Division of Research
Graduate School of Business Administration

May 1987

THE ROLE OF WHITE KNIGHT AGREEMENTS, LOCK UPS AND SPIN-OFFS IN TAKEOVERS

Working Paper #514

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We wish to thank Michael Bradley and the participants of the seminar at The University of Michigan. We are responsible for any errors that remain.

This research has been supported by a summer grant from The University of Michigan.

Abstract

We analyze a situation where a firm faces the possibility of being taken over by a raider and searches for another bidder to possibly compete against him. Using the Nash bargaining solution, we show that the target is better off guaranteeing the second bidder a win if he makes a negotiated bid (a white knight agreement), than having him compete against the raider in an auction. The threat of elimination forces the first bidder to make a high opening bid thus improving the target's payoff. The elimination is effected through a lock up and occurs even if the white knight's value is less than that of the raider. This inefficiency is resolved through spinoffs whereby the white knight re-sells the target to the raider. It turns out that, the stronger the bargaining power of the white knight against the raider, the better off the target is.

Introduction

It is often observed that the management of a target responds to a "hostile" tender offer bid by a raider by searching and negotiating with another bidder, popularly referred to as a white knight. In order to guarantee the white knight a win, the management enters into a 'lock up' agreement with him. Through this agreement the target sells, at a discount, some of its assets to the white knight thereby making it unprofitable for the raider to acquire the target.

On the surface, guaranteeing a win to a white knight suggests entrenchment tendencies on the part of the target management to the detriment of the shareholders. The popular wisdom is that the target management prefers to be taken over by a white knight as this improves its chances of remaining employed. In this paper, we show that a white knight agreement may in fact benefit target shareholders more than if the second bidder competes against the raider in an English auction and the target is sold to the winner.

We establish that whenever the target can eliminate an existing bidder via a white knight agreement, the bidder makes a high opening bid in an attempt to avoid elimination. Getting a high bid may compensate the target for reducing the competition for its acquisition. However, a social inefficiency results from such an agreement whenever the higher value bidder is eliminated. We show how spin-offs, through which the white knight resells the target to the eliminated bidder, can do away with this inefficiency.[1]

The model works as follows. A bidder investigates a target, discovers that he can generate synergy gains by acquiring it and makes a tender offer. At this stage the target searches for a second bidder who is also interested in acquiring the target. On finding such a bidder, the target can enter into one of two contracts with him. Under one contract the target pays the second bidder a negotiated amount (which may be negative if the bidder pays the target for its proprietory information about the synergy gains) to induce him to compete against the first bidder in an English auction. Under the second contract, the target guarantees a win to the second bidder if he agrees to make a negotiated bid, by locking up some of the target's assets with him. We apply the Nash bargaining solution to both contracts, and show under what conditions the white knight contract gives the target a better payoff.

Whenever the white knight agreement results in the target being sold to a lower value bidder, there are potential gains from reselling the target to the higher value bidder. We show that when we allow for reselling, the nature of the bargaining changes as the white knight agreement depends also on the bargaining outcome between the white knight and the first bidder. This interrelationship affects the level of the opening bid made by the first bidder, as the 'penalty' from being eliminated by a white knight agreement is reduced. We establish that both bidders are better off from spin-offs, but the effect on the target's payoffs depends on the bargaining power of the white knight against the first bidder. The target is better off if this bargaining power is high, because both the amount of pre-emption by the first bidder and the "synergy gains" to be divided between the target and the white knight increase with this bargaining power.

Most papers dealing with sequential arrival of bidder, such as, Baron (1986), Berkovitch and Khanna (1985), Fishman (1985) and Khanna (1985) do not distinguish between a white knight and an ordinary second bidder. In Shleifer and Vishny (1986), both the target and bidder can search each other for synergy gains and the white knight is a bidder with whom the target discovers that it can generate synergies. In this respect, the method of discovering a white knight in our paper is similar to their's. However, the two papers differ in the nature of the agreement that is entered into by the different player.

