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Author(s): Daniel P. O'Brien and Greg Shaffer

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The Welfare Effects of Forbidding Discriminatory Discounts: A Secondary Line Analysis of Robinson-Patman

Daniel P. O'Brien
U.S. Department of Justice

Greg Shaffer
University of Michigan

We examine the welfare effects of forbidding price discrimination in intermediate goods markets when firms can bargain over terms of their nonlinear supply contracts. In particular, our focus is on secondary line injury to competition under three interpretations of what it means to forbid price discrimination. We find that in each case, forbidding discriminatory discounts renders retailer bargaining power useless in mitigating manufacturer market power. As a result, all retailers end up paying higher input prices, and all retail prices rise. We show by example that the welfare loss can be substantial.

1. Introduction

An oft encountered question in antitrust law is whether externalities caused by particular business practices harm competition or simply transfer rents. Nowhere are the issues more difficult than in intermediate goods markets, where buyers of a product subsequently compete in its resale. Because downstream firms' demands are interdependent, each firm's profit depends not only on its own input price but also on those of its rivals. If some buyers can use their bargaining leverage to extract discounts that rivals cannot secure, the rivals are disadvantaged and thereby injured. Injury to competitors, however, is not the same thing as injury to competition, and it is not obvious that competition is harmed in this case.

Nevertheless, in an effort to protect small business from alleged unfair purchasing practices of larger rivals, and thereby to ensure "equal competitive opportunity," Congress enacted the Robinson-Patman Act in 1936. It amends Section 2a of the original Clayton Act, and makes it unlawful for a seller "to discriminate in price between different purchasers of commodities of like grade and quality" where substantial injury to competition may result. As interpreted by the courts, price discrimination has often been found to be illegal upon a mere showing of injury to competitors. This interpretation has rightfully spawned an enormous amount of criticism when applied to primary line cases (alleged injury to rivals of the seller offering the discriminatory

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price), but surprisingly, there has been little criticism of its application to secondary line cases (alleged injury to rivals of the buyer receiving the discriminatory price).¹

Indeed, a common view is that society is best served by ensuring “equal competitive opportunity” among downstream rivals. According to one proponent, who is now a federal judge:

Price discrimination impairs efficiency in the market in which the purchasers from the discriminating seller sell, by creating competitive cost disparities unrelated to differences in the relative efficiency of the competitors. The purchaser to whom the discriminating seller sells at a lower price may be no more efficient than the competing seller who is charged a higher price. (Posner, 1976:177)

An alternative view, expressed by Bork (1978), is that the welfare effect of forbidding price discrimination in secondary line cases is ambiguous at best. Borrowing from the literature on third-degree price discrimination in final goods markets, he notes that price discrimination generally results in buyers with a low (high) elasticity of demand receiving a higher (lower) price than they would receive under uniform linear pricing. He concludes that the overall effect on welfare is likely to be positive if new markets are served at the lower price; otherwise, the change in welfare turns on the concavity of demand curves.

However, Katz (1987:154) (who came “to exhume Robinson-Patman, not to praise it”) correctly points out that there are fundamental differences between final goods and intermediate goods markets. One difference is that in intermediate goods markets buyers have interdependent demands. Another is that buyers of intermediate goods can often integrate backward and supply the input themselves. Building on these insights, Katz shows in a model with linear pricing that “under reasonable conditions, intermediate goods price discrimination leads to higher input prices being charged to *all* buyers” (1987:156). The implication is that, *ceteris paribus*, Robinson-Patman may be socially beneficial.

But intermediate goods markets differ from final goods markets in other ways as well, most notably in the propensity of suppliers to bargain with downstream firms and use nonlinear pricing. The consequences of these prac-

1. Primary line cases used to turn on showing injury to competitors from alleged predatory conduct by the defendant. See *Moss v. FTC*, 148 F.2d 378, (2d Cir.), *cert. denied*, 326 U.S. 734 (1945), where the Court indicated that diversion of business away from rivals in itself was sufficient to violate the statute. In another example, which Bowman (1967:84) has called “the most anticompetitive antitrust decision of the decade,” *Utah Pie Co. v. Continental Baking Co.*, 386 U.S. 685 (1967), the Supreme Court inferred injury to competition from evidence of a “drastically declining price structure.” Since then, the burden of proof on plaintiffs claiming predation has grown substantially. Recently, in *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 113 U.S. 2578 (1993), the Supreme Court ruled that a claim of primary line injury under Robinson-Patman is of the same general character as a predatory pricing claim under Section 2 of the Sherman Act, thus making it much tougher to win a primary line case.

tices for efficiency are substantially different under downstream rivalry than they are under downstream monopoly. In the latter case, the seller and single buyer each agree that the marginal payment should be chosen to induce the buyer to maximize joint profits; bargaining occurs only over the fixed payment. Under rivalry, however, each buyer has an incentive to negotiate unilaterally a lower marginal payment in an effort to gain a cost advantage over its rivals. Obviously, a cost advantage gives the buyer higher profits in the resale market. But since each buyer ignores the effect on its rivals' profits, it does not fully internalize the dissipation in joint profits. Since lower marginal payments subsequently translate into lower retail prices, consumers stand to gain, and on balance social welfare rises as well.² Intervening in this process by forbidding intermediate product price discrimination can have adverse consequences.

To illustrate this idea, Section 2 presents a model of a single manufacturer who negotiates nonlinear contracts with two retailers who subsequently compete in distribution. We solve for a "benchmark" equilibrium for the case of no government intervention.

Section 3 examines how alternative interpretations of the government's ban on price discrimination affect equilibrium pricing. While the precise meaning of secondary line price discrimination under Robinson-Patman is not given in the statute, the courts appear to have settled on the following: The act is violated if (a) retailers are offered different payment schedules, or (b) retailers are offered the same payment schedule, but the discounts received by some retailers are not "functionally available" to all. Translating this interpretation into the implied restrictions on the set of bargaining instruments available in the model allows us to solve for various Robinson-Patman equilibria. Our main finding is that forbidding intermediate goods price discrimination leads to *higher* marginal input prices for *all* buyers. In contrast to Katz, our model implies that, *ceteris paribus*, Robinson-Patman unambiguously reduces welfare. This finding is independent of both the degree of asymmetry among the downstream firms as well as their idiosyncratic bargaining powers.

Section 4 illustrates these results in a linear demand example, which shows that the welfare loss caused by Robinson-Patman can be quite large. We also compare and contrast profits under alternative regimes. Not everyone loses under Robinson-Patman; this may account for some of the lobbying behavior observed when the act was passed and whenever policy reforms are considered.

2. The failure to maximize joint profits in this case is due to a form of contractual incompleteness. The problem is that under bilateral bargaining, nonlinear contracts are insufficient to align incentives for bilateral opportunism with the goal of maximizing joint profits. Doing so requires retailers' payments to depend on their own and their rivals' actions (see O'Brien and Shaffer, 1992). There are many reasons why such contracts may not be feasible, ranging from the costs of enforcement to illegality under the antitrust statutes.

2. Model

We consider an intermediate goods market in which a single manufacturer produces a product at constant marginal cost c and sells it to two competing retailers for subsequent distribution to final consumers. The upstream monopoly assumption is made partly for tractability and partly to rule out a priori any primary line issues. In particular, we will not be concerned with issues of predatory pricing, or whether price discrimination fosters cartel instability. Thus, our welfare conclusions ignore these traditional concerns. The assumption of constant marginal cost dismisses any possible Robinson-Patman defense on cost justification grounds.³ The restriction to two retailers is purely for expositional convenience. Like the assumption of constant marginal cost, it can be generalized without altering any qualitative results.

