Bargaining, Bundling, and Clout: The Portfolio Effects of Horizontal Mergers

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Abstract

This paper examines the output and profit effects of horizontal mergers between upstream firms in intermediate-goods markets. We consider market settings in which the upstream firms sell differentiated products to, and negotiate nonlinear supply contracts with, a downstream retail monopolist. If the merging firms can bundle their products, transfer pricing is efficient before and after the merger. Absent cost savings, consumer and total welfare do not change, but the merging firms extract more surplus. If the merging firms cannot bundle their products, the effects of the merger depend on the merged firm's bargaining power. If the merged firm's bargaining power is low, the welfare effects are the same as with bundling; if its bargaining power is high, and there are no offsetting cost savings, the merger typically reduces welfare. We evaluate the profit effects of mergers on rival firms and the retailer for the case of two-part tariff contracts. In this setting, a merger that harms rival firms and the retailer may still reduce final-goods prices.

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I. Introduction

Merger policy in the industrialized countries is largely motivated by classical theories of oligopoly whose roots trace to the theories developed by Cournot (1838) and Bertrand (1883).[1] The Merger Guidelines in the U.S., for example, rely heavily on modern variants of these theories, which predict that a merger between competitors with market power can raise prices significantly unless the merger generates offsetting efficiencies or attracts sufficient post-merger entry.[2] Unfortunately, however, the classical theories and their progeny generally make no distinction between final good and intermediate-goods markets. The theories assume that firms set take-it or leave-it prices that apply to all buyers, which is a reasonable assumption for most final-goods markets and some intermediate-goods markets, but it is not descriptive of pricing in many intermediate-goods markets.

A common feature of pricing in manufacturing sectors is that contracts are negotiated with individual downstream firms. For example, manufacturers of products sold through retail outlets like supermarkets, convenience stores, and mass merchants often negotiate different contracts with each distributor. Moreover, these contracts are a far cry from the simple, linear price set unilaterally by firms in the classical theories. The payment schedules one observes in reality are often highly nonlinear, with features like slotting fees, minimum quantity thresholds, and quantity discounts. They may also involve variants of bundling, such as aggregate rebates and full-line forcing.

In this paper we incorporate nonlinear supply contracts, bargaining and bundling (defined as inter-dependent price schedules) into a model of upstream competition to examine the effects of

work in this area is Horn and Wolinsky (1988), who use the Nash bargaining solution to analyze incentives for mergers in markets where competing downstream firms acquire inputs from independent suppliers, and in which they acquire inputs from a monopoly supplier. Horn and Wolinsky differ from us in that their upstream suppliers do not compete, bargaining takes place over linear prices only, and the inputs are assumed to be homogeneous. von Ungern-Sternberg (1996) and Dobson and Waterson (1997) also use the Nash bargaining solution to analyze the effects of mergers on input prices. They too, however, restrict attention to linear prices and do not consider bundling. The market structure they consider consists of a single upstream firm. Other papers in this area look at different market structures, do not allow for bargaining, and do not consider bundling.[5]

Much of the literature on multiproduct pricing focuses on the use of bundling to extract surplus from heterogeneous buyers (Adams and Yellen, 1976; McAfee, et al. 1989; Mathewson and Winter, 1997) or to leverage monopoly power across markets (Whinston, 1990; Choi and Stefanadis, 2001; and Carlton and Waldman, 2002). In contrast, bundling is profitable in our model even when there is a single buyer (the downstream retail monopolist) and no opportunity to leverage across markets. Bundling also takes place with substitute goods in our model, in contrast to the well-studied cases of bundling with independent or complementary goods. The closest paper to ours in the literature on multiproduct pricing is Shaffer (1991), who considers bundling in a bilateral monopoly setting with take-it-or-leave-it offers. However, his model does not allow for upstream rivalry, mergers, or bargaining, nor does he consider the welfare implications of a policy prohibiting bundling.

The remainder of the paper is organized as follows. Section II presents the model and solves for

II. The Model and Pre-Merger Equilibria

$N \geq 2$ upstream firms (manufacturers) each distribute a single differentiated product through a downstream monopolist.[6] Manufacturer i's production cost is $C_i(q_i) \geq 0$, where $C_i(0) = 0$ and $q_i \geq 0$ is the quantity it produces. The downstream firm (retailer) resells the manufacturers'

We now characterize the bargaining equilibrium. Given the vector of contracts $T \equiv (T_1(\cdot); T_2(\cdot); \ldots; T_N(\cdot))$, the retailer chooses quantities to maximize profits. Let $\Omega(T)$ be the set of quantity vectors that maximize the retailer's profit given the contract vector T. That is,

$$\Omega(T) \equiv \arg\max_{q} R(q) - \sum_j T_j(q_j):$$

In the first stage, the retailer and each manufacturer negotiate their contract recognizing that the retailer will subsequently choose quantities from the set $\Omega(T)$. Let T_{-i} denote the vector of contracts of firm i's rivals, e.g., $T_{-1} \equiv (T_2(\cdot); T_3(\cdot); \ldots; T_N(\cdot))$. Then, given T_{-i}, we can define the feasible set of quantity-contract combinations available to manufacturer i and the retailer as

$$A_i(T_{-i}) \equiv \{(q_i; T_i(\cdot)) \mid q \in \Omega(T); T_i(0) = 0; T_i(q_i) \geq C_i(q_i)\}:$$

