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Redesigning CERCLA Liability: An Analysis of the Issues

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EXECUTIVE SUMMARY

Superfund, the federal hazardous substance cleanup program, is one of the most hotly debated pieces of environmental legislation. It empowers the Environmental Protection Agency to identify high-priority contaminated sites and clean them up with the financial help of those responsible for the contamination. Since its enactment in 1980, it has been criticized for:

- Relying on inaccurate risk assessments that overstate environmental risk;
- Requiring more cleanup than may be reasonable, leading to costs out of proportion to benefits;
- Placing responsibility for cleanup on innocent parties, unfairly distributing cleanup costs, and imposing large liability where there is no fault;
- And, as a result of all these, encouraging long, bitter, and expensive litigation over what should be a Superfund site, who should pay for its cleanup, and how much they should pay.

Environmental scientists and policymakers (including the Clinton Administration) now universally recognize that Superfund reform is in order. Superfund problems were all debated during reauthorization hearings in the 103rd Congress. The cost side of the problem—hitting people, as it did, in the pocketbook—attracted most of the attention. Three types of liability that exist under Superfund were considered in reform bills:

- Strict liability, under which a party is responsible for cleanup, even though it may not have acted negligently;
- Joint and several liability, under which a party can be liable for the whole cleanup, even though it may have only been responsible for a small part of the overall contamination; and,
- Retroactive liability, under which a party is responsible for cleanup, even though the contamination may have happened long before Superfund took effect.

Many people believe that these forms of liability are unfair for several reasons. First, nearly everyone who has touched a hazardous substance between its generation and its disposal can be held responsible for its cleanup. Second, the standards of proof for the EPA are less stringent than those required under common law. Third, the burden of proof is shifted to potentially responsible parties to show that they are not liable. According to others, however, draconian liability is necessary so that people take proper care with hazardous substances.

Superfund reform efforts in the 103rd Congress failed, but it is virtually certain that industry and environmental groups will tackle the issue again in the 104th Congress. The question of who should pay (and how much) for cleaning up hazardous substances is also important on the state level, since many

states have adopted their own hazardous substance cleanup programs to supplement the federal program.

This report examines ideas for reforming Superfund liability. It looks at the three forms of liability and asks how efficiently alternative proposals reduce risks, allocate costs, and allocate risks among potentially responsible parties. A good liability rule should encourage people to prevent pollution and clean it up when it happens. However, it should keep in mind that there is such a thing as “too much cleanup” or “too much prevention.” Liability rules should make people bear the consequences of their actions by paying to clean up (to a reasonable level) the contamination that they've caused. However, to punish people for unforeseeable, non-negligent contamination that occurred long ago would have no deterrent effects. In addition, liability rules should be structured so that the allocation of costs is fair and risks can be spread for those parties who cannot easily absorb large risks. In some cases, though, a tradeoff among these goals may be necessary.

This report concludes that:
(1) In cases of retroactive application:
- Strict liability should be eliminated; and,
- A negligence-based rule should be adopted for both care and mitigation.

(2) In cases of prospective application:
- Strict liability should be retained;
- Joint and several liability should be eliminated, except when the parties have a contractual relationship (as do generators and site owners, or buyers and sellers of land).

I. INTRODUCTION

In 1993-1994 the U.S. Congress began debating reauthorization of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), better known as "Superfund,"[1] one of the most controversial pieces of environmental legislation ever enacted. The main goal of CERCLA is to provide a mechanism for responding to and paying for cleanup of contamination from hazardous substances. The reauthorization proceedings provide an opportunity to reexamine the mechanisms embodied in the original act and its subsequent amendment.[2] In particular, they provide an opportunity for Congress to respond to some of the many criticisms of CERCLA.[3]

The major criticisms surround two aspects of CERCLA. The first is the extent of cleanup that is required. Critics have claimed that "too much" cleanup is required in some cases, due either to an overestimation of the risks associated with the contaminant or a failure to consider the likely exposure to those risks as determined by the intended land use. Thus, they claim that the resulting cleanup is excessive.[4] Second, critics contend that the allocation of cleanup cost responsibility is unfair, since the final apportionment does not necessarily reflect the relative contributions or "fault" of the parties involved.[5] In addition, fighting over who will pay the final bill results in large expenditures on "transactions costs" (such as litigation costs) that do not add appreciably to the cleanup goal and in many cases deter it.[6]

This paper discusses a number of issues that arise in evaluating the liability provisions of CERCLA. While the question of "how clean is clean" is also a key component of the CERCLA debate, the issue is beyond the scope of this paper. We focus instead solely on the question of paying for the cleanup, assuming the level of cleanup has already been determined.[7] The analysis suggests that the issues are complex. The different approaches have both advantages and disadvantages. As a result, any policy choice will involve tradeoffs. Our intention is to point out the nature of those tradeoffs. Nonetheless, there do appear to be

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1 Comprehensive Environmental Response, Compensation and Liability Act of 1980, Pub. L. No. 96-510, 94 Stat. 2767, *codified* at 26 U.S.C. §§ 4611-4682 (1982) and at 42 U.S.C. §6911(a), §§ 9601-9657 (1982).

2 In 1986 CERCLA was amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613, *codified* at 42 U.S.C.A. §§9601-9657 (West Supp. 1987).

3 See, for example, James Lis and Melinda Warren, "Reforming Superfund," Center for the Study of American Business, Policy Study Number 118, February 1994; Harold C. Barnett, *Toxic Debts and the Superfund Dilemma*, Chapel Hill, NC: University of North Carolina Press, 1994; National Research Council, *Environmental Epidemiology Vol. 1: Public Health and Hazardous Waste*, Washington, D.C.: National Academy Press, October 17, 1991; General Accounting Office, "Superfund Program Management," GAO/HR-93-10 (Washington, D.C.: GAO, December 1992); and "Exaggerating Risk," Washington, D.C.: Hazardous Waste Cleanup Project, June 1993.

4 This claim is examined in detail in Katherine D. Walker, March Sadowitz, and John D. Graham, "Confronting Superfund Mythology: The Case of Risk Assessment and Management," Center for Risk Analysis, Harvard School of Public Health, November 1993; W. Kip Viscusi and James T. Hamilton, "Human Health Risk Assessments for Superfund," Department of Economics, Duke University, November 1993; and Shreekant Gupta, George Van Houtven, and Maureen L. Cropper, "Cleanup Decisions Under Superfund: Do Benefits and Costs Matter," *Resources*, Resources for the Future, Spring 1993.

5 See, for example, Lis and Warren, "Reforming Superfund."

6 See Jan Paul Acton, Lloyd S. Dixon, et al., *Superfund and Transaction Costs: The Expenses of Insurers and Very Large Industrial Firms*, (Santa Monica, CA: The Rand Corporation, 1992); Lloyd S. Dixon, Deborah S. Drezner, and James K. Hammitt, Private-Sector Cleanup Expenditures and Transaction Costs at 18 Superfund Sites, (Santa Monica, CA: The Rand Corporation, 1993); and A. Light, "A Defensive Counsel's Perspective on Superfund," *Environmental Law Reporter*, vol. 15, no. 7, (July 1985).

7 The actual determination of the appropriate level of cleanup is very difficult. In many cases, the relevant costs and benefits associated with different levels of cleanup are not known, and, even when they are known, how they should be weighed in the cleanup decision is the subject of debate. Interested parties differ in how much protection they feel is appropriate, with some stakeholders wanting maximum cleanup at any cost. Because we cannot do justice to this complex issue within the limits of this paper, we instead simply assume throughout that parties have agreed on the level of cleanup that is desired and the question is who should be liable for the cleanup costs. In our discussions of the incentives that alternative assignments of liability create for parties to reduce contamination (and thus cleanup costs), we assume that an important policy objective is a weighing of costs and benefits. See further discussion in Section V.

some reasonable policy conclusions that can be drawn, which can serve as a starting point in the process of reconsidering the liability provisions of CERCLA.

II. AN OVERVIEW OF CERCLA

Unlike the Resource Conservation and Recovery Act (RCRA), which focuses mainly on regulation of waste disposal activities, CERCLA was designed as a response to existing contamination problems.[8] The force of the statute is felt after the contamination has occurred rather than before. The immediate purposes of CERCLA were to meet the urgent need for cleanup of contamination that threatens health and the environment and to facilitate the cleanup financially. However, the "after-the-fact" or "ex post" measures imposed under CERCLA create "before-the-fact" or "ex ante" incentives as well.

CERCLA empowers the Environmental Protection Agency (EPA) to identify high priority sites and requires EPA to develop a plan (the "National Contingency Plan") that lays out the processes that are to be used in selecting sites and methods for cleanup. If necessary, EPA can undertake emergency actions at sites that pose an imminent threat to health and the environment. EPA's emergency response and other cleanup actions are financed out of the "Hazardous Substances Trust Fund" (or "Superfund"), which is funded through special taxes on petroleum and chemical feedstocks and corporations. These taxes are not tied to the firm's level of hazardous waste generation.

In addition, EPA is charged with identifying the parties responsible for the contamination. In identifying potentially responsible parties (PRPs), EPA is allowed to include four types of parties: 1) the current owner or operator of the site or vessel, 2) any person who owned or operated the site at the time of disposal of the wastes; 3) any person who arranged for disposal, treatment or transportation of the waste, and 4) any person who accepted the waste for transport. Thus, the definition of responsible parties has included nearly anyone who was involved with the waste or waste site at some point between generation and final disposal. Under the statute, PRPs are responsible for: 1) all costs of removal or remedial action incurred by the state or federal government, 2) any other necessary costs of response, and 3) damages for injury to, destruction of, or loss of natural resources owned, managed or held in trust by the government.

