Federalism and Environmental Regulation: A Normative Critique

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Vesting control over environmental regulation at the federal level is most commonly justified both in the legal academic literature and the legislative arena by two normative rationales. First, advocates of federal control argue that in its absence interstate competition would result in a "race to the bottom." Second, the maintain that federal regulation is necessary to prevent interstate externalities (Stewart 1977; Dwyer 1995).

This essay shows that the race-to-the bottom justification is analytically flawed, at least as a general argument for federal minimum standards. In contrast, while the presence of interstate externalities provides an analytically unimpeachable argument for federal intervention in cases in which the states cannot engage in Coasian bargaining,[1] the federal environmental statutes have in fact done little to mitigate such externalities, and may, in fact, have exacerbated the problem.[2]

The race-to-the-bottom rationale for federal environmental regulation posits that states will try to induce geographically mobile firms to locate within their jurisdictions, in order to benefit from additional jobs and tax revenues, by offering them suboptimally lax environmental standards. The asserted race has the same structure as a prisoner's dilemma. It is a non-

cooperative game with a dominant strategy that is socially undesirable: because they cannot coordinate their actions, states rationally choose a standard of environmental protection that is undesirably lax.

The problem of interstate externalities arises because a state that sends pollution to another state obtains the labor and fiscal benefits of the economic activity that generates the pollution but does not suffer the full costs of the activity. Under these conditions, economic theory maintains that an undesirably large amount of pollution will cross state lines.

Though they are sometimes conflated, the race to the bottom and the problem of interstate externalities are analytically distinct. Interstate externalities can be prevented by limiting the amount of pollution that can cross interstate borders, thereby "showing" upwind states the costs that they impose on downwind states. As long as the externality is eliminated, advocates of federal regulation concerned about controlling interstate externalities should not care whether the upwind state chooses to have poor environmental quality--a central concern of race-to-the-bottom advocates. Conversely, if an upwind state were to choose a high level of environmental quality within its borders but were to encourage the sources in the state to have tall stacks and locate near the interstate border, so that their effects were felt only in the downwind state, the situation would pose an interstate externality problem, though not a race-to-the-bottom problem.

These two rationales also are distinct from, but sometimes confused with, public choice arguments for vesting responsibility for environmental regulation at the federal level. Such public choice arguments rest on the claim that state political processes undervalue the benefits of environmental regulation, or overvalue the corresponding costs, relative to the federal process, and that the outcome of the federal process is socially more desirable. Even if there were no interstate externalities, or if industry were wholly immobile so that there could be no race to the bottom, environmental standards would still be more protective at the federal level if, as the public choice argument posits, environmental groups are more effective at this level. Conversely, the interstate externality and race-to-the-bottom arguments for federal environmental regulation may apply even if states properly value the benefits of environmental protection. The analysis of public choice issues surrounding federal environmental regulation is outside the scope of this essay.

I. Assessing the Race-to-the-Bottom Rationale

Race-to-the-bottom advocates must clear an initial hurdle. If one believes that competition among sellers of, say, widgets is socially desirable, why is competition among states, as sellers of a good--the right to locate within their jurisdictions--socially undesirable?

Indeed, states sell location rights because, even though they might not have the legal authority to prevent firms from

locating within their borders, such firms must comply with the fiscal and regulatory regime of the state in which they wish to locate. The resulting costs to the firms can be analogized to the sale price of a traditional good. If federal regulation mandating a supra-competitive price for widgets is socially undesirable, why should it be socially desirable to have federal regulation mandating a supra-competitive price for location rights, in the form of more stringent environmental standards than those that would result from interstate competition?

It is easy to identify possible distinctions between a state as seller of location rights and sellers of widgets. These differences, however, do not provide support for race-to-the-bottom claims.

First, if individuals are mobile across jurisdictions, the costs that polluters impose on a state's residents will depend on who ends up being a resident of the state; the resulting supply curve is thus far more complex than that of a widget seller. In the context of environmental regulation, however, race-to-the-bottom claims have focused exclusively on the mobility of capital, thereby assuming, at least implicitly, that individuals are immobile. Moreover, it is not clear that individual mobility renders competition among states different from competition among widget sellers. Indeed, even if individuals move in search of the jurisdiction that has the level of environmental protection that they favor (Tiebout 1956; Bewley 1981), and if there is capital mobility, the choice of environmental standards can

nonetheless be efficient (Oates and Schwab 1987).

Second, while a seller of widgets is indifferent to the effect of the sale price on the welfare of the good's purchaser, a state ought to be concerned about the interests of the shareholders of the polluting firm who reside in the jurisdiction, both as individuals adversely affected by pollution and as owners of capital adversely affected by the costs of meeting regulatory requirements. But this difference does not support race-to-the-bottom arguments. Indeed, if some of the regulated firm's shareholders did not reside in the regulating jurisdiction and if capital were immobile, a state could extract monopoly profits by setting suboptimally *stringent* standards, benefiting its in-state breathers at the expense of out-of-state shareholders. (If capital is mobile, competition eliminates this problem.) Nothing in this account provides support for the opposite proposition: that interstate competition leads to suboptimally lax standards.

Third, states are not subject to the discipline of the market. If a producer of widgets consistently sells at a price that does not cover its average costs, it will eventually have to declare bankruptcy. A state, in contrast, can continue in existence even if it recklessly compromises the health of its residents. This difference merely establishes that a state might undervalue environmental benefits. But such undervaluation can take place even if capital were not mobile: it is a public choice problem rather than a race-to-the-bottom problem.

