WORKING PAPER

Merger Wars: Bidding for Complementary Assets

Lynne M. Pepall
Department of Economics
Tufts University

Daniel J. Richards
Department of Economics
Tufts University

Discussion Paper 2000-20

Department of Economics
Tufts University
Medford, MA 02155
(617) 627-3560

ABSTRACT

Merger Wars: Bidding for Complementary Assets

By Lynne M. Pepall and Daniel J. Richards
Department of Economics
Tufts University
Medford, MA 02155
e-mail: lynne.pepall@tufts.edu
dan.richards@tufts.edu

We examine the bidding competition for a set of complementary assets arising between two firms who also compete in a differentiated product market. The bidding contest takes the form of an acquisition battle for a third firm initially holding the assets. Depending on the nature of product competition between the bidding firms, either *both* bidding firms are made worse off by the availability of these assets or, paradoxically, the firm winning the bidding contest is less profitable than is the firm losing it. Our analysis is relevant to the many recent mergers in telecommunications, finance, and transportation, e.g., Viacom's purchase of CBS.

Keywords: mergers, product differentiation, bidding

JEL Classification Codes**:** L22, G34

Merger Wars: Bidding for Complementary Assets

By Lynne M. Pepall and Daniel J. Richards*

I. *Introduction*

In a recent acquisition battle, Rupert Murdoch's News Corp. beat Viacom to buy the extensive TV-station network of Chris-Craft, Inc. Many analysts viewed this merger as a way for News Corp. to acquire a distribution network for its productions in order to improve its competitive position in the entertainment production market.[1] This view suggests that the merger is essentially a vertical one in that it is a merger between two firms whose assets are complementary. The acquisition of CBS by Viacom and Disney's purchase of ABC are, in this sense, similar to the News Corp. and Chris-Craft merger. However, in other vertical mergers the complementarity lies between the two firms' non-competing but related product lines. A long-distance phone company such as AT&T may purchase a local phone system (TCI) or a cable system (MediaOne). Similarly, a firm specializing primarily in insurance and brokerage operations (Traveler's) may acquire a firm specialized in consumer banking (Citicorp), or a regional railroad firm (Union Pacific) extending its geographic reach by acquiring a second rail carrier in an adjacent area (Southern Pacific).

Mergers of complementary assets have been a substantial component of the current and now, quite long-lived merger wave. As the examples above illustrate, many of the mergers in the entertainment, telecommunications, finance and fashion industries have been precisely such a union of complements rather than a union of direct competitors.[2] Moreover, as the takeover battles over Chris-Craft, or CBS and MediaOne make clear, the acquiring firm is typically not the only firm interested in merging with the target firm and obtaining its assets. Indeed, the firms interested in bidding for the target are more often than not firms that *do* directly compete in some product market. They extend this competition in the pursuit of the complementary asset precisely because they believe ownership of the asset will enhance their success in that product market.

One curious anomaly about mergers in general is that while the bids for the target firms are generous and typically include a large premium above the initial share price of these firms, the return to the acquiring firms is, in fact, quite modest. For example, Jensen and Ruback (1983), summarize the purchase premia found in thirteen separate studies as providing an average two-month return to target firm stockholders of 29.1 percent. Yet both their work and that of Jarrell, Brickley, and Netter (1988) can be summarized as indicating that, in the window of time around the merger, the acquiring firm's stockholders are only marginally better off. Similarly, Loughran and Vijh (1997) find an abnormal return to target firm shareowners of 25.6 percent while the buying firm's excess return over a five-year horizon averaged -6.5%. To be sure, the return to the acquiring firm is not always easy to measure because it requires the use of an event window methodology and it is not always clear just when the window was opened. Often the official announcement of the acquisition is preceded by a release of substantial information, the filing of 13D's, and other public actions. Still, the clear finding of the empirical literature is that the benefits of most acquisitions to the acquiring firms have been modest at best.

In this paper we examine the competition for complementary assets between firms who also compete in a differentiated product market. A key assumption in our approach is that firms differentiate their products through the use of differentiated inputs and that the complementary asset that a firm seeks to acquire can serve this differentiation role, whether it is a unique location, brand name, or distribution chain. Typically, such assets are initially held by a business entity that we refer to as the target firm. Therefore, the competition for such assets is played out in the market for corporate acquisitions.

