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CONSENT AND EXCHANGE

Oren Bar-Gill and Lucian Arye Bebchuk

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Harvard Law School
Cambridge, MA 02138

Consent and Exchange*

Oren Bar-Gill† and Lucian Arye Bebchuk‡
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Abstract

In some cases, the law permits a party that unilaterally provides a benefit to another party to recover the estimated value of this benefit. Despite calls for expanding the set of cases to which such a restitution rule applies, the law commonly applies a mutual consent rule under which a party providing another with a benefit cannot obtain any recovery without securing the advance consent of the beneficiary to the transaction. We provide an efficiency rationale for the undesirability of broad use of the restitution rule by identifying significant adverse ex ante effects of the rule that are avoided by the consent requirement. Even assuming that courts' errors in estimating buyer benefits would be unbiased, a restitution rule would strengthen sellers' hand by providing them with a put option that they may but do not have to use. As a result, the restitution rule would encourage inefficient market entry by low-quality sellers that would not contribute to any efficient transactions but would be able to extract payments from buyers seeking to avoid an exchange with them. Furthermore, the restitution rule would discourage efficient market entry by some or all potential buyers of a good or service. Beyond the restitution rule, we extend our analysis to show that similar adverse effects can also arise from other "pricing" rules that provide buyers or sellers with call or put options to force an exchange at a judicially-determined price.

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JEL classification: C72, C78, D23, K10, K11, K1

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† NYU School of Law; URL www.law.nyu.edu/faculty/homepages/bargill; Email bargill@nyu.edu.
‡ Harvard Law School and NBER; URL www.law.harvard.edu/faculty/bebchuk; Email bebchuk@law.harvard.edu.

1. Introduction

Exchanges – transfers of value from a "seller" to a "buyer" for a consideration –commonly require the mutual consent of both sides to the exchange. So common and familiar is the use of this mutual consent rule that economists take it for granted. In some situations, however, the law allows a party to "force" an exchange on another party.

Under the "Restitution Rule," which is the focus of this paper, a "seller" may elect to confer a benefit on another party – say, by transferring an asset or providing a service – and thereby become entitled to a payment from the other party equal to the value of the provided benefit. If the "buyer" declines to pay, a court will intervene and force him to pay the estimated value of this benefit. For example, if B's ship is sinking and S's ship carries it to shore, S would be entitled to *quantum meruit* – the reasonable value of S's services. And, if S builds a house on an adjacent tract owned by B mistakenly thinking that the house is being built on land owned by S, then S is again entitled to recovery for the benefit that he conferred on B. Many other examples can found be in standard treatises on the law of restitution (see, e.g., Palmer, 1995).[1]

Various legal scholars call for expanding the domain of the restitution rule (e.g., Dagan, 2004, ch. 5; Porat, 2007). Nevertheless, restitution still remains the exception, not the rule, and is generally applied only in cases in which negotiations are impossible or very costly. Most exchanges are governed by the mutual consent rule which requires a potential seller to get a potential buyer's consent to become entitled to any payment from the buyer. In these standard situations, a seller that unilaterally confers a benefit on a buyer has no claim against the buyer no matter how large the benefit is.

Limiting the scope of the restitution rule to exceptional cases is often defended on non-consequential grounds by appealing to the potential buyers' autonomy and his "right to be left alone." In this paper we seek to contribute to the development of a consequentialist justification for limiting the use of the restitution rule to exceptional cases rather than following the call to expand the rule's scope.

[1] The restitution rule on which we focus refers to situations where a seller forces a trade on a buyer. The use of this rule should not be confused with the use of the restitution remedy. When a party breaches a duty toward another party, the restitution remedy would force the breaching party to pay the other party an amount equal not to the other party's damages but rather an amount equal to breaching party's gains from the breach. Schankerman and Scotchmer (2001) studies the restitution remedy in the intellectual property context from an ex ante perspective similar to the one used in this paper.

Posner (2003), in his well-known treatise on law and economics, seeks to provide an efficiency rationale for not using restitution based on ex post considerations. Posner makes the common assumption that parties know better than courts. He argues that when buyers and sellers can easily bargain the law should encourage them to bargain by refraining from imposing exchanges upon them in the absence of mutual consent. Mutual consent, secured through bargaining, ensures that the exchange take place if only if it is ex post efficient. It is not clear, however, that this ex post consideration provides a good basis for opposing restitution. This is because the restitution rule does not prevent parties from bargaining; it simply changes the background rule against which bargaining takes place.

In the hypothetical case of no transaction costs, a transaction would take place if and only if it is efficient no matter what the background rule is. In situations in which bargaining is possible but costly, the restitution rule would have both disadvantages and advantages vis-à-vis the mutual consent rule. While the mutual consent rule might be better at preventing inefficient transactions, it might be worse at facilitating efficient transactions. Indeed, the analysis in Kaplow and Shavell (1996) suggests that there are many situations in which bargaining would be more likely to produce an ex post efficient outcome under a restitution rule (or some other pricing rule) than under the mutual consent rule. [2]

Another ex post argument against the restitution rule is that it will involve litigation costs as parties will turn to courts to determine the value of benefits conferred unilaterally (on the effect of litigation costs on the optimal choice of legal rules—see, e.g., Polinsky and Rubinfeld, 1988, Bernardo, Talley and Welch, 2000). However, the mutual consent rule may also involve litigation costs arising from disputes about whether consent was in fact obtained and whether the process producing it was valid. More importantly, under the restitution rule, parties will not generally end up in court. Rather, the buyers' knowledge that sellers can turn to a court will lead buyers to pay the price that a court would be expected to set if the issue were brought before it. In the absence of informational asymmetries between parties, litigation can be expected to be avoided (see, e.g., Spier 2007; accordingly, models that allow for a litigation outcome commonly assume asymmetric information, see, e.g., Bebchuk, 1984, Reinganum and Wilde, 1986, Spier, 1992).

Whether or not an ex post analysis will ultimately identify significant advantages of limiting the use of restitution to exceptional cases, our focus in this paper is on the ex ante advantages of doing so. To focus on ex ante effects, we study a setup in which a meeting between a buyer and a seller is bound to have an efficient ex post outcome. In particular, we make the standard assumption that the cost and value of the transfer are commonly known to the parties and that transaction costs are zero. Courts are assumed to have less information than the parties themselves. They know only the distribution from which buyers and sellers are drawn. Given courts' information, the application of the restitution rule will involve payment of estimated benefits based on averaging across types.