Fourth, states do not sell "location rights" at a single-component price; they require that firms comply with a variety of regulatory standards and that they pay taxes. The resulting market is thus more complex than one involving the sale of a traditional good. For example, a jurisdiction that imposes a lax worker safety standard but a stringent pollution standard will be desirable for a labor intensive, non-polluting firm, whereas a jurisdiction with stringent safety and lax pollution standards will be desirable for a capital intensive, polluting firm. It is far from clear, however, why this additional complexity in the market would make interstate competition destructive. Instead, the example suggests a desirable sorting out of firms according to the preferences of individuals in the various jurisdictions.

In sum, while the analogy between interstate competition for industrial activity and markets for traditional goods is not perfect, it raises serious questions about race-to-the-bottom claims. At the very least, it should require race-to-the-bottom advocates to bear the burden of identifying relevant differences between the two markets, and explaining why they turn otherwise desirable competition into a race to the bottom.[3]

Quite to the contrary, and contrary to the prevailing assumption in the legal literature and in the legislative debates, the leading economic model of the effects of interstate competition on the choice of environmental standards shows that interjurisdictional competition leads to the maximization of social welfare, rather than to a race to the bottom. Oates and

Schwab (1988) posit jurisdictions that compete for mobile capital through the choice of taxes and environmental standards. A higher capital stock benefits residents in the form of higher wages, but hurts them as a result of the foregone tax revenues and lower environmental quality needed to attract the capital.[4]

In their model, individuals live and work in the same jurisdiction and there are no interjurisdictional pollution spillovers. Each jurisdiction produces the same single good, which is sold in a national market. The production of the good requires capital and labor, and produces waste emissions. The various jurisdictions set a total permissible amount of emissions as well as a tax on each unit of capital. Capital is perfectly mobile across jurisdictions and seeks to maximize its after-tax earnings, but labor is immobile.[5]

Each individual in the community, who is identical in both tastes and productive capacity, puts in a fixed period of work each week, and everyone is employed. Additional capital raises the productivity of workers, and therefore their wages.

Each jurisdiction makes two policy decisions: it sets a tax rate on capital and an environmental standard. Oates and Schwab show that competitive jurisdictions will set a net tax rate on capital of zero (the rate that exactly covers the cost of public services provided to the capital, such as police and fire protection). For positive net tax rates, the revenues are less than the loss in wages that results from the move of capital to other jurisdictions. In contrast, net subsidies would cost the

jurisdiction more than the increase in wages that additional capital would generate.

In turn, competitive jurisdictions will set an environmental standard that is defined by equating the willingness to pay for an additional unit of environmental quality with the corresponding change in wages. Pollution beyond this level generates an increment to wage income that is less than the value of the damage to residents from the increased pollution; in contrast, less pollution creates a loss in wage income greater than the corresponding decrease in pollution damages.

Oates and Schwab show that these choices of tax rates and environmental standards are socially optimal. With respect to tax rates, one condition for optimality is that the marginal product of capital--the increase in the output of the good produced by an additional unit of capital--must be the same across jurisdictions. Otherwise, it would be possible to increase aggregate output, and, consequently, aggregate social welfare, by moving capital from a jurisdiction where the marginal product of capital is low to one where it is high. Because capital is fully mobile, the market will establish a single rate of return on capital. This rate is equal to the marginal product of capital minus the tax on capital. The choice by competitive jurisdictions of a net tax of zero equalizes the marginal product of capital across jurisdictions and is therefore consistent with optimality.

With respect to environmental standards, competitive

jurisdictions equate the marginal private cost of improving environmental quality (measured in terms of foregone consumption) with the marginal private benefit. For net tax rates of zero, the marginal private cost is, as noted above, the decrease in wage income produced by the marginal unit of environmental protection. This decrease is also the marginal social cost, since it represents society's foregone consumption. Thus, instead of producing a race to the bottom, competition leads to the optimal levels of environmental protection.

So far, the inquiry has not revealed support for the claim of systematic environmental under-regulation in a regime without federal intervention. It is possible, however, that in particular instances, the game-theoretic interactions among the states would lead to under-regulation absent federal intervention. In such cases, federal minimum standards would be desirable. But it is equally plausible that in other instances the reverse would be true: that the game-theoretic interactions between the states would lead to overregulation absent federal intervention. In such cases, federal regulation would be desirable as well, but in such cases federal <u>maximum</u> standards would be called for. Accordingly, there is no compelling race-to-the-bottom justification for across-the-board federal minimum standards, which are the cornerstone of federal environmental law.

As an example of such game-theoretic interactions, consider, in the Oates and Schwab model, a situation in which states decide

to impose a positive net tax rate on capital, perhaps because they cannot finance the provision of public goods through a non-distortionary tax, such as a head tax. In such a situation, environmental standards will be suboptimally lax because the jurisdiction will continue to relax these standards beyond the optimal level in order to benefit from the additional net tax revenue that results from attracting additional capital.

