Price Discrimination with Contract Terms: The Lost Volume Problem

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Abstract. In a common commercial pattern, the seller of a standard product contracts with one buyer and then sells to another at the contract price after the initial buyer breaches. Sellers argue, and courts largely agree, that the seller could have served the contract buyer as well as the later buyer; hence, the seller is entitled to retain a down payment to the extent of, or sue to recover, the profit – price less cost – that it would have realized on the initial sale had that sale been completed. Some courts and many scholars disagree, arguing that resale of the contract product at the contract price is fully compensatory; consequently, the seller is not entitled to damages. In this paper, we show that sellers in these "lost volume" contexts may use non-refundable down payments and later transaction prices in an attempt to practice second degree price discrimination. Sellers select among combinations of low down payment and high transaction price – which maximize the number of contracts as these serve low-value buyers, who are relatively unlikely to trade and pay the transaction price but who would be deterred by a significant down payment – and combinations of high down payment and low transaction price – which maximize the likelihood of transaction given a contract and serve high value buyers, who are relatively undeterred by a high down payment as they expect to benefit from increased trade at the low transaction price. These disparate preferences sometimes enable sellers to induce separation among the buyers by offering contracts that differ in their down payment/transaction price combinations. As a positive matter, we identify a form of price discrimination that does not require the seller to vary either the quantity or the quality of goods sold to an individual buyer. As a normative matter, we argue that a rule enforcing price discrimination contracts – i.e., restricting sellers to retention only of the down payment – is preferable to any mandatory rule on the treatment of liquidated damages as well as to the current majority default rule, which permits sellers to recover lost profits when they exceed the down payment, or the current minority default rule, which permits sellers to recover nothing.

1. Introduction

1.1 The problem

This paper addresses a vexing problem in contract damages. A buyer agrees to purchase a product for the price *P* and later reneges. The seller resells the product for *P*. Putting the additional selling cost aside, does the seller have a damages remedy?

The applicable statute – the Uniform Commercial Code, or "UCC" – is unclear. Under §2-708(1), when the buyer breaches, the seller is entitled to the difference between the contract price and the market price, but that difference is zero. Section 2-706 awards the seller the difference between the contract price and the price at which it later resells, but that difference also is zero. On the other hand, §2-708(2) permits the seller to recover a profit that breach caused it to lose, and the seller could thus retain any down payment to the extent of such lost profit.[1] Does the seller lose a profit when it resells the contract goods at the contract price?

There are four positions in the cases and the scholarly literature, which rest on different assumptions about the relevant market:

A. The unlimited supply view: On this view, if the seller has an unlimited supply of goods at a constant cost it could make an infinite number of sales. It follows that the seller could have served both the buyer who breached and the buyer who later appeared. Breach thus caused

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[1]The contracts in lost volume cases commonly require down payments, which the seller attempts to retain. The existence of a down payment does not affect the legal issue. Section 2-718(2) of the UCC allows a seller to retain the lesser of $500 or 20% of the contract price without having to prove damages, but since actual down payments often are considerably larger than this, the seller must show that §2-708(2) authorizes a damage recovery. The seller also could claim that the down payment constituted liquidated damages, per §2-718(1), but a liquidated damage clause must reflect a reasonable estimate of the harm a party would suffer from breach. If the seller is deemed not to have lost a profit, its harm would predictably be zero, so the down payment would be stricken as an unenforceable penalty. Hold

the seller to lose one profit. This is the majority view in the cases when the seller is a retailer whom the manufacturer does not ration.[2]

B. The competitive market view: A firm can sell everything it produces, but maximizes profits by increasing output until marginal revenue – the market price – equals marginal cost. Denote the profit maximizing output as q_c^*. If a buyer breaches, the seller will replace the buyer with another, in order to sell q_c^*. As a consequence, the seller's output is invariant to breach, so it has not lost a profit. Or, to say the same thing, the profit to the seller of a marginal sale is zero and so no profit is lost when a buyer breaches.[3]

C. The myopic monopolist view: A monopolist seller serves the entire market and can profitably sell to the marginal buyer. Hence, it incurs a loss when the market shrinks. The monopolist thus loses a profit.

D. The sophisticated monopolist view: A monopolist seller anticipates the number of breaches, which is assumed to be exogenous to the damages remedy. Let P_d be the price the seller would charge in a regime that awarded lost profit damages and let c be the seller's marginal cost. Assume that of the N buyers in the market who would contract for the sale of

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[2]Farnsworth (2004) (at 773) summarizes the decisions: "Many courts have allowed the lost volume supplier to recover damages for breach of the first contract with no reduction as a result of the second contract." The same conclusion is in Calamari and Perillo (2003) §14.23. Perhaps the most famous case is Neri v. Retail Marine Corp., 30 N.Y. 2d 393, 285 N.E.2d 311 (1972), where the court said: "If the dealer has an inexhaustible supply of cars, the resale to replace the breaching buyer costs the dealer a sale, because, had the breaching buyer performed, the dealer would have made two sales instead of one. The buyer's breach, in such a case, depletes the dealer's sales to the extent of one, and the measure of damages should be the dealer's profit on one sale." The court went on to hold that the typical retailer "has an inexhaustible supply."

[3]This view has been in the literature for a long time. See Comment, Chicago Kent Law Review (1973); Speidel and Clay (1972).

goods in the relevant period, $n < N$ will breach. Thus, the breach probability is $n/N = \pi < 1$. If

the seller could not recover lost profit damages, it would raise its price to P_{nd} , where P_{nd} solves

$$P_{nd} - c = \frac{P_d - c}{1 - \pi}$$. That is, the seller would gross up the nominal price to cover the

profit that breach would cause it to lose; and the buyers, who would pay no damages in the event

of breach, would accept this nominally higher price. On this approach, therefore, although a

seller does lose a sale when a buyer breaches, it does not meaningfully lose a profit because the

loss is anticipated.[4]

    None of these positions has carried the day among the scholars.[5] There also are

dissenting cases.[6] Thus, there is room for a new approach.

    1.2. Our approach

    Prior work used neoclassical tools to analyze the lost volume problem. These tools are

inapposite for two reasons. First, neoclassical markets clear instantaneously, so neoclassical

analysis is poorly suited to explain breach, which occurs when conditions change between the

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[4]A number of scholars hold the view that naive monopolists will lose profits, but that these losses are moderated, or vanish, as the monopolist comes to have rational expectations. See Scott (1990); Goldberg (1984); Goetz and Scott (1979).