Our analysis highlights that, even though courts are assumed to neither over-estimate nor under-estimate buyer benefits, on average, the restitution rule provides a significant advantage to sellers. Under the restitution rule, potential sellers have a "put" option allowing them to unilaterally transfer an asset or provide a service to another party and receive an exercise price equal to the court-estimated value of the asset or service to the other party. (Under the mutual consent rule, since potential sellers cannot unilaterally become entitled to any payment, they can be viewed as having a put option with an exercise price of zero.) While potential sellers may use the put option given to them by the restitution rule when doing so would be to their advantage, they need not use it when it is not in their interest to do so. As a result, the restitution rule transfers value from the buyer side to the seller side of the market.

Furthermore, the restitution rule produces ex ante efficiency costs, distorting parties' decisions whether to enter the market in two ways. First, focusing on quality heterogeneity among sellers, the restitution rule induces entry by inefficient, low-quality sellers. Under the mutual consent rule, only sellers that can generate efficient exchanges will enter the market. Sellers that cannot be party to an efficient transaction with at least some buyers will have no reason to enter the market. In contrast, under the restitution rule, some inefficient sellers will enter the market. Because a court will base its estimate on the average value produced by sellers, it will overestimate the value of the benefit provided by a low-quality seller in the event that he decides to confer this benefit on the buyer.

[2] A full ex post analysis should take into account not only whether a transaction would be efficient relative to no transaction but also relative to having one of the parties transact with another partner (see Levmore, 1985).

Thus, the restitution rule provides such sellers with a credible threat to force inefficient exchanges and get the judicially determined valuation from buyers. The existence of this credible threat enables sellers to extract payments from buyers wishing to avoid such inefficient transactions. This inefficient entry by low-quality sellers reduces the average surplus generated from meetings between buyers and sellers. This problem is especially significant in the likely common situations where the supply of inefficient providers of a good or a service is large.

Second, focusing on buyer heterogeneity, our analysis identifies another inefficiency that arises under the restitution rule. Under the mutual consent rule, buyers can never lose from an encounter with a seller. They can always withhold consent and avoid a losing prospect. This is not so under the restitution rule, which gives sellers the right to sue for a payment equal to the valuation of the average buyer. Under the restitution rule, buyers with relatively low value will expect to lose from participating in some efficient transactions as they will have to pay more than the good or service is worth to them. Consequently, some buyers who would have benefited from a given good or service will not enter the market at all and the efficient transactions in which they could have participated will be lost.

The effect of the restitution rule on buyer entry will be especially severe if courts base the judicially-required payment not on the average value in the full population of potential buyers but rather on the average value in the subset of potential buyers who enter the market. Under this version of the restitution rule the market would unravel: all buyers other than those whose valuation is at the very top of the valuation distribution will elect not to enter the market. The result we obtain in this case resembles the well-known unraveling result in Akerlof (1970). The difference is that in our case the unraveling is caused not by asymmetric information between buyers and sellers as in Akerlof's lemon market but rather by the informational disadvantage that courts have relative to the transacting parties.

While our analysis focuses on the restitution rule, we also consider other pricing rules, i.e., rules that give the seller a put option to force the sale of a good or service at a court-determined price. Whereas under the restitution rule the option's exercise price equals the (average) benefit to the buyer, different exercise prices can be easily imagined. We show that any pricing rule will produce ex ante effects of a similar nature (though possibly of different magnitude) as those we identified for the restitution rule as long as the court-determined price is not so low as to make the pricing rule practically equivalent to the mutual consent rule.

We also extend our analysis to consider a "Seller Compensation" rule which is used in some cases and enables a buyer to force an exchange on a seller for a court-determined price. (Using the influential taxonomy proposed by Calabresi and Melamed 1972, the seller compensation rule protects sellers only with a liability rule rather than with a property right.) For example, B may moor B's boat at S's dock in a storm even without the dock owner's consent provided only that B afterwards pays the resulting costs to S. While the seller compensation rule is used in many cases, those are (as with the restitution rule) largely ones in which transaction costs make negotiations impossible or very costly. We show that the seller compensation rule has negative ex ante effects that are similar in nature to those produced by the restitution rule but applying to the other side of the market -- encouraging entry by some potential buyers that should not enter the market from an efficiency perspective and discouraging entry by some potential sellers that should enter the market from an efficiency perspective. [3]

Before proceeding, we should note that although we identify certain disadvantages that the restitution rule and other pricing rules have vis-à-vis the mutual consent rule, we do not study the full universe of possible rules for governing exchanges. In particular, we do not attempt to determine whether and how the standard mutual consent rule could be improved upon by legal rules that courts can practically apply. This is an important subject for future research, and the issues we identify might be useful for such research.[4]

The remainder of the paper is organized as follows. Section 2 describes our framework of analysis. Section 3 focuses on buyer heterogeneity and derives the ex ante demand-side costs of the restitution rule. Section 4 focuses on seller heterogeneity and derives the ex ante supply-side

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[3] When the forced exchange involves transferring an existing asset (rather than producing an asset or providing a service), the "Seller Compensation" rule is equivalent to the "Taking of Things" rule considered by Kaplow and Shavell (1996). They discuss several problems with the rule including ones similar to those we model as well as others. Our analysis of the Seller Compensation rule formalizes and extends some of the points mad by their study.

[4] The mechanism-design literature shows that it is possible to obtain even first-best efficiency under certain conditions. See, e.g., Fudenberg and Tirole (1991), ch. 7. Achieving the first best, however, might require courts to apply mechanisms that are more sophisticated than those currently used by legal systems. Our focus is on understanding the comparative merits of some alternative approaches that legal systems have considered and used.

Our analysis also contributes to the contracting literature. Much of this literature has focused on the process by which consent is obtained and on the remedies available when consent is obtained (see, e.g., Polinsky (1983), Rogerson (1984), Katz (1990, 1993), Schweizer (2006)). In contrast, we study why consent is at all necessary.

costs of the restitution rule. Section 5 analyzes a more general model, incorporating both buyer heterogeneity and seller heterogeneity, where both efficiency costs are present. Section 6 considers two extensions: general pricing rules and the seller compensation rule. Section 7 concludes.