A corollary, however, is that environmental standards will be suboptimally stringent if a jurisdiction, perhaps because of the visibility that attaches to attracting a major facility, chooses a tax rate on capital that is less than the cost of the public services that capital requires. Under this scenario, the optimal strategy for the jurisdiction is to strengthen the environmental standards beyond the optimal level so as to reduce the negative fiscal consequences.[6]

Similarly, a recent study relaxes the assumptions of constant returns to scale and perfect competition, which are a cornerstone of the Oates and Schwab model (Markusen, Morey, and Olewiler 1993, 1995). Instead, it considers the effects of state regulation on an industry that exhibits increasing returns to scale, a condition generally associated with imperfect competition. The conclusions of the model are that, depending on the levels of firm-specific costs, plant-specific costs, and transportation costs, interstate competition can produce either suboptimally lax or suboptimally stringent levels of pollution. In summary, just as there are game-theoretic situations in which

interstate competition produces environmental under-regulation, there are other plausible scenarios under which the result is over-regulation.

But even if, left to their own devices, states systematically enacted suboptimally lax environmental standards, federal environmental regulation would not necessarily improve the situation. Race-to-the-bottom arguments appear to assume, at least implicitly, that jurisdictions compete over only one variable--in this case, environmental quality. Consider, instead, the problem in a context in which states compete over two variables--for example, environmental protection and worker safety. Assume that, in the absence of federal regulation, State 1 chooses a low level of environmental protection and a high level of worker safety. State 2 does the opposite: it chooses a high level of environmental protection and a low level of worker safety protection. Both states are in a competitive equilibrium, with industry not migrating from one to the other.

Suppose that federal regulation then imposes on both states a high level of environmental protection. The federal scheme does not add to the costs imposed upon industry in State 2, but it does in State 1. Thus, the federal regulation will upset the competitive equilibrium, and unless State 1 responds, industry will migrate from State 1 to State 2. The logical response of State 1 is to adopt less stringent worker safety standards. This response will mitigate the magnitude of the industrial migration that would otherwise have occurred.

Thus, if a race to the bottom exists, federal environmental standards can have adverse effects on other regulatory programs, in this case, worker safety. On this account, federal environmental regulation is desirable only if its benefits outweigh the costs that it imposes by shifting to other programs the pernicious effects of interstate competition.

More generally, the presence of such secondary effects implies that federal regulation would not be able to eliminate the negative effects of interstate competition, if such negative effects existed. Recall that the central tenet of race-to-the-bottom claims is that competition will lead to the reduction of social welfare; the assertion that states enact suboptimally lax environmental standards is simply a consequence of this more basic problem. In the face of federal environmental regulation, however, states will continue to compete for industry by adjusting the incentive structure of other state programs.

So, for example, if states cannot compete over environmental regulation, they will compete over worker safety standards. One might respond by saying that worker safety should also be (and is) the subject of federal regulation. But states would then compete over consumer protection laws or tort standards, and so on. And even if all regulatory functions were federalized, the competition would simply shift to the fiscal arena, where the competition would lead to the underprovision of public goods. Thus, the reduction in social welfare implicit in race-to-the-bottom arguments would not be eliminated.

The race-to-the-bottom rationale for federal environmental regulation is, therefore, radically underinclusive. It seeks to solve a problem that can be addressed only by wholly eliminating state autonomy. In essence, then, race-to-the-bottom arguments are frontal attacks on federalism. Unless one is prepared to federalize all regulatory and fiscal decisions it is far from clear that federal intervention in the environmental arena would mitigate the adverse social welfare consequences of a race to the bottom, if such a race existed.

II. Assessing the Interstate Externality Rationale

The discussion in this section focuses on the Clean Air Act, which is the statute designed to deal with the pollution that gives rise to the most serious problems of interstate externalities. It shows despite these problems, the statute has been an ineffective response to the problem of interstate externalities, and that, to some extent, it has had counterproductive effects.

1. Ambient and Emission Standards

The core of the Clean Air Act consists of a series of federally prescribed ambient standards and emission standards. Ambient standards prescribe maximum permissible concentration of pollutants in air, but do not directly constrain the behavior of individual polluters. The National Ambient Air Quality Standards (NAAQS) are the statute's centerpiece; they establish minimum

levels of air quality that, in principle, must be met nationwide. In addition, under the Prevention of Significant Deterioration (PSD) program, areas with air quality that is better than the NAAQS must meet a more stringent ambient standard consisting of a baseline--the level of air quality on the date that the first major facility in the area applies for a permit--plus an increment above that baseline. In contrast, areas with air quality worse than the NAAQS are subjected under the nonattainment provisions to interim, less stringent ambient standards designed to accomplish "reasonable further progress" toward the attainment of the NAAQS.

Emission standards, in contrast, impose enforceable limitations on individual sources. The federally prescribed emission standards for stationary sources include New Source Performance Standards (NSPS), which apply to certain categories of stationary sources, as well as standards for major new sources in PSD areas, set by reference to the best available control technology (BACT); standards for major new sources in nonattainment areas, set by reference to the lowest achievable emission rate (LAER); and standards for existing sources in nonattainment areas set by reference to reasonably available control technology (RACT). Emission standards for automobiles are also federally prescribed. In contrast, the states are primarily responsible for the choice of emission standards for existing sources (except as constrained by the RACT requirements) through State Implementation Plans (SIPs) designed to ensure that

the states are meeting the ambient air quality levels prescribed by the NAAQS.

The federal emission standards are not a good means by which to combat the problem of interstate externalities. These standards constrain the pollution from each source, but do not regulate the number of sources within any given state or the location of the sources.

Similarly, the various federal ambient air quality standards also are not well targeted to address the problem of interstate externalities, because they are both overinclusive and underinclusive. From the perspective of constraining interstate externalities at a desirable level, ambient standards are overinclusive because they require a state to restrict pollution that has only in-state consequences. Concern about interstate externalities can be addressed by limiting the amount of pollution that can cross interstate borders. Because some air pollution has only local effects, such externalities can be controlled even if the upwind state chooses to have poor environmental quality within its borders.

