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“FACTS ARE STUBBORN THINGS”: AN EMPIRICAL REALITY CHECK IN THE THEORETICAL DEBATE OVER THE RACE-TO-THE-BOTTOM IN STATE ENVIRONMENTAL STANDARD-SETTING

Scott R. Saleska† and Kirsten H. Engel††

INTRODUCTION

A central rationale for placing primary responsibility for environmental protection with federal authorities—as opposed to state or local authorities—is the long-standing belief that, in the absence of federal regulation, state governments will engage in a welfare-reducing “race-to-the-bottom” in environmental standard-setting for the purpose of attracting and retaining mobile industries.¹ According to this rationale, failures in the national market for “industrial firm locations,” such as the failure illustrated by the classic “prisoner’s dilemma” of non-cooperative game theory,² provide economic incentives that discourage individual

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¹ The “race-to-the-bottom” theory has existed as a legal rationale for the imposition of national minimum environmental standards under federal environmental statutes such as the Clean Air and Clean Water Acts. See Richard B. Stewart, *Pyramids of Sacrifice? Problems of Federalism in Mandating State Implementation of National Environmental Policy*, 86 *YALE L.J.* 1196, 1211-12 (1977); Richard B. Stewart, *The Development of Administrative and Quasi-Constitutional Law in Judicial Review of Environmental Decisionmaking: Lessons from the Clean Air Act*, 62 *IOWA L. REV.* 713, 747 (1977); Craig N. Oren, *Prevention of Significant Deterioration: Control-Compelling Versus Site-Shifting*, 74 *IOWA L. REV.* 1, 29 (1988); Vicki Been, “Exit” as a Constraint on Land Use Exactions: Rethinking the Unconstitutional Conditions Doctrine, 91 *COLUM. L. REV.* 473, 509 (1991).

² In the traditional story that accompanies the prisoner’s dilemma, two prisoners who are accused of committing a crime are separately interrogated by the district attorney and each faces the same two choices: “cooperate” (with each other) by maintaining silence about the crime; or “defect” by confessing joint involvement in the crime. Each prisoner is unable to consult with the other prisoner in determining what course of action to follow. If both remain silent, the district attorney will only have sufficient evidence to convict the two of a lesser crime for which there is a light sentence; however, if both confess, each is given a sentence of moderate severity. If one confesses but the other does not, the one who confesses is rewarded with release while the silent prisoner is punished with the harshest possible sentence. In the classic prisoner’s dilemma, the punishments are arranged such that overall time served (the sum of the two jail terms) is least if neither confesses. But because each has the possibility of getting a better individual deal (full release) if she confesses, and because each risks getting a worse individual deal (the harshest possible sentence) if she remains silent, each follows her

states from adopting optimally stringent environmental standards. The results of such a "race-to-the-bottom" are inadequate environmental standards, poor environmental quality, and lower overall social welfare. The consensus solution to this problem consists of legally binding agreements reached collectively by state representatives at the level of the federal government and enacted as federal law.³ The federal environmental laws, because they are national in scope, provide a minimum environmental quality threshold for states, thereby circumventing the environmentally-based interstate competition for industries that would otherwise drive a race-to-the-bottom.⁴

Six years ago, Professor Richard Revesz initiated a heated debate within the legal academic community concerning the integrity of the race-to-the-bottom rationale for federal environmental regulation. Revesz argued that there was no race-to-the-bottom in state environmental standard-setting, and that interstate competition should actually be

own self-interest and confesses. For a discussion of the theoretical aspects of the prisoner's dilemma and its application in economics and social science see: ROBERT AXELROD, *THE EVOLUTION OF COOPERATION* 7-11 (1984); R. DUNCAN LUCE & HOWARD RAIFFA, *GAMES AND DECISIONS: INTRODUCTION AND CRITICAL SURVEY* 95 (1967); SHAUN P. HARGREAVES HEAP & YANIS VAROUFAKIS, *GAME THEORY: A CRITICAL INTRODUCTION* 146-66 (1995); ERIC RASMUSEN, *GAMES AND INFORMATION* 17-18 (1994).

³ In practice, the national environmental laws are implemented through a cooperative arrangement between state and federal authorities. *See, e.g.*, Federal Insecticide, Fungicide, and Rodenticide Act ("FIFRA"), 7 U.S.C. §§ 136-136(y); Toxic Substances Control Act ("TSCA"), 15 U.S.C. §§ 2601-2692; Endangered Species Act ("ESA"), 16 U.S.C. §§ 1531-1544; Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. §§ 1201, 1202, 1211, 1221-1230(a), 1231-1243, 1251-1279, 1281, 1291-1309, 1311-1316, 1321-1328; Federal Water Pollution Control Act (FWPCA), 33 U.S.C. §§ 1251-1387; Oil Pollution Act of 1990 ("OPA"), 33 U.S.C. §§ 2701-2761; Safe Drinking Water Act ("SDWA"), 42 U.S.C. §§ 300(f)-300(j)(26); National Environmental Policy Act ("NEPA"), 42 U.S.C. §§ 4321-4370(d); Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §§ 6901-6992(k); Clean Air Act ("CAA"), 42 U.S.C. §§ 7401-7671(q); Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), 42 U.S.C. §§ 9601-9675; Emergency Planning and Community Right-to-Know Act ("EPCARA"), 42 U.S.C. §§ 11001-11050. Although national in scope and implemented through regulations promulgated by the federal Environmental Protection Agency, many of the federal environmental laws provide for the delegation of permitting and enforcement responsibilities to state officials with the federal government retaining some oversight. *See, e.g.*, FWPCA, 42 U.S.C. § 1342(b) (providing for the delegation to states of the Clean Water Act's industrial discharge permitting and enforcement powers); CAA, 42 U.S.C. §§ 7661(a), (b) (providing for the delegation to states, of industrial air pollution discharge permitting and enforcement powers); RCRA, 42 U.S.C. § 6926 (providing for the delegation of the power for states to create permitting program for hazardous waste disposal facilities).

⁴ Because federal environmental laws specify that less stringent state standards are preempted by stronger federal standards, but often allow state standards that are more stringent than federal standards, federal standards impose environmental quality "floors," but not always "ceilings." *See, e.g.*, FWPCA, 42 U.S.C. § 1370 (1994) (prohibiting states from adopting or enforcing water standards less stringent than those promulgated under the Act, but otherwise retaining state authority to adopt water standards); CAA, 42 U.S.C. § 6929 (same with respect to air standards).

viewed as welfare-enhancing rather than welfare-reducing.⁵ The theoretical foundation for Revesz's argument is neoclassical economics, according to which ideally competitive markets lead to economically-efficient outcomes. Revesz extended this theory to the public sphere and argued that competitive markets will also lead to efficient levels of local government-supplied environmental protection.⁶

The theoretical foundation for the race-to-the-bottom argument, by contrast, is non-cooperative game theory, a branch of economics invented specifically to deal with particular exceptions to the "ideally competitive market" assumption underlying much of neoclassical economics.⁷ The classic prisoner's dilemma model, which is perhaps the simplest example of a welfare-reducing game, can be used to illustrate conditions under which the interstate market is not ideally competitive and to show why two states might consequently establish sub-optimally lax environmental standards in order to attract industry—even though they would both be better off if they collectively maintained optimally stringent environmental standards.⁸ Unlike the "spillover" rationale for

⁵ See Richard Revesz, *Rehabilitating Interstate Competition: Rethinking the Race-to-the-Bottom Rationale for Federal Environmental Regulation*, 67 N.Y.U. L. Rev. 1210, 1211-12 (1992) ("contrary to prevailing assumptions, competition among states for industry should not be expected to lead to a race that decreases social welfare; indeed, as in other areas, such competition can be expected to produce an efficient allocation of industrial activity among the states").

⁶ See *id.* at 1253.

⁷ Von Neuman and Morgenstern developed game theory out of frustration with those assumptions of neoclassical economics that are inappropriate for markets consisting of relatively few players. In such small markets, the two scholars showed that the actions of any single individual would depend upon how that individual believed the other participants would respond to her actions, much like the attitude of players in a game. See generally JOHN VON NEUMANN & OSKAR MORGENSTERN, *THEORY OF GAMES AND ECONOMIC BEHAVIOR* (1947) (this book is considered the birthplace of modern game theory); MANCUR OLSON, JR., *THE LOGIC OF COLLECTIVE ACTION* (1965) (applying game theory to the problem of public goods); Garrett Hardin, *The Tragedy of the Commons*, 162 Sci. 1243-45 (1968) (applying game theory and the prisoner's dilemma to environmental problems specifically).

⁸ The analogy between the prisoner's dilemma and states' use of regulatory standard-setting to compete with other states for mobile industries is a simple one. In brief, states engaged in competition for industry can be thought of, in the most simplistic model, as facing two basic choices: (1) maintain the stringency of their existing environmental standards, or (2) relax the stringency of their environmental standards. States face a dilemma similar to the prisoner's dilemma if, through the relaxation of their standards (assuming there are no changes in any of the other states' standards), one state can attract industries currently located in other states. In such a situation, each state will relax its standard so as to capture the economic benefits of additional industries, although collectively the states engaged in the competition would be better off if they maintained the stringency of their existing standards. See Kirsten H. Engel, *State Environmental Standard-Setting: Is There a "Race" and Is it "to-the-Bottom"?* 48 HASTINGS L.J. 271, 304-05 (1997) (for a concrete example of this "Environmental Regulator's Dilemma"). Other scholars analogize interstate competition in environmental standard-setting to the prisoner's dilemma. See, e.g., Kathryn Harrison, *The Regulator's Dilemma: Regulation of Pulp Mill Effluents in the Canadian Federal State*, 29 CAN. J. POL. SCI. 469 (1996); James A. Brander, *Economic Policy Formation in a Federal State: A Game Theo-*

federal regulation,⁹ the race-to-the-bottom argument does not apply strictly to environmental problems resulting from interstate externalities, such as the "spillover" of air or water pollution across state boundaries. Instead, the race-to-the-bottom argument is based upon the need to correct environmental problems whose effects may be contained wholly within a state's boundaries, but whose causes are rooted in interstate competition that takes place under less-than-ideal conditions.

Revesz and others following him argued, however, that a race-to-the-bottom in state environmental standard-setting was an economic fiction, and had "no theoretical foundation."¹⁰ Reasoning by analogy, Revesz asserted that since interstate competition in environmental standard-setting is efficiency-enhancing in an economic model developed by Wallace Oates and Robert Schwab,¹¹ we should expect that interstate competition in the real world is likewise efficiency-enhancing.¹² Thus,

retic Approach, in INTERGOVERNMENTAL RELATIONS 33, 47-49 (Richard Simeon ed., 1985); Revesz, *supra* note 5, at 1229-31; PETER S. MENELL & RICHARD B. STEWART, ENVIRONMENTAL LAW AND POLICY 246 (1994); Richard B. Stewart, *Environmental Regulation and International Competitiveness*, 102 YALE L.J. 2039, 2058-59 (1993).

