Using Economic Analysis in Teaching Environmental Law: The Example of Common Law Rules*

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We have been asked to discuss the uses that we make of economic analysis in our introductory courses on environmental law. Our discussion here will focus on our approach, from an economic perspective, to the study of common law rules as they bear on the liability of polluters for injuries caused by their activities. Before addressing that topic, however, some preliminary remarks are in order.

The use of economics in our courses is hardly limited simply to the subject of common law liability rules. Our teaching relies considerably (but not exclusively) on economic analysis as an organizing framework,[1] for four reasons:

1. "Environmental law" is an uneasy aggregation of decisional law, statutes, and regulations. The subject matter embraced is sprawling and its limits are ill-defined. It is not based on any distinct, integrated corpus of common law doctrine, and its content is constantly undergoing rapid change. In these circumstances, it is practically a pedagogical necessity to provide, if only provisionally, a theoretical framework for organizing questions of environmental law and policy. Although there are important limitations in economic analysis, particularly as applied to environmental issues, it provides in our view the most general, powerful, and consistent organizing framework that is now available.[2]

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* This paper was originally presented at an Educator's Conference on Economic Analysis in the Teaching of Land Use and Environmental Law, held in Cambridge, Massachusetts on December 15, 1979 under the sponsorship of the Lincoln Institute of Land Policy. At that time, Professor Krier was Professor of Law, Stanford University, and Professor Stewart was Visiting Professor of Law, University of California, Berkeley.

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1. This characterization applies as well to our coursebook, R. STEWART & J. KRIER, ENVIRONMENTAL LAW AND POLICY (2d ed. 1978) [hereinafter cited as STEWART & KRIER].

2. We examine some of the central limitations of economic analysis in connection with the materials in STEWART & KRIER at 163-97 (Discussing, *e.g.*, prob-

2. Beyond providing a provisional organizing framework, economic analysis serves as a useful pedagogical foil for identifying and dissecting values or considerations, other than efficiency, that are relevant to environmental law and policy. Many students find economic analysis uncongenial; its use drives them to articulate competing concerns (such as moral duties or the just demands of future generations—factors that a strictly economic analysis might ignore) and defend them as coherent and justified grounds for choice in light of counter-arguments based on efficiency grounds (for example, that environmentalism is elitist, paternalistic, or anti-democratic).

3. Economic analysis of law is an important subject of academic study to which students should be exposed during their law school careers. While there are many subjects other than environmental law that could serve as a vehicle for exposure, environmental law provides an especially fertile opportunity for teaching students its characteristics, strengths, and limitations.

4. Familiarity with economic analysis of environmental issues proves useful to students who subsequently practice environmental law or engage in the development of environmental policy. Economic analysis and related forms of cost-benefit analysis have long informed law-making in this area; they are being used increasingly by legislatures, administrative agencies, and some courts as they confront problems of pollution, toxic substances, and the management and disposition of natural resources. Some prior exposure to economic concepts and applications in the environmental context demystifies the subject and provides a beginning orientation for advocacy and analysis—a benefit to students whether or not they happen to find the approach congenial.

Our courses develop the economic analysis of environmental law in a number of contexts. We begin by introducing general welfare economic principles and their applications in rather abstract terms. We then seek to give the approach greater concreteness by using it to analyze common law doctrines and particular common law decisions regarding liability for pollution damage—our subject in this paper. Discussion of the common law leads naturally into an examination of legislative and administrative

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lems of uncertainty and of distributional justice). In these same pages and in others, *e.g.*, STEWART & KRIER at 37-96, we also offer alternatives perspectives (for example, technological and political) on environmental problems. *See also* Graff, Book Review, 93 HARV. L. REV. 282 (1979), questioning the appropriateness of economics as a basic organizing framework for environmental law.

regulatory intervention as an alternative approach. We consider a number of regulatory issues both at the "macro" level (How should ambient air quality standards be set? Should they be uniform or vary geographically? Should ambient standards be scrapped in favor of uniform technology-based emission limitations?) and at the "micro" level (Should auto manufacturers be granted extensions of pollution reduction deadlines? How should new source performance standards be set?). Having considered such questions, we proceed to develop a systematic economic critique of command-and-control regulation[3] and consider alternatives (particularly emission fees, transferable pollution permits, and "mixed" systems)[4] that follow from the economic approach and that might well prove superior, in both static and dynamic con-

3. "Command-and-control regulation" is a currently popular label for the traditional (and contemporary) mode of legislative intervention in environmental problems. As the phrase perhaps implies, this regulatory approach typically proceeds by imposing rigid standards of conduct on individual pollution sources (*e.g.*, standards requiring that sources meet a specified emission ceiling, or that they use a specified control technology) backed up by sanctions designed to assure full compliance with such standards by each source.