If responsible parties can be identified, EPA can then either force those parties to undertake cleanup, or undertake the cleanup itself and then seek reimbursement for its expenses through legal actions against those parties. In determining the responsible parties' liability, the courts have interpreted CERCLA as imposing strict, retroactive, and joint and several liability. These are far-reaching liability standards. The broad-based standards coupled with the broad definition of PRPs facilitate private funding of cleanup and reduce the amount of cleanup that must be financed (without reimbursement) out of the Hazardous Substances Trust Fund. The ability of EPA to recover cleanup costs is further aided by the standards of proof required under CERCLA (which are generally less stringent than those required under common law) and the shift in the burden of proof to the PRPs.[9]

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[8] For a useful description of both RCRA and CERCLA, see Roger C. Dower, "Hazardous Wastes," in Paul R. Portney, ed., *Public Policies for Environmental Protection*, (Washington, D.C.: Resources for the Future, 1990).

[9] For a discussion of the evidentiary standards and burden of proof under CERCLA, see Frederick R. Anderson, "Natural Resource Damages, Superfund, and the Courts," (Chapter 3) and Howard Kenison, "Uncertain Legal Issues: Comments on Chapter 3," (Chapter 4) in Raymond J. Kopp and V. Kerry Smith, eds. *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment* (Washington, D.C.: Resources for the Future, 1993).

III. TYPES OF CERCLA CASES

CERCLA is a single piece of legislation that deals with two quite distinct types of contamination from hazardous substances. The first type stems from sudden and accidental releases of hazardous substances, primarily oil spills. The second type of contamination results from gradual releases, primarily from the disposal of hazardous wastes.

While the end result in both cases is contamination from hazardous substances, the policy issues that arise in the control of these two types of contamination can be quite distinct. For example, for oil spills there is no issue of retroactive application of liability and generally the identity of the firm responsible for the spill is known. In addition, there is generally a single responsible party, so that issues regarding joint and several liability do not arise. Both retroactive and joint and several liability issues do arise, however, in the context of many gradual occurrences resulting from waste disposal. Similarly, while the measurement of natural resource damages has not yet been a major issue in waste site cases, it has been one of the most controversial aspects of the statute as applied to oil spills.[10]

Because the sudden and gradual contamination occurrences are very different, it is not clear that they should be governed by a single set of mechanisms for providing incentives and determining the allocation of costs. In particular, as discussed below, the evaluation of alternative policy approaches can differ substantially across the two types of cases. An approach that works well for one type will not necessarily work well for the other type. For this reason, in its policy deliberations the Congress should consider separating the treatment of the two types of cases.

IV. WHAT ARE THE COSTS OF CONTAMINATION?

In deciding who should bear the costs of contamination from hazardous substances, it is necessary to be explicit about what those costs are. From an economic perspective, the term “costs” means the social costs of contamination. The social costs of contamination are the sum of three components: 1) the cost of *an efficient amount of cleanup at the site*; 2) the interim (before cleanup) and residual (after cleanup) damages to natural resources; and 3) the interim and residual damages to third parties. We consider each of these in turn.

Consider first the cost of cleanup. An efficient amount of cleanup is an amount such that the cost of any further cleanup would exceed the benefit (that is, the reduction in the damages from residual contamination). In some cases, it might be efficient not to clean up the site at all, as, for example, when there is no exposure to the contamination and it does not cause any harm (damages) now and is very unlikely to do so in the future. In other cases where the damages are very large, full cleanup might be efficient even if the cost of that cleanup is very high. Thus, the determination of an efficient amount of cleanup requires that physical contamination be translated into an estimate of damages that reflects not only the extent of the contamination *per se* but also *the exposure to that contamination.*

Many have argued that cleanups at many Superfund sites are excessive.[11] Specifically, they claim that the cleanup that is required is inefficient, since the costs exceed the benefits.[12] If so, in addition to the inefficiency in the level of cleanup, other inefficiencies can result as well. For example, holding parties strictly liable for these costs will result in excessive care and too little output since the total costs incurred by the firm would exceed the social costs of its activities.[13] However, the increase in costs due to

[10] See Raymond J. Kopp and V. Kerry Smith, eds. *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment* (Washington, D.C.: Resources for the Future, 1993).

[11] See, for example, the references in Notes 3 and 4.

[12] This suggests that actual cleanup decisions are based on some criteria other than economic efficiency.

[13] Excessive cleanup costs will not always affect care and output levels in this way, however. For example, under a negligence rule, as

excessive cleanup can be offset somewhat by other factors that tend to reduce the firm's costs, such as limited assets (which limit the firm's exposure to liability) or insufficient incentives for plaintiffs to bring suit.

The second component of social costs, the interim and residual damages to natural resources, can be decomposed into two parts: 1) reductions in the use value of the resource; and 2) reductions in the non-use value of the resource. The use value reflects the value from direct use of the resource, such as the use of a recreational site.[14] Non-use value, on the other hand, stems from value that individuals place on the resource even if they do not directly use it, as, for example, when individuals value the existence of a population of animals or a natural environment.[15] If people are willing to pay to preserve both the use of a resource and its existence, then both components are legitimate sources of value and both should be included in damages when the quantity or quality of the resource is reduced.

The difficulty, of course, lies in the measurement of these damages. Considerable theoretical and empirical work relating to "natural resource damage assessment (NRDA)" has been conducted to date.[16] The issue has been quite controversial. Much of the controversy surrounds the appropriate treatment and measurement of non-use values.[17] The primary methodology available for measuring non-use value is the contingent valuation method (CVM), which relies on survey responses to construct measures of the value of lost resources. Critics claim that the method is not reliable because it is based on answers to hypothetical questions and as such does not provide meaningful estimates of damages.[18] Defenders of CVM claim that well-constructed surveys can provide meaningful estimates and that with properly conducted surveys the potential biases in the method can be minimized.[19]

Despite questions regarding the accuracy of CVM, there is no evidence that it systematically over- or underestimates non-use values. Clearly, however, excluding non-use values from the estimation of damages (because of the difficulty of measuring them) would underestimate total damages, particularly for remote resources where non-use value would comprise a large portion of the total value of the resource.

The third component of social costs are the damages borne by individuals as a result of contamination. While CERCLA explicitly holds PRPs liable for "damages for injury to, destruction of, or loss of natural resources" owned or managed by the public, it does not provide for liability for third-party damages. Parties suffering personal injuries as a result of contamination would have to seek compensation under the common law. Common law might be effective in ensuring that firms are held liable for third-party damages that result from sudden releases that immediately cause large, concentrated damages. It is likely to be less effective for gradual releases that involve long lags between the time of the offending activity and the manifestation of damages (for example, the contraction of cancer), particularly when it is

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long as the due standard of care is set at the efficient level, the excessive cleanup costs will have no effect on the firm's incentive to take care since if it is not negligent it will not have to pay those costs anyway.

[14] See Kenneth E. McConnell, "Indirect Methods for Assessing Natural Resource Damages under CERCLA," in Kopp and Smith, eds. *Valuing Natural Assets*, pp. 153-196.

[15] See A. Myrick Freeman III, *The Measurement of Environmental and Resource Values: Theory and Methods* (Washington, D.C.: Resources for the Future, 1993); and A. Myrick Freeman III, "Nonuse Values in Natural Resource Damage Assessment," in Kopp and Smith, eds. *Valuing Natural Assets*, pp. 264-306.

[16] See Kopp and Smith, eds., *Valuing Natural Assets*; and Thomas Grigalunas and James J. Opaluch, "Assessing Liability for Damages Under CERCLA: A New Approach for Providing Incentives for Pollution Avoidance?" *Natural Resources Journal*, vol. 28, no.3, (Summer 1988).

[17] See Freeman, "Nonuse Values in Natural Resource Damage Assessment."

[18] See, for example, Peter A. Diamond and Jerry Hausman, "On Contingent Valuation Measurement of Nonuse Values," in Jerry Hausman, ed., *Contingent Valuation: A Critical Assessment* (New York: North-Holland, 1993).

[19] See W. Michael Hanemann, "Contingent Valuation and Economics," *Journal of Economic Perspectives*, forthcoming, 1994.

difficult to prove that the activity was in fact the cause of the injury.[20] In addition, third parties injured by contamination may face insufficient incentives to sue for compensation, due for example to the large litigation costs involved and the uncertainty about the outcome of the suit.[21] To the extent that PRPs are not held liable for third-party damages, their total liability will not reflect the full social costs of their activities. In addition, failure to compensate third-party victims leaves those victims bearing substantial risks if they do not have insurance.

Another component of social costs not included above is the transaction or litigation costs that arise in implementing policies. In the case of CERCLA, these costs include the litigation expenditures by both EPA and the PRPs, as well as all of the costs associated with determining the amount of cleanup that will be required (such as site investigation and preparation of Records of Decision). In some cases, these costs are a large component of total expenditures, although they vary considerably by firm and site.[22] Under the American system, each party bears its own litigation costs, regardless of the outcome of the suit.[23] Thus, even if PRPs bear the full social costs of contamination as defined above (the efficient cleanup cost plus all interim and residual damages), they will not bear all of the costs that arise from contamination.

