The Welfare E®ects of Third Degree Price Discrimination In Intermediate Good Markets: The Case of Bargaining

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Abstract

This paper examines the welfare e®ects of third degree price discrimination by an intermediate good monopolist selling to downstream ¯rms with bargaining power. One of the downstream ¯rms (the \chain store") may have a greater ability than rivals to integrate backward into the supply of the input. In addition to this outside option, the ¯rms' relative bargaining powers depend on their disagreement profits, bargaining weights, and concession costs. If the chain's integration threat is not a credible outside option, and if downstream ¯rms cannot coordinate their bargaining strategies, then price discrimination reduces input prices to all downstream ¯rms.

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\When a degree of non-transferability...su±cient to make [price] discrimination pro¯table is present, the relation between the monopolistic seller and each buyer is, strictly, one of bilateral monopoly. The terms of the contract that will

The ability to pursue an outside option, such as backward integration, is an important potential source of a buyer's bargaining power, but it is not the only source. The modern literature on bargaining identifies three additional factors that may affect the relative bargaining powers of a buyer and a seller: the costs of making price concessions, the loses inflicted on each other by delaying agreement, and bargaining costs. Other factors equal, a buyer's bargaining power is greater the higher the cost it bears from granting a small price concession to the seller, the greater the loss it inflicts on the seller by delaying agreement, and the less costly it is to hold out for a better deal. Once these additional sources of bargaining power are recognized, the analysis of price discrimination is more complex than it is in the take-it or leave-it environment studied by Katz. Even if an explicit threat to integrate backward is not credible, the chain may receive a discount if it has greater bargaining power than the independent. Moreover, a policy forbidding price discrimination may do more than simply constrain the prices the seller can set; it may alter relative bargaining powers.

In this paper, I extend Katz's take-it or leave-it model to a Nash bargaining framework that incorporates four sources of bargaining power: outside options, concession costs, inflicted losses, and bargaining costs. Intermediate prices are negotiated in pair-wise meetings between the supplier and individual downstream firms, one of which (the chain store) has lower costs of integrating backward into the supply of the input. As in Katz's model, the chain's integration advantage may allow it to negotiate lower prices than its rival. However, the bargaining model provides three plausible explanations for chain discounts. First, the chain may be able to threaten credibly to integrate backward, as in Katz's model. Second, the chain may earn higher profits than its rival if it fails to reach an agreement with the supplier. In bargaining language, the chain may have a higher disagreement profit than the

Postlewaite (1992), R. Preston McAfee and Marius Schwartz (1994), and DeGraba (1996) for the case of nonlinear pricing in intermediate good markets.

rival, which gives it greater bargaining power. Third, the chain may have lower bargaining costs than the rival. For example, the chain may have a lower discount rate than the rival, price discrimination reduces the bargaining power of downstream ¯rms relative to the seller.

The implications of the concession cost e®ect of price discrimination policy are clearest when downstream ¯rms have equal bargaining power and the chain cannot credibly threaten to integrate backward when price discrimination is allowed. In this case, a policy forbidding price discrimination raises the wholesale price charged to both downstream ¯rms, reducing total output and welfare. Critics of price discrimination policy have often argued that the e®ects of forbidding price discrimination reach beyond markets exhibiting persistent asymmetries in input prices. A common criticism is that forbidding price discrimination prevents sporadic and selective discounts by cartel members that might break down cartel discipline and lead to lower prices. My results show that upstream competition is not necessary for a policy forbidding price discrimination to raise prices in markets where systematic discrimination is not observed. All that is required is buyer bargaining power.

If the chain has greater bargaining power than the rival, then the analysis is less clear cut. The key complication is that when price discrimination is forbidden, the supplier prefers to have the weaker buyer negotiate the common price, while the buyers both prefer to have the stronger buyer negotiate the price. I show that if the supplier negotiates with the weaker buyer, and if the chain's integration threat does not bind when discrimination is allowed, then a policy forbidding price discrimination raises the average wholesale price. On the other hand, if the buyers can arrange to have the stronger buyer negotiate price, forbidding price discrimination can reduce the average price if the discounts received by the stronger buyer when discrimination is allowed are large enough.