[5]Some authors believe that sellers should be partly or totally restricted from recovering lost profits on fairness grounds, especially when the buyers are individual consumers. See Breen (1996); Cooter and Eisenberg (1985).

[6]See R.E. Davis Chem. Corp. v. Diasonics, Inc., 826 F.2d 678 (7th Cir. 1987) (applying the competitive market view); Scullin Steel Co. v. PACCAR Inc., 748 S.W.2d 910 (Mo. App. 1988)(same).

time of contract and the time for performance. Second, neoclassical analysis focuses on markets

(and production functions) rather than contracts. Contract law, however, holds that the remedies

for breach "shall be liberally administered to the end that the aggrieved party may be put in as

good a position as if the other party had fully performed ...."[7] A court cannot effectively pursue

this end without understanding how the seller's contract was meant to function.

Thus, we ask what contracts parties would write to sell the standard goods that appear in

lost volume cases, and when buyers would fail to comply with these contracts. The seller cannot

lose a profit in a purely competitive market under any contract because, consistent with the

"competitive market view" described above, this seller is indifferent to its marginal sale, which

provides it no profit. To make the problem interesting, then, we assume that the seller has

market power. This assumption does not imply that sellers are free from competition. Even

workably competitive markets seldom behave in the ideal fashion that textbooks describe as

perfect competition. Rather, sellers often face downward sloping demand curves, in

consequence of either location or product differentiation, and they may be able to use this market

power to price above marginal cost. Markets with such sellers are "monopolistically

competitive".[8] Such markets are common in the retail industry. Therefore, the issue is what

contract a seller with market power would write.

We treat the seller's problem as a form of second degree price discrimination. We begin

with the plausible assumptions that buyer valuations for a product differ and are private

information. The seller's object is to extract as much of the surplus from trade as it can by

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[7]UCC §1-106.

[8]See Butters (1977) for an analysis.

charging different prices to buyers with different valuations. In the usual price discrimination model, the seller offers a menu of contracts that differ in either the quantity or the quality dimension. Higher valuing buyers are willing to pay higher prices for more or better quality goods while lower valuing buyers are not. The buyers thus will (partly) separate themselves by their choice from the menu of contracts the seller offers.[9]

Discrimination on the basis of quantity or quality may be unavailable to the seller in the lost volume context. Buyers commonly purchase one unit or none and the goods appear to be similar in the quality dimension. In the model below, two factors permit the seller to practice second degree price discrimination. First, the likelihood that a buyer will complete a trade is a function of the buyer's valuation. We assume that a buyer may experience an exogenous shock in the interim between making a contract to purchase and when the sale is to be concluded. An experienced shock will either increase the buyer's valuation (a positive shock) or decrease the buyer's valuation (a negative shock). In the event of a negative shock, a contract buyer might breach; the probability of such breach is greater the lower the buyer's initial valuation.

To introduce the second factor, realize that a seller need not charge a single price; rather, the seller can specify a portion of the total contract price the buyer will pay whether or not the buyer ultimately purchases the contractual goods and an additional portion that the buyer will pay only if it chooses to purchase. We assume here that the seller requires a nonrefundable deposit – a down payment – from each buyer who enters a contract, and then later charges an additional transaction price to buyers that trade. This assumption is consistent with the transaction pattern in the reported cases, and is also made to clarify thought. Although part 4 of

[9]For a discussion, see Bolton and Dewatrapont (2005), Chapter 2.

this paper discusses issues of down payments per se, nothing in our model turns on the presence of an actual down payment; the analysis would be identical if a seller collected no down payment but the contract instead specified damages in an amount equal to what we describe as the down payment. Thus, our analysis generally applies to the lost volume problem, even where that problem presents itself in the absence of a down payment.

Regarding that analysis, buyers whose initial valuations differ have different preferences over the relative size of the down payment and the transaction price. Buyers with low initial valuations dislike high down payments. These deter some low valuers from making contracts and cause others to forfeit more if they later fail to trade. In contrast, buyers with high valuations dislike high transaction prices because these buyers are more likely to conclude trades, and thus to pay the high prices. The seller can discriminate among buyers by varying the down payment and the transaction price.

The probability of breach in our model, therefore, is partly endogenous. Breach is a function of the buyer's initial valuation and the magnitude of its negative exogenous shock, but breach also is a function of the contract the seller offers. The greater the difference is between the required transaction price and the seller's cost, the less likely the buyer is to conclude a trade. In turn, as we show below, the relative magnitudes of the down payment and the transaction price are a function of the legal rule the courts adopt. The neoclassical approach in the prior literature supposed breach to be purely exogenous, and thus failed fully to appreciate how the contracts the law could induce will affect the buyer's behavior.

1.3 The judicial policy space

There is an efficiency aspect to the lost volume problem because the price discriminating contracts described above are inefficient in two dimensions. Ex ante, the positive down payment will prevent some low valuing buyers from contracting; a fraction of these buyers would later have traded at a price above the seller's marginal cost. Ex post, when transaction prices exceed the seller's marginal cost, some buyers whose valuations are above that cost but below the price will inefficiently breach.

To understand how contract law can affect efficiency, it is helpful to clarify the court's choices. Courts are not administrative agencies and so cannot regulate sellers to ensure efficient pricing. As we explain below, the optimal legal rule in any market may depend on the distribution of buyers by valuation type. A court could not analyze all buyers in the relevant industry and then derive the appropriate rule for that industry. Rather, the court realistically can respond to the form of second degree price discrimination analyzed here by choosing among one of three salient approaches. First, the court can enforce price discrimination contracts according to their terms. This response would permit the seller to recover only the down payment and thus would permit buyers otherwise to exit costlessly. Second, the court can permit the seller to recover its full profit – the difference between price and cost – when that profit is greater than the contractually required down payment. Third, the court can award no damages. This third response would force the seller to charge a single price because the seller could not keep the

down payment.[10] The lost volume problem thus can be concisely put: Which of these possible

policy responses should a court that wants to maximize social welfare adopt?

