Using Decoupling and Deep Pockets to Mitigate Judgment-proof Problems

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We examine how financial penalties for social damages can be structured to mitigate judgment-proof problems. These problems occur when a producer has insufficient wealth to compensate victims for the most serious damages that can arise from his activities. We demonstrate that a policy in which assessed penalties are decoupled from realized damages generally generates greater social surplus than does a policy of compensatory damages. We also show that a lender’s deep pockets can generally be employed to mitigate judgment-proof problems, despite recent suggestions to the contrary in the literature. © 1999 by Elsevier Science Inc.

I. Introduction

The judgment-proof problem has long been recognized as one with serious practical implications, particularly in the areas of environmental protection and product safety. A judgment-proof problem arises when the total resources that a producer’s commands are small relative to the social damages that his activities may cause. The producer’s limited wealth makes him judgment proof in the sense that he cannot be forced to compensate victims fully for the losses they suffer because of his activities. Consequently, the producer may take too little (unobservable) care to limit the social damages that can arise from his activities (e.g., losses from environmental contamination or unsafe products).¹

The present research examines two potential means for mitigating judgment-proof problems: decoupling and deep pockets. Decoupling is implemented when the finan-

cial penalty that is imposed on the producer who causes social damages is allowed to differ from the magnitude of the damages he causes, even when these damages do not exceed the producer’s assets. The deep pockets of a lender are employed when the financial resources that she provides to the producer are used to compensate victims who are harmed by the producer’s activities. In contrast to some suggestions in the literature, we find that decoupling and deep pockets can both serve as effective means of mitigating judgment-proof problems.

Our focus is on penalty and reward structures that maximize expected social surplus, explicitly accounting for the social damages that can arise from a producer’s activities and for the costly care that the producer can undertake to limit these damages. We find that when higher damages are systematically associated with less care by the producer (in a sense defined precisely below), the optimal decoupling of fines from damages involves a threshold damage policy. The risk-neutral producer faces no fine at all if damages are sufficiently small but forfeits his entire assets if realized damages are sufficiently large. This threshold damage policy creates stronger incentives for care than does a policy that requires the solvent producer to compensate victims exactly for the damages they suffer. It does so by promising the producer particularly pronounced incremental rewards when he avoids the largest social damages. Under some conditions, a threshold damage policy can induce even a judgment-proof producer to deliver the ideal level of care.

We also explore how the deep pockets of lenders can best serve to mitigate judgment-proof problems in the same setting. Under the surplus-maximizing arrangement, the lender delivers some funds to the producer and receives no repayment if realized damages are sufficiently small. However, to ensure that the transaction offers sufficient expected profit to the lender, the solvent producer is required to repay more than the full value of the funds he receives when larger damage realizations occur. This repayment structure, like a threshold damage policy, creates particularly strong incentives for the producer to provide care to make the smaller damages more likely and the larger damages less likely.

Our analysis builds on the important contributions of other authors and, in doing so, provides some substantive contrasts. Boyd and Ingberman (1994) explain why decoupling can enhance incentives to limit social damages. We extend their important insights in two directions. First, we characterize completely the optimal decoupling of penalties from damages in a setting where realized damages are systematically linked to the producer’s unobserved care. Second, we explain the potential value of deep pockets and characterize their optimal use in mitigating judgment-proof problems in this setting. In related work, Polinsky and Che (1991), among others, explain the merits of decoupling the penalties imposed on injurers from the awards given to successful plaintiffs. In their model, the decoupling of penalties from awards to plaintiffs serves to reduce the incentives of injured victims to sue and, thereby, reduces socially costly litigation. Litigation does not occur in our model because the single producer’s activities are known to have resulted in an observable level of damages.

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2Also see Polinsky and Shavell (1989), Hylton (1990), and Katz (1990), for example.
3Although the penalty imposed on the injurer exceeds the plaintiff’s award in Polinsky and Che’s (1991) model, the penalty need not exceed total damages, because both society and the plaintiff may be harmed by the injurer.
4Our focus on the case of a single producer allows us to abstract from issues of joint liability that can arise when multiple producers pollute the environment simultaneously, for example [see Tietenberg (1992), pp. 533-534] and Watts (1998)].
assumption enables us to focus on the issue of how to structure penalties to induce a judgment-proof producer to take care to avoid excessive social damages. Pitchford (1995) presents a relatively pessimistic view of the role that a lender’s deep pockets can play in mitigating judgment-proof problems. Our assessment is more optimistic and, thus, may be more consistent with the widespread use of deep pockets in practice.\(^5\) Our more optimistic assessment stems in part from the decoupling that we permit.\(^6\)

Our analysis of the roles of decoupling and deep pockets proceeds as follows. First, we describe the key elements of our model in Section II, focusing on the setting where higher damages are systematically associated with less care by the producer. This focus is not without loss of generality, but it facilitates the simplest demonstration of the more general merits of decoupling and deep pockets. Our main findings in this setting are recorded and explained in Section III. In Section IV, we discuss how our findings will vary in different settings. We explain why the ideal policy may not entail threshold damages in the absence of a systematic relationship between damages and care, even though the merits of decoupling and deep pockets persist quite generally. We also explain why our central findings are likely to change when such important considerations as equity and fairness are taken into account. Because our formal model does not incorporate these considerations, though, our analysis is better viewed as an assessment of the potential benefits that decoupling can provide in mitigating judgment-proof problems than as a complete assessment of the benefits and costs of alternative legal regimes.\(^7\)

