Volume 32, Issue 4

Environmental conflicts with reimbursement: experimental evidence

Todd L Cherry
*Dept of Economics, Appalachian St Univ; CICERO
Center for Intl Climate & Environmental Research-Oslo*

Stephen J Cotten
*Department of Economics and Finance, University of
Houston - Clear Lake*

Abstract

Most environmental laws, such as the Clean Water Act, Clean Air Act and Endangered Species Act, include provisions that encourage private enforcement by empowering citizens and NGOs to file suit against negligent firms and government agencies. One element of these 'citizen suits' is that the citizens' legal costs are reimbursed if they win, while those of a winning firm or agency are not. This paper follows previous theoretical work with an experimental investigation of alternative reimbursement rules, including the asymmetric reimbursement structure prescribed in many U.S. environmental laws. Results suggest that reimbursement increases the social cost of enforcement, and in the case of asymmetric reimbursement, the increased cost falls disproportionately upon the defending firm or government agency.

1. Introduction

In much of the world, legal systems operate under the so-called *English Rule*, which requires the losing party to pay the winner's legal costs, including lawyers' fees. This is generally not the case in the United States, where the *American Rule* provides that each party is responsible for paying its own legal costs.[1] Exceptions however arise within the provisions of most environmental laws, including the Clean Water Act, Clean Air Act and Endangered Species Act. In an effort to supplement state and federal enforcement, environmental laws often include provisions that enlist citizens and NGOs to serve as "private attorneys generals" by empowering them to file suit against either private parties for violating a specific environmental law or government agencies for failing to take mandatory actions. Citizen suits can seek civil penalties and injunctive relief that halt the polluting activity as well as the reimbursement of their legal costs. The cost structure of these citizen suits therefore resembles an asymmetric hybrid of the *English* and *American* rules—the citizens' costs are reimbursed if they win, but those of a winning agency or firm are not.[2]

Naturally, different cost structures of litigation will result in different behavior, as evidenced by different propensities to initiate litigation (Cooter and Rubinfeld, 1989). Little consensus, however, exists on the final impact of the various rules. A primary intent of the *English Rule* is to lower costs by reducing the number of low-probability-of-prevailing plaintiffs (i.e., frivolous lawsuits), but research indicates that costs may actually be higher under the *English Rule* (Katz, 1987). For instance, the winner-take all approach may lead to excessive appeals that push for additional chances to avoid legal costs.[3] With such complexity in how reimbursement rules drive legal actions and outcomes, it seems worthwhile to explore the effectiveness of the asymmetric reimbursement rules established by major U.S. environmental legislation. The literature provides some theoretical background for this question, but the potential for hidden incentives and unintended consequences calls for an experimental investigation of the issue. Herein we revisit theory and experimentally test the theoretical predictions in the lab. We explore the relative costs of three reimbursement rules: no reimbursement (*American Rule*), symmetric reimbursement (*English Rule*), and a hybrid asymmetric reimbursement structure akin to the citizen suits facilitated by U.S. environmental law.

We find the aggregate cost of conflicts is greatest under the symmetric *English Rule* and lowest under the *American Rule*. The hybrid asymmetric reimbursement scheme increases expenditures on conflicts over the *American Rule* but the totals are less than the *English Rule* with this

---

[1] Debates regarding the merits of each system have persisted among policymakers and academics. Primary issues of debate center on relative costs of each scheme, including whether one, if either, leads to relatively fewer frivolous lawsuits or more out-of-court settlements (Donohue, 1991).

[2] Efforts have been made to limit citizen suits, but in 2000, the U.S. Supreme Court upheld and extended its recognition of citizen suits (Friends of the Earth v. Laidlaw Environmental Services). Polluters also created the SLAPP defense strategy (Strategic Litigation against Public Participation), which seeks to intimidate citizens and NGOs with civil lawsuits on the grounds of defamation, discrimination, etc.