4. Some definitions may be in order here. Emission fees refer to pollution taxes, long popular with economists. Under this approach, a charge (or a price, or a fee, or a tax—all these labels are used) is set on each unit of pollution, either at a level that reflects the damage caused by that unit or at a level that will yield, in the aggregate, a target level of pollution control. Unlike command-and-control regulations, emission fees do not require or aim for a given degree of control from each pollution source; rather, sources pollute as little or as much as they are willing to pay for. The notion is that a properly set fee will induce all sources considered together to achieve the desired aggregate level of emissions. Those firms which can control pollution relatively cheaply will control to a greater degree and pay less in fees; those firms with larger pollution control costs will find it in their interests to control less and pay fees on a higher level of emissions. A chief advantage of this approach is that, by inducing different amounts of control by different sources in accordance with their respective control costs, it tends to minimize the costs of control. For a popular account of the emission fee approach, *see* Ruff, *The Economic Common Sense of Pollution*, 19 PUB. INTEREST 69 (1970).

Under a system of transferable pollution permits, pollution is not priced directly; rather, a fixed number of rights to pollute is established, and these may be bought and sold. A source wishing to pollute has to purchase the required number of rights, and this gives it incentives—similar to those generated by emission fees—to control. Again, different sources will control to different degrees, and control costs will tend to be minimized. The popular account in this case is J. DALES, POLLUTION, PROPERTY AND PRICES (1968).

Mixed systems refer to any number of hybrid approaches to control. An example would be a command-and-control regulation limiting emissions per source, but adding an emission fee for each unit of pollution within the regulatory ceiling, the aim being to induce sources to undertake even greater degrees of control. *See* STEWART & KRIER at 596–602.

texts, to the more conventional regulatory controls. Finally, our courses take up matters of process—administrative law, the National Environmental Policy Act,[5] and issues relating to the funding of environmental advocacy. These subjects provide an opportunity to contrast the role of courts in reviewing administrative action with their role in common law adjudication, and to consider the relevance of economic analysis in the context of judicial review.

By the end of their exposure to the variety of topics sketched above, our students should have learned enough about economic analysis (and its limitations) to understand its power as a means, positive and normative, for uncovering, organizing, and examining issues of environmental law and policy. This is not to say that we expect or aim for our students to necessarily *accept* economics as the appropriate basis for ultimate judgments about the sorts of issues we address. If anything, the pedagogical effectiveness of economic analysis as a foil for highlighting other relevant concerns and points of reference tends to lead to a situation where, by the end of the course of study, questions are left in unresolved (but, we hope, illumined) conflict. Given the intractable nature of many of the problems that we discuss, this result strikes us as appropriate.

We now turn to the focus of this paper—the uses that we make of economic analysis in considering common law rules of liability for pollution damage. We introduce the subject to our students in four steps:

1. Overview of the basic concepts of economic analysis.
2. Preliminary application of the concepts to traditional common law rules.
3. Extension and qualification of the analysis.
4. Detailed application of the analysis to four alternative rules of decision.

The balance of our discussion takes up these points in order.

I.

OVERVIEW OF THE BASIC CONCEPTS OF ECONOMIC ANALYSIS

A persistent problem in teaching economic analysis of law is the wide disparity among law students in previous exposure to economics. Some have had no economics at all; others may have Ph.D.s in the field. Thus, exposition risks being either too simplistic or too advanced for some significant sector of the class,

5. 42 U.S.C. §§ 4321-47 (1970 & Supp. V 1975).

with attendant risks of boredom or incomprehension. Teachers have adopted a variety of approaches to deal with this problem: Special readings or review sessions for students without an economics background; several sessions of "basics" which students with an economics background are invited to skip; insistence upon an economics background as a prerequisite for enrollment in the course.

