMENTS

Design Elements of Tradeable Permit Systems	**Potentially Salient Characteristics of Transition Economies**							
	High level of pollution and control targets	Low marginal control costs	Poor monitoring and enforcement	Rapid economic growth	Large state-owned sector	Nascent private sector	Rapid structural adjustment	Market concentration
Aggregate Control Target	**T**	**T**		**T**				
Permit Currency			**T**	**T**				**T**
Allocation Mechanism				**T**	**T**	**T**	**T**	**T**
Market Definition	**T**			**T**	**T**		**T**	**T**
Market Operation					**T**	**T**		
Monitoring & Enforcement			**T**					
Distributional & Political Issues	**T**				**T**			
Integration with Existing Structure					**T**		**T**	

APPENDIX:
FUNDAMENTAL LESSONS FROM RESEARCH AND EXPERIENCE WITH TRADEABLE PERMIT SYSTEMS

More than two decades ago, Crocker (1966) and Dales (1968) developed the idea of using transferable discharge permits to allocate the pollution-control burden among firms or individuals; and Montgomery (1972) provided a rigorous proof that such systems could, in theory, provide a cost-effective policy instrument for pollution control. A sizeable literature on tradeable permits has followed.[a]

The claims made for the cost-effectiveness of tradeable-permit systems have often exceeded what can reasonably be anticipated. Tietenberg (1985) assimilated the results from ten analyses of the costs of air pollution control, and in a frequently cited table, indicated the ratio of cost of actual command-and-control programs to least-cost benchmarks. Unfortunately, the resulting ratios (which ranged from 22.0 to 1.1) have sometimes been taken by others to be directly indicative of the potential gains from adopting specific ("cost effective") mechanisms such as tradeable emission permits. A more realistic and appropriate comparison would be between actual command-and-control policies and either actual trading programs (such as EPA's bubble policy) or *reasonably constrained* theoretical permit programs (Hahn and Stavins 1992).

It is now recognized that a number of factors can adversely affect the performance of tradeable permit systems: concentration in the permit market (Hahn 1984, Misolek and Elder 1989); concentration in the output market (Malueg 1989); non profit-maximizing behavior, such as sales or staff maximization (Tschirhart 1984); the pre-existing regulatory environment (Bohi and Burtraw 1992; the degree of monitoring and enforcement (Keeler 1991); and the presence of significant transaction costs (Tschirhart 1984; Baumol and Oates 1988; Hahn and Hester 1989; Tripp and Dudek 1989; Stavins 1995).

There have been five major uses of tradeable permit systems for pollution control. All have been within the United States: the criteria air pollutants emissions trading program; point and non-point water pollutant trading; the phase down of lead in gasoline; the phase out of particular ozone depleting substances; and SO_2 trading as a means to combat acid rain.

The U.S. EPA's criteria air pollutant emissions trading program was initiated in 1974 to facilitate cost-effective achievement of ambient air quality standards within metropolitan regions.[b] Savings with the program have been on the order of $5-$12 billion (Hahn 1989), although less

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[a]Extensive surveys of the literature are found in Tietenberg (1985, 1980). A more recent, though less comprehensive survey is provided by Cropper and Oates (1992).

[b]Among the air pollutants covered by the program are: volatile organic compounds (VOCs); carbon monoxide (CO); sulfur dioxide (SO_2); oxides of nitrogen (NO_x); and particulate matter. A variety of types of firms considered as sources under the Clean Air Act are regulated under four parts of the emissions trading program: bubbles for existing sources; netting for new sources within firms to avoid new source performance standards; offsets for new sources in non-attainment areas including across firms; and banking over time.

than one percent of emissions have been traded, due to the rules of the program and its lack of statutory authority (Hahn and Hester 1989). A program also exists in the United States for trading of point and non-point source water pollutants to achieve ambient water quality standards cost effectively. Trading programs were set up for the Fox river in Wisconsin beginning in 1981, and for Dillon Reservoir in Colorado beginning in 1984,[c] but the outcome of these programs has been a complete lack of trading. The impediment of required government prior approval may have been the major factor (Hahn and Hester 1989).

The great success story of tradeable permit use in the United States is the phase down of lead in gasoline. The program, which took place nationwide, ran from 1982 until 1987, when the phase down to unleaded gasoline (ten percent of the original leaded level) was completed. Under the program, there was both inter-refinery and intra-refinery averaging of lead content of fuels through individual contracts. The outcome of the program was an estimated twenty percent savings relative to alternatives, possibly amounting to $200 million annually, for a total savings in excess of $1 billion. The level of trading was exceptionally high, compared with other tradeable permit experiences,[d] and the major explanation given for the great success of this program is the lack of required prior approval by government, and the fact that the trading partners -- gasoline refineries -- already knew each other very well, and were used to buying and selling commodities with one another (Kerr and Maré 1994).

The U.S. has also used a tradeable permit system as one of its policy instruments to reduce stratospheric ozone depletion in accordance with the Montreal protocol, under which the production and consumption of ozone depleting substances (chloroflourocarbons -- CFCs -- and hydrochlorofluorocarbons -- HCFCs) are being reduced, and in some cases phased out. Trading is among both producers and consumers, and there are few restrictions on trading. Thirty-four firms have participated in a total of eighty trades (as of mid-1991), and there has been a small number of international trades, as well.

The program that has received the greatest attention has been the new allowance scheme for SO_2 emissions, intended to cut acid rain in the United States by fifty percent. The program has very few restrictions on trading, although the legislation includes a number of politically (regionally) motivated elements that will have the effect of reducing trade; also, the pre-existing regulatory environment is likely to be a great impediment to trading. It is now predicted that the program will result in savings on the order of 1-3 billion per year, a fifty to seventy-five percent cost savings.[e]

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[c]The pollutants covered are biological oxygen demand (BOD), and nitrogen and phosphorous loadings. Paper plants, waste water treatment plants, and non-point sources such as housing developers are potential traders under this program, to be carried out on the basis of individual, state-approved contracts for specific trades.

[d]In 1985, over half of all eligible firms traded with other firms, fifteen percent of rights were traded, and thirty-five percent of rights were banked (Hahn and Hester 1989).

[e]In addition, the metropolitan Los Angeles region has recently established a new program, the Regional Clean Air Implementation Markets Program (RECLAIM).

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