The remainder of this paper is organized as follows. The bargaining model is introduced in Section I. Section II presents the implications of the bargaining model when price discrimination is allowed. Section III examines the e®ects of forbidding price discrimination.

[6] See, e.g., Dennis W. Carlton and Je®rey M. Perlo® (1994), p. 416.

Following Ken Binmore et al. (1986), I model negotiations using an asymmetric Nash bargaining framework and motivate the role of outside options, disagreement payo®s, and bargaining weights from an underlying noncooperative bargaining game.[9] When price discrimination is allowed, the supplier attempts to negotiate a separate wholesale price with each downstream ¯rm. Suppose the supplier and ¯rm 2 have agreed (or are expected to agree) to the price w_2 (the negotiations determining w_2 will be described shortly). In an equilibrium in which the chain chooses not to integrate backward, the asymmetric Nash bargaining solution between the supplier and the chain solves

$$(1)\ \max_{w_1} \phi_1(w_1, w_2) = [U(w_1, w_2) - d_{u1}]^{1- \ _1}[\pi(w_1, w_2) - d_1]^{\ _1}\ s.t.\ \pi_1(w_1, w_2) \quad \pi^I(v, w_2^I)$$

where d_{u1} and d_1

exploited by a third party. Binmore et al. show that the unique subgame perfect equilibrium to the Rubinstein bargaining game converges to an asymmetric Nash bargaining solution as the time between o®ers becomes small. Each ¯rm's bargaining weight in this solution is a decreasing function of its bargaining cost, as measured by its discount rate.[11] Intuitively, the more costly it is for a ¯rm to reject an o®er, the less bargaining power the ¯rm has. This is re°ected by a lower bargaining weight in the asymmetric Nash bargaining solution.

The disagreement payo®s can also be motivated from the same Rubinstein-style bargaining model that yields the bargaining weights. Binmore et al. show that in the time preference solution, the disagreement payo®s are the pro¯ts earned by ¯rms while they are negotiating prices. In the standard solution, the disagreement payo®s are the pro¯ts received game ignoring the outside option yields a lower payoff to the chain than it would receive by exercising its option. If the chain chooses integration, I assume that the supplier and firm 2 negotiate (or renegotiate) their price. This leads to a wholesale price for firm 2 of w_2^I. I assume that there exists a set $\mathcal{A}_1$ of wholesale prices for firm 1 such that $U(w_1, w_2^I) > d_{ui}$ for all $w_1 \in \mathcal{A}_1$, $i \in \{1, 2\}$.

The wholesale price negotiated by the supplier and firm 2 solves a similar Nash bargaining problem without the integration constraint:

$$\text{(2)} \qquad \max_{w_2} \ \phi_2(w_1, w_2) = [U(w_1, w_2) - d_{u2}]^{1-\gamma_2}[\pi_2(w_1, w_2) - d_2]^{\gamma_2}$$

where d_{u2} and d_2 are the disagreement payoffs of the supplier and firm 2, and γ_2 is firm 2's bargaining weight.[13] ter.639 2.449ax

Assumption 1 $U(w_1, w_2)$ is strictly quasi-concave.

Assumption 2 $\phi_i(w_1, w_2)$ is strictly quasi-concave in w_i, $i \quad \{1, 2\}$.

Assumption 3 $\phi_i(w, w)$ is strictly quasi-concave in w, $i \quad \{1, 2\}$.

Assumption 4 $-1 < R_i'(w_j) \quad (\partial\pi_i/\partial w_j)/(\partial\pi_i/\partial w_i)$, $i \quad \{1, 2\}$, $i \neq j$.

Assumptions 1–3 imply that the supplier's profit function and the Nash products with and without price discrimination are single-peaked. Assumption 4 embodies two assumptions. The second inequality is true if and only if firm i's profits from its negotiations with the supplier are increasing in firm j's wholesale price. This assumption is quite natural, although it is not implied by the others. Combining this assumption with the first inequality in Assumption 4 ensures that the bargaining equilibrium is (locally) strictly stable. These assumptions are satisfied in a variety of environments, e.g., under Cournot or differentiated Bertrand competition with linear demand and constant marginal cost.