The ultimate solution to the background problem may lie in reform of the first year curriculum to include an introduction to economics for all students who lack some minimum training; a number of schools now take, or have plans to adopt, this approach. In the meantime, we have attempted to respond to the problem through a textual note in our materials that explains in concise terms the basic premises and working concepts of micro-welfare economics.[6] The note is designed to provide an introduction for the novice, while at the same time putting sufficient emphasis on theory and on a number of more advanced points to attract the attention of the student with previous background in economics. (We find that a considerable number of students with such a background nevertheless deploy efficiency analysis in a rather automatic and uncritical way. Even for them, then, a review of basic premises can serve a useful function.) We generally spend one class reviewing the basic themes in the note; students with an economics background are welcome to absent themselves if, after reading the note, they judge that they have mastered its content. The note, the lecture, the subsequent elaboration and application of economic analysis throughout the course, and special invitations to the perplexed for informal conferences appear to provide most students with an understanding of economic analysis of environmental law and policy sufficient for the achievement of the pedagogical objectives we have described above. The understanding often falls short of mastery, of course, and a few students may fail to obtain even a basic grasp of the material. These shortcomings, however, could probably be overcome only through extensive and intensive drill and review which, we believe, would divert too much time and resources from other materials and issues in the course. Instructors who seek to introduce students to economic analysis of law in the context of other courses aimed at specific areas of substantive law are likely to reach similar conclusions.

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6. *See* STEWART & KRIER at 99-117.

In introducing economic analysis to students in class, we develop the basic concepts of Pareto optimality and Pareto superiority[7] and illustrate them diagramatically and by example. We underscore their normative premises (*e.g.*, the assumption that more, of whatever it is that individuals happen to want, is better) and their relation to distributional considerations (distributional considerations furnish one way to choose among Pareto-optimal points; Pareto-superior moves may be rejected under some theories of distributional equity). We also emphasize the fact that Pareto-superior moves are rarely available in the real world of policy making. This latter fact provides a bridge for introducing students to the concept of applied economic efficiency (as determined by aggregate willingness-to-pay and opportunity costs) and the related apparatus of cost-benefit analysis. Applied efficiency analysis is explained as a response to the difficulty of identifying or arranging Pareto-superior moves. Its ethical premises are reviewed: Willingness to impose losses on some people because of greater aggregate benefits to other people, and the practical barriers to arranging transfer payments to compensate the losers; reliance on existing preferences and distributions of wealth and entitlements to provide a yardstick of value.[8]

Finally, we provide a brief account of how "market failure" can arise and produce inefficiently high levels of pollution. Market failure is first analyzed as a "collective good" problem—polluters enjoy an implicit right or entitlement to pollute, and transaction costs and free-rider effects[9] prevent the effective organization of

7. Pareto optimality is the term economists use to denote an allocation of resources such that no reallocation could make some person better off without necessarily making some other person worse off. Pareto superiority identifies moves (resource reallocations) that make someone better off without hurting anyone; the reallocation would be Pareto superior to the state that exists. A Pareto optimal state, of course, has no Pareto superior. For a good introductory discussion, *see* B. ACKERMAN, ECONOMIC FOUNDATIONS OF PROPERTY LAW vii–xvi (1975).

8. The concepts of Pareto superiority and applied efficiency take existing preferences, and the existing distribution of wealth, as givens, and make no judgments about them. Value is a function of willingness to pay, and nothing else, and willingness to pay is, of course, a function of wealth and preferences. Thus to be content with the statement that a move is Pareto superior or that it increases efficiency is to accept the normative proposition that, for example, the distribution of wealth in society is acceptably just. Yet, on reflection, one might conclude that it is not just at all; in such a situation, Pareto superiority and applied efficiency lose much of their appeal as tools for policy making. The job for the teacher, then, is to stress the usefulness, but also the limitations, of applied efficiency analysis.

9. *See* notes 11 and 15 *infra*.

receptors to pay polluters to produce clean air. Market failure is then analyzed as a "collective bad" problem—receptors enjoy an implicit right or entitlement to clean air, but polluters can easily violate that entitlement through self-help by polluting, and receptors lack effective legal machinery for vindicating their rights. In class, we develop the point that the choice among these views depends on (or reflects) an implicit assignment of rights. We also point out that essentially four basic means are available to government to redress inefficiencies created by either the "collective good" or "collective bad" version of market failure: Common law liability rules, regulatory controls, subsidy programs, and fee systems. The choice among alternative approaches may be analyzed in efficiency terms, but might also be influenced by the assignment of entitlement.

II.