1.4 This paper's results

A. If the seller is constrained to offer a single contract to every buyer, it will choose a

"two part tariff": a contract that requires a positive down payment and a later transaction price,

rather than a "linear tariff", a contract with a single price. The down payment will be less than

the seller's full profit. Hence, if the down payment is viewed as a liquidated damages clause, the

seller under-liquidates. As a consequence, the transaction price will exceed cost. This contract

is ex ante inefficient because it prevents some low valuing buyers from making contracts, and it

is ex post inefficient because it produces excessive breach.

B. Casual empiricism suggests that sellers act as if they are constrained to offer single

contracts; two part tariffs are common but menus seem not to be seen in lost volume contexts.

Nevertheless, theory predicts that sellers will attempt to separate buyers with contract menus.

Virtually every contract in such a menu will be ex ante inefficient because it will require a

positive down payment and virtually every contract will be ex post inefficient because it will

require a transaction price that exceeds cost. Therefore, virtually every contract the court sees

will face the court with the lost volume problem.

C. When a court awards the seller its full profit, this profit becomes the effective down

payment because buyers must forfeit it if they fail to trade. The seller is then constrained to set a

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[10]A court could, of course, adopt variants of these positions, awarding half of lost profits, for example. But, as noted above and explained below, a court will lack the information intelligently to choose any mandatory rule and so nothing would be served by examining intermediate positions.

transaction price that equals cost. This court induced contract thus maximizes ex ante

inefficiency – it prevents the most low valuing buyers from contracting because the effective

down payment is so high – but it also maximizes ex post efficiency – all breaches are efficient.

D. When a court awards no damages at all, it imposes on the seller a linear tariff and so

the seller must exploit buyers with a single price. This court induced contract thus maximizes ex

ante efficiency – every buyer signs a contract – but also maximizes ex post inefficiency – the

high price induces the maximum number of buyers to breach inefficiently.

E. It is impossible to make a global efficiency ranking among the three contracts that

courts could induce. We argue, however, that courts should enforce the fully consensual price

discrimination contracts according to their terms. Because these contracts are consensual, they

yield the parties' more utility than would a rule that impeded trade between them. Although this

does not imply that a mandatory linear tariff or mandatory lost-profit remedy could not improve

the parties' joint utility, in the absence of evidence in particular cases it is better to realize the

welfare gain yielded by a consensual arrangement than to reject it in favor of speculative

efficiency gains under the other available judicial responses. In addition, sellers have an

incentive to minimize the inefficiency associated with the consensual contracts, consistent with

realizing monopoly profits. A menu of contracts that separated buyers by type could accomplish

such reductions in inefficiency. The other legal rules provide the seller no opportunity to

minimize inefficiency.

Part 2 below sets out a model that captures the essential features of the lost volume

problem. Part 3 solves the model to show that unconstrained sellers will screen over buyers by

offering contracts with two part tariffs. Part 4 analyzes the normative issues that these

consensual contracts and mandatory alternatives pose and extends our results to a discussion of default rules. Part 5 concludes by summarizing the results of the model and by offering an extension of those results. It argues that the court should treat a down payment of unspecified purpose as a cap on damages and it exhibits the relevance of our analysis to current debates about liquidated damage clauses and the unconscionability doctrine. Although this paper contains considerable formal analysis, we stress the intuition throughout.

2. A Second Degree Price Discrimination Model

.   A seller with market power offers an identical contract to each buyer at t^0 under which the buyer is to purchase one unit of a standard product. Delivery is scheduled for t^2; the market price does not change between t^0 and t^2. The buyer's expected t^2 value for the product, as of t^0, is v_1, which is distributed on G. At t^1, every buyer observes an increment to her expected value. This increment is v_2 with support $\{-v_1, +\infty\}$ and distribution of F. The seller knows the two value distributions, but a buyer's valuation is private information to her. The buyer decides whether to trade or not at t^2.

Every buyer who concludes a sale pays a total of P. A buyer must make a non-refundable payment of $D \geq 0$ when the contract is signed, and will then make a later payment $p \geq 0$ if she accepts delivery. Thus $P = D + p$. When D exceeds zero, we refer to it as a down payment and when p exceeds zero we refer to it as the unit, or transaction, price. A buyer who contracts will trade when her realized valuation exceeds the unit price: that is, the buyer completes the deal when $v_1 + v_2 > p$, or when $v_2 > p - v_1$. The seller produces at a constant marginal cost of c. Thus, the efficient transaction price is $p = c$. Regarding breach, in this model

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buyers trade when they have positive shocks because $p - v_1 < 0$. A buyer will breach when his shock is sufficiently negative.

We make three additional assumptions:

A_1: A buyer with a large negative shock will not accept delivery in order to resell the good. Buyers commonly are less efficient than sellers at making sales and providing post-sale services. Thus, a buyer either trades and realizes the positive payoff of value less price or breaches and realizes the negative payoff of $-D$. This assumption implies that the seller's market power will not be eroded by buyer entry.

A_2: Renegotiation at t^2 will not occur. Valuations remain private information so the seller never learns what $v_1 + v_2$ is for any buyer; rather, the seller learns only that this valuation exceeds the price for buyers who are willing to trade. These buyers would pay no more than the contractually enforceable transaction price. Since the down payment is sunk for both parties, however, the seller has an incentive later to reduce this price to sell to the lower valuing buyers. Should buyers anticipate this, every buyer may initially refuse to trade. We abstract from this "durable goods monopoly problem" for two reasons. First, it would complicate the analysis without yielding much additional insight. (In such a model, the expected transaction price would fall so the down payment would rise, but the seller still would use a two part tariff). Second, many sellers, especially retailers, effectively commit not to lower prices for contract buyers by eliminating the discretion of point of sale employees to alter prices. This strategy raises the costs to buyers of first breaching and then renegotiating the price.

A_3: We initially restrict the seller to one contract. There are two reason. First, the assumption apparently is realistic: Firms seldom seem to sell standard products with contract

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menus that offer different down payments and transaction prices. Second, the assumption is convenient. We begin by proving that the seller, if otherwise unconstrained, will prefer to offer a contract with a two part tariff, and with price that exceeds cost, rather than either a linear tariff or a contract with a price that equals cost. The economic reason for two part tariffs in this context and their inefficiencies can be shown by analyzing a single contract. We later relax the single contract assumption, and we then show that the seller, at least in theory, can offer buyers a menu of contracts, but every contract in the menu will have the same policy relevant features that the single contract has.