II. Elements of the Model

We examine a simple setting with two risk-neutral actors: a producer and a lender. The producer’s activity generates private profit, V, but also gives rise to social damages, D. For simplicity, we take V > 0 to be a known, fixed constant.\(^8\) In contrast, realized social damages are stochastic and can take on any value in the interval \([0, D]\). The producer can undertake an unobservable activity, called care, to limit social damages.\(^9\) To illustrate, the care delivered by a firm that transports crude oil by sea might encompass the monitoring and screening of ship captains or the vigilant inspection of ship safety devices and procedures. We focus on settings where increased care by the producer systematically reduces the likelihood of large social damages and increases the likelihood of small damages, and does so at a decreasing rate. Formally, Assumptions 1 and 2 are assumed to hold in this section and the next. (Alternative settings are considered in the concluding section.) The assumptions refer to \(f(D|c)\), which is the density of

\(^5\)The use of deep pockets is mandated in many important settings by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). CERCLA extends liability for environmental damages to certain creditors of the producers that cause the damages. For a discussion of CERCLA and its interpretation by the courts, see Barr (1990), Nation (1994), Probst and Portney (1992), Strasser and Rodosevich (1993), Singer (1995), and Jennings (1996), for example.

\(^6\)We also allow for a continuum of possible social damages from the producer’s activities, whereas Pitchford (1995) focuses on the case where the social damage can only assume one of two possible values. This difference turns out to be important, even when decoupling is not permitted [see Lewis and Sappington (1997b)].

\(^7\)Additional links between our research and related studies are also drawn in Section IV.

\(^8\)Thus, we abstract from any product-market effects of either liability rules or the producer’s efforts to limit social damages [Polinsky and Shavell (1994)]. This and most other elements of our model parallel those in Pitchford (1995).

\(^9\)For simplicity, we do not model the victims of social damages explicitly. We thereby abstract from the efforts that victims might take to mitigate the damages they suffer.
damages, $D$, when the producer has provided care level $c$. $F(D|c)$ is the corresponding distribution function.

**ASSUMPTION 1:** $f(D|c)/f(D|\bar{c})$ is strictly increasing in $D$ for all $D \in [0, \bar{D}]$, for any $\bar{c} > c \geq 0$.

**ASSUMPTION 2:** $F_{cc}(D|c) \leq 0$ for all $D \in [0, \bar{D}]$ and for all $c \geq 0$.

Assumption 1 is the critical assumption for our purposes. The assumption states that $f(D|c)$ satisfies the monotone likelihood ratio property (MLRP) [see Milgrom (1981)]. This means that the relative odds ($f(D|c)/f(D|\bar{c})$) of observing a particular damage level, $D$, according to whether the producer has provided a low level of care, $c$, rather than a high level of care, $\bar{c}$, are greater, the larger the damage level. This is the formal sense in which higher damage levels are systematically associated with less care by the producer.

Two density functions that satisfy MLRP are illustrated in Figure 1. The solid line in Figure 1 depicts the likelihood of various damage levels when substantial care ($\bar{c}$) is provided. The dashed line represents the corresponding likelihood when less care ($c$) is provided. Notice that greater care makes the lower damage realizations ($D < \bar{D}$ in Figure 1) more likely and the higher damage realizations ($D > \bar{D}$) less likely. Furthermore, when MLRP holds, the amount by which the height of the dashed line exceeds the height of the solid line increases as $D$ increases, capturing the aforementioned increase in the relative odds of observing a given damage realization.

Assumption 1 is a strong assumption, but it captures the intuitive notion that the

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10This density is twice continuously differentiable and has strictly positive support on the interval $[0, \bar{D}]$. 
observed damage realization is systematically informative about the unobserved actions of the producer. (We will consider alternative assumptions in Section IV.) Assumption 2 is not particularly stringent. It simply states that the relationship between greater care and a reduced likelihood of the larger damage realizations is subject to diminishing returns. In other words, the higher the initial level of care being delivered, the smaller is the reduction in the larger damage realizations that results from increased care.

Care is costly for the producer to deliver. We will denote by \( K(c) \) the monetary value of the disutility incurred by the producer when he delivers care level \( c \). Care is supplied with increasing marginal cost, so \( K'(c) > 0 \) and \( K''(c) > 0 \) for all \( c \geq 0 \).11

Because the level of care that the producer delivers is unobservable, he cannot simply be ordered to deliver a prescribed level of care. Instead, he must be motivated to deliver care by the financial rewards and penalties that he faces.12 If the producer’s personal resources are sufficiently large, a compensatory damage policy can induce him to deliver the surplus-maximizing level of care, \( c^* = \arg\max_c \{ V - \int_0^D D dF(D(c)) - K(c) \} \).

Under a compensatory damage policy (CDP), the solvent producer must compensate victims exactly for the damages they suffer. Formally, letting \( P(D) \) denote the payment that the producer must make to victims when damages, \( D \), occur, a CDP is implemented when \( P(D) = D \) for all \( D \in [0, A] \), where \( A \) denotes the producer’s financial assets. Because a CDP holds a wealthy producer financially responsible for the full social costs of his activities, a CDP will induce him to deliver the level of care that maximizes total expected social surplus.

However, when the maximum potential social damage from his activities, \( D^* \), exceeds his financial assets, \( A \), a CDP will not induce the producer to deliver the surplus-maximizing level of care, \( c^* \). When he cannot be forced to bear the full social cost of damages that exceed his assets, \( D \in (A, D^*) \), the producer will deliver less care than \( c^* \). This is the essence of the judgment-proof problem.