Retailers are differentiated in the sense that although the product they sell is homogeneous, customers have different store preferences. Let consumer demands for the products of retailers 1 and 2 be $D_i(P_1, P_2)$, $i = 1, 2$. We assume that demands are downward sloping, that the goods are substitutes, and that a unit increase in both prices causes the demand for good i to fall.

We consider a three-stage model of pricing and distribution. In the initial stage, the manufacturer publicly announces supply terms for each retailer. Unfortunately for the manufacturer, he cannot commit to these terms in the absence of laws constraining his behavior. Thus, he may soon (stage two) find himself entering into private, bilateral negotiations with each retailer, as described in detail below. Stage one is actually redundant when negotiations are unconstrained in stage two, but it becomes important when bilateral renegotiation is disallowed by Robinson-Patman. We have in mind situations like what occurred in *U.S. v. Borden Company*, 370 U.S. 460 (1962), where suppliers of fluid milk used private letters to offer varying discounts to certain chain stores and independents (Breit and Elzinga, 1989:363). Such discounts may be offered unilaterally by the manufacturer, or they may arise from bargaining pressure exerted by downstream firms.

Once contract terms are agreed upon, the retailers engage in Bertrand competition (stage three) to establish final goods prices. A key assumption is that the i th retailer's negotiated contract is private information between the manufacturer and retailer i . This assumption is natural when contracts are determined through bilateral bargaining, since firms would adhere to publicly announced first-stage contracts only if it were in their bilateral interest to do so. An implication is that a (secret) adjustment in one buyer's marginal

3. One of the traditional criticisms of the Robinson-Patman Act is that discrimination under the law is not the same thing as economic discrimination. In theory, the act allows for price differentials "which make only due allowance for differences in the cost of manufacture, sale, or delivery." In practice, however, the cost justification defense is generally recognized as a mirage. The inherent difficulty in determining economic costs and arbitrariness in allocating them to individual products makes for a very difficult trial defense. Our model abstracts from these difficulties by ruling out cost differences from the start.

payment does not affect its rival's final goods pricing behavior. Thus, when the manufacturer and retailer i adjust only their contract, they take as given the retail price the rival plans to set.

We capture the essence of both fixed and marginal payments by assuming that retailer i 's payment to the manufacturer is 0 if $D_i = 0$ and $F_i + w_i D_i$ if $D_i > 0$, where w_i is the marginal payment (wholesale price) and F_i is the fixed payment. The fixed payment can be either a fixed fee (if positive) or a discriminatory slotting allowance (if negative). Let the manufacturer's profit be $\pi_M = \sum_{i=1}^2 (w_i - c) D_i(P_1, P_2) + F_i$, and let retailer i 's profit be $\pi_i = (P_i - w_i) D_i(P_1, P_2) - F_i$. We assume that if an equilibrium to the Bertrand pricing game exists in which both retailers are active, that equilibrium is unique.⁴

2.1 Solving the Model in the Absence of Government Intervention

When a degree of non-transferability . . . sufficient to make [price] discrimination profitable is present, the relation between the monopolistic seller and each buyer is, strictly, one of bilateral monopoly. The terms of the contract that will emerge between them is, therefore, . . . subject to the play of that "bargaining" (Pigou, 1932:278).

Turning to the details of the contracting process, we assume that when Robinson-Patman is not enforced, the manufacturer bargains simultaneously with each retailer in stage two. A variety of assumptions have been made in the literature about the details of bargaining in vertical control models like ours. The most common assumption is that the manufacturer has all the bargaining power, and offers take-it-or-leave-it two-part tariffs that are observed by both retailers before choosing final prices (i.e., stage two would be the same as stage one in our setup). Under this assumption it is well known that the unique subgame perfect equilibrium yields a wholesale price vector \mathbf{w}^1 that induces retailers to charge the vertically integrated retail price vector \mathbf{P}^1 and fixed fees that collect retailers' surplus (Dixit, 1983; Mathewson and Winter, 1984). A difficulty with using this approach to examine the effects of Robinson-Patman, however, is that it ignores incentives the manufacturer and each retailer may have to renegotiate *privately*.

We desire an equilibrium concept incorporating the idea that equilibrium contracts should be robust against private renegotiation by firms who contract with each other, at least in situations when bilateral renegotiation is legal. A fairly general way to capture this idea is to define a *bargaining equilibrium* as a set of contracts (and Bertrand final goods prices induced by those contracts) that simultaneously solve asymmetric Nash bargaining solutions (Nash, 1953) between the manufacturer and each retailer.⁵ To ensure that each Nash bar-

4. It suffices to assume that retailer i 's profit under two-part tariffs is concave in P_i and obeys the dominant diagonal condition $|\partial^2 \pi_i / \partial P_i^2| > |\partial^2 \pi_i / \partial P_i \partial P_j|$.

5. The phrase "bargaining equilibrium" is due to Harsanyi (1977), who considers the general problem of simultaneous bargaining by two-player coalitions in N -player bargaining games. Our definition is actually closer to that of Horn and Wolinsky (1988), who examine incentives for

gaining problem is well defined under our assumption that contracts are private information, we assume that the manufacturer and each retailer bargain taking the rival retailer's contract and retail price as given.⁶

In addition to embodying the idea of robustness against renegotiation (to be made more precise below), the bargaining equilibrium concept also has foundations in noncooperative game theory. Appendix A describes two extensive-form games that yield bargaining equilibria as perfect Bayesian equilibria under the "refinement" that retailers view any unexpected behavior by the manufacturer as a unilateral deviation.⁷ Hence, our assumption that the manufacturer and retailer bargain taking the rival retailer's contract as given is equivalent to assuming unilateral deviations beliefs in the underlying extensive-form game (see Appendix A). This assumption is not innocuous, as discussed in more detail below.

The Nash bargaining problem of the manufacturer and retailer i is described by their disagreement points, $(d_{M_i}, 0)$, and by the convex set of payoff pairs, $\Omega_i = \{(\pi_M, \pi_i) | \pi_M - d_{M_i}, \pi_i \geq 0\}$. We assume the disagreement point d_{M_i} corresponds to the profit the manufacturer expects to earn if negotiations with retailer i breaks down. In this event, the manufacturer and rival retailer negotiate as bilateral monopolists according to their respective bargaining strengths.⁸

A set of asymmetric Nash bargaining solutions is a vector of wholesale prices and fixed fees that maximize the Nash products $\phi_i = (\pi_M - d_{M_i})^{\alpha_i} (\pi_i)^{1-\alpha_i}$, $i = 1, 2$, where $\alpha_i \in (0, 1)$ is a measure of the manufacturer's bargaining power in negotiations with retailer i . Differentiating ϕ_i with respect to F_i gives the pair of first-order conditions

$$\frac{\partial \phi_i}{\partial F_i} = \alpha_i \pi_i + (1 - \alpha_i)(\pi_M - d_{M_i}) = 0, \quad i = 1, 2. \quad (1)$$

Differentiating ϕ_i with respect to w_i , using (1), and simplifying gives the first-order conditions

horizontal mergers by upstream and downstream firms when input prices are negotiated. The main difference between our definition and theirs is that they consider observable linear contracts, whereas we consider nonlinear contracts that are private information.

