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ABSTRACT

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 cash and coupons to purchase units of the defendant's product at a discount – 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.

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I. Introduction

In many consumer lawsuits, 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 highly 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 in some circumstances to give defendants an incentive to raise the prices of their products and in other circumstances to lead consumers to buy an excessive amount of the products.²

In this article we show that the use of coupons can be socially valuable. Specifically, we demonstrate 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 have caused.³ By making firms' costs more closely correspond to their harms, the 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*

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, pp. 107-12) and Leslie (2002, pp. 1004-52).

² See, respectively, Borenstein (1996) and Polinsky and Rubinfeld (2003).

³ Remedies involving a choice of cash or coupons have been used in a number of cases. See Gramlich (1986, pp. 273, 274n.31), Note (1996, pp. 823-24), Miller and Singer (1997, pp. 102-03, 123), and Leslie (2002, pp. 1056-57). See also note 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).

*America.*⁵ Suppose a car manufacturer chooses a type of tire that, given the common use of its cars, makes the tires 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. Suppose also that it is very difficult or expensive to determine the driving habits of tens of thousands of class members. The court now offers the following remedy: coupons good for the purchase of four new tires during the next year, with a face value of \$1,000, or \$500 in cash. The coupon option will be more valuable to individuals who drive mainly in urban areas, while 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 the preceding paragraph 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;

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"). The settlement offered "authorized claimants" a choice of four new replacement tires, or a \$1,000 credit towards the purchase or lease of a new Volvo, or \$500 in cash.

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

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 cash remedy.

In section II we describe the general model and prove the main result. In section III we provide an example.⁷

II. 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

⁶ For another illustration of how a coupon-cash remedy could help reveal damages, consider the following example. Suppose that the pricing of upgrades to a computer operating system has been deemed to be anticompetitive. Some consumers upgrade frequently, and suffer relatively high harm, while others do so only occasionally, and suffer relatively low harm. A time-limited coupon for a discount off of the price of an upgrade is more valuable to the former group, while a smaller cash alternative may be preferred by the latter group.

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, pp. 268-69) discusses the advantage of a coupon remedy over a cash remedy in terms of

x = level of care chosen by a firm;

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

h = harm suffered by a consumer;

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

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

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

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

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

Let

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

where

$$\bar{h}(\theta) = \int_0^{\infty} hf(h, \theta)dh. \quad (1)$$

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 θ -type firm, $x^*(\theta)$, minimizes

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

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

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

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.

compensating victims without having to identify them (though he does not consider a coupon-cash remedy in this regard).

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

Consider the behavior of a firm, given damages d . The firm will pick the level of care x to minimize

$$x + p(x)d. \quad (3)$$

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

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

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

To see that there exists a θ^* -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 θ). The derivative of social costs (4) with respect to damages d can be written as

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

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, $x(d^*) < x^*(1)$. By a similar argument, it follows that $x(d^*) > x^*(0)$. Thus, given d^* , there exists a firm such that $0 < \theta < 1$ 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 it causes. Consequently, some firms ($\theta < \theta^*$) are induced to take excessive care, while other firms ($\theta > \theta^*$) are induced to take too little care. Only one type of firm — the θ^* -firm — takes first-best care.

The coupon-cash remedy. Under a coupon-cash remedy, the court chooses the number of coupons to award and a cash alternative. 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 the introduction). The cost to the firm for each coupon that is redeemed is the same for all consumers.⁸ 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. An h -type consumer — a consumer whose harm is h — 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

⁸ 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.

assume that n and m are chosen so that for some positive value of h , consumers are indifferent between coupons and cash.⁹ 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.

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

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

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 θ^* -firm under the coupon-cash remedy bears the same cost as under the pure cash remedy and therefore continues to choose first-best care. This condition will be satisfied for any n and m combination such that

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

Observe that if m is set equal to d^* and n is set equal to d^*/c , so that $nc = d^*$, then (7) would be satisfied, and the outcome for all firms under the coupon-cash remedy would be identical to that under the pure cash remedy.