⁹ According to the "spillover" rationale, federal intervention is necessary to prevent the environmental, social and economic losses resulting from interstate pollution because the originating state has insufficient incentive to curb the pollution (because they benefit from having the harmful effects of pollution externalized) and the dispersion of the pollutants may prevent the injured state from seeking legal recourse through an action in nuisance or trespass. See Stewart, *supra* note 1, at 1215-16 (explaining spillover rationale); Thomas W. Merrill, *Remarks as Third Panelist on Panel III: International Law, Global Environmentalism, and the Future of American Environmental Policy*, 21 ECOLOGY L.Q. 486 (1994) ("The spillover argument is in many respects the most obvious justification for federalization" of environmental law.).

¹⁰ Revesz, *supra* note 5, at 1244. Revesz's claim that there is "no theoretical foundation" for a race-to-the-bottom is a puzzling one, in light of the well-developed foundation for such a race provided by the half-century of scholarship in non-cooperative game theory. See *supra* note 7 (for references); see also James A. Brander, *Economic Policy Formation in Federal State: A Game Theoretic Approach*, in INTERGOVERNMENTAL RELATIONS 33, 47-49 (Richard Simeon ed., 1985); and Eli M. Noam, *Governmental Regulation of Business in a Federal State: Allocation of Power Under Deregulation*, 20 OSGOOD HALL L.J. 762-72 (1982) (applying prisoner's dilemma-like models to the race-to-the-bottom problem in the context of a federal system of states).

¹¹ See Wallace E. Oates & Robert M. Schwab, *Economic Competition Among Jurisdictions: Efficiency Enhancing or Distortion Inducing?*, 35 J. PUB. ECON. 333, 336-39 (1988). Oates and Schwab construct a neoclassical economic model in which jurisdictions independently establish efficient environmental standards despite competing against one another for a mobile stock of capital. In the model, the jurisdictions may entice mobile capital either by lowering taxes or by relaxing environmental standards. Lower taxes lead to increased capital and hence higher wages, but at the expense of lower public revenues. Laxer emissions standards also lead to increased capital and hence increased wages, but at the expense of environmental quality. Under these constraints, rational regulators in the individual jurisdictions will choose both an efficient environmental standard and tax rate. The efficient environmental standard will be the standard that corresponds to the point at which the marginal private cost of pollution equals the marginal private benefit from additional capital. See Engel, *supra* note 8, at 305-09 (for a more detailed explanation of the model).

¹² See Revesz, *supra* note 5, at 1211-12.

Revesz concludes that there is no race-to-the-bottom.¹³ Revesz's article did not call attention to the fact that his conclusions depend on the "ideally competitive market" assumption, even though game theory rose to prominence as a branch of economics in the past forty years, in large part because of the widespread failure of that assumption in real-world economies. The article also failed to consider what empirical evidence might exist supporting his proposed analogy between the Oates and Schwab model and the real world. Revesz made no argument—empirical, theoretical, or otherwise—for why his preferred model should be considered more plausible than the alternative, prisoner's dilemma-like models of non-cooperative game theory.¹⁴ He nonetheless asserted, on the basis of the Oates and Schwab analogy alone, that there was little reason to believe that the effects of interstate competition upon state environmental standards were welfare-reducing, and that interstate competition instead should be presumed to be efficiency and welfare-enhancing.¹⁵

A central thesis of our article is that simple assertions of the applicability of one theory or another, in the absence of any consideration of evidence about the way the world actually works, constitute what we refer to as "theoretical hubris," a problem that is unfortunately not uncommon in the legal literature. The palliative for theoretical hubris is "stubborn facts" that put proposed theories to the empirical test. In a recent article, Engel began applying this empirical palliative in the context of the race-to-the-bottom debate.¹⁶ Drawing from a large economic literature on firm location studies, together with data from a survey she conducted of state environmental regulators and others influential in state environmental standard-setting, Engel argued that state environmental standard-setting, in the absence of a national federal backstop, would result in sub-optimal environmental standards.¹⁷

¹³ See *id.*

¹⁴ Near the beginning of his article, Revesz (to illustrate the position he will argue against) presents a simple prisoner's dilemma-like model of interstate competition in environmental standard-setting that results in a race-to-the-bottom. See Revesz, *supra* note 5, at 1229-33. While Revesz explains the Oates and Schwab model, which produces a different (efficient) outcome, he fails to indicate why the latter model should trump the former one.

¹⁵ See Revesz, *supra* note 5, at 1229-33; see also Henry R. Butler & Jonathan R. Macey, *Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority*, 14 *YALE J. ON REG.* 23, 42-45 (1996) (rejecting the race-to-the-bottom rationale for federal environmental regulation on the grounds that there are variations in local preferences for environmental quality and an asserted association between wealth and higher levels of environmental quality).

¹⁶ See Engel, *supra* note 8.

¹⁷ See *id.* at 351-59.

Since then, Revesz responded¹⁸ to Engel's criticism, as well as to the comments of his other critics, Daniel Esty,¹⁹ Joshua Sarnoff,²⁰ and Peter Swire.²¹ Although he does not present any empirical evidence of his own, Revesz criticizes Engel's empirical argument as being insufficiently compelling.²² Instead, Revesz's rejection of federal environmental standards relies almost solely upon a "presumption in favor of decentralization"²³ that may be rebutted if there is "a systemic evil in letting states decide the level of environmental protection that will apply within their jurisdictions."²⁴ Thus, Revesz indicates that this "presumption" should substitute for empirical evidence concerning what is, at bottom, an empirical question.

Part I of this article briefly reviews the race-to-the-bottom debate, replies to Revesz's critique of Engel's empirically-based argument, and presents new empirical findings to support Engel's initial conclusions that, in relaxing their environmental standards to attract mobile industry, a substantial minority of states engage in welfare-reducing race-to-the-bottom behavior.²⁵ Part II proposes possible explanations for the apparent irrationality of many state environmental regulators that is inferred from empirical evidence supporting the hypothesis that some regulators are engaged in a race-to-the-bottom.²⁶ In brief, our claim in Part I, that some states engage in a race-to-the-bottom, rests upon our finding that states relax their standards in order to attract industry, despite a large body of studies indicating that economic performance is unaffected by

¹⁸ See Richard Revesz, *The Race-to-the-bottom and Federal Regulation: A Response to Critics*, 82 MINN. L. REV. 535, 535-37 (1997).

¹⁹ See Daniel C. Esty, *Revitalizing Environmental Federalism*, 95 MICH. L. REV. 570, 627-38 (1996) (because states act strategically and the market for environmental-policy-driven location rights is relatively imperfect, untrammelled regulatory competition among states produces sub-optimal state environmental standards).

²⁰ See Joshua D. Sarnoff, *The Continuing Imperative (But Only from a National Perspective) for Federal Environmental Protection*, 7 DUKE ENVTL. L. & POL'Y F. 225, 278-84 (1997) (arguing that, even if correct, Revesz' argument for the efficiency of state environmental standard-setting relies upon the appropriateness of aggregating resident preferences for environmental quality and economic well-being on the state level, whereas aggregation at the national level may be more appropriate and yield different measures of social welfare).

²¹ See Peter P. Swire, *The Race to Laxity and the Race to Undesirability: Explaining Failures in Competition Among Jurisdictions in Environmental Law*, 14 YALE J. ON REG. 67, 94-104 (1996) (arguing that the market failures that define environmental problems contradict the assumptions underlying the economic models predicting the efficiency of state environmental standard-setting despite interstate competition for mobile industry).

²² See Revesz, *supra* note 18, at 554-56.

²³ *Id.* at 536 ("My starting point is a rebuttable presumption in favor of decentralization.").

²⁴ *Id.* at 537 ("This presumption for decentralization should be overcome, however, if there is a systemic evil in letting states decide the level of environmental protection that will apply within their jurisdictions.").

²⁵ See *infra* text accompanying notes 28-55.

²⁶ See *infra* text accompanying notes 56-75.

environmental stringency and that industry is largely indifferent to variations in stringency of environmental standards when making location decisions. Part II seeks to answer the question: Why might state regulations be set at seemingly irrational, i.e., low, levels?²⁷ This seemingly irrational standard-setting results in sub-optimally low environmental standards just as would a prisoner's dilemma dynamic. As we discuss in Part II, however, the real world behavior of state regulators points to a dynamic different from both the classic prisoner's dilemma-like race-to-the-bottom and the neoclassical models of ideal competition.²⁸ Drawing on the economic development policy literature, a simple model of decision-making under uncertainty is proposed, which illustrates a plausible incentive structure that would explain why state policy decisions are not always rational for the state as a whole, even if they are rational from the perspective of the individual decision-makers who make state policy. Finally, in Part III an empirically-based risk-benefit approach to environmental law and policy that takes account of the inevitable uncertainties faced by policymakers is proposed. We advocate this approach as a preferred alternative to what we call the "ideological stacked deck" of across-the-board presumptions.

I. EMPIRICAL EVIDENCE OF A RACE-TO-THE-BOTTOM IN STATE ENVIRONMENTAL STANDARD-SETTING

A. TESTING THE "RACE-TO-THE-BOTTOM" HYPOTHESIS WITH EMPIRICAL EVIDENCE

Although it is generally acknowledged that competition among states to attract or retain industries causes states to relax their environmental standards,²⁹ such relaxation by itself does not constitute a race-to-

²⁷ The terms "rational" and "irrational" are used in their precise economic sense: decisions that maximize expected net welfare are by definition rational while decisions that avoid welfare-maximizing choices in favor of sub-optimal ones are by definition irrational.

²⁸ The data raise this third possibility because it provides a picture that is inconsistent with both a classic prisoner's dilemma-like model and with ideally-competitive neoclassical models: both of these modeling approaches assume that industry location decisions are significantly affected by stringency of environmental standards. Further, both modeling approaches assume rationality in decision-making, i.e., that a state, when faced with several alternatives, will always opt for the one with the highest expected net social welfare payoff. The data we present here suggest that states which lower standards are not acting rationally from the perspective of overall state welfare. Essentially, these states are failing to choose the alternative that would be best for the state as a whole. Since the data does not support the theory that interstate competition mirrors the classic prisoner's dilemma, nor does it mirror competitive efficiency, it must be concluded that a third possibility, consisting of state regulators reacting to incentives different from that of the state as a whole, best explains the empirical data.

