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# A Damage-Revelation Rationale for Coupon Remedies

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This article studies optimal remedies in a setting in which damages vary among plaintiffs and are difficult to determine. We show that giving plaintiffs a choice between coupons to purchase units of the defendant's product at a discount and cash—a coupon-cash remedy—is superior to cash alone. The optimal coupon-cash remedy offers a cash amount that is less than the value of the coupons to plaintiffs who suffer relatively high harm. Such a remedy induces these plaintiffs to choose coupons, and plaintiffs who suffer relatively low harm to choose cash. Sorting plaintiffs in this way leads to better deterrence because the costs borne by defendants (the cash payments and the cost of providing coupons) more closely approximate the harms that they have caused.

## 1. Introduction

In many lawsuits brought by consumers, the remedy takes the form of awarding plaintiffs coupons that can be used to purchase the defendant's product at a discounted price. Commentators generally have been critical of this type of remedy. The dominant reason is that coupons are thought to facilitate a settlement between the defendant and the lawyers representing the class of consumers that is not in the best interests of the consumers.[1] Coupons also have been shown to give defendants an incentive to raise the prices of their products and to lead consumers to buy an excessive amount of the products.[2]

In this article, we demonstrate that the use of coupons can be socially valuable. Specifically, we show that it is possible to design a remedy in which coupons are offered as an alternative to cash—a coupon-cash remedy—that will lead defendant firms to bear costs that better reflect the harms that they

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1. Specifically, a defendant and a class lawyer have an incentive to overstate the value of the coupons to the class so that the defendant's costs are reduced and the lawyer's legal fees are enhanced. See generally Miller and Singer (1997, 107–12) and Leslie (2002, 1004–52).

2. See, respectively, Borenstein (1996) and Polinsky and Rubinfeld (2006).

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have caused.[3] By making firms' costs more closely correspond to their harms, the coupon-cash remedy will induce firms to make better ex ante decisions regarding how much care to take.[4]

To see why a coupon-cash remedy can lead to more accurate liability for defendants, consider the following example, motivated by the facts in *Tuchman v. Volvo Cars of North America*.[5] Suppose a car manufacturer chooses a type of tire that is unusually prone to failure when driving on pot-holed pavement. Such pavement is much more common in urban areas than in suburban areas. As a result, drivers who drive primarily in urban areas have higher expected damages than drivers who drive primarily in suburban areas. It may be very difficult or expensive, however, to determine the driving habits of tens of thousands of class members. Suppose instead that the court offers the following remedy: coupons good for the purchase of four new tires during the next year, with a face value of $1000, or $500 in cash. The coupon option will be more valuable to individuals who drive mainly in urban areas, whereas the cash alternative will be more valuable to individuals who drive primarily in suburban areas. Thus, the liability costs borne by the car manufacturer will naturally reflect the driving habits of—and therefore the harms suffered by—its customers. In contrast, if a cash remedy were used alone in these circumstances, a court would find it difficult to determine how much harm had been caused and would be likely to either overestimate or underestimate damages.

The point of this example is relevant in a wide range of circumstances. It applies whenever damages are difficult to measure, plaintiffs vary in the harm suffered, and plaintiffs who incurred above-average losses are likely to have above-average demands for the defendant's product in the future. It is then possible to structure a coupon-cash remedy that leads high-loss plaintiffs to prefer coupons and low-loss plaintiffs to prefer a smaller cash alternative; the plaintiffs' choices reveal the relative mix of high-loss and low-loss victims, and thereby result in a more accurate assessment of damages.[6]

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3. Remedies offering a choice between coupons and cash have been used in a number of cases. See Gramlich (1986, 273–4 n.31), *Harvard Law Review* (1996, 823, 824), Miller and Singer (1997, 102–3, 123), and Leslie (2002, 1056–7). See also footnote 5 below.

4. See Kaplow and Shavell (1996) for a general discussion of the circumstances under which firms will make better care decisions as a result of damages being measured more accurately. See also Spier (1994).