6. We thank an anonymous referee for suggesting the need to clarify the assumptions defining the utility possibility frontier in each bilateral bargaining problem.

7. This restriction is referred to as "passive beliefs" by McAfee and Schwartz (1994) and "market-by-market bargaining" by Hart and Tirole (1990). The same idea is implicit in the "contract equilibrium" concepts of Cremer and Riordan (1987) and O'Brien and Shaffer (1992).

8. Under this assumption the Nash bargaining solution between the manufacturer and each retailer corresponds to the equilibrium of an alternating-offer, noncooperative bargaining game in which firms are motivated to reach agreement by fears that negotiations may break down. Our qualitative results hold equally well when the disagreement point corresponds to the profit stream the manufacturer earns from firm j while in a state of disagreement with firm i . See Binmore, Rubinstein, and Wolinsky (1986) for the theoretical connection between noncooperative bargaining and these two interpretations of the disagreement point in the Nash bargaining solution. The assumption made here simplifies computations in deriving explicit solutions to the model.

$$D_i + (P_i + c) \frac{\partial D_i}{\partial P_i} + (w_i - c) \frac{\partial D_j}{\partial P_i} = 0, \quad i = 1, 2, \quad j \neq i. \quad (2)$$

Optimal retailer pricing requires

$$D_i + (P_i - w_i) \frac{\partial D_i}{\partial P_i} = 0 \quad i = 1, 2. \quad (3)$$

Conditions (1), (2), and (3) are necessary for $(w_1, w_2, F_1, F_2, P_1, P_2)$ to arise in a bargaining equilibrium. Surprisingly, they yield the following strong prediction.

Proposition 1. When price discrimination is allowed, the bargaining equilibrium wholesale prices equal the manufacturer's marginal cost.⁹

Proof. Substituting Equation (3) into (2), we see that setting $w_1 = w_2 = c$ satisfies (2). Thus, $w_1 = w_2 = c$ is a solution to Equations (2) and (3), and fixed fees can be chosen to satisfy (1). Appendix B shows that marginal cost pricing is the only solution to Equations (1)–(3). Q.E.D.

This conclusion is independent of α_i and holds for any amount of demand asymmetry. Intuitively, because retailer 2 cannot observe retailer 1's actual supply terms, the manufacturer and retailer 1 know that a unilateral adjustment in w_1 will not affect either P_2 or F_2 . Suppose $w_2 = c$, so that the manufacturer extracts a surplus of F_2 from retailer 2. Then in negotiations with retailer 1, it is as if retailer 2 does not exist. The manufacturer and retailer 1 simply act as if they are bilateral monopolists, taking P_2 as given. In this case, it is well known that the Nash bargaining solution reduces to a two-step procedure. The two parties first maximize joint surplus by choosing a marginal payment equal to marginal cost ($w_1 = c$), then they divide the surplus with a fixed fee determined according to their individual bargaining strengths. Now suppose $w_1 = c$. Then by the same reasoning, the manufacturer and retailer 2 perceive themselves as bilateral monopolists and choose $w_2 = c$. Thus, the set of contracts with $w_1 = w_2 = c$ and F_1, F_2 chosen to reflect bargaining strengths are mutual (bilateral) best responses and therefore arise in a bargaining equilibrium.

This intuition is analogous to that given by Katz (1991) for the case of two principals distributing goods through *separate* agents who do not observe each other's contracts. In our model, the common principal link between the two retailers is effectively separated by the assumption that the manufacturer and each retailer bargain taking the rival retailer's contract as given, which is equivalent to assuming that retailers have unilateral deviations beliefs in the

9. This result is robust to allowing general nonlinear contracts (O'Brien and Shaffer, 1992) and Cournot competition (Hart and Tirole, 1990; McAfee and Schwartz, 1994).

underlying extensive-form bargaining game (see Appendix A). Without restrictions on beliefs, the extensive-form game generally has multiple perfect Bayesian equilibria, some of which involve wholesale prices above marginal cost.¹⁰ It is in that sense that the unilateral deviations beliefs assumption implicit in the bargaining equilibrium concept is not innocuous.

Our reason for adopting the bargaining equilibrium concept is that it embodies the idea of robustness against private renegotiation. To see this, note that in addition to characterizing the bargaining equilibrium wholesale prices, Equation (2) is the first-order condition for choosing a wholesale price w_i to maximize the bilateral profits $\pi_M + \pi_i$ of the manufacturer and retailer i . Since wholesale prices equal marginal cost in any bargaining equilibrium, it follows that if either wholesale price were different from marginal cost, the manufacturer and at least one retailer could secretly negotiate a new wholesale price that would increase their joint surplus, and a fixed fee that would make both firms better off.¹¹

Despite their best efforts, neither retailer in this model gains a marginal cost advantage over its rival in equilibrium.¹² This does not mean that the resulting retail prices are the same (since demands may be asymmetric), nor does it mean that the average prices paid for the manufacturer's product are the same. Each retailer's average price is determined by the quantity it buys in equilibrium and its fixed fee. The fixed fee, in turn, depends *inter alia* on relative bargaining powers. Suppose, for example, that retailer 2 is a large chain store and retailer 1 is a small independently owned concern. Then there are two factors that may tend to give the chain a lower average price. First, because of

10. For example, if retailers believe they will be treated symmetrically (the "symmetry beliefs" of McAfee and Schwartz, 1994), incentives for bilateral opportunism are attenuated, and wholesale prices above marginal cost can be supported in perfect Bayesian equilibrium. As McAfee and Schwartz point out, however, symmetry beliefs are not very compelling, because the manufacturer's preferred contracts with other firms generally differ from the contract with the first firm.

11. One might argue that the need to develop a reputation might prevent the upstream firm from engaging in this type of opportunism. But reputation alone is not always enough, especially for young upstream firms. For example, retailers may believe that the upstream firm will not be around long enough to reap the benefits of building a reputation. Even for experienced firms, if downstream orders are infrequent, the short-term gains from private renegotiation may outweigh the value of building a reputation. Another problem arises if retailers have difficulty distinguishing opportunism from exogenous fluctuations in market conditions. In this case a supplier may simply be unable to build a reputation. Finally, from the complex franchise contract law on disclosure and dealer termination, it is clear that reputation does not work in every case.