²⁹ In addition to revising existing standards to make them less stringent, "relaxation" in this context also refers to the failure to adopt an environmental standard in the first place, or to delay the adoption of a standard. Given that the existence of lowered standards in response to interstate competition rests upon anecdotes rather than a systematic study, it is surprising that

the-bottom. For purposes of the current scholarly debate, a "race-to-the-bottom" refers to a relaxation of state environmental standards that also results in lower net social welfare.³⁰ In arguing that there is no "race-to-the-bottom," Revesz is not necessarily contending that states do not relax their standards in response to interstate competition for industry, but that the relaxation of standards does not occasion any lessening of social welfare.³¹ Revesz's scenario could result from state standards that were too high in the first place, i.e., a situation in which lower standards return to the state sufficient additional economic benefits to more than make up for the welfare losses that followed from the lowering of state environmental quality.³²

In a prior article,³³ Engel assembled empirical evidence to test the race-to-the-bottom hypothesis and argued that the evidence refuted the proposition that state competition is efficiency-enhancing, and that it instead tended to support the idea that interstate competition for industry results in a welfare-reducing race-to-the-bottom in state environmental standard-setting. Engel's evidence consisted of: (1) data from a survey of state environmental regulators showing that a substantial minority of state regulators admitted a willingness to relax their state's environmental standards out of a conviction that lax standards are important to attracting and retaining industries;³⁴ and (2) the widely replicated results of

both policy-makers and scholars alike assume that the relaxation of standards is the natural state response to interstate competition. Part III of this Article presents data from a survey that tested this assumption. See *infra* text accompanying notes 76-84.

³⁰ See Revesz, *supra* note 5, at 1219.

[A] race to the bottom requires not just the existence of a "race," but also that the race be "to the bottom." This latter element requires, first, that a competitive jurisdiction adopt a less stringent pollution control standard than an otherwise identical island jurisdiction would have adopted. Second, it requires that the less stringent standards that emerge from the competitive process be socially undesirable.

Id.

³¹ See *id.* at 1241, 1243.

³² Thus, Revesz's critique extends only to federal regulation and the belief that this regulation prevents a race-to-the-bottom. His critique does not extend to federal standards intended to prevent any relaxation of state environmental standards caused by interstate competition, regardless of the impact upon total social welfare. Nor does Revesz's critique undermine federal standards deemed necessary according to a rationale other than the race-to-the-bottom, such as the need to prevent interstate spillovers, to take advantage of economies of scale, or to enforce a human right to minimum levels of public health. See Engel, *supra* note 8, at 285-87.

³³ See *id.*

³⁴ See *id.* at 337-47. The survey data relied upon in Engel's article and in the present paper came from responses to a mailed questionnaire sent to five groups of people influential in state environmental standard setting: state environmental agency officials (air and water officials, as well as officials in the State Administrator's office), state legislators, state economic development officials, representatives of state chambers of commerce, and staff of state citizen environmental organizations. The survey asked each group of respondents five sets of substantive questions relevant to the race-to-the-bottom hypothesis. The survey found that regulators and economic development officials in many states are concerned about industry relocation and siting, that such concern does influence their environmentally related actions,

econometric studies showing that stringency of state environmental standards is a small to negligible factor in industry-location decisions.³⁵ In one prominent firm location study, for example, Timothy Bartik was able to rule out the existence of all negative effects upon industry location attributable to environmental regulatory stringency, with the exception of very small effects.³⁶ Engel argued that this data, taken together, provided support for the logical inference that if (a) states compete for industry by relaxing environmental standards (as indicated by (1) above), but (b) industry location is substantially unaffected by this competition (as indicated by (2) above), then (c) interstate competition will result in a lessening of state welfare because the state fails to gain economic benefits to offset its environmental quality losses.³⁷

B. THE REVESZ RESPONSE AND THE QUESTION OF THE "BASELINE"

Professor Revesz criticizes the logic behind Engel's conclusion that states are engaged in a race-to-the-bottom by observing that the conclusion assumes that the starting point, or "baseline," from which a state relaxes its environmental standards, pursuant to interstate competition, must be presumed to be optimal or less than optimal in order for the consequence to be a race-to-the-bottom.³⁸ Revesz suggests that it is possible that the "baseline" environmental standard of an "island" jurisdiction might be inefficiently high, in which case lowering standards will not signal a race-to-the-bottom, but will instead bring the state's standards closer to their optimal level.³⁹ Revesz speculates that a state might

policies and standards, and that a substantial minority of states have, at some point in the past, relaxed their standards in response to this concern. *See id.* at 377-98 (Appendix) (The methods used to conduct the survey and a full summary of the survey's results can be found in the article.).

³⁵ *See id.* at 321-37 (studies cited and discussed); *see also* Arik Levinson, *Environmental Regulations and Manufacturers' Location Choices: Evidence from the Census of Manufactures*, 62 J. PUB. ECON. 5 (1996) (Although Levinson uses a broader range of industries and measures of stringency than had been used in previous studies, he confirms earlier studies by showing that interstate differences in environmental regulations do not systematically affect the location choices of most manufacturing plants.).

³⁶ *See* Timothy J. Bartik, *The Effects of Environmental Regulation on Business Location in the United States*, 22 GROWTH AND CHANGE 22, 23 (1988). To give some indication of what "small" means in this context, Bartik reports that if a state were to tighten its standard for particulate reduction (the most sensitive of the environmental parameters tested) by an amount sufficient to raise its rankings from the national average to the top one-third in state environmental stringency, the state would lose no more than 3.3% of the total number of new plants that would have located in its state had the state never tightened its particulate standard. *See id.* By contrast, the same size change in the percentage of a state's labor force that is unionized would produce a 30-40% drop in the number of new firm sitings. *See id.* at 33.

³⁷ *See* Engel, *supra* note 8, at 351-54 (for a more detailed explanation of this conclusion).

³⁸ *See* Revesz, *supra* note 18, at 555.

³⁹ *Id.*

set sub-optimally stringent baseline environmental standards “perhaps because the state believed that it had ‘monopoly power’ in the market.”⁴⁰

While Revesz correctly points out an important assumption underlying Engel’s approach to demonstrating the existence of a race-to-the-bottom, he offers nothing to counter the assumption that a state’s pre-competition baseline is optimal or sub-optimal, except his own unsupported speculation that states might believe themselves to be monopolists. There is no basis, however, for thinking this to be true. Both leading economic models of interstate competition that Revesz discusses assume that the environmental standards of an “island” jurisdiction, or a jurisdiction that does not engage in interstate competition, will be optimal. For example, the Oates & Schwab model, upon which Revesz’s argument relies, assumes that an island jurisdiction’s environmental standards will be optimal.⁴¹ Similarly, the prisoner dilemma model also assumes that, in the absence of interstate competition, states will establish optimal environmental standards.⁴²

Other prominent models, public choice analysis being the most important,⁴³ would tend to predict that an island jurisdiction would adopt sub-optimally lax environmental standards.⁴⁴ According to the economic theory of regulation, laws tend to respond to the wants of small, cohesive special interest groups, such as industry, at the expense of the wants of the larger, more diffuse public.⁴⁵ The public, which is the intended beneficiary of stringent regulation, is often in a weaker political position than industry, which is the primary beneficiary of less regulation.⁴⁶

According to public choice analysis, a state’s baseline environmental standards are likely to be sub-optimally lax. Any lessening of state standards from the public choice baseline most assuredly results in a race-to-the-bottom. Although Revesz argues that there is no basis to think that the under-provision of environmental law posited by public choice analysis is any more severe at the state level than at the federal level, he does not appear to question the essential public choice claim

⁴⁰ *Id.*

⁴¹ See Oates & Schwab, *supra* note 11, at 336.

⁴² See Engel, *supra* note 8, at 304-05.

⁴³ See William N. Eskridge, Jr., *Symposium on the Theory of Public Choice: Politics Without Romance: Implications of Public Choice Theory for Statutory Interpretation*, 74 VA. L. REV. 275, 285 (1988) (public choice scholarship applies the lessons of game theory to the dynamics of interest groups seeking legislation).

⁴⁴ See OLSON, *supra* note 7, at 44 (problem of free-riders more severe for large groups than for small groups); Eskridge, *supra* note 43, at 286-87.

⁴⁵ See Olson, *supra* note 7, at 44; Eskridge, *supra* note 43, at 286-87.

⁴⁶ See Swire, *supra* note 21, at 101.

that interest group politics will under-provide for public goods like environmental protection.⁴⁷

In the end, however, the question of whether the baseline is optimal or sub-optimal is one that can be answered with empirical evidence. If the Revesz speculation that the baseline is too high is in fact correct, then this should be demonstrable by observation: lower environmental standards should in fact be associated with increased overall social benefits. Such an observation would, by definition, imply that the prior baseline was sub-optimally high. On the other hand, if increases in benefits are *not* observed to be associated with reductions in environmental standards, Revesz's speculation that they might be too high is empirically refuted. It is to this empirical question that we now turn.

C. FURTHER EMPIRICAL EVIDENCE OF A RACE-TO-THE-BOTTOM

To further test the conclusion that a substantial minority of states engage in a welfare-reducing race-to-the-bottom, we constructed additional hypotheses and tested them against additional empirical data. If interstate competition for industry through environmental standard-setting is welfare-enhancing (the "efficiency hypothesis"), then three conditions should hold for states that engage in such competition: (1) they should have laxer environmental standards, and hence, potentially worse environmental quality than similarly situated states with more stringent standards; but (2) they should experience stronger economic performance than their less competitive neighbors; and (3) they should experience net welfare gains after trading off (1) for (2).

Analysis of the third condition is beyond the scope of the study because it would entail a detailed cost-benefit assessment of economic and environmental gains and losses, including consideration of differences across state populations in preferences and marginal rates of substitution between environmental and economic amenities. The first and second conditions, however, when taken together, present an initial hurdle that must be overcome before the third condition becomes relevant. If there are environmental losses, but no detectable economic gains as a result of interstate competition, then the detailed cost-benefit calculus entailed in testing the third condition becomes academic. Under such circumstances there are no economic gains to be "traded off" against the environmental losses and the efficiency hypothesis is refuted.

⁴⁷ See Revesz, *supra* note 18, at 559 ("The public choice analysis in this article has explained reasons to expect both levels of government to under-provide environmental law, compared with the baseline of what the voters prefer.").

1. *Does Regulator Competitiveness Enhance Economic Performance?*

We conducted an empirical study of the first and second conditions, which together comprise the "initial hurdle" described above. To conduct this test, we used data on state economic performance, including growth in employment, growth in per capita income, and growth in gross state product. This data was obtained from the most recent statistics available from the U.S. Department of Commerce's *Survey of Current Business*.⁴⁸ We used data on state environmental quality, including air and water pollution, from the widely-used "Green Index."⁴⁹ We then sorted state regulators according to the degree of "competitiveness" they exhibited in their responses to survey questions designed to measure the extent to which they compete against other states for industry through environmental standard-setting.⁵⁰ Finally, we compared each state's degree of "competitiveness" against indicators of environmental quality and economic performance. If competition is welfare-enhancing, as the efficiency hypothesis posits, regulator competitiveness should be negatively correlated with indicators of environmental quality (the first condition), but positively correlated with indicators of economic performance (the second condition).

The results of our initial analysis are summarized in Table 1 and Figure 1. These results suggest that a state's willingness to "compete" with other states by lowering environmental standards is associated with: (1) either no detectable effect or a significant negative effect on environ-

⁴⁸ U.S. DEP'T OF COMMERCE, *SURVEY OF CURRENT BUSINESS* (1995).

