CORRELATED VALUES IN THE

THEORY OF PROPERTY AND LIABILITY RULES

by

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Abstract. Kaplow and Shavell ["K&S"] have claimed that property rules tend to protect tangible entitlements more efficiently than do liability rules. They argue that while liability rules tend to efficiently harness the defendant's private information when courts are imperfectly informed as to litigants' valuations of intangible entitlements, this harnessing effect does not apply to tangible entitlements for two reasons. First, they argue that the prospect of multiple takings (by others or even the original entitlement holder taking back the entitlement) makes it impossible to implement liability rules with regard to tangible entitlements. Second, they argue that liability rules cannot harness private information when the disputants' valuations are correlated and that valuations of tangibles tend to be more correlated than valuations of intangibles.

In this article, we reject the correlated-value claim. Our thesis is that, while correlated-valuations create real problems of implementation, K&S's own harnessing result can be extended to redeem the usefulness of liability rules even when values are correlated. We will show that, even in the presence of these problems, enlightened courts can manipulate the damages that takers expect to pay so as to induce efficient takings.

K&S's numeric examples purporting to show the dominance of property rules systematically understate the potential efficiency of liability rules. Their examples compare the more efficient property rules to liability rules that use inefficient damages and systematically delegate allocative authority to the less efficient litigant. If the more appropriate comparisons are made then in all of K&S's examples liability rules (which anticipate non-consensual takings) dominate property rules.

The relative efficiency of property and liability rules turns out to be independent of whether the disputants' values are correlated. Regardless of the degree of correlation, liability rules dominate whenever the court perceives that the range of possible valuations by the option holder extends above and below the mean valuation of the non-option holder.

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INTRODUCTION

Scholars have often conceived of the core difference between property rules and liability rules as

the difference between protecting by deterrence and protecting by compensation. Property rules protect

entitlements by deterring non-consensual takings, while liability rules compensate entitlement holders if a

non-consensual taking occurs.[1] Kaplow and Shavell ["K&S"], however, in a truly excellent article that

repays close reading have reoriented the debate by showing how liability rules are an *allocative* device that

economizes on the litigants' private information when a court is imperfectly informed as to their valuation.[2]

As K&S succinctly put it: "[T]he virtue of the liability rule is that it allows the state to harness the

information that the injurer naturally possesses about his prevention cost."[3] They show that setting damages

equal to the court's estimate of the entitlement holder's valuation not only compensates the entitlement

holder for any non-consensual takings that occur, but also induces value-enhancing takings. A potential

defendant considering whether to take an entitlement protected by a liability rule will tend to take only if

her benefits from taking are greater than her estimation of what damages will be. And since the latter is tied

to the court's estimate of the entitlement holder's value, defendants will only tend to take the entitlement

[1]Carol M. Rose, *The Shadow of the Cathedral*, 106 YALE L.J. 2175 (1997); Ian Ayres, *The 1998 Monsanto Lecture: Protecting Property with Puts*, 32 VAL. U. L. REV. 793 (1998); Ian Ayres & Paul M. Goldbart, *Optimal Delegation and Decoupling in the Design of Liability Rules*, 100 Michigan L. Rev. 1 (2001).

[2]Louis Kaplow & Steven Shavell, *Property Rules Versus Liability Rules: An Economic Analysis*, 109 HARV. L. REV. 713 (1996).

[3]Kaplow & Shavell, supra note 2, at 725.

when their value is greater than the entitlement holder's value.[4]

This "harnessing" result clarifies and formalizes the pioneering work of Calabresi and Melamed.[5] After K&S, it is now possible to see that courts should set liability rule damages so that potential takers – given their private information about the value of taking – will only take when the taking is expected to enhance value.[6] By having the courts set damages at their best estimate of the entitlement holder's harm

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[4]K&S provide the following numeric example:

If harm is $1000 but the state does not know whether the prevention cost is $800 or $1200, the state may make one of two mistakes: giving the victim the right to be free from harm when in fact the prevention cost is $1200 (so that it would be socially desirable for harm to occur), or giving the injurer the right to cause harm when the prevention cost is only $800 (so that it would be desirable for the injurer to prevent harm). Inevitably, the state will make mistakes in assigning entitlements to parties when its information about the injurer's prevention cost is imperfect. Under the liability rule, however, the socially optimal outcome will always occur. Faced with damages of $1000 for harm, the injurer will cause harm if and only if his prevention cost (which he knows) is $1200; if his prevention cost is $800, he will prevent rather than cause harm. Kaplow & Shavell, supra note 2, at 725 (footnotes omitted)

[5]Guido Calabresi & Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089 (1972). The "harnessing" result might alternatively be thought of as an "internalization" result, because such damages cause the decision maker to internalize the expected costs as well as the benefits of her decision. We slightly prefer the term "harnessing" because of its implicit emphasis on the harnessing of the decision maker's private information. If the private litigants do not have an information advantage over the courts, there is no need to delegate the allocative choice to the litigant (via potential taking) – the court could merely assign the entitlement to the higher valuer via a property rule. Kaplow & Shavell, supra note 2, at 724.

[6]In some ways, their harnessing result is a generalization of the idea of efficient breach in contract theory. David Friedman, *The Efficient Breach Fallacy*, 18 J. Legal Stud. 1, 5-7 (1989). Setting expectation damages equal to the court's estimate of the promisee's value of performance will tend to induce the promissor to breach only when breach is efficient (that is, when the promissor's cost of performance is greater than the promissee's benefit from performance).

from the taking, liability rules seem to focus on the entitlement holder.[7] But after K&S, it is now possible to think of liability rules as focusing on the potential taker. Liability rules are designed with the secret ambition of giving the potential taker the incentive to take efficiently.

The harnessing result allows K&S to overthrow one of the most basic tenets of law and economics scholarship – the idea (distilled from Calabresi and Melamed) that property rules are presumptively more efficient than liability rules when transaction costs are low.[8] K&S (following Ayres & Talley)[9] showed that there is no reason to think that liability rules will produce lower efficiency than property rules in low transaction cost settings:

> [We] cast doubt on the belief that property rules are best when transaction costs are low -- assertedly because the use of property rules will induce parties to bargain and reach desirable

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[7]From the option perspective, both the plaintiff and the defendant under a Type-2 liability rule are really entitlement holders. The defendant has an entitlement to a valuable taking option, while the plaintiff owns the underlying asset subject to this option. See Rose, supra note 1, at 2183; Ayres, supra note 1, at 797; Ian Ayres & Eric Talley, *Solomonic Bargaining: Dividing a Legal Entitlement to Facilitate Coasean Trade*, 104 YALE L.J. 1027 (1995) (hereinafter Ayres & Talley I}.

[8]Calabresi &Melamed, supra note 5, at 1106-10. For a more explicit characterization, see Robert Cooter & Thomas Ulen, Law and Economics 98-100 (2d ed. 1995). Numerous additional citations to the proposition can be found in Daphna Lewinsohn-Zamir, *The Choice Between Property Rules and Liability Rules Revisited: Critical Observations from Behavior Studies* (unpublished manuscript 2001).