[3] This is illustrated by Naomi Campbell's 2001 invasion of privacy lawsuit against the *The Daily Mirror*. Campbell initially won an award of £3,500 plus legal costs, which her lawyer claimed to be £250,000. The decision was reversed after an appeal by the newspaper, at which time Campbell was ordered to pay the paper's £350,000 legal costs, and then the original decision was reinstated after an appeal by Campbell. In the end, the paper faced a total legal costs bill of more than one million pounds; nearly 300 times Campbell's award of £3,500 (BBC News, 2004).

difference arising from the relatively lower effort expended by the non-reimbursed party. Results provide insights on the impacts of alternative reimbursement rules, specifically the potential implications of the decision to shift the enforcement of environmental laws from public agencies to private citizen groups.

2. Theory and Hypotheses

2.1 Symmetric Reimbursement

Following previous work (e.g., Baik and Shogren, 1994; Naysnerski and Tietenberg, 1992), suppose two players compete over an exogenous prize, g, which represents the opportunity cost of environmental quality.[4] Player i expends irreversible, observable, and non-reimbursable effort x_i to influence the probability of winning the conflict. The probability of success for player i is defined by (see Tullock, 1980 and Dixit, 1987):

$$p_i(x_i, x_j) = \left[\frac{x_i}{x_i + x_j} \right].$$

Let β reflect the proportion of effort reimbursed if a player wins, where $0 \le \beta \le 1$. Note $\beta = 0$ represents the *American Rule* system of no reimbursement, from which the model collapses to the basic contest model (Tullock, 1980), and $0 < \beta \le 1$ represents the *English Rule* system of partial or complete reimbursement. Competing players unilaterally choose effort levels to maximize expected returns:

$$\pi_i = p_i(x_i, x_j)(g + \beta x_i) + (1 - p_i(x_i, x_j))(-\beta x_j) - x_i$$
$$\pi_j = p_j(x_i, x_j)(g + \beta x_j) + (1 - p_j(x_i, x_j))(-\beta x_i) - x_j.$$

Deriving and solving reaction functions provides the following Nash equilibrium, which is represented in Figure 1,

$$(x_i^{nash}, x_j^{nash}) = \left[\frac{g}{4(1-\beta)}, \frac{g}{4(1-\beta)} \right].$$

From this solution we have the following symmetric reimbursement research hypotheses:

> HYPOTHESIS 1. *Total effort expended in a conflict with symmetric reimbursement rules increases as the reimbursement rate increases.*

> HYPOTHESIS 2. *Total effort expended in a conflict with symmetric reimbursement rules exceeds the value of the reward when reimbursement rate exceeds 50 percent.*

---

[4] A number of studies use the auction theoretic approach to model legal systems (e.g., Baye et al., 2005), including experimental efforts to examine reimbursement rules (e.g., Dechenauz and Mancini, 2008).

Figure 1: Reaction Functions with Symmetric Reimbursement
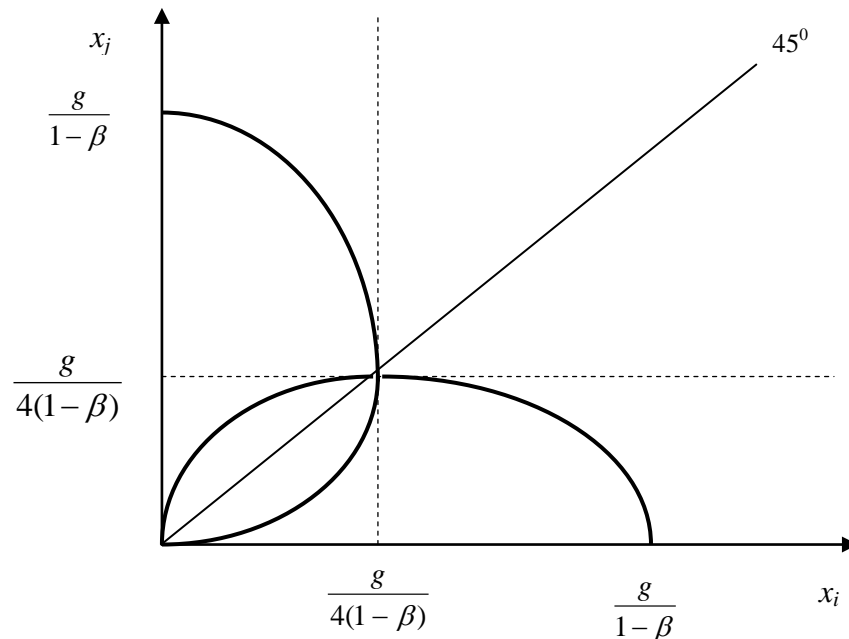
2.2 Asymmetric reimbursement
While reimbursement of legal costs generally does not occur in the U.S., there is an exception provided in the citizen suit provisions of most environmental laws. In such cases, an asymmetric reimbursement rule dictates that a victorious citizen group's legal costs are reimbursed, but a victorious firm's are not (Baik and Shogren, 1994). Letting player *i* represent the citizen group and player *j* represent the firm, each unilaterally chooses effort levels to maximize expected returns:

$$\pi_i = p_i(x_i, x_j)(g + \beta x_i) - x_i$$
$$\pi_j = p_j(x_i, x_j)g + (1 - p_j(x_i, x_j))(-\beta x_i) - x_j.$$

Again, deriving and solving the reaction functions yield the following Nash equilibrium, which is represented in Figure 2,

$$(x_i^{nash}, x_j^{nash}) = \left[\frac{g(1 - \sqrt{1 - \beta})}{2\beta\sqrt{1 - \beta}}, \frac{g(1 - \sqrt{1 - \beta})}{2\beta} \right].$$

The solution yields the following asymmetric reimbursement research hypotheses:

> HYPOTHESIS 3. *Total effort expended in a conflict with asymmetric reimbursement rules is less relative to the symmetric case for any given reimbursement rate.*

> HYPOTHESIS 4. *Effort expended by the reimbursed player is greater than that expended by the non-reimbursed player.*

Figure 2: Reaction Functions with Asymmetric Reimbursement
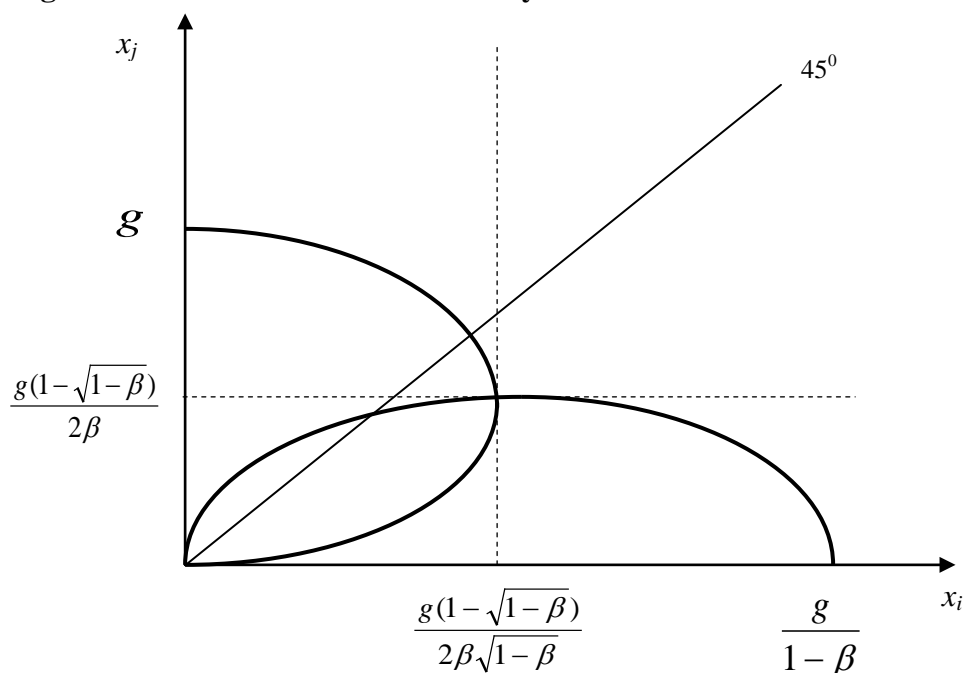
3. Experimental Design