Conversely, the federal ambient air-quality standards are also underinclusive from the perspective of controlling interstate externalities because a state could meet the applicable ambient standards but nonetheless export a great deal of pollution to downwind states because the sources in the state have tall stacks and are located near the interstate border. In fact, a state might meet its ambient standards precisely *because*

it exports a great deal of its pollution.

The federal ambient and emissions standards could perhaps be justified as a second-best means by which to reduce the problem of uncontrolled interstate externalities. One might believe that by reducing pollution across the board they reduce interstate externalities proportionately.

Such a view, however, is incorrect as a matter of both theory and empirical observation. The amount of aggregate emissions is not the only variable that affects the level of interstate externalities. In particular, two other factors play important roles. The first is the height of the stack from which the pollution is emitted. The higher the stack, the lesser the impact close to the source and the greater the impact far from the source. Thus, absent a federal constraint, states have an incentive to encourage their sources to use tall stacks, as a way to externalize both the health and environmental effects of the pollution, as well as the regulatory costs of complying with the federal ambient standards.

Second, the level of interstate externalities is affected by the location of the sources. In the eastern part of the United States, where the problem of interstate pollution is most serious, the prevailing winds blow from West to East. Thus, states have an incentive to induce their sources to locate close to their downwind borders so that the bulk of the effects of the pollution is externalized. They can induce this result, for example, through the use of tax incentives or subsidies, or

through permitting and zoning decisions.

The best evidence that states do indeed encourage sources to use tall stacks can be found in the provisions of the SIPs adopted by at least fifteen states in response to the enactment of the Clean Air Act in 1970. These SIPs allowed sources to meet the NAAQS by using taller stacks rather than by reducing emissions (Senate Committee on Public Works 1974; Ayres 1975). In those SIPs, the permissible level of emissions was an increasing function of the height of the stack.[7] If the stack was sufficiently high, the effects would be felt only in the downwind states and would therefore have no impact on in-state ambient air-quality levels. Through these measures, the states created strong incentives for their firms to externalize the effects of their sources of pollution.

It is true that states had an incentive to externalize pollution even before the enactment of the Clean Air Act in 1970 because, by encouraging tall stacks, states could make other states bear the adverse health effects of pollution. The 1970 provisions, however, created an additional incentive. By encouraging the use of tall stacks, states could also externalize the regulatory impact of the standards, thereby availing themselves, for example, of the opportunity to attract additional sources without violating the NAAQS.

Taller stacks entail higher costs of construction and, possibly, operation. It is therefore conceivable that a state that did not view the externalization of health effects as

sufficient by itself to outweigh imposing such costs on in-state firms would reach a different conclusion when tall stacks lead to the externalization of both health and regulatory impacts.

More generally, before 1970, the states had not developed extensive regulatory programs for controlling air pollution. The net benefits of taller stacks, if any, might not have been worth the institutional investment necessary to create a regulatory program to transmit incentives for such stacks. The Clean Air Act, by requiring states to prepare SIPs, gave them no choice but to create an institutional structure designed to regulate the emissions of industrial sources. With that structure in place, it became comparatively easier to encourage tall stacks.

In addition, the health benefits of reducing the impact of emissions on in-state ambient air-quality levels are external to the firm emitting the pollution. Thus, a firm will take such effects into account only if required to do so by a regulator. In contrast, the regulatory benefits of reducing the impact on in-state ambient air-quality levels can be captured directly by the firms, which, by using taller stacks, need to invest less to reduce their emissions.[8] While before 1970, firms would have expended resources in tall stacks only if required to do so by a state regulatory agency, after 1970 they had an independent incentive for pursuing such a policy.

It is therefore not surprising that the use of tall stacks expanded considerably after 1970. For example, whereas in 1970 only two stacks in the United States were higher than 500 feet,

by 1985 more than 180 stacks were higher than 500 feet and twenty-three were higher than 1000 feet (Reitze 1991; Vestigo 1985). While the ability of states to externalize pollution in this manner is now less of a problem as a result of a system of regulation of stack height that followed the 1977 amendments to the Clean Air Act, tall stacks remain a means by which excessive pollution can be externalized.[9]

In contrast to the experience with tall-stack provisions, it is difficult to find direct evidence concerning whether states also provided incentives for sources to locate close to their downwind borders, because such incentives are unlikely to be reflected in regulatory documents. There is, however, literature suggesting that such incentives are present in the case of the siting of waste sites (Mank 1995; Wiygul and Harrington 1993-94; Ingberman 1995; Zimmerman 1994). It would thus not be implausible to believe that states acted in the same manner with respect to air pollution facilities.[10]

In summary, far from correcting the problem of interstate externalities, the Act's ambient and emission standards may well have exacerbated it.

2. Acid Rain Provisions

The acid-rain provisions of the 1990 amendments are often hailed as a means of reducing interstate externalities because acid rain is produced by pollution that travels long distances. However, these provisions apply only to the two pollutants that

lead to the formation of acid rain: sulfur dioxide and nitrogen oxides. Further, they apply to only one type of facility: electric utilities. Moreover, these provisions are not structured to allocate emissions between upwind and downwind states in a desirable manner.