PRELIMINARY APPLICATION OF THE CONCEPTS TO TRADITIONAL COMMON LAW RULES

Our next step is to apply the economic concepts developed above to legal rules by using Coase's well-known article[10] to distinguish the case of few parties/low transaction costs from the case of many parties/high transaction costs.[11] Our objective here is to examine, in the two instances (high and low transaction costs), the resource allocation and distributional effects of the three rules of decision on which courts have *traditionally* relied in pollution cases: Polluter subject to injunction; polluter not liable at all (*i.e.*, receptor subject to injunction); polluter liable for damages. We simplify our analysis by considering only damage and abatement costs, which permits an easy diagrammatic exposition.[12]

We begin by applying Coase's analysis to a two-party setting

10. Coase, *The Problem of Social Cost*, 3 J. LAW & ECON. 1 (1960).

11. Transaction costs refer to all the costs of parties getting together and carrying out exchanges—identifying each other, conducting negotiations, drawing up agreements, enforcing them. More broadly, transaction costs can include the administrative costs occasioned as a governmental agency goes about determining, establishing, and policing a regulatory program. One might think that transaction costs would be low when few parties are involved—a few polluters (or only one) and a few receptors (or only one). As we shall see, however, this is not necessarily (or perhaps even usually) the case, and our statement in the text should not be taken to imply that it is.

12. *See* STEWART & KRIER at 134.

(polluter P and receptor R) under the assumption of zero transaction costs. We note the importance of the latter assumption (no information, decision-making, or bargaining costs) and possible ambiguities in it (On what assumptions do bargaining deadlocks not occur?). We also note how a two-party situation in the real world might resemble as well as depart from this hypothetical.

Next we make the abstract point that in a world without transaction costs, Pareto optimality will be achieved regardless of the legal rule adopted by a court to deal with P's pollution because (by definition) any Pareto-superior resource reallocations that exist following adoption of the rule will be achieved either through unilateral moves or bilateral agreement. We illustrate this general point by considering P's and R's responses to each of the three traditional legal rules that a court might adopt (P subject to an absolute injunction prohibiting any discharge of pollutants; P not liable at all; P liable for damages). Using our simplified diagram that takes into account only abatement and damage costs, we show that:

(a) Whether the court adopts a rule prohibiting all pollution by P or a rule allowing unlimited amounts thereof, P and R will negotiate an agreement under which P will pollute up to the point where the marginal damage caused by pollution and the marginal costs of abatement are equal. The agreement will be accompanied by side payments, the identity of the payer being dependent upon the court's choice of rule and the amount of the payment being determined by bargaining.

(b) If the court adopts a rule awarding (correctly measured) damages to R, P will (in anticipation of future damage liability) unilaterally control pollution to the point where marginal damage costs and marginal abatement costs are equal.[13]

The foregoing suggests that a Pareto-optimal allocation of resources will occur regardless of the court's choice of rule. However, we emphasize that the choice of rule (and hence of entitlement) will affect, perhaps dramatically, the distribution of wealth between P and R, and that this in turn may affect the value to R of clean air (bid or asking price)[14] and hence the location of the

13. The diagram ignores potential "corner solutions" in which the efficient result is either for P to shut down or R to leave.

14. If P is entitled to clean air, the value of clean air to P can be seen as the asking price that P would demand for selling that entitlement in a market transaction. If R is entitled to pollute, the value of clean air to P can be seen as the bidding price that P would offer in order to purchase R's entitlement. Because P's total real wealth is greater in the former situation, the asking price would normally be greater than the bidding price.

point where marginal damage costs equal marginal control costs. More generally, the zero-transaction-costs case becomes an appropriate occasion for asking what values *other* than Pareto optimality or efficiency should be considered in the choice among liability rules, because in such a case it is only those alternative values that will affect the choice.

We then consider, again in a preliminary way, the effect of the court's choice among the same three alternative liability rules in the more characteristic case where the number of parties involved is large and transaction costs are high. Specifically, we deal with the case of a single polluter and numerous receptors, showing that the choice of a rule enjoining P from polluting or a rule freeing P from all liability for pollution (in the same diagrammatic context involving only damage and abatement costs) could often lead to serious inefficiencies because of the parties' inability (due to transaction costs and associated hold-out and free-rider problems)[15] to bargain and negotiate an efficient reallocation of resources. However, the analysis indicates that adoption of a rule holding P liable in damages could lead P to an efficient level of control, and the obvious point is made that an injunction mandating an efficient level of control would likewise be efficient.

III.