[9]Ian Ayres and Eric Talley had previously provided a numeric example in which bargaining under liability rules produced greater efficiency than bargaining under property rules. Ayres & Talley I, supra note 7. Ayres and Talley showed that liability rules have an information-forcing effect in bargaining (not shared by property rules) that might cause disputants to bargain more efficiently. While the two authorial pairs agree that property rules need not dominate liability rules when transaction costs are low, they differ on the reason. See Louis Kaplow & Steven Shavell, *Do Liability Rules Facilitate Bargaining? A Reply to Ayres and Talley*, 105 YALE L.J. 221 (1995); Ian Ayres & Eric Talley, *Distinguishing Between Concensual and Nonconsensual Advantages of Liability Rules*, 105 YALE L.J. 235 (1995) (hereinafter Ayres & Talley II).

outcomes . . . . We find that this belief is often contradicted: when transaction costs are low, parties will tend to bargain under liability rules as well as under property rules and may reach outcomes superior to those reached under property rules . . . .[10]

When transaction costs are nil, the Coase theorem preordains that liability and property rules will be equally efficient – and transaction cost advocates have never advanced a reason why property rules should produce more efficient bargaining when transaction costs increase from zero to merely low.[11] Indeed, K&S's harnessing results suggest that bargaining might tend to be more efficient under a liability rule because the litigants bargain in the shadow of more efficient threat points.[12]

To our minds, both the harnessing result and K&S's critique of property rule dominance in low

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[10]Kaplow & Shavell, supra note 2, at 718.

[11]Ayres & Talley II, supra note 9, at 242. K&S make the point thus:
One [often finds] summary expression of the belief that use of a property rule to bar outright appropriation of things is desirable because it forces a person who wants something to bargain for it with its possessor. The belief derives from the idea that, through the requirement of bargaining, we can be reasonably confident that property will change hands when and only when the change is efficient. For example, bargaining can ensure that my car will be transferred to another person when and only when he values it more highly than I do. This argument, however, is not one that supports property rules over liability rules in any obvious way. If we believe that bargaining will result in the achievement of mutually beneficial transfers when they exist, that will be so under a liability rule as well as under a property rule. If Jack can take my car if he pays damages of $10,000, but in fact I value the car more highly than he does, I could still bargain with Jack, paying him to refrain. (This is, of course, an application of the Coase Theorem.) Kaplow & Shavell, supra note 2, at 721-22.

[12]Ayres & Talley referred to this as the "non-consensual advantage" of liability rules. Ayres & Talley II, supra note 9, at 241. The harnessing result gives liability rules a non-consensual advantage over property rules when bargaining is not feasible, and K&S conjecture that such an advantage is likely to persist as transaction costs are reduced and bargaining becomes feasible. Id. It is far from clear, however, that more efficient threat points (i.e., the payoffs that will result if bargaining is unsuccessful) translate into more efficient bargains. Indeed, Ayres & Talley show that less efficient threat points (induced by expected litigation costs) can induce more efficient bargaining. Id. at 245.

transaction cost setting are unassailable. But K&S go further. Their article also tries to replace the void left by their transaction cost critique. If low transaction costs don't explain the prevalence of property rules, what does? Their answer is that property rules tend to be the more efficient way to protect tangible entitlements (what they term "the taking of things") while liability rules -- because of the harnessing result -- tend to be the more efficient way to protect intangible entitlements (what they term "harmful externalities").

Their attempt to find a more solid foundation for property rules is admirable. Both property and liability rule protections have had such enduring and widespread (but not all encompassing) usage, that it is quite natural to look for an explanatory theory that doesn't prove too much. To hold that liability rules are systematically more efficient than property rules in all contexts (say, because of the harnessing result) would mean that an inefficient form of entitlement protection had been able not just to survive but to thrive. This strikes many (law and economics) scholars as presumptively implausible.

To support their thesis that property rules tend to dominate with regard to the protection of tangibles, K&S offer two core arguments. First, they argue that liability rules cannot harness private information when the disputants' valuations are correlated and that valuations of tangibles tend to be more correlated than valuations of intangibles. Second, they argue that liability rules cannot feasibly be used to protect tangible entitlements because of the problem of multiple takings (by others or even by the original entitlement holder taking back the entitlement). We will refer to these two arguments respectively as the "correlated-value" and the "multiple-takings" claims. Because the correlated-value and multiple-takings problems do not apply to intangible entitlements, K&S argue that the harnessing result causes liability rules to be the more efficient way to protect intangibles. But because correlated-value and multiple-takings

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problems undermine liability rules' ability to harness private information, they argue that property rules tend to be the more efficient way to protect tangible entitlements.

In this article, we reject the correlated-value claim. Our thesis is that, while correlated valuations create real problems of implementation, K&S's own harnessing result can be extended to redeem the usefulness of liability rules even when values are correlated. We will show that even in the presence of these problems, enlightened courts can manipulate the damages that takers can expect to pay so as to induce efficient takings. K&S's laudable desire to develop a theory that could broadly explain observed legal practice seems to have trumped their willingness to run with what to our minds is the more important insight – the ability of liability rules to harness a taker's private information.

K&S's numeric examples purporting to show the dominance of property rules when values are correlated systematically understate the potential efficiency of liability rules. Their examples compare the more efficient property rules to liability rules that use inefficient damages and systematically delegate allocative authority to the less efficient litigant. We will show that if the optimal liability rule is instead compared to the more efficient property rule, then in all of the numeric examples constructed by K&S themselves, liability rules (which contemplate non-consensual takings) dominate.

The relative efficiency of property and liability rules turns out to be independent of whether the disputants' values are correlated. Regardless of the degree of correlation, liability rules dominate whenever the court perceives that the range of possible valuations by the option holder extends above and below the mean valuation of the non-option holder.

This article's critique of the correlated value claim parallels a pre-existing critique of the multiple-

takings claim. The multiple-taking problem only arises if courts impose naive stationary damages. But a moment's reflection suggests that stationary damages for successive takings is inconsistent with K&S's own harnessing idea. The very fact of an initial taking should make the court revise upward its beliefs about the taker's valuation. Indeed, imposing higher damages for successive takings actually allow courts to better harness the private information of all potential entitlement owners in what amounts to a more efficient auction.[13] It turns out that the "multiple takings" and "correlated value" problems can both be solved by using elevated damages to better harness private information instead of using naive liability rule damages that are simply set at the plaintiff's unconditional mean value.

At the outset, we should emphasize that this is not an applied paper, but a theoretical critique -- written at basically the same level as K&S's own analysis. Except with respect to a few points, we give relatively little attention to the practical difficulties involved in setting optimal damages or to the institutional questions about who should be making such decisions.

This article is divided into two sections. The first distinguishes the empirical and theoretical aspects of K&S's tangibility thesis. The second critiques the correlated-value claim. Even though we ultimately reject tangibility as an adequate grounds for property rule protection, we believe that K&S deserve credit for seeing even further into the cathedral than their predecessors.

I. DISTINGUISHING EMPIRICAL AND THEORETICAL ASPECTS OF THE TANGIBILITY THESIS

K&S's claim that tangible entitlements tend to be most efficiently protected by property rules can be decomposed into empirical and theoretical elements. As a theoretical matter, they argue that when

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[13]See Ayres & Balkin, *supra* note ?; and Ayres & Goldbart, *supra* note 1.

disputants' valuations are correlated or when entitlements are potentially subject to multiple takings that property rule protections tend to be more efficient.[14]   As an empirical matter, they argue that tangible entitlements are likely to give rise to correlated values and multiple takings.[15]

Their empirical claim is supported by an appeal to archetypes. For them, the archetypal intangible is a nuisance entitlement, while the archetypal tangible is a chattel entitlement.[16] They plausibly argue that the benefits from pollution are likely to be uncorrelated with harms to the recipient of pollution -- so that in nuisance disputes the valuations are likely to be uncorrelated. While in a dispute over some chattel (say, an automobile), the valuation of the potential taker is more likely to be positively correlated with the valuation of the initial owner. Hence, the archetypal tangible entitlement has correlated values, while the archetypal intangible does not.

Similarly, they argue that tangible chattel are more potentially subject to multiple-taking problems than intangible nuisance entitlements. Almost anyone might be a potential taker of an automobile (and once taken the original owner might decide to take back). But there are only a few neighboring landowners who could pollute a particular piece of land, and it is all but impossible for the pollutee to physically take back her initial entitlement (to be free from pollution).