We will assume throughout that a judgment-proof problem exists under a CDP because the producer’s assets are strictly less than the maximum possible social damage, \( D^* \), from operation. The producer's assets are the sum of his initial wealth (\( W \geq 0 \)), his operating profit (\( V \geq 0 \)), and any loan (\( L \geq 0 \)) he receives from the lender.13 The lender is assumed to have \( L \) dollars at her disposal. She can lend any portion of this amount to the producer if she finds it profitable to do so.14 The lender’s expected profit when she delivers \( L \) dollars to the producer is \( \int_0^D R(D) dF(D(c)) - L \), where \( R(D) \) is the payment that the producer must make to the lender when damage level \( D \) occurs. The sum of the producer’s payments to victims and to the lender cannot exceed his assets, so \( P(D) + R(D) \leq W + V + L \) for all \( D \in [0, D^*] \).

We seek to characterize efficient penalty and reward policies in the setting under consideration. An efficient policy is one that maximizes total expected surplus while ensuring that the uncompensated damages that victims suffer are not too pronounced.

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11 We assume that the producer is always induced to deliver a strictly positive level of care. This will be the case in our model if \( \lim_{c \to 0} K'(c) = 0 \).
12 We consider only monetary rewards and penalties. Segerson and Tietenberg (1992) and Polinsky and Shavell (1993) examine the role that incarceration can play in motivating desired behavior when monetary rewards and penalties are limited.
13 For simplicity, we treat the producer’s initial wealth, \( W \), as cash that is readily transferred to victims or the lender, rather than as capital employed in the production process.
14 The lender need not be a bank or other financial intermediary. The lender could be a parent corporation, and the producer could be one of its subsidiary firms, for example.
in expectation. Formally, an efficient policy \( \{P(D), R(D), L\} \) is the solution to the following problem, labeled \([PB]\).

Maximize \( V - \int_0^{\tilde{D}} DdF(D) - K(c) \)  

subject to

\[
\int_0^{\tilde{D}} [D - P(D)]dF(D) \leq M,  
\]

\[
\pi(c) = \int_0^{\tilde{D}} [V + L - P(D) - R(D)]dF(D) - K(c) \geq 0,  
\]

\( c \in \text{argmax}_{c'} \pi(c') \),  

\[
P(D) + R(D) \leq W + V + L \text{ for all } D \in [0, \tilde{D}],  
\]

\[
\int_0^{\tilde{D}} R(D)dF(D) - L \geq 0, \text{ and}  
\]

\( L \leq \tilde{L}. \)

Expression (1) reflects the goal of maximizing total expected surplus, which is the net return from production \((V - K(c))\) less expected social damages. Expression (2) ensures that the expected compensation delivered to victims does not fall short of the damages that they are expected to incur by more than \(M \geq 0\) dollars. Expression (3) is the producer’s participation constraint, requiring that he anticipate at least his opportunity profit level, which is normalized to zero. Expression (4) indicates that the producer will deliver the level of care that maximizes his expected profit, taking as given the payments he must make to victims and to the lender. Expression (5) is the producer’s liquidity constraint, which prohibits him from making payments that exceed his assets. Expression (6) is the lender’s participation constraint, requiring that she anticipate non-negative profit when she loans \(L\) dollars to the producer. Expression (7) reflects the limit on the lender’s resources.

Expressions (3) and (6) rule out any form of coercion that would obligate the producer or the lender to abide by the terms of a financial arrangement against their will. Thus, the producer and the lender prefer to operate under the prescribed contract than to not operate at all. However, the producer and lender are not free to specify their

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15We assume that total expected surplus is strictly positive at the solution to \([PB]\).

16In solving \([PB]\), we replace expression (4) with the requirement that \(\pi'(\tilde{c}) = 0\). In other words, we assume that the “first-order approach” is valid. Rogerson (1985) proves that the first-order approach is valid when the counterparts to Assumptions 1 and 2 hold in a setting in which the distribution of the outcome, \(D\), is discrete, rather than continuous.

17Thus, we normalize to zero the lender’s opportunity profit level. Results analogous to those derived below arise if we assume that the lender’s opportunity cost of each dollar loaned to the producer is \(1 + r\) dollars, provided \(r \geq 0\) is not too large.
preferred financial arrangement. In essence, we treat this financial arrangement as being structured by society to best mitigate the judgment-proof problem. Notice, too, that the lender’s role is limited here. She cannot monitor the producer’s actions, prevent him from taking undesired actions, or provide guidance or technical assistance, for example. This formulation enables us to focus exclusively on the role that a lender’s financial resources can play in mitigating judgment-proof problems. In Section IV, we identify the main changes that arise when the lender is able to monitor the level of care delivered by the producer.

III. The Efficient Policy

We begin the discussion of our main findings with Proposition 1, which describes an efficient policy when deep pockets are not available (i.e., when \( L = 0 \)).

**Proposition 1:** When \( L = 0 \), an efficient policy entails threshold damages. Under threshold damages, the producer incurs no penalty if realized damages are sufficiently small, but he is required to deliver his entire assets to victims whenever realized damages exceed a critical level. (Formally, there exists a \( D^0 \) such that \( P(D) = 0 \) if \( D \leq D^0 \) and \( P(D) = W + V \) if \( D > D^0 \) at the solution to \( [PB] \).)

**Corollary 1:** The efficient policy when \( L = 0 \) is not a CDP in the present setting.

To understand why the efficient policy is not a CDP, consider Figure 2. The line drawn with broken segments in Figure 2 depicts the producer’s final net worth as realized damages vary under a CDP. Notice that if damages, \( D \), are zero, the producer retains his wealth, \( W \), and his operating profit, \( V \). Thus, his final net worth is \( W + V \) when \( D \) is zero. At the other extreme, when realized damages equal or exceed the sum of the producer’s initial wealth and profit (so \( D \geq W + V \)), the producer forfeits both \( W \) and \( V \), and is left with a final net worth of zero. For damage realizations between zero and \( W + V \), the producer’s final net worth declines by one dollar as realized damages increase by one dollar.