3.1 The Basics

Sixty-six undergraduate students participated in a computerized contest game. Upon arrival to the lab, subjects sat at partitioned stations and were randomly assigned into pairs. Subjects remained anonymous and communication was not allowed. A monitor read the experimental instructions aloud with subjects following along independently. Each subject received an endowment of 150 tokens and subsequently engaged in a contest with another subject over a prize of 100 tokens ($g=100$).

The probability that each player wins the contest, p_i and p_j, was common knowledge, and equaled the ratio of the individual player's effort to the total effort expended by both players. Effort was costly, with each unit of effort costing one token. Using their endowment, players chose how much effort to expend towards influencing the likelihood of winning the prize. Effort contributed by each player was announced, along with the resulting probabilities of each person winning the prize. A random draw from a distribution determined by the relative effort levels determined the winner, and individual payoffs were announced and recorded.

Subsequent rounds followed with a fresh endowment and contest. Each session lasted 20 rounds. After the final round, subjects received their cash earnings in private, and left the lab one-by-one without any discussion. Given the behavioral sensitivity of open form games, we take a few precautions to establish a clean experimental setting. First, each subject participated under a single set of rules; a between-subject design. Second, subjects were randomly reassigned a new and different opponent each round; stranger design. And third, when roles differ in the asymmetric treatment, subjects maintained the same role throughout the session; no role reversal.

3.2 The Treatments

The experimental design entailed three treatments: a no-reimbursement baseline that corresponds to the *American Rule*, a symmetric reimbursement treatment that corresponds to the *English Rule*, and a hybrid reimbursement system that corresponds to the structure of citizen suits in many U.S. environmental laws. We use a fifty percent reimbursement rate in the two reimbursement treatments ($\beta = 0.50$).

In the baseline treatment, each player contends with her randomly assigned opponent to win the prize. Win or lose, each player pays for her own effort; $\beta = 0.00$ for both sides. In the symmetric reimbursement treatment, the two players contend to win the prize, and a percentage of the winner's effort is paid by the loser; $\beta = 0.50$ for both sides. The asymmetric reimbursement treatment differentiates the two players according to reimbursement rules. One player enjoys the prospect of reimbursement, and only pays for her own effort if she loses. Conversely, the other player is responsible for her own effort whether she wins or loses, but in addition, she must also pay for a percentage of her opponent's effort if she loses; $\beta = 0.50$ for one side; $\beta = 0.00$ for the other. Each of the three treatments entailed one session with 22 participants in 20 repeated contests (N=1320). Sessions lasted approximately 45 minutes and earnings ranged from \$12 to \$22 and averaged approximately \$18.

4. Results

Table 1 reports the predicted and observed mean individual and total effort levels in each treatment. Results reveal a strong correspondence between the relative effort levels predicted by theory and observed in the lab. In each treatment, absolute effort levels exceed the Nash predictions, but the relative effort levels correspond well to theory. The aggregate results provide initial support for the two symmetric reimbursement hypotheses. As predicted by the first hypothesis, mean individual effort increased from 44.6 units of effort in the no reimbursement treatment to 106.1 units in the symmetric reimbursement treatment (p<0.001).[5] Related to the second hypothesis, total effort expended by both parties exceeds the value of the reward; 212.2 vs. 100.0 (p<0.001).

The results also provide evidence of support for the two asymmetric hypotheses. We find, as purported in the third hypothesis, total effort is less with asymmetric reimbursement than symmetric reimbursement; 184.8 vs. 212.2 (p<0.001). And, consistent with the fourth hypothesis, observations from the asymmetric reimbursement treatment reveal that effort expended by the reimbursed player exceeds that expended by the non-reimbursed player; 105.3 vs. 79.5 (p<0.001).