Some scholars might be willing to dispute these empirical tendencies. And K&S themselves

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[14]Kaplow & Shavell, supra note 2, at 720.

[15]Id. at 757.

[16]Id. at 760.

provide counterexamples.[17] But it is important to note that these empirical claims are not essential. K&S might have repositioned their thesis to argue -- purely from theory -- that property rules tend to be more efficient when there are correlated-value or multiple-taking problems. They could have then left it to the reader to decide whether chattel (or particular types of chattel) have one or the other attribute.

Decomposing their theoretical and empirical contributions probably would have also clarified their thesis. For at present, K&S never say whether property rules will tend to dominate if only one of the two attributes is present. If, for example, an entitlement has the correlated-valuation but not the multiple-taking attribute, are liability or property rules more efficient? While K&S do not explicitly answer this question, their arguments appear disjunctive. If *either* correlated-valuation problems *or* multiple-taking problems exist, the beneficial harnessing effect of liability rules is rendered inoperative and property rules would dominate.

Inferring whether their theory is disjunctive is of more than passing interest, because in important parts of the cathedral only one feature exists. Contractual entitlements probably have correlated values but not the multiple-taking feature. Valuations of contractual entitlements to services will tend to be correlated (even though the cost of performance and the benefits of use may be independent) because the exchange value is likely to be correlated. The seller could sell the service (say, a rock concert performance) to another buyer and this should induce positive correlation in valuation. But if a seller breaches her promise of performance (thus taking the promisee's contractual entitlement), it will be difficult for the promisee (or for a third party) to take back the entitlement.

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[17]Id. at 772 (discussing the taking of a hotel's ocean view as involving correlated values).

K&S continue the Calabresian tradition of ignoring contractual entitlements -- possibly because neither the transaction cost nor the tangibility theory provides a very good explanation of why these entitlements are dominantly protected by liability rules. Calabresi and Melamed's transaction cost theory held that property rules should dominate when transaction costs were low -- but with regard to the protection of contractual entitlements where the parties have already demonstrated an ability to enter into an initial transaction, the law protects entitlements with the liability rule of expectation damages instead of the property rule of specific performance.[18] Similarly, K&S's correlated-value claim leads us to expect that many contractual entitlements would be protected by property rules, when they are not.

In this article, we do not take on the empirical aspects of the tangibility thesis. We think the archetypal distinction between nuisance and chattel entitlements is illuminating, but we demur as to whether correlated valuation and multiple-taking potentials are central tendencies. Our agnosticism as to whether chattel give rise to correlated valuation grows out of an agnosticism about the nature of court ignorance. For correlated valuations to undermine the harnessing effect of liability rules, that part of litigants' value *not visible to the courts* must be correlated. While K&S quite plausibly argue that the total chattel valuations of disputants are often positively correlated, it is less clear that the portion of value unobservable to courts is correlated. A major source of correlated valuation is the potential exchange value of the entitlement.

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[18]The incompatibility of transaction cost theory with contract practice has led some scholars to call for a reform of practice – expanding the use of property rule protection of contractual entitlements. See Anthony T. Kronman, *Specific Performance*, 45 U. Chi. L. Rev. 351, 352 (1978); Thomas S. Ulen, *The efficiency of Specific Performance: Toward a Unified Theory of Contract Remedies*, 83 Mich. L. Rev. 341, 375-76 (1984); Alan Schwartz, *The Case for Specific Performance*, 89 Yale L. J. 271 (1979).

What tends to be correlated in value is that component for which there is a market value. But market

values may tend to be relatively observable by judges. It is the litigants' idiosyncratic, non-market values

that are likely to be less observable by courts and less correlated. This is not to say that there cannot be

correlated values that are privately known, only that the strength of the tendency may not be as great as

K&S suggest in their examples.[19]

But even if the empirical distinctions that K&S posit are true, we will show in this article that K&S's

own harnessing principle can be extended and generalized to cope with the very real problems of correlated

valuations.

II. CRITIQUE OF THE CORRELATED-VALUE CLAIM

One of the most innovative and important contributions of K&S's article concerns their analysis

of correlated valuations. If the valuation of the potential taker and the entitlement holder are positively

correlated, then it becomes more difficult to use liability rules to harness the potential taker's private

information (about her own value). Simply setting damages equal to the plaintiff's average valuation can

easily lead to inefficient overtaking by defendants. If the defendant's and plaintiff's valuations are positively

correlated, a high realized defendant valuation also implies a higher-than-average realized plaintiff valuation.

A defendant might have a valuation higher than the average plaintiff value (and thus want to take) even

though, given the correlated valuations, the defendant knows that its own valuation is still likely to be lower

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[19]See infra at 14 (discussing K&S's numeric examples in which the correlated component of value
is assumed to vary over a range ten times larger than that of the idiosyncratic component of value).

than the plaintiff's expected valuation.

K&S illustrate this correlated-value problem with a series of examples in which the litigants' overall valuation can be decomposed into "common value" and "idiosyncratic value" components.[20] For example, in one of their examples they assume that (i) the litigants' common value component is uniformly distributed between 90 and 110; (ii) the plaintiff's idiosyncratic value component is uniformly and independently distributed between 0 and 10; and, (iii) the defendant's idiosyncratic value component is uniformly and independently distributed between 0 and 8.[21] These assumptions mean that a litigant's individual valuation will be the sum of the realized common value and his or her realized idiosyncratic value.[22] The litigants' valuations are correlated here because there is a common variable component to each litigant's overall valuation.

K&S show that a traditional liability rule -- which would force a taking defendant to pay damages set equal to the plaintiff's mean valuation of 105 (100 mean common value plus 5 mean idiosyncratic plaintiff value) -- will be less efficient than giving the plaintiff the entitlement protected by a property rule. The expected joint payoff under a liability rule with 105 damages is 104.82, while the joint payoff under a property rule is 105.

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[20]Kaplow & Shavell, supra note 2, at 759-60 ("First, suppose that things have a significant common value, that is, a component of value that is the same for both the owner and any taker. . . Second, assume that things also have idiosyncratic value to individuals. Idiosyncratic value derives from characteristics of a thing that different individuals evaluate differently, such as the design of a home").

[21]Kaplow & Shavell, supra note 2, at 789.

[22]For example, if the common value of both parties turns out to be 103 and if the idiosyncratic value of the plaintiff turns out to be 8, the plaintiff's total realized value would be 111.

When the litigants' valuations are positively correlated, it is difficult for the court's allocative price to distinguish between unexpectedly high realizations of the common value component versus unexpectedly high realizations of the idiosyncratic value component. In the foregoing example, a liability rule with 105 damages induces the defendant to take too often. For example, if the common value component should turn out to be 108, a defendant would always take -- even if its idiosyncratic value were as low as 0. These takings, on average, would be inefficient because on average the plaintiff's idiosyncratic value is higher than the defendant's (5 vs. 4). A high realization of the common value tells us nothing about whether the defendant's idiosyncratic value is greater than the plaintiff's – and the latter comparison is what drives allocative efficiency.

A court would like to induce defendants to take only when they have a high idiosyncratic value, but in structuring a liability rule courts can only announce a damage amount which represents a combination of the common and idiosyncratic valuations. A defendant who chooses to take (when its total value is greater than expected damages) may be doing so either (i) because it has high idiosyncratic damages or (ii) because both plaintiff and defendant have a high common value. The former takings will on average be efficient (for the same harnessing rationale discussed above), but the latter takings (driven by high common values) will tend to be inefficient.[23]

K&S attempt to show how correlated valuation causes property rules to tend to dominate liability rules with a series of five examples which they analyze in their text and appendix. The first three rows of

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[23]Kaplow & Shavell, supra note 2, at 760.