Thus, the Nash bargaining solution between manufacturer i and the retailer solves

$$\max_{(q_i; T_i(\cdot)) \in A_i(T_{-i})} (\pi_i - d_i)^{\tau_i} (\pi_r - d_{r_i})^{1-\tau_i} \tag{1}$$

where $\pi_i = T_i(q_i) - C_i(q_i)$ is manufacturer i's profit; $\pi_r = R(q) - \sum_j T_j(q_j)$ is the retailer's profit; d_i and in which manufacturer i and the retailer choose a quantity-forcing contract with two parameters,

$$T_i^F(q_i) = \begin{cases} 0 & \text{if } q_i = 0 \\ F_i & \text{if } q_i = q_i^0 \\ \infty & \text{otherwise} \end{cases};$$

and quantity q_i, from the feasible set of quantity-contract combinations

$A_i^F(T$

such that

$$\pi_i \equiv F_i - C_i(q_i); \tag{4}$$

$$\pi_r \equiv R(q) - F_i - \sum_{j \neq i} T_j(q_j) - d_{r_i}; \tag{5}$$

where constraints (4) and (5) ensure that manufacturer i and the retailer earn at least their disagreement profits. The equality in (3) follows because the constraint $(q_i; F_i; q_{-i}^0) \in A_i^F(T_{-i})$ requires that q_{-i} maximize $R(q) - \sum_{j \neq i} T_j(q_j)$. Since $F_i - C_i(q_i)$ is independent of q_{-i}, and F_i and d_{r_i} are fixed when the retailer chooses q_{-i}, this amounts to choosing q_{-i} to maximize the Nash product.

The first-order conditions for F_i and q_i at an interior solution of (3) are

$$\beta_i \pi_i^{(\beta_i - 1)}(\pi_r - d_{r_i})^{(1-\beta_i)} - (1-\beta_i)\pi_i^{\beta_i}(\pi_r - d_{r_i})^{-\beta_i} = 0. \tag{6}$$

$$-C_i'(q_i)\beta_i \pi_i^{(\beta_i - 1)}(\pi_r - d_{r_i})^{(1-\beta_i)} + \frac{\partial R(q)}{\partial q_i}(1-\beta_i)\pi_i^{\beta_i}(\pi_r - d_{r_i})^{-\beta_i} = 0. \tag{7}$$

Substituting (6) into (7) and simplifying yields

$$\frac{\partial R(q)}{\partial q_i} - C_i'(q_i) = 0; \tag{8}$$

which implies that q_i maximizes the joint profit of manufacturer i and the retailer given T_{-i}. Since this must be true for all i, the bargaining equilibrium quantities must maximize overall joint profits, i.e., $q_i = q_i^I$, provided (3) has an interior solution for each i. This proves the following proposition.

Proposition 1 All N-product bargaining equilibria replicate the fully-integrated outcome.

Proposition 1 extends to bargaining with N upstream firms the well-known result in the agency

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III. Post-merger Equilibria and Output Effects

Suppose manufacturers 1 and 2 merge. This alters negotiations in potentially three ways. First, it affects the retailer's disagreement profit with the merged firm. After the merger, the retailer's disagreement profit is the profit it would earn if it did not sell products 1 and 2. Second, it may affect the retailer's bargaining power. After the merger, the retailer's bargaining weight in the Nash solves

$$\max_{(q_1,q_2,T_m(\cdot,\cdot))\in A_m(T^B_{-1,2})} (\pi_m - d_m)^{\beta_m} (\pi_r - d_{r_m})^{(1-\beta_m)}; \tag{9}$$

where d_m and d_{r_m} are the disagreement profits of the merged firm and retailer. The disagreement profit of the merged firm is $d_m = 0$. The disagreement profit of the retailer with the merged firm is

$$d_{r_m} = \max_{q_{-1,2}} R(0,0,q_{-1,2}) - \sum_{j \neq 1,2} T_j(q_j).$$

Characterization of equilibrium quantities and payoffs

We can use the same method that we used in the previous section to characterize equilibrium quantities and payoffs. In particular, let $T^F_m(\cdot,\cdot)$ be a quantity-forcing contract with $T^F_m(0,0) = 0$, $T^F_m(q^0_1, q^0_2) = F_m$, and $T^F_m(q_1,q_2) = \infty$ otherwise. Then, as we show in the appendix, we can characterize the equilibrium quantities and payoffs for the merged firm and retailer by solving

$$\max_{q_1,q_2,F_m,q_{-1,2}} (F_m - C_m(q_1,q_2))^{\beta_m} \left(R(q) - F_m - \sum_{j \neq 1,2} T^B_j(q_j) - d_{r_m} \right)^{(1-\beta_m)} \tag{10}$$

such that

$$F_m \geq C_m(q_1,q_2); \tag{11}$$

$$R(q) - F_m - \sum_{j \neq 1,2} T^B_j(q_j) \geq d_{r_m}: \tag{12}$$

where constraints (11) and (12) ensure that the merged firm and retailer earn at least their disagreement profits when q_1, $q_2 > 0$. The constraints that the retailer would rather choose q_1, $q_2 > 0$ than $q_1 = 0$, $q_2 > 0$, or $q_1 > 0$, $q_2 = 0$, are not binding because $T^F_m(q_1,q_2)$ in these cases equals ∞.

The first-order conditions for F_m and q_i at an interior solution of (10) are

$$\beta_m \pi_m^{(\beta_m - 1)} (\pi_r - d_{r_m})^{(1-\beta_m)} - (1-\beta_m) \pi_m^{\beta_m} (\pi_r - d_{r_m})^{-\beta_m} = 0: \tag{13}$$

$$-\frac{\partial C_m(q_1,q_2)}{\partial q_i} \beta_m \pi_m^{(\beta_m - 1)} (\pi_r - d_{r_m})^{(1-\beta_m)} + \frac{\partial R(q)}{\partial q_i} (1-\beta_m) \pi_m^{\beta_m} (\pi_r - d_{r_m})^{-\beta_m} = 0: \tag{14}$$

Substituting (13) into (14) and simplifying yields

$$\frac{\partial R(q)}{\partial q_i} - \frac{\partial C_m(q_1,q_2)}{\partial q_i} = 0; \tag{15}$$

which implies that q_i^B maximizes the joint profit of the merged firm and retailer given $T^B_{1;2}$. Since this must be true for $i = 1; 2$, and since rival manufacturers solve the same problem as before (prior to the merger), it must be that the bargaining equilibrium quantities maximize overall joint profit, i.e., $q_j^B = q_j^I$, provided (3) and (10) have interior solutions. This proves the following proposition.

