

Delegation with Asymmetric Reimbursement Systems in an Environmental Conflict*

Sung-Hoon Park** · GiSeung Kim***

This paper reports on a study that explores how asymmetric reimbursement rules affect effort expended in an environmental conflict. Both lawyers for a citizen group and a polluting firm work on an hourly-fee basis. The citizen group pays a monitoring cost to observe its lawyer's effort level; whereas, the firm has either in-house legal advice or lawyers on retainer. We examine: (i) how monitoring cost decreases the citizen group lawyer's effort level to enable the firm to be the favourite although the firm's fault exists; (ii) how the reimbursement rule can tilt the contest odds toward the citizen group; and (iii) how the reimbursement rule can increase expected payoff for the citizen group and promote citizen suits. Three findings are as follows: First, the lawyer of the citizen group reduces effort as the monitoring cost of the citizen group increase so that the firm can be the contest favourite with the firm's fault. Second, the reimbursement rule causes the citizen group to increase its lawyer's effort level so that it leads the group to be the contest favourite relative to no reimbursement. Third, the reimbursement rule can increase the expected payoff of the citizen group that promotes the citizen suit.

JEL Classification: Q2, C7

Keywords: asymmetric reimbursement, delegation, environmental conflict, expected payoff, probability of winning

* Received December 3, 2008. Accepted April 30, 2009. We thank two anonymous referees for their helpful comments.

** Research Fellow, Department of Economic and Social Policies, Gyeonggi Research Institute, 179, Pajang-dong, Jangan-gu, Suwon, Gyeonggi-do, Korea, Tel: 82-31-250-3552, E-mail: shpark123@gri.re.kr

*** Author for correspondence, Faculty of Economics, Cheongju University, 36, Naedok-dong, Sangdang-gu, Cheongju, 360-764, Korea, Tel: 82-10-7575-0505, E-mail: gskim@cju.ac.kr

1. INTRODUCTION

Conflict models are often used to examine the resolution of environmental conflicts (see Settle *et al.*, 2001). Studies of the theory of an environmental conflict have examined the efficiency consequences of citizen(s) and firm(s) ‘directly’ competing over a prize without delegates (see, e.g., Baik and Shogren, 1994; Heys, 1997; Hurley and Shogren, 1997; Liston-Heys, 2001; Park and Shogren, 2003; Park and Lee, 2007a).

Exceptions are Lim and Shogren (2004) and Park and Lee (2007b, 2007c). Lim and Shogren (2004) adopted a situation in which a firm’s attorney (on retainer) is paid an hourly fee, but a citizen group’s attorney fee is paid on a contingent basis since the group cannot benefit financially from taking legal action against a firm with no assets. They assumed the citizen group’s delegate receives reimbursement for the delegate’s effort if the group wins the lawsuit. Park and Lee (2007b, 2007c) in various directions have expended the literature on strategic behavior initiated by Lim and Shogren (2004).

According to Naysnerski and Tietenberg (1992) and Settle *et al.* (2001), Park and Lee (2007b, 2007c) assumed that the citizen group does receive reimbursement for legal costs if it wins the lawsuit. Park and Lee (2007b) analyzed the effects of asymmetric reimbursement in a delegate model where the lawyers for a citizen and a polluting firm work on a contingent-fee basis. The major findings from Park and Lee (2007b) are as follows. First, the asymmetric reimbursement increases the citizens’ expected surplus, thereby promoting environmental conflicts. Second, the asymmetric reimbursement enhances the possibility that the environmental conflict goes to settlement by decreasing the magnitude of expected loss less expected surplus. Third, the asymmetric reimbursement reduces total litigation effort levels if the conflict goes to settlement and curtails the rent dissipation. Fourth, the asymmetric reimbursement incurs the total litigation effort levels if the conflict goes to trial.

Following Lim and Shogren (2004), Park and Lee (2007c) examined a

polluting firm that represents itself in court at its in-house attorney's legal advice, while a citizen's attorney is employed on a contingent fee basis. The major findings from Park and Lee (2007c) are as follows. First, for low degrees of firm fault, the asymmetric reimbursement raises winning probability of the citizen while enhancing total litigation effort levels. This increases frequency of conflicts as well as rent dissipation. Second, for high degrees of firm fault, the asymmetric reimbursement makes no changes in winning probability of the citizen and total litigation effort levels, thus leaving frequency of conflicts and rent dissipation intact.