II. Price Discrimination in the Bargaining Model

A [illegible]

Intuition about the bargaining solution can be gained by rewriting the first order condition for the negotiations between the supplier and firm i when the integration constraint is slack:

$$\text{(6)} \qquad \frac{\gamma_i[-\partial\pi_i(w_1^A, w_2^A)/\partial w_i]}{\pi_i(w_1^A, w_2^A) - d_i} = \frac{(1-\gamma_i)[\partial U(w_1^A, w_2^A)/\partial w_i]}{U(w_1^A, w_2^A) - d_{ui}}$$

or

$$\text{(7)} \qquad \frac{\text{Firm } i\text{'s weighted concession cost}}{\text{Firm } i\text{'s net profits}} = \frac{\text{Supplier's weighted concession cost}}{\text{Supplier's net profits}}.$$

That is, in a bargaining equilibrium, the wholesale price negotiated by the supplier and firm i equalizes their weighted concession costs as a percentage of their gains from trade, where the weights are the ¯rms' bargaining weights. The intuitive interpretation of this condition is that the ¯rm with the lower percentage concession cost loses less when improving its o®er and thus should do so to facilitate reaching agreement.[14]

tween integration and non-integration when the wholesale prices are $I(w_2)$ and w_2, i.e., $\pi_1(I(w_2), w_2) = \pi^I(v, w_2)$ for all w_2. The chain prefers integration over non-integration for all (w_1, w_2) to the right of $I(w_2)$. The integration constraint was the only source of chain bargaining power in the take-it or leave-it model studied by Katz. He showed that if the supplier finds it profitable to sell to the chain, it maximizes profits by choosing the wholesale prices represented by point T, where the supplier's iso-profit contour is tangent to the integration constraint. The chain receives a discount relative to the independent because it has a credible threat to integrate backward.

In the bargaining model, the integration constraint will not bind if the chain has enough bargaining power from other sources. For example, point A^0 represents a bargaining equilibrium when downstream firms have symmetric bargaining power ($d_1 = d_2$, $d_{u1} = d_{u2}$, $\gamma_1 = \gamma_2$) high enough that the integration constraint is slack. An increase in the chain's bargaining power through any of the mechanisms described above is represented as a leftward shift of its bargaining reaction function, e.g., from $R_1^0(w_2)$ to $R_1^1(w_2)$. This changes equilibrium wholesale prices from point A^0 to point A^1. The chain's wholesale price falls unambiguously. The independent's price may rise or fall, but Assumption 4 implies that it cannot fall by more than the chain's price. Thus, an increase in the chain's bargaining power allows it to negotiate a discount relative to the independent. These results are summarized in the following Lemma.

Lemma 1 Suppose the integration constraint is slack. Then in a bargaining equilibrium when price discrimination is allowed, firm i's wholesale price w_i^A is strictly decreasing in γ_i, d_i, and $-d_{ui}$. Moreover, firm i's equilibrium discount, $w_j^A - w_i^A$, is strictly increasing in γ_i, d_i, and $-d_{ui}$.

When Robinson-Patman was passed, the common perception was that chain stores tended to pay lower wholesale prices than independents. In this model, four types of factors affect the chain's ability to negotiate discounts: the chain's integration threat, the buyers' disagreement profits, the supplier's disagreement profits, and the firms' bargaining weights. I discuss briefly the role each factor might play in generating chain discounts.

The potential for backward integration (or, more generally, the ability to seek alternative supplies) affects the chain's bargaining power by giving it an outside option. The effect of this option is similar to its role in the take-it or leave-it model studied by Katz. In both cases, the potential for backward integration may constrain the wholesale prices the supplier can charge without inducing chain integration. The main difference between the models is that the threat to integrate backward is not a binding constraint in the bargaining model if the chain has enough bargaining power from other sources.

From Lemma 1, a sufficient condition for the chain to receive a discount is that to carry the supplier's product. If the chain has better alternatives than the independent, then $d_1 > d_2$.