Proposition 2 Sg726oe1eon.

such that

$$F_1 + F_2 \geq C_m(q_1, q_2); \tag{17}$$

$$R(q) - F_1 - F_2 - \sum_{j \neq 1,2} T_j^{NB}(q_j) \geq d_{r_m}; \tag{18}$$

$$R(q) - F_1 - F_2 - \sum_{j \neq 1,2} T_j^{NB}(q_j) \geq \max_{q_2, q_{-1,2}} R(0, q_2, q_{-1,2}) - T_2^F(q_2) - \sum_{j \neq 1,2} T_j^{NB}(q_j); \tag{19}$$

$$R(q) - F_1 - F_2 - \sum_{j \neq 1,2} T_j^{NB}(q_j) \geq \max_{q_1, q_{-1,2}} R(q_1, 0, q_{-1,2}) - T_1^F(q_1) - \sum_{j \neq 1,2} T_j^{NB}(q_j); \tag{20}$$

where constraints (17) and (18) ensure that the merged firm and retailer earn at least their disagreement profits when q_1, $q_2 > 0$. Constraints (19) and (20) are individual rationality constraints that ensure that the retailer earns weakly higher profit by choosing q_1, $q_2 > 0$ than by dropping product 1 (constraint 19) or product 2 (constraint 20). The right-hand sides of (19) and (20) are weakly larger than the right-hand side of (18). With bundling, these constraints are always satisfied because in these cases $T_m^F(\cdot, \cdot) = \infty$. Without bundling, however, these constraints may bind.

Lemma 2 There exists $\bar{\lambda}_m \in (0, 1)$ such that for all $\lambda_m > \bar{\lambda}_m$ constraints (19) and (20) bind.

Proof: See the appendix.

Lemma 2 says that if the manufacturer's bargaining weight is sufficiently high, (19) and (20) must bind in any N-product bargaining equilibrium. To see this intuitively, suppose the merged firm had all the bargaining power ($\lambda_m = 1$). If constraints (19) or (20) did not bind, the merged firm would raise one of the fixed fees to the point where the retailer earns its disagreement profit $d_{r_m} = \max_{q_{-1,2}} R(0, 0, q_{-1,2}) - \sum_{j \neq 1,2} T_j^{NB}(q_j)$. Since d_{r_m} is weakly smaller than the right-hand sides of (19) and (20), this contradicts the assumption that one of the constraints does not bind.

When the constraints do not bind ($\lambda_m < \bar{\lambda}_m$), the problem in (16) is equivalent to the problem in (10) with $F_m = F_1 + F_2$. In this case, bargaining without bundling yields the fully-integrated outcome. When the constraints bind ($\lambda_m > \bar{\lambda}_m$), the equilibrium quantities for the

$$v_2(q_2) = \max_{q_{-\{1;2\}}} R(0; q_2; q_{-\{1;2\}}) - F_2 - \sum_{j \notin \{1;2\}} T_j^{NB}(q_j): \quad (22)$$

The function $v_i(q_i)$ is the profit of the retailer if it purchases product i but drops product j. Substituting these definitions into constraints (19) and (20), and then substituting the constraints into the objective in (16), the merged firm and retailer's maximization problem becomes

max

Proof : See the appendix for the case in which $T_j^{NB}(q_j)$ is not continuously differentiable.

Proposition 3 contains the main result of the paper. It says that if the merged firm's bargaining weight vis a vis the retailer is sufficiently low, then the constraints (19) and (20) do not bind and the incentives of the two firms are to maximize bilateral joint profit. However, if the merged firm has a lot of bargaining power ($\ _m > \bar{\ }_m$), then maximizing bilateral joint profit is not optimal because the negotiated F_1 and F_2 will be constrained by the ability of the retailer to drop one or both of the products. For example, if the merged firm attempts to extract 'too much' surplus by raising F_1, then the retailer can drop product 1 (constraint (19) is violated), and similarly, product 2 will be dropped if the merged firm attempts to extract 'too much' surplus by raising F_2 (constraint (20) is violated). To relax these constraints, it is optimal for the merged firm to induce an upward distortion in its input pricing (decrease its quantities) in order to decrease the retailer's payoff. By reducing the retailer's quantity of product 2, for example, the retailer is harmed in the event it sells products 1 and 2, but it would be harmed even more if it were to drop product 1 (because products are substitutes). The former is a second-order effect while the latter is a first-order effect.

This result is surprising because it contrasts with the common intuition that overall joint profits tend to be maximized in situations of common agency and complete information. We have shown that this intuition does not necessarily extend to a negotiations setting in which the upstream firm has sufficiently high bargaining power. In that case, the merged firm (or any multiproduct firm) will find it optimal to knowingly reduce the overall profit pie because in doing so it can capture a larger share for itself. With a larger share of a smaller pie, the manufacturer can gain.

Our results have implications for the output and welfare effects of mergers. They imply that a merger without bundling either does not affect output ($\ _m < \bar{\ }_m$) or causes the merged firms' outputs to fall ($\ _m > \bar{\ }_m$). In the former case the post-merger contracts are efficient and the welfare effects are the same as in the case with bundling: welfare is higher if there are efficiencies related to the merger, and otherwise there is no change. In the latter case, the merged firm no longer has an incentive to negotiate an efficient contract, and welfare would typically fall. Because the goods are substitutes, rival firms would respond by increasing their quantities, but typically not by enough to offset the negative welfare effect of the reduction in the merged firms' quantities.