V. THE ROLE OF LIABILITY

The basic approach to paying for cleanup of hazardous substances embodied in CERCLA is the use of legal liability. Use of liability as an environmental policy tool can serve several functions. In particular, liability can be used to achieve three goals: 1) risk reduction, 2) cost allocation, and 3) risk allocation.[24]

A. Risk Reduction

A major goal of environmental policy is to reduce environmental risks or damages.[25] Because liability imposes costs on individual parties when environmental pollution occurs, it provides an incentive for those parties to take steps to reduce those costs by reducing either the probability or the magnitude of contamination. Reductions in the probability of contamination result when the parties engage in increased preventive actions, such as reductions in the amount of waste disposed or increases in the amount of care taken in ensuring proper disposal. Likewise, the magnitude of contamination can be reduced through early detection and containment or mitigation. Liability encourages both prevention and response, since both will reduce damages and therefore the liability that the party could face. Thus, with legal liability, it will be in the interest of private parties who could be held liable to take steps to reduce environmental risks.

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[20] See, for example, *Injuries and Damages from Hazardous Wastes—Analysis and Improvement of Legal Remedies*, S. Rept. 97-12, 97 Cong. 2 sess. (1982) (Washington, D.C.: Government Printing Office, 1982); J. Trauberman, *Statutory Reform of "Toxic Torts": Relieving Legal, Scientific, and Economic Burdens on the Chemical Victim* (Washington, D.C.: Environmental Law Institute, 1983); and Donald Dewees, "Tort Law and the Deterrence of Environmental Pollution," in T.H. Tietenberg, ed., *Innovation in Environmental Policy: Economic and Legal Aspects of Recent Developments in Environmental Enforcement and Liability* (Hants, UK: Edward Elgar, 1992), pp. 139-164.

[21] See Steven Shavell, "The Social versus Private Incentive to Bring Suit in a Costly Legal System," *Journal of Legal Studies*, vol. 11, (1982).

[22] See Acton and Dixon, *Superfund and Transaction Costs*; Dixon, Drezner, and Hammitt, Private-Sector Cleanup Expenditures; and Light, "A Defensive Counsel's Perspective on Superfund."

[23] Under the British system, the litigation costs of both parties are borne by the loser of the suit.

[24] See Kathleen Segerson, "Policy Response to Risk and Risk Perceptions," in *The Social Response to Environmental Risk: Policy Formation in an Age of Uncertainty*, Daniel W. Bromley and Kathleen Segerson, eds., (Boston: Kluwer Academic Publishers, 1992), pp. 101-130.

[25] The term "damages" here and throughout the remainder of the paper refers to the social costs of contamination discussed above, which include both the cost of an efficient amount of cleanup and any interim losses that occur between the time of contamination and the time of cleanup.

The effect of liability on risk-reduction incentives can be evaluated in terms of economic efficiency.[26] An activity level is defined to be economically efficient if the level cannot be changed (increased or decreased) so that the benefit of the change exceeds its cost. Efficiency thus requires that firms engage in prevention and mitigation activities until the additional benefits from those activities equal the additional costs. Beyond that, any additional risk-reduction activities cost more than they are "worth"—the costs of those increases exceed the benefits. Similarly, efficiency requires that a firm increase its output until the marginal benefit from additional output equals the marginal cost of producing that output, including environmental costs. Beyond that, any additional output costs more (in production and environmental costs) than it is worth—the cost of the additional output exceeds its benefit.[27] Efficiency typically requires that the firm's total costs reflect the full social costs of its production, where full social costs include not only typical production costs (the cost of labor, capital, and materials) but also any "external" costs borne by others (the damages from reduced environmental quality).[28] In evaluating the economic efficiency of a liability rule, we can see whether it encourages firms to engage in an efficient amount of prevention and mitigation and to produce an efficient amount of output, that is, whether firms are induced to consider the full social costs of their actions when choosing prevention, mitigation, and output levels.

B. Cost Allocation

A second goal of environmental policy and legal liability is to allocate the costs of contamination, including the costs of cleanup and any interim and residual damages. Clearly, different policies imply different allocations of these costs. Policies that make firms responsible for damages resulting from their production activities are consistent with the "polluter-pays principle." Alternatively, those that absolve polluters of responsibility for payment provided they "play by the rules" transfer the costs of contamination to other parties. Likewise, policies that make firms responsible for the production activities of others also transfer costs of contamination, in this instance from an offending party to nonoffenders.

Unlike risk reduction, however, cost allocation is generally not evaluated in terms of economic efficiency.[29] Since it concerns the distribution of costs across different groups, it is instead evaluated on the basis of fairness.[30] Many have argued that the polluter-pays principle is justified on the basis of fairness, since those firms who benefited from the activity that led to contamination should be made to pay for it. On the other hand, some have argued that, as long as the firm complied with all existing environmental regulations at the time of its production, it is unfair to make it pay for unexpected contamination. This argument has been made most forcefully in cases where the production activity that led to contamination

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[26] Economic efficiency is, of course, not the only criterion that can be used to evaluate risk reduction. Some stakeholders in the CERCLA debate seek a maximum level of risk reduction (regardless of the cost) rather than an efficient level (that weighs benefits and costs). While recognizing the potential importance of alternative criteria, we use the economic efficiency criterion to evaluate risk reduction, since it explicitly accounts for the inevitable tradeoffs that must be made in choosing a desired level of risk reduction, recognizing that an increase in the resources devoted to risk reduction implies a decrease in the resources devoted to other activities that benefit society as well.

[27] For a general discussion of efficiency in the context of pollution control, see William J. Baumol and Wallace E. Oates, *The Theory of Environmental Policy* (Cambridge: Cambridge University Press, 1988). Efficiency in the context of risks and accidents is discussed in detail in Steven Shavell, *Economic Analysis of Accident Law* (Cambridge, MA: Harvard University Press, 1987).

[28] This is not always necessary to ensure efficient output, however. For example, a negligence rule under which negligence was defined in terms of both care and output would induce efficient output decisions even though the firm would not bear the full costs of its activities. Such rules are rare in practice.

[29] To the extent that ensuring an efficient output choice requires that firms bear the full social costs of their activities, then the cost allocation can be judged on the basis of its efficiency implications. Here, however, we focus on the distributional implications only.

[30] For a discussion of the allocation of property rights implicit in any cost allocation, see Daniel W. Bromley, "Entitlements and Public Policy in Environmental Risks," in Bromley and Segerson, ed. *The Social Response to Environmental Risk*, pp. 1-22, and the references cited therein.

occurred many years ago, at a time when no one anticipated the possibility of future liability for contamination.[31]

C. Risk Allocation

A third goal of environmental policy relates to the allocation of the risk associated with production activities. While the two are often lumped together, risk allocation is in fact different than cost allocation. Consider, for example, a policy under which firms pay a waste generation tax but are not liable for actual cleanup costs, which would be paid by the government using revenues from the tax. Under such a policy, firms would still bear the costs of cleanup through payment of the tax. However, the costs that the firm will bear are certain given its level of waste generation. The tax-based approach to financing cleanup essentially provides a form of insurance for firms, where the "premium" takes the form of tax payments. Thus, such a policy imposes costs without imposing risks. In contrast, if firms are held liable for cleanup costs, then they bear both the costs of cleanup and the risk associated with the uncertainty of those costs.[32] If they can purchase environmental liability insurance in the market, they can transfer the risk to the insurer and be left simply with the cost. However, when liability insurance is not available, a liability-based approach can leave the polluter bearing both the costs and the risks associated with cleanup.

If firms are averse to bearing risk, then the risk per se imposes an additional cost on the firm.[33] In other words, for a risk-averse firm, the firm would prefer to make certain payments rather than face uncertain payments with the same expected value since those uncertain payments involve risk. Thus, a risk-averse firm would always want to purchase actuarily fair insurance[34] against losses, since that insurance allows it to make a sure payment (the insurance premium) in lieu of facing the prospect of uncertain losses. Similarly, a risk-averse firm would rather pay $10,000 in sure tax payments than face a 5 percent chance of having to pay $200,000 in liability (where .05*200,000=10,000). Firms are likely to be risk-averse with regard to liability payments if they can not buy environmental liability insurance or diversify risks in other ways.

When firms are risk-averse, a policy's risk allocation becomes important in evaluating that policy's desirability. As with risk-reduction incentives, risk allocation can be evaluated in terms of economic efficiency. Economic efficiency requires that risks be allocated to those parties who are best able to bear them.[35] In other words, if some parties can diversify their risks (making them "risk-neutral") and others can not, then transferring risk from the latter to the former (in exchange for a sure payment) can make both parties better off, since the risk-averse party would pay more to eliminate his risk than the risk-neutral party would require to accept it. The risk-neutral party would effectively be insuring the risk-averse party against its losses in exchange for a premium. Both the insurer and the insured would be better off.

In evaluating alternative liability rules, we can see how efficiently they allocate or spread risk. In doing so, however, it is important to keep in mind the distinction between risk allocation and cost allocation. The question of who should pay for hazardous waste cleanup is separate from the question of who should

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[31] See, for example, Vincent F. Pace, "Do Something About Superfund," *New York Times*, Letters Section, May 31, 1993, p. 18.