We are not aware of any empirical work that deals with white knights specifically. However work on spin-offs and voluntary divestiture exists and the findings are that both the selling firms and the buying firms gain (see, for example, Alexander, Benson and Kampmeyer (1984), Hite and Owens (1983)).

The paper is organized as follows. In section 1 we describe the environment and distinguish between a white knight and an ordinary second bidder. In section 2, using the uniform distribution, we compare the target's payoffs when it negotiates with the second bidder as a white knight and when it deals with him as an ordinary bidder. In section 3, we show that the white knight agreement is enforceable and extend the analysis to more general conditions in section 4. The effect of spin-offs on the white knight agreement and the resulting payoffs are described in section 5, which is followed by a conclusion.

Section 1: 'White Knight' Agreement with Lock up Provision

Consider an acquisition market in which firms may be able to generate synergies by coming together.[2] The amount of synergy is match specific and is not known before search. Search takes place through auditing the accounts or learning the production technology of the firm under investigation, the target. The synergies are revealed only to the auditing firm, and it may take over the target via a tender offer whenever these synergies are positive.

Consider the situation where an auditing firm, bidder-1, discovers a target with which it can generate synergy gains of a, and bids $w(a) < a$. The amount of his synergy gains is his private information while the bid is publicly observable. The bid remains open for one period and, in response to the bid, the target searches for another bidder with which it can generate synergies. Following Shleifer and Vishny (1986), we assume that the target provides the second bidder with some private information which is either not available or too expensive to buy. We also assume that it can investigate only one such bidder before the bid expires. Let the synergy generated with the second bidder be b. If $b < w(a)$ then the second bidder serves no purpose, but if $b > w(a)$, then both he and the target can benefit through some mutual agreement. Before we describe the nature of the agreement, we make the following assumptions.

A1. Bidder-1 does not know the identity or synergy value of bidder-2 before the latter makes a bid.

A2. Bidder-2 depends on target-search for discovering its synergy gains.

A3. All firms are risk neutral.

Assumption-A1 implies that bidder-1 does not change his opening bid before the target and bidder-2 enter into an agreement and is introduced to keep the model simple. Assumption-A2 is also not restrictive as, in the event bidder-2 arrives without target search, the target can search for a third bidder and the analysis goes through. So, all that is implied is that there exist some bidders in the market who are unable to identify their synergy gains without help from the target.

Given Assumptions A1 and A2, the target and bidder-2 face a bilateral bargaining situation in which the target provides some proprietory information and bidder-2 helps in increasing the existing bid. The bargaining can take several forms and we consider two scenarios in particular. In Scenario-1, the target makes a negotiated payment to bidder-2 to make him compete against bidder-1 as if in an English auction.[3] Scenario-2 involves an agreement with bidder-2 which, together with a lockup arrangement, guarantees him a win as long as he bids a negotiated bid. Because of these features, we refer to the bidder-2 in this scenario as a white knight.

We now use the Nash bargaining solution to describe and compare both scenarios. In both, given an opening bid of w(a) by bidder-1, the bargaining situation has a disagreement outcome of w(a) for the target and zero for the bidder-2/White Knight as he does not discover his synergy gains, b, if the target does not search him out. However, the opening bid is different for each scenario as bidder-1 acts differently in each case.

At this point it is worth discussing why we use this approach for Scenario-1 instead of a simpler game in which the target reveals its information to bidder-2 who enters without any payments taking place and competes against bidder-1. In the event no further communication after the revelation is possible, it is optimal for bidder-2 to enter and compete as soon as he gets the information. However, we believe that communication which results in a more involved bargaining situation is always possible. In particular, whenever the negotiations result in bidder-2 paying the target for his proprietory information, it is hard to justify a scenario in which the target gives the information costlessly.