With respect to nitrogen oxides, the provisions set emission standards for new and existing sources. As discussed above, emissions standards are not a well targeted means for controlling interstate externalities.

With respect to sulfur dioxide, the acid rain provisions establish a system of grandfathered permits, under which existing emitters are assigned, for free, a number of permits equal to their historical emissions, subject to certain constraints. These permits are tradeable in a single national market.

Although these constraints on the grandfathering of permits are likely to reduce the amount of acid rain, particularly after the year 2000, they make no attempt to allocate emissions between upwind states and downwind states in an optimal way. The acid rain problem manifests itself primarily in the Northeast, but is caused primarily by emissions from the Midwest. Because the market is national, Midwestern sources can buy, without restriction, permits from the West and the Northeast. Such trades would have an undesirable impact in the Northeast. In fact, downwind states are attempting to prevent their sources from selling permits to upwind sources, though such measures may well be struck down on constitutional grounds.

3. Interstate Spillover Provisions

Sections 110(a)(2)(D) and 126(b), which date to the 1977 amendments, are the most comprehensive means for controlling interstate spillovers. These provisions prohibit a state from "contribut[ing] significantly to nonattainment in, or interfer[ing] with maintenance by," any other state with respect to the NAAQS, or "interfer[ing] with measures required by" any other state under the PSD program.

Unlike the federal ambient and emissions standards, the interstate spillover provisions are designed to prevent excessive pollution from crossing interstate borders. Unlike the tall-stack and acid-rain provisions, they are designed to deal with the problem comprehensively. Unfortunately, however, both in resolving various threshold issues and in interpreting substantive questions under the interstate spillover provisions, the administrative practice and case law have rendered these provisions virtually useless as a means of constraining interjurisdictional externalities.

The Environmental Protection Agency (EPA), through the resolution of various threshold issues, has blocked the prospects of downwind states complaining about excessive upwind pollution in important ways. First, it has maintained that it cannot predict such impacts more than 50 kilometers (about 30 miles) from the source of the pollution, and has summarily rejected the predictions made by downwind states on the basis of longer range models.[11] Thus, sections 110(a)(2)(D) and 126(b) have been of

no use to downwind states challenging pollution from sources not immediately contiguous to their borders.

The second threshold issue relates to the treatment of pollutants that are transformed as they travel through the atmosphere. For example, increased sulfur dioxide emissions upwind have an effect downwind not only on ambient air-quality levels of sulfur dioxide, but also on ambient air-quality levels of particulates. The EPA has consistently taken the position, which has been upheld by the courts, that the impact of transformed pollution need not be taken into account in evaluating whether the upwind pollution is excessive.[12] Thus, the phenomenon of acid rain, an important manifestation of the problem of interstate pollution, has been largely outside the reach of sections 110(a)(2)(D) and 126(b).

Third, the EPA has not set a national ambient air quality standard for sulfates (Ackerman and Hassler 1991), even though a relative consensus developed within the scientific community in the 1980s concerning the adverse environmental effects of acid rain (Kulp 1990; Lee 1981). Nor has the EPA promulgated regulations to combat regional haze,[13] despite a statutory obligation under section 169A to do so by 1979. Had the EPA done so, it would have been required by sections 110(a)(2)(D) and 126(b) to take into account the impact of upwind emissions of sulfur dioxide on the downwind ambient air-quality levels of sulfates as well as their impact on regional haze.[14]

EPA's interpretation of the substantive standards of

sections 110(a)(2)(D) and 126(b) has further contributed to render these provisions ineffective in controlling interstate externalities. It is useful in this regard to construct a three-category taxonomy defined by reference to whether the downwind state would meet the federal ambient standards if it did not have to face pollution transported from the upwind state and whether the downwind state actually meets the federal ambient standards despite the upwind pollution.

In the first category, the downwind state would meet the federal ambient standards without the upwind pollution, and meets these standards despite the upwind pollution. In the second category, the downwind state would not meet the federal ambient standards even if there were no upwind pollution and, of course, does not meet the standards with the upwind pollution. In the third category, the downwind state would meet the federal ambient standards in the absence of upwind pollution, but does not meet these standards with the upwind pollution; here, the upwind pollution is the but-for cause of the violation of the federal ambient standards. This taxonomy is summarized in Table I.

TABLE I: TAXONOMY OF INTERSTATE SPILLOVERS

	Violation Without Upwind Pollution	Violation with Upwind Pollution
Category I	No	No
Category II	Yes	Yes
Category III	No	Yes

As to each of these categories, two questions are relevant. First, should the federal government play a role in controlling the upwind pollution? Second, assuming that such a role is appropriate, how should the federal government determine the permissible amount of upwind pollution that can enter the downwind state?

In Category I, absent a violation of the federal ambient standards--either the NAAQS or the PSD increments--the EPA has chosen to place no limits on the upwind pollution. In this situation, the upwind pollution will be unconstrained even if it leads to a violation of a *state* ambient standard in the downwind state that is stricter than the federal standard. Further, the upwind pollution will be unconstrained even if the downwind state has limited the emissions of its sources in order to preserve a margin for growth that will permit it to attract new industry. Finally, the upwind pollution will be unconstrained even if the downwind state has been unable to set a baseline under the PSD program, thereby constraining further environmental degradation,

because no major source has applied for a permit.[15]

In Category II cases, where the upwind pollution exacerbates a violation of a federal ambient standard in the downwind state, the EPA has never found upwind pollution to meet the "significant contribution" standard and has given little guidance on what factors distinguish a "significant" contribution from an "insignificant" one. In cases involving a single upwind source, the EPA concluded that contributions of 1.5% and of 3% were not excessive.[16] It reached these conclusions with no analysis, apparently basing its determination on the fact that those percentages do not seem particularly large. Nor did the EPA engage in any inquiry as to the cumulative impacts of upwind emissions. In light of the large number of sources that are likely to affect ambient air-quality levels in the downwind state, this approach is quite unprotective of the interests of downwind states.