2. Framework of Analysis

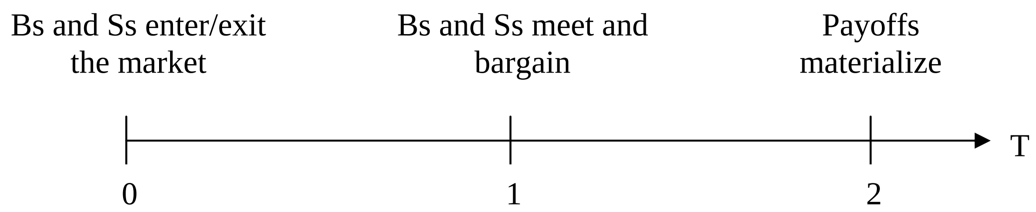
2.1. Sequence of Events

The model focuses on two groups of economic actors (individuals or firms): potential buyers, Bs, and potential sellers, Ss. Buyers and sellers are assumed to be risk neutral with a discount rate of zero. The sequence of events in the model, which is illustrated in Figure 1 below, is as follows:

T = 0: Buyers and sellers decide whether to enter the market.

T = 1: Buyers and sellers meet and bargain over a potential exchange.

T = 2: Payoffs materialize.



<u>Fig. 1: The Sequence of Events</u>

2.2. Two Cases

The formulation used is sufficiently general to cover two cases. The term exchange will be used to indicate one of two cases – (i) S transfers an existing asset to B in return for a payment, or (ii) S produces a new asset and transfers it to B in exchange for a payment. In both cases, if an exchange takes place, S gives up a value of *C*, where in the existing asset case, *C* denotes the use-value of the asset to S, and in the new asset case, *C* denotes the cost to S of producing the asset. Also, in both cases, if an exchange takes place, B obtains the asset. Let *V* denote the value of the asset to B. The surplus, which can be either positive or negative, is: $W = V - C$.

We shall now specify the assumptions we make at each of the three stages.

2.3. T = 0: Entering the Market

At T = 0, buyers and sellers decide whether to enter the market. We assume that buyers and sellers can costlessly enter the market, and will do so if and only if they expect a strictly positive payoff. The model can be readily extended to allow for positive entry costs. (Costly entry only increases the welfare costs of the restitution rule.) The idea of entry into a market is clear in the context of well-defined marketplaces, such as a farmers' market or a commodity exchange. Decisions to enter a market are also well-studied in the industrial organization and antitrust contexts. But our analysis also applies to more mundane scenarios where a person decides, for example, whether to start offering goods or services door-to-door or via the mail or the internet.[5]

Since buyers and sellers do not know each other at T = 0, when they make their entry decisions, they cannot contract about their entry decisions nor the rules that will govern their future negotiations should they meet at T = 1.

Buyers are heterogeneous with respect to the value they attach to the asset. Specifically, we assume that the value of the asset to a buyer has a buyer-specific idiosyncratic component, $\mu \in [0, \mu_{\max}]$; μ represents the buyer's type. The distribution of buyer types is characterized by the probability density function, $f(\mu)$, and the corresponding cumulative distribution function, $F(\mu)$. Let $\bar{\mu}$ denote the average buyer-specific valuation, i.e., $\bar{\mu} = \int_0^{\mu_{\max}} \mu f(\mu) d\mu$. We assume that each buyer needs (at most) one unit of the good or service.

Seller heterogeneity is introduced in Section 4. For now we assume that all sellers are the same, producing or possessing an asset of a quality, *q*, that is normalized to zero, i.e., $q = 0$. The value of the asset to a buyer is $V = q + \mu$, and for now, with $q = 0$, we have $V = \mu$. We further assume that the cost to a seller of producing the asset or parting with the asset is *C*, and that

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[5] Our ex ante analysis focuses on participation – entry and exit – decisions. Similar effects obtain when other ex ante decisions/investments (e.g., investments in search or in hiding/self-help, and investments in enhancing the value of a potential transaction) are considered.

sellers have unlimited capacity. We assume that $\overline{V} = \overline{\mu} > C$, namely, that the average benefit to a buyer is greater than the cost to a seller. It would seem that this condition is satisfied in well-functioning markets. More importantly, as will be made clear below, this assumption is necessary for a meaningful distinction between the mutual consent rule and the restitution rule to be drawn.

2.4. T = 1: Buyer-Seller Meeting and Bargaining

Sellers and buyers meet through a random matching process. Specifically, each buyer is randomly assigned to one seller. (While our analysis assumes that each buyer is matched with a seller only once, our main results hold when a buyer can be matched with several sellers sequentially.) This random matching protocol provides a simple formalization that covers markets where each buyer demands (at most) one unit of the good or service and sellers have no capacity constraint (as we assumed). Our analysis can be extended to other procedures that match buyers and sellers.

At T = 1 the buyer and the seller observe $V = \mu$. The court knows the distribution $f(\mu)$, but does not observe the specific buyer type μ. In other words, we adopt the standard assumption in the incomplete contracting literature that the value of the asset to the buyer, *V*, and the cost to the seller, *C*, are observable to the parties but not verifiable to a court.[6]

The assumption that *C* and *V* are both common knowledge, together with the assumption that transaction costs are zero, ensure that the outcome will be ex post efficient under any legal rule. That is, an exchange will take place *if and only if* $W > 0$ – that is, if and only if $V > C$. While the outcome will be ex post efficient regardless of the background rule, the legal rules will

[6] The no verification assumption can be relaxed. As long as verification is costly the court's value estimate will be imperfect (though unbiased), and our main results will hold. Our results depend on the assumed information structure, and specifically on the informational advantage that parties enjoy vis-a-vis the court. We recognize, however, that such an informational advantage does not always exist. It is not always the case that courts estimate the benefit to the buyer based on a known distribution of types, when the parties know the exact type. Rather, courts, attempting to ascertain the benefit to the specific buyer, might make unbiased errors, e.g., based on evidentiary uncertainty, that are not anticipated by the parties. Our results do not hold in such cases. It should be emphasized, however, that these two categories of imperfect information – one where parties know more than courts and the other when both parties and courts are similarly uninformed – are not mutually exclusive. Our results hold as long as some imperfect information of the former category is present.

affect how the surplus (if any) will be divided which in turn will affect ex ante decisions and ex ante efficiency.