Another way to model the bargaining problem of this paper is through Rubinstein's (1982) strategic approach. Although this method may provide a better description of the bargaining process, we believe that it will not change any of the major conclusions. In particular, Binmore, Rubinstein and Wolinsky (1986) have shown that in many cases the strategic approach yields the same outcome in the limit as Nash bargaining.

Section 2: Synergies Distributed Uniformly [0,1]

2.1 Scenario-1: The target pays bidder-2 to compete.

In Scenario-1 the bargaining is over what the target should pay to bidder-2 to make him compete against bidder-1. In the event bidder-1 realizes that this is the nature of the bargaining between the target and bidder-2, it is optimal for him to make an opening bid of zero instead of pre-empting competition by opening with a higher bid. This is so because deterrence is no longer valuable as only bidders with values less than the opening bid are deterred and the opening bidder would have anyway outbid them with lower bids. However, with an opening bid of zero his value does not get revealed. Under this circumstance, and given that the synergy gains are distributed uniformly over [0,1], the expected payoff to the target on discovering a bidder-2 with synergy gains b, is:

$$(2.1) \qquad V_t(b) = \int_0^b s\,ds + b(1 - b) = b - \frac{1}{2} b^2$$

where the term under the integral is the expected return to the target when bidder-1 has value less than b, and the second term is the expected return when bidder-1's value is higher than b.

The payoff to bidder-2 is the expectation over the difference between his value and his bid when he wins. Since his bid equals the value of bidder-1 if this value is below b, bidder-2's expected payoff is:

$$(2.2) \qquad V_{B=2}(b) = \int_0^b (b - s)ds = \frac{1}{2} b^2.$$

Given these payoffs, the bargaining is over the amount with which the target must compensate bidder-2. Since we assume risk neutrality, we can denote this amount by P, the net payoff to the target by $V_t(b) - P$ and to bidder-2 by $V_{B=2}(b) + P$. Note that P is not the actual amount paid but the transfer of wealth from the target to bidder-2.[4] The amount that the target must give to bidder-2 according to the generalized Nash bargaining solution (see Roth 1979), is the solution to:

$$(2.3) \qquad \max_{P} \{V_t(b) - P\}^{\alpha_1} \{V_{B=2}(b) + P\}^{\alpha_2}$$

where α_1 and α_2 are positive constants. This is because the disagreement outcome for the target is zero as $w(a) = 0$. Substituting for $V_t(b)$ and $V_{B=2}(b)$ from (2.1) and (2.2) gives us,

$$(2.4) \qquad \max_{P} \{b - \frac{1}{2} b^2 - P\}^{\alpha_1} \{\frac{1}{2} b^2 + P\}^{\alpha_2}$$

This maximization yields the following solution for P:

$$(2.5) \qquad P = b - \frac{1}{2} b^2 - \gamma b$$

where $\gamma = \dfrac{\alpha_1}{\alpha_1 + \alpha_2}$ represents the relative bargaining power of the target, or the fraction of the 'cake' captured by the target. Note that P may be negative (i.e., bidder-2 pays to the target for the "rights" to bid or for the information it reveals to him) in cases where γ is close to 1. The resulting payoffs to the target and bidder-1 are computed in Proposition-1.

2.2 Scenario-2: The White Knight Agreement

In Scenario-2 the bargaining is over the amount that bidder-2 will bid. The other difference from Scenario-1 is that, through lock ups, bidder-2 is guaranteed a win in the event he makes the pre-determined bid. This bid, w(b), is determined by the solution to:

$$\max_{w(b)} \left(w(b) - w(a)\right)^{\alpha_1} \left(b - w(b)\right)^{\alpha_2}$$

and is:

$$(2.6) \qquad w(b) = w(a) + \gamma(b - w(a))$$

The expression for w(b) is the payoff of the target under the Nash bargaining solution. However, $w(b)$ may not be the actual bid made by the white knight because of the following enforceability problem.