In Category III, the EPA has indicated that the plain meaning of the statutory phrase "prevent attainment" requires the Agency to deem excessive any upwind pollution that was the but-for cause of a violation of the federal ambient standards in the downwind state. In the only case in which the situation was presented, however, the Agency rejected the downwind claim, stating that it doubted the accuracy of the modeling analysis performed by the downwind state.[17]

In summary, three principal rules emerge from the administrative interpretations of sections 110(a)(2)(D) and

126(b), which have been uniformly upheld by the courts: upwind pollution is never constrained if the downwind state meets the federal ambient standards; upwind pollution that exacerbates a violation of the federal ambient standards in the downwind states is constrained only if the upwind sources "significantly contributes" to the violation; and upwind pollution that is the but-for cause of the violation of federal ambient standards in the downwind state is always constrained.

The combination of these rules leads to illogical and, in practice, unprotective results. Consider first the Category I case of a downwind state that is not violating the NAAQS or the PSD increments. The amount by which the downwind state's ambient air-quality levels are better than the federal ambient standards represents that state's margin for growth. If the downwind state is not able to attract new sources, because, for example, it is experiencing a temporary economic downturn, the rules allow an upwind state to consume the downwind state's margin for growth without constraint. Indeed, the rules even allow an upwind state to consume the downwind state's margin for growth by amending its SIP to permit its existing sources to increase their emissions up to the point at which the federal ambient standards become constraining in the downwind state.[18] Once the air-quality levels in the downwind state reach the level of the federal ambient standards (with the help of the upwind state), the downwind state will be unable to attract any sources without requiring emission reductions from its existing sources. At the

extreme, a downwind state with no existing industrial base would be precluded from ever acquiring one.

In contrast, if the downwind state consumes its margin for growth first, either by attracting new sources or by amending its SIP to allow existing sources to pollute more, any increase in the pollution that the upwind state sends downwind would be deemed a violation of sections 110(a)(2)(D) and 126(b). An upwind state without an industrial base at the time that the downwind state reaches the federal ambient standards might be effectively precluded by this rule from attracting any polluting sources in the future if, as a result of the state's geography, any in-state emissions would be likely to migrate downwind.

Accordingly, the margin for growth in the downwind state would be allocated on a "first come-first served" basis. Such rules of capture are undesirable; they create incentives for both upwind and downwind states to use the downwind state's margin for growth at a faster rate than is economically desirable, and do not allocate this margin for growth to whichever state values it most highly.

The discussion so far has focused on a downwind state that intends to use its margin for growth for economic expansion. Instead, states might set state ambient standards that are more stringent than the federal standards because they attach more value to environmental protection. The federal environmental laws emphasize, as explicitly reflected in section 116 of the Clean Air Act, that federal standards are floors and not

ceilings, and that, with exceptions not relevant to this discussion, states remain free to enact standards that are more stringent than the federal standards. Indeed, more stringent standards are undesirable only if they are an effort to externalize to other states the costs of pollution control.

Under the current administrative and judicial approach, however, more stringent state ambient standards can be used only to limit the emissions of in-state sources and cannot be invoked, under any circumstances, to constrain upwind emissions. Such a regime creates a disincentive for downwind states to have more stringent state ambient standards: downwind states bear all the costs of such standards (the costs of tougher emissions limitations for in-state sources), but the upwind states can appropriate the benefit by taking the additional opportunities created for the externalization of pollution.

The administrative and judicial approach to Category II situations, in which the upwind pollution aggravates a violation of the federal ambient standards, also is misguided. In Category II cases, the downwind state would be unable to constrain the upwind pollution unless the pollution was deemed a "significant contribution" to the violation. Under the nonattainment provisions of the Clean Air Act, however, the downwind state has an obligation to reduce its emissions until it meets the NAAQS. Thus, absent a "significant contribution" from upwind sources, the full burden of pollution reduction falls initially on the downwind sources, even if upwind reductions would be far less

costly.

But once the downwind state made sufficient improvements so that it could meet the NAAQS were it not for the upwind pollution, the situation would change. The upwind pollution would then be the but-for cause of the violation of the NAAQS in the downwind state—a Category III problem. The upwind pollution would be enjoined as "prevent[ing] the attainment" of the NAAQS, even if the cost to the upwind state of doing so were wholly disproportionate to the cost to the downwind state of somewhat more stringent pollution controls. As already indicated, in cases in which all emissions from the upwind state have at least some impact downwind, such a rule would prevent any polluting activity in the upwind state. The downwind state, by reducing its emissions to the point at which it could meet the NAAQS in the absence of the upwind pollution, but no further, could effectively destroy the upwind state's industrial base.

In summary, of the three rules articulated by the EPA and the courts to address the problem of interstate spillovers, two are overly lenient. In contrast, the third is overly harsh, though, perhaps as a result of its harshness, EPA has failed to apply it to any specific case.