Our analysis is set in the framework of a duopoly model. There are two firms who produce and market differentiated products and compete in price for customers. The firms also compete to buy a target firm or complementary asset, e.g., CBS. We assume that the complementary asset has a public good character in so far as how its acquisition affects consumer demand for the differentiated product. That is, in the eyes of consumers, News Corp.'s purchase of Chris-Craft, or Disney's purchase of ABC will affect the quality, respectively, of every News Corp. or Disney production.

In order for there to be a bidding competition for the complementary asset, or for the target firm, the asset must be relatively scarce. In the context of a duopoly model, such scarcity implies that there is only one complementary asset to be bought. Accordingly, we examine the merger bidding strategy of two competitors in a product-differentiated market; each interested in purchasing the unique complementary asset as a means of competing more effectively in the product market. We then examine the implications of the bidding game for the outcome in the product market where the two bidders compete. Chen (2000) also considers a strategic bidding game between two firms, but in a very different context. There, a firm with a monopoly in one market competes with a new entrant for the license to produce a new related product. Unlike the bidders in Chen's model, the two firms bidding for the asset in our model both compete in the same markets.

One central finding of our analysis is that the low returns observed for the shareholders of the acquiring company reflects something quite different from—and more interesting than—the mere competing away of any rents. We find that the bidding game not only results in substantial premia paid to the acquired firm, but it often leads to a product market outcome such that ***both*** bidders are less profitable than firms in other industries for which no such complementary asset existed. Moreover, in some cases, a kind of "winner's curse" can emerge in which the so-called winning bidder or the firm that acquires the asset is worse off than the loser is.

The Model

There are two rival firms competing in a product-differentiated market. A firm i sells a differentiated product whose demand, denoted by q_i, depends upon its own price p_i, as well as that of the rival firm's product p_j. The demand for product i is also affected by the employment of a unique complementary asset, denoted by A_i, and whether or not the rival has such a complement A_j. The variables A_i and A_j are normalized to take on the value 1 if the firm has the desired complementary asset or 0 if it does not. Further, since there is only one such complementary asset available, if A_i is 1,then A_j must be 0.

The above features of competition for customers in the product market are captured by assuming a simple demand for good i given by:

$$q_i = 1 - p_i + \beta p_j + A_i - \alpha A_j; \quad i = 1,2; \quad j \neq i; \qquad (1)$$
$$0 < \alpha < 1,\ 0 < \beta < 1,\ A_i = 1, 0$$

The parameter β measures the positive effect on firm *i*'s demand due to an increase in the price of the rival firm's product. The parameter α measures the adverse effect on the firm's demand when its rival has the complementary asset.

The complementary asset may be purchased in the financial markets at current price *C*. This price may reflect the asset's replacement cost or simply the reservation selling price of the asset's current owners. Presumably, the latter value would be reflected in the stock market value of the target firm prior to the emergence of its value as a complement to either of the bidding firms. Once a firm purchases the asset, it's use in production raises consumer willingness to pay for the firm's product. There is also a constant marginal cost of production, which is assumed to be the same for each firm and, for simplicity, set equal to zero.

The complementary asset is either bought by the firm making the highest bid, provided that the bid exceeds *C*, or it is not acquired at all. The bid could be an offer of a simple lump sum paid to the current asset owners. However, the owners and also the firms bidding to buy the asset from the owners understand the nature of competition in the product market, and therefore know the additional profit earned by the firm that acquires the asset. As a result, any lump sum payment to the asset owners may also be expressed as a contract offering those owners a fraction s of the acquiring firm's profit π such that $s\pi$ yields the equivalent dollar lump sum. This second approach facilitates solution of the bidding game and also seems close to the common reality in which owners of the target firm are often given shares of stock in the newly merged entity.[3] Denote then by $\underline{s}$ the reservation profit share. That is, $\underline{s}$ is the profit share such that the payment for the asset $\underline{s}\pi = C$.

The game has two-stages. In the first stage, each firm *i* makes a bid for the complementary asset s_i, expressed as a share of its profit. The firm that makes the highest bid, provided that the bid is greater than $\underline{s}$, acquires the asset. In the case of a tie, we assume that firm 1 gets the asset and firm 2 does not. If both firms' bids, s_1 and s_2, are less than $\underline{s}$ then neither firm purchases the asset. After the bidding is done and the ownership of the complementary assets is determined, production takes place and, in stage two, the two rival firms compete in prices, p_1, p_2, for consumers in the differentiated product market.