Our results also have implications for policy toward bundled discounts. If the bargaining power of the merged firm is high enough, prohibiting bundling leads to higher marginal transfer prices for the merged firm's products. Any attempt by authorities to prevent a multi-product firm from increasing its "clout" through bundling may therefore result in higher prices for final consumers. This finding suggests that antitrust concerns with bundling by dominant, multiproduct firms may be misguided unless there is reason to believe that bundling has foreclosed, or is likely to foreclose rivals. In our model bundling arises not to foreclose rivals but to extract rent from the retailer.

IV. Profit Effects

Expressions for equilibrium profits can be derived for each case by solving the restricted (quantity-forcing) negotiations of each firm for its optimal fixed fee and then substituting back into the expressions for profits. The resulting equilibrium profit expressions for the pre-merger case are

$$ {}_i = {}_i \left(R(q^I) \quad C \right. $$

and post-merger profits at this level of generality. Further restrictions are needed to make this comparison. In the remainder of this section we restrict attention to two-part tariff contracts, and we assume that the manufacturers have constant marginal costs, i.e., $C_i^{00}(q_i) = 0$, $i = 1; :::; N$.

Before proceeding we need some more notation. Let $w_i^I = C_i^0(q_i)$, $i = 1; :::; N$, be the constant per-unit prices (wholesale prices) that yield the vertically-integrated outcome. Define

$$\Pi \quad R(q^I) \quad \sum_i w_i^I q_i^I; \qquad (28)$$

$$\Pi_{\ i} \quad \max_{q_{\ i}} R(0; q_{\ i}) \quad \sum_{j \neq i} w_j^I q_j; \qquad (29)$$

$$\Pi_{\ 1;2} \quad \max_{q_{\ 1;2}}$$

an agreement with manufacturer i prior to the merger. Equation (33) indicates that the merger will be profitable if the expression in parenthesis is positive, i.e., if the retailer's cost of failing to reach an agreement with the merged firm is greater than the sum of the costs of failing to reach agreement with of each of the merging firms prior to the merger. This is intuitive. A manufacturer's bargaining strength comes in part from its ability to inflict a loss on the retailer by refusing an agreement. If the loss imposed by the merged firm exceeds the sum of the losses imposed by the merging firms prior to the merger, then the merged firm will extract greater rents from the retailer. In general, the concavity of joint profits ensures that this will be the case. Since the products are substitutes, the loss imposed by the merged firm will indeed exceed the sum of the losses imposed by the merging firms prior to the merger (see the proof of Proposition 4 below).[9] Thus, we have that $\Delta\ ^B_m > 0$, implying that mergers are profitable for the merging firms when bundling is feasible.

Next we consider the profitability of a merger when bundling is infeasible. If the merged firm's bargaining weight is less than $\bar{\ }_m$, then the constraints (19) and (20) do not bind and the maximization problem in (16) is the same as the maximization problem in (10) with $F_m = F_1 + F_2$. In this case, the merger is profitable and the profit of the merged firm is the same with or without bundling. However, if $\ _m > \bar{\ }_m$, then at the integrated quantities the merged firm is constrained from capturing its share of the incremental profits from its products. That is, an unconstrained Nash bargaining solution would require $(1 \quad _m)\ _m = \ _m(\ _r \quad d_{r_m})$, but constraints (19) and (20) force $(1 \quad _m)\ _m < \ _m(\ _r \quad d_{r_m})$. This establishes an upper bound on $\ _m$. Since the wholesale price of each non-merging firm is unchanged whether or not bundling is feasible, it follows that the merged firm is worse o when $\ _m > \bar{\ }_m$ and bundling is infeasible than when bundling is feasible.

To determine whether the merger itself is profitable when bundling is infeasible and $\ _m > \bar{\ }_m$, let $\ ^{NB}_m$ denote the profit of the merged firm in this case. Then, using the fact that the constraints (19) and (20) will bind in any bargaining equilibrium, and that when $\ _m >$

equilibrium rather than q^I, it can be shown that (see the proof of Proposition 4 below)

$$\pi_m^{NB} > \sum_{i=1,2}\left(R(q^I) - \sum_{j\neq i} w_j^I q_j^I - \Pi_{-i}^A\right) - C_m(q_1^I; q_2^I): \tag{34}$$

Assuming, as before, that the merger does not affect relative bargaining weights or the merged firm's costs ($C_m(q_1; q_2) = C_1(q_1) + C_2(q_2)$), the benefit to manufacturers 1 and 2 from merging is

$$\Delta\pi_m^{NB} = \pi_m^{NB} - \pi_1 - \pi_2$$
$$> \sum_{i=1,2}(1-\lambda_i)\left(R(q^I) - C_i(q_i^I) - \sum_{j\neq i} w_j^I q_j^I - \Pi_{-i}^A\right); \tag{35}$$

which is positive if pre-merger profits are positive and $\lambda_i < 1$. Intuitively, the merger is profitable even when the manufacturer is constrained for two reasons. First, the merged firm's fixed fees rise to the point where constraints (19) and (20) bind, whereas they do not bind prior to the merger unless $\lambda_i = 1$. Second, the merged firm earns additional profit by reducing its output of each product (raising its wholesale price) in order to capture more profit from selling the other product.

We summarize these results for the bundling and no-bundling cases in the following proposition.

Proposition 4 A merger between manufacturers 1 and 2 is profitable whether or not bundling is feasible, even if there are no cost-savings from the merger and no increase in their collective bargaining weight. If $\lambda_m < \bar{\lambda}_m$, then the merged firm's profits are the same with and without bundling. If $\lambda_m > \bar{\lambda}_m$, then the merged firm's profit is higher with bundling than without bundling.