Denote by \( \bar{c} \) the level of care that the producer delivers under a CDP. \( \bar{c} \) is chosen to maximize the difference between the producer’s expected monetary payoff under the CDP and his personal cost of care, \( K(c) \). When the producer’s assets \( (W + V) \) are small relative to the maximum damage he may cause, \( \bar{D} \), the producer will provide less than the surplus-maximizing level of care, i.e., \( \bar{c} < c^* \). The question, then, is how the CDP might be modified to induce the producer to deliver more care.

One modification is depicted by the solid line segments in Figure 2. The essence of the modification is to increase the producer’s payoff when the smallest damage realizations are realized.
izations \((D \in [0, D_1])\) occur and decrease his payoff when larger damages \((D \in (D_2, W + V])\) occur. Doing so will increase the producer’s incentive to avoid relatively large damages and to increase the likelihood of smaller damages. The horizontal line segment at \(W + V\) in Figure 2 reflects the fact that under the modified CDP, the producer is not required to compensate victims for the damages they suffer if these damages are sufficiently small (i.e., less than \(D_1\)). The horizontal line segment at 0 for \(D \in [D_2, W + V]\) in Figure 2 implies that the modified CDP penalizes the producer to the greatest extent possible if one of these larger damage realizations occur. In particular, the producer forfeits his initial wealth, \(W\), and his profit from operation, \(V\), even though realized damages are less than the sum of \(W\) and \(V\). Thus, relative to the CDP, the producer is penalized less severely when the smallest damage realizations \((D \in [0, D_1])\) occur and more severely when larger damage realizations \((D \in [D_2, W + V])\) occur. When lower damages are linked systematically to increased care (as ensured by Assumption 1), the smallest damage realizations become more likely, and the larger damage

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**FIG. 2. Improving on a compensatory damage policy.**

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**Compensatory Damage Policy (CDP).**

**Modified CDP.**
realizations become less likely as the producer increases care above $\tilde{c}$. Therefore, the producer will find it in his own best interest to raise his care above $\tilde{c}$ when the CDP is modified along the lines depicted in Figure 2. Proposition 1 reports that the efficient policy is a natural extension of the modified CDP depicted in Figure 2. As illustrated in Figure 3, the efficient policy relieves the

Proposition 1 is readily verified that for any given level of care, $c$, the producer’s expected return under the modified CDP depicted in Figure 2 is the sum of his expected return under the CDP and $\int_{0}^{D^*} D dF(D) - \int_{D^*}^{W+V} [W+V-D] dF(D)$. Therefore, the envelope theorem implies that the rate at which the producer’s expected return increases with $c$ when $c = \tilde{c}$ is $\int_{0}^{D^*} D f(D) dD - \int_{D^*}^{W+V} [W+V-D] f(D) dD$. This expression is positive because $D_1$ and $D_2$ are chosen so that $f(D) > 0$ for all $D \in [0, D_1]$ and $f(D) < 0$ for all $D \in [D_2, W+V]$. Because his expected return is increasing in $c$ when $c = \tilde{c}$, the producer will choose to deliver more care under the modified CDP than under the CDP.
producer of any obligation to compensate victims whenever the damages they incur are sufficiently small, i.e., $D \leq D^*$. Once a threshold level of damages, $D^*$, is exceeded, however, the producer is penalized to the maximum extent possible. He forfeits his entire wealth and his operating profit whenever realized damages exceed $D^*$, even though the damages he causes may be less than the sum of his wealth and profit.

Decoupling assessed penalties from realized damages in this manner creates the strongest incentives for care in the present setting. As noted above, when Assumption 1 holds, increased care systematically increases the likelihood of small damages and decreases the likelihood of large damages. Therefore, when he faces the largest possible reward if small damages arise and the largest possible penalty if large damages occur, the producer has particularly strong incentives to increase the level of care he supplies.

By providing such strong incentives to deliver care, the efficient policy can sometimes induce even a judgment-proof producer (i.e., one with assets below $D^*$) to deliver the surplus-maximizing level of care. As Corollary 2 reports, this will be the case when the producer’s initial assets $(V + W)$ are sufficiently large. The threat of forfeiting all of his substantial assets over an entire range of intermediate damages realizations $(D \in (D^0, W + V])$ can provide sufficient incentive for the producer to deliver $c^*$, even though his assets are outweighed by the maximum damage that he may cause.

**Corollary 2:** When $L > 0$ but $V + W (<D)$ is sufficiently large, the efficient policy will induce a judgment-proof producer to deliver the surplus-maximizing level of care.

Having illustrated how the decoupling of penalties from damages can help to mitigate judgment-proof problems, we now consider the incremental role that a lender’s resources ($L \geq 0$) play. For ease of exposition, we focus on the setting in which the total available resources $(W + V + L)$ are sufficiently small that the producer cannot be induced to deliver the surplus-maximizing level of care, even when all of these resources are employed efficiently. Our main finding in this setting is recorded in Proposition 2.

**Proposition 2:** When $L > 0$, the efficient policy makes full use of the lender’s deep pockets while implementing threshold damages (i.e., $L = \bar{L}$ at the solution to $[PB]$). Also, there exists a $D^k \in (0, D)$ such that $P(D) + R(D) = 0$ for all $D \leq D^k$ and $P(D) + R(D) = W + V + \bar{L}$ for all $D > D^k$.