Whenever $a > w(b)$, bidder-1 has an incentive to compete against bidder-2 by bidding above this bid. Thus, the target may wait for bidder-1 to rebid after bidder-2 has bid. Knowing this possibility, bidder-2 will not enter into the above agreement with the target if he believes that there is a high enough probability that $b < a$. This problem may be resolved with the use of a lock up as follows.

The target undertakes to sell to the white knight certain assets at a discount, D, below market value provided he makes a bid equal to the agreed upon amount plus D. Bidder-2 gets to keep D even in the event bidder-1 wins by raising the bid. However, bidder-1 can be prevented from winning if the discount paid to bidder-2 is high enough to reduce bidder-1's synergy to below b. Note that it is not necessary to know bidder-1's value as a high enough D can be chosen to prevent bidder-1 from winning. We assume that the locked-up asset has common value to both bidders, thus, the remaining synergy gains to bidder-1 are 'a' less the discount amount, and the actual bid made by the white knight is $w(b) + D$.

The use of a lock up restricts bidder-1 to only one bid as he gets eliminated if the bid is below the value of the white knight. This may, on occasion, result in the elimination of a higher-value acquirer. This apparent inefficiency is remedied by permitting the white knight to resell the asset to bidder-1 and we model this possibility in a later section.

The restriction to one bid forces bidder-1 to choose a bid, w, such that he maximizes his expected gains as follows:

$$\max_{w} \; (a-w)w \tag{2.7}$$

This is so as bidder-1 wins only in the event that his bid, w, is higher than the value of the white knight. If he wins, he gets a - w and this occurs with probability w (the probability that the white knight's value is below his bid).

The solution for (2.7) is $w = \frac{a}{2}$. Consequently, bidder-1 preempts all White Knights with values below $\frac{a}{2}$.

We are now ready to compare the white knight agreement with a guaranteed win (Scenario-2) to Scenario-1. Proposition-1 shows that scenario-2 is preferred by the target. Moreover, under most reasonable conditions, it is preferred over scenario 1 even when no payment, $(P \equiv 0)$, is needed to make bidder-2 compete.

Proposition-1:

(i) The expected payoffs to the target are higher under the White Knight agreement than under Scenario-1.

(ii) When bidder-2 competes without bargaining and the target provides him information costlessly $(P \equiv 0)$, the white knight agreement yields higher expected payoffs to the target whenever $\gamma > \frac{1}{3}$.

Proof:

(i) Given the white knight agreement, bidder-1 bids $\frac{a}{2}$ and bidder-2 bids and wins according to (2.6). Therefore, the ex ante expected payoff to the target, V_t^{S2}, is an expectation over all possible values of a and b, where b > a, and is:

(2.8) $$V_t^{S2} = \int_0^1 \left\{\frac{a}{2} + \gamma \int_a^1 (b - \frac{a}{2})db\right\}da = \int_0^1 \left\{\frac{a}{2} + \gamma(\frac{1}{2} - \frac{a}{2})\right\}da = \frac{1}{4} + \frac{\gamma}{4}$$

Under Scenario-1 (S1), and given a, the target's payoff is:

$$(2.9) \qquad V_t^{S1}(a) = \int_0^a [b - P(b)]db + \int_a^1 [a - P(b)]db.$$

The first integral is the expected payoff for the target given $b > a$, and the second is the payoff given $a > b$. Using (2.5) for $P(b)$ and taking expectation over a, we obtain:

$$V_t^{S1} = \int_0^1 [\int_0^a (\frac{1}{2} b^2 + \gamma b)db + \int_a^1 (a - b + \frac{1}{2} b^2 + \gamma b)db] da = \frac{\gamma}{2}$$

It can be seen that, for all $\gamma < 1$, $\frac{1}{4} + \frac{\gamma}{4} > \frac{\gamma}{2}$, and for $\gamma = 1$, $\frac{1}{4} + \frac{\gamma}{4} = \frac{\gamma}{2}$, and thus, the proof for (i) is completed.