Proof: See the appendix.

The result that mergers are always profitable in our model even if there are no cost savings contrasts with the results in the standard models of horizontal mergers in final-goods markets where the profitability of a merger often turns on whether the firms' strategies are strategic substitutes or strategic complements. In the latter case, we know from Deneckere and Davidson (1985) and others that mergers of any size are profitable because, in addition to the usual gains from coordination, they induce less aggressive pricing by the non-merging firms. In the former case, however, we know (20Tdai)1n-417(n)-764t-yheres profitable because they induce rival firms to respond by increasing their outputs. In our model, mergers are profitable even without cost savings because (a) they allow the merging firms to impose

constraints just begin to bind.[10] As we show in the appendix, we find that the derivative is negative at this point, implying that the retailer is typically worse o under bundling than it is with no bundling. Mathematically, tightening the no-bundling constraint (decreasing b) has a first-order positive eect on the retailer's profits, as shown in (38) and (39). It also has a second-order eect that comes through equilibrium adjustments in wholesale prices and quantities as the bundling constraint is tightened. However, the second-order eects are outweighed by the first-order eects.

Proposition 6 A merger between manufacturers 1 and 2 reduces the retailer's pro t if there are no cost savings from the merger. If $_m < \bar{}$

Differentiating the expression in (40) with respect to and using the envelope theorem gives

$$\frac{\partial \ _m}{\partial} = \ _m \frac{\partial C_m(q_1^I; q_2^I; \ )}{\partial} \qquad (41)$$

Since $\frac{\partial C_m(q_1;q_2; \ )}{\partial} > 0$ by assumption, condition (41) implies that $\frac{\partial \ _m}{\partial} < 0$. Thus the merged firm benefits from cost savings, whether the cost savings are fixed or marginal. The retailer will also benefit in this case because Nash bargaining will allow it to share in the cost savings.

The effects of the merged firm's cost savings on the non-merging firms' profits depend on whether the cost savings reduce fixed or marginal costs. Marginal-cost savings will have the same effect on profits as a reduction in w_1, as expressed in (37), and therefore will reduce the non-merging firms' profits. Fixed cost savings, on the other hand, do not affect the non-merging firms' profits.

It can be shown that cost savings in the no-bundling regime with $\ _m > \bar{\ }_m$ have the same qualitative effects. The retailer benefits from fixed and marginal cost savings; non-merging firms are harmed when the savings reduce the merged firm's marginal costs and are not affected otherwise.

Proposition 7 *Suppose the merger between manufacturers 1 and 2 reduces its costs. Fixed-cost reductions benefit the merged firm and the retailer and do not affect the non-merging firms. Marginal-cost reductions benefit the merged firm and the retailer and harm the non-merging firms.*

In this model, the merged firm's outputs increase if and only if its marginal costs decrease. It follows that the merger harms the non-merging firms if and only if it reduces the merging firms' marginal costs. Since the merged firm extracts greater rents from the retailer, the merger will of upstream mergers in intermediate-goods markets often focus on the effects of the merger on the combined entity's bargaining strength vis a vis the customer, and whether the customer will be harmed as a result.[11] In this paper, additional clout may come from three sources: bargaining power, as measured by a firm's bargaining weight in its asymmetric Nash bargaining solution; the ability to negotiate contracts on products jointly rather than separately; and the ability to bundle products via interdependent price schedules, for example, by offering discounts and rebates that are applied 'across-the-board.'

goods markets when contracts are negotiated. The model is too simple at this point to be definitive for policy conclusions. However, it is rich enough to show that the effects of mergers in this environment can be substantially different than the effects predicted by classical oligopoly models.

A simplification in this paper is the restriction to a single downstream firm. Under this assumption, equilibrium contracts are efficient (in the sense of replicating the fully-integrated outcome) before and after the merger except when bundling is prohibited and the merging firm's bargaining power is sufficiently high. This result has strong implications for the effects of mergers. If bundling is allowed, so that contracts are efficient before and after the merger, the merger increases the merged firm's output if and only if it reduces marginal costs. This result is independent of the degree of market power in the upstream market and the degree of substitution among upstream products. The merger also increases the merging firms' clout in negotiations with the retailer by increasing the combined loss the merging firms can impose by refusing to sell. An implication is that a merger with small cost savings enhances welfare even though it reduces the profits of rival firms and the retailer.

The obvious next step is to extend the model to an environment with downstream oligopoly. Once there is downstream competition, the rents to be split by a manufacturer and retailer will depend *inter-alia* on the amount of competition the retailer faces from rival retailers who sell the same product. In this case, contracts generally will not lead to the vertically-integrated outcome. An additional complication is that the nature of the equilibrium will depend on whether downstream firms can observe each others' contracts. If contracts are not observable, it can be shown that per-unit transfer prices will still equal marginal cost in a bargaining equilibrium. In this case, many of the results in this paper carry through. However, the implication that per-unit transfer prices equal marginal cost does not appear to be consistent with pricing in many intermediate-goods markets in which non-linear contracts are negotiated. If contracts are observable, then firms have incentives to negotiate contracts that dampen competition so as to increase the size of the total surplus to be split.[12] This generally leads to per-unit transfer prices that exceed marginal cost. The analysis of

[12] One factor that tends to make contracts more observable is the Robinson-Patman Act, which constrains the

mergers when contracts are observable among rivals is more complicated and awaits further work.

Another extension would be to allow for non-contractible investments by upstream or downstream firms. The need for ongoing, non-contractible investments in marketing or quality is another reason for upstream firms to earn positive economic margins, as one often observes in practice.

ability of manufacturers to price discriminate. See O'Brien and Sha er (1994).