27 The lender’s deep pockets are valuable in this setting because they can be employed to create a reward system that offers particularly strong incentives for the producer to deliver care. As Figure 4 illustrates, the efficient policy authorizes the producer to keep all of his initial assets $(W + V)$ and the entire loan from the lender, $\bar{L}$, if he avoids large social damages (i.e., if $D \leq D^k$). However, the producer forfeits all of these assets if the realized social damage exceeds the threshold level, $D^k$. In essence, the loan from the

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24 Proposition 1 and Corollary 1 hold even when $M = 0$. Therefore, even when expected payments to victims must match expected damages exactly, it is efficient to decouple the compensation that victims receive from the actual damages they incur.

25 Similar reward structures have been shown to be optimal in settings characterized by wealth constraints, risk-neutral actors, and the MLRP. See, for example, Innes (1990).

26 Technically, we assume that $W + V + \bar{L} < A^*$, where $A^*$ is the smallest level of $W + V + \bar{L}$ for which $c = c^*$ at the solution to $[PB]$. The case where $W + V + \bar{L} > A^*$ is similar, and so is not discussed in detail.

27 If constraints (2), (3), and (6) do not bind at the solution to $[PB]$, then $D^k$ is defined by $f_c(D^k) = 0$. 
lender acts much like an increment to the producer’s initial wealth: The producer is permitted to retain both his initial wealth and this increment to his wealth (as well as his profit) if damages are sufficiently small, but not otherwise. This reward and penalty structure creates particularly strong incentives for care, because greater care increases the producer’s chances of securing the substantial reward (when $D \leq D^L$) and avoiding the pronounced penalty (when $D > D^F$). The greater the lender’s resources, the larger the incremental reward the producer can be offered for limiting social damages, and thus the more care he can be induced to deliver.

**Corollary 3:** The deeper the lender’s pockets, the more care the producer is induced to provide under the efficient policy (i.e., $dc/dL > 0$ at the solution to [PB]).

Proposition 2 reports that a valuable role for the lender’s deep pockets is ensured in the present setting when penalties can be decoupled from realized damages. More
generally, however, deep pockets are not always valuable in mitigating judgment-proof problems, as Pitchford (1995) demonstrates. The imposition of a CDP can result in a reduced role for deep pockets because the CDP limits the set of feasible financial arrangements between the producer and the lender. In particular, it is not always possible to both match penalties to damages and to employ the lender’s resources to create a reward structure that enhances the producer’s incentives to deliver the care that limits social damages.

A corollary of the fact that the lender’s deep pockets can always be employed to create stronger incentives for the producer to limit social damages when decoupling is permitted is that conventional liability insurance will be counterproductive in the present setting. Under conventional liability insurance, the producer makes a payment to the insurer before production takes place. In return, the insurer compensates the producer for some portion of realized damages above a threshold level. The net effect of such an insurance policy is to reduce the producer’s incremental reward for avoiding large social damages. Consequently, conventional liability insurance is not an efficient means to elicit greater care from the producer.

**Corollary 4:** Conventional liability insurance for the producer is not a component of the efficient policy.

**IV. Conclusions and Extensions**

We have identified two methods for mitigating judgment-proof problems: decoupling and deep pockets. We have shown that by decoupling compensation from damages a producer can be motivated to deliver more care to reduce social damages. We have also shown that when such decoupling is permitted, a lender’s deep pockets can always be usefully employed to enhance incentives for care.

We found that a lender’s deep pockets were valuable even though the lender in our model could only deliver and collect funds. The lender’s deep pockets may be even more valuable when, as is common in practice, the lender can monitor and direct the activities of producers to whom they loan funds. We have extended the model developed here to allow the lender to discover hard evidence of inadequate care by the producer. It turns out that when increased care by the producer systematically reduces the likelihood that the lender will discover incriminating evidence, the efficient policy continues to involve threshold damages. The producer retains all of his assets if realized damages are sufficiently small, but he employs his entire assets to

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28See Balkenborg (1997) and Lewis and Sappington (1997b) for qualifications of Pitchford’s (1995) conclusions. Lewis and Sappington (1997b) explain why Pitchford’s (1995) conclusions depend on his maintained assumption that if damages occur, they are of a fixed magnitude.

29The payment by the insurer to the producer may be a fixed amount or it may increase with realized damages. The payments are structured to ensure non-negative expected profit for the insurer.

30Shavell (1986) reaches an analogous conclusion in a related setting. Trebilcock and Winter (1998), in contrast, demonstrate the merits of conventional liability insurance when insurers are better able than others to monitor the activities that producers undertake to avoid social damages. (See the concluding section for further discussion of this issue.)

31CERCLA distinguishes between creditors that play an active role in the producer’s activities and those that merely hold a financial interest in the producer. CERCLA does not hold liable a creditor “who, without participating in the management of a vessel or facility, holds indicia of ownership primarily to protect his security interest in the vessel or facility” (42 USC § 9601 (20)(A)). See Strasser and Rodosevich (1995) for a detailed analysis of this distinction.