Table 1 describe the assumptions underlying these examples.[24] Example 2 was the basis of our earlier

discussion:[25] the common value component of both litigants is uniformly distributed between 90 and 110;

the plaintiff's idiosyncratic value is uniformly distributed between 0 and 10; and the defendant's

idiosyncratic value varies between 0 and 8.

The examples all assume that the court's uncertainty as to common value (seen here by the width

of the distribution) is greater than the court's uncertainty as to the defendant's idiosyncratic value. As

mentioned above, this latter assumption is empirically contestable.[26] But we will show that (contrary to

K&S) liability rules can still be useful when a court's imperfect information mainly stems from its difficulty

in estimating the litigants' common value.

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[24]Examples 1 through 4 can be found in their appendix, id. at 789. Example 5 can be found in their text, id. at 761. The textual example asks the reader to assume "most of these idiosyncratic values are in the neighborhood of $25" which suggests a normal distribution. Id. But for the sake both of simplicity and comparability with the other examples, we assume that all distributions in Table 1 are uniform.

[25]See supra at 12.

[26]See supra at 10.

Table 1: Kaplow and Shavell's Numeric Examples					
	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5
Common Value Distribution	[90, 110]	[90, 110]	[95, 105]	[95, 105]	[0, 200]
Plaintiff's Idiosyncratic Value Distribution	[0, 10]	[0, 10]	[0, 10]	[0, 10]	[0,50]
Defendant's Idiosyncratic Value Distribution	[0, 5]	[0, 8]	[0, 6]	[0, 8]	[0,10]
Expected Joint Payoff Under "Plaintiff" Property Rule	105	105	105	105	125
Assumed (Defendant Choice) Liability Rule Damages	105	105	105	105	125
Expected Joint Payoff Under Assumed (Defendant Choice) Liability Rule	104.147	104.816	104.697	105.129	117.041
More Efficient Rule	Property	Property	Property	Liability	Property

The remaining rows of Table 1 replicate K&S's efficiency analysis. The efficiency of a particular regime is directly captured by measuring the expected joint payoffs to the litigants. K&S ask: Which type of regime will produce the highest expected joint payoffs in the absence of bargaining? If a regime is more efficient when bargaining is not possible, they conjecture that it is likely to remain more efficient as transaction costs fall.[27]

Under a plaintiff property rule, the expected joint payoffs in the absence of bargaining will equal the plaintiff's mean value (mean common value plus mean plaintiff idiosyncratic value). The defendant gets

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[27]See supra note 12.

zip. Continuing our discussion of Example 2, we see in Table 1 that under the plaintiff property rule the

expected joint payoff is 105 (the mean common value of 100 plus the mean plaintiff idiosyncratic value of

5).

K&S compare this payoff to the payoff from what we will term a traditional liability rule[28] with

traditional damages. They ask what would be the expected joint payoff if the defendant had the option to

take the entitlement non-consensually and pay the plaintiff her expected value. Since K&S *assume*

damages equal to the mean plaintiff's value, the damages row is identical to the property rule expected

payoff row in Table 1 (again, 105 for Ex. 2). As discussed above, the problem with correlated valuations

is that they can induce defendants to over take -- taking even when their value is lower than what, given

correlated values, they expect the plaintiffs value to be. In Example 2, defendant takings create expected

losses from inefficient takings that are 31.3% greater than the expected gains from efficient takings.

Indeed, in four of the five examples, property rules are claimed to be more efficient. Only in

Example 4, where the variation in common value becomes relatively small compared to the variation in the

defendants' idiosyncratic value does the liability rule become more efficient. But this is consistent with

K&S's theory (which we will show to be false)[29] that as the variation in common value becomes small, the

litigants' valuations become less correlated and the harnessing result once again militates toward the

superiority of liability rules. K&S use these examples to argue that the more correlated the valuations the

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[28]Under the Calabresi and Melamed schema, giving the defendant the option to take and pay represents a "Rule 2" implementation. Calabresi &Melamed, supra note 5, at 1108. See also Ayres, supra note 1, at 797.

[29]See infra at 30.

more likely property rules are to be efficient.

K&S's finding that it is more difficult to use liability rules to harness private information when the litigants' valuations are correlated is an important result which we wish to praise.[30] But while K&S are correct that correlated valuations make it more difficult to harness private valuations, they are wrong to conclude that property rules dominate liability rules when valuations are positively correlated.

Their examples systematically overstate the advantages of property rules by comparing the more efficient property rule to a liability rule that has non-optimal damages and the less efficient chooser. Just as there are two possible property rules (giving the entitlement to the plaintiff or the defendant), Calabresi and Melamed famously showed that there are two possible liability rules – the traditional Type 2 rule (which gives the defendant the right to pollute if it pays damages) as well as Type 4 rule (which gives the plaintiff the right to stop pollution if it pays damages).[31] In all of K&S's examples, it turns out that Type 4 is the more efficient liability rule (for reasons that we will soon make clear). If we compare the more efficient property rule (plaintiff ownership), to the more efficient liability rule (Type 4) with optimal damages, it turns out that liability rules dominate property rules in K&S's own examples – even though valuations are correlated.

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[30]It has long been recognized that the optimal mechanism for auctions or bargaining will turn on whether or not the bidders'/negotiators' values are independent or not. See Peter Cramton & Alan Schwartz, *Using Auction Theory to Inform Takeover Regulation*, 7 J. L. Econ. & Org., 27 (1991); R. Preston McAfee & John McMillan, *Auctions and Biddings*, 25 J. Econ. Lit. 699, 722 (1987).

[31]There are a wide variety of rules that are allocatively identical to the traditional Type 4 rule. Ayres & Goldbart, supra note 1, at 27. For example, giving the plaintiff the entitlement plus the (put) option to sell it for $X should produce the same allocation as giving the plaintiff the (call) option to buy the entitlement for $X. Id.

A. *The Optimal Damages*

Let us begin by investigating how optimal damages should be calculated in the presence of correlated values. It turns out that K&S's own harnessing result can be extended to shed light on this issue. The core insight of K&S is that damages should be set so that a potential taker will only take when *given her private information about her own value* the taking is expected to be value enhancing. When the litigants' valuations are uncorrelated, setting (Type 2) damages equal to the plaintiff's expected value accomplishes this. But when damages are correlated, setting damages at the plaintiff's expected value systematically induces too much taking because a defendant knowing it has a higher than average value should also expect (as in the earlier example) that the plaintiff has a higher than average value.

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This positive correlation between the defendant's value and what the defendant expects the plaintiff

value on average to be is depicted in Figure 1 for the distribution assumed in Example 2. Look first at the

most extreme possible defendant valuations. If the defendant knows her value to be 90, then she can infer

that the plaintiff's expected value is 95.[32] And if the defendant knows her value to be 118, than she can
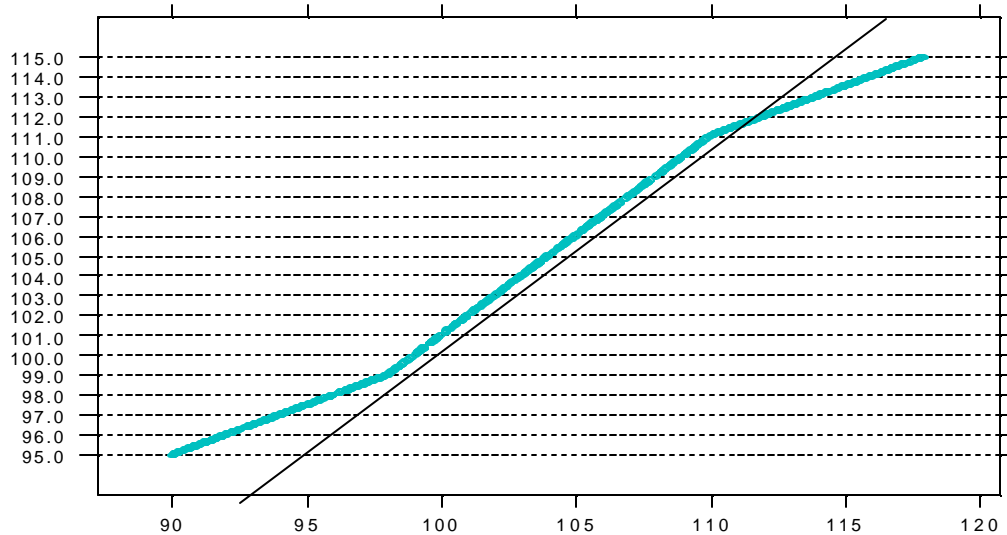