12. We have abstracted from several considerations that could give one buyer lower marginal prices. First, the manufacturer may have a lower marginal cost of selling to one buyer than another. If so, then each buyer would receive its good at the marginal cost of serving it. Second, retailers may differ in their degrees of risk aversion. For example, a retailer that is more risk averse may negotiate a lower fixed payment in exchange for a higher wholesale price. Third, some buyers may be compensated at the margin for performing tasks that are traditionally reserved for wholesalers. We leave these extensions for future research, but note here that as long as the engendered cost advantage is small enough, our qualitative results will continue to hold.

its size, the large chain can spread its fixed cost over a greater quantity than can its smaller rival. Second, the chain store is likely to have more bargaining power than the smaller store and hence may be able to negotiate a lower fixed fee.¹³

3. Forbidding Price Discrimination

A secondary line violation of the Robinson-Patman Act is established if there is a reasonable possibility that the seller's discriminatory prices may injure competition. Historically, the Supreme Court has inferred the requisite injury to competition from price differentials sufficient in amount to influence resale prices or impair profits.¹⁴

Translated into our model, we interpret the Supreme Court as requiring the marginal payment (i.e., the wholesale price) to be the same for both retailers. This requirement is independent of whether a firm receiving a lower wholesale price passes some of it through to consumers via a lower retail price. Obviously, any pass-through creates a retail price wedge over and above what would exist in the absence of any discrimination, and the firm paying the higher wholesale price has grounds to sue by virtue of the link between the additional wedge and its resulting loss in sales. But even if the favored retailer does not lower its retail price, the firm paying the higher wholesale price can still sue on the grounds that its profit was impaired relative to its rival.¹⁵

By the same reasoning, we interpret the Supreme Court as requiring any fixed payment to be the same for both retailers. However, whether or not fixed payments are even allowed depends on how the courts interpret a fixed payment schedule that is the same for all downstream buyers regardless of their size. The law is somewhat ambiguous regarding instances in which by virtue of the same fixed payment, a large retailer in effect receives a lower average price than a small retailer. But it appears that a finding of injury turns on the degree of asymmetry between buyers. If a lower average price were judged "functionally available" to all, then the manufacturer's payment schedule would not be deemed to have caused injury. On the other hand, if the lower

13. In general, the size of the discount a retailer can negotiate is increasing in its threat point, the inverse of its discount rate, and its cost of making bargaining concessions. Thus, a chain store may obtain a lower average price than a smaller independent store because it has better alternatives in the event negotiations break down, it has a higher discount rate, or it is more costly for it to accept a higher price.

14. See *FTC v. Morton Salt Co.*, 334 U.S. 37 (1948). In the Supreme Court's most recent statement on secondary line injury, *Falls City Industries, Inc. v. Vanco Beverage, Inc.*, 460 U.S. 428 (1983), it reaffirmed that an inference of injury can be overcome only by "evidence breaking the causal connection between a price differential and lost sales or profits."

15. See *Foremost Dairies, Inc. v. FTC*, 348 F. 2d 674 (5th Cir.), cert. denied, 382 U.S. 959 (1965). According to the most recent American Bar Association monograph on the Robinson-Patman Act (1980:99), the inference of injury rule "applies even if resale prices between favored and unfavored purchasers remain the same, since the latter may still be injured by impairment of their profits or their ability to provide services."

average price were not “functionally available” to all, then the requisite injury would be found.¹⁶

Based on this interpretation, we consider two cases. In the first case, the manufacturer must charge a common wholesale price and cannot specify a fixed fee. In the second case, the manufacturer is allowed to charge a common fixed fee in addition to a common wholesale price. The second case is permitted provided the degree of asymmetry among retailers is small enough. We also consider a third case which practically may arise because of information constraints. In some situations the courts simply may not be able to verify discriminatory fixed fees. Thus, in our third case, although the manufacturer must charge a common wholesale price, the fixed fees are determined through bargaining.

The timing in our model is the same as before. In the initial stage, the manufacturer publicly announces its supply terms. However, these terms are now subject to legal restrictions. Bargaining, if any, takes place in stage two, and retail prices are chosen in stage three. We assume that bargaining can arise only in case three, that is, only when the courts cannot verify discriminatory fixed fees, and then only over the fixed payment. We do not allow bargaining over the wholesale price. Our justification for this assumption is the clause in Section 2f of the Robinson-Patman Act which makes it illegal for a buyer “knowingly to induce or receive a discrimination in price.” In other words, retailers in our model refrain from renegotiating the wholesale price because if they were successful, they would be held liable for inducing illegal price discrimination. The manufacturer obviously prefers that there be no bargaining over the wholesale price and has every incentive to remind retailers of their liability under Section 2f.¹⁷

We begin by solving the retailers’ pricing problem, the stage of the game that is common to each of the three cases. Each retailer chooses its price P_i , to maximize $\pi_i = (P_i - w)D_i(P_1, P_2)$, $i = 1, 2$. The first-order conditions are given as follows:

16. For instance, one of the reasons the Court found against Morton Salt was that “theoretically, these discounts are equally available to all, but functionally they are not,” *Morton Salt*, 334 U.S. 37, 42–43 (1948). According to Rowe (1962:97–98), “no price discrimination arises if the same concessions are practically accessible to all customers” (he cites *National Lead Co.*, 49 FTC 791 (1953) and *United States Rubber Co.*, 28 FTC 1498 (1939)).

17. An alternative assumption, which we do not make, is that retailers can negotiate over the wholesale price, cognizant of the fact that if any retailer is successful in obtaining a discount, the lower wholesale price is then granted to their rivals as well. The disadvantage of this alternative assumption is that it requires a more complete specification of the bargaining process, and would at best only mitigate the welfare problem we identify, without altering our qualitative conclusions. Intuitively, bargaining over the wholesale price loses much of its appeal to buyers who know that they cannot gain a marginal cost advantage. Adding to this is the fact that the manufacturer will be more reticent to grant wholesale price concessions precisely because such concessions must be given to all buyers. Both of these factors lead to a higher wholesale price when discrimination is forbidden than when it is allowed.

$$\begin{aligned}\frac{\partial \pi_1}{\partial P_1} &= (P_1 - w) \frac{\partial D_1}{\partial P_1} + D_1 = 0, \\ \frac{\partial \pi_2}{\partial P_2} &= (P_2 - w) \frac{\partial D_2}{\partial P_2} + D_2 = 0.\end{aligned}\quad (4)$$

Solving gives the final-stage equilibrium retail prices $\mathbf{P}^* = (P_1^*(w), P_2^*(w))$.¹⁸ We assume that retail prices are increasing in w . It suffices that reaction functions be upward sloping.

3.1 Common Wholesale Price, No Fixed Fee

Consider first the strictest interpretation of the Robinson-Patman Act—that is, that the manufacturer must charge a common wholesale price and cannot specify a fixed fee. Given the equilibrium retail prices derived above, the manufacturer's problem is to choose w to maximize

$$\pi_M^{NF} = (w - c) \sum_i D_i(\mathbf{P}^*),$$

where the superscript NF is a mnemonic for “no fee.” Differentiating π_M^{NF} with respect to w gives the first-order condition

$$\sum_{i=1}^2 D_i(\mathbf{P}^*) + (w - c) \sum_{i=1}^2 \sum_{j=1}^2 \frac{\partial D_i}{\partial P_j} \frac{dP_j^*}{dw} = 0. \quad (5)$$

Solving yields $w^{NF} > c$. Substituting into the final-stage equilibrium retail prices gives $P_i^{NF} = P_i^*(w^{NF}) > P_i^*(c)$, for $i = 1, 2$.

Proposition 2. When the Robinson-Patman Act requires a common wholesale price and no fixed fee, both retail prices are strictly higher than when price discrimination is allowed.¹⁹

Intuitively, since the manufacturer cannot extract surplus with a fixed fee, it has no alternative than to raise the wholesale price above its marginal cost.

18. Equilibrium retail prices are a function of the common wholesale price, which is common knowledge to both retailers.

19. That Robinson-Patman results in higher retail prices (Propositions 2–4) is robust to the constant marginal cost assumption. One simply replaces c in condition (5) [and in conditions (6) and (8), below] with C' , where $C(D_1 + D_2)$ is the manufacturer's total cost. Then by the same arguments as in the text, the wholesale price will exceed marginal cost in each Robinson-Patman regime, and a sufficient (but not necessary) condition for Robinson-Patman to raise retail prices is that C be convex. To see this, suppose instead that Robinson-Patman lowers retail

Retailers then add their own markup. In effect, the courts mandate a “double markup” solution, with consumers as the definitive losers.