3. The Consensual Contract

3.1 Analysis of a single contract[11]

We begin with the assumption that while the model constrains the seller to use a single contract the law does not constrain the seller's choice of D or p. In this case, the seller maximizes revenue by the appropriate choice of these variables. If buyers are homogenous – each has the same ex ante valuation and the same probability of completing a trade – the solution to the seller's problem is straightforward and first-best efficient. The seller will set a transaction price that equals marginal cost, to maximize trade, and extract surplus through the down payment.[12] The seller's problem is more complex when buyers are heterogenous. In

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[11]Part 3.1 contains considerable mathematics. Readers unfamiliar with formal analysis can skip to Part 3.2, which discusses the intuition and its implications.

[12]The resultant D, and thus p, can yield first-best because every buyer contracts and all breaches are efficient. Compare Butters (1977).

analyzing this problem, it is helpful first to specify a potential buyer's expected gain from making a contract.[13] This is

$$(1) \quad -D + \int_{v_2 > p - v_1}^{\infty} (v_1 + v_2 - p) f(v_2) dv_2$$

The first term is the down payment, which the buyer makes when she signs a contract. The second term is the buyer's expected surplus from a completed sale, the realized surplus being $v_1 + v_2 - p$. The valuation of the marginal buyer solves (1) as an equality (the down payment just equals the expected gain from concluding a sale). We denote this marginal value as $\hat{v}_1(D,p)$.[14]

The seller's problem is clarified by first analyzing how buyers respond to changes in the down payment and transaction price. Letting $v_2 = x$ and $v = \hat{v}_1$, we rewrite (1) as

$$\varphi = \int_{v_2 > p - v_1}^{\infty} (v + x - p) f(x) dx - D$$

Then taking comparative statics,

$$\frac{\partial \varphi}{\partial p} = \int_{p-v}^{\infty} (-f(x) dx$$

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[13]We omit discount rates for convenience.

[14]Normalizing the buyer's utility to zero if she does not purchase, this marginal value becomes the buyer's participation constraint.

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$$\frac{\partial \varphi}{\partial v} = \int_{p-v}^{\infty} f(x)dx$$

$$\frac{\partial \varphi}{\partial D} = -1$$

By the implicit value theorem, $\dfrac{dv}{dp} = -[\dfrac{\partial \varphi}{\partial p} / \dfrac{\partial \varphi}{\partial v}] = 1$. Also,

$$\frac{dv}{dD} = -[\frac{\partial \varphi}{\partial D} / \frac{\partial \varphi}{\partial v}] = 1 / \int_{p-v}^{\infty} f(x)dx = 1/[1-F(p-v)].$$

That $\dfrac{dv}{dp} = 1$ implies that raising the unit price p by a dollar raises the critical value to

contract, $\hat{v}_1$, by a dollar. That $\dfrac{dv}{dD} > 1$ implies that when the seller raises the down payment by

a dollar, the critical value to contract increases by more than a dollar. Buyers are more sensitive

to an increase in the down payment than to an increase in the unit or transaction price: Every

consumer must make the down payment, but the later transaction price is paid only by buyers in

the upper tail of the distribution for v_2 (i.e., those with high realizations).

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It is now possible to state the seller's maximization problem. Buyers make contracts if their expected value for the product exceeds that of the marginal buyer. The probability that a buyer will have this valuation is $(1 - G(\hat{v}_1)(D,p))$, and the seller receives revenue of D on each made contract. The probability that a buyer who makes a contract actually performs it is the product of the probability that the buyer contracts and the probability that the buyer's realized valuation exceeds the unit price, or $(1 - F(p - \hat{v}_1))(G(\hat{v}_1))$. The seller earns price less cost on each completed sale $(p - c)$. Hence, the seller's problem is to

$$(2) \quad Max_{(D,p)}[(1 - G(\hat{v}_1)(p,D))]D + (p - c) \int_{v(p,D)}^{\infty} (1 - F(p - v_1))g(\hat{v}_1)(d\,\hat{v}_1)$$

where $\hat{v}_1(p,D)$ solves $\displaystyle\int_{v_2 > p - v_1}^{\infty} [\hat{v}_1 + v_2 - p]f(v_2)dv_2 = D.$

The down payment equals the marginal buyer's expected surplus from a completed sale so that buyers with higher valuations get positive expected utility from signing a contract. The first term in (2) is the probability that the buyer will enter a contract times the down payment: i.e., the seller's expected revenue from making contracts. The second term is the probability that a buyer who makes a contract will trade times the surplus the seller makes on a sale: i.e., the seller's additional expected revenue from a completed transaction. The first order condition for D (from Expression 2) is

$$(3) \quad [1 - G(\hat{v}_1)] - Dg(v)[\frac{dv}{dD}] + (p - c)\frac{dB}{d\hat{v}_1}\frac{d\hat{v}_1}{dD} = 0$$

where $B = \displaystyle\int_{v_1(\hat{\varphi},D)}^{\infty} (1 - F(p - v_1)g(v_1)dv.$

The first term in (3) is positive, indicating that if D is raised by a dollar, the seller gets a

dollar more from everyone who contracts; the second term is negative, indicating that when D is

raised by a dollar, fewer buyers make down payments; and the third term, the change in the surplus

from buyers who trade, also is negative,[15] reflecting the number of ex post margins the seller loses

when D is raised by a dollar.

The first order condition for p is

$$(4) \quad -Dg(\hat{v}_1)[\frac{d\hat{v}_1}{dp}] + (p - c)[\frac{\partial B}{\partial p} + \frac{\partial B}{\partial \hat{v}_1}\frac{\partial \hat{v}_1}{\partial p}] + B = 0$$

To understand this condition, let the first term in (4) be δ, the second term be α and the third term

be β. We then can rewrite (4) as $\alpha + \beta = \delta$. If α and β are positive, then both must be less than δ.

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[15]The derivative of B with respect to v_1 is negative.

The β term is positive (it equals B) and α will be positive if p exceeds c. Suppose then that $p = c$

and let the seller consider whether to raise the price p by a dollar. The increase would cause the

seller to lose $\$1(1 - F(p - \hat{v}_1))$ from marginal buyers but to gain

$\$1(1 - F(p - v_1))$ from inframarginal buyers. Since $\hat{v}_1 < v_1$, the gain must

exceed the loss, so the seller would set p above c. Thus α is positive as well. Therefore, both α

and β are less than 6. This reasoning implies that if the law were to constrain p to equal c, causing

the second term in (4) to disappear, the seller would not be at a maximum. To summarize, a seller

who must offer a single contract but who is otherwise unconstrained will use a two part tariff that

requires a transaction price that exceeds cost and a down payment that is less than the seller's

expectation, which would be the full difference between the total price P and the cost of making a

sale.