5. Superior Court of New Jersey, Law Division, Bergen County, Civil Action Docket No. BER-L-1808-97, available at http://www.gardencitygroup.com/cases (see link to "Volvo Tire Settlement") (last accessed March 15, 2006). The settlement offered "authorized claimants" a choice of four new replacement tires, or a $1000 credit toward the purchase or lease of a new Volvo, or $500 in cash.

6. For another illustration of how a coupon-cash remedy could help reveal damages, consider the class-action lawsuit against Apple Computer regarding the durability of internal batteries in iPod music players. In an August 2005 settlement, Apple agreed to offer users who experienced battery failure the choice of $25 in cash or a $50 credit at an Apple retail store. Intensive iPod users are more likely to experience another battery failure in the future and would value the store credit more than the cash alternative, whereas infrequent users would benefit more from the cash.

We formally analyze the coupon-cash remedy in a model in which firms differ in the distribution of harms they cause to victims. Ideally, firms that cause higher expected harm should take greater care. The court, however, cannot observe firm type directly. Thus, if a pure cash remedy were employed, it would have to be the same for all firm types and would lead to underdeterrence of firms that cause high harm on average and overdeterrence of firms that cause low harm on average. We demonstrate that it is possible to construct a coupon-cash remedy that reduces both the underdeterrence and the overdeterrence that would result under the pure cash remedy.

In Section 2 we describe the general model and prove the main result. In Section 3 we provide an example.[7]

## 2. The Superiority of the Coupon-Cash Remedy

In this section we compare the coupon-cash remedy to the pure cash remedy in a general model. Each firm chooses a level of care that affects the probability of harm. Victims differ in the level of harm that they suffer. Each firm is characterized by a parameter that determines the distribution of harm among victims. Let

$x$ = level of care chosen by a firm;

$p(x)$ = probability that harm occurs; $p'(x) < 0$;

$h$ = harm suffered by a consumer;

$\theta$ = firm type; $0 \leq \theta \leq 1$;

$g(\theta)$ = density of firm types;

$f(h, \theta)$ = density of harm among consumers caused by a $\theta$-type firm; and

$F(h, \theta)$ = cumulative distribution of harm among consumers.

We assume that $F_\theta < 0$, so firms with a higher $\theta$ cause higher harm on average.

Let

$\bar{h}(\theta)$ = average harm suffered by consumers of a $\theta$-type firm,

where

$$\bar{h}(\theta) = \int_0^\infty hf(h,\theta)\mathrm{d}h. \tag{1}$$

7. To our knowledge, the point that a coupon-cash remedy can reveal harm better than a pure cash remedy, and thereby induce better care decisions by potential injurers, has not been made previously. Relatedly, however, Gramlich (1986, 268–9) discusses the advantage of a coupon remedy over a cash remedy in terms of compensating victims without having to identify them (though he does not consider a coupon-cash remedy in this regard).

Note that $\bar{h}(\theta)$ also represents total harm, assuming that the population is normalized to be unity.

The first-best level of care for a $\theta$-type firm, $x^*(\theta)$, minimizes

$$x + p(x)\bar{h}(\theta). \tag{2}$$

Obviously, $x^*(\theta)$ is strictly increasing in $\theta$ since $\bar{h}(\theta)$ is strictly increasing in $\theta$.

We assume that if an accident occurs, firms are strictly liable for harm.[8]

## 2.1 The Cash Remedy

Under a pure cash remedy, the court determines the level of damages to impose on the defendant firm. Let

$d =$ damages imposed under the cash remedy.

The court is assumed to know the various distributions described above, but not each defendant firm's type.