Figure 1: Plaintiff's expected value conditional on Defendant's realized value

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[32]If a defendant's total valuation is 90, she can infer (under the Example 2 distributions) that her idiosyncratic value must be 0 and that the common value must be 90. If the common value is 90, then the plaintiff's expected total value is 90 plus her mean idiosyncratic value of 5.

infer that the plaintiff's expected value is 115.[33] Figure 1 shows the plaintiff's expected valuation for any given level of defendant value.

The figure illustrates K&S's over taking result. If liability rule damages are naively set equal to the plaintiff's unconditional mean of 105, then defendants with valuations only infinitesimally above 105 will be induced to take the entitlement and pay damages. But the figure shows that when the defendant's value is 105, the plaintiff's expected value is 106. Thus, setting damages at the plaintiff's unconditional mean causes some defendants to take inefficiently -- even though they know (because of correlated values) that the plaintiff has a higher expected value.

But while Figure 1 shows a positive correlation between a defendant's value and the plaintiff's expected value, we can see that the plaintiff's expected value grows more slowly. Comparing the endpoints, for example, we see that as the defendant's value grows 28 (from 90 to 118), the plaintiff's conditional mean grows only 20 (from 95 to 115). As long as the correlation in the litigants' valuations is not perfect, a given increase in the defendant's known value will translate into a smaller increase in the plaintiff's conditional mean value. The relative flatness of the curve is important because it implies that there will often exist a point at which the plaintiff's conditional mean value will equal the defendant's value. This cross over point (or what economists sometimes call a "fixed point") is shown in Figure 1 as the intersection of the conditional mean curve with the 45-degree line. For the distributions assumed in Example 2, it turns out that this fixed point occurs at 112.

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[33]If a defendant's total valuation is 118, she can infer that her idiosyncratic value must be 8 and that the common value must be 110. If the common value is 110, then the plaintiff's expected total value is 110 plus her mean idiosyncratic value of 5.

Indeed, setting damages at this fixed point is optimal. In example 2, if damages are set at 112, then defendants with valuations just infinitesimally above 112 will be induced to take the entitlement. But Figure 1 shows that all such takings can be expected on average to increase value. All defendants with valuations greater than 112 will be taking from plaintiffs who they can expect to have a lower value.

The figure further clarifies the difference between compensation and efficient allocation as the motive force behind liability rules. Damages of 112 will induce efficient takings by defendants, but some defendants will know that these damages will systematically undercompensate the plaintiffs: the plaintiff's expected valuation conditional on the defendant's value being greater than 112 will also be greater than 112 (just not as much greater).[34]

The fixed-point result is just a generalization of K&S's own harnessing theory. When the litigants' valuations are correlated, the optimal liability rule damages are still set equal to the plaintiff's mean value -- but because this mean value is now itself a function of the defendant's value, it is a conditional mean instead of an unconditional mean. Optimal damages should equal the plaintiff's mean conditional on the defendant's value also equaling the damage amount. Because the plaintiff's mean value is now a function of defendant's value, optimal damages will find the fixed point at which the defendant's value equals the plaintiff's conditional mean value.[35]

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[34]In a separate article, we show that is possible for courts to construct allocatively identical versions of the traditional Type 2 which continuously vary how the gains from taking are divided between the litigants – thus allowing the court to decouple its distributive and allocative concerns. Ayres & Goldbart, supra note 1, at 10.

[35]More formally if we denote the idiosyncratic plaintiff, idiosyncratic defendant and common components of value by ? , ? , and C, respectively and denote the distribution of each component as $f_?(?)$,

The intuitions behind K&S's harnessing result also generalize. When the litigants' valuations are correlated, the court should select a damage amount such that if the defendant's value were to equal this amount, the damages would, on average, equal the plaintiff's value. K&S are correct that the unconditional mean does not accomplish this, but they overlooked how setting damages equal to plaintiffs' *conditional* mean could resurrect their harnessing result.[36]

$f_?(?)$, and $f_C(C)$ respectively, then optimal damages, D, are those that solve the following equation:
$$E[C + ? ? C + ? = D] = D.$$
But because the expectation of a sum can be reexpressed as the sum of individual expected values, this can be reexpressed as:
$$E[C ? C + ? = D] + E[? ? C + ? = D] = D.$$
Because the plaintiff's idiosyncratic value is independent of both the common value and the defendant's idiosyncratic value, this expression simplifies to:
$$E[C ? C + ? = D] + E[?] = D.$$

[36]K&S, in a footnote and in the appendix, did consider the possibility of higher damages. But they did not derive the criteria for setting optimal damages:

> [W]e should consider briefly whether a liability rule with damages different from average value might perform better than the liability rule with damages equal to average value. If damages exceed average value -- say, damages equal the highest possible common value plus the mean idiosyncratic value to owners -- those few takings that would occur would constitute efficient transfers, on average. . . . We mention, however, that the range of possible common values can be quite large. (Just what is the highest possible common value of having a laptop computer with which to take notes at a conference?)

Kaplow & Shavell, supra note 2, at 762 n.157. See also id. at 790:

> The above analysis assumes that damages equal the average common value, 100, plus the average owners' idiosyncratic value, 5, for a total of 105. Higher damages clearly are optimal. In the third example, for instance, if damages were 110, takings would be rare: only takers with idiosyncratic values above 5 would take (for the highest possible common value is 105 and damages are 110) and they would take infrequently (a necessary condition is that the common value exceed 104). Such takings would, on average, be desirable, because the taker's value would, on average, exceed the owner's value. (See our discussion in note 157.) We would, however, interpret such a rule as more like a property rule than a liability rule: even though damages are not infinite, they are high enough to deter virtually all takings.

Neither of these discussions focuses on optimal damages. The first passage mentions setting damages at

Table 2 re-analyzes the five examples from Table 1 using the optimal damages. Instead of setting damages equal to the plaintiff's unconditional mean, it sets damages equal to the conditional mean at the crossover point. For example, the table reports optimal damages in Example 2 of 112 as shown above in Figure 1.

The table also reports the expected joint payoffs under a liability rule with optimal damages. In contrast to Table 1's comparison using naive (unconditional) damages – where property rule protection happens to be superior in four out of the five examples -- Table 2 shows that liability rules with optimal (conditional, fixed-point) damages are more efficient in three of the five cases. For Example 2, the optimal damages of 112 give rise to expected joint payoffs of 105.113 instead of the 105 expected damages produced under a liability rule.

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the highest possible common value, but our discussion of Example 2 shows that such a standard is still lower than optimal fixed-point damages (110 vs 112). The second passage, in contrast, considers damages that are inefficiently high. K&S analyze damages of 110 for Example 3 when optimal fixed-point damages are only 109 (see infra Table 2). These examples suggest that K&S understood that elevated damages could increase efficiency, but had not derived the fixed point result for estimating the exact amount that would harness information. Counter to their suggestion, it is not necessary that a common value have an upper support in order for the court to calculate the fixed-point conditional mean. Finally, K&S's assertion that it is appropriate to interpret higher damages as property rules because they "deter virtually all takings" conflates deterrence-based protections such as injunctions with harnessing protections, which aim to induce value-enhancing transfers.