3.2 Intuition and implications

To introduce the intuition, suppose that the seller uses a two part tariff, and initially sets the

transaction price equal to its cost. This would not be an equilibrium price where buyers are

heterogeneous. To see why, recall that buyers are more sensitive to an increase in the down

payment than to an increase in the transaction price. The critical value to contract thus would fall

by more than a dollar if the seller reduced D by a dollar while the critical value to contract would

increase by only a dollar if the seller raised p by a dollar. This implies that the seller could keep

constant the number of contracts it makes were it to reduce D but increase p by more. Under this

strategy, the seller would lose ΔD on each made contract but would expect to gain Δp times the

probability that the buyer would later trade. The greater propensity of infra marginal buyers to trade implies that a small enough increase in p will reduce the probability of trade by an amount that can be arbitrarily close to zero. Thus, there is room for the seller to realize gains on net by raising p above c by more than it reduces D. That the seller can do this implies that it may also lower D and raise p such that it lowers (rather than holds constant) the critical value to contract and increases its gains through additional contracts with lower value buyers.

This reasoning may appear to imply that the optimal down payment is zero, but the implication is incorrect. Formally, if D is set to zero, a negative term disappears from Expression (3), implying that the seller would not be at a maximum. Thus, the seller will set $D > 0$. The down payment is positive because the seller wants to extract surplus from any buyer whose expected value from trade would exceed c. Were D to equal zero, the seller could only extract surplus from buyers with the transaction price, which would have to equal the full monopoly price P. Hence, the seller would lose an opportunity for exploitation if it failed to require a positive down payment. Linking this intuition with that in the prior paragraph, when $p = c$ the seller would lose nothing from a forgone transaction with a contracting buyer (D would be fully exploitative), but as p is raised above c forgone transactions become increasingly costly.

Were a buyer to contract and trade, the seller would realize the total price less the cost of the sale: $P - c$. This is the seller's expectation. Recalling that $P = p + D$, that the seller sets $p > c$ implies that $D < P - c$. This and the reasoning in the prior two paragraphs is summarized in

> Proposition 1: When the seller is restricted to the use of one contract, but is
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> otherwise legally unconstrained, it will use a two part tariff: Buyers who contract
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> must make a non-refundable down payment that is less than the seller's

expectation, and buyers who later trade must pay a transaction price that exceeds
the seller's cost.

Remark 1: The seller's contract maximizes the utility of the parties who sign it in the sense that contracting buyers prefer trading to not and the seller maximizes profits. The contract is socially inefficient, however. The positive down payment cuts off contracting with low valuing buyers. These buyers would contract when $D = 0$ and some of them would later have traded at a price greater than c. A transaction price above cost also produces inefficient breach: Contracting buyers whose valuations exceed c but are below p will not trade. We consider contract menus, below, before addressing whether contract law could induce more efficient contracts than the single unconstrained contract.

Remark 2: The model is difficult to test empirically. It predicts that the seller will charge a price above marginal cost, and require a down payment that is less than the difference between the monopoly price and marginal cost. It is difficult for the econometrician to recover a firm's marginal cost, and the monopoly price is partly a function of the distribution of buyer valuations. These also are difficult to recover. Thus, our conclusions are entitled to belief in so far as our model rests on realistic assumptions.

3.3 Separating buyers with contract menus

Having modeled the single contract case above, we now use a graphical treatment to analyze the question whether a seller in our model will offer a contract menu. Consider the following figure.
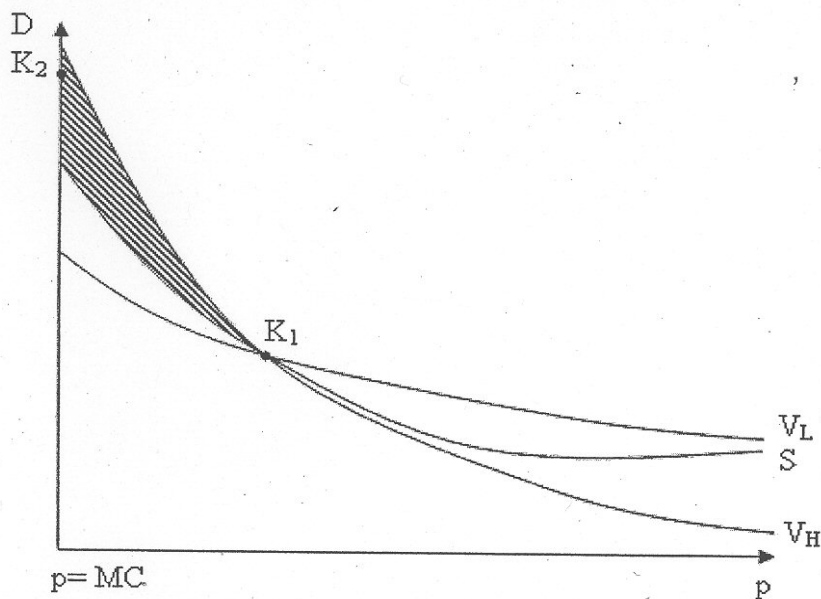
The down payment is drawn on the vertical axis and the transaction price is drawn on the

horizontal axis; the origin is zero for the down payment and $p = c$ for the transaction price. We

begin with two buyer types, a high valuer and a low valuer.

We draw an indifference curve for each type, V_H for a high value type and V_L for a low

value type. The buyers' indifference curves are drawn convex to the origin because as p increases

above c the probability of a completed transaction declines at an increasing rate.[16] The slope of the

high value buyer's curve is steeper than that of the low value buyer's curve because at $p = c$ there

is a greater probability that the high value buyer will complete a transaction. Given these different

slopes, the indifference curves of the two buyer types can cross, as they do in the figure.

The seller's indifference curve S reflects the seller's return conditional on contracts with

both the high value buyer and the low value buyer. This curve, like those of the buyers, is convex

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[16]The decline at an increasing rate holds if the distribution of v_2 has an ever thinning
upper tail. Our model assumes an infinite upper support of v_2, which implies such a tail.