We focus on the Restitution Rule (R Rule). Under the restitution rule, S may give the existing asset to B, or produce the asset and give it to B, and thereby become entitled—without B's consent being required—to the court-estimated value of *V*. Let $\hat{V}$ denote the court's estimate. Given our assumption that *V* is not verifiable and the court knows only the distribution of values, the court's estimate will equal the average value. There are two versions of the restitution rule, depending on the nature of this average. Under one version of the restitution rule, the R^P Rule, the court's estimate is based on the average value in the full population of buyers: $\hat{V} = E[\mu] = \overline{\mu}$. Under a second version of the restitution rule, the R^M Rule, the court's estimate is based on the average value in the subset of buyers who enter the market: $\hat{V} = E[\mu | \mu \in \Omega_B]$, where Ω_B represents the subset of buyers who enter the market.

With imperfect information, there will be sometimes reason for the parties to bargain. Having a "pricing" rule does not prohibit bargaining, it simply gives one of the parties an option to act unilaterally. In the event that bargaining takes place, it will be assumed that S makes a take-it-or-leave-it offer with probability θ and B makes a take-it-or-leave-it-offer with probability $1-\theta$, with $\theta \in [0,1]$. The presence of the unilateral option, however, will affect what will happen if bargaining fails and thus will shape the outcome. Specifically, when the party without the option, B, makes the take-it-or-leave-it offer, the position of the party with the option, S, is unambiguously improved by the existence of the option. On the other hand, when S makes the take-it-or-leave-it offer the existence of the option may either improve or worsen the position of S, if he cannot commit to give up the option. We will assume that such a commitment is impossible to make. The analysis is qualitatively similar under the alternative assumption, and the welfare costs under the restitution rule only increase.

We compare the restitution rule to the Mutual Consent Rule (MC Rule). This is the familiar rule under which an asset will be transferred, or produced and transferred, in exchange for a payment by B, *if and only if* both parties agree for this to happen. To enforce this rule courts need to be able to verify only whether transfer and payments occur and whether mutual consent was given. We assume that courts have the requisite information. Under the mutual consent rule, if the parties meet, it will be assumed, as before, that S can make a take-it-or-leave-it offer with probability θ and B can make such an offer with a probability $1-\theta$. Accordingly, if a positive surplus W exists, S will make an expected gain of θW and B will make an expected gain of $(1-\theta)W$.

2.5. T = 2: Final Payoffs

If an exchange does not take place at T = 1, then B does not receive the asset and S receives C, the use-value of his asset or cost-saving from not having to produce a new asset. For convenience, we normalize the resulting payoffs to zero. Under the restitution rule, even when an exchange does not take place B might still be forced to "bribe" S not to impose an inefficient exchange. Let π denote the amount of the bribe. Accordingly, B's payoff will be $W_B = -\pi$, and S's payoff will be $W_S = \pi$.

If an exchange takes place, B will pay S a price π and obtain the asset. In this case, B will use the asset at T = 2 and obtain *V*. B's payoff will be $W_B = V - \pi$. Correspondingly, S's payoff will be $W_S = \pi - C$. Of course, W_B and W_S must add up to *W* – the total social surplus (if any) from the exchange both when an exchange takes place ($W > 0$, $W_B + W_S = W > 0$) and when an exchange does not take place ($W = 0$, $W_B + W_S = 0$).

3. Discouraging Buyer Entry

It is socially desirable for buyers to enter the market if the value they obtain from the asset exceeds the seller's cost. That is, buyers should enter the market if and only if $\mu > C$. This efficient outcome obtains under the mutual consent rule. Under the restitution rule, low-valuation buyers expect to lose from an exchange and thus do not enter the market, leading to a welfare loss. To focus on buyers' entry decisions, we assume that the homogeneous sellers enter the market.[7]

Buyers' entry decisions under the restitution rule and the resulting welfare loss are stated in the following proposition.

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[7] In terms of the model's parameters, we are assuming that $C < \mu_{\max}$. This assumption guarantees that even sellers with $q = 0$ have a chance to generate a positive surplus ($q + \mu > C$)—a chance that would materialize when they meet a buyer with $\mu = \mu_{\max}$.

Proposition 1: *The restitution rule will deter some buyers with* $\mu > C$ *from entering the market. In particular—*

(a) Under the R^P *Rule, when the court's estimate is based on the average value in the full population of buyers, then in equilibrium buyers with* $\mu \in [C, \overline{\mu}]$ *will not enter the market, leading to a welfare loss of* $\Delta W = \int_C^{\overline{\mu}} (\mu - C) f(\mu) d\mu$, *as compared to the MC Rule.*

(b) Under the R^M *Rule, when the court's estimate is based on the average value in the subset of buyers who enter the market, then in equilibrium only buyers of the highest type,* $\mu_{\max}$, *enter the market, and the market effectively collapses. The resulting welfare loss, as compared to the MC Rule, is* $\Delta W = \int_C^{\mu_{\max}} (\mu - C) f(\mu) d\mu$**.**

Proof:

(a) We show that only buyers with $\mu > \overline{\mu}$ earn a positive payoff and enter the market. Given the assumption that $\overline{\mu} > C$, there are three cases:

Case I: $\mu < C < \overline{\mu}$. In this case, $W_B = -[(1-\theta)\cdot(\overline{\mu} - C) + \theta \cdot (\overline{\mu} - \mu)]$ or, after some rearranging, $W_B = -[(1-\theta)\cdot(\mu - C) - (\mu - \overline{\mu})]$. Since $\hat{V} = \overline{\mu} > C$, $(\mu - C) - (\mu - \overline{\mu}) > 0$, which also implies $(1-\theta)\cdot(\mu - C) - (\mu - \overline{\mu}) > 0$ (since $\mu < C$). Therefore, $W_B < 0$.

Case II: $C < \mu < \overline{\mu}$. In this case, $W_B = \mu - \overline{\mu} < 0$.