[32] The allocation of risk under a liability rule depends on the specific rule that is used. See further discussion below.

[33] See Kenneth J. Arrow, *Essays in the Theory of Risk-Bearing* (Chicago: Markham Publishing, 1971).

[34] Insurance is said to be "actuarily fair" if the premiums reflect the average or expected payout by the insurance company, that is, the average loss that is covered.

[35] When all parties are risk-averse, then efficiency requires that risks be spread across the parties rather than concentrated on any individual party. For a discussion of optimal risk sharing, see K. Borch, "Equilibrium in a Reinsurance Market," *Econometrica*, Vol. 30, (1962); Steven Shavell, "Risk Sharing and Incentives in the Principal and Agent Relationship," *The Bell Journal of Economics*, vol. 10, no. 1, (Spring 1979); Kathleen Segerson, "Risk Sharing in the Design of Environmental Policy," *American Journal of Agricultural Economics*, vol. 68, no. 5., (December 1986); and Kathleen Segerson, "Risk and Incentives in the Financing of Hazardous Waste Cleanup," *Journal of Environmental Economics and Management*, vol. 16., no. 1, (January 1989).

bear the risks associated with the uncertainty of the cleanup costs. In principle, those who bear the costs need not be the same as those who bear the risks.

VI. ISSUES IN THE CHOICE OF A LIABILITY RULE

Given these three possible roles that liability can play, we can evaluate alternative liability rules in terms of these roles. In particular, we can ask how well a particular rule provides incentives for efficient risk reduction, how fairly it allocates costs, and how efficiently it spreads risks. In addition, the rules can be evaluated in terms of their transaction costs, since transaction costs add to the overall cost of a given rule.

A. Should Liability be Strict?

The two basic types of liability rules are a strict liability rule, under which a party responsible for damages is held liable regardless of how much care it took, and a negligence rule, under which the party is held liable only if it was negligent in conducting the activity, where negligence is defined as failure to conform to some "due standard of care."[36] Economic theory suggests that either a strict liability approach or a negligence approach can induce firms to undertake an efficient amount of care to reduce damages.[37] Since under strict liability firms will have to pay for the damages or cleanup associated with contamination, they will have an incentive to engage in cost-reducing activities. Likewise, since under a negligence rule firms will have to pay if they are negligent, they have an incentive to engage in efficient care to avoid liability. Thus, either approach can induce firms to take efficient steps to reduce risks. However, the efficiency of the negligence rule requires that the due standard of care be set at the efficient level and that the standard be known to the injurer at the time of the care decision. If they are not, the negligence rule will no longer result in efficient care.[38] Likewise, efficiency of strict liability requires that the firm would be liable for an efficient amount of cleanup (where costs don't exceed benefits). If the required cleanup is excessive, then under strict liability the firm would be excessively careful. A similar conclusion holds under a negligence rule if both the amount of potential liability and the due standard of care reflect the excessive cleanup.

However, engaging in an efficient amount of care (an amount at which the benefits from additional care equal the costs) does not eliminate the possibility of contamination. Thus, there is still the possibility that cleanup costs and/or damages will have to be paid. Even though they have similar *risk-reduction incentives*, strict liability and negligence clearly differ in their allocation of costs and risks. Assuming a firm engages in efficient care under either approach, that firm would still pay for cleanup costs under strict liability, while it would not be liable under a negligence rule. In other words, under strict liability, a firm pays for both the costs of its pollution prevention activities and the costs of any contamination that still results. In contrast, under a negligence rule, if the firm complies with the due standard, it pays only for the cost of complying with that standard and not for any damages that might occur despite its compliance.

Whether the allocation of costs under strict liability is "better" or "worse" than the allocation under a negligence rule is a subject of considerable debate. In terms of economic efficiency, economic theory suggests that strict liability is preferable since firms bear all of the costs of their production activities.[39] In this case, both product prices and output levels will reflect all production costs and will thus be

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[36] These rules can be further delineated according to whether or not they allow a defense of contributory negligence by the harmed party or "victim." However, in the case of hazardous waste, victim incentives are not usually an issue, except, for example, when a party knowingly purchases property near a waste disposal site with the intention of "up-grading" the use of the land (which might increase the amount of required cleanup).

[37] See, for example, Steven Shavell, "Strict Liability Versus Negligence," *Journal of Legal Studies*, vol. 9, no. 1, (1980).

[38] For a detailed discussion of negligence rules, see Robert D. Cooter, "Prices and Sanctions," *Columbia Law Review*, vol. 84, (1984).

[39] See A. Mitchell Polinsky, "Strict Liability vs. Negligence in a Market Setting," *American Economic Review Papers and Proceedings*, vol. 70, no. 2., (1980).

economically efficient. In contrast, under the negligence rule, the firm's costs will actually be less than the true social cost of production (by the amount of the cleanup or damages that the firm does not bear). This results in a price that is "too low"—below the social opportunity cost of production—and a corresponding output level that is too high. Thus, the allocation under strict liability is more economically efficient.

The two allocations can also be compared on the basis of fairness. Here, however, economic theory offers little guidance on the evaluation of the two approaches. The two represent a different allocation of property rights, with producers having more of a "right" to engage in potentially polluting activities under the negligence rule than under strict liability. Whether this is desirable or not depends on the notion of fairness applied. As noted above, the allocation under strict liability is consistent with the polluter-pays principle, which states that those parties who benefit from a given production activity should pay the full costs associated with it. On the other hand, the allocation under the negligence rule is more consistent with the notion that if a party "plays by the rules," that party should not be penalized.

By imposing the uncertain cleanup costs on responsible parties, strict liability also imposes considerable risk on those parties. In contrast, the negligence approach does not impose risks, since compliance with the due standard absolves the party from responsibility for the uncertain costs. Instead, the risks are borne by whomever must ultimately pay for cleanup (for example, federal taxpayers) or bear the costs if no cleanup is conducted (for example, the neighboring residents or other "victims"). Whether the allocation of risks is better under strict liability or negligence depends on whether victims or the government will bear the risks when firms do not (that is, whether the cleanup will be financed by the government) and on the ability of each of the parties to spread their risks through, for example, the purchase of insurance or increases in prices or taxes.[40] In general, victims cannot spread the risks of exposure to contamination or payment of cleanup costs, but the federal government can spread cleanup costs across taxpayers. Similarly, while large firms may be able to spread the risks of uncertain cleanup costs through increased prices or self-insurance, small firms may not, unless environmental liability insurance is readily available. Thus, a negligence rule will place considerable risk on risk-averse victims if cleanup of contamination from non-negligent behavior is not paid for through government funds, while strict liability will place considerable risk on small, risk-averse firms if environmental liability insurance is not available.

Finally, the two approaches can be evaluated in terms of the transactions costs that are likely to result. Because a negligence rule requires a showing of negligence to establish liability, it can be argued that it will involve higher transaction costs per case. However, these higher transaction costs will also serve to deter potential lawsuits. Thus, the number of lawsuits filed could be lower under the negligence rule than under strict liability, where no such finding is required. A reduction in the number of suits would tend to decrease total transactions costs (even though the cost per lawsuit would be higher). Whether the net effect of these two counterbalancing influences is an increase or a decrease in total transactions costs under the negligence rule depends upon their relative strengths.

Summary: While both strict liability and a negligence rule provide incentives for parties to take preventive care, under the strict liability approach firms would be liable for the full social costs of their activities. This provides incentives for efficient output and pricing decisions that do not exist under the negligence rule. There does not appear to be a strong reason for society as a whole to prefer one to the other on the basis of fairness, risk allocation, or transaction costs, though individuals or specific firms may benefit from one approach over the other, depending on their particular circumstances.

Recommendation 1: Retain strict liability for cases of *prospective* application of liability.

A recommendation for the case of retroactive application is made below. (See Recommendation 3.)

B. Should Liability be Joint and Several?

[40] See Shavell, "Risk Sharing and Incentives," pp. 65-70 for related discussion.

1. General Effects of Joint and Several Liability

One of the most controversial aspects of CERCLA is its imposition of joint and several liability, under which a party can be held liable for the full amount of cleanup even if its contribution to the contamination is very small.[41] Joint and several liability can be imposed either under a strict liability rule or under a negligence rule. Under the latter rule, only negligent parties would be held jointly and severally liable. Joint and several liability allows EPA to target PRPs who have "deep pockets," large asset bases from which to pay for cleanup costs. Under the right of contribution, the targeted parties can then in turn sue other PRPs for recovery of some of those costs.

Joint and several liability has been criticized primarily on fairness grounds. It is argued that it is unfair to hold parties liable for contamination that they did not cause. In addition, joint and several liability creates enormous risks for individual parties. If these parties are risk averse and do not have means for diversifying such risks, then the allocation of risk under joint and several liability may be inefficient. A policy that defines the shares of each PRP with more certainty would reduce their risks and perhaps result in more efficient risk spreading.

It has also been argued that joint and several liability greatly increases transactions costs.[42] While the initial transactions costs of EPA may be reduced by the ability to target a smaller number of PRPs, the potentially high stakes for any individual PRP provide a powerful incentive for firms to fight doggedly with EPA, the other PRPs, and all of the associated insurance companies. On net, it is likely that the use of joint and several liability does in fact increase overall transaction costs.