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to the origin because as p increases above c the probability of a completed transaction declines at

an increasing rate. The seller may be able to maintain indifference with a declining reduction in D

but at some point increases in p will reduce the seller's revenue such that the seller could maintain

indifference only through an increase in D. This reasoning explain the "U" shape of S.

Importantly, as the seller's indifference curve moves from $p = c$, its slope is steeper than the slope

of the indifference curve of the low valuer and shallower than the slope of the indifference curve

of the high valuer. The slope of the seller's curve reflects the blended probability of a completed

transaction across buyer types; at $p = c$, this blended probability is between the probabilities of a

completed transaction by the individual buyer types. S is drawn such that it is declining when it

passes through the intersection of V_H and V_L.

We label as K_I the intersection of the three indifference curves. Proposition 1 shows that a

seller who faces a continuous distribution of heterogeneous buyers and who is constrained to offer

a single contract to all of them will choose $p > c$, and a correspondingly lower D, in order to

contract with the low valuers. We thus assume that the seller in this illustration, if constrained to

offer a single contract, would offer both buyer types a contract with the terms of K_I and we assume

that K_I is consistent with the low value buyer's participation constraint (and thus necessarily

consistent with that of the high value buyer).

By inspection of the above figure, there are points – i.e., contracts – that lie *above* (and to

the right of) S, *below* (and to the left of) V_H and *above* (and to the right of) V_L. The set of such

points is in the shaded area. Note that the seller prefers indifference curves away from the origin

because it prefers the greater revenues associated with the higher D and higher p associated with

those curves, while the buyers prefer indifference curves closer to the origin, because they prefer

the lower D and lower p associated with those curves. Thus, the seller and the high value buyer would strictly prefer any contract in the shaded area to the contract labeled K_1. The low value buyer, however, would prefer K_1 to any contract in the shaded area because the contracts in it would put this buyer on a lower indifference curve. The seller, therefore, would do better offering two contracts: each intended for and preferred by a different buyer type and separation would occur.[17] In this example, the seller would offer the contract K_2 to the high valuer because this would maximize its revenue consistent with the high valuer agreeing to contract. Contract K_2 also maximizes ex post efficiency because $p = c$.

For the reason just given, a contract intended for the highest value buyer would set $p = c$ so that D equaled the lost profit measure of $P - c$. But for all other contracts – i.e., for virtually every contract that a court could see – the terms of contracts in a separating equilibrium would include $p > c$ and thus $D < P - c$. This is because separation could not occur unless the seller offered contracts to the low value buyers with down payments sufficiently low and transaction prices sufficiently high that the higher valuers would do better accepting the contracts intended for them rather than pool on the contracts intended for the low valuers. Consider the figure again. Every buyer type strictly prefers a contract with a lower D where $p = c$. When $p = c,$ the buyers capture all gains from trade; D becomes the seller's only instrument of contract differentiation.

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[17]We show that separation would occur in equilibrium because separation with the low value buyer accepting the contract K_1 is Pareto superior to pooling on K_1, which is assumed to be the contract that would prevail were the seller constrained to a single contract. This does not imply that, given separation, the equilibrium low value contract is K_1 as opposed to some other menu choice, but the distinction is irrelevant for our purposes. In a similar vein, separation would not formally place the seller on a higher indifference curve than S, as S reflects a single contract entered by both buyer types. This is merely a formal distinction, however, as the defection of high valuation buyers from a contract on S to a contract above and to the right of S is strictly preferable to the seller as the defection reflects strictly higher revenues from D or p.

Consequently, no contract where $p = c$ can satisfy a low value buyer's participation constraint without also attracting all higher value buyers that the seller might seek to exploit with a higher D.

Similarly, virtually no contract a court could see will include a term of $D = 0$. This is because such a contract maximally exacerbates ex post inefficiency, so the seller will not use such a contract if it has any alternative that would both attract a low value buyer and prevent pooling. This is thus a limiting case, not one a court is likely to face.

We summarize this reasoning in:

Proposition 2: A legally unconstrained seller may separate buyers with a menu of contracts. Virtually every contract in the menu will be relevantly identical from a policy point of view to the single contact that Proposition 1 characterizes; that is, virtually every litigated contract will require a positive down payment and a transaction price that exceeds cost.

4. Normative implications

4.1 The appropriate rule when the seller discriminates.

It is analytically impossible to make a global efficiency ranking among the three contracts that a court could induce. Awarding the seller lost profits induces a contract that is ex post efficient but excludes more buyers than the consensual contracts. Awarding the seller nothing (a mandatory linear tariff) induces a contract that is ex ante efficient (everyone contracts) but minimizes ex post efficiency (the greatest number of inefficient breaches occur). The consensual contracts fall in between.

We next offer two reasons for courts to enforce the consensual contracts. First, the contracts reflect the free choice of the parties to them. As a result, the contracts generate more utility for the parties than would a rule that prevented trade between them. Although this does not

imply that a mandatory lost-profit remedy or a mandatory linear tariff could not improve the parties' joint utility, absent evidence of the conditions in particular markets, we know of no reason to assume that efficiency would be so improved and would thus enforce the contracts as written as the parties may have recognized efficiencies that we have not considered. That is, when parties freely enter contracts according to explicit terms their legitimate reasons may be unknown to scholars or to lawmakers. Thus the parties' choices should be respected absent affirmative reason to overrule them.[18]

Second, there is an endogenous bound to inefficiency under the consensual contracts. To see this, note that where a lost profit remedy is mandatory the law requires price to equal cost. When $p = c$, however, pooling will occur. The resultant menu of contracts could then differ on only one dimension, D, and every buyer type prefers the lowest D available. Freed from the constraint of $p = c$, the seller might induce more entry by offering a menu that attracted lower value buyers to a contract with a relatively low D and high p yet retain the higher value buyers with a contract that offered a more (ex post) efficient higher D and a p closer to c. Similarly, the mandatory linear tariff, where $D = 0$, would induce the seller to set p inefficiently high for all buyers, as again pooling would be inevitable, while absent the constraint on D the seller might offer a menu of contracts that retained low value buyers with a low D even while it increased (ex post) efficiency with a higher D, lower p, contract that would attract higher value buyers.