We are interested in strategies consisting of bids (s_1,s_2) for the complementary asset A and prices (p_1, p_2) in the differentiated products market that yield a perfect equilibrium outcome to the game. In the usual fashion, we work backwards from the final stage of the game.

Stage 2:

In stage 2 of the game the ownership of the complementary asset and hence, A_1, A_2, has been determined in the previous stage. The second side of the two-side competition—the price competition for consumers—now takes place. In this second stage, as noted above, the each firm's unit cost of production is the same and is constant, and for simplicity is set equal to zero.

Given demand for the differentiated product i, $q_i\,(p_i, p_j, A_i, A_j)$, $i = 1,2$, $j \neq i$, described in (1), firm i chooses price p_i in stage 2 to maximize profit $\pi_i(p_i, p_j; A_i, A_j)$. The best response function for firm i in stage 2 of the game is:

$$p_i^* = \left[\frac{1+\beta p_j + A_i - \alpha A_j}{2}\right] \quad ; \quad i = 1,2\ ; \quad j \neq i \qquad (2)$$

The best response functions shown in equation (2) in turn imply that a Nash equilibrium in stage 2 of the game is a set of prices (p_1^*, p_2^*) such that:

$$p_1^* = \left[\frac{(2-\alpha\beta)A_1 - (2\alpha-\beta)A_2 + 2 + \beta}{4-\beta^2}\right]$$

$$p_2^* = \left[\frac{(2-\alpha\beta)A_2 - (2\alpha-\beta)A_1 + 2 + \beta}{4-\beta^2}\right] \quad . \qquad (3)$$

Corresponding to these prices are equilibrium (gross) profits:

$$\pi_1^*(A_1, A_2) = \left[\frac{(2-\alpha\beta)A_1 - (2\alpha-\beta)A_2 + 2 + \beta}{4-\beta^2}\right]^2$$

$$\pi_2^*(A_1, A_2) = \left[\frac{(2-\alpha\beta)A_2 - (2\alpha-\beta)A_1 + 2 + \beta}{4-\beta^2}\right]^2 \qquad (4)$$

The term (2α-β), in both equations (3) and (4), describes how the equilibrium price set by one firm is affected by its rival's ownership of the complementary asset. When (2α-β) > 0, one firm's acquisition of the asset results in the other firm having a lower equilibrium price. In this case, price competition between the two firms is *intensified* when one firm acquires the complementary asset and the other does not. Ownership of that asset by one firm shifts the price response curves of both firms inward so that price competition is more aggressive in the final stage of the game. In the spirit of Bulow, Geanakopolus and Klemperer (1985), the complementary asset is like a strategic substitute, and acquisition of it by the rival intensifies competition.[4]

On the other hand, when (2α-β) < 0, then ownership of the complementary asset by one firm results in a higher equilibrium price for the other firm. Both firms' response functions shift in such a way that stage 2 is characterized by *softer* price competition. In this case, the complementary asset is like a strategic complement and its acquisition softens competition between the two firms.

Stage 1:

In the first stage of the game the two bidding firms compete for ownership of the complementary target firm. Because there is only one target firm or one complementary asset, there are only three possible patterns of ownership involving the two bidding firms. Either $A_1 = 1$ and $A_2 = 0$, or $A_1 = 0$ and $A_2 = 1$, or $A_1 = A_2 = 0$. In what follows, we denote the gross profit of the firm that wins the bidding and acquires the complementary asset by π^W and the gross profit of the firm without that asset by π^L. Because the second stage of the game is characterized by either tough or soft price competition depending on whether or not ($2\alpha - \beta$) > 0, we examine the first stage bidding game separately for each case.