The chain can also receive a discount if, other factors equal, the supplier's disagreement pro¯t in negotiations with the chain is lower than its disagreement pro¯t in negotiations with the independent, i.e., $d_{u1} < d_{u2}$. Suppose that if negotiations break down with the chain, but not the independent, the chain will be a stronger competitor against the independent than the independent would be against the chain in the opposite situation where negotiations broke down with only the independent.[1] If the chain integration constraint is slack in the event negotiations break down with the independent, we would expect $d_{u1} < d_{u2}$. The logic is that if the supplier is unconstrained in selling to only one of the downstream ¯rms, it is better o® selling unconstrained to the ¯rm that faces less vigourous competition.[1]

Finally, the chain will also receive a discount if, other factors equal, it has a greater bargaining weight than the independent. This occurs if the chain has a lower discount rate, which might be the case if it has lower capital costs than the independent.

III. The E®ects of Forbidding Price Discrimination

When price discrimination is forbidden, the two buyers will pay a single price.[18] It is not obvious what role each ¯rm will play in determining that price. One possibility is that the supplier can select one of the downstream ¯rms to negotiate a common price. At an intuitive

[16] A breakdown with only one of the downstream ¯rms might occur if an entrant comes in and displaces only that ¯rm.

[17] Plausible reasons can also be given for why d_{u1} might exceed d_{u2}. For example, if the chain integration constraint binds in the event negotiations with the independent break down, then the supplier might earn more selling through the independent than the chain if the chain has better outside opportunities than the independent. As another example, suppose the supplier's inside option in negotiations with ¯rm i is the pro¯t it earns from sales to ¯rm j while it negotiates with ¯rm i. If the price charged to independent during negotiations with the chain is higher than the price charged the chain during negotiations with the independent in this event, then it is also possible to have $d_{u1} > d_{u2}$.

[18] In this paper I am abstracting from enforcement costs that might permit some price discrimination to go unchallenged even when discrimination is illegal.

questions that a®ect the in°uence each buyer is likely to have in negotiating a common price. Instead, I will consider two cases distinguished by which buyer negotiates the wholesale price. These two cases represent endpoints of the set of agreements that are likely to emerge from bargaining when price discrimination is forbidden.

Suppose ¯rst that the supplier negotiates a common price with the independent. If both ¯rms prefer to have the chain remain non-integrated, their Nash bargaining solution solves

$$\max_{w} \ \phi_2(w,w) = [U(w,w) - d_{u2}]^{1- \ 2}[\pi_2(w,w) - d_2]^{\ 2} \quad s.t.\ \pi_1(w,w) \quad \pi^I(v, w_2^I).$$

The ¯rst order condition is

$$\begin{aligned} 0 &= (1-\gamma_2)\sum_i \frac{\partial U}{\partial w_i}[\pi_2 - d_2] + \gamma_2 \sum_i \frac{\partial \pi_2}{\partial w_i}[U - d_{u2}] + \eta \sum_i \frac{\partial \pi_1}{\partial w_i} \\ &= \frac{\partial \phi_2}{\partial w_2} + \left\{(1-\gamma_2)\frac{\partial U}{\partial w_1}[\pi_2 - d_2] + \gamma_2 \frac{\partial \pi_2}{\partial w_1}[U - d_{u2}]\right\} + \eta \sum_i \frac{\partial \pi_1}{\partial w_i}, \end{aligned} \tag{8}$$

$$\eta \quad 0, \quad \eta[\pi_2(w,w) - \pi^I(v, w_2^I)] = 0 \tag{9}$$

where η is a Lagrangian multiplier. Recall that $\partial\phi_2/\partial w_2$ is the derivative of the Nash product for negotiations between the supplier and ¯rm 2 when discrimination is allowed. Suppose ¯rst that ¯rms 1 and 2 are symmetric except for their abilities to integrate backward (i.e., $d_1 = d_2$, $d_{u1} = d_{u2}$, and $\gamma_1 = \gamma_2$). Then $w_1^A = w_2^A$, and $\partial\phi_2(w_2^A, w_2^A)/\partial w_2 = 0$ by the ¯rst order condition for the optimal choice of w_2^A. The term in curly braces in (8) is positive at (w_1^A, w_2^A) because ¯rm 2's pro¯t is increasing in w_1, $\partial U/\partial w_1$ is positive over the range of con°ict, and net pro¯ts are positive in a bargaining equilibrium when discrimination is allowed. Therefore, if the integration constraint is slack at $w = w_2^A$, the price that solves (8), say w^F (the superscript `F' for \forbidden"), must exceed w_2^A

