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# Market-Oriented Environmental Policies in Latin America: Roles of the State and the Private Sector

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## *I. Introduction: Extending the Market-based Paradigm to Environmental Policy*

Environmental problems seem endemic in Latin America, too costly to address when economies are in crisis, and exacerbated when growth allows Latin Americans to buy and produce more. As the region turns to greater reliance on market mechanisms in other sectors through trade and price liberalization, policymakers have begun to explore the use of market-based environmental policy. So far, the actual implementation of such policies has been rather limited, but the market-based paradigm is setting down intellectual roots within the region. Skeptics of this approach fear it will turn out to be pro-business rather than pro-market, and that it will undermine efforts to strengthen the capacity and commitment of governments to enforce environmental laws in Latin America.

Filtered through layers of doctrinal distortion and simple misinterpretation, the market-based approach to environmental policy is portrayed as an alternative to strengthening the institutional capacity of regimes. Yet the scope of environmental degradation seems to call for swift, decisive government action. As frustration mounts with the failure of Latin American governments to establish sound environmental policies, so does the polarization between those who support or mistrust the market-based paradigm. Effective strategies to conserve natural resources, however, depend both on the nature of the good and the broader social context in which policies are made. In this paper, my goal is to clarify the range of conditions under which markets are likely -- or not -- to outperform state intervention in Latin America.

The market-based approach to environmental policy promises several advantages over traditional regulatory schemes. First, it suggests the possibility of 'leapfrogging' over perceived errors in developed countries' progression from costly command-and-control policies to more cost-effective, flexible strategies. Critics of conventional regulation claim that EPA rules in the United States typically cost about $50 million for each life saved.[1] Such expenses are unjustifiable in Latin America, where 110 million people - or nearly a quarter of the population- live on incomes of less than $1 per day and many basic needs are unmet (World Bank 1996). Under these circumstances, expensive smokestack scrubbers and tertiary sewage treatment are a low priority compared to provision of services in basic health care, access to water, and investment in education. By establishing reasonable prices for environmental amenities, the hope is that firms will set logical priorities and choose least cost abatement techniques that are within economic reach.

Second, the market-based strategy promises to transform an expensive regulatory drain on national budgets into a source of income: by shifting environmental responsibilities to the private sector (including, in some cases, enforcement itself), businesses are expected to shoulder the burden of improving environmental quality or to compensate the public for damage. 'The polluter pays' principle

[1] *The Economist* (March 15, 1997) cites this figure from work by Robert Hahn of the American Enterprise Institute.

yields fiscal revenues in the form of user fees, emissions fees and the auction of tradable permits. These charges yield a 'double dividend,' by reducing harmful activities and by substituting efficient taxes for more distorting taxes such as those on exports and labor.[2]

Third, the region's governments have proven institutionally weak in the implementation of environmental policies. Whereas the United States' EPA employs some 17,000 workers, most Latin American environmental agencies operate on a shoestring. These agencies have little police power to enforce well-defined laws, much less to engage in sophisticated analyses of environmental damage and remediation strategies. Market-based strategies, free of the entrenched bureaucratic, clientelistic styles of government, could tap the greater technological capacity and incentive structure of the private sector.[3]

Critics of the market-based approach have argued that it is more appropriate in developed countries, where governments have the capacity to gather information on the value of environmental damage, to monitor the consequences of this flexible approach, and to manage an extremely diverse set of revenue sources to ensure compliance. Moreover, some economic instruments, such as emissions fees and front-end charges on hazardous materials, have the advantage of ensuring that the *costs* of pollution control are well defined, but yield uncertain outcomes in terms of the *amount* of environmental damage that occurs. Particularly if threshold effects exist, this uncertainty can add considerably to environmental risk. Without the establishment of clear rights to environmental amenities, and the institutional development to protect them, a muddled version of market-based environmental policy may turn out to be neither green nor efficient.[4]

Even if Latin American governments could develop the technical capacity to manage incentive-based policies, these policies are often in conflict with the goal of achieving greater social equity. 'Efficient' environmental taxes tend to be regressive, and schemes to privatize publicly held assets are viewed with suspicion by those who doubt that the proceeds of privatization will be broadly shared.

These concerns are valid. Yet the status quo - the concoction of haphazard environmental policies now in place in most Latin American countries - hardly measures up well against the feared outcome of market-based polices, when judged either in terms of environmental quality or social equity. Government control over the supply of electricity and water have led to profligate waste by some citizens

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[2] See Russell and Powell (1996) for a brief discussion of this 'double dividend.' Taxes on environmental damage carry low (or if perfectly set, no) deadweight losses, and are thus more efficient than many of the tax tools now used in Latin America.

[3] Russell and Powell (1996) argue that it is, ironically, this lack of institutional development and technical capacity in government that makes a market-based strategy inappropriate in the poorer Latin American countries. They argue that the identification of optimal levels of pollution and charges that would achieve these standards involves complex modelling that exceeds the capacity of these regimes. While the importation of environmental standards from developed countries is inappropriate, much of the related technology is useful. By focusing on technology and simple monitoring standards, governments can reduce the opportunities for corruption associated with instruments that involve money transfers (p.33).