Case A: (2α - β) > 0, The Complementary Asset Toughens Price Competition

From equation (4), we find that when one firm successfully acquires the complementary asset then the gross profits of the two rival firms π^W and π^L are:

$$\pi^W = \left[\frac{(2-\alpha\beta)+2+\beta}{4-\beta^2}\right]^2 \qquad (5)$$

$$\pi^{L} = \left[\frac{2+\beta-(2\alpha-\beta)}{4-\beta^{2}} \right]^{2}$$

For the outcome when neither firm acquires the complementary asset, the gross profit earned by each firm is denoted by π^0, where π^0 is given by:

$$\pi^{O} = \left[\frac{2+\beta}{4-\beta^{2}} \right]^{2} \tag{6}$$

Of course, the complementary asset will only remain unpurchased if the both bids made by the two rival firms—s_1 and s_2—are less than $\underline{s}$, i.e., if the lump sum value of the bid is less than C. The profit π^O earned for the case in which the target firm is not acquired by either firm serves a useful benchmark for our analysis below. For the case $(2\alpha - \beta) > 0$, the following relationship must hold: $\pi^W > \pi^O > \pi^L$.

Recall that the profit π^W earned by the firm that acquires the complementary asset is not the firm's *net* profit. Because the acquiring firm must share its profit with the owners of the target firm, its net profit is $(1-s)\pi^W$ for any given value of $s \geq \underline{s}$. For the rival bidding firm, or the one that does not acquire the complementary asset, the gross profit and the net profit are, however, the same because no contracts have been executed requiring this firm to share its profit.

To work out a pair of best responses (s_1*, s_2*) for stage 2 of the game it is useful to define two critical shares of the gross profit earned by the firm acquiring the complementary asset π^W. These are denoted by s^O and s^L and satisfy the following equations:

$$\begin{aligned} \pi^W (1- s^O) &= \pi^O \\ \pi^W (1- s^L) &= \pi^L. \end{aligned} \tag{7}$$

The profit share s^O is defined as that share such that the net profit earned by the firm purchasing the unique asset is exactly equal to the profit that same firm would have earned in the case that neither rival firm acquired the asset. Similarly, the other important benchmark profit share s^L is defined as a share such that the net profit of the firm purchasing the complementary asset is exactly equal to the profit of its rival who of course loses the bidding war. Because we are assuming that $(2\alpha - \beta) > 0$, and hence we have that $\pi^W > \pi^O > \pi^L$, it also follows that the profit share $s^L > s^O$. For this case of $(2\alpha - \beta) > 0$, the following propositions hold.

Proposition A1: When the reservation selling price of the asset C is such that the reservation share $\underline{s}$ satisfies $0 \leq \underline{s} \leq s^O$, then the unique perfect Nash equilibrium outcome has bids for the target firm such that $s^*_1 = s^L$, $s^*_2 = s^L$. Given our tie-breaking rule, firm 1 acquires the asset and firm 2 does not.

Proof: When $s^*_1 = s^L$, $s^*_2 = s^L$, firm 1 buys the asset and earns a net profit, $\pi^W (1\text{-}s^L)$, which is equal to π^L, the net profit earned by firm 2. Firm 2 does not have a profit incentive to deviate from its bid of $s_2 = s^L$. Offering a lower s_2 will leave firm 2 in the same outcome of not obtaining the complementary asset hiring and earning profit π^L. A bid of $s_2 > s^L$ will result in firm 2 winning the bidding war and acquiring the target firm but at the cost of driving its net profit below π^L. Clearly, neither deviation improves firm 2's net profits.

Likewise, firm 1 also has no profitable deviation. A higher bid of $s_1 > s^L$ gives away profit, and a lower bid of $s_1 < s^L$ loses the bidding war in which case firm 1 does not obtain the target firm. Firm 1's net profit is then π^L which is no greater than the net profit the firm earns with its current bid of $s^*_1 = s^L$.

To see that $s^*_1 = s^L$, $s^*_2 = s^L$ is also a unique Nash equilibrium outcome when $0 \leq \underline{s} \leq s^O$, consider first any pair of bids (s_1, s_2) where $\underline{s} \leq s_1 < s_2 < s^L$. Clearly this cannot be an equilibrium outcome because in this case firm 1 has an incentive to raise its bid above that of firm 2 and thereby buy the complementary asset and increase its ultimate net profit. The same reasoning holds for firm 2 for any pair of bids (s_1, s_2), where $\underline{s} \leq s_2 \leq s_1 < s^O$. For bids (s_1, s_2) where $s_1 < s_2 \leq \underline{s}$, firm 1 has an incentive to increase its bid to $\underline{s}$ and buy the asset. The firm would then earn net profit $\pi^W (1\text{-}\underline{s}) > \pi^O$ since $\underline{s} \leq s^O$. Finally, for bids (s_1, s_2), where $s_2 \leq s_1 \leq \underline{s}$, there is similarly an incentive for firm 2 to deviate and bid $\underline{s}$ and increase its profit. QED.