Case III: $C < \overline{\mu} < \mu$. In this case, $W_B = \mu - \overline{\mu} > 0$.

Since only buyers with $\mu > \overline{\mu}$ enter the market, social welfare equals $W^R = \int_{\overline{\mu}}^1 (\mu - C) f(\mu) d\mu$.

The welfare loss is:

$$\Delta W = \int_C^1 (\mu - C) f(\mu) d\mu - \int_{\overline{\mu}}^1 (\mu - C) f(\mu) d\mu = \int_C^{\overline{\mu}} (\mu - C) f(\mu) d\mu .$$

(b) Let $\overline{\mu}^M$ denote the average value among buyers who enter the market. Generalizing from part (a), $W_B(\mu) > 0$ if and only if $\mu > \overline{\mu}^M$. In equilibrium, $\overline{\mu}^M = E[\mu | \mu > \overline{\mu}^M]$. This condition is only satisfied when $\overline{\mu}^M = \mu_{\max}$ and only buyers of the highest type, $\mu_{\max}$, enter the market. The welfare loss: $\Delta W = \int_C^{\mu_{\max}} (\mu - C) f(\mu) d\mu$. ■

Remark: The intuition for this result is as follows:

(a) Under the R^P Rule, buyers with below-average valuations expect to earn a negative payoff and do not enter the market. Buyers with $C < \mu < \overline{\mu}$ anticipate a positive surplus, but expect to pay a price—equal to the court's estimate, $\overline{\mu}$—that is higher than their valuation. Buyers with $\mu < C < \overline{\mu}$ anticipate a negative surplus and expect to pay a bribe to avoid the inefficient transaction.

(b) Under the R^P rule, we obtained an equilibrium where only above-average buyers, i.e., buyers with $\mu > \overline{\mu}$ enter. This is not an equilibrium under the R^M Rule, because under this rule the court's estimate will adjust upward to reflect the higher average valuation among entering buyers. This upward adjustment stops only when the average valuation in the market equals the valuation of the highest-type buyer, $\mu_{\max}$. This market unraveling resembles the unraveling result obtained in Akerlof (1970). Interestingly, however, while Akerlof's unraveling was the result of asymmetric information between buyers and sellers, the unraveling in our model follows from the court's imperfect information. (Buyers and sellers both have symmetric and complete information in our model.)

4. Encouraging Entry by Low-Quality Sellers

We now introduce seller heterogeneity. To focus attention on the supply-side effect of the restitution rule, we assume that buyers are homogeneous and normalize their valuation to zero, i.e., $\mu = 0$. The value of the asset to a buyer is now a function of seller-specific quality, $q \in [0, q_{\max}]$, i.e., $V = q$, where q represents the seller's type. We assume that the distribution of seller types is characterized by the probability density function, $k(q)$, and the corresponding cumulative distribution function, $K(q)$. Let $\overline{q}$ denote the average quality, i.e., $\overline{q} = \int_0^{q_{\max}} q k(q) dq$.

We assume that $\overline{V} = \overline{q} > C$, so that the average benefit to a buyer is greater than the cost to a seller. Under the R^P Rule, the court's estimate is $\hat{V} = E[q] = \overline{q}$. Under the R^M Rule, the court's estimate is $\hat{V} = E[q | q \in \Omega_S]$, where Ω_S represents the subset of sellers who enter the market.

From a social welfare perspective, low-quality sellers who cannot possibly generate a positive surplus should not enter the market. In particular, sellers with $q < C$ should not enter the market.[8] Indeed, under the mutual consent rule these low-quality sellers choose not to enter the market. Not so under the restitution rule. We focus on sellers' entry decisions, but it can be shown that the homogeneous buyers will enter the market.

Sellers' entry decisions under the restitution rule and the resulting welfare loss are stated in the following proposition.

Proposition 2: *The restitution rule will induce sellers with $q < C$ to enter the market, leading to a welfare loss of $\Delta W = \frac{K(C)}{1-K(C)} \int_C^1 (q-C)k(q)dq$, as compared to the MC Rule.*

Proof:

We show that all sellers earn a positive payoff and enter the market. Given the assumption that $\overline{q} > C$, there are three cases:

Case I: $q < C < \overline{q}$. In this case, $W_S = (1-\theta)\cdot(\overline{q} - C) + \theta \cdot (\overline{q} - q)$ or, after some rearranging, $W_S = (1-\theta)\cdot(q - C) - (q - \overline{q})$. Since $\hat{V} = \overline{q} > C$, $(q-C)-(q-\overline{q}) > 0$, which also implies $(1-\theta)\cdot(q-C)-(q-\overline{q}) > 0$ (since $q < C$). Therefore, $W_S > 0$.

Case II: $C < q < \overline{q}$. In this case, $W_S = \overline{q} - C > 0$.

Case III: $C < \overline{q} < q$. In this case, $W_S = \overline{q} - C > 0$.

Since all sellers enter the market, social welfare equals $W^R = \int_0^1 \max(q-C,0)k(q)dq = \int_C^1 (q-C)k(q)dq$. The welfare loss is:

$$\Delta W = \frac{1}{1-K(C)} \int_C^1 (q-C)k(q)dq - \int_C^1 (q-C)k(q)dq = \frac{K(C)}{1-K(C)} \int_C^1 (q-C)k(q)dq. \quad \blacksquare$$

Remark: The intuition for this result is as follows: Under the restitution rule, low-quality sellers expect to extract bribes from buyers who wish to avoid inefficient exchanges and thus enter the market (this occurs under both versions of the restitution rule, the R^P Rule and the R^M Rule). When low-quality sellers enter the market, the average value of an exchange is reduced. This results in a welfare loss.[9]

5. Buyer Heterogeneity and Seller Heterogeneity Combined

We now study a general model that includes both buyer heterogeneity and seller heterogeneity. We show that the two welfare costs identified in the preceding sections remain in the general model. In this model the value of the asset to a buyer is $V = q + \mu$, where q and μ are follow the distributions defined in the preceding sections. We assume that $\overline{V} = \overline{q} + \overline{\mu} > C$, namely, that the average benefit to a buyer is greater than the cost to a seller. Under the R^P Rule, the court's estimate is $\hat{V} = E[q + \mu] = \overline{q} + \overline{\mu}$. Under the R^M Rule, the court's estimate is $\hat{V} = E[q + \mu | q \in \Omega_S, \mu \in \Omega_B]$, where Ω_S and Ω_B represent the subsets of sellers and buyers, respectively, who enter the market.