[4] The concern that permitting processes intended to cut red tape and deregulate can disintegrate into a free-for-all is not limited to the Latin American context. The Natural Resources Defense Council (NRDC) recently issued a harsh criticism of New Jersey's flexible permitting process for industrial air pollution, claiming that in its first two years the new approach has led to greater pollution and less accountability (*Amicus*, Spring 1997).

while others lack basic access to these services, and the application of arbitrary pollution standards has left some of the worst offenders (mainly, old cars) untouched while the poor suffer disproportionately from respiratory disease. Thus this new incentive-based approach merits closer examination.

### *II. Conceptual Background*

In a seminal article, Coase (1960) argued that private parties can often negotiate efficient solutions to externality problems, provided rights are clearly established. Coase also argued that government attempts to resolve such problems often lead to even less desirable, inefficient outcomes. This provocative work suggested that the so-called market failures associated with externalities are often not failures at all, but a reflection of an efficient allocation of environmental resources between two competing needs.

In the literature on market-based approaches to environmental policy that has evolved since 1960, one important strand has sought to distinguish between market failure and policy failure, identifying situations where the elimination of government intervention might enhance the protection of natural resources.[5]

A strong case for reliance on markets can be made in instances where the resource is unambiguously a rival good, that is, one for which the consumption by one person precludes consumption by another. Most ordinary goods (bread, clothing, housing) fall into this category, and economists would not argue for intervention by the state except to achieve some income redistributive purposes.

Yet states do intervene in markets for rival goods, and Latin American regimes have historically intervened more than most. At least since the establishment of import substituting industrialization in the 1940s, Latin American governments have been deeply involved in markets for minerals, petroleum, electricity, fertilizers, pesticides, irrigation water, and forest products.[6] Where the state has not been the outright owner of resources, it has often imposed price controls or subsidies that distort the market's ability to signal scarcity. Thus prices for electricity, gasoline and pesticides have been *below* market equilibrium and the tendency has been to overconsume these goods. In markets for agricultural land, restrictions on the provision of credit and price supports have played an important role in rural land use, arguably accelerating deforestation.

Under these circumstances, Stiglitz's two-step approach to policy (first identify market failures, then ask if governments can do better) requires an additional preliminary step, to identify whether government intervention is a source of the problem. Simply eliminating state intervention may be a step toward improving environmental quality, even if an unregulated market is imperfect.

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[5] See, for example, Panayotou (1995), Project 88 (1991) , von Amsberg (1995).

[6] In fact, it is fair to claim that prior to reforms of the past decade, most Latin American regimes intervened in *all* markets by distorting relative prices through exchange rate and trade policies.

For rival goods that involve no (or small) externalities, markets generally do a better job than government in setting efficient prices. Often localized externalities can be resolved by taxing the externality or by establishing effluent standards (e.g., for treatment of water effluents), and markets can then determine prices that reflect scarcity. The point is that state control of the entire production process and the final product price is probably unwarranted[7].

For some rival goods, failure to establish clear property rights leads to environmental damage. Lack of title, or an ability to enforce title, leads to premature harvesting of fuelwood in Haiti and poor regions of Central America. Similarly, protection of indigenous lands might preserve a sustainable communal management of rainforest resources. The problem of open access, or *res nullius*, leads to an over-exploitation of resources. The solution need not lie exclusively in individual ownership, although market-oriented economists tend to favor this, but at the very least, communal rights (*res communis)* must be accompanied by clear boundaries, well-defined membership in user groups, rules of resource use and sanctions for misbehavior.

Forests and fisheries, municipal landfill dumps and water use, are examples of 'open access' resources that might be better managed by defining rules of common property use. Resources such as these can sometimes be more efficiently allocated and mechanisms for their conservation more efficiently adopted if beneficiaries are charged according to use. In some cases, privatization is a logical step toward efficient management. Where complete privatization is impossible, the auction of quotas or user fees serve a similar purpose, preventing the over-exploitation of the resource, but the need to rely on the state to set efficient quotas or fees suggests that this is a second-best approach.

By contrast, public goods such as clean air and biodiversity are inherently nonrival and nonexclusionary.[8] Although policymakers can set up tradable emissions permits, tax effluents, or subsidize environmentally benign behavior, markets themselves will not represent the public interest. Because exclusion is not possible, markets inadequately protect or provide public goods, creating a strong justification for state intervention.[9] The question that arises in these cases is not whether the state should intervene, but how it should do so, and who should bear the cost of protecting public goods, particularly where rights are poorly defined (as in the case of biodiversity).

In sum, there is big difference between market-based policies, which assume that markets function more or less efficiently, and the use of financial incentives to modify behavior in the face of market failures (incentive-based policy). The implications for the role of the state are comparably distinct:

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[7] This is consistent with Washington Consensus arguments for market liberalization (See Williamson, 1994).

[8] See Randall for an excellent critique of how economists use the term 'public good,' typically failing to identify whether both characteristics are necessary. Moreover, some goods such as forests have both distinctly rival uses (timber) and non-rival, nonexclusionary values (biodiversity). In this paper, I do not try to impose definitive boundaries around these terms, but focus instead on policies to address the various dimensions of each resource.