Table 2: Kaplow and Shavell's Examples With Optimal Damages					
	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5
Expected Joint Payoff Under "Plaintiff" Property Rule	105	105	105	105	125
Assumed (Defendant Choice) Liability Rule Damages	105	105	105	105	125
Expected Joint Payoff Under Assumed (Defendant Choice) Liability Rule	104.147	104.816	104.697	105.129	117.041
Optimal (Defendant Choice) Liability Rule Damages	115	112	109	107	210
Expected Joint Payoff Under Optimal (Defendant Choice) Liability Rule	105	105.113	105.011	105.225	125
More Efficient Rule	Property	Liability	Liability	Liability	Property

B. *The Optimal Option Holder*

By itself, the superiority of liability rules in a slight majority of these five examples tells us very little.

K&S's examples certainly aren't adequately structured to prove that property rules tend to dominate, but

given the arbitrariness of the specific numbers assumed we would – without more analysis – have to be

agnostic about a general tendency.

But as it turns out, there is a second way that K&S's original comparison overstated the dominance

of property rules. *They choose to compare the more efficient property rule to the less efficient*

liability rule. In all of these examples it is more efficient to give the initial entitlement to the defendant and

give the plaintiff the right to take and pay damages. This is the famous Type 4 rule of Calabresi and

Melamed that was judicially implemented in *Del Web*.[37]

It is straightforward to see that the more efficient property rule is to give the entitlement to the litigant with the higher expected value (in these examples always the plaintiff). In the absence of bargaining, this straightforwardly maximizes the parties' expected joint payoff. K&S made the facially plausible assumption that the more efficient liability rule would give the initial entitlement to the litigant with the higher value (and to give the lower-valuing litigant only the taking option).

But this assumption turns out to be false -- and the reason can quickly be seen once we appreciate that liability rules confer upon potential takers the *option* to take or not to take. From an option perspective, liability rules can be seen as dividing the litigants' claims to the entitlement. One litigant receives a call option -- the option to buy -- while the other receives the entitlement subject to the call.[38] Appreciating this option interpretation directly leads to the conclusion that Type 4 dominates Type 2. A

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[37]Spur Indus., Inc. v. Del E. Webb Dev. Co., 494 P.2d 700, 708 (Ariz. 1972) (Cameron, V.C.J.). The court's unconditional order seems to differ from the previous definition of a Type 4 rule, which gives the Resident the choice of whether (a) to pay to stop further pollution or (b) not to pay and to allow the Polluter to continue polluting. To harmonize the case with the definition, it is necessary to speculate about what would have happened if Del Webb had petitioned the court to void its order enjoining the pollution as well as its order that Del Webb indemnify Spur. If we believe that the court would have in effect allowed Del Webb to withdraw its initial complaint, it would have in effect been giving Del Webb the Type 4 choice—that is, the choice of paying to stop pollution or not paying and allowing the pollution to continue. Alternatively, at a minimum, future developers will realize that suing in this jurisdiction may be choosing to pay for an injunction.

[38]See Ayres & Talley I, supra note 7, at 1048; Rose, supra note 1, at 2183; Ayres & Goldbart, supra note 1, at 18.

fundamental result of option theory is that options are more valuable the more volatile the underlying asset.[39]

As applied to liability rules, this means that courts should tend to give the option to the litigant with the more variable valuation distribution.[40] From Table 1, we can see that in all of K&S's examples, the plaintiff's valuations are not only systematically higher but systematically more volatile. From an option perspective, this suggests that the plaintiff is the more efficient taker – so that Type 4 is likely to be more efficient than Type 2.

Table 3 shows this in fact to be the case for all five examples. It reports the expected joint profits under a Type 4 regime using optimal (conditional, fixed-point) damages. Comparing Tables 2 and 3, it is easy to see that Type 4 dominates. The expected joint profits under Type 4 are systematically larger than the expected joint profits under Type 2. In Example 2, Type 2 (with optimal damages) produces expected joint payoffs of 105.113, while Type 4 is more efficient, producing the higher expected joint payoff of 105.213.

The greater efficiency of Type 4 combined with optimal damages completely reverses K&S's claim that property rules will tend to be more efficient than liability rules when valuations are correlated. In all five of their examples, the optimal liability rule turns out to be more efficient than the best possible property rule.

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[39]*See* RICHARD A. BREALEY & STEWART C. MYERS, PRINCIPLES OF CORPORATE FINANCE 557 (5th ed. 1996)

[40]This proposition is formally shown in Ayres & Goldbart, supra note 1, at 28.

Table 3: Kaplow and Shavell's Examples With Optimal Damages and Plaintiff Choice (Type 4)					
	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5
Expected Joint Payoff Under "Plaintiff" Property Rule	105	105	105	105	125
Assumed (Defendant Choice) Liability Rule Damages	105	105	105	105	125
Expected Joint Payoff Under Assumed (Defendant Choice) Liability Rule	104.147	104.816	104.697	105.129	117.041
Optimal (Plaintiff Choice) Liability Rule Damages	95	98	101	103	10
Expected Joint Payoff Under Optimal (Plaintiff Choice) Liability Rule	105.052	105.213	105.180	105.427	125.008
More Efficient Rule	Liability	Liability	Liability	Liability	Liability

Five examples don't prove a tendency, but we can go still further. It turns out that as long as the option holder's idiosyncratic value distribution can take on values both above and below the other litigant's idiosyncratic mean that the liability rule will be superior.[41] As long as the option holder's potential values overlap the non-option holder's mean value, there will exist an "interior" fixed-point damage amount -- that is, a damage amount within the support of the option holder's probability distribution where the option

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[41]More formally, as long as the non-chooser's unconditional idiosyncratic mean lies within the support of the chooser's idiosyncratic value then the liability rule will dominate either possible property rule. In contrast, K&S assert: "A sufficient condition for superiority of the property rule is that the support of the [defendant's idiosyncratic distribution] lies below the [plaintiff's idiosyncratic mean]." Kaplow & Shavell, supra note 2, at 788. Table 3 shows, however, that this assertion is only true if one restricts attention to Type 2 implementations.

holder's value equals the non-option holder's conditional mean value.[42]   The existence of interior, liability damages assures the dominance of liability rules because in equilibrium the option holder will non-consenually take whenever her privately known value is higher than the non-option holder's conditional mean. Sufficient variation in the option holder's idiosyncratic values (relative to the other litigant's idiosyncratic mean) implies that the option has both private and social value – sometimes it will be efficient to exercise the option (and transfer the entitlement) and sometimes it will be efficient for the option holder not to exercise.

This sufficient condition for liability rule dominance also explains why examples 1 and 5 switch from having property to liability rule dominance as we switched from Type 2 to Type 4 implementations. In Example 1, the plaintiff's and defendant's idiosyncratic valuation varies between 0 and 10 and between 0 and 5 respectively. Under Type 2 when the defendant is the option holder, the defendant's possible idiosyncratic values [0 to 5] do not vary above and below the plaintiff's mean idiosyncratic valuation of 5. Giving the defendant an option to take in this example has no social value, because there are never realizations of defendant's idiosyncratic value where we would want the defendant to take.