3.2 Common Wholesale Price, Common Fixed Fee

A looser interpretation of the Robinson-Patman Act is that a nonlinear pricing schedule is permitted as long as the discounts are “functionally available” to all. In other words, in equilibrium, sales of the two retailers must be “close enough.” Assuming that $D_1(\mathbf{P}^*) \approx D_2(\mathbf{P}^*)$, in this subsection we analyze the case in which the manufacturer is allowed to charge a common wholesale price and fixed fee. Assuming the manufacturer sells to both retailers, it will set its fixed fee to extract fully the surplus of the less profitable retailer. Let retailer 1 be this retailer. Then, given the final-stage equilibrium retail prices, the manufacturer’s problem is to choose w to maximize

$$\pi_{\mathcal{M}}^{CF} = (w - c) \sum_{i=1}^2 D_i(\mathbf{P}^*) + 2(P_1^* - w)D_1(\mathbf{P}^*),$$

where the superscript CF is a mnemonic for “common fee.” Differentiating $\pi_{\mathcal{M}}^{CF}$ with respect to w , using (4), and simplifying gives the first-order condition

$$\begin{aligned} (w - c) \sum_{i=1}^2 \sum_{j=1}^2 \frac{\partial D_i}{\partial P_j} \frac{dP_j^*}{dw} + (D_2(\mathbf{P}^*) - D_1(\mathbf{P}^*)) \\ + 2(P_1^* - w) \frac{\partial D_1}{\partial P_2} \frac{dP_2^*}{dw} = 0. \end{aligned} \quad (6)$$

Since $dP_2^*/dw > 0$, $\partial D_1/\partial P_2 > 0$ and $D_2(\mathbf{P}^*) - D_1(\mathbf{P}^*) \approx 0$, the left-hand side of (6) is positive when evaluated at $w = c$.²⁰ Assuming the objective function is quasi-concave in w ,²¹ the wholesale price is higher when discrimination is forbidden than when it is allowed. Let w^{CF} denote the equilibrium wholesale price. Substituting into the final-stage equilibrium retail prices gives $P_i^{CF} = P_i^*(w^{CF}) > P_i^*(c)$, for $i = 1, 2$.

prices. This increases total demand, and by the assumption of convex costs, (weakly) increases upstream marginal cost. Since $w > C'$ under Robinson-Patman, and since retail prices are increasing in w , this implies that Robinson-Patman increases retail prices, contradicting the initial hypothesis.

20. More formally, a sufficient condition for the left-hand side of (6) to be positive, when evaluated at $w = c$, is that sales of the less profitable retailer be less than sales of the more profitable retailer. For $N > 2$ retailers, the generalization of the sufficient condition is that sales of the least profitable retailer be less than the average sales across all retailers.

21. The objective is quasi-concave, for example, under linear demand.

Proposition 3. When the Robinson-Patman Act requires a common wholesale price and fixed fee, and when the two-part tariff must be functionally available to all ($D_2(\mathbf{P}^*) - D_1(\mathbf{P}^*) \approx 0$), both retail prices are strictly higher than when price discrimination is allowed.

Intuitively, because the Robinson-Patman Act prohibits retailers from knowingly inducing discriminatory prices, the wholesale price is not bargained down to marginal cost. Instead, the manufacturer unilaterally sets its wholesale price above marginal cost in order to internalize downstream competition and thereby drive retail prices closer to their joint profit maximizing levels.²² Consumers are unambiguously worse off as a result.

3.3 Common Wholesale Price, Discriminatory Fixed Fees

The last scenario we consider is not so much a new interpretation of the Robinson-Patman Act as it is a recognition of an information constraint on the ability of the courts and retailers to ascertain price discrimination violations. One possibility is that the courts can verify wholesale prices but cannot verify discriminatory fixed fees, which may take the form of under-the-table payments, rebates, or other allowances that are difficult to uncover. In this case, a disadvantaged retailer simply cannot prove a discriminatory fixed fee violation of Robinson-Patman. Another possibility is that the courts can verify fixed fees if called upon to do so, but a retailer may be unwilling to incur the cost of verification if it does not know for sure whether it has been disadvantaged. For example, suppose retailers can infer discrimination only when they observe “surprise” retail prices by their rivals. Any rival who receives discriminatory terms can hide this fact by setting its retail price equal to what it would set in the absence of any favoritism. By doing so, it avoids detection. In either case, the Robinson-Patman Act serves only to ensure stability in retail prices, not equity in surplus extraction.

We model this situation by assuming that the manufacturer must choose a common wholesale price, but that fixed fees are determined through secret bilateral bargaining.²³ This case differs from the previous two in that now the bargaining stage of the model matters. We proceed to solve backwards. Given the final-stage Bertrand equilibrium retail prices [$P_1^*(w), P_2^*(w)$], the manufacturer and each retailer negotiate in stage two over the fixed fees. Negotiations with retailer i yields a fixed fee that maximizes the Nash product $\phi_i = (\pi_M -$

22. If the two-part tariff is not required to be functionally available to all, the manufacturer has to balance its desire to internalize downstream competition with the possibility that sales of the less profitable retailer will be hurt more at the margin than sales of the more profitable retailer. This caveat arises because when the manufacturer is restricted to a common fixed fee, it cannot fully extract the surplus of the more profitable retailer.

23. There is no loss of generality in assuming that the wholesale price is observable. As long as the recipient of the discriminatory contract sets its retail price equal to what it would set in the absence of any favoritism, bargaining over the wholesale price and bargaining over the fixed fee are equivalent.

$d_{M_i}^{\alpha_i(\pi_i)^{(1-\alpha_i)}}$. Differentiating ϕ_i with respect to F_i gives the pair of first-order conditions found in (1). Simultaneously solving the two equations for F_1 and F_2 as functions of w , and then substituting them into the manufacturer's profit yields

$$\pi_M^{DF} = \frac{\alpha_1 \alpha_2 (\sum_{i=1}^2 (P_i^* - c) D_i) + \sum_{j \neq i} (1 - \alpha_i) \alpha_j d_{M_i}}{\alpha_1 + \alpha_2 - \alpha_1 \alpha_2}, \quad (7)$$

where the superscript DF is a mnemonic for “discriminatory fee.”

Proceeding backwards, in the initial stage the manufacturer chooses w to maximize its profit, knowing how its decision will subsequently affect fixed fee negotiations in stage two and retail pricing decisions in stage three. Differentiating (7) with respect to w , using (4), and simplifying gives the first-order condition

$$\begin{aligned} \alpha_1 \alpha_2 \left((w - c) \sum_{i=1}^2 \sum_{j=1}^2 \frac{\partial D_i}{\partial P_j} \frac{dP_i^*}{dw} + \sum_{i=1}^2 \sum_{j \neq i} (P_i^* - w) \frac{\partial D_i}{\partial P_j} \frac{dP_i^*}{dw} \right) \\ + \sum_{j \neq i} (1 - \alpha_i) \alpha_j \frac{d(d_{M_i})}{dw} = 0. \end{aligned} \quad (8)$$

Since $dP_j^*/dw > 0$ and $\partial D_i/\partial P_j > 0$, $j \neq i$, a sufficient condition for the left-hand side of (8) to be positive when evaluated at $w = c$ is that the derivative of the manufacturer's disagreement point with respect to w be nonnegative. Under our interpretation of the disagreement point as the profit the manufacturer can expect to earn if negotiations with retailer i break down, the derivative is zero.²⁴ Hence, assuming the objective function is quasi-concave in w , the wholesale price will be higher when price discrimination is forbidden than when it is allowed. Let w^{DF} denote the equilibrium wholesale price. Substituting into the final-stage equilibrium retail prices gives $P_i^{DF} = P_i^*(w^{DF}) > P_i^*(c)$ for $i = 1, 2$.