The three papers previously mentioned assumed that the attorney fees of the plaintiffs are paid on contingent basis. However, the contingent fees do not officially exist in Korea.¹⁾ This study assumes that a citizen group's attorney is paid on an hourly basis and the citizen group pays a monitoring cost to observe its lawyer's effort level.

The goal of asymmetric reimbursement is to promote a citizen's suit by reducing the costs of putting environmental regulation into private hands. The present model showed how the asymmetric reimbursement rule increases the expected payoff for the citizen group and promotes citizen suits.

The results suggest: First, a monitoring cost motivates the citizen group to decrease the effort level of its lawyer so that the firm can be the contest favourite although the firm's fault exists. Second, an increase in the level of asymmetric reimbursement for the citizen group causes the group to increase its lawyer's effort level so that it leads the group to be the contest favourite relative to no-reimbursement. Third, the asymmetric reimbursement can increase the expected payoff of the citizen group that promotes the citizen suit.

2. A MODEL

Consider a situation in which a citizen group suffers environmental

¹⁾ See Baik and Kim (2007) for details.

damage that a firm causes in an effort to earn a profit. The citizen group fights to receive compensation for environmental damage. The environmental conflict is modeled as a contest in which two risk-neutral players, 1 (a citizen group) and 2 (a polluting firm), compete with each other for the environmental damage, v .²⁾

Each player hires a lawyer for the environmental conflict. For clarity, let agent 1 be the lawyer of player 1; likewise for agent 2. Both agents work on an hourly-fee basis. Assume player 1 pays a monitoring cost to observe the agent's effort; whereas player 2 has either in-house legal advice or lawyers on retainer.

The environmental conflict is modeled as a contest: Agents 1 and 2 that represent players 1 and 2, expend their efforts simultaneously and independently to win the lawsuit. Let x_1 and x_2 be the effort levels put into the contest by agent i ($i = 1, 2$);³⁾ and let γx_1 represent the monitoring costs by player 1, where $\gamma > 0$.⁴⁾ The costs of player 1 depend on the monitoring costs and agent 1's effort levels. The costs of player 2 depend only on agent 2's effort levels.

Let $p_1(x_1, x_2; \theta)$ represent the probability that player 1 wins the lawsuit. The objective probability is defined by the probability success function $p_1(x_1, x_2; \theta) = x_1/(x_1 + \theta x_2)$ if x_1 and/or x_2 are positive while $p_1(0, 0) = 1/2$. Assume player 1's agent has the objective merits of the case ($0 < \theta \leq 1$). Define θ as the degree of legality for player 2.⁵⁾ If $\theta = 1$, then player 1's case is without merit; If $\theta \rightarrow 0$, player 2 is wrong. This function implies that it is

²⁾ The court enforces the liability rules which award monetary damages (v) to player 1. The amount of the award is designed to correspond to the amount of damage inflicted. Environmental conflicts may involve another contest in which the structure of the prize differs for the competitors (Alpay, 2005). As an example, we can consider an environmental conflict over the development of timberland between a citizen group and a syndicate of firms.

³⁾ The effort of the agent is an index of real inputs such as, the time spent by the agent, filing fees, and the consulting fees of experts translated into dollars. Agent i 's effort (x_i) represents the agent's fee player i must pay.

⁴⁾ See Baik and Kim (2007) for details.

⁵⁾ See Park and Lee (2007b, 2007c) for details.

increasing according to agent 1's effort and decreasing according to agent 2's effort. It is decreasing in the level of legality for player 2.

3. A DELEGATION WITHOUT REIMBURSEMENT

Before moving into the question of environmental policy rules, we first establish a benchmark model without reimbursement. Let Π_1 represent the expected payoff for player 1:

$$\Pi_1 = p_1 v - (1 + \gamma)x_1 \quad (1)$$

where $(1 + \gamma)x_1$ represents the total costs of player 1. Let L_2 represent the expected loss for player 2. The loss, as a function of effort levels, is:

$$L_2 = p_1 + x_2 \quad (2)$$

which implies that delegation costs player 2 a total amount of x_2 . Agent 1 exerts effort x_1 which maximizes player 1's expected payoff taking agent 2's effort as given; whereas agent 2 exerts effort x_2 which minimizes player 2's expected loss taking agent 1's effort as given. Player i computes x_i which agent i then implements. Algebraically, this optimization results in each agent's reaction function. Using the two reaction functions, we obtain a Nash equilibrium in the game when $x_1 + x_2 > 0$. Lemma 1 states the effort levels of agents 1 and 2, the probability of winning for player 1, the expected payoff for player 1, and the expected loss for player 2.