Given these negative features of joint and several liability, why might one want to impose such a rule? Clearly, for the EPA the use of joint and several liability increases the likelihood and magnitude of the recovery of cleanup costs from PRPs, thereby increasing the resources available for financing cleanups. While this may be an advantage to EPA, *it is not an advantage for society as a whole since it simply changes the distribution of cleanup costs*—any gain in resources to the EPA is offset by a corresponding loss to PRPs. In addition, if EPA is known to target certain types of PRPs (e.g., "deep pockets"), then the risk-reduction incentives of non-targeted types are reduced. In particular, since they do not expect to be held liable for damages or cleanup, they have a reduced incentive to reduce the probability or extent of contamination.[43] The right of contribution can mitigate the effect of EPA's targeting strategy to some extent, since it allows targeted parties to sue non-targeted responsible parties for recovery of some portion of the liability payment. However, incentives for non-targeted types are still likely to fall short of what they would be if each party were held liable in relation to its contribution.[44]

In addition, when parties are potentially insolvent, then whether joint and several liability is more or less efficient than several-only liability depends on the costs and benefits associated with each party's

[41] While the statute does not explicitly impose joint and several liability, the courts have interpreted it in this way. See, for example, United States v. Conservation Chemical Company, 589 F. Supp. 59 (1984) and United States v. Chem-Dyne Corp., 572 F. Supp. 802 (1983). For a more general discussion of the role of the courts in interpreting CERCLA, see Anderson, "Natural Resource Damages, Superfund, and the Courts."

[42] For a discussion of the relationship between transaction costs and the number of parties involved in a site, see Acton, Dixon, et al., *Superfund and Transaction Costs*, pp. 22-24.

[43] See Tom H. Tietenberg, "Indivisible Toxic Torts: The Economics of Joint and Several Liability," *Land Economics*, vol. 65, no. 4, (November 1989).

[44] Of course, in theory joint and several liability is designed for cases where the court is unable to determine on a reasonable basis the relative contributions of the parties and thus is unable to apportion damages in accordance with those contributions. In the context of waste sites, determining relative contributions is difficult. While the volume of waste contributed by each party may be known, this is not in general a meaningful measure of the contribution to damages since wastes vary greatly in their levels of toxicity.

activities as well as on the levels of solvency.[45] Furthermore, even in the absence of potential insolvency, if under joint and several liability firms expect to incur liability costs that exceed the social costs associated with their activities, then product prices will be too high and correspondingly output will be below the efficient level.[46]

The use of joint and several liability can positively affect risk-reduction incentives. For example, under an EPA targeting strategy, PRPs of the type generally targeted by EPA would face greater liability than they would under several-only liability. Thus, they would have an increased incentive to take precaution, since any increase in a given party's expected share of the costs will provide an increased incentive for that party to take care.[47] Thus, if a party views his expected share as higher under joint and several liability than it would be under several-only liability, then the joint and several liability will result in more care to reduce the risk of contamination than the several-only rule would.[48] Of course, this effect would be offset somewhat by the reduced incentives faced by parties who do not expect to be targeted by EPA.

The effect of joint and several liability on incentives to settle rather than litigate are also ambiguous. In particular, whether joint and several liability promotes or discourages settlements relative to several-only liability depends on the correlation between the probability of successful litigation against the PRPs as well as their solvency.[49]

2. Effects When the Parties Have a Contractual Relationship

a. Vertical vs. Horizontal Liability

The above discussion applies to parties that would be held jointly and severally liable as multiple users of a waste disposal site. Such parties are generally related only in their use of the common site. While each has a contractual relationship with the site owner or operator, they do not have a contractual relationship with the other waste disposers.

Joint and several liability can also be imposed on parties that have a contractual relationship. In general, two parties are said to have a contractual relationship when they interact through the purchase/sale of a good or service. For example, waste generators establish a contractual relationship with transporters, disposers and/or site owners or operators when they purchase transportation and disposal services.[50]

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[45] Lewis A. Kornhauser and Richard L. Revesz, "Apportioning Damages Among Potentially Unsolvent Actors," *Journal of Legal Studies*, vol. 19, no. 2, (1990).

[46] For a discussion of inframarginal incentives relating to activity levels in the context of joint torts, see Thomas J. Miceli and Kathleen Segerson, "Joint Liability in Torts: Marginal and Infra-Marginal Efficiency," *International Review of Law and Economics*, vol. 11, (1991).

[47] Under a strict liability rule, any expected fixed apportionment of damages—either explicitly under a fixed apportionment rule (where each responsible party pays a fixed proportion of the damages) or implicitly through the probability of being held liable under joint and several liability—will provide inefficient incentives for care, since the party will bear the full costs associated with increased care but will not reap the full benefit in the form of reduced liability. Thus, any expected sharing of liability that does not tailor each party's share to its contribution will result in inefficient levels of care. See Lewis A. Kornhauser and Richard L. Revesz, "Sharing Damages Among Multiple Tortfeasors," *The Yale Law Journal*, vol. 98, no. 5, (March 1989).

[48] Similarly, under a negligence rule, if damages are non-distinct, then joint and several liability will induce efficient care while in general a rule of several-only liability will not. Damages are said to be "non-distinct" if the damage caused by one actor increases the damages caused by the other actor, that is, if the combined damages from the two acting in combination exceeds the sum of the damages when they act independently. Technically, damages are non-distinct if the damage function is convex. See Kornhauser and Revesz, "Sharing Damages Among Multiple Tortfeasors."

[49] See Lewis A. Kornhauser and Richard L. Revesz, "Settlements under Joint and Several Liability," *New York University Law Review*, vol. 68, (1993); Lewis A. Kornhauser and Richard L. Revesz, "Multi-Defendant Settlements: The Impact of Joint and Several Liability," *Journal of Legal Studies*, vol. 23, (1994); and Lewis A. Kornhauser and Richard L. Revesz, "Multi-Defendant Settlements under Joint and Several Liability: The Problem of Insolvency," *Journal of Legal Studies*, vol. 23, (1994).

[50] Clearly, a site owner/operator can have a contractual relationship with many generators simultaneously. The contract price for each of the individual contracts will reflect the owner/operator's expected liability with and without the individual's waste contribution. This

Similarly, buyers and sellers of land have a contractual relationship, as do lenders and borrowers. Joint and several liability among parties with a contractual relationship—say, the generator and the site owner—can be thought of as "vertical liability." On the other hand, joint and several liability among unrelated parties—say, different generators — can be thought of as "horizontal liability."

When parties have a contractual relationship, the purchase/sale price provides a mechanism for shifting the expected costs of joint and several liability between parties. While such shifting may be imperfect, it can affect risk-reduction incentives. For example, if a property owner plans to sell his land in the future, the knowledge that he could be held jointly and severally liable for any contamination that is detected at the site in the future can create an increased incentive for the landowner to take precaution now.[51]

More generally, when two parties have a contractual relationship and one or both are potentially judgment-proof,[52] then holding both parties jointly and severally liable for the damages caused by the activities of one of them can increase both parties' incentive to take care. For example, holding both the generator and transporter of hazardous waste jointly and severally liable provides an incentive for generators not to contract with "fly-by-night" transporters who might otherwise have little incentive to take care in the transportation of waste. Similarly, the imposition of joint and several liability can provide incentives for generators to consider potential future liability as well as price when choosing a waste disposal site. In the absence of this incentive, an "adverse selection" problem exists under which disposal-site owners/operators that underestimate future cleanup costs will underprice their services (relative to other sites with more accurate cost estimates), thereby attracting too much waste.[53]

These beneficial effects of joint and several liability when the parties have a contractual relationship assume that both parties are aware of the potential liability at the time that the contract price is set. This seems appropriate in cases where the transaction occurs after CERCLA liability is known, as, for example, when liability is imposed prospectively. In cases of unanticipated liability, for example, where land was purchased or leased many years ago, the price will clearly not reflect the assignment of liability. For this reason, in such cases, *retroactive application of joint and several liability will not have the above beneficial effects even when the parties have a contractual relationship.*

b. The Special Case of Property Transfers

Since CERCLA includes in the definition of PRPs both current and past owners and operators of a site, purchasers of a contaminated site can inherit liability for cleanup. Some critics have argued that this discourages property sales. In particular, it has been argued that this provision of the law discourages redevelopment of previously developed areas ("brownfields") and instead promotes development of undeveloped areas ("greenfields").[54] While CERCLA includes an "innocent landowner defense" designed to protect purchasers who had no knowledge nor reason to know of the contamination, this exemption is

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could, in turn, depend on the decisions of other generators using the site. In other words, the contract price will reflect the increase in liability given the disposal and care decisions of the other generators using the site.

[51] Kathleen Segerson, "Property Transfers and Environmental Pollution: Incentive Effects of Alternative Policies," *Land Economics*, vol. 70, no. 3, (August 1994). The effect of liability on decisions to buy/sell property is discussed in more detail below.

[52] A party is termed "judgment-proof" if he can somehow escape payment of judgments rendered against him. This can occur when parties are insolvent or have insufficient assets to satisfy the full judgment, or can otherwise escape payment through legal protection. In our context, the existence of judgment-proof parties creates "orphan" shares when apportioning liability.

[53] For a discussion of this problem, see Robert G. Hansen and Randall S. Thomas, "The Efficiency of Sharing Liability for Hazardous Waste: Effects of Uncertainty Over Damages," paper presented at the American Law and Economics Association Meeting, August 1994.