32See Shavell (1987) and Boyer and Laffont (1994) for related investigations of settings in which the lender can monitor the producer’s activities perfectly and costlessly.
compensate victims and to repay the lender when larger damage realizations occur. The range of damages over which the producer forfeits his assets is larger when the lender presents evidence of inadequate care by the producer.33

Thus, the qualitative findings derived above persist when monitoring is incorporated into the simple model analyzed here. It remains to be determined whether our main findings persist more generally. Risk aversion on the part of the producer or the lender may alter certain features of the efficient policy, but risk aversion seems unlikely to modify the central effects identified above. With risk-averse actors, the threshold damage policy in which the producer retains all of his assets or none of them will likely be replaced by payoffs that vary more smoothly with realized damages. However, decoupling and deep pockets seem likely to be valuable even when parties are risk averse.34,35

The value of decoupling in mitigating judgment-proof problems must be weighed against its drawbacks in settings in which a significant divergence between the penalty imposed on a producer and the damages he causes is considered to be unfair or unjust. In such settings, the ideal extent of decoupling is likely to be less pronounced than it is under the threshold damage policy identified in Propositions 1 and 2.36 Any extreme divergence between damages and penalties may be reserved for instances in which the realized damage level provides particularly compelling evidence about the producer’s likely level of care.

A role for conventional liability insurance and an additional role for deep pockets may also emerge when society values a close proximity between realized damages and assessed penalties. Insurance and deep pockets can provide the resources required to compensate victims for the damages they incur and can, thereby, enhance social welfare. Thus, although equity or justice concerns may limit the role of decoupling, they may promote an expanded role for deep pockets.

Even when society has no aversion to decoupling, decoupling may not always take on the particular form that it does in the threshold damage policy identified in Propositions 1 and 2. A threshold damage policy is efficient in the setting on which we have focused because of the systematic relationship between realized damages and unobserved care implied by Assumption 1. To consider the properties of efficient policies in alternative settings, first consider the special setting in which greater care by the producer reduces the probability that an accident will occur but does not affect the likelihood of different damages levels when an accident occurs. In this case, the efficient policy will impose no penalties on the judgment-proof producer if he avoids an accident, but it will require him to forfeit all of his assets whenever an accident occurs. In particular, there is no positive threshold level of damages that triggers particularly severe or lenient penalties after an accident. Although penalties are decoupled from

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33Under this payment structure, the lender will find it profitable to reveal evidence of insufficient care by the producer whenever such evidence is available. In contrast, Chu and Qian (1995) demonstrate that lenders will have an incentive to conceal evidence of negligence if they are held partially liable when the producer is found to be negligent.


35Payoffs that vary more smoothly with damages may also be efficient in settings in which the producer can devote effort to mitigate damages after observing their initial magnitude. See Polinsky and Shavell (1994) for an investigation of this issue.

36Although equation (2) in [PB] implicitly presumes that society suffers if expected penalties diverge too far from expected damages, it does not incorporate a corresponding cost for society when actual penalties diverge from realized damages.
damages, the producer’s payoff does not vary with realized damages after an accident in this setting as they do when Assumption 1 holds.\footnote{There are also settings in which realized damages within certain ranges are uninformative about particular types of care. To illustrate, precautions taken to limit massive environmental damage if an oil tanker runs aground may have no impact on minor oil leakage during transport. In such settings, a threshold damage policy that imposes large penalties for relatively large, but still minor, spills during transport and no penalties for minimal spills will not improve incentives to undertake precautions designed to limit massive environmental damage.}

The efficient policy may not be a threshold policy even when greater care increases the likelihood of small damages and decreases the likelihood of large damages. To illustrate this fact, consider the following simple setting. Suppose the producer can either deliver little care, $c$, or significant care, $c^\#$, to limit social damages. Realized social damages are either low ($D_L$), intermediate ($D_I$), or high ($D_H$). The probabilities of low, intermediate, and high damages when the producer delivers little care are 0.1, 0.6, and 0.3, respectively. The corresponding probabilities when the producer delivers significant care are 0.7, 0.1, and 0.2. Under this probability structure, higher effort is systematically associated with lower expected damages, in the sense that the probability that realized damages will be at or below any specified level is higher, the higher is the level of care undertaken by the producer.\footnote{The probability of $D_L$ is 0.7 if care is $c^\#$, and is 0.1 if care is $c$. The probability that damages are either $D_L$ or $D_I$ is 0.8 if care is $c$, and is 0.7 if care is $c^\#$. Technically, these relationships ensure that the conditional distribution of $D$ when $c = c^\#$ dominates the corresponding distribution when $c = c$ in the sense of first-order stochastic dominance [see, for example, Hadar and Russell (1969)].} Despite this systematic association between care and expected damages, the efficient policy will generally not entail threshold damages. The reason is that the intermediate damage realization is relatively likely to occur when the producer supplies little care. Consequently, the strongest incentives for care will generally be created by imposing more stringent penalties on the producer when intermediate damages ($D_I$) occur than when high damages ($D_H$) occur. Decoupling will continue to be efficient, but the decoupling will not impose minimal penalties for the smaller damage realizations and maximal penalties when larger damages occur, despite a systematic association between care and expected damages.

This example illustrates the strength of Assumption 1. Assumption 1 imposes a systematic relationship between care and damages for each possible damage realization and not simply a systematic association between care and expected damages.\footnote{Assumption 1 (MLRP) requires the difference between the height of the solid line in Figure 1 and the height of the dashed line to decrease systematically as $D$ increases. First-order stochastic dominance is less stringent. It simply requires the area under the solid line in Figure 1 to exceed the corresponding area under the dashed line for all values of $D \in (0, D_I)$.} Absent the systematic relationship summarized in Assumption 1, the efficient policy to mitigate judgment-proof problems may not entail the extreme form of decoupling identified in Propositions 1 and 2. However, the merits of decoupling and deep pockets are quite general and, so, will arise even when the structure of Assumption 1 is not present. This structure merely facilitates a simple illustration of the more general merits of decoupling.