Proposition 4. When the Robinson-Patman Act requires a common wholesale price but allows discriminatory fixed fees, both retail prices are strictly higher than when price discrimination is allowed.

24. The nonnegativity of the derivative of the disagreement point with respect to w is robust to the alternative interpretation that d_{M_i} corresponds to the profit stream that the manufacturer expects to earn from retailer j while he is in a state of disagreement with retailer i . In this case, $d_{M_i} = (w - c)\bar{D}_j + \bar{F}_j = \alpha_j(P_j - c)D_j + (w - c)[\bar{D}_j - D_j] - (1 - \alpha_j)(w - c)[D_i - \bar{D}_i]$, where \bar{D}_j represents demand for j 's product while retailer i is in a state of disagreement, \bar{D}_i represents demand for i 's product while retailer j is in a state of disagreement, and \bar{F}_j represents retailer j 's negotiated fixed fee as a function of w . Since $\bar{D}_i > D_i$, $i = 1, 2$, it is straightforward to verify that $(\partial d_{M_i}/\partial w)|_{w=c} > 0$.

Intuitively, the manufacturer commits to a uniform wholesale price knowing that it will subsequently negotiate a given fraction of the profits derived from each good. Thus the manufacturer effectively chooses the wholesale price in stage one to maximize a weighted average of the profits earned by each good. This requires raising the wholesale price above marginal cost to at least partially internalize the externality from downstream competition. This case is similar to the common-fee case in that the wholesale price is not needed for surplus extraction and can be used to internalize downstream competition, but note that the term $D_2(P^*) - D_1(P^*)$ is absent from the first-order condition. Since discriminatory fixed fees are negotiated, the manufacturer does not need to balance the possibility that raising the wholesale price might reduce sales of the less profitable retailer by more than sales of the more profitable retailer.

An important implication of this model is that the Robinson-Patman Act has adverse effects even when it does not affect the type of discrimination that actually emerges in equilibrium. Both the benchmark case and the common wholesale price/discriminatory fee case yield a common wholesale price and discriminatory fee in equilibrium (except under symmetry, in which case both yield common fees). Nevertheless, the wholesale price is higher when a common wholesale price is required by law than when it is derived from private bilateral negotiations. The adverse effect of Robinson-Patman is to prevent such negotiations from driving down wholesale prices.

4. Profit and Welfare Comparisons

"Wherever a little band of lawmakers are gathered together in the sacred name of legislation," said one observer, "you may be sure that they are . . . thinking up things they can do to the chain stores." (Palamountain, 1955:162)

We now turn to the policy implications of our model. In particular, we ask what the model implies about how the government can proceed to achieve its objectives. The discussion below is summarized by the flow chart in Figure 1.

The first thing to notice is that *all* firms (weakly) prefer some price discrimination policy over no policy at all.²⁵ Firms differ, however, in their preferences among Robinson-Patman regimes. The common-fee case, if informationally feasible, is the worst for the small retailer, since the manufacturer commits to a fixed fee that extracts its entire surplus. Thus, if Congress intended the Robinson-Patman Act as a means of protecting the small

25. To see this, compare the discriminatory-fee case, which maximizes joint profits, to the benchmark case, which does not. Let Π be the joint profits of the manufacturer and both retailers. It is straightforward to show that in any bargaining equilibrium in which fixed fees are not constrained, the manufacturer earns $\pi_M = A\Pi + B$, where $A = \alpha_1\alpha_2/(\alpha_1 + \alpha_2 - \alpha_1\alpha_2)$ and $B = [\sum_{j \neq i} (1 - \alpha_j)\alpha_j d_{Mj}]/(\alpha_1 + \alpha_2 - \alpha_1\alpha_2)$, and retailer i earns $\pi_i = C_i\Pi + D_i$, where $C_i = (1 - \alpha_i)\alpha_j/(\alpha_1 + \alpha_2 - \alpha_1\alpha_2)$ and $D_i = (1 - \alpha_i)(d_{Mj} - d_{Mi} - \alpha_j d_{Mj})/(\alpha_1 + \alpha_2 - \alpha_1\alpha_2)$. Since each firm's profit is an affine function of joint profits under the two cases, and since the disagreement points do not depend on w , each firm is better off at $w^{DF} > c$.

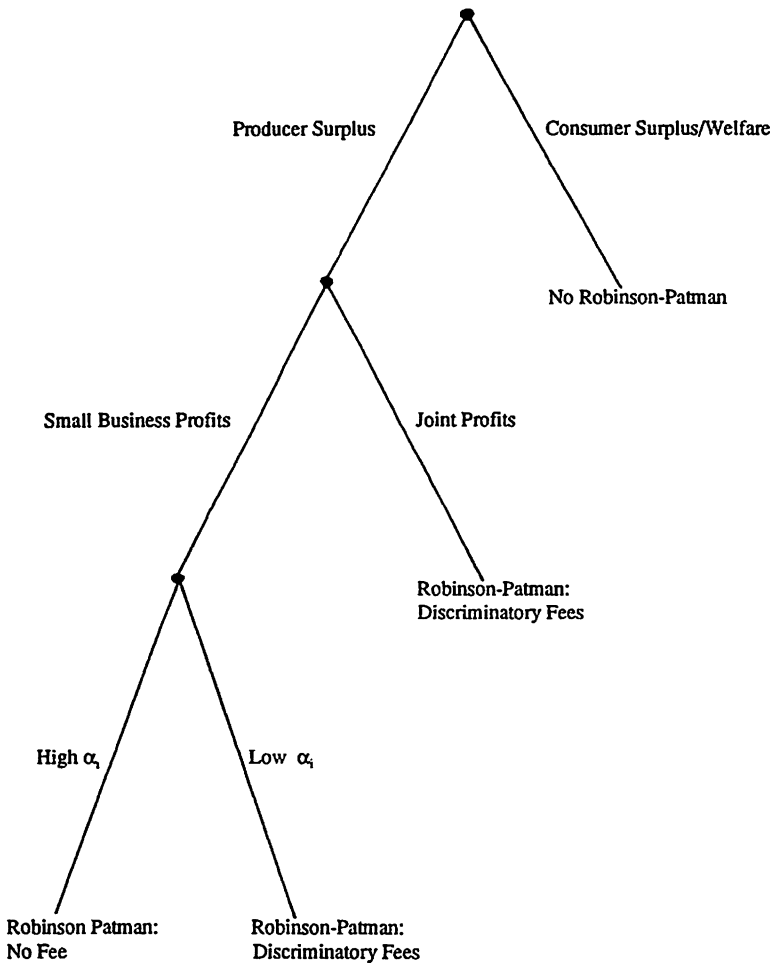


Figure 1. Government objectives in intermediate goods price discrimination.

businessman from the chain store “menace” (American Bar Association, 1980:14–19), its choice is between the no-fee case and the discriminatory-fee case. If the small retailer has little or no bargaining power, as was generally believed when Robinson-Patman was passed, then the no-fee regime serves it best. This is because the rents associated with its markup in the no-fee regime are not transferred to the manufacturer as they are in the other regimes. On the other hand, if the small retailer has substantial bargaining power, the discriminatory-fee regime serves it best. This is because the discriminatory-fee regime maximizes joint profits; if the small retailer has enough bargaining power, its share of maximized joint profits exceeds what it earns under the no-fee regime.