⁴⁹ BOB HALL & MARY LEE KERR, *1991-1992 GREEN INDEX: A STATE-BY-STATE GUIDE TO THE NATION'S ENVIRONMENTAL HEALTH* (1992).

⁵⁰ The competitiveness indicator was derived by taking state regulator's responses to each of twelve questions in a survey of state regulators conducted by Kirsten Engel. This survey asked whether the regulator was aware of instances in which the state had relaxed, not adopted, or not enforced an environmental standard due, at least in part, to concerns over the impact of such action upon the location of new industry or the retention of existing industry within their state. See Engel, *supra* note 8, at 377 (listing summary of all survey questions; questions 5-14, 23, and 24, were the basis for the competitiveness indicator). "Competitiveness" was calculated as the number of "yes" answers to each of these twelve survey questions, and thus each survey respondent was assigned a competitiveness value that could range from zero to twelve. The number of regulators responding from a given state ranged from zero to four. Where more than one regulator responded from a given state in a given category, a state's "competitiveness" was derived from the average of all responses. Because this "competitiveness" value appeared to have an approximately log-normal distribution across survey respondents, for regression analysis we used $\log(\text{competitiveness} + 1)$ as the competitiveness indicator. In determining the association between the state's competitiveness and water pollution, only the responses of water pollution regulators was analyzed. Similarly, in determining the association between the state's competitiveness and air pollution, only the responses of air pollution regulators was analyzed. In determining the association between the state's degree of competitiveness and various indicators of economic growth, the responses of both air and water regulators were averaged together.

mental indicators in those states (as might be expected under both the efficiency and race-to-the-bottom hypotheses); and (2) no detectable impact, and sometimes even a negative impact, on indicators of economic performance (in contradiction to the prediction of the efficiency hypothesis, but consistent with the race-to-the-bottom hypothesis). In the initial analysis, for example, there was no detectable association between a state's overall regulator competitiveness and the strength of its overall "Green Policy." Partitioning environmental quality and regulator competitiveness into water and air sub-categories, however, increased analytical precision and revealed a statistically significant ($p < .05$) negative correlation (-0.5) between the degree of a state's competitiveness reported by water regulators and the Green Index's indicator of state water quality (Figure 1A).⁵¹

At the same time, however, the analysis failed to indicate any detectable positive correlation between a state's degree of environmental regulator competitiveness and its economic performance. We tested the associations between overall regulator competitiveness and a number of different indicators of economic performance (Table 1), including growth in employment, growth in per capita income, and growth in gross state product. Additionally, the growth in state product data was tested both as a whole and broken down by sector, including sectors which might benefit disproportionately from a competitive reduction in environmental standards, e.g., agriculture, mining, construction, manufacturing, manufacturing of durable and non-durable goods, transportation, etc. Correlation coefficients were mostly insignificant. Two indicators, growth in outputs from non-farm agriculture and the manufacture of durable goods, however, were significantly negative ($p < .05$) in their association with environmental competitiveness. The analyses conducted thus far fail to provide any support for the efficiency hypothesis that increased environmental competitiveness leads to stronger economic performance. Indeed, in some instances the association appears to go in the opposite direction.

⁵¹ The Green Index's composite score for water quality averages state rankings for toxic chemical release to surface water and to public sewers, toxic chemical underground injections, number of public sewers in noncompliance, investment in sewer needs until the year 2008, miles of rivers, streams, lakes and reservoirs impaired, spending on water quality and development, people served by groundwater, households served by own wells, households with septic tank only, pesticide-contaminated groundwater, surface and groundwater possibly contaminated, water systems violating the Safe Drinking Water Act, water systems in significant non-compliance, population with SDWA violations, and water use for drinking and cooking. See HALL AND KERR, *supra* note 49, at 35-38. The Green Index's composite score for air quality is based on similar indicators, including toxic releases into the air, National Ambient Air Quality (NAAQ) violations, per capita emissions of SO₂, NO, CO₂, etc. See *id.*

TABLE 1. THE EFFECT OF REGULATOR COMPETITIVENESS ON ENVIRONMENT AND ECONOMY ACROSS STATES: SIMPLE CORRELATION ANALYSIS. STATISTICALLY SIGNIFICANT CORRELATIONS ARE IN BOLD, WITH SIGNIFICANCE LEVEL INDICATED BY * ($P < .05$), AND ** ($P < .01$).

<i>Environmental^(a) Indicators</i>	"Competitiveness" ^(b) of:	Correlation between Indicator & "competitiveness" ^(c)
Overall "Green" Policy	All Regulators	+0.09
Air Quality	Air Regulators only	-0.16
Water Quality	Water Regulators only	-0.46*
<i>Economic Indicators^(d) growth rate of:</i>		
Gross State Product	All regulators	-0.09
Employment	"	-0.03
Per-Capita Income	"	-0.10
Growth in output, by sector:		
Farm	"	-0.05
Non-farm agriculture (services, forestry, fishing, etc.)	"	-0.41**
Mining	"	-0.19
Construction	"	-0.00
Manufacturing	"	+0.04
Durable Goods	"	-0.33*
Non-durable Goods	"	+0.12
Transportation & public utilities	"	-0.08
Wholesale trade	"	+0.03
Retail trade	"	-0.14
Finance, insurance, & real estate	"	-0.06
Services	"	-0.08
Government & public enterprise	"	+0.05

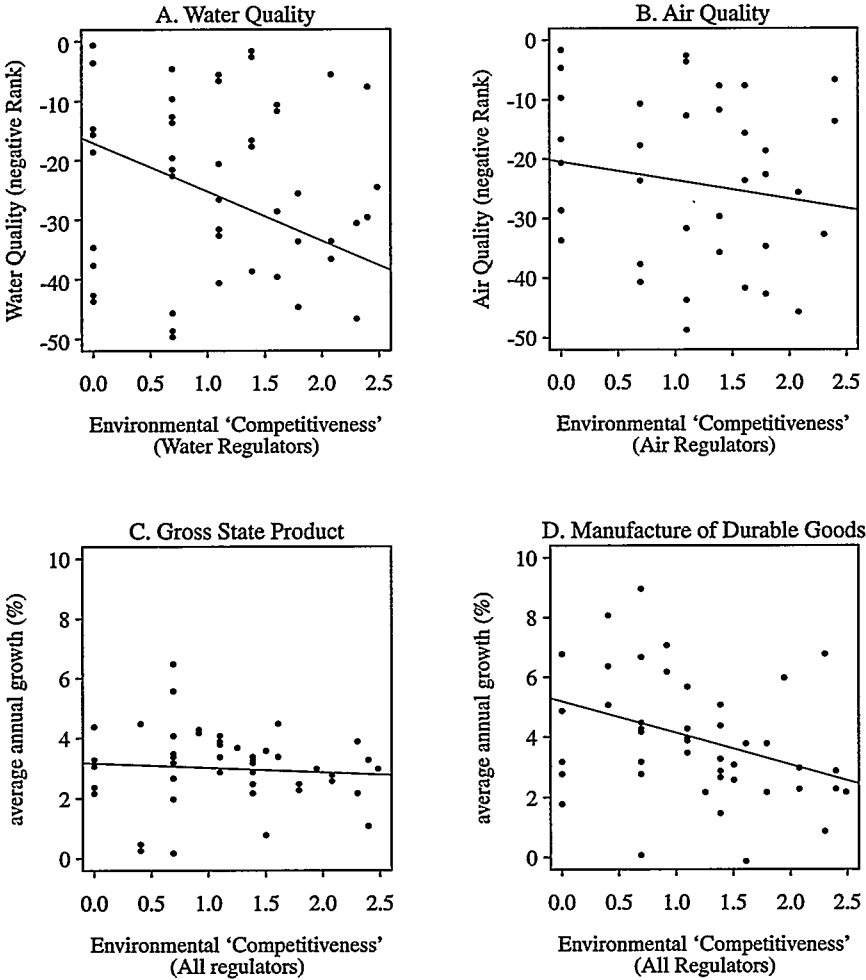
(a) Environmental indicators are based on a relative ranking (1="best" environmental quality) of states by the "Green Index." See *supra* note 51. "Green Policy" is an overall indicator of the strength of environmental policy generally, "water quality" and "air quality" are indicators of environmental quality of those media only. Since a high rank corresponds to comparatively low water quality, the negative rank was used in the correlation analysis so that positive correlations indicate a positive relation between competitiveness and the given indicator.

(b) The competitiveness indicator was derived from regulator responses to a survey of state environmental regulators. See *supra* note 50. Sample sizes were: N=45 (out of a possible 51 states) in regressions on all regulators (no regulators from Louisiana, Nebraska, New Mexico, Texas, Virginia, or West Virginia responded to the survey). N=33 states (regressions on air regulators only), and N=28 states (water regulators only).

(c) Simple correlation coefficient (range -1.0 to +1.0). Positive values mean that regulator competitiveness across states is positively associated with the indicator. Negative values indicate a negative association between the two. Statistical power was sufficient to resolve correlations of 0.25 (all regulators), 0.31 (water regulators only), and 0.29 (air regulators only) at the 90% confidence level, i.e., smaller real correlations would not be detected with confidence by this study.

(d) Economic indicators are from the U.S. Department of Commerce. See *supra* note 48. Economic growth rates are an average over 10 years (1983-1992), based on 1987 fixed weights.

FIGURE 1. GRAPHICAL ILLUSTRATION OF SOME OF THE CORRELATIONS IN TABLE 1. COMPETITIVENESS OF ENVIRONMENTAL REGULATORS IS MORE OR LESS NEGATIVELY ASSOCIATED WITH ENVIRONMENTAL QUALITY (A, B), BUT HAS LITTLE (C), OR EVEN NEGATIVE (D) ASSOCIATION WITH INDICATORS OF ECONOMIC PERFORMANCE.



2. *Two Possible Critiques of The Empirical Analysis.*

These results should be critically evaluated before accepting any conclusions as definitive. Two important questions concerning this analysis are: (1) is the “competitiveness indicator” used an appropriate one?, and (2) is it possible that unaccounted-for “confounding variables” are masking the true relationship between competitiveness and economic or environmental indicators in a way that makes the simple correlation anal-

ysis of Table 1 and Figure 1 fundamentally misleading? Any attempt to empirically probe complex questions will have potential problems. An understanding of the means by which such problems might affect or skew the outcome of the analysis help when determining whether these problems significantly affect the results of the analysis. Once this understanding is established, it is possible to compensate for the effects of any such problems on the analysis. Here we consider such issues in relation to the two questions posed above.