Proposition A2: When the reservation selling price of the asset C is such that $\underline{s}$ satisfies $s^O < \underline{s} \leq s^L$, then there are multiple perfect Nash equilibria. One equilibrium is the bid pair, $s^*_1 = s^L$, $s^*_2 = s^L$, in which case firm 1 acquires the complementary asset and firm 2 does not. In addition, there is also a second set of equilibria consisting of all offer pairs ($s^*{}_1$, $s^*{}_2$) satisfying $s^*{}_1 < \underline{s}$ and $s^*{}_2 < \underline{s}$, such that neither firm acquires this asset.

Proof: The first part of the proof that $s^*{}_1 = s^L$, $s^*{}_2 = s^L$ is an equilibrium is the same as above for Proposition A1. However, all offer pairs where both $s^*{}_1$ and $s^*{}_2$ are less than $\underline{s}$ are also Nash equilibria. Clearly, in each such case, no firm has an incentive to lower its offer. No firm has an incentive to raise its offer either. Doing so can only affect the market outcome if the offer is raised to the level of $\underline{s}$. However, the firm that raises its offer this high will see its profit fall from π^0 to $\pi^W(1-\underline{s})$. Accordingly, neither firm has an incentive to deviate from the proposed equilibrium. QED.

The last case to consider is that in which the value or reservation purchase price $\underline{s}$ of the target firm satisfies $\underline{s} > s^L$, or alternatively $C > s^L\pi^W$.

Proposition A3**:** When the reservation price of the asset C is such that $\underline{s}$ satisfies $s^L < \underline{s}$ then there are many perfect Nash equilibria, ($s^*{}_1$, $s^*{}_2$)all of which are characterized by a pair of offers satisfying $s^*{}_1 < \underline{s}$ and $s^*{}_2 < \underline{s}$. In all such cases, neither firm acquires the complementary asset, and there is no bidding war.

Proof**:** The proof of this last proposition is self-evident. Purchasing the complementary asset requires offering a profit share $\underline{s}$ greater than s^L. This will unequivocally lower the profit of the firm making such a bid. Hence, neither firm has any incentive to do so. QED.

The various types of equilibria that arise when one firm's ownership of the asset toughens price competition in the product market, i.e., when (2α - β) > 0, carry a number of interesting implications. First, note that in any outcome in which the complementary asset or target firm is purchased, the initial owners of the target firm earn overall $s^L\pi^W > C$. Second, each of the rival bidding firms, the one who obtains the asset and the one who does not, earn precisely the same *net* profit. This, of course, is quite consistent with the empirical findings. As noted in the Introduction, the actual data typically find that target firm shareholders earn a large premium above the above their initial share price, whereas the share holders of the acquiring firms are typically shown to have gained little especially when compared to the returns earned by stockholders in firms not acquiring such assets. More importantly, the profit earned by each rival is actually ***less than*** π^O, the profit that is earned when no acquisition is made. In other words, the successful purchase of the target firm yields a market outcome with a "prisoners' dilemma" aspect. Both bidding rival firms earn ***lower*** profit than they would have earned if the target firm never existed. In other words, two factors interact to reduce the net profitability of the firm making the acquisition. The first of these is the necessary payment to the initial owners of the complementary asset. The second is that purchase of the asset itself intensifies price competition within the product differentiated market. As a result, the net profit of the firm acquiring the complementary asset may look especially low when compared with the net profit of firms in other industries.

Case B: $(2\alpha - \beta) < 0$, The Complementary Asset Softens Price Competition

When the term $(2\alpha - \beta) < 0$, price competition between the rival firms is quite different from that in the previous case. Now one firm's ownership of the complementary asset softens price competition between both firms. It is straightforward to verify from equation (4) that in this case the gross profits are such that $\pi^W > \pi^L > \pi^O$. In other words, if firm 1 wins the bidding war in the first stage and acquires the target firm, the profit of the rival firm 2 is now *greater* than the profit earned by either firm 1 or firm 2 if neither firm purchases the complementary asset. As in Case A, we define the benchmark profit shares s^O and s^L, such that $\pi^W(1\text{-}s^O) = \pi^O$, and $\pi^W(1\text{-}s^L) = \pi^L$. However, since for this case $\pi^W > \pi^L > \pi^O$, it follows that we also have $s^O > s^L$. Similar to above we derive three propositions as follows.