Given damages $d$, a firm will pick its level of care $x$ to minimize

$$x + p(x)d. \tag{3}$$

Let $x(d)$, which is independent of $\theta$, be the solution to this problem. The court's problem is to choose $d$ to minimize social costs,

$$x(d) + p(x(d))\int_0^1 \bar{h}(\theta)g(\theta)\mathrm{d}\theta. \tag{4}$$

We now show that, given optimal damages $d^*$, there exists a firm whose $\theta$ is between 0 and 1 that takes first-best care; we designate this the $\theta^*$-type firm. Firms with lower $\theta$ take excessive care and firms with higher $\theta$ take inadequate care.

To see that there exists a $\theta^*$-type firm, suppose otherwise, that $x(d^*) \geq x^*(1)$ or $x(d^*) \leq x^*(0)$. Suppose first that $x(d^*) > x^*(1)$. Since every firm is taking excessive care, social costs clearly would decline if $d$ were lower. Now suppose $x(d^*) = x^*(1)$. Given that the 1-type firm is taking first-best care, the derivative of (2) with respect to $x$ evaluated at $x(d^*)$ is 0 for $\theta = 1$ and positive for $\theta < 1$ (since $x^*(\theta)$ is strictly increasing in $\theta$). The derivative of social costs (4) with respect to damages $d$ can be written as

$$x'(d)\int_0^1 [1 + p'(x(d))\bar{h}(\theta)]g(\theta)\mathrm{d}\theta. \tag{5}$$

Clearly, $x'(d) > 0$. The expression in brackets is the derivative of (2) with respect to $x$, which is positive for $\theta < 1$ and 0 for $\theta = 1$. It follows that (5) must be positive, contradicting the optimality of $d^*$. Hence,

8. We are abstracting from the effect of the remedies on consumers' purchasing decisions. In effect, we are assuming that the amount of the good purchased by each consumer is exogenous.

$x(d^*) < x^*(1)$. By a similar argument, it follows that $x(d^*) > x^*(0)$. Thus, given $d^*$, there exists a firm for which $0 < \theta < 1$ that takes first-best care.

To summarize, the pure cash remedy is a second-best outcome in which all firms are induced to take the same level of care because the court cannot make the costs borne by each firm depend on the harm each firm causes. Consequently, some firms ($\theta < \theta^*$) are induced to take excessive care, whereas other firms ($\theta > \theta^*$) are induced to take too little care. Only one type of firm—the $\theta^*$-firm—takes first-best care.

## 2.2 The Coupon-Cash Remedy

Under a coupon-cash remedy, the court chooses the number of coupons to award and a cash alternative.[9] We assume that the value a consumer attaches to a coupon depends on the harm he has suffered, with the valuation increasing in harm (consistent with the tire example described in Section 1). The cost to the firm for each coupon that is redeemed is the same for all consumers.[10] Let

$n$ = number of coupons available to each consumer;

$v(h)$ = value of each coupon to a consumer whose harm is $h$; $v'(h) > 0$;

$c$ = cost to a firm of each coupon that is redeemed; and

$m$ = cash alternative available to each consumer ("$m$" for money).

Consider the decisions of consumers whether to elect coupons or cash. A consumer whose harm is $h$—an $h$-type consumer—will prefer coupons over cash if $nv(h) > m$. To make the comparison between the coupon-cash remedy and the pure cash remedy interesting, we assume that $n$ and $m$ are chosen so that for some positive value of $h$, consumers are indifferent between coupons and cash.[11] Let

$\hat{h}(m, n)$ = value of $h$ at which a consumer is indifferent between cash amount $m$ and $n$ coupons.

Since the value of coupons is increasing in $h$, consumers with lower $h$ prefer cash and consumers with higher $h$ prefer coupons.

9. In practice, courts do not actually choose the remedy; rather, their role typically is to accept or reject a remedy proposed by the parties as part of a class-action settlement. A court can, however, affect the form that the remedy takes by making clear to the litigants what would be acceptable. For simplicity, we treat the court as choosing the remedy.

10. We make this assumption for simplicity. This would be the case if all consumers electing to receive coupons would have purchased the good anyway, for then each coupon results in the same loss of revenue.