Lemma 1: *At the Nash equilibrium, each agent's effort level is respectively: $x_1^* = \theta v / (1 + (1 + \gamma)\theta)^2$ and $x_2^* = (1 + \gamma)\theta v / (1 + (1 + \gamma)\theta)^2$.*

The probability that the citizen group wins at the Nash equilibrium is: $p_1^ = 1 / (1 + (1 + \gamma)\theta)$.*

The expected payoff for the citizen group is: $\Pi_1^ = v / (1 + (1 + \gamma)\theta)^2$.*

The expected loss for the firm is: $L_1^* = (1 + 2(1 + \gamma)\theta V) / (1 + (1 + \gamma)\theta)^2$.

Using Lemma 1, we obtain $(1 + \gamma)x_1^* = x_2^*$. This implies that the difference between the effort levels of the two agents depends on player 1's financing or monitoring costs. Define the product $\{(1 + \gamma)\theta\}$ of the key parameters: the degree of legality (θ), and the total hourly fee rate $(1 + \gamma)$, as the relative 'composite' strength of player 1 (Baik, 1998). Equilibrium levels for the effort depend on the relative composite strength.

Proposition 1: *At the Nash equilibrium under no-reimbursement, (a) agent 2 expends more effort than agent 1; and (b) the citizen group is the favourite if $\gamma < (1 - \theta)\theta$ and the firm is the favourite if $\gamma > (1 - \theta)\theta$.*⁶⁾

Proposition 1 indicates that the increase in γ , for a given θ , can cause the firm to be the favourite by holding $x_1^* < x_2^*$. Some economists show that each party's effort levels are the same; whereas the probability of winning the lawsuit completely depends on the degree of legality θ — i.e., $x_1 = x_2$, and $p_1 = 1/(1 + \theta) > 1/2$ in the present model. Some of these economists are Farmer and Pecorino (1999) and Hirshleifer and Osborne (2001). The different results are discussed here. Since the authors implicitly assumed a situation in which plaintiff and a defendant directly competes over a prize without delegates, they did not consider a lawyer's moral hazard. Herein, the degree of legality completely controls who wins the lawsuit. However, the present paper has assumed agent 1 works on an hourly-fee basis so that player 1 is to monitor agent 1's effort level.⁷⁾ From the players' optimization problem, we attain that the probability of winning depends on both the monitoring costs of player 1 and the exogenous merits of the case. This implies that the monitoring costs incur an undesirable

⁶⁾ In a contest game, a contest favorite has more than a 50% chance of winning the prize (Dixit, 1987).

⁷⁾ Since player 2 has either in-house legal advice or lawyers on retainer, here is no need for player 2 to monitor agent 2 (see Lim and Shogren, 2004).

outcome under a no-reimbursement case. Examined next are the consequences when a fair-minded regulator sets policy through an asymmetric reimbursement affecting the odds of the conflicts.

4. A DELEGATION UNDER ASYMMETRIC FULL REIMBURSEMENT

Now consider is how the U.S. federal environmental policy rule of asymmetric reimbursement for the victorious player 1 affects the consequences of player 1 and player 2 competing over the prize, v . Assume that agent 1's fee (x_1), which player 1 pays, is fully reimbursed by player 2 if player 1 wins the lawsuit. Let $\hat{\Pi}_1$ represent the expected payoff for player 1 and let \hat{L}_2 represent the expected loss for player 2. The functions of the effort level pairs (x_1, x_2) are:

$$\hat{\Pi}_1 = p(v + x_1) - (1 - \theta)x_1 \quad (3)$$

and

$$\hat{L}_2 = p(v + x_1) + \theta x_2 \quad (4)$$

The analysis of this game is similar to that in section 3.⁸⁾ We report the following when $x_1 + x_2 > 0$: the effort levels of agents 1 and 2; the probability of winning for player 1; and the expected payoff for player 1 and the expected loss for player 2 at the Nash equilibrium in the contest.

⁸⁾ The second-order condition for maximizing $\hat{\Pi}_1$ is satisfied with $0 < x_2 < v/\theta$ and the second-order condition for minimizing \hat{L}_2 is always satisfied with all x_1 ; whereas the condition to make the reaction function for player 1 be positive on x_2 is $0 < x_2 < v/(1 + \gamma)\theta$ and the condition to make the reaction function for player 2 be positive on x_1 is $x_1 < \theta v/(1 - \theta)$. Since $v/(1 + \gamma)\theta < v/\theta$, the second-order conditions hold for both players.