In sum, the seller may have an incentive to reduce inefficiency under the consensual contracts, consistent with extracting a monopoly profit, but the seller cannot reduce inefficiency

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[18] Similar arguments for the enforcement of related market contracts are made in Edlin and Schwartz (2003) and Stole (1992).

under the mandatory contracts the law might induce. This does not mean that a mandatory rule

cannot be efficient overall, but a lawmaker unsure of the most efficient rule risks much with a

mandatory one.

4.2 *The appropriate default rule*

Above, the court's choice is between enforcement of a consensual contract and imposition

of a mandatory rule. For the reasons given, we favor enforcement of the consensual contract

according to its terms. The discussion did not consider the need for a remedy default because the

contracts we model explicitly require a non-refundable down payment, D. Cases will arise,

however, in which the contract will fail to specify the seller's remedy in the event of breach.

Some buyers, moreover, may be individuals, who are unaware of the applicable legal rule. Thus, it

is necessary to analyze default rules.

We note, in introducing the discussion of a remedy default, that a down payment may serve

several purposes: it may facilitate price discrimination, as modeled above; it may compensate the

seller for contract-specific sunk investment – such as wasted preparation of the contract product or

risk of market price fluctuation[19] – between the time of contract and the time of performance;[20] and

it may finance the seller's production.[21] With this background, there are four cases to consider.

1. There is a down payment and the contract recites that the down payment is not refundable.

2. There is a down payment and the contract recites that the down payment is refundable.

3. There is a down payment and the contract is silent on whether the down payment is refundable.

4. There is no down payment.

In case one, the seller should be permitted to retain the down payment but should not be

permitted to recover any greater amount as lost profits. Had the seller desired a greater return for

any reason – including as compensation for sunk investment – it might have specified so in the

contract. If a court permitted a seller to recover lost profits in excess of a down payment, it might

effectively permit a fraud where the seller uses a lower-than-expectation down payment, i.e., under

liquidates, but then insists on a full lost profit remedy from buyers attracted by the low down

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[19]The lost volume problem addresses the question of seller remedy *absent* market price fluctuation in the contract product. Thus, above, we do not model such fluctuation, which could be incorporated into our seller market-power model if c were made stochastic rather than fixed. The prospect of market-price fluctuation would induce the seller to demand a recovery as payment for the buyer's purchase option. Compare Scott & Triantis (2004).

[20]In the introduction, above, we explicitly put these "additional selling costs" aside without loss of generality. Our model compares the seller's *variable* costs and the buyer's realized valuation. Costs already incurred at the time for performance and necessary to replicate in a resale would be irrelevant to this comparison.

[21]A down payment may have other purposes as well, such as assuring the buyer's seriousness. These other purposes may overlap with those listed and are not further analyzed. A down payment intended to assure the buyer's seriousness, for example, may also help to finance production and, in any event, represents a trivial case if the parties intend the down payment to be refundable should the buyer decide not to purchase.

payment and unaware of the applicable legal rule.[22] This would strike many as unfair and might

induce too much contracting (by misled low value buyers). Even if buyers could educate

themselves about the law, the costs of such education would unnecessarily burden efficient trade.

In case two, if the buyer refuses the good, the seller should be required to return the down

payment. The seller should not be permitted to initiate a separate action to recover lost profits. A

rule permitting this action would implausibly treat the refund of the deposit as an accounting

contrivance, or an allocation of burden on the seller to show damages. Rather, the parties'

probable intention is to permit the buyer to exit costlessly; had they another intention, such as a

means to compensate the seller for sunk investment, the down payment would have been made

non-refundable. A seller may require a refundable down payment when the purpose of the down

payment is to finance production. If the buyer reneges before the seller incurs costs, finance is no

longer necessary so again the seller should return the down payment.

The seller in case three should be treated no better than the seller in case one. For the

reasons given above, the seller should not be permitted to collect more than the down payment even

if its lost profits are greater. As a general rule, the seller should be permitted to retain the down

payment. The down payment may be intended as an implicit liquidated damages clause, to

accomplish price discrimination or to compensate the seller the for sunk investment. As described

above, price discrimination may serve efficiency. Moreover, efficiency requires that the seller be

permitted to recover investments that must be sunk between the time of contracting and the time

when the buyer is to take the goods.[23] Otherwise, too many lower value buyers would contract and

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[22]See Goetz and Scott (1985).

[23]This is the current law. See UCC §§2-708(2); 2-710.

induce such investment; the costs would be wasted on an expected basis because the probability of trade by such buyers is low. When the discernable purpose of the down payment is to finance production, the seller should be required to return it to the extent not required as compensation for sunk costs. An exception to a default that permits sellers to retain down payments when contracts are silent may be justifiable when buyers are individual persons. As said above, sellers could use down payments inefficiently and unfairly in these cases. A seller could contract away from this exception by explicitly making the down payment non refundable.[24]

In case four, where there is no down payment, the seller should not be entitled to a remedy if the market price is stable. The lack of a down payment implies the absence of price discrimination; an individual buyer may be unaware of her liability for breach, even if that were the default; and the seller could defect from a no-recovery default with an explicit remedy term. Against these considerations, lost profit recovery would induce efficient breach and permit the seller to recover its sunk investment. . Importantly, however, that the seller is not price discriminating suggests that the relevant market is competitive, or nearly so. In this case, lost profits would be minimal after the contract good is resold for the contract price because, as discussed above in connection with position B in Part 1.1, the seller's output would be invariant to the number of breaches. Thus, a court should deny damages when there is no down payment and the contract is silent as to remedy.

It is important to observe here that while the possibility of minimal lost profits in some contexts supports a no-recovery default rule, this possibility does *not* support the law's return of an *explicitly* non-refundable down payment, or negation of any liquidated damages clause, even where

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[24]The exception thus would be a penalty default.

the court believes that the amount of the down payment or liquidated damages exceed actual lost profits.[25] The law treats an excessive non-refundable down payment – or other high liquidated damages clause – as a penalty for breach, which it will not enforce. However, the results of this paper, and those of related literature explained more fully in the Conclusion below, suggest that sellers rarely over liquidate and that when they do they do for good reason. Thus, a court should not assume or lightly conclude that a non-refundable down payment is an over liquidation or that the purpose of any over liquidation is to impose a penalty.