(ii) When $P \equiv 0$, V_t^{S2} remains the same. Now, substituting $P \equiv 0$ in (2.9) yields:

$$V_t^{S1} = \int_0^1 [\int_0^a bdb + \int_a^1 adb] da = \frac{1}{3}$$

Therefore, for $\gamma > \frac{1}{3}$, $V_t^{S2} - V_t^{S1} = \frac{1}{4} + \frac{\gamma}{4} - \frac{1}{3} > 0$.

Q.E.D.

Proposition-1 shows that the target prefers the white knight agreement to scenario-1. This appears to be a surprising result as Scenario-1 is the one with more competition. However, the lower competition in the white knight agreement is more than compensated for by a higher pre-emption by bidder-1 who bids high to avoid elimination by a white knight.

Section 3: Implementability of the White Knight Agreement

The advantage of the white knight agreement is that it forces bidder-1 to make a high opening bid. However, in order for the white knight agreement to be enforceable, the target must not have an incentive to switch to Scenario-1 given that a high opening bid already exists. If such an incentive exists, then the target will not receive a high opening bid in the first place. We now show that the target does not have such an incentive.

Proposition-2:

Suppose bidder-1 bids $w(a) = \frac{a}{2}$ as in Scenario-2. Then, given this bid, the target does not gain by bargaining with bidder-2 as in Scenario-1.

Proof:

We show that given $w(a) = \frac{a}{2}$, the target gets the same payoffs under both scenarios. The payoff to the target under the white knight agreement remains the same as in section-2 and equals $w(b) = \frac{a}{2} + \gamma\ (b - \frac{a}{2})$. In order to calculate the payoff under Scenario-1, note that the problem changes as the opening bid is $\frac{a}{2}$ instead of zero and the bargaining situation is different. Next, we calculate P for two cases.

Case-I: $b < a$: In this case

$$P \ \varepsilon \ \arg\max_{P} \ \{b - P - \frac{a}{2}\}^{\alpha_1} P^{\alpha_2}$$

as the payoff for the target under an English auction is b - P and its disagreement outcome is $\frac{a}{2}$, the existing bid. The resulting P is given by:

$$P = (1 - \gamma)(b - \frac{a}{2})$$

and the payoff to the target is:

$$V(b|b < a) = b - P = b - (1 - \gamma)(b - \frac{a}{2}) = \frac{a}{2} + \gamma\ (b - \frac{a}{2})$$

which is the same as the payoff under a white knight agreement.

Case-II: $b > a$: In this case

$$P \in \arg\max_{P} \left(a - P - \frac{a}{2}\right)^{\alpha_1} (b - a + P)^{\alpha_2}$$

as bidder-2 wins in the English auction for a bid of a. The resulting P is given by

$$P = \frac{a}{2} - \gamma \left(b - \frac{a}{2}\right).$$

The resulting payoff to the target is

$$V(b \mid b > a) = a - P = \frac{a}{2} + \gamma \left(b - \frac{a}{2}\right)$$

which is again the same as the payoff under the white knight agreement.

Q.E.D.

This result may look surprising at first, especially in the situation $b < a$ where the total synergy is higher in the English auction than in the white knight agreement. However, the 'total cake' which is available for division between the target and the white knight remains the same, i.e., $b - \frac{a}{2}$, as even when $b < a$, bidder-1 wins in an English auction for a bid of b. Thus the difference in the total synergy is captured by bidder-1.[5]

Section 4: Dominance of the White Knight Agreement Under more General Conditions

We now investigate under what conditions the white knight agreement dominates Scenario-1 when we allow for a larger class of distribution functions of the synergy gains. Suppose the synergy gains are distributed over the support $[\underline{a}, \overline{a}]$, $\overline{a} > 0$, with a twice differentiable cumulative distribution function F and density function f. Suppose, as before, a bidder realizes his synergy gains with a particular target to be an $a > 0$. Under the white knight scenario, his problem is to bid so as to maximize his expected gain, (4.0) $\underset{w}{\text{Max}}\ (a-w)\ F(w)$

s.t. $w \geq 0$

where F(w) is the probability that the synergy gains of the white knight are below w. The first order maximization condition for an interior solution is:

(4.1) $af(w) - wf(w) - F(w) = 0$

and the second order condition is:

(4.2) $af' - f - wf' - f < 0$

In order to simplify the analysis we make the following assumption:

(A4) $\frac{F}{f}$ is weakly increasing.