Although protecting the manufacturer and large retailer was never a stated

goal of Robinson-Patman, it could be a secondary goal if the government values their profits or if they have political influence. In general, the preferences of these firms over the different Robinson-Patman regimes depends on their relative bargaining powers and the degree of substitution between retailers' products. However, their preferences may well conflict with that of the small retailer. For example, if retailers are close to being symmetric, the manufacturer earns close to the maximized joint profit in the common-fee case. Retailers, however, do poorly. As another example of conflicting preferences, if the chain store has substantial bargaining power, it prefers the discriminatory-fee regime, since that regime maximizes joint profits. But if at the same time, the small retailer has little bargaining power, it prefers the no-fee regime, and so forth.

Like most of the antitrust statutes, the Robinson-Patman Act proscribes actions whose effect "may be substantially to lessen competition." If "competition" refers to a process tending to lower price toward marginal cost, then our results imply that Robinson-Patman itself lessens competition. Unlike the firms, consumers are best served when price discrimination is allowed, for in each Robinson-Patman regime the prices are higher than in the benchmark case.

We can get an idea of how large the welfare (producer plus consumer surplus) loss from Robinson-Patman can be in a linear demand example. Assume that aggregate net utility is

$$U = \left(\frac{(1 + \gamma)V_1 + \gamma V_2}{1 + 2\gamma} \right) q_1 + \left(\frac{(1 + \gamma)V_2 + \gamma V_1}{1 + 2\gamma} \right) q_2 - \frac{1}{2} (q_1 + q_2)^2 - \frac{(q_1 - q_2)^2}{2(1 + 2\gamma)} - \sum_{i=1}^2 P_i q_i,$$

where V_1 , V_2 , and γ are nonnegative constants and q_i is the quantity consumed of the i th good. Differentiating with respect to quantity and inverting gives the demand system

$$D_i(P_1, P_2) = \frac{1}{2}(V_i - (1 + \gamma)P_i + \gamma P_j), \quad i = 1, 2, \quad j \neq i.$$

The parameter γ represents the degree of substitution between products. For a unit increase in P_i , retailer i loses $1 + \gamma$ in sales, and of this, γ sales are diverted to retailer j . Thus $\gamma/(1 + \gamma)$ represents the increase in j 's sales as a fraction of the reduction in i 's sales. When $\gamma = 0$, no sales are diverted; consumer demands are independent. As $\gamma \rightarrow \infty$, retailers become perfect substitutes in the eyes of consumers. Differences between the market size parameters V_1 and V_2 reflect the degree of asymmetry.

Figure 2 illustrates the percentage decrease in total welfare arising from the three Robinson-Patman regimes when $V_1 = 9$, $V_2 = 10$, and $c = 0$. Notice that as the retailers' products become closer substitutes (γ increasing), the welfare loss under the discriminatory-fee and common-fee cases increases,

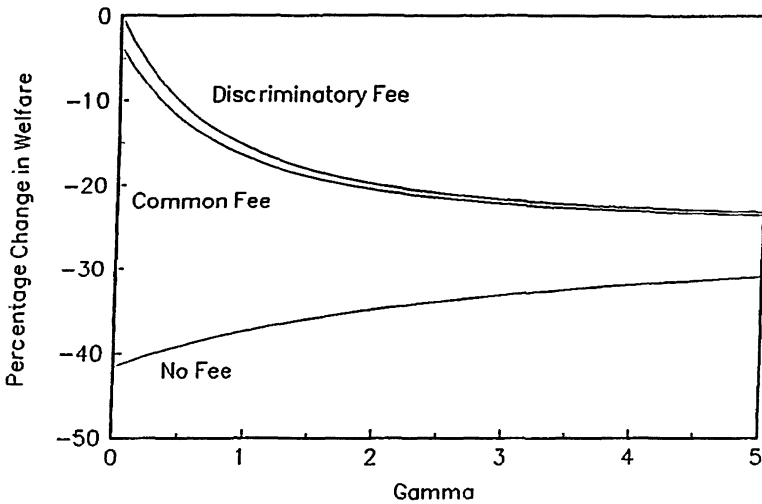


Figure 2. Welfare loss under Robinson-Patman when $V_1 = 9$, $V_2 = 10$, $c = 0$.

while the welfare loss decreases in the no-fee case. At $\gamma = 0$, the welfare loss is 0 percent, 3.6 percent, and 41.5 percent, respectively; at $\gamma = 5$, the welfare loss is 23.4 percent, 23.7 percent, and 31.2 percent. Intuitively, the discriminatory-fee and common-fee cases yield similar welfare results because the retailers are close to symmetric in the example. Nevertheless, the discriminatory-fee case is always preferable to the common-fee case and yields zero welfare loss at the polar extreme where the retailer's products are independent ($\gamma = 0$). By contrast, the double markup in the no-fee case is exacerbated as retailers' products become less substitutable (γ decreasing). On the other hand, as retailers' products become more substitutable (γ increasing), all three cases converge in the limit to maximize joint profit (not shown). But the welfare loss associated with joint profit maximization (25 percent) is still substantial when compared to the competitive benchmark.

5. Conclusion

The Robinson-Patman Act was enacted in 1936 to limit the purchasing power of large retail chain stores. Few have questioned its basic intent. Instead, most criticism deals with primary line issues of predatory pricing, barriers to entry, and cartel stability, as well as practical difficulties in enforcing the act, such as the lack of an adequate cost justification defense (often deemed illusory), and the inevitable impediments to distributional efficiency engendered by preventing retailers integrated into wholesaling from being compensated by the manufacturer for their services.²⁶

26. See Schwartz (1986) for an excellent summary of these issues.

So substantial was the early criticism that gradually a broad consensus emerged that intermediate goods price discrimination should not be proscribed. Reflecting this view, public enforcement became dormant through the 1970s.²⁷ But Robinson-Patman is no longer dormant. Encouraged by the courts' increasing sensitivity to economic analysis, the Federal Trade Commission's approach is now characterized as one of "cautious commitment."²⁸ Moreover, the Robinson-Patman Act's visibility was recently enhanced by the Supreme Court cases *Texaco, Inc. v. Hasbrouck*, 110 S. Ct. 2535 (1990) and *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 113 U.S. 2578 (1993).²⁹ In addition, private litigation continues unabated (Salop and White (1988) estimate that 18.1 percent of all private federal antitrust suits filed between 1973 and 1983 involved Robinson-Patman claims), and the prospect of treble damages still causes manufacturers to assess carefully the consequences of their pricing decisions.

Despite the historical and renewed importance of secondary line protection under Robinson-Patman, the welfare effects of forbidding discriminatory discounts have only recently been subjected to formal economic modeling.³⁰ However, these efforts have not incorporated bargaining or nonlinear pricing, two practices that are pervasive in many intermediate goods markets. When they are included, the analysis of secondary line price discrimination is altered in a crucial way. For instance, our model predicts that while firms (including small retailers) may benefit from Robinson-Patman, they always do so at the expense of consumers and total welfare. Put succinctly, forbidding intermediate goods price discrimination constrains the bargaining process by inhibiting buyers from seeking marginal price concessions that lower retail prices. This insight, along with the numerous primary line criticisms pointed out by others, and the practical difficulties of enforcement, raises serious concerns about the efficacy of the Robinson-Patman Act.