5. Conclusion

There are three salient, implementable policy responses to the lost volume problem given the information that litigation will make available to courts. One response is to enforce the contracts that the seller would use were the law to erect no constraints. This response would award a seller its agreed upon liquidated damages when a buyer refuses contract goods; this would occur, typically, through the retention of a down payment that is less than the seller's full lost profit. There are two alternative responses. One of these would permit a seller to recover its expectation even if the agreed upon down payment was lower. This response would permit the seller to retain a down payment and then sue for the difference between it and the full profit. The second alternative response would prevent a seller from recovering any damages even if the buyer had agreed to permit such recovery. In this case, the seller would be required to return even an explicitly nonrefundable down payment. None of the three policy responses can be shown analytically to Pareto dominate the others, but Part 4 argued that the court should reject either of the alternatives and adopt the first

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[25]See UCC §2-718(1), discussed above in part 1.2.

response, enforcement of explicit liquidated damages clauses. Part 4 also argued in favor of a default rule that treats an undercompensatory down payment as a cap on damages.

Liquidated damages are sometimes disfavored by the courts, but such disfavor is inappropriately applied to our conclusions here. There is a concern that professional sellers will exploit amateur buyers, but this concern *favors* enforcing the consensual contracts. The current legal rules on liquidated damage clauses prohibit clauses that would have the promisor pay more than the promisee's expectation. Here, the relevant term we recommend permits the promisor-buyers to pay *less than* the promisee's expectation. In the absence of unconscionability, under-liquidation is not a ground for the refusal to enforce a contract.

The analysis in this paper is relevant to two broader issues. The first, as just remarked, concerns the normative desirability of the liquidated damage rules. As noted, these rules prohibit parties from agreeing to a liquidated damage clause that would overcompensate the disappointed promisee; the rules rest largely on the premise that the stronger party has an incentive to exact an overcompensatory liquidated damage clause from the weaker party. Prior papers have shown that this premise is false in the contexts that those papers considered. The parties in the earlier models had no incentive to write penalty clauses unless a party with market power was attempting to exclude rivals from the market, the contract required one or both parties to make a relation specific investment, or breaches sometimes went undetected. When none of these three conditions were present, parties wrote liquidated damage clauses that either perfectly compensated the promisee or that undercompensated the promisee.[26]

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[26]A summary of the literature is in Edlin and Schwartz (2003). See also Stole (1992); Schwartz (1990). In any case where liquidated damages clauses were over-compensatory, rarely was the promisor properly characterized as a victim.

A recent paper by Scott and Triantis (2004) reaches results similar to those just described. These authors analyze the property of options embedded in contracts to provide the option holder with insurance. In the course of their analysis, these authors conclude that apparently overcompensatory liquidated damages in fact merely permit an option grantor to recover the cost of the option it wrote, and can be efficient in the provision of insurance.[27]

These disparate analyses support a telling conclusion: the liquidated damage rules ban a practice – exacting supracompensatory payments for breach – that markets rarely follow and when they do, commonly with good reason. The rules thus encourage frivolous law suits but seldom produce social gains. The burden now should be on proponents of the rules that prohibit penalty clauses to show just when, apart from the situations noted above, parties would actually and inefficiently maximize profits with penalty clauses.

The second broader issue concerns the relevance of seller monopoly power to unconscionability adjudications. Ever since the famous Henningsen case[28] that sellers have market power has been thought to count against enforcing private contracts. Early scholarly analyses responded that sellers are more likely to exploit monopoly power by charging supra competitive

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[27]Like the buyer in the Scott and Triantis model, the buyer in the price discrimination contracts we analyze holds an option on performance the strike price of which is the transaction price: The buyer exercises by paying this price when the option is in the money (the buyer's realized valuation exceeds the transaction price) and burns the option otherwise. The down payment will include the cost of this option, but it is still lower, we show, than the seller's expectation. On a more general level, our policy solution unsurprisingly is consistent with the Scott and Triantis paper, for they argue that contracts with embedded options should be enforced according to their terms, at least in business contexts, while we argue that the particular under-liquidation contracts that parties to lost volume contracts prefer also should be enforced.

[28]Henningsen v. Bloomfield Motors, Inc., 32 N.J. 358, 161 A. 2d 69 (N.J. 1960).

prices than by degrading contract quality.[29] This conclusion requires modification. When sellers

have market power and buyers have private payoff relevant information, sellers will sometimes offer

contracts that both require excessive prices and contain inefficient non-price terms.[30] For example,

in the model above, the seller uses a down payment that cuts off efficient trade and charges an

inefficiently high transaction price.

Inefficiency borne of monopoly power, however, does not imply a proper opportunity for a

court to apply the unconscionability doctrine. The relevant question is whether courts can do better

than the market on the information that courts are likely to have, particularly when the courts' only

policy instruments are the willingness or the refusal to enforce contract terms. This paper has shown

that, in lost volume contexts, courts are unlikely to improve on private contracting, as inefficient as

that contracting may be. Stole has made a similar showing for liquidated damage clauses in another

context.[31] Contrary demonstrations are hard to come by. The existence of monopoly thus should not

count against the enforcement of particular contract terms in the absence of a showing that the

refusal to enforce those terms would yield contracts that will be more efficient than the contracts in

current use.

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[29]E.g., Schwartz (1977); Schwartz and Wilde (1983).

[30]For a description of this phenomenon in related contexts, see, e.g., Craswell (1993);
Katz (1990).

[31]The formal paper closest to ours is Stole (1992). There, a seller with market power
faces buyers with different, private valuations, but it is the seller who may breach. The seller
thus can screen over buyers by offering liquidated damage clauses that vary in the compensation
they award. The highest valuing buyer accepts the fully compensatory contract while lower
valuing buyers choose less breach insurance, of varying amounts. These contracts are inefficient
in a similar way to ours. The seller breaches too often because it commonly has to pay
undercompensatory damages, and some low valuers will not contract. Stole nevertheless argues
that courts should enforce the consensual contract rather than require sellers to offer more
compensation. See also Matthews and Moore (1987) (sellers screen with warranties).

Finally, our analysis is broader than the lost volume problem that is its motivation. The results that we derive hold whenever a seller has market power and faces a pool of potential buyers who are, though of different types, indistinguishable to the seller. Under these circumstances, a seller and each buyer will not reach a first-best efficient contract even though neoclassical theory suggests that they will. This has little to do with a lost volume of sales, but rather reflects the difficulty in creating efficient agreements when parties are asymmetrically informed. Put another way, what we have shown here is that the lost volume problem is a misnomer; the problem that the seller and buyer face is actually a contracting problem.

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