We turn to a conditional analysis of individual effort to further develop our initial interpretation. Table 2 presents the results from the following empirical model of individual effort:

$$E_{it} = \alpha + \psi Sym_i + \delta Asym_i + \theta Asym*TypeA_i + \phi_t + u_i + \varepsilon_{it},$$

---

[5] All tests, unconditional and conditional, employ clustered-by-subject robust standard errors to account for individuals making repeated decisions.

Table 1. Mean Effort Levels by Treatment

	Individual			Total		
	Predicted	All Rounds	Last 5 Rounds	Predicted	All Rounds	Last 5 Rounds
No Reimbursement	25.0	44.6 (4.30)	40.7 (4.50)	50.0	89.2 (6.40)	81.4 (6.07)
Symmetric Reimbursement	50.0	106.1 (6.71)	101.1 (9.11)	100.0	212.2 (10.15)	202.2 (14.83)
Asymmetric Reimbursement	(x_j) 41.4	105.3 (8.72)	100.9 (11.07)	70.7	184.8 (10.12)	158.5 (8.98)
	(x_i) 29.3	79.5 (9.25)	57.6 (10.72)			

Notes: Numbers in parentheses are clustered (by subject) standard errors; the reimbursement rates are $\beta = 0.00$ in the no reimbursement treatment and $\beta = 0.50$ in both reimbursement treatments; in the asymmetric reimbursement treatment, the top number is the mean effort of the player receiving reimbursements (i.e., citizen groups) conditional on winning and the bottom number represents the unreimbursed player (i.e., defendant), win or lose.

where E_{it} is the level of effort put forth by the ith subject in trial t; Sym_i is a binary variable that signifies whether subject i faced symmetric reimbursement rules (=1 if yes; =0 otherwise); $Asym_i$ is also a binary variable that equals 1 if the reimbursement rule was asymmetric, 0 otherwise; $Asym*TypeA_i$ is an interaction variable that captures the impact of the ith subject being in the disadvantaged position of an asymmetric reimbursement conflict; ϕ_t is a set of T-1 dummy variables that capture potential period-specific effects; α is the estimated intercept, u_i are random effects which control for unobservable individual characteristics (e.g., risk aversion), and ε_{it} is the well-behaved error term.

The conditional estimates from two models are reported in Table 2 corroborate our initial impressions. Even when conditioning on subject- and period-specific effects, the impact of reimbursement rules on subject behavior is consistent with the set of hypotheses developed by theory. The estimated treatment effects across both models indicate that effort is over 60 units greater under reimbursement rules than without reimbursement (p<0.001). Further, both models suggest that effort under asymmetric reimbursement rules is nearly 50 units greater than levels observed in the no reimbursement treatment (p<0.001) and about 14 units lower than the symmetric reimbursement (p=0.11). And from model 2, the estimated coefficient for the interaction term indicates the disadvantaged party in the asymmetric treatment spends about 25 fewer units of effect than the advantaged party (p<0.001).

The experimental results provide four key results that are consistent with theoretical predictions. First, reimbursement increased total effort of a conflict. Second, reimbursement may lead to effort levels that exceed the value of the reward. Third, asymmetric reimbursement leads to less effort than symmetric reimbursement, but still greater than the case with no reimbursement. And fourth, under asymmetric reimbursement, the party that receives reimbursement conditional on winning exerts greater effort than the non-reimbursed party.

Table 2. Panel Estimation Results for Individual Effort

Variable	Model 1	Model 2
Constant	38.49***	38.49***
	(6.71)	(6.71)
Symmetric Reimbursement	61.56***	61.55***
	(8.05)	(8.06)
Asymmetric Reimbursement	47.85***	60.75***
	(8.24)	(9.83)
Asymmetric*AType	--	-25.81**
		(12.84)
$\chi^2 (u_i = 0)$	165.57***	120.19***
N	1320	1320

Notes: dependent variable is the subject's effort level (E_i); robust standard errors are reported in parentheses; estimates control for round- and subject-specific effects. *, **, and *** represent significant at the 10%, 5%, and 1% confidence levels, respectively.