EXTENSION AND QUALIFICATION OF THE ANALYSIS

Up to this point our students have been exposed only to a relatively pure and elementary sort of economic analysis. What we do

15. For discussion of transaction costs, *see* note 11 *supra*. The hold-out problem arises when each member of a group must agree to sell a right—such as the right to clean air—in order for an effective exchange to be concluded. Thus if P, as the result of a suit by a group of Rs, is enjoined from polluting, he must buy off all the Rs, and this will prove difficult. Each R must release the injunction, yet each has incentives to appropriate a lion's share of the gains from trade by holding out for an exorbitant price, knowing that if P does not come to terms with each R, P will still be subject to the injunction. The free-rider problem is essentially the converse case; it arises when a group of Rs must buy off P (whom we shall now suppose the court has freed from all liability). Since clean air is a collective good—a good that can be enjoyed by all members of the group of Rs whether or not they contribute to its purchase—each R has incentives to withhold contributions toward a deal with P, hoping to take a free ride on the contributions of others. Since in both cases—the hold-out setting and the free-rider setting—each R tends to reason as the others do, group transactions are very difficult to conclude. This is another way of saying that hold-out and free-rider problems give rise to high transaction costs—higher even than the mere presence of large numbers of negotiating parties might at first suggest.

next is elaborate the analysis by introducing a number of considerations that afford greater realism and cast some doubt on the likelihood that economic analysis can be counted on to guide judges to more efficient decisions, or otherwise serve as an appropriate basis for choice among alternative legal outcomes in concrete cases. The objective here is not to disparage the analysis, but rather to show that its application is not so easy as might at first appear.

First, we point out that efficiency requires a minimization of all of the (opportunity) costs involved in the use of an environmental resource such as the atmosphere. These include not only damage and abatement costs, but transaction costs as well (the cost of litigation and of judicial decision making—including error costs—must be considered). The theoretical ideal of aiming at the resource allocation that would occur in the absence of transaction costs is challenged as an appropriate ideal in a world shot through with high transaction costs, whose reduction is a principal aim of the legal system.

Second, we develop as a related point the enormous difficulty of quantifying each of the relevant costs (particularly damage and transaction costs), and the danger that judicial assessments of such costs will often be ad hoc, subjective, and just plain inaccurate to a greater or lesser degree. The significance of this observation, of course, is that the efficiency of a given outcome can turn on the accuracy of the judge's assessment of the relevant variables; an inaccurate assessment can lead to an inefficient result.

Third, we question the assumption that few parties means low transaction costs. In fact, the paradigm two-party case has elements of bilateral monopoly,[16] and one can draw from economic and game theory to show that in such a setting strategic behavior (bluffing and the like) on the part of the parties can lead to suboptimal outcomes. The parties play games with each other which have the effect of increasing the costs of transacting (the game-playing takes time and may involve costly commitments of resources as part of an overall bargaining strategy); indeed, the parties may fail to reach agreement at all. This is a well documented point,[17] and one easy enough for the students to see. We

16. A bilateral monopoly arises when, in a two-party transaction, neither party has any alternatives (or any good alternatives) to dealing with the other. *See* R. POSNER, ECONOMIC ANALYSIS OF LAW 45 (2d ed. 1977).

17. *See, e.g.*, Polinsky, *Controlling Externalities and Protecting Entitlements: Property Right, Liability Rule, and Tax-Subsidy Approaches*, 8 J. LEGAL STUD. 1 (1979). A version of this paper written in a fashion more accessible to lawyers

also explore at this juncture the tensions between an efficiency assessment that considers only the parties before the court (this may suggest that the judge is confronted with a few-parties case) and the potential impact of a ruling in such a situation on other actors waiting in the wings (the case in fact involves many parties).

Fourth, we develop in general terms additional difficulties in the use of economic analysis to determine choices among legal rules, with emphasis on such issues as distributional justice (including justice among generations) and considerations of moral duty and entitlement.

Added together, the foregoing considerations suggest that efforts by courts to determine efficient outcomes on a case-by-case basis—whether by assessing and balancing all relevant costs (including the transaction costs of progressively more detailed inquiry about and analysis of such costs by the court and the litigants), or by relying on the parties engaging in Pareto-superior transactions—might well be unwise, or at least unduly hopeful. We explore these observations by using the *Versailles*[18] and *Waschak*[19] decisions as examples, asking, among other matters, that the students make their own assessments of the various costs involved, and their own assessments of the appropriate characterization (few parties or many parties) of the cases. At this point students may well conclude that economic analysis has little or nothing to contribute to a judge's choice among the traditional common law rules.

IV.

DETAILED APPLICATION OF THE ANALYSIS TO FOUR ALTERNATIVE RULES OF DECISION

We conclude our application of economic analysis to common law rules with an effort at revivification. Shifting from a particularistic, case-by-case analysis (*Versailles* and *Waschak*) back to a consideration of general rules of decision, we try to suggest that for all the difficulties it presents, the economic mode of reasoning can still produce useful insights for the reflective judge. While

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is forthcoming. *See* Polinsky, *Resolving Nuisance Disputes: The Simple Economics of Injunctive and Damage Remedies,* 32 STAN. L. REV. 1075 (1980).