Lemma 2: *At the Nash equilibrium, each agent's effort level is respectively:*

$$\hat{x}_1^* = (1 + (1 + \gamma)\theta)v / 2\varphi - v / 2 \quad \text{and} \quad \hat{x}_2^* = (-1 + (1 + \gamma)\theta)v / 2\theta\varphi - v / 2\theta.$$

The probability that agent 1 wins at the Nash equilibrium in the game is:

$$\hat{p}_1^* = ((1 + (1 + \gamma)\theta) - \varphi) / 2\theta.$$

The expected payoff for the citizen group is:

$$\hat{\Pi}_1^* = ((1 + \gamma)(\varphi - (1 + \gamma)\theta) + (1 - \gamma))v / 2\varphi.$$

The expected loss for the firm is: $\hat{L}_2^ = ((1 + \gamma)^2\theta^2 + 4\theta - (\varphi - 1)^2)v / 4\theta\varphi$.*⁹⁾

Proposition 2 summarize the key results from Lemma 2.

Proposition 2: (a) *At the Nash equilibrium under the asymmetric reimbursement, agent 1 expends more effort than agent 2 if $\gamma < 1/(1 + \theta)$. But agent 2 expends more effort than agent 1 if $\gamma > 1/(1 + \theta)$; (b) the citizen group is the favourite for $\gamma < (2 - \theta)/2\theta$, while the firm is the favourite if $\gamma > (2 - \theta)/2\theta$.*

Proposition 2 indicates that, in the range of $0 \leq \gamma < 1/2$, agent 1 expends more effort than agent 2 and the citizen group is always the contest favourite for $0 < \theta \leq 1$.

By considering Lemmas 1 and 2 together, we can compare the reimbursement rule and the no-reimbursement rule. The differences are between (i) \hat{x}_1^* and x_1^* ; (ii) \hat{x}_2^* and x_2^* ; (iii) \hat{p}_1^* and p_1^* ; (iv) \hat{L}_2^* and L_2^* ; and (v) $\hat{\Pi}_1^*$ and Π_1^* . The results are:

$$(i) \quad \hat{x}_1^* - x_1^* > 0 \quad \text{for} \quad 0 < \theta \leq 1 \quad \text{and} \quad \gamma \geq 0.$$

$$(ii) \quad \hat{x}_2^* - x_2^* > 0 \quad \text{for} \quad \theta = 1 \quad \text{and} \quad \gamma \geq 0.$$

the sign of $(\hat{x}_2^* - x_2^*)$ is ambiguous for $0 < \theta < 1$: the increase in the firm level

⁹⁾ For simplicity, denote that $\varphi = (\gamma^2\theta^2 + 2(1 + \theta)\gamma\theta + (1 - \theta)^2)^{1/2}$, where $\varphi > 0$ for $0 < \varphi \leq 1$ and $\gamma \geq 0$.

of guilt (i.e. $\theta \rightarrow 0$) causes the value to change from a positive sign to a negative sign at a certain value of θ , for given γ ; and the increase in γ causes the value to change from a negative sign to a positive sign at a certain value of γ , for given θ .

$$(iii) \hat{p}_1^* - p_1^* > 0 \quad \text{for } 0 < \theta \leq 1 \text{ and } \gamma \geq 0.$$

$$(iv) \hat{L}_2^* - L_2^* > 0 \quad \text{for } 0 < \theta \leq 1 \text{ and } \gamma \geq 0.$$

(v) Let $\hat{\Pi}_1^* - \Pi_1^*$ represent $D\hat{\Pi}_1^*(\gamma, \theta)$. Then, it is found that $D\hat{\Pi}_1^*(\gamma, \theta) > 0$ for $0 < \theta \leq 1$ and $0 \leq \gamma \leq 0.658$.¹⁰⁾

From the above, Proposition 3 summarizes our key result.