[9] In the extreme, as Randall puts it, public goods raise the ultimate case of market failure, that is, the failure of the market to exist at all.

if markets allocate natural resources efficiently, a withering of the state may be desirable; on the other hand, to the extent that environmental policy involves public goods, the state needs a sound institutional footing for intervention.

State intervention need not be justified only by the existence of public goods: distributive concerns and antitrust issues, for example, are entirely acceptable bases for intervention. Yet conflicting policy goals have contributed to ineffective environmental policies throughout Latin America, and in many cases the outcome also fails to serve distributive or antitrust purposes well.

To be more specific, the clarification of social equity goals could facilitate a more efficient allocation of natural resources. For example, a significant amount of the electricity generated in Caracas is lost to illegal connections by low-income families. (See Sucre, 1995.) Because the society is widely viewed as inequitable, the social will does not exist to impose harsh penalties for such theft. Only when a sense of broader social justice is achieved will it be possible, at least without repression, to shift the system toward one in which consumers pay according to their use of electricity and the full marginal cost of its production. Similarly, zoning laws aimed at establishing greenbelts around urban areas throughout Latin America will fail in the face of invasions by squatter communities so long as cultural norms accept, however despairingly, the right of the poor to settle on unused land.

Finally, while Coase argued that the allocation of rights is often irrelevant to identifying an efficient solution, an acceptable assignment of rights is a precondition for securing political support of either market-based or incentive-based environmental policies. Critics of these policies fear that natural resources and public good amenities will be undervalued in any scheme that transfers the right to use these resources. Where public lands have been privatized, for example, lack of transparency has fueled complaints that assets are under-priced. Moreover, the state has appropriated rights that many citizens consider personal, such as the right not to die from toxic emissions. Even if citizens could identify an acceptable level of compensation for pollution risks, the revenues collected from taxes on such emissions are rarely directed to those most likely to suffer from the pollution (e.g., people with respiratory illness). In countries struggling with corruption, such taxes are widely perceived to line the pockets of elites rather than to compensate society as whole for environmental deterioration. To establish a legitimate set of property rights for the use of natural resources, the socioeconomic system as a whole may need greater legitimacy.

In the sections that follow, I invite readers to ask four questions about specific resources policies: Is there a public good involved? If so, is it significant enough to warrant policy intervention? Is the state capable of intervening constructively? And, are efficient environmental policies compatible with social policy goals?

## *III. Defining the Role of the State and Markets in Environmental Policy*

The foregoing analysis suggests that market-based environmental policy is likely to succeed best for natural resources with predominantly rival good qualities; strong public goods inevitably require state intervention, even if this can take the form of incentive-based policies. In this section, I focus on the assessment of market and incentive-based policies in the context of concrete environmental problems, using examples drawn from a variety of Latin American countries.

In reality, few goods fit neatly along a rival/public good continuum. Instead, many of the goods that concern environmental economists have both rival and public good qualities. (Forests, for example, both yield timber and sequester carbon to reduce global warming.) The task, then, is to assess the significance of public good problems and to weigh options for state intervention, mindful of the fact that environmental policies must be compatible with other regulatory and equity concerns. The examples cited below, though hardly a comprehensive survey of environmental policy in Latin America, suggest that the appropriate degree of reliance on markets depends on characteristics not only of the environmental good itself, but of the broader policy context within which policy is being designed.

### A. Potential cases for greater reliance on markets

An easy first step toward market based environmental policy is the elimination of distorting subsidies that encourage destructive behavior. This is so obvious, and so often repeated, that the theory behind it hardly merits further analysis except to note the political dynamics that inhibit policy change[10]. A trickier task is to identify actual subsidies that are unambiguously bad (or more technically, which generate costs that greatly outweigh benefits). Subsidies are widely used in Latin America to redress an extremely unequal distribution of income, and the region is only slowly grappling with alternative social programs that can serve as adequate substitutes for these subsidies.
Thus it makes sense to prioritize the elimination of subsidies in terms of both their consequent environmental damage and redistributive purposes.

Subsidies can take a variety of forms, some of which are not easy to detect at first glance. These include favorable exchange rates or price controls for the purchase of agricultural inputs, import duty drawbacks, credit subsidies and tax exemptions. Pesticide subsidies, for example, have historically taken the form of favorable exchange rates for imported inputs, while fertilizer production has benefited from direct government investment and energy subsidies. Until 1987, firms in Brazil enjoyed a 50 percent tax exemption on income invested in the Amazon: although not explicitly aimed at the livestock sector, two-

[10] See Panayotou (1995) for a detailed discussion of subsidy elimination

thirds of the projects approved under this scheme were for livestock-raising that accelerated deforestation.[11] Similarly, access to credit was typically tied to the extent of land cleared.

Fiscal austerity under neoliberalism in the 1990s has sharply reduced the extent of credit subsidies, price supports and tax advantages directed toward agriculture, particularly that which earns little foreign exchange. Subsidies most frequently targeted for elimination are those on pesticides, fertilizers, energy and irrigation water. In the early 1980s, roughly a third of the cost of pesticides was subsidized in Honduras, Colombia and Ecuador, straining fiscal budgets and exacerbating rural health problems.[12] The consolidation of multiple exchange rate systems and the shift toward lower uniform tariffs has greatly reduced implicit subsidies on harmful imported products. Subsidies on electricity and water consumption have been slower to disappear, however, partly because the state tends to be involved in production.