5. Discussion

The effectiveness of environmental policy depends not only on the policy instruments and design, but also on the effectiveness of enforcement. The 1970 amendments to the Clean Air Act introduced a new element of enforcement by empowering private citizens to seek injunctions and penalties against firms violating environmental laws and government agencies failing to undertake mandated actions. Today, nearly all environmental laws contain provisions that facilitate some form of citizen suits. One aspect often included in these provisions is the potential for citizens to be reimbursed for legal costs if they win, while not allowing any reimbursement for firms that win. Policymakers believed such an asymmetric reimbursement rule would provide greater incentives for citizen suits and therefore greater private enforcement of environmental laws.

Building upon the theoretical work provided in the literature, we experimentally investigate the impacts of alternative reimbursement rules. We provide empirical evidence that supports previous theoretical predictions that reimbursement increases the social cost of conflict. This suggests that provisions of environmental laws that incorporate reimbursement may, a priori, raise the cost of enforcement, and further that this increased cost may fall upon the defending firm or government agency. Therefore, the regulatory savings associated with shifting enforcement to "private attorneys generals" via citizen suits may be diminished by the increased cost associated with the provision of asymmetric reimbursement.[6]

---

[6] In some instances the agency may welcome such suits. The Fish and Wildlife service often requires the directive of the judicial ruling in order to free up the resources needed for the economic analysis necessary for the designation of critical habitat (Berrens et al., 1999).

References

Baik, K.H and J. F. Shogren. (1994) "Environmental Conflicts with Reimbursement for Citizen Suits," *Journal of Environmental Economics and Management*, 27(1), 1-20.

Baye, M., D. Kovenock, and C. de Vries. (2005) "Comparative Analysis of Litigation Systems: An Auction-Theoretic Approach." *The Economic Journal*, 115, 583-601.

Berrens, R., M. McKee and M. Farmer. (1999) "Incorporating Distributional Considerations in the Safe Minimum Standard Approach: Endangered Species and Local Impacts," *Ecological Economics*, 30(3), 461-474.

BBC News (2004) "Naomi Campbell Wins Privacy Case," Thursday, 6 May 2004 (http://news.bbc.co.uk/2/hi/uk_news/3689049.stm; viewed on July 6, 2008).

Cherry, T.L. and S.J. Cotten. (2008) "Sleeping with the Enemy: The Economic Costs of Internal Environmental Conflicts," Appalachian State University Department of Economics Working Paper.

Cooter, Robert D. and D. L. Rubinfeld. (1989). "Economic Analysis of Legal Disputes and Their Resolution." *Journal of Economic Literature*, 27, 1067-1097

Dechenaux, E. and M. Mancini. (2008) "Auction-Theoretic Approach to Modeling Legal Systems: An Experimental Analysis." *Applied Economics Research Bulletin*, 2, 142-177.

Dixit, A. (1987) "Strategic Behavior in Contests," *American Economic Review*, 77, 891-898.

Donohue, J.J. (1991) "Opting for the British Rule, or if Posner and Shavell Can't Remember the Coase Theorem, Who Will?" *Harvard Law Review*, 104(5), 1093-1119.

Katz, A. (1987) "Measuring the Demand for Litigation: Is the English Rule Really Cheaper?" *Journal of Law, Economics, and Organization*, 3(2), 143-176.

Naysnerski, W. and T. Tietenberg. (1992) "Private Enforcement of Federal Environmental Law," *Land Economics*, 68(1), 28-48.

Snyder, E.A. and J.W. Hughes. (1990) "The English Rule for Allocating Legal Costs: Evidence Confronts Theory," *Journal of Law, Economics, and Organization*, 6(2), 345-380.

Tullock 1980. "Efficient Rent Seeking," in *Toward a Theory of the Rent-Seeking Society* (Buchanan, J., Tollison, R., Tullock, G.. eds.) Texas A&M University Press, College Station TX, 97-112.