Proposition B1: If C and therefore $\underline{s}$ are such that $0 \leq \underline{s} \leq s^L$, then there is a unique perfect Nash equilibrium outcome described by the pair of offers $s^*_1 = s^L$, $s^*_2 = s^L$, where again, given our tie-breaking rule, firm 1 wins the bidding war and firm 2 does not.

Proof: When $s^*_1 = s^L$, $s^*_2 = s^L$, firm 1 wins the bidding contest, acquires the target firm and earns a *net* profit, $\pi^W(1\text{-}s^L) = \pi^L$, the same net profit that its rival, firm 2, earns. Firm 2 does not have a profit incentive to deviate from its bid of $s^*_2 = s^L$. Offering a lower s_2 will leave it in the same outcome and with the same net profit. A higher bid of $s_2 > s^L$ will win the asset for firm 2, but only at the cost of driving firm 2's net profit below π^L. Clearly such a deviation is not profitable. Similarly, there is no profitable deviation for firm 1. A higher bid of $s_1 > s^L$ simply gives more profit to the initial owners of the complementary asset leaving less for firm 1. A lower bid such that $s_1 < s^L$ results in firm 2 acquiring the desired asset instead of firm 1, which again does not raise firm 1's profit.

That the solution $s^*_1 = s^L$, $s^*_2 = s^L$ is a *unique* Nash equilibrium outcome when $0 \leq \underline{s} \leq s^L$ is shown by the following argument. Consider first any pair of bids (s_1, s_2) where $\underline{s} \leq s_1 < s_2 < s^L$. Clearly this cannot be an equilibrium outcome because in this case firm 1 has an incentive to raise its bid above that of firm 2 and acquire the target firm. As long as $s_1 < s^L$, firm 1's net profits will be increased by this deviation. A similar argument holds for firm 2 where $\underline{s} \leq s_2 < s_1 < s^L$. Now consider bidding pairs (s_1, s_2) where either $s_1 < s_2 < \underline{s}$, or where $s_2 \leq s_1 < \underline{s}$. In either case, neither firm acquires the complementary asset. As a result, they both face tougher price competition and earn profit π^O. In such a scenario at least one firm has an incentive to increase its bid to $\underline{s}$ sufficient to acquire the target firm. By so doing, such a firm would earn net profit $\pi^W(1-\underline{s}) > \pi^O$ since $\underline{s} < s^O$. QED.

Proposition B2: If C and therefore $\underline{s}$ are such that $s^L < \underline{s} \leq s^O$, then any pair of bids (s^*_1, s^*_2) where either $s^*_1 = \underline{s}$ and $s^*_2 < \underline{s}$, or $s^*_1 < \underline{s}$ and $s^*_2 = \underline{s}$, describes a perfect Nash equilibrium.

Proof: The firm that pays $\underline{s}$ and obtains the complementary asset has no incentive to lower its offer. Doing so will simply reduce its net profit to π^O. Raising its bid will also reduce the firm's net profit by transferring more profit to the owners of the target firm. Clearly, the rival firm that loses the bidding cannot gain by lowering its offer. Nor can it do so by raising its offer above $\underline{s}$. This will win the complementary asset but only at the cost of pushing the firm's profit below $\pi^W(1-\underline{s})$. QED.

Similar to Case A, there is a third, remaining possibility to consider. This is when C and hence $\underline{s}$ are such that $\underline{s} > s^O$. The relevant proposition for this possibility is given below.

Proposition B3: If C and therefore $\underline{s}$ are such that $\underline{s} > s^O$, then there are multiple perfect Nash equilibria consisting of offer pairs (s^*_1, s^*_2) satisfying $s^*_1 < \underline{s}$ and $s^*_2 < \underline{s}$, and in all of which neither firm acquires the complementary asset.

Proof: Clearly, no firm can do better by lowering its offer. Neither can any firm do better by raising its offer. Doing so only affects the market outcome when the raised offer is at least $\underline{s}$. However, since $\underline{s} > s^O$, giving this share of gross profit to the shareholders of the target firm implies that the firm acquiring that target will earn less net profit than it earns when neither firm makes such an acquisition. Hence, it cannot be in the interest of any firm to raise its bid unilaterally to $\underline{s}$. When $\underline{s} > s^O$, neither firm acquires the complementary asset. No merger occurs. QED.