Putting aside market liberation from damaging subsidies and price controls, we return to the issue of which natural resource markets are likely to function well in the absence of state intervention. Classic rival goods that fit into this category are depletable minerals, petroleum and landfill space, as well as some renewable resources such as managed forests.

A strong case can be made for allowing markets to allocate rival, depletable resources (such as minerals) over time, for prices signal both present and anticipated scarcity. Governments are not necessarily more likely than entrepreneurs to anticipate future scarcity and, through stock market valuation, the latter have a profit-incentive to conserve resources for future generations. The main argument for intervention is that private markets use discount rates that are too high relative to the social ideal, but it is difficult to establish consensus around any particular social discount rate. Moreover, government management of extraction rates in the US and Latin America have tended to be so patently inefficient that the divergence-between-discount-rates argument fails to win converts.

Why then, have state-owned oil and mineral companies been among the last to be put up for auction in the sweep of privatization across Latin America? The consequence has often been a weak application of environmental standards in the extraction process and low product prices that encourage excessive domestic consumption. Yet the establishment of trust in the political management of state assets is an important, and so far unmet, precondition for a more decisive shift to privatization.

Public resistance to privatization of minerals and oil in Latin America seems not to be based on efficiency concerns, but fear that revenues will be wasted by corrupt or populist (or both) regimes. Voters may believe it is easier to protect intergenerational equity ('the national patrimony') if assets are retained in the ground in the form of oil or minerals rather than deposited in the national treasury. Thus, while

[11] United Nations, *Sustainable Development :Changing Production Patterns, Social Equity and the Environment,* ECLAC, Santiago, Chile, 1991.
[12] *ibid.*, p. 39

efficiency dictates greater reliance on market mechanisms to set extraction rates, the failure to establish public institutions that can manage financial assets hinders privatization.

For different reasons, privatization of solid waste disposal has also proceeded slowly outside of a few relatively wealthy communities, such as the La Reina section of Santiago, Chile. The treatment of solid waste disposal as a rival good is in keeping with the trend toward user fees within the United States. As long as illegal dumping is a negligible problem, this treatment successfully internalizes the cost of consumer decisions to buy disposable products.

Unfortunately, in many poor Latin American communities, rights are not so clearly assigned (or enforced) and residents dispose of their trash in gutters, ravines, or open lots. The result is a health problem with classic *public good* characteristics: private efforts to clean up a neighborhood yield benefits for which it is impossible to charge fees. Under these circumstances, government intervention is essential, and in the short run subsidization can yield high returns in the form of reduced health costs. Curitiba, Brazil, for example, has instituted a *reverse* pay-per-bag system, rewarding *favela* residents for trash collection by offering bus tokens in exchange for trash. In addition, the city has established drop-off sites for recyclable material outside grocery stores, where containers are exchanged for store credit.[13] By combining such an approach with campaigns to increase civic pride in poor neighborhoods, it may be possible to move gradually to a situation in which dumping is sufficiently rare to allow for implementation of user fees in trash disposal.[14] For most Latin American municipalities, however, this point of transition is far off.[15]

**B. Market-based strategies that require significant regulatory controls**

Many natural resources involve a combination of rival and public goods characteristics. Often it is possible to rely on markets for the bulk of resource allocation, while intervening to address a limited set of public goods concerns. In addition, some resources require significant regulatory control for antitrust reasons or raise equity issues that are likely to dominate policy decisions.

Electricity is a rival good that is generally more efficiently supplied by private firms. A market-based strategy would privatize remaining state-owned utilities and allow prices to reflect scarcity and the social costs of any emissions from power generation. One approach is to tax emissions and then cede

[13] "Curitiba saca provecho de la basura," *ECOMUNA*, Centro de Investigación y Planificación del Medio Ambiente (CIPMA), September 1994.

[14] See Kligerman and Randolph for an example of one such effort in a Brazilian slum. This program involves working with school children and community outreach to educate adults about the health consequences of improper trash disposal.+

[15] Even at the municipal level, illegal dumping is a serious problem. According to the World Bank (1995), nearly a third of the trash that should be collected in legal landfills in Argentina instead winds up in open air dumps, often located near water supplies that are susceptible to contamination. Apparently efforts to screen waste to prevent landfill deposit of hazardous materials has led to greater illegal dumping.

remaining allocative decisions to the market.[16] Because of the monopolistic nature of this industry, regulatory oversight of pricing and costs remains necessary. A full shift to competitive retail-wheeling that allows consumers to choose among suppliers --an option under development in various US states -- is both technologically and institutionally out of reach for most Latin American countries.

How realistic is it for Latin American countries to achieve efficient levels of conservation through the price mechanism alone? Electricity rates throughout Latin America are low (see Sucre, 1996), and rationing often takes the form of brownouts in poorer countries of the region. Demand side management (DSM) strategies are not widely employed by electric utilities in Latin America. DSM provides incentives for firms to invest in conservation -- through home energy audits, subsidization of energy efficient appliances and better maintenance of equipment and transmission lines. According to a neoclassical economic analysis, this strategy is inferior to relying on consumers' response to full-cost pricing of electricity. Yet the price elasticity of demand for electricity is low, because households use discount rates that are much higher than market interest rates and because the cost of gathering information about energy efficiency is so high. As population and incomes rise, and the demand for energy intensive luxuries such as air-conditioning grows, DSM offers a strategy for staving off construction of new hydroelectric dams and fossil-fuel generated power plants. So long as it remains politically difficult to fully incorporate environmental costs into the price of electricity, this highly 'interventionist' system of cross subsidies may be a second best strategy.