In closing, we note one fruitful direction for future research and emphasize one important caveat regarding our analysis. We have focused our attention on the design of \textit{ex post} liability rules to induce greater levels of care by the producer. However, \textit{ex ante} enforcement of care standards can be optimal in settings in which the producer’s care level can be observed (imperfectly).\footnote{See Menell (1991) for a useful discussion of the conditions under which \textit{ex ante} regulation is preferable to \textit{ex post} use of liability rules.} Future research might profitably investigate how...
decoupling and deep pockets are optimally linked with *ex ante* investigation procedures. The concluding caveat is that although decoupling and deep pockets can help to mitigate judgment-proof problems in some settings, they will not serve as panaceas in all settings. For instance, when latent risks are present, it is often difficult to estimate the magnitude of likely damages or even to identify in advance activities that are likely to cause social damages. Therefore, it may prove difficult to design and enforce the efficient policy described above in the presence of latent risks. Related difficulties may emerge when the initial resources of producers are not observable. As Ringleb and Wiggins (1990) have observed, policies that employ producers’ assets to compensate victims can induce producers to conceal or dissipate assets. Modifications of the policies developed above may be required to discourage such behavior. One possible modification is to ration access to the activity in question in proportion to the personal assets that a producer brings to bear. By limiting the scale or scope of profitable activities that a producer who claims to have limited assets is allowed to undertake, incentives to understate or dissipate wealth can be mitigated. It can be shown that when the wealth endowments of producers are independent realizations of a uniformly distributed random variable, for example, such rationing of access can be quite effective. Not only can such rationing induce all producers to reveal their privately known wealth endowments, but it can also ensure the care level that would be induced if the wealth of all producers were known and were concentrated in the hands of a single producer. Further research regarding the design of efficient liability rules when judgment-proof producers are privately informed about their financial resources is recommended.

Appendix

The proof of Proposition 1 is analogous to the proof of Proposition 2 and, so, is omitted. The proof of Corollary 4 is also omitted, because it follows immediately from the discussion in the text.

**Proof of Corollary 1**

Because \( P(D) < D \) for all \( D \in [0, D^0] \) and \( P(D) > D \) for all \( D \in (D^0, W + V) \), the efficient policy does not have \( P(D) = D \) for all \( D \in [0, A] \), and so is not a CDP. However, if realized damages are either 0 or \( \tilde{D} > 0 \), then an efficient policy will generally entail \( P(0) = 0 \) and \( P(\tilde{D}) = W + V < \tilde{D} \), which is a CDP. ■

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41See Wittman (1977), Shavell (1984a, 1984b), and Kolstad et al. (1990), for example, for useful analyses of the use of *ex ante* safety policies and *ex post* liability rules.

42Ringleb and Wiggins ([1990], p. 575) cite “radiation, DES, cigarette smoking, saccharin, occupational carcinogens, asbestos, dioxin, vinyl chloride, [and] PCB” as examples of substances and activities that entail latent health hazards the long-term impacts of which took many years to recognize. See Tietenberg ([1992], pp. 512–516) for a discussion of the special problems associated with identifying and controlling latent health hazards. Also see Schwartz (1985) for a discussion of the drawbacks to holding a producer liable for damages associated with risks that he cannot reasonably be expected to anticipate.

43Ringleb and Wiggins ([1990], p. 589) estimate that “the incentive to evade liability has led to roughly a 20 percent increase in the number of small corporations in the U.S. economy.” See Boyd and Ingherman (1997) for related observations.

44See Lewis and Sappington (1997a) for an analysis of optimal incentive contracts in a moral hazard setting when agents are privately informed about their financial resources.
Proof of Corollary 2

Let $\mathcal{W}$ be the minimum level of initial assets $(W + V)$ required to induce care level $c^*$ under the efficient policy. $\mathcal{W}$ is defined by

$$\mathcal{W} = \int_0^D f_0(D)(c^*) \, dD - K'(c^*) = 0 \text{ for some } D \in (0, \bar{D}).$$

Suppose that $\mathcal{W} \leq \bar{D}$. Then $\int_0^D f_0(D)(c^*) \, dD \leq K'(c^*)$. Therefore, Assumption 1 implies that $\int_0^D f_0(D)(c^*) \, dD < \int_0^D f_0(D)(c^*) \, dD < K'(c^*)$, which contradicts the fact that $c^*$ is the surplus-maximizing level of care. Consequently, $\mathcal{W} < \bar{D}$, and the efficient policy will induce $c^*$ whenever $W + V \in [\mathcal{W}, \bar{D})$.

Proof of Proposition 2

Let $\gamma^M$, $\lambda^L$, $\mu$, $\lambda^T$, $\xi(D)$, and $\gamma^L$ represent the Lagrange multipliers associated with constraints (2) to (7), respectively. Then the necessary conditions for a solution to $[PB]$ are readily shown to include:

$$Z^P(D) = [\gamma^M - \lambda^L]f_0(D) - \mu f_0(D) - \xi(D) \leq 0; \quad P(D)Z^P(D) = 0. \quad (A1)$$

$$Z^R(D) = [\lambda^L - \lambda^T]f_0(D) - \mu f_0(D) - \xi(D) \leq 0; \quad R(D)Z^R(D) = 0. \quad (A2)$$

$$Z^L = \lambda^L - \gamma^L - \gamma^L + \int_0^D \xi(D) \, dD \leq 0; \quad LZ^L = 0. \quad (A3)$$

$$Z^* = -\int_0^D f_0(D) \, dD - K'(c) + \mu \left[ \int_0^D [V + L - P(D) - R(D)] f_0(D) \, dD - K'(c) \right] + \lambda^L \int_0^D R(D) f_0(D) \, dD + \gamma^M \int_0^D [P(D) - D] f_0(D) \, dD = 0. \quad (A4)$$

The proof proceeds by using expressions (A1) to (A4) to derive the following five findings.