The competitiveness indicator used was derived from state regulator responses to survey questions.⁵² It is thus derived from regulators' self-reported knowledge about various regulatory practices in his or her state regulatory agency. The disadvantages of this approach are the following: (1) the difficulty of controlling for differing regulator perceptions across states; (2) the possibility of response bias in answers to survey questions; and (3) the fact that the competitiveness indicator is generally a subjective rather than an objective one. Differing regulator perceptions arise because the regulators responding in one state are different people from those responding in other states, and may have different individual standards for what they consider to be "competitive." This gives rise to the possibility that two states with the same level of "competitiveness," according to some objective standard, may nonetheless be assigned different values for their survey-derived competitiveness factors. This problem will increase the variance, i.e., the "background noise," in estimates of state competitiveness, but is less likely to cause a systematic bias in one direction or another. Thus, although real correlations between competitiveness and economic or environmental indicators will be harder to detect statistically, there is no reason for lack of confidence in correlations that are detected at nominal levels of statistical significance.

Response bias to survey questions is another issue. In survey research it is always possible for conscious or subconscious bias to influence the answers of survey respondents. In this case, as discussed in greater detail by Engel,⁵³ we believe that survey respondents, if anything, are more likely to understate the willingness of their state to relax environmental standards in the face of economic concerns. Although this would cause an underestimation in the overall level of state regulator "competitiveness," it may or may not influence the correlation analysis presented here, since shifts in the mean of the variables in a correlation analysis will not affect the degree of correlation or its statistical significance.

In any case, neither of these issues are likely to create correlations that are not there, but they may make it more difficult to detect true

⁵² See *supra* note 50.

⁵³ See Engel, *supra* note 8, at 339-40.

correlations. An ideal analysis of this issue might avoid some of these issues by using objectively measurable standards of competitiveness, perhaps based on analysis of the actual stringency of, e.g., pollutant emission standards by state, and how they vary in response to stringency in neighboring states, opportunities for in-state firm location, etc. This may be possible in a future study of this issue. In the meantime, we offer this approach, based on survey responses, as a limited but reasonable initial analysis and test of the effect of regulatory competitiveness on economic performance and environmental quality.

The second question, whether there are unaccounted for "confounding variables" that make the simple correlation analysis of Table 1 and Figure 1 fundamentally misleading, is a potentially more serious issue. For example, there is no reason to believe, *a priori*, that the correlations summarized in Table 1 and Figure 1 are causal. Even assuming these correlations are causal, it is not readily apparent which direction the causation runs. Economies are complex, and controlled by many factors. These other factors could act as confounding variables that prevent simple correlation analysis from revealing the true positive effect of regulatory competitiveness. For example, not all states are equally competitive on the regulatory front, and it may be that states whose economies are performing poorly for underlying structural reasons are systematically more likely to compete (e.g., their regulatory agencies might well be expected to come under increased political pressure to "give industry a break" where possible in order to help stimulate the economy). Regulators in states with strong economies may be much less likely to come under such pressure. Thus, even if regulatorily competitive states have a real, positive economic advantage over non-competitive states, there could still be an overall negative correlation between economic performance and regulator competitiveness across all states. Under such a scenario, the primary mechanism of causation runs in the other direction: poor economies cause states to become more competitive. Although these economically depressed states may realize a marginal improvement in their economy from relaxing environmental standards, their economy may remain poor relative to non-competitive, strong economy states.

It is also possible that a similar kind of scenario underlies the apparent negative association between regulator competitiveness and environmental quality. For example, consider the above scenario, but with the additional caveat that strong economies provide the necessary resources to improve environmental quality. States with poor economies would thus tend to also have poor environmental quality, and according to the above scenario, would also have more competitive regulators. Under these circumstances, there could be an overall negative correlation be-

tween regulator competitiveness and environmental quality even if competitiveness had no actual impact on the environment.

The traditional tool to compensate for the effect of possibly confounding variables is multiple regression (or partial correlation) analysis. Hence, in order to investigate whether such scenarios could account for the apparent correlations reported in Table 1, we used multiple regression analysis to adjust for a variety of potentially confounding variables that might mask the true relationship between regulator competitiveness and both economic performance and environmental quality. Examples of these analyses for GSP growth, water quality, and air quality are shown in Table 2. For example, GSP growth in Table 2 is significantly and positively associated with several factors (population growth, per capita income, and growth in per capita income), but the inclusion of these potentially confounding variables did not change the lack of correlation between GSP growth and regulator competitiveness: the statistically insignificant simple correlation of -0.09 in Table 1 becomes an essentially identical insignificant partial correlation of -0.12 in Table 2.

TABLE 2. THE EFFECT OF REGULATOR COMPETITIVENESS ON ECONOMY AND ENVIRONMENT: MULTIPLE CORRELATION ANALYSIS TO ACCOUNT FOR OTHER POTENTIALLY IMPORTANT CONFOUNDING VARIABLES. STATISTICAL SIGNIFICANCE OF CORRELATIONS IS INDICATED BY BOLD: † ($P < .10$), * ($P < .05$), ** ($P < .01$), AND *** ($P < .001$)

<i>Economic Indicators</i>	Influencing variables	Partial correlation between indicator & influencing variable
Gross State Product	Regulator competitiveness	-0.12
	Population growth	$+0.90$ ***
	Per capita income	$+0.25$ †
	Per capita income growth	$+0.85$ ***
Environmental Indicators		
Water Quality	Water regulator competitiveness	-0.41 *
	Per capita income	$+0.37$
	Log (state population)	-0.56 ***
Air Quality	Air regulator competitiveness	-0.09
	Per capita income	$+0.36$ *
	Log (state population)	-0.57 ***

We conducted similar analyses for economic output growth rates by sector (the farming, non-farm agriculture, mining, construction and manufacturing sectors), exploring the effect of a range of potentially confounding variables (population size, population growth rates, overall size of state's economy, growth rates of supporting sectors such as transportation, etc.) on the direction and significance of regulator competitiveness. In no case did the inclusion of other explanatory factors make the associ-

ation between sectoral growth rates and overall regulatory competitiveness significantly positive,⁵⁴ as predicted by the efficiency hypothesis.

Multiple regression analysis on the environmental indicators likewise failed to alter the fundamental patterns previously revealed by simple correlation analysis. For example, environmental competitiveness among water regulators remained significantly negatively correlated with water quality, even after adjusting for other important, potentially causal, variables such as population size and per capita income (Table 2).⁵⁵ Similar patterns were observed between air regulator competitiveness and air quality (Table 2), although as before, they did not rise to statistical significance at the ninety-five percent confidence level.

3. *Summary: Results of the Empirical Analysis*

The multiple regression analyses tend to reinforce the initial results of the simple correlation analysis, and to refute the possibility that they are artifacts. Because it is impossible to test all potentially confounding variables, it is always possible that a variable not considered will change prior interpretations. In addition, it is important to note that, as with any empirical study, the statistical power to resolve correlations is limited by the size of the dataset. For example, it is possible that there exist small (less than 0.25) but undetectable positive correlations between competitiveness and economic performance. It should also be noted, however, that the statistical power of this analysis was sufficient to detect a number of correlations, including negative associations between economic performance and competitiveness (Table 1), and that it is equally plausible that additional small but undetectable negative correlations exist. Therefore, these results should be interpreted with caution given the complexities involved. They are entirely consistent with the existence of a race-to-the-bottom in environmental standard-setting, and are inconsis-

⁵⁴ In one case (growth in output from farming), competition among water regulators had a statistically significant positive association with growth when per capita income, farm output, and overall GSP were also included in the regression model. This was counter-balanced by a negative association of a similar magnitude between air regulators and growth in a similar model. The net effect of regulatory competitiveness in this case is thus unclear. When overall regulatory competitiveness was used, the association between competitiveness and growth in farm output was always insignificantly negative.

⁵⁵ In a regression of the Green Index indicator of a state's ordinal rank (1=best), by water quality against water-regulator competitiveness, the correlation coefficient was $r=0.46$ ($p=.02$). Since a high rank corresponds to comparatively lower water quality, the correlation between water quality and competitiveness is negative. Regressing water quality rank against water-regulator competitiveness, along with the log of state population and per capita income, gave the following partial correlation coefficients: $r=.41$ ($p=.04$) for competitiveness, $r=.56$ ($p=.0006$) for log of population size, and $r=-.37$ ($p=.02$) for per capita income. This suggests that poor water quality (high rank) is correlated with large populations and anti-correlated with income, but that even after adjusting for these important influences, poor water quality remains significantly correlated with water regulator competitiveness.

tent with the hypothesis that interstate competition is efficiency-enhancing. The results suggest that, contrary to the expectation that states will realize economic gains to offset losses in welfare attributable to reduced environmental quality, environmentally competitive states realize essentially no economic gains. States that compete for industry through environmental standard-setting thus appear to be "worse off" than states that do not compete.

II. THE APPARENT "IRRATIONAL" BEHAVIOR OF STATE ENVIRONMENTAL REGULATORS

The above empirical conclusions point to an apparent enigma. Studies indicate that industry location decisions are largely unaffected by variations in the stringency of state environmental standards.⁵⁶ In addition, as posited above, states that reportedly compete vigorously for industry by relaxing environmental standards do not fare any better in terms of economic growth than states that do not employ environmental standards to compete for industry. While survey results indicate that many states were engaged in tightening their standards,⁵⁷ they also indicate that a substantial minority of state environmental regulators report that their state nevertheless relaxes the stringency of its environmental laws in order to attract and retain industry.⁵⁸ Several competing explanations for this seemingly irrational behavior are examined below.

A. THE GAMES REGULATORS PLAY: SIMPLE GAME THEORETIC ILLUSTRATIONS OF REGULATOR BEHAVIOR

According to the available evidence on firm location decisions,⁵⁹ the payoffs to a single state from adopting more or less stringent environmental laws should be analogous to those displayed below in Table 3, "The Regulator's Reality." According to the structure of this game, a state has only to gain from enacting optimally stringent environmental laws, since it receives a payoff of 200 for maintaining optimally stringent standards, but a payoff of only 100 if it lowers its standards, regardless of what the other state does.⁶⁰ The stringency of state environmental standards is of little to no importance to industries in choosing site locations.⁶¹ Hence, improvements in environmental quality entail no trade-offs in economic benefits and states will maximize net welfare by mak-

⁵⁶ See Engel, *supra* note 8, at 340, 346.

⁵⁷ See *id.* at 345.

⁵⁸ See *id.* at 341-45.

⁵⁹ See *supra* note 34.

⁶⁰ The specific numbers shown in this example are hypothetical. Their relative values in Table 3 and subsequent tables were chosen, however, to illustrate various plausible pay-off structures for game-like interactions.

⁶¹ See *supra* note 35.

ing environmental laws optimally stringent. Another consequence of the negligible effect of stringency on firm locations is that each state's payoff is not affected by what the other state does. Thus, the game represented by Table 3 is a non-strategic one.

TABLE 3: THE "REGULATOR'S REALITY" NET WELFARE PAYOFFS TO TWO JURISDICTIONS FROM RELAXING AND TIGHTENING ENVIRONMENTAL REQUIREMENTS.

Payoffs are to: (State A, State B).