Water supply is another example in which a modified market-based strategy is appropriate. Water consumption, whether for personal use or for irrigation, is a rival good. Privatization of water supply and waste water treatment systems is rapidly accelerating in Latin America. Chile has adopted a system of tradable water rights, enabling farmers to purchase, rent and lease water rights. Between April 1993 and April 1994, approximately 3 percent of the total water rights in the counties of Santiago, Chillán and Bulnes changed hands in 587 transactions. Almost all of the water (94 percent) involved was traded between farmers, but exchanges also occurred between agriculture and urban use or mining.[17] In the immediate term, the system provides incentives for farmers to shift away from water-intensive crops or to adopt techniques such as drip irrigation that conserve water. It also provides a mechanism for rationally addressing long-term changes in the structure of demand for water, as urban areas grow and the composition of economic activity changes.

The Chilean system is a prime example of the Coasian notion that once rights are clearly assigned, markets can efficiently allocate resources. By forcing municipalities, farmers and mining companies to compete in the same market for access to water, all have an equal incentive to conserve at

[16] It is worth noting that the air pollution caused by power generation varies greatly depending on the energy source (hydroelectric power, natural gas, petroleum, coal). Some countries in Latin America rely heavily on relatively clean natural gas, thus casting doubt on the notion that intervention is justified by the level of externalities involved.
[17] R. Gazmuri Schleyer and M.W. Rosegrant, p. 41.

the margin because a single price prevails.[18] It remains the task of the state, however, to identify the appropriate level of in-stream water needed to protect wildlife: conflicts over the damming of the Bio-Bio river suggest that -- as in California -- further institutional development is needed before the state is in a position to systematically address this nontrivial concern.

Within municipalities, additional regulatory issues relate to water distribution. As a natural monopoly with no threat of competitive entry, urban water supply calls for state regulation. In Chile, this is being done through conventional rate regulation. The Ministry of Commerce sets maximum tariffs based on the cost of water rights, maintenance, management and amortization of infrastructure. Argentina has awarded a 30-year concession to a private consortium for investment and management responsibility of the Buenos Aires water system, with similar regulatory oversight. The challenge is to identify mechanisms to encourage conservation in the context of political resistance to higher water prices. One strategy is to employ demand side management, using tools such as building code requirements and subsidization of low-flow plumbing fixtures to foster water conservation. In Chile, where nearly all urban residents already have access to water, the government has defused issues of equity by subsidizing water rates for the poorest 20 percent of the population.

In cities where a large proportion of the population lacks access to water, the problem of financing urban water systems is far greater. Squatter households in Port-au-Prince, Haiti spend a fifth of their income on water, purchased from private vendors who charge between 17 and 25 times the price of municipal drinking water.[19] As inefficient as this arrangement is -- and it is replicated in *favelas, pueblos jovenes* and *barrios* throughout Latin America -- private markets fail to generate an investment in water supply infrastructure for these communities. Part of the problem lies in the vague assignment of rights: lack of clear land titling makes collection of user fees more difficult and hinders investments in infrastructure. This problem sits within a larger set of regulatory risks related to the fact that utility rate adjustments are often catalysts for social conflict.[20] Thus, it is almost impossible to arrange a full utility privatization for very poor communities. Although the World Bank argues that build-own-transfer or build-own-operate contracts delay the systemic improvements that would take place under full privatization, competitive bidding on components of the water supply process may be the most realistic strategy for lowering the cost of water for the poor.

Access to safe water in poor communities also entails a public good externality -- in the form of disease prevention -- that makes it an especially desirable tool for income redistribution. Among the most common causes of disease transmission are inadequate handwashing and improper cleansing of utensils

[18] Mexico is at an earlier stage in the privatization process: with IDB support, it has transferred control of irrigation systems to local user associations (*The IDB*, Novermber 1996).
[19] P. Annez and A. Friendly, "Cities in the Developing World," *Finance and Development*, December 1996, p. 13.
[20] In addition, local access to bond financing is driven by unstable interest rate and exchange rate policies that are outside the control of local jurisdictions.

that have been in contact with perishable foods. Easier access to water would encourage improved sanitation, but a World Bank report argues strongly against such subsidies, claiming "externalities are the first refuge of scoundrels!"[21] Subsidies do have the undesirable effect of overriding household decision-making about resource allocation, and it is true that most subsidies for water supply systems in Latin America have been directed to the rich, but neither of these arguments seems strong enough to undermine the high priority of ensuring access to safe water in communities where child mortality rates are high.