11. Otherwise, all consumers would elect cash or all consumers would elect coupons. The latter outcome is equivalent to a pure cash remedy from the perspective of firms—each firm would bear the same cost and take the same level of care, regardless of the harms suffered by consumers.

Given consumers' decisions, the cost borne by a θ-type firm is

$$mF(\hat{h}(m,n),\theta) + nc(1 - F(\hat{h}(m,n),\theta)). \tag{6}$$

To demonstrate that the coupon-cash remedy is superior to the cash remedy, we first show that it is possible to pick the number of coupons $n$ and the cash alternative $m$ such that the outcome for all firms under the coupon-cash remedy is identical to that under the pure cash remedy. Specifically, set $m$ equal to $d^*$ and $n$ equal to $d^*/c$, so that $nc = d^*$. Then (6) equals $d^*$ for all θ, implying the result, provided that setting $n$ equal to $d^*/c$ is feasible.

To see that $n = d^*/c$ is feasible, observe that the upper bound on $n$, call it $\tilde{n}(m)$, is determined by the requirement that not all consumers prefer coupons to cash. In other words, $\tilde{n}(m)$ solves $\tilde{n}(m)v(0) = m$, so that $\tilde{n}(m) = m/v(0)$. It follows that $n = d^*/c$ is feasible if $d^*/c < \tilde{n}(d^*) = d^*/v(0)$ or, equivalently, if $v(0) < c$. This condition states that the consumer who suffers the least harm, and consequently values coupons the least, values a coupon less than the cost to the defendant of providing the coupon. We assume that this plausible condition holds. Thus, there exists a coupon-cash remedy that can duplicate the best pure cash remedy.

We next show that, starting from $m = d^*$ and $n = d^*/c$, it is possible to lower $m$ and raise $n$ so as to: (a) reduce the excessive care taken by firms with $\theta < \theta^*$; (b) increase the inadequate care taken by firms with $\theta > \theta^*$; and (c) not affect the care taken by firms with $\theta = \theta^*$ (who take first-best care). Condition (c) requires that $m$ and $n$ be chosen so as to satisfy

$$mF(\hat{h}(m,n),\theta^*) + nc(1 - F(\hat{h}(m,n),\theta^*)) = d^*. \tag{7}$$

Starting from $m = d^*$ and $n = d^*/c$, it is obvious that if $m$ decreases, $n$ must increase in order for (7) to hold again; otherwise the left-hand side of (7) would be a weighted average of $d^*$ and a number less than $d^*$. Equivalently, assuming continuity, $\mathrm{d}n/\mathrm{d}m < 0$ at $m = d^*$ and $n = d^*/c$.[12] Thus, for some ε sufficiently small, if $m$ is lowered to $d^* - \varepsilon$, there exists a $\delta(\varepsilon)$, such that if $n$ rises to $(d^*/c) + \delta(\varepsilon)$, (7) can be maintained.

We next demonstrate that the slope of the care function (care as a function of θ) is positive if ε is positive, but can be made arbitrarily small by picking ε sufficiently small; therefore, this slope can be made less than the slope of the first-best care function. This implies that firms for which $\theta < \theta^*$ can be induced to take less care, but not too much less care, and firms for which $\theta > \theta^*$ can be induced to take more care, but not too much more care.

From (2), the first-order condition determining the first-best level of care for a θ-type firm, $x^*(\theta)$, is

$$1 + p'(x^*(\theta))\bar{h}(\theta) = 0. \tag{8}$$

12. This follows from totally differentiating (7), substituting in $m = d^*$ and $n = d^*/c$, and observing that $F(\cdot)$ is between 0 and 1.