Finding 1: $\mu > 0$.

Proof: The proof consists of two distinct proofs by contradiction. Initially, suppose $\mu = 0$. Then it can be shown that $\lambda^L = 0$ and $\gamma^M = \lambda^T > 0$. But then (A1) implies that $\xi(D) > 0$ for all $D \in [0, \bar{D})$, so that $P(D) + R(D) = W + V + L$ for all $D \in [0, \bar{D})$. Under such a payment structure, $c = 0$, contrary to assumption. Hence, $\mu \neq 0$.

Next, suppose $\mu < 0$. Then, using techniques analogous to those outlined in the proofs of Findings 2 to 4 below, it is readily shown that there exists a $\bar{D} \in (0, \bar{D})$ such that at the solution to $[PB]$, $P(D) + R(D) = W + V + L$ for all $D \in [0, \bar{D})$ and $R(D) + P(D) = 0$ for all $D \in (\bar{D}, \bar{D}]$. But under this payment structure, $c = 0$, contrary to assumption. Therefore, $\mu > 0$.

Finding 2: $R(D) + P(D) \notin (0, W + V + L)$ over any interval in $[0, \bar{D})$.

Proof: Suppose $R(D) + P(D) \in (0, W + V + L)$ over some interval $(D_1, D_2)$. Then (A1) and (A2) imply that $\xi(D) = 0$ for all $D \in (D_1, D_2)$ and that
\[
\mu \frac{f_1(D|c)}{f(D|c)} = \max \{ \gamma M - \lambda^P, \lambda^L - \lambda^L \} = m \quad \forall \quad D \in (D_1, D_2).
\]  

But (A5) contradicts Assumption 1, which implies that \(d/dD \left[ f_1(D|c)/f(D|c) \right] < 0 \forall \ D \in [0, \tilde{D}] \) [see Milgrom (1981)].

**Finding 3:** If \(R(D_1) + P(D_1) > 0\) for some \(D_1 \in [0, \tilde{D}]\), then \(R(D) + P(D) > 0\) for all \(D \in [D_1, \tilde{D}]\).

**Proof:** If \(R(D_1) + P(D_1) > 0\), then (A1) and (A2) imply:

\[
\mu \frac{f_1(D_1|c)}{f(D_1|c)} = m - \frac{\xi(D_1)}{f(D_1|c)}. \tag{A6}
\]

Now suppose that \(R(D_2) + P(D_2) = 0\) for some \(D_2 \in (D_1, \tilde{D})\). Then \(\xi(D_2) = 0\) because \(R(D_2) + P(D_2) < W + V + L\). Therefore, it follows from (A1) and (A2) that

\[
\mu \frac{f_2(D_2|c)}{f(D_2|c)} \geq m - \frac{\xi(D_2)}{f(D_1|c)} = \mu \frac{f_1(D_1|c)}{f(D_1|c)} \tag{A7}
\]

The second inequality in (A7) holds because \(\xi(D) \geq 0\) for all \(D \in [0, \tilde{D}]\). The equality follows from (A6). But because \(\mu > 0\) from Finding 1, (A7) contradicts Assumption 1.

**Finding 4:** \(R(D) + P(D) = \begin{cases} 0 & \forall \ D \in [0, \tilde{D}^2] \\ W + V + L & \forall \ D \in (\tilde{D}^2, \tilde{D}] \end{cases} \) for some \(\tilde{D}^2 \in (0, \tilde{D})\).

**Proof:** If \(R(0) + P(0) > 0\), then \(R(D) + P(D) = W + V + L\) for all \(D \in [0, \tilde{D}]\) from Findings 2 and 3. But then \(c = 0\), contrary to assumption. If \(R(\tilde{D}) + P(\tilde{D}) = 0\), then \(R(D) + P(D) = 0\) for all \(D \in [0, \tilde{D}]\) from Finding 3. But then the producer’s payoff is independent of \(D\), and so \(c = 0\), a contradiction. Therefore, Finding 4 follows directly from Findings 2 and 3.

**Finding 5:** \(L = \tilde{L}\).

**Proof:** Suppose \(\gamma^L = 0\). Then (A3) implies

\[
\lambda^P - \lambda^L + \int_0^{\tilde{D}} \xi(D) dD \leq 0. \tag{A8}
\]

Also, (A2) implies

\[
[\gamma^P - \lambda^L] f(D|c) + \xi(D) \geq -\mu f_1(D|c) \quad \forall \quad D \in [0, \tilde{D}]. \tag{A9}
\]

In addition, because \(\xi(D) = 0\) for all \(D \in [0, \tilde{D}^2]\), it follows from Assumption 1 and Finding 1 that (A9) holds as a strict inequality for some \(D \in [0, \tilde{D}^2]\). Therefore, integrating (A9) over all \(D \in [0, \tilde{D}]\) implies

\[
\lambda^P - \lambda^L + \int_0^{\tilde{D}} \xi(D) dD > 0. \tag{A10}
\]

Because (A10) contradicts (A8), it follows that \(\gamma^L > 0\), and so \(L = \tilde{L}\).  

\[
\square
\]
If \( c \) did not increase with \( \bar{L} \), then there would be no strict increase in expected surplus as \( \bar{L} \) increases. But this contradicts the findings in the proof of Proposition 2 that \( \gamma^L > 0 \). ■

References