The nature of sewage control as a rival is equally dependent on context in Latin America. In wealthy communities, sewage treatment can be handled as a rival good, for few households would consider dumping raw sewage into neighborhood gutters. Even in these communities, however, final sewage treatment has been minimal: as of a few years ago, only 2 percent of Buenos Aires' sewage received any treatment.[22] Here the cost burden of sewage treatment (at least at the primary or secondary level) can be imposed on users, linking fees for treatment of residential effluents to water billing. In very poor neighborhoods, however, the externalities caused by airborne fecal matter and the difficulty of enforcing laws against open sewage canals suggest the need for government intervention (if principally at the community level).

Water and electricity are predominantly rival goods: still, state intervention is needed to deal with problems of natural monopoly, conflicts over income distribution, and a set of public good externalities that are limited in scope (at least outside the poorest communities). By contrast, forests offer an interesting case in which rival characteristics and public good characteristics can both be extremely important. Rival, excludable characteristics include forest use for timber, extraction of rubber and other marketable products. Public good qualities are reflected in indirect use value (such as watching wildlife documentaries), option value (for potential ecotourism or scientific research), and existence value (which rests on respect for the existence of nature regardless of its benefit to mankind -- the Noah principle). Because of the difficulty of capturing public good benefits, both conservative market-oriented policy analysts and a host of 'rainforest crunch' liberals advocate for forest protection through mechanisms that capture forest direct use values.

In the late 1970s, the Chilean government privatized land that had been appropriated under the socialist Allende government. In addition to low sale prices, heavy tax subsidies favored afforestation to revive the forest products industry. These tracts, though largely monocrop forests, are maturing into profitably managed forests. Except for their dependence on subsidies, they conform to the conditions advocated by market-oriented policy makers: private ownership ensures that trees are viewed as long term

[21] Serageldin, p. 26.
[22] Serageldin, p. 4.

assets, in contrast to the incentive to prematurely harvest under short-term concessions, and ownership makes it possible to collateralize loans.[23]

A second market-based approach to protecting forests has taken the form of profit-sharing deals with pharmaceutical companies. In exchange for about $1 million and shared rights to forest-related drug profits, Costa Rica set aside 25 percent of its rain forest as a biodiversity reservoir for research use by Merck, the world's largest pharmaceutical company. Similarly, the California based drug company, Shaman Inc., has reached agreements with small communities in Brazil and Argentina to share profits from drugs based on knowledge from local medicine people.

This market-based approach to forests suffers, however, from the fact that the extent of forest preservation is determined only by use value (and in these cases, only a small component of use value -- timber and drug value). Public good benefits such as reduced global warming and scenic landscapes are not incorporated into decision-making. Nor, in the case of forests grown for timber, is the benefit that would be derived from greater biodiversity. Thus both the quantity and the quality of forests secured by this 'market-oriented' approach may be inadequate.

In some forests, use value is sufficient to preserve substantial tracts of land and uses are consistent with broader sources of value. Under the best circumstances, the interests of private firms(such as drug companies) and conservationists are compatible, and there is not a great divergence between the profit-maximizing level of forest conservation and the efficient level that reflects both direct use values and indirect or existence value. Even though this approach leads to a level of conservation that is below the efficient amount, projects based on use value will be financially viable, and advocates for this approach can point to tangible successes.

Unfortunately, this scenario is less likely where the principle gains derived from forest preservation are nonrival, nonexclusionary benefits such as biodiversity preservation and carbon sequestration.[24] In these cases, the use value derived from rubber, tropical nuts, drug development, or ecotourism may be very small, and a market-based approach, even if couched in the attractive jargon of 'community-based conservation,' will fail to preserve a significant amount of forest.[25] It is fair to argue that such market failures are the concerns of Northern countries, and that these countries should pay for any preservation based on existence value, yet the negotiation of such multinational deals requires active government participation.

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[23] Although, in theory, tax credits distort resource allocation toward excess timber production, this outcome is certainly superior to more common subsidies that favor deforestation, given the positive externalities generated by forests. This particular Chilean example has been controversial because allies of the Pinochet regime were seen as the primary beneficiaries of these subsidies and the reversal of land reform.

[24] It is important to distinguish between the use value generated by biodiversity for pharmacuetical research and broader existence values that derive from biodiversity. Not all species are equally eagerly protected by drug companies for medical research, nor do these companies have an interest in preserving vast tracts of forests.

[25] See Lopez (1996) for a discussion of policy instruments to bridge the gap between national and international interests in forest preservation in Latin America.

**C. Incentive-based state intervention to protect public goods**

Natural resources that are predominantly public goods require intervention by the state.[26] Clean, breathable air is an unambiguous public good; states may use financial incentives to protect air quality, but only the state can effectively represent society's interests in protecting (or selling) the right of its citizens to clean air. Latin American governments do not perform this task especially well at present: many residents of the region would argue that the state typically fails to intervene at all (in essence, ceding rights to polluters) or tends to intervene in a way that both burdens the polluter and yields little compensatory benefit to those who suffer from the pollution.[27] The question, then, is not whether the state should intervene, but how it might effectively do so.

The use of financial incentives provides a mechanism for inducing least-cost abatement of pollution, ensuring that the costs of control are consistent with its benefits (assuming the state can accurately identify such a level). The two principal tools in this approach are taxes and tradable quotas.[28]

When environmental taxes are applied directly to emissions, the final level of pollution remains undetermined, but the economic burden of control is bounded. In practice, most environmental taxes are indirectly linked to emissions; for example, the gasoline tax takes gasoline use as a measure of emissions, regardless of whether catalytic converters are functioning or not. As imperfect as this approach may be, it is hard to envision Latin American governments moving to variable taxes based on direct measurement of emissions using current monitoring technologies.