[54] For a discussion of this issue, see James Boyd, Winston Harrington, Molly K. Macauley, and Mary Elizabeth Calhoon, "The Impact of Environmental Liability on Industrial and Greenfield Commercial Real Estate Development," Discussion Paper 94-03, Resources for the Future, Washington, D.C., 1994.

viewed as too restrictive and too vague to provide adequate protection against liability for buyers of contaminated sites.[55]

Similarly, lending institutions who become owners of a site through a foreclosure or become somehow involved in the operation of a site in an effort to prevent foreclosure are included in the category of "owners or operators" and have thus been held liable for cleanup costs.[56] This potential for "lender liability" has sparked great concerns in the lending community. While CERCLA includes an exemption from liability for secured creditors who, "without participating in the management" of a site, hold "indicia of ownership" primarily to protect their security interest, again the exemption was viewed as too vague to offer much protection.[57] In fact, courts had found that a "mere capacity to influence" operations at the site was sufficient to void the exemption.[58] In response, the EPA promulgated rules to define more explicitly the conditions under which lenders would or would not face potential liability.[59] However, EPA's authority to issue these regulations has been challenged in the courts.[60]

For cases of existing contamination, liability transfers can be evaluated in terms of their impacts on the incentives to buy and sell contaminated land. Transfers of liability from a seller to a buyer (or from an owner to a lender) represent a shifting of costs between two parties who have a contractual relationship. In the case of the seller and the buyer, the contractual relationship is through the sale of the land for a given price. For the owner and the lender, the contractual relationship is the through the provision of the loan at a given interest rate.

In the absence of contractual or other imperfections, any transfer or change in the allocation of liability between the two parties (effectively, a change in the terms of the contract) will simply be reflected in a change in the price of the land or the interest rate for the loan—it will not affect whether or not the land is sold or the loan is provided.[61] Consider, for example, a full transfer of liability from the seller to the buyer. In the absence of the liability transfer, the seller will demand a price for the land and the buyer will be willing to pay a price for the land that reflects the fact that any liability for contamination will remain with the seller. If liability is transferred, the seller will demand a lower price (since he will not have to pay for cleanup) and the buyer will be willing to pay a lower price (since he will have to pay for cleanup). Given this adjustment in price, the incentives to buy and sell the land are identical to what they would have been in the absence of the liability transfer, although the price paid for the land will be different. Likewise, if liability is transferred from owners to lenders, then lenders will charge a higher interest rate to cover their expected liability. If owners will be absolved of their liability under such a transfer, they would be willing to pay a higher interest rate as well.

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[55] See Terry Dinan and F. Reed Johnson, "Effects of Hazardous Waste Risks on Property Transfers: Legal Liability vs. Direct Regulation," *Natural Resources Journal*, vol. 30, (1990).

[56] See, for example, Walter D. James, III, "Financial Institutions and Hazardous Waste Litigation: Limiting the Exposure to Superfund Liability," *Natural Resources Journal*, vol. 28, (1988).

[57] See R. Tom, "Interpreting the Meaning of Lender Management Participation under Section 101(20)(A) of CERCLA," *The Yale Law Journal*, vol. 98, (1989).

[58] See Nill V. Toulme and Douglas E. Cloud, "The *Fleet Factors* Case: A Wrong Turn for Lender Liability Under Superfund," *Wake Forest Law Review*, vol. 26, no. 1, (1991).

[59] See Federal Register, Vol. 57(3), p. 18344, April 29, 1992.

[60] See Richard B. Schmitt, "Appeals Court Invalidates EPA Rules Shielding Lenders from Superfund Law," *Wall Street Journal*, February 10, 1994, p. B8.

[61] For details regarding the results discussed here, see Kathleen Segerson, "Liability Transfers: An Economic Assessment of Buyer and Lender Liability," *Journal of Environmental Economics and Management*, vol. 25, (1993).

The above argument assumes that prices can shift perfectly to reflect the allocation of liability. In reality, shifting is likely to be imperfect. For example, when one or both of the parties will potentially be insolvent or otherwise judgment-proof at the time that liability is imposed, then perfect shifting will not occur. Likewise, the absence of clear clean-up requirements can result in imperfect shifting in prices.

The efficiency implications of imperfect shifting depend on both the liability rule that is used and the relative probabilities that the parties will be judgment-proof.[62] Under a rule where all liability remains with the seller—the buyer does not assume any liability by purchasing the property—the buy/sell incentives will be unaffected by the potential liability since the liability of both parties (full liability for the seller and no liability for the buyer) is the same regardless of whether or not the sale occurs. This is true even when the seller might be judgment-proof, as long as the probability that he will be judgment-proof does not change if he sells the land. Thus, the land market is not affected by the liability when all liability remains with the seller.

However, if some liability is transferred to the buyer when the land is sold, then the land market can be affected—the transfer of liability can affect whether or not a sale occurs. Under several-only liability where each party is liable only for his own share of the cleanup (regardless of whether the other party is judgment-proof), transferring some or all liability to the buyer can either promote or discourage sales, depending on the relative probabilities that the buyer and seller will be judgment-proof. In particular, if the seller is less likely to be judgment-proof than the buyer, then transferring liability can actually promote sales. The explanation is that the reduction in the price that the seller demands will be greater than the reduction in the price the buyer is willing to pay, thus making the sale more likely.

To illustrate this effect, suppose that the expected cleanup cost is $10 million and the liability is to be divided evenly between the buyer and the seller. If neither can escape payment, then the buyer will reduce his offer price by $5 million (to reflect his expected liability) and the seller will reduce the price he is willing to accept by $5 million (to reflect the reduction in his liability from $10 million to $5 million if he sells the land). Since both reduce their prices by the same amount, the likelihood of the sale is the same with the sharing of liability as it would have been if the seller had retained all liability. Thus, the assignment of liability will have no effect on whether the sale occurs.

Now suppose instead there is a 20 percent chance that the buyer will be judgment-proof (implying an 80 percent probability that he actually pays his share) and only a 10 percent chance that the seller will be judgment-proof (implying a 90 percent chance of actually paying). In this case, the buyer will reduce his offer price by $4 million (5*.8), while the seller will reduce the price he is willing to accept by $4.5 million (to reflect a reduction in his expected liability from $9 million (.9*10) to $4.5 million (.9*5)). Because the buyer is more likely to be judgment-proof than the seller, the amount he anticipates actually paying in liability is less than the liability payment the seller anticipates saving by selling the land. Thus, the transfer of liability actually increases the likelihood that the sale will occur. Conversely, if the seller is more likely to be judgment-proof, a transfer of liability will make the sale less likely. As a result, with several-only liability, the effect of the transfer on the land market is ambiguous.

Suppose, instead, the transfer is coupled with a rule of joint and several strict liability under which there is an initial allocation of liability between the buyer and the seller, but, if one party turns out to be judgment-proof, the other party will be liable for the full amount of cleanup. Under such a rule, if there is any likelihood that the seller will be judgment-proof and this likelihood is independent of whether he sells the land, the use of joint and several liability will discourage property sales. This is because the seller will decrease the price he will accept by less than the buyer will decrease the price he will offer. In the above example, there is a 90 percent chance that the buyer's share of the liability will be $5 million (the seller will not be judgment-proof) and a 10 percent chance that the buyer will be liable for the full $10 million in damages (the seller will be judgment-proof). The buyer's expected legal liability is thus $5.5 million (.9*5+.1*10). Since he pays this only if he is not judgment-proof (which occurs with an 80 percent

[62] Ibid.

probability), the expected value of his actual payment is $4.4 million (5.5*.8). He will reduce his offer price by this amount. Similarly, the seller's expected legal liability is $6 million (.8*5+.2*10). Since the probability that the seller will actually pay this amount (that he will not be judgment-proof) is 90 percent, the expected value of the seller's actual payment is $5.4 million. Selling the land would thus reduce his expected payment by $3.6 million (from $9 million (.9*10) to $5.4 million), and he will reduce the amount he is willing to accept by this amount. Since the reduction in the offer price exceeds the reduction in the price the seller is willing to accept,[63] the sale is less likely.

The above discussion assumes that the level of contamination is known by both the buyer and the seller. In prospective cases where both parties are aware of CERCLA liability, buyers clearly have an incentive to obtain information about possible contamination levels (for example, through an environmental assessment[64]) and sellers are often legally required to reveal this information.[65] However, if sellers have better information about contamination levels than buyers, then this information asymmetry can further discourage property sales.[66] In the extreme case where buyers have no information about the contamination level at a particular site, they will base the price that they are willing to pay on the average (or expected) contamination levels of the properties that are being offered for sale. This creates a "lemons" problem,[67] since this price will be sufficiently high to induce high contamination sites to be offered for sale but not high enough to induce low contamination sites to be offered. As a result, the average quality of the land offered for sale will deteriorate and buyers will be less likely to purchase property if they will inherit some portion of the liability for cleanup.

While the above conclusions relate to transfers of liability between a seller and a buyer, similar conclusions can be drawn in the context of lenders, where in this case the adjustment would occur through the price of the loan (e.g., the interest rate) rather than the sale price of the land.[68] However, because in general owners are more likely to be judgment-proof than lenders (since lenders tend to be "deep pockets" with considerable assets), transferring liability to lenders under a several-only rule will discourage loans and hence property sales that must be financed by loans. However, the effect of this on efficiency is ambiguous, since it is not clear whether the incentive to buy and sell is efficient in the absence of such a transfer.