K&S have provided an example where a property rule dominates a Type 2 implementation, but it should now be clear that the superiority of the property rule has *nothing* to do with the correlated valuation. Even if there were no correlated value (which could easily be accomplished by eliminating the variation in the common value distribution) the property rule would dominate because the Type 2 option

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[42]This result is formally proved in Ayres, Goldbart and Knysh, *A Generalized Theory of Liability Rules as Auctions* (working paper 2002).

would have no social value.[43]

But Example 1 also shows that the failure of the sufficiency condition with regard to a Type 2 implementation does not imply that the condition will fail with regard to a Type 4 implementation. Under Type 4, the plaintiff is the option holder. In Example 1, the plaintiff's idiosyncratic mean varies between 0 and 10 and the defendant's idiosyncratic mean is 2.5 – so the plaintiff call option will have both private and social value.[44] Some realizations of the plaintiff's idiosyncratic value will make a taking efficient and other realizations will make a taking inefficient. It is in just these circumstances that a liability rule will dominate property rule.

Note that our sufficiency condition merely compares the litigants' idiosyncratic distributions. It is completely independent of the common value distribution. This is important because it implies that the superiority of liability rules to property rules does not turn on whether the variation in the litigants' values is more importantly influenced by variation in common or idiosyncratic values. Regardless of how much (or how little) the common value varies, liability rules will dominate if the sufficiency condition holds. This finding directly contradicts K&S's assertion that property rules will dominate as long as the variation in the

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[43]When the option holder's idiosyncratic distribution does not overlap with the non-option holder's mean idiosyncratic value, there will not be an interior fixed-point damage amount – so that the optimal damages will be set at an extreme value under which the defendant will never take (or always take). This can be seen in Table 2 by the Example 1 liability damages of 115 which replicate a property rule outcome by deterring all defendant takings.

[44]A similar analysis shows why, for Example 5, a property rule dominated a Type 2 implementation but not a Type 4 implementation. In Example 5, the plaintiff's and defendant's idiosyncratic value distribution varied from 0 to 50 and from 0 to 10 respectively. Under Type 2, the defendant option-holder's distribution lies strictly below the plaintiff's mean value of 25. But under Type 4, the plaintiff option-holder's distribution lies both above and below the defendant's mean value of 5.

common value is large relative to the variation in the litigants' idiosyncratic value.[45] That conclusion was

an artefact of their comparisons of systematically inefficient liability rules to the most efficient property rules.

When the more appropriate horse race is run, it turns out that liability rules can dominate even when

the idiosyncratic valuations are very small compared to common value variation. In Example 5, the

common value variation (0 to 200) is four times the plaintiff's idiosyncratic variation (0 to 50) and twenty

times the defendant's idiosyncratic variation (0 to 10), yet a liability rule still can produce slightly higher

expected payoffs (125.008 vs. 125 as shown in Table 3).

Put simply, if a liability rule dominates in the absence of any common value variation, it will continue

to dominate even if the common value variation becomes arbitrarily large. To be sure the degree of

dominance will narrow as the damages move toward a property rule level and the difference between the

expected property and liability rule joint payoffs declines. But the mere existence of correlated valuation

does not mean that harnessing private information becomes theoretically untenable. Indeed, the question

of whether the best liability rule is more efficient than the best property rule is independent of whether the

litigants' valuations are correlated. The degree of correlation, while not affecting the relative efficiency of

liability and property rules, will affect the absolute difference in efficiency. Higher degrees of correlation

will tend to reduce the efficiency shortfall from mistakenly using a property rule.

Some readers might seize upon this narrowing result to argue that liability rules may be more

efficient – but only to an insignificant extent. The optimal liability rule increases the expected joint payoffs

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[45]See supra at 16.

of the litigants above those generated by a property rule but only by a small amount. Table 4 shows in

Example 2 that the optimal liability rule expected joint payoff is only slightly higher than the expected joint

payoff under a "Plaintiff" property rule (105.213 v. 105).

Table 4: Assessing the Movement Toward First-Best Allocative Efficiency					
	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5
A. Expected Joint Payoff Under "Plaintiff" Property Rule	105	105	105	105	125
B. Expected Joint Payoff Under Optimal (Plaintiff Choice) Liability Rule	105.052	105.213	105.180	105.427	125.008
C. First-Best (Perfect Information) Joint Payoff	105.417	106.066	105.600	106.067	125.333
D. Improvement in Allocative Efficiency As Percentage of Property Rule Shortfall from First Best (B-A)/(C-A)	12.5%	19.5%	30%	40%	2.4%

But the failure to produce substantial increases in efficiency is simply a byproduct of there being

very little potential gains of trade to be had in K&S's examples. Table 4 reports the maximum expected

gains of trade that might be had if the court were perfectly informed about the litigants' private valuation

and could thus assign with certainty the entitlement to the higher valuer. We can see that the "first-

best/perfect information" expected payoff is only slightly higher than the plaintiff's mean valuation – implying

that in these examples there are, to begin with, very few potential gains from trade. If we compare the

enhanced efficiency of liability rules relative to this first-best upper limit, we see that liability rules capture

a sizable proportion of the potential gains from efficient allocation (30% and 40% of the potential gains in

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Examples 3 and 4). If we alter the examples to allow for more substantial gains from trade, we find that optimal liability rules produce more substantial increments (over property rules) in the expected joint payoff.[46]

C. *Joint Veto Rules*

While we have shown that Type 4 liability rules are more efficient than property rules in K&S's own examples, some might respond that pure Type 4 rules will sometimes be difficult to implement.[47] A plaintiff might only gain the option to take an entitlement after the defendant has taken some triggering action (such as polluting).

Another alternative to the simple liability rules modeled by K&S can be found in what we have elsewhere called a "joint veto" liability rule.[48] Joint veto rules are rules that allow that allow either side to veto the transfer of an entitlement (say, from plaintiff to defendant). For example, sometimes the closest

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[46]For example, if both the common-value and the plaintiff-idiosyncratic components are distributed uniformly between 0 and 100, while the defendant-idiosyncratic component is distributed uniformly between 40 and 60, the expected joint payoff under a property rule is 100 while the expected joint payoff under the optimal (plaintiff choice) liability rule is 108.33 – which represents a capturing of 65.7% of the potential gains of trade (112.67).

More generally, the incremental and percentage improvement in efficiency produced by the optimal liability rule (relative to the optimal property rule) will increase as either the mean or the variance of the common value component decreases (relative to the mean or variance of the option holder's idiosyncratic value component). As discussed above, supra at 10, there is no reason to believe that the common value component will have from the court's perspective a relatively large variance (given the tendency of common values to be dominantly influenced by observable market forces) and K&S never defend their consistent assumption that the common value mean is large (100 in their examples) relative to the idiosyncratic means (less than 10).

[47]Indeed, we have made this argument ourselves. Ayres & Goldbart, supra note 1, at 48.

[48]Id. at 61.

the law can come to a Type 4 rule is to give the plaintiff a *take back option* in the second-stage of a two-stage game. Under such a regime, the defendant would first decide whether the benefits of initially taking the plaintiff's entitlement are greater than the cost of the expected court award and the plaintiff would then decide whether the costs of losing the entitlement were worse than the benefit of expected damages. Either party could veto the transfer: the defendant by not initially polluting and the plaintiff by exercising its take back option.

In a separate article, we have extensively analyzed such "joint veto" options and shown that they can sometimes be more efficient than either Type-2 or Type-4 liability rules.[49] But for now it is sufficient to see how nicely joint-veto rules can respond to the correlated-value problem – even if Type-4 liability rules are not feasible.