To see that it is feasible to set $n = d^*/c$, 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 $\tilde{n}(m) = m/v(0)$. Thus, $n = d^*/c$ 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

⁹ Otherwise, all consumers would elect cash or all consumers would elect coupons. The latter outcome is equivalent to the pure cash remedy from the perspective of firms. The reason is that the cost to each firm is independent of the harm suffered by the plaintiff; consequently, all firms would take the same level of care.

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.

We next show that, starting from $m = d^*$ and $n = d^*/c$, it is possible to lower m and raise n so as to reduce the excessive care taken by firms with $\theta < \theta^*$ and increase the inadequate care taken by firms with $\theta > \theta^*$, while still satisfying (7).

Starting from $m = d^*$ and $n = d^*/c$, it is obvious that if m decreases, n must increase in order for (7) to be satisfied again; otherwise the left-hand-side of (7) would be a weighted average of d^* and a number less than d^* .

To see that there exists an n high enough to restore the effect of the reduction in m , lower m to $d^* - \varepsilon$ and raise n to $(d^*/c) + \delta(\varepsilon)$, where $\delta(\varepsilon)$ is chosen to satisfy (7). It is clear from the definition of $\hat{h}(m, n)$ that lowering m and raising n reduces \hat{h} (both changes make coupons more attractive relative to cash). Consequently, $F(\hat{h}(m, n), \theta^*)$ decreases and $(1 - F(\hat{h}(m, n), \theta^*))$ increases. It follows that the necessary increase in n required to satisfy (7) is less than the increase in n needed if $F(\cdot)$ and $(1 - F(\cdot))$ did not change. We next calculate the δ — referred to as $\bar{\delta}(\varepsilon)$ — required to satisfy (7) on the assumption that $F(\cdot)$ and $(1 - F(\cdot))$ do not change. This δ solves

$$(d^* - \varepsilon)F(\hat{h}(d^*, d^*/c), \theta^*) + ((d^*/c) + \delta)c(1 - F(\hat{h}(d^*, d^*/c), \theta^*)) = d^*. \quad (8)$$

Thus,

$$\bar{\delta}(\varepsilon) = \varepsilon F(\hat{h}(d^*, d^*/c), \theta^*)/c(1 - F(\hat{h}(d^*, d^*/c), \theta^*)). \quad (9)$$

We now show that $n = (d^*/c) + \bar{\delta}(\varepsilon)$ is feasible, that is, that $(d^*/c) + \bar{\delta}(\varepsilon) < \tilde{n}(d^* - \varepsilon) = (d^* - \varepsilon)/v(0)$, or $[(d^*/c) + \bar{\delta}(\varepsilon)]v(0) < d^* - \varepsilon$. This condition is satisfied for ε sufficiently small because as ε goes to 0, $\bar{\delta}(\varepsilon)$ goes to zero (see (9)), and the condition becomes $v(0) < c$, which we

previously assumed holds. Clearly, therefore, $n = (d^*/c) + \delta(\varepsilon)$ is feasible for ε sufficiently small.

We next demonstrate that by picking ε sufficiently small, we can improve the care choices of all firms other than the θ^* -firm without affecting the care choice of that firm. To do this, we 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

$$1 + p'(x^*(\theta))\bar{h}(\theta) = 0. \quad (10)$$

We assume that the second-order condition is satisfied, which requires that $p''(\cdot) > 0$. Totally differentiate (10) with respect to θ to obtain:

$$p''(x^*(\theta))x^{*\prime}(\theta)\bar{h}(\theta) + p'(x^*(\theta))\bar{h}'(\theta) = 0. \quad (11)$$