The prospect of a liability transfer can also affect the incentives to engage in risk-reduction activities before an anticipated sale.[69] Again, however, the efficiency effects depend on the form of the liability rule

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[63] It is easy to verify that this would be true in general, provided there is some probability the seller will be judgment-proof. Specifically, let N represent the cleanup cost, let α represent the initial share of liability that is transferred to the buyer, and let τ and θ be the probabilities that the buyer and seller respectively will not be judgment-proof and the buyer will not be judgement proof. (Thus, $1-\tau$ and $1-\theta$ are the probabilities that the two parties will be judgment-proof.) With this notation, the amount by which the buyer will reduce his price is given by $\tau[\theta\alpha N+(1-\theta)N]$. Likewise, the amount by which the seller will reduce his price is given by $\theta N-\theta[\tau(1-\alpha)N+(1-\tau)N]$. It can be easily shown that the former amount exceeds the latter amount whenever $\theta<1$ and $\tau>0$.

[64] In many cases where the purchase of the property is being financed by a lending institution, the institution will require an environmental assessment in the terms of the loan. This stems both from the lender's concern about its own potential liability and the effect that liability might have on the solvency of the buyer, which would in turn affect the buyer's ability to repay the loan. See, for example, M.T. Olexa, "Contaminated Collateral and Lender Liability: CERCLA and the New Age Banker," *American Journal of Agricultural Economics*, Volume 73, 1388-1393 (1991).

[65] See, for example, Connecticut's Transfer Law (C.G.S. Sect. 22a, 134-134d).

[66] For a discussion of this effect, see Kathleen Segerson, "Liability Transfers: The Role of Asymmetric Information," Working Paper, Department of Economics, University of Connecticut, Storrs, CT, 1993.

[67] This term is attributable to Akerlof, who studied a similar phenomenon in the context of the sale of used cars. See George A. Akerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," *Quarterly Journal of Economics*, Volume 84, 488-500 (1970).

[68] Segerson, "Liability Transfers."

[69] See Segerson, "Property Transfers and Environmental Pollution."

used. Under several-only liability, the impact of transferring liability again depends on the relative probabilities that the parties will be judgment-proof. The reason is similar to that given above in the context of incentives to buy/sell land. Both the extent of the contamination that results from the seller's activity and the buyer's share of the liability will affect the price the buyer is willing to pay for the land and the price at which the seller is willing to sell. As before, differences in the probabilities of being judgment-proof imply that transferring liability will have a different effect on the price the buyer is willing to pay and the price the seller demands. This in turn will affect the seller's incentives to reduce contamination. The direction of the effect depends on the relative probabilities of being judgment-proof.

However, with joint and several liability, abatement incentives will generally be increased relative to both the case where no liability is transferred (all liability remains with the seller) and the case of a several-only transfer of liability when the seller is potentially judgment-proof. Again the explanation is similar to the explanation of why joint and several liability discourages property sales. The use of joint and several liability shifts more of the potential liability onto the buyer if the seller is judgment-proof. This possibility causes the buyer to reduce the price he would be willing to offer for the land with a given level of contamination. The seller can offset this effect to some extent by reducing the contamination level. Thus, the use of joint and several liability tends to increase abatement incentives.

The above discussion focuses on the effect of liability transfers on abatement incentives and incentives to buy and sell property. Liability transfers can also be evaluated on the basis of cost and risk allocation. With perfect price adjustment, as long as the assignment of liability is known so that it can be reflected in the price, then the overall allocation of costs (price paid/received plus liability) should be unaffected by transfers of liability. Even if prices do not adjust perfectly, the cost impacts of transfers will still be offset somewhat (although not entirely) by adjustments in price. Thus, the overall allocation of costs is not likely to be greatly affected by transfers of liability when all parties are aware of the extent of the contamination.[70]

However, transfers of unanticipated liability can have a large impact on cost allocation, since the resulting allocation would not be reflected in the price paid for the land. In cases of retroactive application where the sale occurred before one or both of the parties were aware of the potential liability, transferring liability can impose a very large cost on the buyer while leaving the seller with a large gain (through a reduction in liability without a corresponding reduction in price). Thus, the costs would be imposed on the buyer rather than on the seller, who was presumably the party that benefited from the contamination. This transfer of costs would not be coupled with increased incentives, since the buy/sell decision (as well as the abatement decisions) would already have been made. Thus, in the case of retroactive application, neither incentive nor cost allocation considerations provide much support for transferring liability from the seller to the buyer.[71]

When liability is shared by both the buyer and the seller, then risks are shared as well and neither party bears the full risk associated with the level of damages. In contrast, if liability remains fully with the seller or is transferred fully to the buyer, then one party bears all of the risk and the other bears none. A priori, there is no reason to expect buyers to be any better or any worse able to bear risks than sellers. Thus, in terms of risk allocation, there does not appear to be any strong a priori reason to put all of the risk on one party or the other. If both are risk averse, a sharing of risk through a sharing of liability is likely to be preferred. Of course, in the context of lenders, it might be argued that lending institutions are better able to bear risks than are individual property owners (because they have greater opportunities for

[70] As noted above, disclosure laws, environmental assessments, and the availability of the innocent landowner defense are all likely to contribute to the disclosure of information regarding the level of contamination before the sale.

[71] Of course, it might still be possible to take steps to reduce the damages from the contamination through detection and containment. For this reason, it might be useful to distinguish between damages that would have resulted from the initial contamination had it been detected and contained, and the incremental damages due to insufficient detection and containment. Liability could be transferred for the latter damages but not the former, to provide incentives for the current owners to invest in detection and containment.

diversification). If so, this would suggest that for efficient risk spreading liability should be transferred to lenders.

Summary: On efficiency grounds, there does not appear to be a strong case either in favor of or against joint and several liability in cases where the parties do not have a contractual relationship. It increases efficiency in some cases and introduces additional inefficiencies in other cases. Given this, along with the perceived unfairness of joint and several liability, its tendency to concentrate risks rather than spread them, and its potential to increase transaction costs, it appears that the disadvantages of joint and several liability outweigh the advantages for cases where the parties have no contractual relationship.

Where there is a contractual relationship between the parties, as there is, for example, between generators, transporters, disposers, and owners or operators of a site, the argument for abolishing joint and several liability is less convincing when liability is imposed *prospectively.* In this case, the contract price can provide a mechanism for shifting costs and spreading risks, while the use of joint and several liability provides an incentive for each party to contract with other reputable parties.

In terms of the efficiency of incentives to buy and sell land or reduce contamination, the effects of eliminating liability transfers (including lender liability) are ambiguous. In general, the implications depend on characteristics of the buyer and seller in an individual transaction, as well as on the liability rule. Under several-only liability, liability transfers can either increase or decrease both abatement and buy/sell incentives relative to the case where liability remains with the seller. Alternatively, transferring liability under a rule of joint and several liability will tend to discourage property sales. However, it encourages investment in pollution abatement. In addition, under joint and several liability both the costs and the risks will be shared. These beneficial effects can offset the negative impact of joint and several liability on property sales. However, the beneficial incentive effects of transferring liability under a rule of joint and several liability apply only when liability is applied prospectively. In cases of retroactive application, the perceived unfairness of the cost allocation would not be offset by any gain in terms of efficient incentives. Thus, the argument for transferring liability does not apply to cases of retroactive application.

Recommendation 2: In cases of prospective application, eliminate joint and several liability when parties do not have a contractual relationship. When there is a contractual relationship, as for example when property is being transferred, retain liability transfers with joint and several liability.

A recommendation for retroactive cases is given below.

C. Should Liability be Retroactive?

Another controversial aspect of CERCLA liability is its retroactive application. The fact that firms are now being held liable for contamination that resulted from activities that were undertaken many years ago is deemed unfair, especially when the firm used production and waste disposal practices that were acceptable at that time. Some have argued that the retroactive application of CERCLA liability should be eliminated.[72] For example, one option is to eliminate CERCLA liability at all sites where the waste disposal operation closed before January 1, 1981.[73]

In general, liability will have no effect on the likelihood or magnitude of contamination resulting from activities that were undertaken in the past, since it is not possible to change the way in which activities in the past were conducted. Thus, in retroactive cases, the use of liability will not have any effect on the incentives to take precaution (e.g., generate less waste or dispose of it more carefully).[74] It may, however,

[72] See, for example, Lis and Warren, "Reforming Superfund."

[73] See Probst and Portney, "Assigning Liability for Superfund Cleanups," for an analysis of this option.

[74] See Segerson, "Risk and Incentives in the Financing of Hazardous Waste Cleanup."

be possible to reduce the damages from contamination through early detection and containment or other mitigation strategies. In such cases, retroactive application of strict liability can provide efficient mitigation incentives.[75] Similarly, a negligence rule where liability is triggered by failure to take efficient mitigation steps would provide efficient mitigation incentives as well. Since the output produced through the original activity and its corresponding price cannot now be changed, the usual criticism of the negligence rule—namely, that it does not impose full social costs and thus leads to too much output—does not apply in cases of retroactive application.[76]

Aside from mitigation incentives, the main role of retroactive liability is to allocate cleanup costs and the associated risks. As noted above, an evaluation of the cost allocation implication of retroactive liability depends on the notion of fairness that is applied. Based on the polluter-pays principle, the allocation might be judged fair. However, if polluters are required to pay now for past contamination, those who benefited from the contamination (for example, through lower product or service prices) will not bear its costs. Instead, the costs will be borne by current consumers or stockholders.[77] Thus, while past consumers or stockholders benefited from the low product price, current consumers or stockholders would be footing the bill for cleanup. In addition, if fairness is defined instead in terms of punishment for socially inappropriate acts, then holding firms liable when they conformed with all government regulations and standard industry practices at the time of production—when they were not negligent in conducting their activities—would be judged unfair.