Auto emissions now account for the bulk of air pollution in Latin American cities, and car ownership is growing rapidly. Yet most countries have only begun to implement policies to control car emissions. Gasoline prices remain low relative to developed countries, and tax rates on leaded gasoline are lower than taxes on unleaded gasoline. In the case of Mexico, for example, leaded gasoline was 30 percent cheaper than unleaded gasoline as of a few years ago (Carbajo, 389). Governments have been loathe to increase taxes on leaded gas because older cars, which need this gasoline to lubricate engine valves, are mainly owned by lower income families. About 45 percent of Mexico City's cars are 1985 or earlier models, and 11 percent are from 1975 or earlier.[29] Leaded gasoline, on the other hand, destroys the effectiveness of catalytic converters: as of 1996 only a third of Mexico City's cars were 1991 or later

[26] As noted earlier, the concept of public good is often not well-bounded: in this paper, I use the term to refer to goods which are nonrival and nonexclusionary, acknowledging that these qualities themselves are matters of degree.
[27] Sao Paulo, Mexico City and Santiago are often cited as the three most polluted cities in the world. Although the metric behind this distinction can be challenged, the three cities have indubitably dirty air which contributes to higher mortality rates, particularly among the elderly and asthmatic children. (See, for example, Saldiva, et. al.)
[28] Subsidies certainly act as financial incentives; however, their use is limited by the fact that they must be financed (often by taxes that distort resource allocation), and by the fact that they encourage rather than discourage resource use. Subsidies can make sense as an imperfect redistributional tool (e.g., access to water), as a transitional step in the reassignment of rights (as in the Curitiba garbage collection scheme) or where the positive public good externalities of behavior are very strong relative to use value (rainforest preservation).
[29] "Old Cars Blamed for Mexico City Smog," *Mexico Business Monthly*, November 1, 1996.

models with converters. Rather than reversing the relative tax rates on leaded and unleaded gasoline, the government has been gradually phasing out the availability of leaded gasoline, making it more difficult to find.

Other 'perverse' tax differentials contribute to the persistent use of very old cars. In Mexico, for example, the ownership tax on cars becomes zero for vehicles 10 or more years old, whereas purchasers of new cars face both a sales tax and high ownership taxes (Carbajo, 390). Clearly, concern about equity and the desire to tax car ownership as a form of wealth run counter to the state's goal of reducing auto emissions. Further research to assess the actual burden of these taxes relative to income might make it possible to separate environmental and redistributive policy goals.[30]

Rather than using incentive-based strategies for reducing vehicle emissions, most governments have adopted more eclectic approaches. Mexico City, Santiago and Sao Paulo have instituted day-without-a-car programs, the goal of which is to get drivers to leave their cars at home one day per week. The three cases differ in effectiveness: Mexico City's experience led many people to buy older second cars to continue to drive five days a week, eroding the program's effectiveness; Santiago modified this policy design by exempting cars with catalytic converters from the restrictions, thereby encouraging the retirement of older cars (in the context of high income growth); Sao Paulo's voluntary program has been the least effective, relying exclusively on persuasion. Tinkering with such policies misses the key point of economic analysis: effective policies must provide an incentive at the margin to carpool or to use alternative means of transportation. Day-without-a-car programs leave untouched the cost of commuting by car during 4 out of 5 workdays.

In sum, Latin American governments have failed to significantly control urban air pollution, and many analysts rightly attribute this to the failure to use well-designed financial incentives to reduce auto emissions. This failure, however, should not be confused with a notion that markets would outperform the state in this instance. Only the state can act to reduce urban smog, and most regimes are well aware of this, yet few have resolved conflicts between policy goals that would allow for more aggressive environmental protection.

Although widely discussed in academic circles, tradable permits have not been extensively applied to stationary sources of air pollution in Latin America. The significance of stationary sources of air pollution varies considerably across cities. In Sao Paulo, for example, because most power is generated by hydroelectric plants, vehicles are blamed for 90 percent of air pollution;[31] similarly, Argentine industry relies heavily on relatively clean natural gas for fuel. In Mexico City, by contrast, state-owned enterprises, including the former PEMEX refinery, have been a major source of pollution;

[30] See Chernick and Reschovsky (1992) for an analysis of the distributional burden of gasoline taxes in the US. Although these authors argue that the tax is regressive, its burden as a percentage of income, even for the lowest deciles, is tiny. Comparable research in the Latin American context is needed.

[31] *Archives of Environmental Health*, March 1995.

rather than attempting to incorporate an incentive-based policy into a non-market context, the state has intervened directly to shut down offending plants. There is significant potential for the use of tradable permits to contain air emissions but, so far, this approach is seen as a tool with relevance for the more distant future. O'Ryan, for example, argues strongly for the use of an ambient permit system for stationary sources in Santiago but acknowledges that its cost advantage over inflexible uniform concentration standards is small when the desired emissions reductions are below 35 percent. In essence, for simple, cheap abatement techniques, the choice of policy instruments is not critical.[32]

**D. State intervention with non-financial instruments ('command and control')**

Not all public good environmental problems are appropriately addressed using financial incentives. There are at least five conditions under which a command-and-control approach is appropriate, despite the inflexibility that such an approach carries.