When ownership of the complementary asset in this industry softens price competition, i.e., when $(2\alpha - \beta) < 0$, the equilibrium outcome of particular interest is that described by *Proposition B2*. What makes this outcome so intriguing is its "winner's curse" feature. Although it is true that the two rival firms are better off than either firm would be without acquiring the complementary asset, i.e., we have that $\pi^W(1-\underline{s}) \geq \pi^O$ and $\pi^L > \pi^O$, it is also true that for this case we have $\pi^L > \pi^W(1-\underline{s}) \geq \pi^O$. In other words, the firm that "wins" the bidding war and acquires the unique complementary asset earns a net profit $\pi^W(1-\underline{s})$ that is actually ***less*** than the net profit π^L of its rival who "lost" the bidding contest. The precise dilemma facing each firm is this. If neither makes a bid as high as $\underline{s}$, both simply earn a profit of π^O. This outcome cannot be an equilibrium because at least one firm would find it profitable to raise its offer to meet the reservation price of the owners of the complementary asset, i.e., to the level of $\underline{s}$. However, in so doing price competition is softened in the product market, and even though the winning firm earns more profit, its acquisition of the complementary asset raises the profitability of its rival by even more.[5]

Thus, once again we obtain the result that firms who are successful in winning bidding wars are not more profitable than those that lose such contests, and in fact may often appear to be less profitable. Yet the comparison in this instance is somewhat misleading. Yes, the winner is less profitable than the loser. But when $(2\alpha - \beta) < 0$, even the winner enjoys a profit increase as a result of the merger. The truly relevant comparison—but the one that cannot be empirically verified—is the comparison between the winner's post-merger profit and its profit had no merger ever occurred.

IV. *Concluding Remarks*

This paper has focused on two features of the corporate merger wave over the last several years. One of these is that many mergers are either vertical or, more generally, involve the purchase of complementary assets rather than the purchase of assets held by a direct competitor. Furthermore, the complementary assets bought by the acquiring firm are deployed to enhance the firm's ability to compete in its own market. The assets often have a brand name appeal or identity that can be used to differentiate the acquiring firm's product. The second feature of this merger wave has been that the lion's share of any gains generated by the merger to flow shareholders of the target firm rather than the acquiring one.

We have shown that the outcome of noncooperative bidding for firms owning complementary assets depends critically as to how one firm's ownership of such assets affects the price competition in the differentiated product market in which the two bidders compete. One possibility is that when one firm acquires such assets, its rival is so disadvantaged in the eyes of consumers that it must cut price aggressively, thereby, intensifying price competition. The other possibility is that when one firm purchases the complementary assets, the products of the two competing bidders become even more differentiated with the result that price competition is weakened.

We have examined the bidding and product market outcomes for each of the two cases just described. In each case, when a merger occurs, the price paid by the winning bidder exceeds the reproduction cost, or more generally the reservation selling price of the assets acquired. This is consistent with the common observation of significant stock price premia paid to the shareholders of target firms. We have also shown that in each of the two possible cases just described there is a rather unfortunate "prisoner's dilemma" type outcome for the bidding firms. When price competition is toughened by the ownership of the asset, the bidding for the complementary assets and the subsequent price game results in both bidders earning *less* profit than they would have earned if no such assets existed. On the other hand when acquisition of the asset softens price competition, each of the bidding firms does better than it would have done had the assets not existed but, paradoxically, the firm that wins the bidding and that acquires the target firm may wind up with the lowest profit.

Our results are consistent with much empirical merger evidence suggesting that stockholders of an acquired firm do quite well, the stockholders of the acquiring firm barely break even. Yet while appealing this is perhaps not the most important message of the analysis. Instead, what our findings really indicate is that when firms interact strategically in both the product and the input markets, the impact on profit can be particularly harsh.

Endnotes

---

*We thank George Norman and Pierluigi Balduzzi for helpful comments.

[1] See J. Lippman and M. Peers, "In Clash of Media Titans, A Surprise From News Corp.", ***The Wall Street Journal***, 14 August, 2000, p. B1.