We assume that the second-order condition is satisfied, which requires that $p''(\cdot) > 0$. Totally differentiate (8) with respect to $\theta$ to obtain

$$p''(x^*(\theta))x^{*\prime}(\theta)\bar{h}(\theta) + p'(x^*(\theta))\bar{h}'(\theta) = 0. \tag{9}$$

Given our assumption that $F_\theta < 0$, firms with a higher $\theta$ cause higher harm, so $\bar{h}'(\theta) > 0$. Since $p'(\cdot) < 0$ and $p''(\cdot) > 0$, (9) implies that $x^{*\prime}(\theta) > 0$. Let the minimum value of the slope of the first-best care function be

$$x_M^{*\prime} = \inf_{\theta\in[0,1]} [x^{*\prime}(\theta)]. \tag{10}$$

Under the coupon-cash remedy with $m = d^* - \varepsilon$ and $n = (d^*/c) + \delta(\varepsilon)$, a $\theta$-type firm chooses care level $x(\theta)$ to minimize

$$x(\theta) + p(x(\theta))\ell(\theta), \tag{11}$$

where

$$\begin{aligned}\ell(\theta) = {} & (d^* - \varepsilon)F(\hat{h}(d^* - \varepsilon, (d^*/c) + \delta(\varepsilon)), \theta) \\ & + ((d^*/c) + \delta(\varepsilon))c(1 - F(\hat{h}(d^* - \varepsilon, (d^*/c) + \delta(\varepsilon)), \theta)).\end{aligned} \tag{12}$$

Totally differentiating the first-order condition determining $x(\theta)$ with respect to $\theta$ yields

$$p''(x(\theta))x'(\theta)\ell(\theta) + p'(x(\theta))\ell'(\theta) = 0. \tag{13}$$

Observe that $\ell'(\theta) = -[\varepsilon + c\delta(\varepsilon)]F_\theta > 0$ since $F_\theta < 0$. Thus, $x'(\theta) > 0$. In other words, for $\varepsilon > 0$ the slope of the care function under the coupon-cash remedy is positive. Moreover, as $\varepsilon$ goes to zero, $\ell'(\theta)$ goes to zero (since $\delta(\varepsilon)$ also goes to zero), which implies that $x'(\theta)$ goes to zero. Therefore, it is possible to pick $\varepsilon$ sufficiently small so that the slope of the care function under the coupon-cash remedy is less than the slope of the care function in the first-best solution for all values of $\theta$, that is, less than $x_M^{*\prime}$ defined by (10). This implies that if $\varepsilon$ is small enough, the coupon-cash remedy does not cause firms for which $\theta < \theta^*$ to take too little care, or cause firms for which $\theta > \theta^*$ to take too much care. Thus, there exists an $\varepsilon > 0$ that improves the care decision of every firm for which $\theta \neq \theta^*$ without affecting the care decision of the $\theta^*$-firm.[13]

## 3. An Example

In this section, we present an example that illustrates the superiority of the coupon-cash remedy. There are two levels of harm, low harm $h_L$ and high harm

13. Another advantage of the coupon-cash remedy, though outside of our formal analysis, is that consumers who have suffered greater harm receive greater benefits, which might better promote the legal system's goal of compensation (and reduce the bearing of risk). Of course, the detrimental effects of coupons discussed in the first paragraph of this article also need to be taken into account.

$h_H$. Firms either take low care $x_L$ or high care $x_H$. The respective probabilities of harm occurring are $p(x_L) > p(x_H)$. There are two types of firms, a low-harm-causing firm $\theta_L$ and a high-harm-causing firm $\theta_H$, where $\theta$ is the fraction of high-harm victims injured by a firm, with $\theta_L < \theta_H$. The total harm caused by each firm is, respectively, $\bar{h}_L = (1-\theta_L)h_L + \theta_L h_H$ and $\bar{h}_H = (1-\theta_H)h_L + \theta_H h_H$.