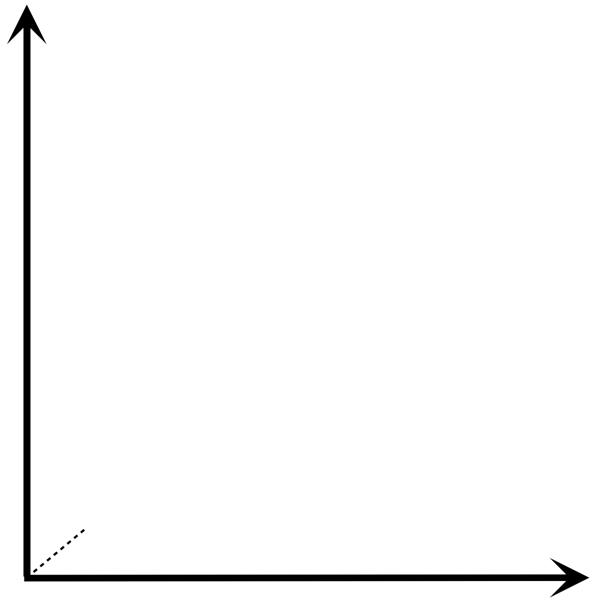
Proposition 1 Suppose that when price discrimination is allowed, the integration constraint is slack. If downstream ¯rms are symmetric, and if there is no integration under either regime, the wholesale price is lower and welfare is higher when price discrimination is practiced than when it is forbidden.

The intuition for this result can be seen by rewriting condition (8) when the integration constraint is slack as

$$\text{(10)} \qquad \frac{\gamma_2[(-\partial\pi_2/\partial w_2) + (-\partial\pi_2/\partial w_1)]}{\pi_2 - d_2} = \frac{(1-\gamma_2)[(\partial U/\partial w_2) + (\partial U/\partial w_1)]}{U - d_{u2}}.$$

Notice that this condition is the same as condition (6) except that ¯rm 2's concession cost is lower by $\partial\pi_2/\partial w_1$ and the supplier's concession cost is higher by $\partial U/\partial w_1$. A policy forbidding price discrimination reduces ¯rm 2's concession cost because an agreement to pay a higher price requires its rival to pay a higher price too. On the other hand, the policy increases the supplier's concession cost because an agreement to charge a lower price must be granted to ¯rm 1 as well as ¯rm 2. Both concession cost e®ects strengthen the supplier's relative bargaining position, allowing it to negotiate a higher wholesale price.

Next, suppose that the chain has greater bargaining power than the independent and that the supplier still negotiates the common price with the independent. The bargaining equilibrium when discrimination is allowed is represented by point A^1 in Figure 2, where wholesale prices are ($w_1^{A^1}, w_2^{A^1}$). The e®ects of forbidding price discrimination can be seen by evaluating condition (8) at the wholesale prices that would be chosen when discrimination is allowed if the chain's bargaining power were the same as the independent's. This is point A^0 in Figure 2, where wholesale prices are (w^{A^0}, w^{A^0}). Since this price lies on the independent's bargaining reaction function, it must be true that $\partial\phi_2(w^{A^0}, w^{A^0})/\partial w_2$ = 0. Since the terms in curly braces in (8) are positive and the Nash product is strictly quasi-concave, this implies that the wholesale price that solves (8), w^F, exceeds w^{A^0}.



Augustin Cournot (1838) has shown that the Cournot equilibrium output is decreasing in the average marginal cost of the Cournot competitors. If downstream firms produce under the same fixed proportions technology, welfare is an increasing function of the total output. These observations yield the following corollary to Proposition 2 for the case of Cournot competition in the downstream market.

Corollary 1 Suppose that when price discrimination is allowed, the integration constraint is slack, and that the supplier can select which downstream firm will negotiate the common price. Suppose further that downstream firms are Cournot competitors that employ a fixed proportions technology. Then if there is no integration under either regime, total output and welfare are higher when price discrimination is practiced than when it is forbidden.