State A	State B	
	<i>Optimally Stringent Environmental Standards</i>	<i>Less Stringent Environmental Standards</i>
<i>Optimally Stringent Environmental Standards</i>	(200, 200)	(200, 100)
<i>Less Stringent Environmental Standards</i>	(100, 200)	(100, 100)

Nevertheless, the practice of some states in relaxing their environmental standards in order to attract and retain industry indicates that at least some government decision-makers believe that the payoff structure is different than that portrayed by industry location studies. Specifically, by relaxing their state's standards, some state decision-makers are acting as if the payoffs from doing so are greater than the payoffs from tightening environmental standards. Tables 4 and 5 ("the Regulator's Delusion" I and II) illustrate two alternative perceived (but delusional) payoff structures for two states that could account for such behavior. Table 4 shows payoffs that are consistent with decision-makers in both states relaxing their environmental standards out of a perception (refuted in actuality by the industry location studies) that one state experiences net welfare gains by relaxing its environmental standards when another state maintains more stringent standards. This payoff structure is also an example of that present in the classic prisoner's dilemma.

Table 5 displays a payoff structure that causes behavior similar to the classic prisoner's dilemma, insofar as both states relax their standards. But because the "best" decision by each state is unaffected by what the other state decides, this game does not involve strategic interactions between the states. Thus, the fact that many states relax their environmental standards in order to attract or retain businesses is consistent with at least two kinds of perceived games: a prisoner's dilemma-type game (Table 4), and a non-strategic game like that illustrated in Table 5, although there could plausibly be other games as well.

The following subsections examine the plausibility of several competing explanations for why the payoff structure might appear to an in-

TABLE 4: THE "REGULATOR'S DELUSION I" PAYOFF STRUCTURE CORRESPONDING TO REGULATOR'S "PERCEPTION" THAT RELAXED ENVIRONMENTAL STANDARDS IMPROVE STATE'S NET WELFARE: PRISONER'S-DILEMMA MODEL

Payoffs are to: (State A, State B).

State A	State B	
	<i>More Stringent Environmental Standards</i>	<i>Less Stringent Environmental Standards</i>
<i>More Stringent Environmental Standards</i>	(300, 300)	(100, 400)
<i>Less Stringent Environmental Standards</i>	(400, 100)	(200, 200)

dustry regulator similar to that displayed in Table 4 or Table 5 (thus inducing the regulator to relax her state's environmental standards), rather than that displayed in Table 3 (which would compel the regulator

TABLE 5: THE "REGULATOR'S DELUSION II" PAYOFF STRUCTURE CORRESPONDING TO REGULATOR'S "PERCEPTION" THAT RELAXED ENVIRONMENTAL STANDARDS IMPROVE STATE'S NET WELFARE (NO STRATEGIC INTERACTIONS BETWEEN STATES)

Payoffs are to: (State A, State B).

State A	State B	
	<i>More Stringent Environmental Standards</i>	<i>Less Stringent Environmental Standards</i>
<i>More Stringent Environmental Standards</i>	(100, 100)	(100, 300)
<i>Less Stringent Environmental Standards</i>	(300, 100)	(300, 300)

to tighten, or maintain the state's environmental standards at optimally stringent levels).

B. EXPLANATIONS FOR THE APPARENT IRRATIONALITY OF STATE ENVIRONMENTAL REGULATORS

1. *Ignorance of Empirical Data on the Importance of Environmental Stringency Upon Industry Location*

One plausible explanation for why state environmental regulators might perceive the payoff structure of variations in environmental stringency to resemble those in Table 4 or Table 5, as opposed to Table 3, is that state environmental decision-makers are simply unaware of the body of empirical data demonstrating the unimportance of environmental strin-

gency to firm location decisions.⁶² This possibility is not difficult to imagine. The day-to-day world of the regulator is far removed from the academic environment where industry location studies are conducted and discussed.

Nevertheless, survey responses of state environmental regulators do not fully support the assertion that regulators are wholly ignorant of the relative unimportance of environmental stringency to firm location decisions. First, although fifty-nine percent of the regulators surveyed answered that they thought stringency of environmental standards was "very important" or "fairly important" to industry location, regulators correctly ranked environmental stringency as the least important factor among the five factors provided.⁶³ Thus, environmental regulators seem cognizant of the relative unimportance of environmental stringency to firm location.

Second, environmental regulators do not appear to obtain their information on matters relevant to interstate competition from groups, such as industry, which have an incentive to tell regulators that the payoffs of environmental stringency are those contained in Table 4 or Table 5. If state regulators relied solely on business for their information, business representatives might overstate the importance of stringency of environmental standards in the hope of obtaining concessions from expensive compliance requirements.⁶⁴ Environmental regulators, however, do not rely solely upon business groups for their information regarding interstate competition. Instead, environmental regulators, as a group, listed industry representatives as a "minor information source," while they ranked national organizations of state officials as a "major information source."⁶⁵

Finally, the responses from the survey of state regulators appear inconsistent with the payoff structure of the prisoner's dilemma set forth in Table 4. According to the prisoner's dilemma model of interstate competition, a state obtains the highest payoff when its standards are less

⁶² See Harold Wolman, *Local Economic Development Policy: What Explains the Divergence Between Policy Analysis and Political Behavior?*, 10 J. URB. AFF. 19, 24 (1988) (suggesting that ignorance of the "exceedingly arcane" research literature on the efficacy of economic development incentives would explain politicians' continued practice of offering fiscal incentives to firms to encourage them to locate within their jurisdiction, despite the general conclusion of researchers that such incentives have little impact upon firm location behavior).

⁶³ See Engel, *supra* note 8, at 378 (Table 5). The other four factors were proximity to transportation, nature of the labor force (e.g., age, skill, union membership), tax incentives and subsidies, and proximity to natural resources.

⁶⁴ Cf. Wolman, *supra* note 62, at 25 (public officials may overrate the importance of fiscal incentives and tax rates in determining firm location because "politicians' information on location behavior comes from local business men, who routinely say that taxes make an important difference.").

⁶⁵ See Engel, *supra* note 8, at 382-83 (Table 5).

stringent than those of a competing state. As a group, the regulators responded that they "disagreed strongly" with the proposition that it is important for one state's standards to be less stringent than those of another state.⁶⁶

2. *The Influence of State Legislators and the Symbolic Importance of Accommodating Business Interests*

State legislative influence is a more plausible explanation for why many states relax their environmental standards in order to attract or retain industry. Previous studies have documented the dominant influence of state legislators over state environmental policy.⁶⁷ It is, therefore, plausible to assume that the relaxation of a state's environmental standards is largely attributable to the influence of state legislators. In response to survey questions, state legislators overstated the importance of environmental stringency to industry location decisions by ranking it third, rather than fifth, in importance out of the five siting factors listed.⁶⁸ Furthermore, legislators were much more apt than environmental regulators to claim that they sponsored or supported the relaxation of an environmental standard in order to attract or retain industry.⁶⁹

Even if one assumes the dominant influence of state legislators over the state's decisions to increase or reduce the stringency of the state's environmental standards, this does not answer the underlying question of why states relax their standards to attract industry. Rather, this assumption merely shifts the responsibility for such seemingly irrational behavior from state environmental bureaucrats to elected state officials. Yet why should the legislators, any more than the regulators, behave contrary to what, according to industry location studies, is welfare-maximizing?

⁶⁶ See *id.* at 383 (Table 5). Seventy-six of the eighty questionnaires received from state environmental regulators recorded a response to the statement, "It is important that our state's environmental standards be *less stringent* than the standards of neighboring states." The mean value of the responses was 1.2, which is closest to 1.0, the value given by the questionnaire to the response of "disagree strongly." The mean constituted the average of the following responses and their values: "disagree strongly" = 1; "disagree somewhat" = 2; "agree somewhat" = 3; and "agree strongly" = 4.

⁶⁷ See Scott P. Hays et al., *Environmental Commitment Among the States: Alternative Approaches to State Environmental Policy*, 26 *PUBLICUS* 41 (1996) ("The political preferences of policymakers and the level of professionalism of state legislatures also exert significant effects on state environmental commitment.").

⁶⁸ See Engel, *supra* note 8, at 378 (Table 5).

⁶⁹ See *id.* at 380-81 (Table 5, Questions 5-10, 13). The three exceptions to this involved questions concerning permitting and enforcement. On three questions, state environmental regulators reported that they were more likely to relax requirements than their state legislatures would relax them through legislative enactment. However, permitting and enforcement, as opposed to standard-setting, are issues with which a state legislator would not be expected to be very familiar but with which a state environmental agency official would be expected to be familiar. This discrepancy is, therefore, not surprising.

In other words, why should legislators, any more than state agency officials, follow the payoff structure of Table 4 or Table 5, as opposed to that set forth in Table 3?

Because a variant of this same question has haunted researchers in the analogous area of state tax and fiscal incentives, the explanations used to explain the similar paradox in state fiscal policy have direct relevance for explaining the seemingly irrational behavior in state environmental standard-setting. The broad consensus in the economic development field is that most traditional economic development policies, such as tax incentives and subsidies, are ineffective in changing the locational decisions of firms.⁷⁰ Nevertheless, state policymakers continue to offer these same policies as a means of attracting industry. Thus, a dilemma surfaces similar to that resulting from the propensity of some states to relax environmental standards despite the evidence demonstrating the ineffectiveness of such actions in attracting or retaining industry.

Researchers in the economic development field explain the apparent divergence between the economic development policies followed by state decision-makers and the policies that would maximize the locality's welfare by pointing out the lingering uncertainty over the efficacy of state economic incentives in attracting industry, together with the substantial symbolic importance attached to providing such incentives. The result is a system of political incentives or "payoffs" that drive a politician to offer industry location subsidies, even if such subsidies have a low probability of success.⁷¹ In short, a politician is better off providing industry with a location subsidy than not providing such a subsidy since, by offering the subsidy, she can claim credit for the siting of new industry if a new plant does in fact choose to site locally, and can avoid blame if industry ends up siting somewhere else. In the latter situation, the politician can at least claim that she used the tools at her disposal to try to attract new business to the community.

Since a reduction in environmental compliance costs is merely a type of location incentive, the same factors discussed above could just as easily apply to a state legislator's decision to relax environmental standards in order to attract or retain industry. The result can be a disparity

⁷⁰ See, e.g., Charles J. Spindler & John P. Forrester, *Economic Development Policy: Explaining Policy Preferences Among Competing Models*, 29 URB. AFF. Q. 28, 36 (1993); Michael J. Wolkoff, *Is Economic Development Decision Making Rational?*, 27 URB. AFF. 340, 343 (1992); Wolman, *supra* note 63, at 24; Jennifer L. Gilbert, *Selling the City Without Selling Out: New Legislation on Development Incentives Emphasizes Accountability*, 27 URB. LAW. 427, 433 (1995).