From a social welfare perspective, buyers with $\mu > \mu_{\min} = \max(C - q_{\max}, 0)$ who can participate in an efficient exchange should enter the market, and sellers with $q < q_{\min} = \max(C - \mu_{\max}, 0)$ who cannot possibly generate a positive surplus should not enter the market. These efficient outcomes obtain under the mutual consent rule, but not under the restitution rule.

The parties' entry decisions under the restitution rule and the resulting welfare loss are stated in the following proposition.

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[8] If the highest-quality seller has unlimited capacity, then in the first-best only the highest-quality seller should enter the market.

[9] Legal doctrine tries to minimize this problem by imposing implied warranties on sellers. An implied warranty can be viewed as a minimal quality, $\underline{q}$, that sellers must provide. Such a rule presumes, however, that courts can verify quality or, at least, verify that quality is below the $\underline{q}$ threshold. We assume that quality is not verifiable. Alternatively, if courts can verify that quality is below the $\underline{q}$

Proposition 3: *Under the restitution rule, buyers who could participate in efficient exchanges will not enter the market and sellers who cannot create a positive surplus will enter the market. In particular—*

(a) Under the R^P *Rule, when the court's estimate is based on the average value in the full population of buyers, then in equilibrium all sellers will enter the market and buyers with* $\mu \in [\mu_{\min}, \hat{\mu}^P]$ *will not enter the market, where* $\hat{\mu}^P$ *satisfies* $\hat{\mu}^P = \overline{\mu} + \Pr(q < C - \hat{\mu}^P) \cdot E[(1-\theta) \cdot (q + \hat{\mu}^P - C) | q < C - \hat{\mu}^P]$.

(b) Under the R^M *Rule, when the court's estimate is based on the average value in the subset of buyers who enter the market, then in equilibrium all sellers will enter the market and buyers with* $\mu \in [\mu_{\min}, \hat{\mu}^M]$ *will not enter the market, where* $\hat{\mu}^M \geq \hat{\mu}^P$. *When* $C < \mu_{\max}$, *only buyers of the highest type,* $\mu_{\max}$, *enter the market, and the market effectively collapses.*

(c) The welfare loss, as compared to the MC Rule, is $\Delta W^i = \Delta W_1 + \Delta W_2^i$, *where:* $\Delta W_1 = \frac{K(q_{\min})}{1 - K(q_{\min})} \int_{\mu_{\min}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu$ *represents the welfare loss from inclusion of low-quality sellers, and* $\Delta W_2^i = \int_{\mu_{\min}}^{\hat{\mu}^i} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu$, *with* $i \in \{P, M\}$, *represents the welfare loss from exit by low-valuation buyers. Since* $\hat{\mu}^M \geq \hat{\mu}^P$, $\Delta W^M \geq \Delta W^P$.

Proof: See Appendix.

Remark: The intuition for this result is as follows:

(a) The result reflects the two effects identified in propositions 1 and 2: low-quality sellers inefficiently enter the market and low-valuation buyers inefficiently decide not to enter the market. An interaction between these two effects should also be noted: entry by low-quality sellers reduces a buyer's expected payoff from a meeting with a seller, thus increasing the restitution rule's inefficient deterrence of entry by low-valuation buyers.

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threshold but cannot verify the exact quality level above the threshold, then our results apply in the $[\underline{q}, q_{\max}]$ range.

(b) As in proposition 1, when the court's estimate is based on the average value in the subset of buyers who enter the market more buyers are deterred from entering the market. However, unlike in proposition 1 it is not always the case that only the highest-valuation buyers enter. The reason is that low-valuation buyers may meet sellers with very high quality and receive a positive payoff. When there are enough high-quality sellers, this reduces the magnitude of the entry deterrence effect under the restitution rule.

(c) The welfare loss under the restitution rule reflects the two adverse effects identified in propositions 1 and 2. The supply-side inefficiency is identical under both the R^P Rule and the R^M Rule. The demand-side inefficiency is larger under the R^M Rule. Accordingly, the overall inefficiency is larger under the R^M Rule.

6. Extensions

6.1. Other Pricing Rules

The preceding analysis focused on the restitution rule and compared this rule to the prevailing mutual consent rule. We chose to focus on the restitution rule because it stands as a real-world alternative to the mutual consent rule, at least under certain conditions. The restitution rule, however, is only one example of a pricing rule, i.e., a rule that gives the seller a put option to force the sale of a good or service at a court-determined price. Under the restitution rule the option's exercise price equals the (average) benefit to the buyer. But rules setting different exercise prices can be easily imagined.

Our model can be extended to study a generic pricing rule with a court-determined exercise price of P. The results stated in proposition 3 for the R^P Rule, which were derived assuming that the court sets an exercise price equal to $\bar{q}+\bar{\mu}$, can be readily generalized to any court-determined exercise price P.[10] We assume $P > C$, otherwise the pricing rule is effectively identical to the mutual consent rule. This generalization is summarized in the following corollary.

[10] There is no meaning to the second version of the restitution rule, the R^M Rule, when the exercise price does not equal the average value of the asset. If P is set equal to some multiple of the average value, then there can be meaning to a version of the R^M Rule, and the results stated in proposition 3 for the R^M Rule could be generalized.

Corollary 1: *Under a general pricing rule with an exercise price P, buyers who could participate in efficient exchanges will not enter the market and sellers who cannot create a positive surplus will enter the market. In particular—*

(a) All sellers will enter the market and buyers with $\mu \in [\mu_{\min}, \hat{\mu}(P)]$ *will not enter the market, where* $\hat{\mu}(P)$ *satisfies* $\hat{\mu}(P) = P - \overline{q} + \Pr(q < C - \hat{\mu}(P)) \cdot E[(1-\theta)\cdot(q + \hat{\mu}(P) - C) | q < C - \hat{\mu}(P)]$, *and* $\hat{\mu}'(P) > 0$.