Katz's Proposition 1 shows that in the take-it or leave-it environment, if integration occurs in neither regime, output and welfare are lower when price discrimination is practiced than when it is forbidden. Propositions 1 and 2 (and Corollary 1) above show that this result is reversed if three conditions hold: i) downstream firms have bargaining power from sources other than outside options; ii) the chain integration threat is not credible (i.e., the constraint is slack) when price discrimination is allowed; and iii) downstream firms are symmetric, or the supplier can select which downstream firm will negotiate a common price. The results of the take-it or leave-it and bargaining environments can be compared using Figure 2. In the take-it or leave-it environment, a policy forbidding price discrimination causes the supplier to reduce wholesale prices from T to T'. Intuitively, a reduction in the independent's wholesale price to bring it in line with the chain's price reduces the chain's profits, requiring a reduction in the chain's wholesale price to prevent it from integrating backward. Thus, both wholesale prices fall when discrimination is forbidden.[20] This result relies on the chain having a credible

[20] Katz also considered a case in which the chain's integration incentives are increasing in the price w_2

threat to integrate backward at the prices offered by the supplier in both regimes, so that a prohibition on price discrimination causes the supplier to adjust prices along the chain integration constraint $I(w_2)$. If the integration constraint is slack when discrimination is allowed, this effect is absent. The policy still affects concession costs, however, in a way that increases the supplier's relative bargaining power with either downstream firm. Under the conditions of Propositions 1 and 2, this effect causes both wholesale prices to rise.

The next case to consider arises when firms are asymmetric and the supplier negotiates a common price with the stronger buyer, assumed to be the chain. This might occur if downstream firms could coordinate on the order in which they bargain, or if the supplier is better off accepting the chain's terms than either risking a lawsuit for engaging in price discrimination or selling only to the independent. A diagrammatic argument similar to the one above suggests that the effects of forbidding price discrimination are generally ambiguous in this case. To see this, suppose that point A^1 in Figure 2 represents the equilibrium wholesale prices when discrimination is allowed. If the independent had bargaining power as high as the chain's, the equilibrium price would be point A^2. By arguments similar to those made above, the supplier and the chain will negotiate a common price greater than w^{A^2}, but this price may or may not exceed $\overline{w}^{A^1}$. If the chain has only a little more bargaining power than the independent (i.e., if R_1^1 is close to R_1^0), then $w^F > \overline{w}^{A^1}$.[21] But if the chain's bargaining power exceeds the independent's by a large amount, (R_1^1 well to the left of R_1^0), then it is possible that $w^F < \overline{w}^{A^1}$.[22]

offered by the supplier to the independent. This can arise in his model if a higher value of w_2 signals that the supplier has higher costs and would charge a higher price to the independent after chain integration. In this case, the integration constraint is downward sloping. A policy forbidding price discrimination can result in a higher wholesale price for the chain, but it still causes the average wholesale price to fall in his model if the chain chooses non-integration in both regimes.

[21] This follows from the continuity of the equilibrium prices in the parameters that affect bargaining power.

[22] The effects of forbidding price discrimination in my model have an analogy with "pattern bargaining" in union-labor negotiations. Under pattern bargaining, the labor union negotiates wage rates with one

To get an idea of the degree of asymmetry required for a policy against price discrimbene¯ts of forbidding price discrimination, when they exist, tend to be small (less than 3 percent if the chain discount is less than 30 percent.) The welfare cost of forbidding price discrimination can be as high as about 10 percent even when the chain negotiates discounts as high as 25 percent.

IV. Two Special Cases

Equations (6) and (10) are useful for motivating how the results are a®ected by di®erent assumptions about downstream rivalry. Suppose that ¯rms 1 and 2 are monopolists in rule:

(11) $$P(X) = w_i - \theta P'(X)x_i, \quad i \quad \{1, 2\}$$

where X is industry output, $P(X)$ is the inverse demand, on the third derivative of the inverse demand function and hence cannot be signed without further assumptions. However, it is possible to determine the values of profits and concession costs under symmetry in the limit as θ 0.