We assume that the first-best solution involves the $\theta_L$-firm taking low care $x_L$ and the $\theta_H$-firm taking high care $x_H$. In other words,

$$x_L + p(x_L)\bar{h}_L < x_H + p(x_H)\bar{h}_L, \tag{14}$$

and

$$x_H + p(x_H)\bar{h}_H < x_L + p(x_L)\bar{h}_H. \tag{15}$$

Under the cash remedy, in which both firms are subject to a damage payment $d$, they will take high care if and only if

$$x_H + p(x_H)d < x_L + p(x_L)d. \tag{16}$$

Because the government cannot distinguish between the firms, the outcome under the cash remedy must be that both firms take low care or both firms take high care. We assume that the second-best outcome is for both firms to take high care. This can be accomplished by setting $d$ to satisfy (16), that is, $d^* > (x_H - x_L)/[p(x_L) - p(x_H)]$. Under the cash remedy, too much care will be taken by the $\theta_L$-firm.

Now consider the coupon-cash remedy, and let $v_L$ and $v_H$ be the value of a coupon to low-harm and high-harm victims, respectively, with $v_L < v_H$. Low-harm victims will choose the cash alternative $m$ and high-harm victims will choose the $n$ coupons if

$$nv_L \leq m < nv_H. \tag{17}$$

Assuming (17) holds, the costs borne by the two firms if harm occurs are, respectively, $\tilde{h}_L(m,n) = m(1-\theta_L) + nc\theta_L$ and $\tilde{h}_H(m,n) = m(1-\theta_H) + nc\theta_H$. Thus, the low-harm firm will choose low care if and only if

$$x_L + p(x_L)\tilde{h}_L(m,n) < x_H + p(x_H)\tilde{h}_L(m,n), \tag{18}$$

and the high-harm firm will choose high care if and only if

$$x_H + p(x_H)\tilde{h}_H(m,n) < x_L + p(x_L)\tilde{h}_H(m,n). \tag{19}$$

There exists a number of coupons $n$ and a cash amount $m$ that satisfies (17) through (19) and thereby achieves the first-best outcome. First, let $m = nv_L$. It is clear, then, that (17) holds since $v_L < v_H$. After some manipulation, it can also be seen that (18) and (19) will hold if and only if

$$\begin{aligned}&(x_H - x_L)/[p(x_L) - p(x_H)][v_L(1-\theta_H) + c\theta_H]\\ &\quad < n < (x_H - x_L)/[p(x_L) - p(x_H)][v_L(1-\theta_L) + c\theta_L].\end{aligned} \tag{20}$$

Since $v_L < c$ (this follows from our assumption in the general model that $v(0) < c$) and $\theta_L < \theta_H$, the left-hand term in (20) is less than the right-hand term. Thus, there exists an $n$ that satisfies (20) and which consequently generates a first-best outcome.

To illustrate the advantage of the coupon-cash remedy over a pure cash remedy, let the levels of harm be $h_L = \$100$ and $h_H = \$1000$; the costs of care $x_L = \$50$ and $x_H = \$250$; the probabilities of harm $p(x_L) = 0.4$ and $p(x_H) = 0.1$; and the firm types $\theta_L = 0.2$ and $\theta_H = 0.8$. The first-best solution requires that the $\theta_L$-firm, which causes harm of $\bar{h}_L = \$280$, takes low care, and the $\theta_H$-firm, which causes harm of $\bar{h}_H = \$800$, takes high care. Under the pure cash remedy, the second-best solution is for both firms to take high care, which can be accomplished by setting damages at $d^* > \$667$. This results in social costs of \$317. Under the coupon-cash remedy, let the valuation of coupons be $v_L = \$5$ and $v_H = \$30$ and the cost to a firm of issuing a coupon be $c = \$25$. Then, for example, if the remedy consists of the choice of 40 coupons or \$200 in cash, the low-harm victims will choose cash and the high-harm victims will choose coupons. Now, instead of both firms bearing damages of $d^* > \$667$ when harm occurs, the $\theta_L$-firm bears costs of \$360, which causes it to choose low care, and the $\theta_H$-firm bears costs of \$840, which causes it to choose high care. This results in social costs under the coupon-cash remedy of \$288, a 9.1% improvement.

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