(b) The welfare loss, as compared to the MC Rule, is $\Delta W(P) = \Delta W_1 + \Delta W_2(P)$, *where:* $\Delta W_1 = \frac{K(q_{\min})}{1-K(q_{\min})} \int_{\mu_{\min}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu$ *represents the welfare loss from inclusion of low-quality sellers, and* $\Delta W_2(P) = \int_{\mu_{\min}}^{\hat{\mu}(P)} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu$ *represents the welfare loss from exit by low-valuation buyers. The welfare loss is increasing in P, i.e.,* $\Delta W'(P) > 0$.

Remark: The proof of this result is a straightforward generalization of the proof of proposition 3 and is therefore omitted. Similarly, the intuition for this result is identical to the intuition provided for the result stated in proposition 3. The two adverse effects of the restitution rule exist under the general pricing rule. The magnitude of these adverse effects is increasing in the price *P*, since a higher exercise price increases the value of the seller's put option. The adverse effects disappear only when *P* < *C*, but then the pricing rule effectively converges to the mutual consent rule.

6.2. The Seller Compensation Rule

We now turn to examine the seller compensation rule which is essentially the mirror image of the restitution rule. The symmetry between the restitution rule and the seller compensation rule can be demonstrated as follows. Under the restitution rule the seller has an option to sell at the court-determined exercise price (a put option). Under the seller compensation rule the buyer has an option to buy/take at the court-determined exercise price (a call option). Under the restitution rule the exercise price is equal to the court's best estimate of the benefit to the buyer. Specifically, we assumed that this benefit has a seller-specific component, quality (*q*), and a buyer-specific component, idiosyncratic valuation (μ). Given the court's imperfect information, its estimate equals the average benefit.

Under the seller compensation rule the exercise price is equal to the court's best estimate of the cost to the seller. This cost clearly has a seller-specific component. It can also have a buyer-specific component. Focusing on the exchange of goods and services, a buyer specific component exists when the buyer can force the seller to produce and deliver a good or a service according to the buyer's specification. In addition, the presence of a buyer-specific component is evident when we extend the analysis to the taking of more general entitlements, e.g., when a polluting factory "takes" a resident's entitlement to clean air—perhaps the most commonly-studied real-world case where the seller compensation rule is applied. In such a case, the extent by which the resident-seller's entitlement is infringed upon—the extent of the harm to the resident-seller—generally depends on characteristics of the factory-buyer.

It should now be clear that the ex ante distortions identified in our analysis of the restitution rule have immediate equivalents under the seller compensation rule. Under the restitution rule, low-valuation buyers would inefficiently choose not to enter the market, potentially leading to the collapse of the market. Similarly, under the seller compensation rule, high-cost sellers would inefficiently decide not to enter the market, potentially leading to the collapse of the market. And, under the restitution rule low-quality sellers would inefficiently enter the market. Similarly, under the seller compensation rule, buyers with high-cost demands or takers that significantly infringe upon a seller's entitlement would inefficiently enter the market.

7. Conclusion

In this paper we provide an efficiency rationale for limiting the scope of the restitution rule to a narrow set of cases as the law does. Focusing on ex ante effects, we show that use of the rule in standard settings would lead to inefficient entry by low-quality sellers and discourage efficient entry by some or all potential buyers. Our analysis justifies the limited scope of the restitution rule and cautions against expansion of the rule's domain of application as urged by some legal scholars. Our analysis and its normative implications extend to a broad category of pricing rules, including both seller-option (put option) rules and buyer-option (call option) rules.

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Appendix

Proof of Proposition 3:

(a) We first show that $\forall q \quad E[W_S|q] > 0$, and thus all sellers enter the market. Given the assumption that $\bar{q} + \bar{\mu} > C$, there are three cases depending on the relative magnitudes of the actual exchange value, $q + \mu$, the court's estimate of the exchange value $\hat{V} = \bar{q} + \bar{\mu}$, and the cost of production (or transfer) to the seller, *C*:

Case I: $q + \mu < C < \bar{q} + \bar{\mu}$ (or $\mu < C - q$). In this case, $W_S = (1-\theta)\cdot(\bar{q} + \bar{\mu} - C) + \theta \cdot (\bar{q} + \bar{\mu} - q - \mu)$ or, after some rearranging, $W_S = (1-\theta)\cdot(q + \mu - C) - (q + \mu - \bar{q} - \bar{\mu})$. Since $\hat{V} = \bar{q} + \bar{\mu} > C$, $(q + \mu - C) - (q + \mu - \bar{q} - \bar{\mu}) > 0$, which also implies $(1-\theta)\cdot(q + \mu - C) - (q + \mu - \bar{q} - \bar{\mu}) > 0$ (since $q + \mu < C$). Therefore, $W_S > 0$.

Case II: $C < q + \mu < \bar{q} + \bar{\mu}$ (or $C - q < \mu < \bar{q} - q + \bar{\mu}$). In this case, $W_S = \bar{q} + \bar{\mu} - C > 0$.

Case III: $C < \bar{q} + \bar{\mu} < q + \mu$ (or $\mu > \bar{q} - q + \bar{\mu}$). In this case, $W_S = \bar{q} + \bar{\mu} - C > 0$.

Therefore: $\forall q \quad E[W_S|q] > 0$, and all sellers enter the market.

We next show that a buyer's expected payoff from an encounter with a seller is monotonically increasing in μ, and that there exists a threshold buyer type $\hat{\mu} < \bar{\mu}$ such that high-valuation buyers, i.e., buyers with $\mu > \hat{\mu}$ gain from an exchange: $E[W_B|\mu > \hat{\mu}] > 0$, buyers with $\mu = \hat{\mu}$ break even: $E[W_B|\mu = \hat{\mu}] = 0$, and low-valuation buyers, i.e., buyers with $\mu < \hat{\mu}$, lose from an exchange: $E[W_B|\mu < \hat{\mu}] < 0$. Again, there are three cases:

Case I: $q + \mu < C < \bar{q} + \bar{\mu}$ (or $q < C - \mu$). In this case, $W_B = -[(1-\theta)\cdot(\bar{q} + \bar{\mu} - C) + \theta \cdot (\bar{q} + \bar{\mu} - q - \mu)]$ or, after some rearranging, $W_B = -[(1-\theta)\cdot(q + \mu - C) - (q + \mu - \bar{q} - \bar{\mu})]$.