⁷¹ See Wolman, *supra* note 62, at 25 ("High local unemployment and job loss are important public concerns to which local politicians must be seen to respond. . . . As Feiock points out, '[W]hen there is strong public pressure to 'do something' about the declining economy, any visible action, even if ineffective, may be politically advantageous.'").

between the payoffs experienced by a politician, in terms of political benefits, and those experienced by the locality, in terms of net increases in overall social welfare. The relaxation of environmental standards may reduce a state's overall social welfare, yet, at the same time, it may accrue sizable political benefits to the politician who claims credit for industry siting within the state. The potential disconnect between the expected benefits from relaxed environmental standards to a politician, on the one hand, and a state's citizenry, on the other, may explain why many state regulators exhibit a willingness to relax standards in order to attract industry even though the evidence shows that lower standards have little, if any, impact upon where industry chooses to locate. The possibility of such a disconnect is illustrated by Table 6, which depicts a hypothetical example⁷² with a disparity between the expected net social welfare benefits to a state from relaxing its environmental standards to attract industry and the expected political benefits that a legislator responsible for such standards is likely to receive.⁷³

Table 6 illustrates a situation in which it is in the best interest of a politician to engineer a relaxation of the state's environmental standard in an effort to attract industry even though the relaxation of standards causes her state to suffer in terms of net social welfare. Table 6(A) shows the impact, upon a state's net social welfare, of a hypothetical decision to relax or not relax a state's environmental standard. Consistent with the evidence from industry location studies, we have assumed, in constructing this hypothetical cost-benefit structure, that the relaxation of environmental standards will have essentially no effect upon industry's decision to locate in-state. Because it is possible that an industry

⁷² The example set forth in Table 6 is an elaboration and adaptation of an example presented by Wolman, which he uses to illustrate that even when the probability that economic incentives will succeed in attracting industry is low, a politician can reap greater political benefits from offering such incentives than from failing to offer such incentives. See Wolman, *supra* note 63, at 26. Our hypothetical example in Table 6 is similar to Wolman's, in that it demonstrates why a politician is better off relaxing environmental standards than not relaxing environmental standards, even though relaxed standards are of no importance in firm location decisions. Our example is different from Wolman's, in that it also explicitly shows how the preferred decision of a politician (relaxing environmental standards) can be opposite of the decision that results in the greatest net benefit to the locality as a whole (i.e., not relaxing environmental standards).

⁷³ The term "expected benefits" is used here and in Table 6 in its traditional Bayesian/utilitarian sense, where the "expected" benefit or utility derived from a decision is defined as the weighted sum of the utilities of each of the possible outcomes, with the weights equal to the probabilities of each outcome. Table 6 is an example of a case where there are two possible, mutually exclusive outcomes (the industry either locates in-state, or does not locate in-state). The expected utility, or net welfare, is thus $u_1p_1 + u_2p_2$, where u_1 is the utility associated with outcome one, u_2 is the utility associated with outcome two, and p_1 and p_2 are the probabilities of each outcome being realized. If the two outcomes are the only two possibilities, then $p_1 + p_2$ must equal one. See K. S. SHRADER-FRECHETTE, RISK AND RATIONALITY 101-04 (1991).

TABLE 6. COST-BENEFIT STRUCTURE POSED BY A HYPOTHETICAL ENVIRONMENTAL-STANDARD RELAXATION DECISION TO (A) THE STATE AS A WHOLE, AND (B) INDIVIDUAL POLITICAL DECISION-MAKER.

(A) Social welfare of state as a whole. (Rational decision: do not relax standards)

Politician's Decision	Industry Location Decision	Probability of Location Decision	(1) Economic Cost/Benefit from Industry Location Decision	(2) Environmental Quality Cost/Benefit from Politician's Decision	(3) Net Social Welfare to State (Economic + Environmental Benefits/Costs)	(4) Expected Net Social Welfare (Net Social Welfare x Probability of Location)
Relax Env. Standards	in-state	.25	100	-25	75	18.75
	out-of-state	.75	0	-25	-25	-18.75
	Combined expected net welfare benefit from relaxing standards:					
Do Not Relax Env. Standards	in-state	.25	100	0	100	25
	out-of-state	.75	0	0	0	0
	Combined expected net welfare benefit from <i>not</i> relaxing standards:					

(B) Individual welfare of political decision-maker. (Rational decision: do relax standards)

Politician's Decision	Industry Location Decision	Probability of Location Decision	(1) Political Cost/Benefit Corresponding to Net Social Welfare to State (see A(3))	(2) Political Cost/Benefit from Individual Credit/Blame Factor	(3) Net Political Benefit (Social Welfare + Individual Credit/Blame Factor)	(4) Expected Net Political Benefit (Net Political Benefit x Probability of Location)
Relax Env. Standards	in-state	.25	75	50	125	31.25
	out-of-state	.75	-25	0	-25	-18.75
	Combined expected net political benefit from relaxing standards:					
Do Not Relax Env. Standards	in-state	.25	100	0	100	25
	out-of-state	.75	0	-50	-50	-31.25
	Combined expected net political benefit from <i>not</i> relaxing standards:					

Note: Table 6 assumes that industry location probabilities (25% in-state, 75% out-of-state) are unaffected by the decision whether or not to relax standards, and that rational decision-making under uncertainty follows the conventional Bayesian model. See *supra* note 73 (describing the Bayesian model). The net social welfare consequences to the state are the sum of the economic benefits associated with the industry siting decision, and the environmental quality impact of the political standard-setting decision. The individual benefits to the political decision-maker are the sum of a net social welfare component (which simply reflects the social welfare benefit to the state as a whole), and an individual credit/blame component which arises from the politician's perceived responsibility for attracting or repelling the industry.

will locate in the state anyway for other reasons (e.g., availability of labor, markets, or transportation), but that the high demand for such industries make the siting less likely than the industry's siting elsewhere, the probability that the industry will locate in-state is assumed to be twenty-

five percent, while the probability that it will locate out-of-state, seventy-five percent.

Consider first the case in Table 6A where a state chooses to relax its environmental standards, thereby subjecting itself to an environmental cost of -25 no matter what industry does. If industry chooses to locate in the state, the state will experience an economic benefit of 100, which after subtracting the -25 due to increased environmental damage results in a net social welfare benefit of seventy-five. Because it is only twenty-five percent likely that the industry will actually locate in-state, the *expected* net social welfare benefit from industry locating in-state is thus $75 \times 25\% = 18.75$. Nevertheless, this expected benefit from an in-state siting decision is cancelled out by the expected negative consequences (-18.75) of an industry decision to locate elsewhere. Hence, a state's combined expected net social welfare benefit from relaxing its standards is exactly zero.

In contrast, when a state does *not* relax its standard, the state reaps a combined expected net social benefit of twenty-five (100 in benefits if the industry locates in-state, times the twenty-five percent probability that this will happen, plus zero in benefits if the industry does not locate in-state times the seventy-five percent probability of that outcome). Because the state has not relaxed its standard, it does not risk ending up with a net loss in the case that industry chooses to locate elsewhere. From this matrix of incentives, it is obvious that a state maximizes its expected net social welfare by adopting the strategy of not relaxing its environmental standards.

The same conclusion does not necessarily hold, however, for politicians who may be perceived by the public as bearing some portion of responsibility for an industry's location decision. In order to account for this in the risk-benefit structure depicted in Table 6B, a political decision-maker's individual welfare equals the sum of two components: a component reflective of the actual social welfare of the state (Table 6B, col. (1)), whatever that may be, and a component related to the perceived direct credit or blame that the public assigns to her for the industry's location decision (Table 6B, col. (2)). This second component creates a wedge between the social welfare of the state and the individual welfare of the politician, giving rise to the possibility that the rational choice for a politician is against the best interest of the constituents she represents. The credit/blame factor of Table 6B makes a difference in two cases: when a politician decides to relax standards at the same time industry locates within state (in which case the politician accrues a benefit of fifty due to public perception that she deserves credit for bringing the benefits of industry to the state), and when a politician fails to relax standards at the same time that an industry locates out-of-state (in which case the

politician suffers a loss of -50 due to the blame assigned by the public for losing the economic benefits that the industry would have brought).⁷⁴ The net result of the wedge between public welfare and an individual politician's welfare (Table 6B, col (2)) is to make the politician's rational decision the reverse of the rational decision for the public welfare as a whole, as shown by the expected net political benefit illustrated in Table 6B, col (4). Given the payoff structure set forth in Table 6B, our politician acts rationally by offering the industry a relaxed environmental standard, even if she knows for a fact that a reduced environmental standard will not influence the industry to site in her state.

The point of the hypothetical exercise of Table 6 is not to show that the rational decisions of state politicians about environmental standards are always at odds with their constituents' best interest.⁷⁵ The point, rather, is to suggest a plausible, rational account that is consistent with the evidence and which suggests that in the absence of a federal environmental backstop, a substantial minority of states are apparently willing to lower their environmental standards for little or no apparent economic benefit. There may of course be other plausible, rational accounts, and our point is also not to suggest that this particular account is preferable to other plausible ones. The point of this example is to illustrate the eminent plausibility (and indeed the virtual undeniable reality) of state-level perverse incentives of some kind that cause the rational best-interest of state decision-makers to diverge from those on whose behalf they make decisions. Once the existence of such incentives is granted (whether they are of the symbolic kind illustrated here, or more concrete ones like campaign contributions from industries that pollute), then the empirical conclusions of Part I, that some states appear willing to act irrationally, should not be puzzling or surprising; indeed they should be expected.

Note that perverse incentives, of the type illustrated in Table 6, are less likely to exist in federal environmental standard-setting. The uniform nature of most federal standards provides less opportunity for state

⁷⁴ We assume that the political credit/blame factor is otherwise zero. For example, in the case where a standard is relaxed, but the industry nonetheless goes elsewhere, public anger is assumed to be ameliorated by the apparent fact that the politician "at least tried." In the converse case, where a standard is not relaxed and the industry locates in-state, the politician loses the opportunity to take special credit for that fact. Also note, that this political credit/blame factor, as constructed, is asymmetric with respect to the perceived responsibility of the politician for economic outcomes versus environmental outcomes, i.e., a politician is perceived as bearing some responsibility for industry location decisions, but is neither blamed for increased pollution nor credited for maintaining environmental protections. This could be a plausible assumption for reasons analogous to those that explain why environmental goods are undervalued by private markets in the first place: their benefits are diffuse public goods, but the costs of preserving them are obvious and fully accounted for by private markets.

⁷⁵ The precise numbers of Table 6 are, after all, purely hypothetical and do not "prove" anything one way or another.

representatives at the national level to use environmental standards to attract industry to particular states or localities. Such mechanisms might, of course, come into play at the international level vis-à-vis individual countries.