Given our assumption that $F_\theta < 0$, firms with a higher θ cause higher harm, so $\bar{h}'(\theta) > 0$. Since $p'(\cdot) < 0$ and $p''(\cdot) > 0$, (11) implies that $x^{*\prime}(\theta) > 0$. Let the minimum value of the slope of the first-best care function be

$$x_M^{*\prime} = \inf_{\theta \in [0, 1]} [x^{*\prime}(\theta)]. \quad (12)$$

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

$$x(\theta) + p(x(\theta))\ell(\theta), \quad (13)$$

where

$$\begin{aligned} \ell(\theta) = & \{(d^* - \varepsilon)F(\hat{h}(d^* - \varepsilon, (d^*/c) + \delta(\varepsilon)), \theta) \\ & + ((d^*/c) + \delta(\varepsilon))c(1 - F(\hat{h}(d^* - \varepsilon, (d^*/c) + \delta(\varepsilon)), \theta)). \end{aligned} \quad (14)$$

By steps analogous to those employed in the preceding paragraph, it is straightforward to show that

$$p''(x(\theta))x'(\theta)\ell(\theta) + p'(x(\theta))\ell'(\theta) = 0. \quad (15)$$

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 ε 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 ε 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 θ , that is, less than x_M^* defined by (12). This implies that if ε 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 a $\varepsilon > 0$ that improves the care decision of every firm without affecting the care decision of the θ^* -firm.¹⁰

III. 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 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

¹⁰ Although we have shown that a coupon-cash remedy can lead to better care decisions of firms, the detrimental effects of coupons (discussed in the first paragraph of this article) also need to be taken into account. .

are two types of firms, a low-harm causing firm θ_L and a high-harm causing firm θ_H , where θ 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 θ_L -firm taking low care x_L and the θ_H -firm taking high care x_H . In other words,

$$x_L + p(x_L)\bar{h}_L < x_H + p(x_H)\bar{h}_L, \quad (16)$$

and

$$x_H + p(x_H)\bar{h}_H < x_L + p(x_L)\bar{h}_H. \quad (17)$$

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

$$x_H + p(x_H)d < x_L + p(x_L)d. \quad (18)$$

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 (18), that is, $d^* > (x_H - x_L)/[p(x_L) - p(x_H)]$. Thus, under the cash remedy, too much care will be taken by the θ_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

$$nv_L \leq m < nv_H. \quad (19)$$

Assuming (19) 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

$$x_L + p(x_L)\tilde{h}_L(m, n) < x_H + p(x_H)\tilde{h}_L(m, n), \quad (20)$$

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

$$x_H + p(x_H)\tilde{h}_H(m, n) < x_L + p(x_L)\tilde{h}_H(m, n) \quad (21)$$

We now show that there exists a number of coupons n and a cash amount m that satisfies
(19), (20), and (21), and that thereby achieves the first-best outcome. First, let $m = nv_L$. It is
clear, then, that (19) holds since $v_L < v_H$. After some manipulation, it also can be seen that (20)
and (21) will hold if and only if

$$\begin{aligned} (x_H - x_L)/[p(x_L) - p(x_H)][v_L(1 - \theta_H) + c\theta_H] < n \\ < (x_H - x_L)/[p(x_L) - p(x_H)][v_L(1 - \theta_L) + c\theta_L]. \end{aligned} \quad (22)$$

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 (22) is less than the right-hand term. Thus, there exists an n that satisfies
(22), and which consequently generates a first-best outcome.

To illustrate the significance of the coupon-cash remedy, let the levels of harm be $h_L =$
\$100 and $h_H = \$1,000$; the costs of care $x_L = \$50$ and $x_H = \$250$; the probabilities of harm $p(x_L) =$
.4 and $p(x_H) = .1$; and the firm types $\theta_L = .2$ and $\theta_H = .8$. The first-best solution requires that the
 θ_L -firm, which causes harm of $\bar{h}_L = \$280$, take low care, and the θ_H -firm, which causes harm of
 $\bar{h}_H = \$800$, take 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 θ_L -firm bears costs of \$360, which causes it to choose low care, and the θ_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 percent improvement.

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