Case II: $C < q + \mu < \bar{q} + \bar{\mu}$ (or $C - \mu < q < \bar{q} + \bar{\mu} - \mu$). In this case, $W_B = q + \mu - \bar{q} - \bar{\mu} < 0$.

Case III: $C < \bar{q} + \bar{\mu} < q + \mu$ (or $q > \bar{q} + \bar{\mu} - \mu$). In this case, $W_B = q + \mu - \bar{q} - \bar{\mu} > 0$.

The expected payoff of a type-μ buyer is:

$$E[W_B|\mu] = \Pr(q < C - \mu)\cdot E[-[(1-\theta)\cdot(q + \mu - C) - (q + \mu - \bar{q} - \bar{\mu})]|q < C - \mu] +$$
$$+ \Pr(q > C - \mu)\cdot E[q + \mu - \bar{q} - \bar{\mu}|q > C - \mu] =$$
$$= \mu - \bar{\mu} + \Pr(q < C - \mu)\cdot E[-(1-\theta)\cdot(q + \mu - C)|q < C - \mu]$$
$$\frac{\partial E[W_B|\mu]}{\partial \mu} = 1 - (1-\theta)K(C - \mu) > 0$$

Define $\hat{\mu}$ such that $E[W_B|\mu = \hat{\mu}] = 0$ or $\hat{\mu} = \bar{\mu} + \Pr(q < C - \hat{\mu})\cdot E[(1-\theta)\cdot(q + \hat{\mu} - C)|q < C - \hat{\mu}]$.

Since $\frac{\partial E[W_B|\mu]}{\partial \mu} > 0$, we have: $E[W_B|\mu < \hat{\mu}] < 0$ and $E[W_B|\mu > \hat{\mu}] > 0$.

Note that $\hat{\mu} \le \bar{\mu}$.

(b) All sellers enter under the R^M Rule as they did under the R^P Rule and based on the same analysis provided for the R^P Rule in part (a).[11]

Buyers' entry decisions are characterized by a threshold value $\hat{\mu}$. To find the threshold value under the R^M Rule, $\hat{\mu}^M$, we return to the expected payoff function from part (a): $E[W_B|\hat{\mu}] = \hat{\mu} - \overline{\mu} + \Pr(q < C - \hat{\mu}) \cdot E[-(1-\theta)\cdot(q + \hat{\mu} - C)|q < C - \hat{\mu}]$. Substituting the equilibrium condition $\overline{\mu}^M = E[\mu|\mu > \hat{\mu}^M]$ we obtain: $E[W_B|\hat{\mu}^M] = \hat{\mu}^M - E[\mu|\mu > \hat{\mu}^M] + A(\hat{\mu}^M)$, where $A(\hat{\mu}^M) = \Pr(q < C - \hat{\mu}^M) \cdot E[-(1-\theta)\cdot(q + \hat{\mu}^M - C)|q < C - \hat{\mu}^M]$.

When $C \le \mu_{\max}$, $\forall q \; q \ge C - \mu_{\max}$, which implies $A(\hat{\mu}^M) = 0$ and thus $E[W_B|\hat{\mu}^M] = \hat{\mu}^M - E[\mu|\mu > \hat{\mu}^M]$. Recalling that $\hat{\mu}^M$ is a threshold value, we have $E[W_B|\hat{\mu}^M] = 0$ or $\hat{\mu}^M = E[\mu|\mu > \hat{\mu}^M]$. This condition is satisfied iff $\hat{\mu}^M = \mu_{\max}$, i.e., iff only buyers of the highest type, $\mu_{\max}$, enter the market.

When $C \le \mu_{\max}$, then clearly $\hat{\mu}^M > \hat{\mu}^P$. It remains to show that $\hat{\mu}^M \ge \hat{\mu}^P$ also when $C > \mu_{\max}$. Let $EW_B^P(\mu) = \mu - \overline{\mu} + A(\mu)$ and $EW_B^M(\mu) = \mu - \overline{\mu}^M + A(\mu)$ denote the expected payoff functions under the R^P Rule and the R^M Rule, respectively. Note that $EW_B^P(\mu = 0) = -\overline{\mu} + A(0)$ and $EW_B^M(\mu = 0) = -\overline{\mu}^M + A(0)$. Since $\overline{\mu}^M \ge \overline{\mu}$, $EW_B^P(\mu = 0) < EW_B^P(\mu = 0)$, which implies $\hat{\mu}^M \ge \hat{\mu}^P$ (since $\partial EW_B^P / \partial\mu = \partial EW_B^M / \partial\mu = 1 + A'(\mu) = 1 - (1-\theta)K(C - \mu)$).

(c) Since all sellers enter the market and only buyers with $\mu > \hat{\mu}$ enter the market, social, welfare equals

$$W^R = \int_{\hat{\mu}}^{\mu_{\max}} \int_{0}^{q_{\max}} \max(q + \mu - C, 0) k(q) f(\mu) dq d\mu = \int_{\hat{\mu}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu .$$

The welfare loss is: $\Delta W = \Delta W_1 + \Delta W_2$,[12] where:

$$\Delta W_1 = \frac{1}{1 - K(q_{\min})} \int_{\mu_{\min}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu - \int_{\mu_{\min}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu =$$

$$= \frac{K(q_{\min})}{1 - K(q_{\min})} \int_{\mu_{\min}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu$$

$$\Delta W_2 = \int_{\mu_{\min}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu - \int_{\hat{\mu}}^{\mu_{\max}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu =$$

$$= \int_{\mu_{\min}}^{\hat{\mu}} \int_{q_{\min}}^{q_{\max}} (q + \mu - C) k(q) f(\mu) dq d\mu$$

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[11] The analysis in part (a) relied on the court's value estimate being above *C*, i.e., $\hat{V} > C$ (in part (a) the court's value estimate was $\overline{q} + \overline{\mu}$, but the same analysis applies to any value estimate above *C*). The court's estimate is above *C* under the R^M Rule.

[12] Clearly $\Delta W_1 \ge 0$. And $\Delta W_2 \ge 0$, since $\hat{\mu} \ge \mu_{\min}$ (it can be readily shown that $\hat{\mu} \ge \mu_{\min}$).