III. A RATIONAL RISK-BENEFIT ALTERNATIVE TO THE IDEOLOGICAL "STACKED DECK"

In his recent response to his critics, Revesz argues for a "rebuttable presumption in favor of decentralization" in environmental regulation generally.⁷⁶ This presumption, according to Revesz, is based upon the assumption that, in addition to differences in the geography of various regions within the United States, each region differs in its preferences for environmental protection.⁷⁷ Furthermore, it is based upon the assumption that the relative costs and benefits of environmental policies differ across geographic regions and the federal government is ill-equipped to respond to these geographic differences.⁷⁸ The presumption for decentralized regulation should be rebutted, according to Revesz, only if there is a "systemic evil in letting states decide the level of environmental protection that will apply within their jurisdictions."⁷⁹ Thus, Revesz proposes a construct that is, in essence, an ideological "stacked deck" in favor of the efficiency hypothesis. According to this construct, the efficiency hypothesis is presumed true in the absence of any evidence whatsoever, whereas the race-to-the-bottom hypothesis is alone saddled with the difficult burden of empirical refutation.

Even if one accepts Revesz's "stacked deck," we argue that, in the specific instance of environmental regulatory policy, we have presented an empirical analysis that carries that burden: evidence presented here and in Engel's prior article rebuts Revesz's "presumption for decentralization" argument. This evidence suggests that there is, in fact, a "systemic evil"—a failure of state regulators to establish welfare-maximizing environmental standards—inherent in state environmental standard-setting. Moreover, even by the skewed standards of a stacked deck, we argue that federal environmental standards are a reasonable response to an empirically well-founded concern about a race-to-the-bottom in state-level environmental standard-setting.

As a general approach to resolving disputes about regulatory policy (or any other kind of controversy, for that matter), the "stacked deck" leaves much to be desired. It is an overly flexible rhetorical device which, in the absence of a reality based anchor, can be applied from any

⁷⁶ See *supra* note 23.

⁷⁷ See Revesz, *supra* note 18, at 536.

⁷⁸ See *id.* at 535-37.

⁷⁹ *Id.* at 537.

direction the writer desires. As Revesz readily admits in the context of the debate about the appropriate level of government for environmental regulation, his opponents could argue just as easily as he for a “rebuttable presumption,” but in the opposite direction: in favor of centralized environmental regulation which may only be “rebutted” by evidence of a “systemic evil” in federal regulation.⁸⁰ Such a presumption in favor of federal regulation could be based upon consideration of the protection of minimum standards of health as a human right that is guaranteed throughout the United States, or upon the considerable economies of scale in the scientific research and decision-making underlying environmental standard-setting, or upon any number of preferred theories.

In the end, however, such an approach leads to an endless academic game of “deck stackmanship.” Instead, we prefer a decision-making approach based on empirically-grounded estimates of the risks, benefits, and uncertainties of various policy alternatives. Such a policy decision-making approach not only requires that the available evidence be used in making the decision, but also that an attempt is made to take account of the risk of being wrong in addition to the benefits of being right. The discipline and analytic tools of risk analysis were developed largely for just this purpose: systematically using evidence to make decisions under conditions of uncertainty.⁸¹ This article is not the place for a detailed risk analysis, but we can take advantage of the insights of that discipline, especially concerning the need to take into account the consequences of being wrong.

Prudent policy-making requires that we ask questions like: what are the costs to society if environmental regulations are set by the federal government because of a fear of a race-to-the-bottom, but it turns out that there is no race-to-the-bottom problem? And importantly, how do those costs compare to the costs to society if individual states are allowed to set standards on the grounds of the efficiency hypothesis, but it turns out that the efficiency hypothesis is wrong, and there is in fact a race-to-the-bottom?

If there is no race-to-the-bottom, then uniform nationwide environmental standards will introduce inefficiencies that will cause the sum total national social welfare to be less than it would be if states were each allowed to set their own standards as they saw fit. The cost of such a mistaken policy is equal to the size of the reduction in welfare that the policy causes. The empirical studies on firm location decisions cited ear-

⁸⁰ *See id.*

⁸¹ *See, e.g.,* M. GRANGER MORGAN AND MAX HENRION, *UNCERTAINTY: A GUIDE TO DEALING WITH UNCERTAINTY IN QUANTITATIVE RISK AND POLICY ANALYSIS* (1990); SHRADER-FRECHETTE, *supra* note 73 (for an overview of the field of risk analysis and its applications).

lier in this article suggest that this reduction is likely to be small, possibly negligibly small. This is because these studies generally find that the stringency of environmental standards is a small to negligible factor in industry location decisions. Thus, the inefficiency introduced by preventing states from competing on environmental standards must likewise be small to negligible, in comparison to the size of the economic activity generated by these industries.

Proponents of the efficiency hypothesis may not be persuaded by this. They would possibly argue that the existence of an avoidable inefficiency is objectionable: after all, if we can avoid the inefficiency and gain a small benefit from separate state standards, why not? A small benefit is better than no benefit, they might argue. The reason "why not," however, is that they might be wrong. If they are wrong, and there is a race-to-the-bottom, but the federal minimum standard backstop were nonetheless mistakenly abandoned, what would be the cost of this mistake? The answer to this is not obvious, but depends on how far down "the bottom" is in the race-to-the-bottom that would follow from a wholesale abandonment of federal standards. Prior to the adoption of the suite of federal environmental laws that are now in place, environmental quality in many areas was much lower, and environmental protection much weaker, than it is today.⁸² It is possible that, because of all that has been learned in the thirty years since the onset of the major federal environmental protection laws, and because of greater public awareness, that states, even left to their own devices, would not retreat to their previous laissez-faire positions on environmental regulation. It is also possible, however, given the potentially great political pressure placed on state regulators, especially in states with faltering economies, that the harm done by dangerously lax standards to human health and to irreplaceable natural resources could be enormous and irreversible.

In sum, the available evidence suggests that there is a race-to-the-bottom in state environmental standard-setting. The evidence also suggests that if this conclusion is wrong, the costs of policies implemented on the (mistaken) assumption that it is right will likely be small. On the other hand, if policies are implemented on the assumption that interstate competition is efficiency-enhancing, and that assumption is wrong, the costs of that mistake are uncertain, but possibly very large. We con-

⁸² See, e.g., S. Rep. No. 92-414, 92nd Cong. (1971), *reprinted in* 1972 U.S.C.C.A.N. 3671 ("The task of setting water quality standards, assigned to the States by the 1965 legislation, is lagging. More than 4 years after the deadline for submission of standards, only a little more than half of the States have fully approved standards."); 116 CONG. REC. 42382 (Dec. 18, 1970) (Sen. Muskie) ("In 1963, the Congress recognized that the Federal Government could not handle the enforcement task alone, and that the primary burden would rest on States and local governments. State and local governments, however, did not respond adequately to this challenge. . . . The Federal presence and backup authority had to be increased.").

clude, therefore, that the maintenance of federal minimum standards, and the protection against the possibility of a state regulatory race-to-the-bottom, is clearly the more prudent and rational public policy choice.⁸³ Certainly, minimum federal standards should not be abandoned without some alternative in their place to guard against the possibility of a destructive race-to-the-bottom between states.⁸⁴

CONCLUSION

Try as they might, legal theorists cannot will away empirical realities. Theories that rest upon certain suppositions about empirical reality must deal with evidence concerning those suppositions. The race-to-the-bottom rationale for federal regulation supports imposing minimum environmental standards at the federal level. The validity of this rationale ultimately rests upon empirical evidence of state behavior. In an earlier article, Engel provided empirical evidence for the existence of a race-to-the-bottom in state environmental standard-setting. Unfortunately, in his

⁸³ In this instance, because the preferred policy option is relatively clear, we have avoided, what in general can be a more complicated decision, between policy options given uncertain knowledge about the state-of-the-world. There are two prominent strategies for decision-making under uncertainty. The Bayesian strategy, *see supra* note 73, is the more common, and seeks to maximize the expected utility of a decision. The "maximin" strategy is a more risk-averse strategy, and seeks to maximize the minimum utility, and thereby avoid the worse outcome. *See* SHRADER-FRECHETTE, *supra* note 73, at ch. 8 (tracing the philosophical origins of these decision strategies, and arguing for the maximin strategy as preferable for public decision-making). According to the full formalism of the Bayesian strategy, the question over the appropriate level of government regulation would be decided by choosing the level of government regulation that maximized expected net social welfare or utility. Thus, if $u(\text{fed—race-to-the-bottom})$ and $u(\text{fed—efficiency})$ are the utilities (or welfare) associated with a federally-based regime of environmental law, in the cases that, respectively, (a) a race-to-the-bottom exists, and (b) efficiency in interstate competition exists; and if $u(\text{state—race-to-the-bottom})$ and $u(\text{state—efficiency})$, are the utilities associated with a state-based regime of environmental law for the same cases, and if p is the probability that the state-of-the-world was such that a race-to-the-bottom existed (and hence $1-p$ is the probability of efficient conditions holding), then the expected net social welfare of a federal regime would be $U_{\text{fed}} = p u(\text{fed—race-to-the-bottom}) + (1-p) u(\text{fed—efficiency})$, and the expected net social welfare of a state regime would be $U_{\text{state}} = p u(\text{state—race-to-the-bottom}) + (1-p) u(\text{state—efficiency})$. The rational policy choice, under a Bayesian strategy, would then be to otherwise choose a federal regime if $U_{\text{fed}} > U_{\text{state}}$, and to choose a state regime otherwise. The maximin strategy would not choose the policy that maximized expected utility, but would instead choose the policy with the highest benefit (i.e. lowest cost) associated with being wrong. In other words, it would only focus on $u(\text{fed—efficiency})$ and $u(\text{state—race-to-the-bottom})$, the utilities associated with being wrong, and would choose a federal regime if $u(\text{fed—efficiency}) > u(\text{state—race-to-the-bottom})$, and a state regime otherwise. The "maximin" strategy has the advantage of giving a well-defined decision, even when the probabilities associated with each possible state-of-the-world are not known.

⁸⁴ *See* Engel, *supra* note 8, at 367-74 (reviewing some approaches to regulatory reform that would both provide for more flexibility in environmental regulation than is found with the current minimum federal standard approach, but would also take to heart the lessons of game theory about how enforceable agreements between parties can prevent destructive races to the bottom).

response, Revesz either ignores this evidence or side-steps it, preferring to hold on to ideological considerations that favor primary reliance upon state environmental regulation. In this article, we have presented additional empirical analysis that extends and confirms Engel's earlier work and we have sought to emphasize the importance of empirical grounding for abstract theories, especially in the context of decisions about public policy where real-world consequences will follow.

Beyond that, we have advanced possible explanations for the apparently irrational behavior of state environmental regulators. Although evidence suggests that more stringent environmental standards cost a state few, if any, industry relocations or initial industry sitings, a substantial minority of states nonetheless express an inclination to relax standards in order to attract or retain industry. Drawing on work in the economic and urban development literature that has developed in response to similar puzzles with regard to taxes and financial incentives, we suggest that the seemingly irrational behavior of state and local officials could arise from an incentive structure that is different for individual decision-makers than for the state as a whole. It is plausible that a race-to-the-bottom results from state decision-makers' rational responses to incentive structures that diverge from those of the public welfare. This mechanism is different from that offered by the classic prisoner's dilemma, but the consequences are the same: a race-to-the-bottom in state environmental standard-setting that results in lower environmental quality and reduced social welfare.