Perhaps the best illustration of the inefficacy of the Clean Air Act's interstate pollution provisions is provided by a dispute in which Kentucky complained about excessive emissions from an electric utility just across the border in Indiana. The Indiana utility was emitting 6 pounds of sulfur dioxide per

million BTU of heat input--a level that reflected no pollution controls at all. In contrast, the electric utility in Kentucky had spent $138 million installing scrubbers in order to meet a standard of 1.2 pounds per million BTU. Moreover, the Indiana utility consumed almost half of the permissible pollution levels in parts of Kentucky. Nonetheless, despite the compelling nature of the facts, the downwind state lost its challenge.[19]

Conclusion

This essay has shown that the race-to-the-bottom argument is an unsound basis for supporting federal minimum standards, and that the problem of interstate externalities has not been successfully addressed by the federal environmental statutes. Thus, there is a serious mismatch between the structure of the environmental statutes and the two most prominent normative justifications for federal intervention in the environmental area.

The essay concludes by briefly reviewing the various plausible normative justifications for federal regulation, and suggesting what forms of federal intervention are needed to address the pathologies that otherwise would result. Of course, space precludes a full analysis of these matters.

1. Interstate Externalities: The preceding discussion has focused on pollution externalities, principally air pollution that crosses state lines. The goal is to design a well functioning system for adjudicating the claims of downwind

states, that takes into account not only whether the emissions of upwind sources are excessive but also whether their stack height and location are an effort to externalize the adverse effects of pollution (Revesz 1996).

A different form of externality arises in the case of endangered species. To the extent that such species are located in a particular state, the costs of protection are largely concentrated in that state, but certain benefits accrue nationally, or, for that matter, globally.

Interstate externalities also arise as a result of existence (non-use) values placed on natural resources by out-of-state citizens. Such existence values provide a powerful justification for federal control over exceptional natural resources such as national parks.

All three of these interstate externality rationales justify only limited federal intervention: intervention designed to internalize the externality. In contrast, much of federal environmental law, such as the NAAQS under the Clean Air Act, regulates purely local effects.

2. Economies of Scale: Advocates of federal regulation often maintain, though without much empirical support, that centralization has strong economies of scale advantages. The economies of scale argument is most plausible at the earlier stages of the regulatory process, particularly with respect to the determination, through risk assessment, of the adverse effects of particular pollutants. Indeed, there is little reason

for this determination to be replicated in each state.

The force of the rationale, however, is far less compelling at the standard-setting phase. At this phase, not only are the savings from eliminating duplication of efforts likely to be much lower, but centralization will have serious social costs. Indeed, different regions have different preferences for regulation, derive different benefits from improving environmental quality, and face different costs of environmental protection. While in principle federal regulation could be attentive to these differences, in practice it is far more likely to be uniform.[20]

3. Uniformity: As already discussed, federal environmental standards are generally minimum standards. The states remain free to impose more stringent standards if they wish to. A few standards, however, which apply to mobile sources, principally automobiles, and pesticides, are both floors and ceilings: they preempt both more stringent and less stringent state standards. Uniformity of this sort can be desirable for product standards where there are important economies of scale in production. In such circumstances, disparate regulation would break up the national market for the product and be costly in terms of foregone economies of scale.

The benefits of uniformity, however, are far from compelling in the case of process standards, which govern the environmental consequences of the manner in which goods are produced, rather than the consequences of the products themselves. Indeed, unlike

the case of dissimilar product standards, there can be a well functioning common market regardless of the process standards governing the manufacture of the products traded in the market.

Particularly in the European context, harmonization of environmental process standards is advocated as a means to deny a comparative advantage to states with lax environmental standards. But the costs of complying with environmental regulation, or, for that matter, the costs of complying with all regulations, are only one component of the total costs of production. Other components include a state's investments in infrastructure, health care, and education, as well as its access to raw materials, wages, and labor productivity. These factors, which can have a significant effect on production costs, are unlikely to be the subject of governmental harmonization efforts. Thus, rather than eliminating cost differences, the harmonization of environmental standards has the effect of conferring a competitive advantage on states that perform well on non-harmonizable components of costs.

4. Protection of Minimum Levels of Public Health: There is a powerful notion, informed in part by constitutional considerations, that a federal polity should ensure all its citizens a minimum level of environmental protection. This argument is frequently invoked by supporters of federal regulation (Stewart 1977). At some level, this justification is obviously compelling: a minimum level of health ought to count as a basic human right, in the same manner as minimum levels of

education, housing, or access to employment. From the perspective of this justification, there are two problems with federal environmental regulation. First, regulation seeks to limit the risk of exposure to particular pollutants or from particular sources, rather than limiting aggregate levels of environmental risk. As a result, the approach is both overinclusive (it regulates more than the minimum that has a claim to quasi-constitutional legitimacy) and underinclusive (it makes no effort to determine aggregate exposure levels, and therefore whether some individuals are in fact below the minimum). Second, because environmental risks are only one component of health risks, it is difficult to understand, particularly in the United States, why the federal government has such a preeminent role with respect to environmental regulation when it does relatively little with respect to the provision of general health care. In fact, investments in health benefits such as immunizations or prenatal care would have a far larger impact on health than investments in environmental regulation. As a result, the justification for federal regulation based on the need to guarantee a minimum level of health calls for a radically different form of regulation than that currently in effect: one that focuses on total environmental health risks and the interactions between environmental health risks and other health risks.