Joint veto rules are well suited to respond to the problem of correlated valuations because these rules allow the other side to *veto* takings that are driven by common value realizations. The problem with the Type 2 rule was that defendants might take merely because the common value component was unexpectedly high. But a joint-veto rule eliminates this problem by allowing the plaintiff to veto takings that are driven by both parties having a high common value. Under a joint-veto rule, the entitlement will only transfer to the defendant if the plaintiff's total value (common plus idiosyncratic) is less than the damage amount and if the defendant's total value (common plus idiosyncratic) is greater than the damage amount. Indeed, it can be shown that the optimal joint-veto rule can at least replicate the efficiency of the Type 2 or Type 4 rules and thus produces systematically higher expected joint payoffs than the optimal property

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[49]Id. at 61.

rule.[50] Thus, even if pure Type 4 implementations are not feasible, "joint veto" liability rules -- which still harness the litigants' private information by contemplating non-consensual transfers -- will still tend to dominate property rules.

K&S can be pardoned for not considering these newfangled joint-veto rules, but their failure to consider the Type-4 rules that Calabresi and Melamed discovered more than 24 years earlier is a more serious error -- an error they probably made by ignoring the implicit option value of liability rules.[51] Just because a plaintiff has the higher average value does not mean that Type 2 liability rules will be more efficient than Type 4. From an option perspective, giving the entitlement initially to a lower valuing defendant and giving the higher valuing plaintiff a taking option can be more efficient if the plaintiff has a systematically more volatile valuation. When the more efficient liability rule is compared to the more efficient property rule, K&S's own examples show that correlated valuations need not undermine their harnessing result.

D. *The Lemons' Problem*

All of the foregoing examples make the seemingly innocuous assumption that the original possessor of the entitlement (the plaintiff) has a higher mean value than the non-possessor (the defendant). K&S

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[50]For these uniform distribution examples, the expected joint profits under the optimal joint-veto rule are identical to the expected joint profits under the optimal Type-4 liability rule. The damages under joint-veto implementations are less extreme than under Type 2 or Type 4 implementations. Instead of relying on more extreme damages to deter inefficient takings (driven by high common value realizations), the joint-veto rules rely on the other side's veto. Id. at 57.

[51]Ayres and Talley made a similar error in comparing bargaining under liability and property rules. Ayres & Talley, supra note 7, at 1048. Their core numeric example assumes that the defendant's valuation is less variable than the plaintiff's valuation, but they ignore the more efficient Type-4 implementation. Id.

reasonably defend this assumption by claiming that the plaintiff's prior decision to "obtain (or choose to retain) things" signals to a court that they place a high idiosyncratic value on the entitlements.[52] But K&S's other assumptions of correlated values and imperfect information undermine our confidence that possessors have higher average valuations.

In probably the most-cited of correlated value articles, *The Market for Lemons*,[53] George Ackerlof (the recent Nobel prize winner) showed that an owner of a used car may be unable to sell at any price even though it is common knowledge that a particular buyer values the car more highly. The classic lemons' problem is that when a buyer's and seller's valuations are correlated but the seller knows more about the entitlement's value, a lower-valuing seller may be unable to sell to a higher-valuing buyer. The lower-valuing seller is stuck with the entitlement.[54]

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[52]Kaplow & Shavell, supra note 2, at 760 ("For example, I may purchase my home just because it has higher idiosyncratic value for me than for others: I may particularly like its design, setting, or location.").

[53]George A. Ackerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q. J. Econ. 488, (1970).

[54]For example, assume that it is commonly known that (a) a seller knows her own value exactly; (b) the buyer's valuation is k (> 1) times greater than the seller's valuation; and (c) the buyer only knows that the seller's valuation for a car is uniformly distributed between 0 and 100. Then if k is less than 2, a rational buyer will refuse to trade at any price. For example, if $k = 1.5$, then a buyer considering whether to buy at a price P will believe that the average value of a seller willing to sell at this price is $P/2$ – which in turn implies that the buyer's expected value of buying such a car is *(k * P)/2 = P * (3/4)*. No rational buyer is willing to pay P for a car that is worth on average only 3P/4. The buyer vetoes any proposed trade – worrying that she would be buying a lemon (a car whose value is expected to be lower than the price). More generally the lemons' problem exists when the buyer's expected value of the car, given that the seller's value is less than P, is less than P -- even though the buyer's expected value is larger than the seller's expected value: $E_B[v_S \mid v_S < P] < E_B[v_B \mid v_S < P] < P$.

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K&S admit that "[t]he assumption that idiosyncratic value is higher for owners means that it will be socially desirable on average for things not to be taken,"[55] but the possibility of a lemons' problem should make us uneasy about assuming that a particular person possesses an entitlement because she values it more than non-possessors. The assumption of systematically higher owner values skews their model against liability rules because it pushes toward non-overlapping probability distributions -- where property rules will be dominant. But Ackerlof's article teaches us that correlated values may impede the ability of lower-valuing owners to sell their goods. Owners may continue to own not because their probability distribution is higher than others, but simply because of the lemons' adverse-selection effect. The fact that correlated values (when combined with private information) tend to drive out consensual trade thuus provides a further justification for focusing -- as we have -- on the relative efficiency of property and liability rules when trade is not feasible.

CONCLUSION

To our mind, the great contribution of *Property versus Liability Rules* is K&S's reconception of liability rule damages as an allocative device instead of a mere compensatory device. With property rules, the court (in the absence of private bargaining) allocates the entitlement. But with liability rules, the court delegates the allocative decision to a private litigant. Even in the absence of bargaining, the litigant with the taking option can choose whether or not to allocate the entitlement to herself. Setting the damages that a taker must pay equal to the expected harm of the non-taker guides the taker's allocative decision – so that

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[55]Id.

she will only take when her private benefit is greater than the non-taker's expected cost. This is the harnessing benefit of liability rules.

But in confronting the real problems of correlated valuations and multiple-takings, K&S lost sight of harnessing. Instead of trying to adapt damages to economize on the taker's private information, K&S argued that it was better to extinguish the takings option and deter all non-consensual takings.

We disagree. The solution to the problem of correlated valuation is not to enjoin and criminalize such takings but to enlarge the damages for non-consenual takings in ways that redeem the potential of liability rules for economizing on the taker's private information. This elevated damage solution parallels a solution that others have already found for the multiple-taking problem – simply elevating the damages for each successive taking can actually better harness the private information of multiple takers. Using elevated damages to extend the harnessing idea solves both problems.

K&S tend to consider such elevated damages as property rules because they deter more non-consensual takings.[56] But there is more than a semantic issue at stake in whether elevated damages are termed as "property" or "liability" protections. The essential question is whether courts (and other lawmakers) should structure the law so as to deter all non-consensual takings or so as to intentionally allow

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[56]Kaplow & Shavell, supra note 2, at 790. At a few points, K&S acknowledge that liability rules with higher damages might promote efficiency. See also id. at 756 ("one can conceive of the two property rules and the liability rule that we studied as all being, in fact, liability rules with different levels of damages: the property rule protecting injurers corresponds to a liability rule with zero damages; the conventional liability rule that we emphasized is the rule with damages equal to courts' best estimate of harm; and the property rule protecting victims mirrors a liability rule with extremely high, or infinite, damages. . . . [T]he fully optimal liability rule may, in principle, be one with any level of damages.); id at 762 n.157 ("a liability rule with damages different from average value might perform better than the liability rule with damages equal to average value").

non-consensual takings that are expected to enhance value. The tangibility thesis seems to claim that deterrence/property protections tend to dominate when entitlements are tangible, but we have shown that the arguments proffered by K&S do not explain why courts cannot still profitably tailor damages to facilitate non-consensual, value-enhancing takings.

Now that the transaction-cost basis for property rules has been undermined (in part by K&S themselves), it is natural and laudable to look for a replacement theory to help explain the prevalence of property-like protections. But the tangibility thesis (while providing interesting insights along the way) ultimately does not convince. The search for a satisfying foundation for property rules continues.[57]

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[57]Ayres & Goldbart, supra note 1, at 103, note a variety of other contenders (such as providing better ex ante investment incentives) that similarly have not withstood sustained analysis.