The first condition refers to circumstances in which the social marginal costs of pollution or resource use are so high that a ban is entirely appropriate. A ban amounts to a prohibitive tax: if mercury poisoning imposes such high costs that society finds no compensation acceptable, the 'efficient tax' -- i.e., the fine for spilling mercury into a river must be so high that no rational agent would choose to do it. Lead in gasoline may be one such example: the evidence points to lead as the most toxic air pollutant in Latin American cities. Thus even if taxes were to be used as a transitional tool to discourage the use of leaded gasoline, one can make a strong argument for banning it altogether. Most countries in the region are slowly phasing out leaded gasoline. Although the immediate outcome is imperfect, the ultimate result promises to be efficient.

A second, related set of circumstances occurs when the cost of acquiring information about toxicity is too high to allow rational choice by individuals. The dangers associated with some pesticides are too great to leave decisions to illiterate farmworkers (even if the externalities to wildlife and groundwater supplies are short-lived). Lead paint in toys, dinnerware and home paint involve similar problems in risk communication. In both instances, Latin American countries lag far behind the OECD countries in protecting their citizens. Far from a case of 'leapfrogging' over the command-and-control approaches used by the developed countries in the early years of pollution control, Latin American countries urgently need to implement such high-benefit bans.

A third condition in which command-and-control may be desirable is when the costs of control do not vary much across polluters and standardization lowers the costs of regulation.[33] Thus, for example, requiring annual inspections on automobiles is now used in Chile and Mexico as a mechanism to ensure

[32] Because fuel-switching (from wood and coal) is the dominant stratgey for emissions control in Santiago's industry, O'Ryan suggests a mix of policies both banning wood and coal as boiler fuels, and establishing a simple permit trading procedure to facilitate the use of permits in the future.

[33] The ban on the use of residential fireplaces in Santiago, Chile, is similar: it is difficult to conceive of a system of taxation that meters fireplace use, and yet unregulated use was a major contributor to urban pollution in the 1980s.

that all cars are maintained with basic tuneups, which drastically reduce emissions at little cost. This very high ratio of benefits to costs across a wide range of vehicles can justify what amount to mandatory tuneups. More controversially, catalytic converters on automobiles may be more efficient than trying to implement an equivalent emissions tax that reflects each tailpipe's exhaust fumes. In Latin American countries where catalytic converters are still not required, the claim is that such a requirement would be too burdensome on low income families. In these cases, the issue tends not to be whether an emissions tax works better, but whether this level of sophisticated pollution control is warranted at all.

Fourth, Latin America has experienced emergencies in which it has been impossible to establish clear rights and a system for market-based or incentive-based policy within the necessary time frame. For example, outbreaks of disease such as cholera may call for radical intervention in the handling of trash and sewage. Similarly, emergency responses to thermal inversions, such as those that led to the closing of schools and major industries in Mexico City in 1992, are a rational response to deadly levels of ground level ozone. In such a situation, it is more important to get the job done quickly than to worry about who pays for it or whether it is the least cost solution. The trick is to ensure that inefficient quick fixes do not become a more generalized strategy for handling persistent problems.

Finally, through zoning, infrastructure development and the creation of urban parks, the state plays an important role in the evolution of land use. Land use patterns are linked to a host of environmental problems. In Latin America, the emergence of unhealthy mega-cities reflects a long history of policy biases -- including overcentralization of fiscal policy, the bureaucratic control of access to credit and foreign exchange, and the neglect of rural development needs -- that involve far more than simply urban planning. As serious as the consequences of past policy errors have been, repudiation by the state of its responsibility for managing urban growth would no doubt lead to equally undesirable urban sprawl.

### *IV. Conclusion*

Despite the tendency to view market-based and incentive-based environmental policy through an ideological lens, this neoliberal approach to policy has advantages and disadvantages that vary across natural resources and among Latin American countries. To the extent that policymakers allow themselves to be caught in polarized debates about this approach, they are likely to be wrong at least part of the time. The issue is not *whether* but *when* to rely on markets and financial incentives.

The failure to distinguish between the market-based and incentive-based policies in common speech is unfortunate, for each involves vastly different assumptions about the roles of the state and markets. Markets clearly work well when the dominant resource characteristics are rival and exclusionary. Under these circumstances, the state's role in resource allocation can be minimal and centered on the assignment of rights. Where significant public goods are involved -- that is, where nonrival and

nonexclusion characteristics prevail -- the state must act to represent the interests of the people, for the individual cannot do so alone.

Governments must have the ability to enforce rights, to identify corrective measures where markets work imperfectly, and to define the terms of social consensus about acceptable levels of public good protection, such as pollution control and biodiversity preservation. As I have argued throughout this paper, the responsibility of the state in these arenas is not easily isolated from its responsibility for mediating conflicts over income distribution; in many cases the implementation of efficient environmental policies must be accompanied by progress in securing consensus about a much broader social agenda. Far from being an alternative to institutional development, this analysis suggests that institutional development to support environmental protection is still a critical task for most Latin American regimes.

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