Appendix

Characterization of equilibrium quantities and payoffs with bundling

To characterize equilibrium quantities and payoffs, we solve an equivalent problem to the one in (9). In the equivalent problem, the merged firm and retailer choose a quantity-forcing contract

$$T_m^F(q_1;q_2) = \begin{cases} 0 & \text{if } q_1 = q_2 = 0 \\ F_m & \text{if } q_1 = q_1^0 \text{ and } q_2 = q_2^0 \\ \infty & \text{otherwise} \end{cases};$$

and quantities q_1 and q_2, from the feasible set of quantity-contract combinations

$A_m^F(T_{1;2}) \quad f \quad (q_1;q_2;F_m;q$

which correspond to (10)–(12), respectively. The rest follows from the discussion in the text.

Characterization of equilibrium quantities and payoffs without bundling

When bundling is not feasible, the merged firm and retailer must negotiate a contract that is additively separable in q_1 and q_2: $T_m(q_1;q_2) = T_1(q_1) + T_2(q_2)$. In this case, we define the feasible set of quantity-contract combinations available to the merged firm and retailer as

$$\hat{A}_m(T_{-1;2}) \equiv \{(q_1;q_2;T_1(\cdot);T_2(\cdot)) \mid q \in \Omega(T); T_1(0) + T_2(0) = 0; T_1(q_1) + T_2(q_2) \geq C_m(q_1;q_2)\}:$$

The feasible set of quantity-contract combinations available to rival firm j is still $A_j(T_{-j})$.

Suppose $(q^{NB};T^{NB})$ form a bargaining equilibrium when bundling is infeasible. Then the Nash bargaining solution between the merged firm and retailer solves

$$\max_{(q_1;q_2;T_1(\cdot);T_2(\cdot))\in\hat{A}_m(T^{NB}_{-1;2})} (\pi_m - d_m)^{\beta_m}(\pi_r - d_{r_m})^{(1-\beta_m)}: \quad (A.3)$$

equilibrium quantities and payoffs for the merged firm and retailer by solving the restricted problem:

$$\max_{(q_1,q_2,F_1,F_2,q_1^0,q_2^0)\in \hat{A}_m^F(T^{NB}_{-1,2})} (F_1+F_2-C_m(q_1,q_2))^{\beta_m}\left(R(q)-F_1-F_2-\sum_{j\notin 1,2} T_j^{NB}(q_j)-d_{r_m}\right)^{(1-\beta_m)}$$

$$=\max_{q_1,q_2,F_1,F_2,q_{-1,2}} (F_1+F_2-C_m(q_1,q_2))^{\beta_m}\left(R(q)-F_1-F_2-\sum_{j\notin 1,2} T_j^{NB}(q_j)-d_{r_m}\right)^{(1-\beta_m)} \quad (A.5)$$

such that

$$F_1+F_2 \geq C_m(q_1,q_2);$$

$$R(q)-F_1-F_2-\sum_{j\notin 1,2} T_j^{NB}(q_j) \geq d_{r_m};$$

$$R(q)-F_1-F_2-\sum_{j\notin 1,2} T_j^{NB}(q_j) \geq \max_{(q_2,q_{-1,2})} R(0,q_2,q_{-1,2})-T_2^F(q_2)-\sum_{j\notin 1,2} T_j^{NB}(q_j);$$

$$R(q)-F_1-F_2-\sum_{j\notin 1,2} T_j^{NB}(q_j) \geq \max_{(q_1,q_{-1,2})} R(q_1,0,q_{-1,2})-T_1^F(q_1)-\sum_{j\notin 1,2} T_j^{NB}(q_j);$$

which correspond to (16)–(20), respectively. The rest follows from the discussion in the text.

Proof of Lemma 2: Suppose (19) or (20) does not bind. Without loss of generality, let (19) be the non-binding constraint. Then the merged firm and retailer will negotiate F_1 to maximize the objective in (16). After some algebra, the first-order condition for F_1 can be written as

$$F_1+F_2=\beta_m\Big(R(q)-\sum_{j\notin 1,2} T_j^{NB}(q_j)-d_{r_m}\Big)+(1-\beta_m)C_m(q_1,q_2). \quad (A.6)$$

Substituting (A.6) into the expression for the retailer's profit gives

$$\begin{aligned}\pi_r &= R(q)-F_1-F_2-\sum_{j\notin 1,2} T_j^{NB}(q_j)\\ &= (1-\beta_m)\Big(R(q)-C_m(q_1,q_2)-\sum_{j\notin 1,2} T_j^{NB}(q_j)\Big)+\beta_m d_{r_m}. \end{aligned} \quad (A.7)$$

Note that

$$\lim_{\beta_m\to 1}\pi_r = d_{r_m} \quad (A.8)$$

Since (19) does not bind by assumption, condition (A.8) implies that for sufficiently large β_m,

$$d_{r_m} = \max_{q_{-1,2}} R(0,0,q_{-1,2})-\sum_{j\notin 1,2} T^{NB}(q_j)$$

$$> \max_{q_2; q_{1;2}} R(0; q_2; q_{1;2}) \quad T_2^F(q_2) \quad \sum_{j \neq 1;2} T_j^{NB}(q_j)$$

$$\max_{q_{1;2}} R(0; 38$$

marginal revenue of product j, so the solution to firm j's maximization problem in (A.11) will not change. That is, $r_j^1(q_1^{NB}; q_{-1;j}) = r_j^1(q_1^{NB} + x; q_{-1;j})$ provided that x is small. Similarly, $r_j^2(q_1^{NB}; q_{-2;j}) = r_j^2(q_1^{NB} + x; q_{-2;j})$ for small x.