(A4) holds near $\underline{a}$ since $F(\underline{a}) = 0$ and $f(\underline{a}) > 0$. With this assumption, we can show the following.

Lemma-1:

Suppose (A4) holds and $a > \frac{F(0)}{f(0)}$, then there exists a unique solution $w^*(a)$ for 4.0, such that $w^*(a) > 0$.

Proof:

Dividing 4.1 by f, we obtain

(4.3) $a - w - \frac{F}{f} = 0.$

At $w = 0$, the left hand side of 4.3 is positive and at $w = a$, it is negative. Therefore by continuity, there exist values of $w > 0$ that satisfy 4.3. To show uniqueness, assume that $\underline{w}$ is the smallest w to satisfy 4.3. For any $w > \underline{w}$, $a - \underline{w} > a - w$ and $\frac{F(\underline{w})}{f(\underline{w})} \leq \frac{F(w)}{f(w)}$. Therefore 4.3 cannot hold for both w and $\underline{w}$.

Q.E.D.

It follows from Lemma-1, that if for some value of a, bidder-1 bids $w^*(a) > 0$, then bidder-1s with $a' > a$ will bid $w^*(a') > 0$. Lemma-2 shows that $w^*(a)$ is increasing in a.

Lemma-2:

Suppose there exists $a' < \bar{a}$, for which $w^*(a') > 0$, then w^* is strictly increasing in a for $a \in [a',\bar{a}]$.

Proof:

Applying the implicit function theorem on 4.1, we obtain:

$$\frac{\partial w}{\partial a} = \frac{- f(w)}{af' - f - wf' - f} > 0 \text{ by } 4.2.$$

Q.E.D.

As discussed in section-2, the advantage of the white knight agreement over Scenario-1 is that the agreement forces bidder-1 to pre-empt. Therefore, the white knight agreement is inferior under any distribution that yields an opening bid of zero by bidder-1. However, if for some realization of 'a' pre-emption takes place under the white knight agreement, then the target may be better off with the agreement provided that the bargaining power of the target is small enough. This result is shown below.

Let the assumptions of Lemma-1 hold, so that there exists $a^* < a$, $w(a^*) > 0$ and $1 - F(a^*) > 0$. Let us now compare the payoff to the target under the two scenarios. The payoff from the white knight agreement is given by 2.6, while Scenario-1's payoffs are dependent on P which is given by the solution to 2.3. Solving 2.3, yields

(4.4) $$P = (1 - \gamma)V_t(b) - \gamma V_B(b)$$

where

(4.5) $$V_t(b) = \int_0^b s \, dF(s|a \geq 0) + b(1 - F(b|a \geq 0))$$

and

(4.6) $$V_B(b) = \int_0^b (b - s) \, dF(s|a \geq 0).$$

(4.5) and (4.6) are similar to (2.1) and (2.2) respectively except that F now represents a conditional distribution given $a \geq 0$ as bidder-1 makes a tender offer only when this condition holds.

Lemma-3:

In Scenario-1, the payoffs to the target are continuous in γ and are zero at $\gamma = 0$.

Proof:

For all b, $\gamma = 0$ implies $P = V_t(b)$ giving the target a payoff equal to zero. To show continuity, note that the payoffs to the target, given $b > w^*(a)$, are

(4.7) $$V_t(b) - P(b) = \gamma[V_t(b) + V_B(b)].$$

From 4.5 and 4.6, V_t and V_B are continuous. Thus $V_t(b) - P(b)$ is also continuous.