18. Versailles Borough v. McKeesport Coal and Coke Co., 83 PITT. L.J. 379 (1935) (declining any relief against polluter).

19. Waschak v. Moffat, 379 Pa. 441, 109 A.2d 310 (1954) (following *Versailles, supra* note 18, on similar facts; the dissenting judge, who wrote the majority opinion in *Versailles,* would have granted relief in damages).

it probably cannot (and no doubt should not) prove conclusive in all instances, it can often enlighten the choice of rule and remedy. Moreover, we try to show that the efficiency concerns of the economic perspective can often turn out to be broadly congruent (or at least compatible) with concerns other than efficiency as guides to choosing among competing doctrines.

The stage for our analysis is set by first reviewing traditional "black letter" doctrine on nuisance and trespass, as presented in judicial opinions and the *Restatement of Torts.*[20] These sources enumerate a jumble of different factors with no apparent coherent structure and with no indication as to how the factors are to be balanced and applied—a fact that highlights the need for a more comprehensive and intelligible framework. To provide that framework, we draw from the work of Calabresi and Melamed[21] to show that in fact there are *four* rules of decision available to a judge—the three traditional rules we have thus far discussed, plus a fourth possibility—receptor liable for damages (which is to say that R may stop P from polluting only if R pays P damages equal to P's abatement costs).[22]

This fourth rule, familiar now thanks to Calabresi and Melamed and to the decision in the *Spur Industries* case,[23] has an interesting intellectual history. So far as one can tell, it was discovered (that strikes us as the appropriate word) by Calabresi and Melamed on the one hand, and by the court in *Spur Industries* on the other, simultaneously but by dramatically different approaches. For Calabresi and Melamed, the rule was a logical product of a modeling exercise. They reasoned that an entitlement exists (say, in our case, an entitlement to use the air resource as one wishes) that can be located in either P or R, and that can be protected, alternatively, by an injunction (in order to violate the entitlement, one must get the permission of its owner) or damages (in order to violate the entitlement, one must pay court-determined damages to its owner). Given that the entitlement can be in either P or R, and

20. *See e.g.*, 1 RESTATEMENT (SECOND) OF TORTS §§ 157-65 (1965); 4 *id.* §§ 822, 826-28 (1979).

21. Calabresi & Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral,* 85 HARV. L. REV. 1089 (1972).

22. There is a potential fifth rule of judicial abstention—neither party is recognized by the court as having a protected entitlement, and each is remitted to self-help. P is free to pollute, and R is free to attempt to abate the pollution by brute force.

23. Spur Industries Inc. v. Del E. Webb Development Co., 108 Ariz. 178, 494 P.2d 700 (1972).

that it can be protected by either of two means, there must be four possible outcomes or rules of decision rather than the three traditionally relied upon by the courts. Hence rule four. We are confident that the court in *Spur Industries* arrived at the same rule by a very different route—one indicated by the logic of concrete necessity rather than the logic of an abstract model. In *Spur,* the court concluded that the nuisance in question should be abated, but concluded also that as a matter of fairness (because the nuisance was there first, and under circumstances in which subsequent development was not foreseeable) the costs of abatement should be borne by the complaining party. Hence rule four again.

The revelation of rule four gives us a full-blown and internally consistent set of alternatives for judicial resolution of conflicts over environmental resources. The final task for us and our students is to run through the alternatives, considering their advantages and disadvantages in light of the considerations and problems we have tried to bring out up to this point.

There are many ways one can go about this. We usually begin by considering the choice between P not liable and P liable in damages, developing an efficiency based argument for a rule of strict polluter liability in damages. The analysis behind such an argument can enrich earlier discussion by introducing principles of risk-aversion and risk-pooling,[24] the global impact of alternative rules on product prices and consumer purchases, and impacts on research and investment decisions. Under this approach, each individual lawsuit becomes part of a dynamic large-number case; the threat of cumulative individual damage awards will drive polluters

24. Risk-aversion simply refers to a dislike of risk (a risk-averse person suffers disutility from the very presence of risk), and risk-pooling—through insurance, for example—describes a means for risk-averse people to avoid risk. Thus a risk-averse person, confronted with a one-in-ten chance of a $1000 loss, might purchase insurance against the loss at a cost of $110, even though the expected value of the loss is only $100. The insurance buyer, being risk-averse, would rather face a certain cost of $100 than an uncertain (risky) cost of $1000, even though the latter may never materialize. For an application of these observations to strict liability, *see* STEWART & KRIER at 226–27:

> The award of damages can operate to spread the harm caused pollution victims among all of the consumers of a polluting enterprise's products. Where the harm to the victims is acute, this loss spreading may be economically efficient. As the example of insurance confirms, people are often willing to suffer a known but small economic harm in order to avoid the possibility of suffering a much larger harm. It may, however, be unduly costly or difficult for private insurance systems to deal with many environmental risks. In these circumstances, judicial imposition of liability without fault may be justified as a governmentally-imposed system of insurance.

to efficient investment decisions (including investment in research and development). The *Reynolds Metals* case[25] can serve as an example of the justifications for such an approach.

In the course of discussing strict liability, we consider—with appropriate attention to burden-of-proof issues—three situations arguably calling for affirmative defenses:

— where R is the cheapest cost avoider (we point out that P could nevertheless be required to compensate R for R's avoidance costs—the *Boomer* case[26] might be an example here);

— where damages will cause P to shut down, resulting in greater harm to the community than the damages caused by continued pollution (because of external benefits contributed by the source—the *Versailles* case[27] might exemplify such a situation, though there the plaintiffs did not seek a damage remedy);

— where damage costs are so diffuse and individually small that the transaction costs of attempting to shift them through private litigation would be greater than any benefits secured as a result.

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25. Reynolds Metals Co. v. Yturbide, 258 F.2d 321 (9th Cir.), *cert. denied,* 358 U.S. 840 (1958). In effect, the *Reynolds Metals* decision imposed strict liability in damages for acute health injuries from pollution. However, the opinion relies on rather artificial *res ipsa loquitur* reasoning to sustain a jury verdict for plaintiffs, because the case was submitted to the jury on a negligence theory and because the court, as a federal court sitting in a diversity case, was unsure whether state law would authorize imposition of strict liability. The case illustrates the elaborate factual investigation needed to determine "fault" under a negligence theory; adoption of a strict liability approach would obviate the need for much of the investigation and thus avoid its associated costs.

26. Boomer v. Atlantic Cement Co., 26 N.Y.2d 219, 257 N.E.2d 870, 309 N.Y.S.2d 312 (1970). The facts in *Boomer* suggest that plaintiffs could most cheaply avoid the pollution costs involved in the case. The court nevertheless awarded damages to plaintiffs, measured by the decline in market value of their properties. Correctly applied, that measure would limit plaintiffs' recovery to their avoidance costs, and thus not occasion an inefficient result. *Boomer* can be justified, then, as an effort to put the costs of avoidance on polluters, whether as a matter of distributive justice or as a means to stimulate research and development, or both. In these terms, *Boomer* is perfectly consistent with a strict liability rationale.

27. *Supra* note 18. *Versailles* was decided during the Great Depression and involved an industry (coal mining) of great importance to the Pennsylvania economy. The court was plainly concerned that an imposition of liability would have disastrous effects on the job market.

We close this part of the discussion by suggesting that a rule of strict polluter liability in damages, subject to the sorts of affirmative defenses mentioned, appears to be broadly congruent with concerns other than efficiency, as well as with the efficiency criterion.

Having accomplished the foregoing, we ask our students to consider why the strict liability rule might nonetheless fail to achieve efficient outcomes, referring back to the difficulties of establishing causal responsibility, quantifying harm or avoidance costs, and "collecting" diffuse and remote harms, many of which have not yet occurred. These shortcomings direct attention to still another alternative rule—injunctive relief to the plaintiffs. Here we bring out the obvious inefficiency that can result if the information available to the court is poor and if transaction costs are sufficiently high to frustrate the sorts of post-injunction bargaining by the parties that could correct the inefficiency generated by an ill-informed court decree. A useful exercise at this point is to ask the students to compare the relative merits, on various sorts of factual assumptions, of two rather bleak alternatives—P liable in damages, P subject to injunction. We suggest that courts should be sensitive to the likelihood that (in a few-parties case) the parties will, or will not, behave strategically. It can prove useful to compare the confidence one has in assessing relevant costs to the confidence one has about the ability of the parties to engage in effective bargaining. The analysis can be extended to a many-parties case, for in some such cases information may be so poor as to justify injunctive relief even if the judge has no reason to believe this will promote efficiency, simply because there is also no reason to believe damages will prove any better in this regard, and because noneconomic considerations may incline one to regard injunctive relief as the best of a poor set of alternatives.