The risk allocation implications of retroactive liability are also important. They can be evaluated independently of the fairness considerations that arise in evaluating cost allocations. Retroactive liability can create large risks for firms, especially when coupled with joint and several liability, since cases of retroactive application are likely to involve more "orphan" shares. That is, retroactive application is likely to involve more parties who are unable to be identified or unable to pay. In addition, while current insurance policies are explicit about whether the costs associated with gradual contamination episodes are covered, this was not the case in the past. Thus, there is great uncertainty about the extent to which past insurance policies cover retroactive liability. Since insurance provides an important mechanism for spreading risks, the lack of coverage for retroactive liability would leave firms with large undiversified risks.[78] If the federal government is better able to bear these risks (through, for example, spreading the cost across taxpayers), then the risk allocation implied by retroactive liability would be inefficient. In addition, the uncertainty over the obligations of insurance companies generates large transactions costs as the companies fight among themselves and with the PRPs over who is ultimately liable for payment.[79]

Summary: On the basis of efficient risk-reduction incentives, there does not appear to be a strong reason to favor strict liability over negligence in cases of retroactive application, since holding current consumers

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[75] For a discussion of the impact of liability on incentives to respond to known contamination, see A. Mitchell Polinsky and Steven Shavell, "Optimal Cleanup and Liability After Environmentally Harmful Discharges," Working paper no. 99, John M. Olin Program in Law and Economics, Stanford Law School, September 1992.

[76] Thus, the conclusion of Polinsky and Shavell regarding the inefficient level of production under a negligence rule (see Polinsky and Shavell, "Optimal Cleanup and Liability After Environmentally Harmful Discharges," Proposition 2, pp. 5-6) does not apply in cases of retroactive application.

[77] If firms are able to increase product prices to cover the costs of liability, then the cost will be passed on to current consumers of their products (since there is no way to retroactively change the price of the product paid by past consumers). The ability of firms to pass increased costs on to consumers depends upon the structure of the markets in which they operate (for example, the amount of competition they face) and whether their competitors face similar cleanup costs. If increased costs are reflected in decreased returns for investors rather than increased prices, then imposing costs on current investors will not change the return earned by the investors who benefited from the activities that led to contamination.

[78] For a discussion of insurance issues in the context of Superfund, see *Insurance Issues and Superfund*, Committee Print 99-61, Senate Committee on Environment and Public Works, 99 Cong. 1 sess. (1985); and General Accounting Office, "Hazardous Waste Issues Surrounding Insurance Availability," GAO/RCED-88-2, 1988.

[79] See Jonathan M. Moses, "Insurer Payout Over Superfund Flow to Lawyers," *Wall Street Journal*, April 24, 1992, p. B1.

liable for past contamination does not change the past output and price levels. Thus, neither the efficiency nor the fairness arguments that might be made for strict liability over negligence in prospective cases hold in the case of retroactive application. In addition, uncertainty regarding the availability of insurance to spread risks implies that the imposition of risk under the strict liability approach will impose large costs on firms.

Recommendation 3: Eliminate strict liability for cases of retroactive contamination but maintain a negligence-based rule for both care and mitigation in these cases.

D. Limitations on the Use of Liability

While legal liability can provide a powerful incentive for firms to engage in risk-reducing activities, those incentives are reduced when the probability that a firm will be held liable for the full amount of damages is less than one. As noted above, there are a number of reasons why a responsible party may not actually pay the full amount of damages even if it would be legally liable for them. One reason is that a suit might never be brought against it. If EPA targets certain types of firms for recovery of cleanup costs and the targeted firms do not seek contribution from other parties, some parties will be left without any obligation for cleanup costs.[80] Likewise, in the case of third-party damages, if those damages are sufficiently dispersed or victims do not have the financial resources to bring a suit against the responsible parties, then those parties will never be held liable for the damages that resulted from their activities.[81]

Secondly, since cleanup costs can be very large,[82] some parties might not have sufficient financial assets to cover their liability. Asset limitations or solvency problems dilute the incentive effects of liability by insulating firms from the full extent of the liability.[83] In some cases the firm may be entirely judgment-proof. Firms can even modify their corporate structure to take advantage of the insulating effect of asset limitations, by, for example, spinning off their risky activities.[84] The judgment-proof problem is exacerbated when there is a long lag between the time of the activity that is responsible for the contamination and the time of the cleanup or damage payment.[85] Long time lags are a particular problem in cases where contamination results from waste disposal, since leaching from a landfill or leaking from a containment structure may not occur until decades after the time of the disposal.[86]

Thirdly, responsible parties can be insulated from liability if it is difficult to prove the link between a given activity and the contamination or between the contamination and the damages from it. For example, it may be difficult to prove that exposure to a given contaminant was the cause of a particular cancer case,[87]

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[80] See Tietenberg, "Indivisible Toxic Torts."

[81] See Shavell, "Private vs. Social Incentives to Bring Suit."

[82] See, for example, Environmental Protection Agency, *Case Studies—Remedial Response at Hazardous Waste Sites*, EPA-540-540/2-84-002, Office of Emergency and Remedial Response (Washington, D.C., 1984).

[83] See Steven Shavell, "The Judgment Proof Problem," *International Review of Law and Economics* vol. 6, (1986) for a discussion in the context of single defendants; and Kornhauser and Revesz, "Apportioning Damages Among Potentially Insolvent Actors," for a discussion of the multiple-defendant case.

[84] A.H. Ringleb and S.N. Wiggins, "Liability and Large-scale, Long-term Hazards," *Journal of Political Economy*, vol. 98, (1990).

[85] Ibid.

[86] While time lags are not generally a problem in oil spill cases, they can be a problem with leaking underground storage tanks.

[87] As a result of this, some have advocated basing liability on exposure rather than contraction. See Glen O. Robinson, "Probabilistic Causation and Compensation for Tortious Risk," *Journal of Legal Studies*, vol. 14, (1985).

even if there is strong evidence that the substance can cause cancer.[88] Again, this is likely to be a particular problem in cases involving waste disposal rather than those involving spills.

Because of these imperfections in the use of liability as a mechanism for providing incentives for risk reduction, it is unlikely that sole reliance on liability will provide efficient incentives to reduce contamination. The question is then whether liability should be used in conjunction with other policy tools designed to provide incentives, such as regulation of activities that can lead to contamination and/or taxation of those activities (ex ante policies),[89] or whether it should be abandoned altogether in favor of sole reliance on ex ante policies.[90] While consideration of alternatives to the use of liability is beyond the scope of this paper, in its debate over reauthorization Congress should not only consider how it might restructure the liability provisions of CERCLA but also recognize the limitations on the use of liability and consider how liability fits into an overall policy package.

VII. A POLICY PROPOSAL

It is clear that the liability under the current version of CERCLA is affecting the costs, risks, and incentives of the involved parties in a myriad of ways. When evaluated in terms of their cost allocation, risk allocation and incentive effects, the different components of the liability imposed under CERCLA often conflict. Thus, decisions about the design of an appropriate liability rule will involve tradeoffs between the advantages and disadvantages of each component.

Out of the above analysis emerges a policy proposal that balances the different goals of liability. The proposal includes the following recommendations for the restructuring of CERCLA liability:

- **Eliminate retroactive strict liability but maintain a negligence-based rule for both care and mitigation.**

For cases of prospective application,

- **Retain strict liability;**
- **Eliminate joint and several liability, except between parties that have a contractual relationship (such as generators and site owners, or buyers and sellers).**

Redesigning CERCLA liability along these lines should provide a balance between the need to provide proper risk-reduction incentives and risk allocation, while at the same time resulting in a cost allocation that seems fair.

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[88] Cancer risks are calculated statistically. Thus, even if it is known that exposure to a substance will increase the number of cancer deaths in a given population by X, because cancer also stems from other causes, for any given cancer case it may not be possible to identify the cause.

[89] This is, of course, already being done somewhat. For example, the Resource Conservation and Recovery Act (RCRA) regulates hazardous wastes from "cradle-to-grave." Likewise, CERCLA contains taxes on petroleum and chemical feedstocks that are used to finance the trust fund ("Superfund") used in financing a component of cleanup costs. For discussions of the joint use of liability and regulation, see Segerson, "Risk Sharing in the Design of Environmental Policy"; Steven Shavell, "A Model of the Optimal Use of Liability and Safety Regulation," *Rand Journal of Economics*, vol. 15, (1984).

[90] See Steven Shavell, "Liability for Harm versus Regulation of Safety," *Journal of Legal Studies*, vol. 13, no. 2, (1984); and Charles D. Kolstad, Thomas S. Ulen, and Gary V. Johnson, "Ex Post Liability for Harm Vs. Ex Ante Safety Regulation: Substitutes or Complements?" *American Economic Review*, vol. 80, no. 4, (1990).

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