Step 3. Suppose $T_j^{NB}(q_j)$ jumps up to the right of q_j^{NB}, but is continuous to the left. At the solution to (A.11), it must be true that

$$\left[\frac{\partial R(q_1^{NB}; 0; r_j^1; q^{NB}_{-1;2;j})}{\partial q_j} - \frac{\partial T_j^{NB}(r_j^1)}{\partial q_j} \right]_- \quad 0 \tag{A.12}$$

where the notation $[\ ]_-$ indicates the left-hand derivative. Suppose the inequality in (A.12) is strict. Consider an arbitrarily small change in q_1 to $q_1^{NB} + x$. Since the marginal revenue function is continuous, the inequality in (A.12) will still hold at $r_j^1(q_1^{NB} + x; q^{NB}_{-1;j})$. Therefore, $r_j^1(q_1^{NB}; q^{NB}_{-1;j}) = r_j^1(q_1^{NB} + x; q^{NB}_{-1;j})$. Suppose that (A.12) holds with equality. This means that the first-order condition holds for movements of q_j in the leftward direction. Movements in the rightward direction will not occur given small changes in marginal revenue because T_j^{NB} jumps upward in that direction. Analogous conditions hold for $r_j^2(q_1^{NB} + x; q^{NB}_{-2;j})$.

Step 4. Suppose $T_j^{NB}(q_j)$ jumps up to the left of q_j^{NB}, but is continuous to the right. At the solution to (A.9), it must be true that

$$\left[\frac{\partial R(q_1^{NB}; 0; r_j^1; q^{NB}_{-1;2;j})}{\partial q_j} - \frac{\partial T_j^{NB}(r_j^1)}{\partial q_j^1} \right]_+ \quad 0 \tag{A.13}$$

where $[\ ]_+$ denotes the right hand derivative. Suppose the inequality in (A.13) is strict. By the same argument as in the preceding paragraph, a small change in q_1 to $q_1^{NB} + x$ will leave r_j^1 unchanged, i.e., $r_j^1(q_1^{NB}; q^{NB}_{-1;j}) = r_j^1(q_1^{NB} + x; q^{NB}_{-1;j})$. Suppose that (A.13) holds with equality. This means that the first-order condition holds for movements of q_j in the rightward direction. Movements in the leftward direction will not occur given small changes in marginal revenue because T_j^{NB} jumps upward in that direction. Analogous conditions hold for $r_j^2(q_1^{NB} + x; q^{NB}_{-2;j})$.

Step 5. Steps 1-4 establish how the solution to each product's sub-maximization problem changes in response to small changes in q_1 starting at the equilibrium quantity q_1^{NB}. In particular, product j's quantity either does not change or it changes to satisfy its first order condition. We now establish that this is true for the solutions to the maximization problems in (A.9) and (A.10).

The solution to the problem in (A.9) is given by the simultaneous solution to the $N - 2$ sub-maximization problems in (A.11). For a given change in q_1 to $q_1^{NB} + x$, let S be the subset of products for which the solution to the product's sub-maximization problem changes according to its first-order condition. By the implicit-function theorem, the simultaneous solution to the sub-maximization problems for products in S (holding constant the quantities of products not in S) are continuous functions of q_1 on the interval $(q_1^{NB}; q_1^{NB} + x)$. This means that a small change x results in a small change in these quantities, and hence a small change in the marginal revenues of the other products whose sub-maximization solutions do not change in response to changes in q_1. Since the change in marginal revenue from all the adjustments for products in S is small, the quantities of the products not in S will not change in response to a small change in q_1 and the associated adjustments in quantities for products in S. Therefore, in the solution to (A.9), the quantity q_j either does not respond to a small change in q_1, or it responds according to its first-order condition.

Now differentiate (23) in the text, and recognize that $\frac{\partial v_1(q_1^{NB})}{\partial q_1} = \frac{\partial R(q_1^{NB}; 0; q_{-1;2}(q_1^{NB}))}{\partial q_1}$ regardless of whether T^{NB}

To see that the right-hand side of (A.14) is positive, define

$$M(q_1, q_2) \equiv \max_{q_{-1,2}} R(q_1, q_2, q_{-1,2}) - w_1^I q_1 - w_2^I q_2 - \sum_{j \neq 1,2} w_j^I q_j. \qquad \text{(A.15)}$$

Since the objective in (A.15) is concave in $(q_1, q_2, q_{-1,2})$, it follows that M is concave in (q_1, q_2). Let $\tilde{q}_1 \equiv \arg\max_{q_1} M(q_1, 0)$ and $\tilde{q}_2 \equiv \arg\max_{q_2} M(0, q_2)$. Using these definitions along with the definitions of Π, $\Pi_{-1,2}$, Π_{-1}, and Π_{-2} in the text, we have

$$\begin{aligned}
\Pi - \Pi_{-1,2} &= M(q_1^I, q_2^I) - M(0,0) \ \text{(by definition)} \\
&> [M(q_1^I, q_2^I) - M(0, q_2^I)] + [M(q_1^I, q_2^I) - M(q_1^I, 0)] \ \text{(by concavity and uniqueness)} \\
&\geq [M(q_1^I, q_2^I) - M(0, \tilde{q}_2)] + [M(q_1^I, q_2^I) - M(\tilde{q}_1, 0)] \ \text{(by the definition of } \tilde{q}_1 \text{ and } \tilde{q}_2\text{)} \\
&= (\Pi - \Pi_{-1}) + (\Pi - \Pi_{-2}) \ \text{(by definition)},
\end{aligned}$$

which implies that the merger is profitable when bundling is feasible or $\delta_m < \bar{\delta}_m$.