[2] See, e.g., "Merger Brief: First Among Equals", ***The Economist***, 26 August, 2000.

[3] Most mergers involve financing, at least in part, with corporate stock.

[4] Similarly, in Chen (2000), the strategic bidding game analyzed there depended upon the nature of the relationship between the new product and the monopoly's product, that is whether they were strategic substitutes or complements.

[5] It is possible to use a mixed strategy solution to answer the question which firm makes the winning bid. Under such a scenario each firm bids the reservation share with some probability. This solution concept would not change the fundamental result that the firm acquiring complementary assets is worse off than the firm that does not.

References

1. Bulow, J., J. Geanakoplos, and P. Klemperer, "Multimarket Oligopoly: Strategic Substitutes and Complements" ***Journal of Political Economy***, 93, (1985), 488-511.
2. Chen, Yongmin, "Strategic Bidding by Potential Competitors." ***Journal of Industrial Economics***, 48, (2000), 161- 175.
3. Jarrell, G. A., J. A. Brickley, and J. M. Nutter, "The Market for Corporate Control: The Empirical Evidence Since 1980." ***Journal of Economic Perspectives***, 2 (Winter, 1988), 49 – 68.
4. Jensen, M. and R. Ruback, "The Market for Corporate Control." ***Journal of Financial Economics***, 11 (January, 1983), 5-50.
5. Loughran, T. and A. Vijh, "Do Long-Term Shareholders Benefit from Corporate Acquisitions?", ***Journal of Finance***, 52 (May, 1997), 1765-90.
6. Ravenscraft, D. J, and F. M. Scherer, "The Profitability of Mergers." ***International Journal of Industrial Organization***, special issue, (March, 1989), 101-16.

TUFTS UNIVERSITY
ECONOMICS DEPARTMENT

DISCUSSION PAPERS SERIES 2000

2000-20 Lynne PEPALL and Daniel RICHARDS; Merger Wars: Bidding for Complementary Assets

2000-19 George NORMAN; The Relative Advantages of Flexible versus Designated Manufacturing Technologies

2000-18 Yannis A. IOANNIDES and Henry G. OVERMAN; Spatial Evolution of the US Urban System

2000-17 Tom DOWNES and Shane GREENSTEIN; Universal Access and Local Commercial Internet Markets

2000-16 Timothy F. HARRIS and Yannis A. IOANNIDES; Productivity and Metropolitan Density

2000-15 Don FULLERTON and Gilbert E. METCALF; Cap and Trade Policies in the Presence of Monopoly and Distortionary Taxation

2000-14 Timothy F. HARRIS and Yannis M. IOANNIDES; History versus Expectations: an Empirical Investigation

2000-13 George NORMAN; Internalization Revisited

2000-12 Yannis M. IOANNIDES and Jeffrey E. ZABEL; Neighborhood Effects and Housing Demand

2000-11 Carlo CARRARO and Gilbert E. METCALF; Behavioral and Distributional Effects of Environmental Policy: Introduction

2000-10 Lynne PEPALL and George NORMAN; Product Differentiation and Upstream-Downstream Relations

2000-09 Edward KUTSOATI; Debt-Contingent Inflation Contracts and Targeting

2000-08 Yannis M. IOANNIDES and George PETRAKOS; Regional Disparities in Greece and The Performance of Crete, Peloponnese and Thessaly

2000-07 Hans H. HALLER and Yannis M. IOANNIDES; Propaedeutics of Strategic Theories of Economic Integration

2000-06 Yannis M. IOANNIDES and Henry G. OVERMAN; Zipf's Law For Cities: An Explanation

2000-05 Drusilla K. BROWN; International Trade And Core Labor Standards A Survey Of The Recent Literature

2000-04 Gilbert E. METCALF; Environmental Levies and Distortionary Taxation: Pigou, Taxation, and Pollution

2000-03 Drusilla K. BROWN; International Labor Standards in the World Trade Organization and the International Labor Organization

2000-02 Alan V. DEARDORFF, Drusilla K. BROWN, and Robert M. STERN; Computational Analysis of the Government Of India's Market Opening Initiatives

2000-01 Drusilla K. BROWN and Robert M. STERN; Measurement and Modeling of the Economic Effects of Trade and Investment Barriers in Services

Discussion Papers Are Available Online at http://ase.tufts.edu/econ/papers