Proposition 3: (a) *The asymmetric reimbursement makes agent 1 expend more effort.* (b) *The decrease in the degree of legality for the firm (i.e., $\theta \rightarrow 0$) causes the value of $\hat{x}_2^* - x_2^*$ to change from a positive sign to a negative sign at a certain value of θ , for given γ ; and the increase in γ causes the value of $\hat{x}_2^* - x_2^*$ to change from a negative sign to a positive sign at a certain value of γ , for given θ .* (c) *Adding the asymmetric reimbursement rule increases the group's chance to win.* (d) *The adding in of the asymmetric reimbursement rule increases player 2's expected loss.* (e) *Also the adding increases player 1's expected payoff for $0 < \theta \leq 1$ and $0 \leq \gamma \leq 0.658$.*

The proofs of parts (a)-(d) are straightforward. Part (e) is proven as follows. $D\hat{\Pi}_1^*(\gamma, \theta)$ is continuous at all values γ of and θ . First, consider the case where $\gamma = 0$, i.e., the case where the financing and/or monitoring costs for player 1 are zero. This case represents $D\hat{\Pi}_1^*(\gamma, \theta)|_{\gamma=0}$

¹⁰⁾ Note that the function consists of a wave length with $\gamma \rightarrow \infty$ even if it converges to 0 with $\gamma \rightarrow \infty$. The decimal fraction is rounded to three decimals.

$= (2 + \theta)\theta / (1 + \theta)^2 > 0$. Second, consider the case in which $\gamma = 0.658$. This case is illustrated in figure 1 in which $D\hat{\Pi}_1^*(\gamma, \theta)|_{\gamma=0.658} > 0$ for $0 < \theta \leq 1$. Third, consider the case when $\theta \rightarrow 0$, i.e., the case in which player 2 is wrong. This case represents $D\hat{\Pi}_1^*(\gamma, \theta)|_{\gamma=0} = 0$.

Figure 1 $D\hat{\Pi}_1^*(\gamma, \theta)|_{\gamma=0.658} > 0$ for $0 < \theta \leq 1$

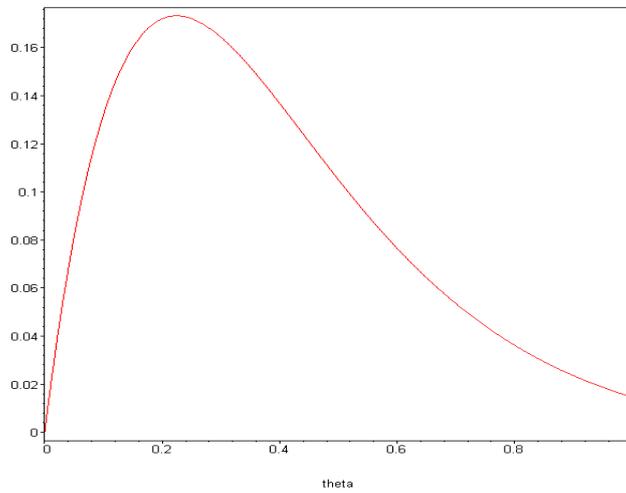
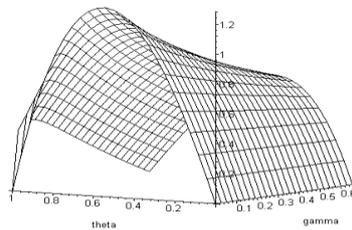


Figure 2 $D\hat{\Pi}_1^*(\gamma, \theta) > 0$ for $0 < \theta \leq 1$ and $0 \leq \gamma \leq 0.658$



Finally, consider the case when player 1 is without merit, $\theta = 1$. This case represents $D\hat{\Pi}_1^*(\gamma, \theta)|_{\theta=1} > 0$ for $0 \leq \gamma \leq 0.658$. All cases are illustrated in figure 2, in which $D\hat{\Pi}_1^*(\gamma, \theta) > 0$ for $0 < \theta \leq 1$ and $0 \leq \gamma \leq 0.658$.

5. CONCLUSION

The United States Supreme Court ruling reinforced an established idea that private citizens have legal standing to be directly involved in the enforcement of federal laws; in this case, environmental protection.¹¹⁾ This legal standing has been codified by most major U.S. federal environmental regulations through citizen suit provisions (for example Clean Air Act, Clean Water Act, and Endangered Species Act; see Miller, 1987; Naysnerski and Tietenberg, 1992). Environmental Conflicts have been extensively studied under the assumptions that the attorney fees of plaintiffs are paid on a contingent basis. In Korea, contingent fees do not officially exist. The citizen group may face less monitoring ability when a citizen group hires a lawyer without contingent fees. This study shows that the firm can be the contest favourite under no-reimbursement even if the firm's fault exists. Adding an asymmetric reimbursement rule tilts the contest towards the citizen group relative to no-reimbursement. This rule may increase the expected payoff for the citizen group and may promote a citizen suit.