Lemma 2 Suppose $w_1 = w_2 = w$. Then the following conditions hold in the limit as the downstream market becomes competitive:

$$\text{(14)} \qquad \lim_{\to 0}\left(\frac{\partial U}{\partial w_i}\right. = x_i + \frac{w-c}{2P'(X\ )},$$

$$\text{(15)} \qquad \lim_{\to 0}\left(-\frac{\partial \pi}{\partial w_i}\right. = \frac{x_i}{2},$$

$$\text{(16)} \qquad \lim_{\to 0} \pi_i = 0.$$

$$\text{(17)} \qquad \lim_{\to 0}\left(-\frac{\partial \pi_i}{\partial w_i} - \frac{\partial \pi_i}{\partial w_j}\right. = -\frac{P''(X\ )X\ + P'(X\ )}{(P'(X\ ))^2\, X}$$

Conditions (14) and (15) show that when price discrimination is allowed, the concession costs of the supplier and downstream firm i are bounded and have the expected signs ($\partial U\ /\partial w_i > 0$ for small enough w and $-\partial \pi_i/\partial w_i > 0$) in the limit as the downstream market becomes perfectly competitive. Condition (16) shows that downstream firms' profits go to zero as the market becomes competitive, as expected. Thus, downstream firm i's concession costs as a percentage of its gains from trade rise to infinity as the downstream market becomes competitive. Since the percentage concession costs of firm i and the supplier must be equalized in a bargaining equilibrium, the supplier's percentage concession costs must also rise to infinity, which requires its net profits to fall to zero too. This establishes the following proposition.

Proposition 3 Suppose that downstream firms are symmetric. In a bargaining equilibrium when price discrimination is allowed, the supplier's net profits fall to zero as the downstream market becomes perfectly competitive.

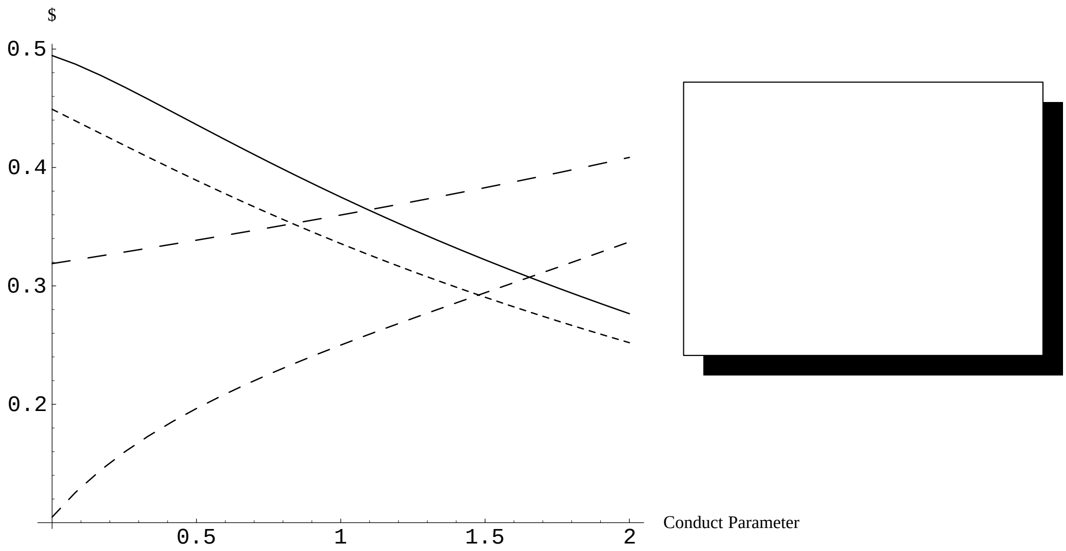
This result may seem counter-intuitive at ¯rst, but it has a natural interpretation in a bargaining environment. A ¯rm's bargaining power comes partly from its ability to in°ict a loss on the ¯rm it is negotiating with by delaying an agreement. When the downstream market is highly competitive, downstream ¯rms earn little pro¯t, so the supplier in°icts only a small loss on each ¯rm by delaying an agreement. The \in°icted loss" source of the supplier's bargaining power falls to zero as the downstream market becomes perfectly competitive, so that in the limit as θ 0 the supplier does no better than earning its disagreement pro¯ts.