If bundling is infeasible and $\delta_m > \bar{\delta}_m$, then Lemma 1 implies that constraints (19) and (20) will bind in any bargaining equilibrium. Suppose $q^{NB} \equiv (q_1^{NB}, \ldots, q_N^{NB})$ and $T^{NB} \equiv (T_1^{NB}, \ldots, T_N^{NB})$ form a bargaining equilibrium. Then, after some algebra, we can rearrange constraint (19) as

$$\begin{aligned}
F_1 &= R(q^{NB}) - \sum_{j \neq 1,2} w_j^I q_j^{NB} - \left(\max_{q_{-1,2}} (R(0, q_2^{NB}, q_{-1,2}) - \sum_{j \neq 1,2} w_j^I q_j) \right) \\
&= R(q^{NB}) - \sum_{j \neq 1} w_j^I q_j^{NB} - \left(\max_{q_{-1,2}} (R(0, q_2^{NB}, q_{-1,2}) - w_2^I q_2^{NB} - \sum_{j \neq 1,2} w_j^I q_j) \right) \\
&> R(q^{NB}) - \sum_{j \neq 1} w_j^I q_j^{NB} - \left(\max_{q_{-1,2}} (R(0, q_2, q_{-1,2}) - w_2^I q_2 - \sum_{j \neq 1,2} w_j^I q_j) \right) \\
&= R(q^{NB}) - \sum_{j \neq 1} w_j^I q_j^{NB} - \Pi_{-1}; \qquad \text{(A.16)}
\end{aligned}$$

where we have used the fact that the non-merging firms offer their products at marginal cost to the retailer whether or not bundling is feasible. Similarly, we can rearrange constraint (20) as

$$F_2 > R(q^{NB}) - \sum_{j \neq 2} w_j^I q_j^{NB} - \Pi_{-2}. \qquad \text{(A.17)}$$

It follows that the profit of merged firm when bundling is infeasible and $\delta_m > \bar{\delta}_m$ is

$$\pi_m^{NB} = F_1 + F_2 - C_m(q_1^{NB}, q_2^{NB})$$

$$> \sum_{i=1,2}\left(R(q^{NB}) - \sum_{j\neq i} w_j^I q_j^{NB} - \Pi_i\right) - C_m(q_1^{NB}; q_2^{NB})$$

$$> \sum_{i=1,2}\left(R(q^I) - \sum_{j\neq i} w_j^I q_j^I - \Pi_i\right) - C_m(q_1^I; q_2^I): \qquad \text{(A.18)}$$

The first inequality follows from (A.16) and (A.17). The second inequality follows from the observation that the merged firm's profit increases when it induces the retailer to choose quantities q^{NB} rather than q^I. Note that (A.18) corresponds to (34) in the text, as was to be proved. Q.E.D.

Proof of Proposition 6: Let $w_1^e(b)$ and $w_2^e(b)$ be the bargaining equilibrium wholesale prices for firms 1 and 2, respectively, and let $q_i^e(b)$, for all i, be the bargaining equilibrium quantities. Rearranging (38) and (39), the upstream profits for products 1 and 2 can be written as

$$\begin{aligned}\pi_1 &= F_1 + w_1 q_1 - C_1(q_1)\\ &= R(q^e(b)) - C_1(q_1^e(b)) - w_2^e(b) q_2^e(b) - \sum_{j\neq 1;2} w_j^I q_j^e(b)\\ &\quad - \max_{q_{-1}}\left(R(0; q_{-1}) - w_2^e(b) q_2 - \sum_{j\neq 1;2} w_j^I q_j\right) + b; \end{aligned} \qquad \text{(A.19)}$$

$$\begin{aligned}\pi_2 &= F_2 + w_2 q_2 - C_2(q_2)\\ &= R(q^e(b)) - C_2(q_2^e(b)) - w_1^e(b) q_1^e(b) - \sum_{j\neq 1;2} w_j^I q_j^e(b)\\ &\quad - \max_{q_{-2}}\left(R(0; q_{-2}) - w_1^e(b) q_1 - \sum_{j\neq 1;2} w_j^I q_j\right) + b: \end{aligned} \qquad \text{(A.20)}$$

Using (36), the profit of a rival firm i can be written as

$$\begin{aligned}\pi_i = \lambda_i\Big[&R(q^e(b)) - C_i(q_i^e(b)) - w_1^e(b) q_1^e(b) - w_2^e(b) q_2^e(b) - \sum_{j\neq 1;2} w_j^I q_j^e(b)\\ &- \max_{q_{-1}}\left(R(0; q_{-1}) - w_1^e(b) q_1 - w_2^e(b) q_2 - \sum_{j\neq 1;2;i} w_j^I q_j\right)\Big]; \quad \forall i \neq 1; 2: \end{aligned} \qquad \text{(A.21)}$$

Total profits can be written as

$$\pi = R(q^e(b)) - \sum_i C_i(q_i^e(b)): \qquad \text{(A.22)}$$

The retailer's profits are given by

$$\pi_r = \pi_1 + \pi_2 + \sum_{i \neq 1,2} \pi_i. \tag{A.23}$$

Let q_i^j maximize the retailer's profits when the retailer drops product j. For example, q_2^1 is the quantity of product 2 that solves the maximization term in equation (A.19). Substituting (A.19)-(A.22) into (A.23), differentiating π_r with respect to b, and using the envelope theorem gives

$$\frac{\partial \pi_r}{\partial b} = -2 \left\{ \sum_{i \neq 1} {}_i (q_1^i - q_1^e) \frac{\partial w_1^e(b)}{\partial b} + \sum_{i \neq 2} {}_i (q_2^i - q_1^e) \frac{\partial w_2^e(b)}{\partial b} \right\}.$$

The terms involving $q_j^i - q_j^e$ for all i, $j \neq i$, are positive because the products are substitutes and an increase in b induces increases in w_1 and w_2. It follows that $\frac{\partial \pi_r}{\partial b} < 0$. Q.E.D.

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