¹¹⁾ In January 2000, the Justices of the United States' Supreme Court voted 7-2 to preserve the right of a private citizen to sue an alleged polluter or developer for violating a federal environmental regulation (*Friends of Earth, inc. v. Laidlaw Environmental Services (TOC), Inc.* (98-822), 149 F.3d 303). Private citizens helping to enforce laws dates back over 600 years to a 1388 statute in England (Dickinson, 1997). See for example Clauson (1997), Grant (1997), Leonard (1995), and Pring and Canon (1995) for discussions on the legal aspects of citizen suits in environmental policy.

REFERNECES

- Alpay, S., "Interactions among Economic Development, Openness to Trade and Environmental Sustainability with a Case Study on South Korea," *Journal of the Korean Economy*, 6, 2005, pp. 67-89.
- Baik, K. H., "Difference-form Contest Success Functions and Effort Levels in Contests," *European Journal of Political Economy*, 14, 1998, pp. 685-701.
- Baik, K. H. and I. G. Kim, "Contingent Fees versus Legal Expenses Insurance," *International Review of Law and Economics*, 27, 2007, pp. 351-361.
- Baik, K. H. and J. F. Shogren, "Environmental Conflicts with Reimbursement for Citizen Suits," *Journal of Environmental Economics and Management*, 27, 1994, pp. 1-20.
- Clauson, H. L., "How Far Should the Bar on Citizen Suits Extend Under Section 309 of the Clean Water Act?," *Environmental Law*, 27, 1997, pp. 967-990.
- Dixit, A., "Strategic Behavior in Contests," *American Economic Review*, 77, 1987, pp. 891-898.
- Farmer, A. and P. Pecorino, "Legal Expenditures as a Rent-seeking Game," *Public Choice*, 100, 1999, pp. 271-288.
- Grant II, D. S., "Allowing Citizen Participation in Environmental Regulation: An Empirical Analysis of the Effects of Right-to-Sue and Right-to-Know Provisions of Industry's Toxic Emissions," *Social Science Quarterly*, 78, 1997, pp. 859-873.
- Heys, A. G., "Environmental Regulation by Private Contest," *Journal of Public Economics*, 63, 1997, pp. 407-428.
- Hirshleifer, J. and E. Osborne, "Truth, Effort, and the Legal Battle," *Public Choice*, 108, 2001, pp. 169-195.
- Hurley, T. M. and J. F. Shogren, "Effort Levels in a Cournot Nash Contest with Asymmetric Information," *Journal of Public Economics*, 69, 1998, pp. 195-210.

- Leonard, A. R., "When Should an Administrative Enforcement Action Preclude a Citizen Suit Under the Clean Water Act?," *Natural Resources Journal*, 35, 1995, pp. 555-624.
- Lim, B. I. and J. F. Shogren, "Unilateral Delegation and Reimbursement Systems in an Environmental Conflict," *Applied Economics Letters*, 11, 2004, pp. 489-493.
- Liston-Heys, C., "Setting the Stakes in Environmental Contests," *Journal of Environmental Economics and Management*, 41, 2001, pp. 1-12.
- Miller, J. G., *Citizen Suits: Private Enforcement of Federal Pollution Control Laws*, Wiley Law Publications, 1987.
- Naysnerski, W. and T. Tietenberg, "Private Enforcement of Federal Environmental Law," *Land Economics*, 68, 1992, pp. 28-48.
- Park, S. H. and J. F. Shogren, "Public-private environmental conflicts," in J. Wesseler, H. P. Weikard, and R. Weaver, eds., *Risk and Uncertainty in Environmental Economics*, Edgar Elgar, Cheltenham, UK, 2003, pp. 161-192.
- Park, S. H. and M. H. Lee, "Public-Good Nature of Environmental Conflicts: Individual and Collective Litigations," *Seoul Journal of Economics*, 20, 2007a, pp. 283-295.
- _____, "A Bilateral Delegate Model with Asymmetric Reimbursement in Environmental Conflicts," *Environmental and Resource Economics Review*, 16, 2007b, pp. 3-25 (in Korean).
- _____, "Policy Implications of the Asymmetric Reimbursement Rule in a Unilateral Delegate Model of Environmental Conflicts," *Journal of Environmental Policy and Administration*, 15, 2007c, pp. 65-88 (in Korean).
- Pring, G. W. and P. Canan, *SLAPPs: Getting Sued for Speaking Out*, Temple University Press, Philadelphia, 1995.
- Settle, C., T. Hurley, and J. F. Shogren, "Citizen Suits," in A. Heys, ed., *The Law and Economics of the Environment*, Edward Elgar, Cheltenham, UK, 2001, pp. 217-248.