Although we believe our model identifies an important unintended conse-

27. According to Scherer and Ross (1990), Federal Trade Commission (FTC) complaints fell from an average of 74 per year during 1960–1965 to 5.6 per year during 1966–1970. And in the decade 1975–1985, a total of only 6 complaints were filed.

28. See the April 1991 address to the Robinson-Patman Act Committee of the American Bar Association, by Kevin Arquit, director of the FTC's Bureau of Competition. He describes the recently settled *Boise Cascade Corp.* litigation (No. 91-33) as well as several ongoing internal investigations. The text of his remarks can be found in the CCH Trade Regulation Reports at ¶50,058.

29. In *Texaco*, the Supreme Court affirmed the propriety of functional discounts. It held that discounts are allowable even though not explicitly permitted by the Robinson-Patman Act as long as the price differentials are reimbursement for legitimate marketing functions. The Court further indicated that suppliers do not have to satisfy the rigors of the cost justification defense in order to show the reasonableness of the discount. The *Brooke* case is discussed in note 1 above.

30. Recent articles include DeGraba (1987, 1990) and Katz (1987). In contrast to our analysis, DeGraba and Katz find that secondary line price discrimination reduces welfare. Price discrimination is harmful in DeGraba (1987) because it induces local firms to overly differentiate their products. It is harmful in DeGraba (1990) because it leads retailers to distort their choice of production technology in an inefficient way. Katz (1987) finds that price discrimination reduces welfare unless it prevents inefficient backward integration.

quence of forbidding price discrimination—that is, the mitigation of bilateral incentives to negotiate lower wholesale prices—we made several simplifying assumptions that prevent unambiguous policy prescriptions. For instance, in the absence of unilateral deviations beliefs, which are implicit in the bargaining equilibrium concept, the underlying extensive-form game has multiple perfect Bayesian equilibria when price discrimination is allowed, some of which entail wholesale prices above marginal cost. In addition, Katz (1991) has identified several conditions (not in our model) under which wholesale prices will exceed marginal cost even when contracts are unobservable and two-part tariffs are feasible. For example, in the presence of upstream moral hazard, wholesale prices above marginal cost help mitigate the manufacturer's incentive to chisel on product quality. Wholesale prices may also play a more active role in transferring surplus between a manufacturer and its retailers when there is asymmetric information (e.g., the upstream firm may not know downstream costs), or when there is demand uncertainty and retailers are risk averse. Obviously, welfare comparisons across regimes are more difficult in such situations. Extending the model to include these considerations is left for further research.

Appendix A: Noncooperative Foundations of Bargaining Equilibria

We describe two noncooperative games that yield bargaining equilibria as solutions. Consider first the simple bargaining game in which a single upstream firm makes private take-it-or-leave-it offers to multiple retailers who then compete by simultaneously choosing retail prices. As pointed out by several authors (Hart and Tirole, 1990; O'Brien and Shaffer, 1992; McAfee and Schwartz, 1994), this game and its Cournot variant have multiple perfect Bayesian equilibria owing to the arbitrary nature of retailers' out-of-equilibrium beliefs about offers received by their rivals. Two approaches have been suggested to deal with this problem. One approach is to require equilibria to be immune not only from profitable deviations by individual players, but also from profitable contractual deviations by coalitions of players who contract with each other. Such equilibria were called "contract equilibria" by Cremer and Riordan (1987) in a somewhat different context.³¹ O'Brien and Shaffer (1992) show that a bargaining equilibrium is a contract equilibrium with a particular distribution of rents determined by α_i , $i = 1, 2$.

The second approach to the multiplicity problem is to place restrictions on retailers' out-of-equilibrium beliefs. The "passive beliefs" restriction of McAfee and Schwartz (1994) and the "market-by-market bargaining" restriction of Hart and Tirole (1990) require that retailers view unexpected offers by the manufacturer as unilateral deviations. Under this restriction, the unique perfect Bayesian equilibrium to the take-it-or-leave-it game yields a bargain-

31. A related idea is the "strong equilibrium" concept of Aumann (1959), which requires immunity from profitable deviations by *any* coalition of players. Weakening this to allow deviations only by individuals and coalitions of firms that contract with each other yields a contract equilibrium in our model.

ing equilibrium in which the manufacturer receives all the rents. Intuitively, unilateral deviations beliefs force equilibria to be immune from profitable bilateral deviations by the manufacturer and each retailer.

The take-it-or-leave-it game can be generalized to an infinite-horizon bargaining game in which the manufacturer and each retailer alternate offers each period until reaching agreement or until negotiations break down. The analysis is similar to that of Jun (1989), who examines negotiations between an employer and two unions. The main difference is that Jun finds a unique subgame perfect equilibrium, whereas with unobservable nonlinear contracts, a generalization of the unilateral deviations beliefs assumption is needed to establish uniqueness.

Appendix B: Proofs and Calculations

B.1 Proof of Proposition 1

Equation 2 gives the necessary first-order conditions for wholesale prices to arise in a bargaining equilibrium. Substituting in each retailer's first condition for optimal retail pricing gives

$$\sum_{j=1}^2 (w_j - c) \frac{\partial D_j}{\partial P_i} = 0, \quad i = 1, 2.$$

In matrix notation, this expression can be written as $(w - c)D_p = 0$, where $w = (w_1, w_2)$, $c = (c, c)$, and D_p is the 2-by-2 matrix of demand derivatives. By our assumptions on demand, D_p is invertible. Hence, the bargaining equilibrium wholesale prices are the same for each retailer and are given by $w = c$ —that is, wholesale prices are equal to the manufacturer's marginal cost.

Q.E.D.

B.2 Calculations for the Linear Demand Example

For the linear demand example introduced in Section 4, tedious but straightforward calculations yield the following retail prices as bargaining equilibria in the four regimes:

$$P_i^B = \frac{2(1 + \gamma)V_i + \gamma V_j + (2 + 5\gamma + 3\gamma^2)c}{4 + 8\gamma + 3\gamma^2}, \quad i = 1, 2, \quad j \neq i,$$

$$P_i^{NF} = \frac{(10 + 13\gamma + 3\gamma^2)V_i + (2 + 9\gamma + 3\gamma^2)V_j + (4 + 10\gamma + 6\gamma^2)c}{16 + 32\gamma + 12\gamma^2},$$

$i = 1, 2, \quad j \neq i,$

$$P_i^{CF} = \frac{V_1 + V_2 + 2c}{4}, \quad P_2^{CF} = \frac{(6 + 3\gamma)V_2 + (3\gamma - 2)V_1 + (4 + 6\gamma)c}{8 + 12\gamma},$$

$$P_i^{PF} = \frac{(4 + 3\gamma)V_i + 3\gamma V_j + (4 + 6\gamma)c}{8 + 12\gamma}, \quad i = 1, 2, \quad j \neq i.$$

To generate Figure 2, we used these prices to find equilibrium quantities and then substituted them into the social welfare function (utility plus joint profits). Finally, we constructed percentage change in welfare for each regime using the benchmark case as the base.

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