In discussing injunctive relief, we inquire into a court's abilities to hand-tailor a precise decree mandating the efficient degree of control. *Harvey Aluminum*[28] is a good case in point, revealing in a pointed way how easily the court can fall wide of the mark. In *Harvey,* the judge ordered the aluminum company to install the same controls used by other aluminum companies, without giving attention to such relevant variables as location, nature of the production process, age and size of the defendant's plant, and so forth.

Finally, we turn to rule four and examine its properties. The

28. Renken v. Harvey Aluminum, Inc., 226 F. Supp. 169 (D. Or. 1963).

rule—R may require P to control its pollution if R pays P's abatement costs—is an attractive alternative if the court considers P the cheapest cost avoider but believes that, as a matter of fairness (the situation in *Spur*), P should not bear abatement costs. One difficulty with *Spur* was that the plaintiff (Del Webb Development Company) who was ordered to pay P's abatement costs was not the real party in interest. One could well anticipate, after the order in the case, that Del Webb would agree to let P stay and continue polluting, thus saving the plaintiff the costs of P's abatement. This would be fine if Del Webb's interests in the case were congruent with those of the real parties of concern (a large group of citizen-receptors who had purchased homes from Del Webb in the area and who were suffering from P's nuisance), but there is every reason to believe this was not the case. Thus, an inefficient result could be generated even if Del Webb did bargain with P.

Does this mean that the citizen-receptors should somehow be brought into the case through a class-action device? Assuming that this could be accomplished, it appears that little would be gained. The Rs would then have the choice of tolerating the nuisance, paying P to abate it, or moving away. But how is it possible to determine which of these alternatives the group of Rs would prefer? If we rely on the Rs collectively to decide whether to pay P's abatement costs, there would be confronted the very problems of organization—free-riding and the like—that (one presumes from reading Calabresi and Melamed) rule four was designed to avoid. We could rely on the Rs' class-action representative to make a choice, but there is no way to ensure that his or her decision would be representative of the preferences of the Rs as a whole. In order to avoid large group decision-making problems, P should be given the choice to stay and forego any payment, or to leave and receive an amount equal to the damages P causes the Rs! This alternative promotes efficiency but can also be problematic: Suppose (as will often be the case) that the judge is reasonably confident about P's removal costs but hasn't the faintest notion of the damages to the Rs. Under such circumstances, the convenient rule would be to confront the Rs with the choice of paying P's costs or tolerating the nuisance. But then we are back to the collective action problem mentioned above.

The general point here is that even with a full-blown set of four rules, difficult tradeoffs are at times necessary. We have just mentioned one example, arising from variables having to do with collective action and asymmetric information. A similar tradeoff can arise where fairness considerations dictate a wealth transfer

to one side in the lawsuit, but this is inconsistent with the outcome suggested by considerations relating to asymmetric information, collective action, or the likelihood of strategic behavior. Some of these dilemmas can be resolved, but others cannot (so far as we have been able to tell).

By the end of our exercises with the economic analysis of common law rules, and with the problems with that analysis, we find ourselves asking the class to consider a number of seeming incommensurables—something like summing up an orange, the number 6, and the note F#. This does not, however, lead us to regard the exercises as foolhardy. For one thing, the class becomes painfully aware of the difficulties of good decision making *from any perspective;* for another, the students prove to be equipped with a number of relevant considerations of which they were previously unaware, and they find these useful at the margin in thinking about any particular, difficult case. The mode of analysis also makes students sensitive to the shortcomings of courts as institutions for resolving environmental conflict. Though we consider means to overcome these shortcomings, the general conclusion is pessimistic;[29] thus we develop a nice transition to the material covered in the balance of our courses—various sorts of centralized control. In considering the techniques of centralized control, we rely once again on economic insights, though again not exclusively. Our analysis introduces some old points in a new setting, and it brings out new points (pertaining, for example, to the economics of bureaucracy and of federalism).

In closing, we should note that the multiple stages covered in our study of common law rules, and later of centralized controls, involve a good deal of (intended) overlap and repetition. The focus, however, is different in each iteration, and we believe that the technique of covering and then recovering various points with steadily increasing degrees of realism and concreteness, and with subtle (or dramatic) changes in setting, is pedagogically effective in providing students a reasonably developed understanding of the strengths and weaknesses of economic analysis and, more important, of alternative means of resolving resource conflicts. That matters may in the end be left pretty much up in the air is, we think, a positive not a negative point, given the nature of the problems being discussed. In short, we think our mode of analysis illuminates problems but hardly solves them. We consider the light well worth the candle.

29. *See* STEWART & KRIER at 255-324.