Next, consider the e®ects of forbidding price discrimination as the downstream market becomes competitive. Condition (17) in Lemma 2 implies that when price discrimination is forbidden, ¯rm i's concession costs as a percentage of its net pro¯ts are positive and ¯nite (using the assumption that $R(X)$ is concave). From condition (13), the supplier's percentage concession costs must also be positive and ¯nite, which requires $U - d_{ui} > 0$. Thus, as the downstream market becomes more competitive, wholesale prices remain higher when price discrimination is forbidden than when it is allowed.

Proposition 4 Suppose that downstream ¯rms are symmetric, and that downstream rivalry is described by the conduct parameter θ in condition (11). For all θ $[0, 2]$, total output and welfare are lower when price discrimination is forbidden than when it is practiced.

Figure 4 plots the equilibrium wholesale price and welfare as a function of θ for an example in which $P(X) = 1 - X$, $c = 0$, $\lambda_1 = \lambda_2 = 1/2$, $d_1 = d_2 = 0$, and $d_{u1} = d_{u2} = 3/32$.[2] In this example, a policy forbidding price discrimination has a larger e®ect on wholesale prices the more competitive the market, as measured by the conduct parameter. Welfare rises as the market becomes more competitive in both regimes, but the percentage reduction in welfare

[27]The supplier's pro¯t under successive monopoly is 3=32.


$
0.5
0.4
0.3
0.2
0.5
1
1.5
2
Conduct Parameter

The implications of bargaining for antitrust policy are not well understood. However, bargaining is prevalent in intermediate good markets, where a large share of the antitrust enforcement in developed countries takes place. This paper shows that bargaining has important implications for understanding the e®ects of the Robinson-Patman Act. There is every reason to believe that bargaining could have important implications for understanding the e®ects of antitrust laws governing mergers, vertical restraints, and collusion as well.

market values of grocery manufacturers in the U.S.

APPENDIX

Proof of Lemma 1

Di®erentiating the system (3) and (5) when the integration constraint is slack yields

∂w_i^A

Proof of Lemma 2

For future reference we need the derivatives of the equilibrium quantities with respect to w_1. Di®erentiating the system (11) with respect to w_1 gives

$$\begin{pmatrix} -_{11} & -_{12} \\ -_{21} & -_{22} \end{pmatrix} \begin{pmatrix} \partial x_1/\partial w_1 \\ \end{pmatrix}$$

Substituting (33) into (35) and imposing symmetry yields (15).

Inspection of condition (11) implies that P w_i as θ 0. This implies condition (16).

Let $w_1 = w_2 = w$. Using symmetry, the limit of ¯rm 1's concession costs when price discrimination is forbidden is

$$\text{(36)} \qquad \lim_{\to 0}\left(\frac{-\left[\frac{\theta\,1}{w_1} + \frac{\theta\,1}{w_2}\right]}{\pi_1}\right) = \lim_{\to 0}\frac{\left(-2P'\left[\frac{\theta\,1}{w_1} + \frac{\theta\,2}{w_1}\right]x_1 + x_1\right)}{(P-w)x_1}$$

$$\text{(37)} \qquad = \lim_{\to 0}\left(\frac{\theta^2[P''X \;\; + P']}{(P-w)\text{¢}}\right.\quad .$$

Both the numerator and denominator of (37) converge to zero as θ 0. Let $A = P''X \;\; + P'$, and let A' denote the derivative of A with respect to θ. Applying L'Hopital's rule to condition (37) twice, we have

$$\text{(38)} \quad \lim_{\to 0}\left(\frac{\theta^2[P''X \;\; + P']}{(P-w)\text{¢}}\right. = \lim_{\to 0}\left(\frac{2\theta A + \theta^2 A'}{P'X\;'\,\text{¢} + (P-w)\text{¢}'}\right. \quad \theta X \left(\begin{matrix} X \\ j \quad T\end{matrix}\right. \quad =_A \lim_{\,'}$$

$$= \lim_{\to 0}\left(\qquad 2A + 4\theta A' \right.$$

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