5. International Treaty Obligations: Increasingly, domestic environmental regulation, for example in the case of ozone

depleting chemicals, is undertaken in response to international treaty obligations. To the extent that the federal government plays an exclusive role in international relations, it is probably desirable that the federal government should also bear primary responsibility for domestic regulation that implements treaty obligations.

6. Role of Public Choice Considerations: Some commentators make normative claims against the devolution of federal responsibilities to the states on the grounds, based largely on the theory of collective action, that environmental interests will be relatively under-represented at the state level (Swire 1996). If the theory of collective action is taken seriously, however, the existence of federal regulation would also be difficult to explain: concentrated industrial interests with large stakes in the outcome ought to overpower citizen-breathers even at the federal level.

An extensive public choice literature suggests that the impetus for environmental regulation sometimes comes, implicitly or explicitly, from the regulated firms themselves, which, through rents and barriers to entry obtain an advantage relative to other firms in the industry (Keohane, Revesz, and Stavins 1997). At other times, the advocates are particular regions of the country, which hope to obtain a comparative advantage with respect to other regions (Pashigian 1985). Thus, the lineup in the debates is as likely to be polluter versus polluter or regional interest versus regional interest, as it is polluter

versus breather.

When the relevant interactions are seen in this manner, the case for federal regulation on public choice grounds is considerably weakened. A more definitive conclusion on this question, however, must await further sustained analysis.

* * *

In summary, in a well designed system, the allocation of authority between the federal government and the states would look very different than it does now. The federal government currently performs many functions that would better be discharged at the state level, and fails to perform some functions that can only be effectively carried out at the federal level. Perhaps this gap results in part from confusion over the strength of the race-to-the-bottom and interstate externality justifications for federal environmental regulation, which this essay hopes to help dispel.

NOTES

1. The impediments to such bargaining are explored in Revesz (1996).

2. I have dealt more extensively with some of the issues in this essay in Revesz (1992, 1996).

3. It is paradoxical that in the environmental area, the generally accepted premise is that jurisdictions extract too low a price from firms. In the land use context, influential support exists for the proposition that the price that jurisdictions extract is too high (Been 1991).

4. Cumberland (1979) argues that interstate competition can lead to detrimental results as a result of factors such as the excessive discounting of future damages, but provides no argument for why this determination would be performed better at the federal level.

5. In a companion, unpublished manuscript, they argue that their conclusion that competition among states produces efficient outcomes holds even if individuals are mobile (Oates and Schwab 1987). If individuals are mobile, they will sort out, as in the Tiebout model, by reference to their preference for environmental protection. Individuals who are willing to trade off a great deal in wages for better environmental quality will move to jurisdictions that impose stringent controls on industry; individuals who attach less importance to environmental quality will go to dirtier areas.

6. There is no consensus in the academic literature on whether, on average, states and localities tax or subsidize capital (Mieszkowski and Zodrow 1989).

7. See, for example, Georgia Rules and Regulations for Air Quality Control (1972).

8. The savings can be substantial. For example, a study in the early 1970s, when tall stack credits were most prevalent showed that the cost of complying with regulatory requirements were between $60/kw and $130/kw for a new lime scrubber, as compared with between $4/kw and $10/kw for a tall stack (Senate Committee on Public Works 1974).

9. For discussion, see Revesz (1996).

10. Such incentives for externalization are not confined to the United States. For example, in the 1970s, France had an effluent fee system for water pollution in regions in which part

of the pollution would affect neighboring countries (Unweltprobleme des Rheins 1976).

11. See, for example, New York v. EPA, 716 F.2d 440, 443-44 (7th Cir. 1983); New York v. EPA, 710 F.2d 1200, 1204 (6th Cir. 1983).

12. See, for example, New York v. EPA, 716 F.2d 440, 443 (7th Cir. 1983); New York v. EPA, 710 F.2d 1200, 1204 (6th Cir. 1983).

13. See, for example, New York v. EPA, 852 F.2d 574, 578-79 (D.C. Cir. 1988), *cert. denied*, 489 U.S. 1065 (1989); Vermont v. Thomas, 850 F.2d 99, 103 (2d Cir. 1988).

14. See, for example, New York v. EPA, 852 F.2d 574, 578-79 (D.C. Cir. 1988), *cert. denied*, 489 U.S. 1065 (1989); Vermont v. Thomas, 850 F.2d 99, 104 (2d Cir. 1988); New York v. EPA, 716 F.2d 440, 443 (7th Cir. 1983); New York v. EPA, 710 F.2d 1200, 1204 (6th Cir. 1983).

15. See, for example, Air Pollution Control District v. EPA, 739 F.2d 1071, 1085-88 (6th Cir. 1984); Connecticut v. EPA, 656 F.2d 902, 910 (2d Cir. 1981).

16. See, for example, Connecticut v. EPA, 696 F.2d 147, 165 (2d Cir. 1982); Air Pollution Control District v. EPA, 739 F.2d 1071, 1092-93 (6th Cir. 1984).

17. See New York v. EPA, 852 F.2d 574, 580 (D.C. Cir. 1988), *cert. denied*, 489 U.S. 1065 (1989).

18. Of course, this strategy can be followed only if it does not lead to a violation of the federal ambient standards in the upwind state.

19. See Air Pollution Control District v. EPA, 739 F.2d 1071, 1092-93 (6th Cir. 1984).

20. As discussed above, the Clean Air Act does impose disuniform ambient standards, determined by whether an area is covered by the PSD or nonattainment programs, but the differences are not explainable by the factors discussed above (Oren 1988).

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