Q.E.D

We are now able to state the main result of this section.

Proposition-3:

Under the assumptions of this section, for a given F, there exists $\gamma^*(F) > 0$, such that for all $\gamma < \gamma^*$, the white knight agreement yields higher payoffs to the target than Scenario-1.

Proof:

By lemma-3, Scenario-1 yields payoffs of zero whenever $\gamma = 0$. By lemma-1 and the assumption that pre-emption occurs with a positive probability, the white knight agreement always yields strictly positive profits to the target. The statement of the proposition follows from the fact that the payoffs to the target in Scenario-1 are continuously increasing in γ.

Q.E.D

The intuition behind the result is that whenever bidder-1 pre-empts in order to prevent elimination through the white knight agreement, the target is guaranteed a positive gain even when its bargaining power is low and it may get nothing in Scenario-1. However, unlike the results in section-2, it may not always be the case that the white knight agreement dominates Scenario-1. The reason is that under more general conditions either pre-emption may not occur or may be 'too low' whenever the probability that the target will find a white knight is low, i.e., the probability that $b < 0$ is high. Therefore, if the target's bargaining power is high, it may be better off under Scenario-1. However, the results of section-2 go through whenever the probability of finding a white knight is high enough.

Section 5: Spin-offs

As indicated in section-2, the white knight agreement with lockups can lead to a socially inefficient outcome by preventing the highest value bidder from acquiring the target. However, this inefficiency can be remedied via a spin-off, through which the white knight resells the target to bidder-1 for a negotiated price.

When spin-offs are incorporated into our model, the nature of the bargaining game changes as bidder-1 does not face a complete loss of synergy by being eliminated, in the event the value of the white knight is between his own value and his bid. However, we show that he may still pre-empt, albeit for a lower bid, so as to avoid bargaining with the white knight. We also establish that both bidders 1 and 2 are better off with spin-offs, while the target may be worse off under some conditions with spin-offs than with a white knight agreement without spin-offs.

We start by analyzing the bargaining game between the white knight and bidder-1, after the white knight has acquired the target. At this point, some discussion about the information structure of the model is necessary. In sections 2 and 3, we assume that neither the white knight nor the target knows the value of bidder-1. There, this assumption is not crucial as bidder-1 is eliminated on the basis of his bid and not his value. However, now that the white knight may bargain with bidder-1, bidder-1's value has an important role in determining the bargaining outcome. In order to keep the analysis tractable, we assume that the white knight is able to learn bidder-1's value when he bargains with him and viceversa. In this respect, the assumption is similar to the one we make in the bargaining game between the target and bidder-2. We also assume, as in section-2, that the synergy gains are distributed uniformly over [0,1]. Given these assumptions and using the Nash bargaining solution, the payoffs to bidder-1 from negotiating with a white knight with a value b are $\gamma'(a - b)$, where γ' represents the bargaining power of bidder-1. Given this, we can now describe the optimal opening bid w, as the bid which maximizes bidder-1's expected gains:

$$(5.1) \qquad \operatorname*{Max}_{w}\ (a - w)w + \int_{w}^{a} \gamma'(a - s)ds$$

$$= (1 - \gamma')aw + \left(\frac{\gamma'}{2} - 1\right)w^2 + \frac{\gamma'}{2}a^2.$$

The first term in 5.1, $(a - w)w$, is bidder-1's expected payoff when the value of the white knight is below w, and the second term is his expected gains from the spin-off. The first order condition is

$$(1 - \gamma')\, a + (\gamma' - 2)w = 0 \tag{5.2}$$

which gives the following solution for w:

$$w'(a) = \frac{(\gamma' - 1)a}{\gamma' - 2}. \tag{5.3}$$

It is worth noting that $w'(a) > 0$ whenever $\gamma' < 1$, and $w'(a) < \frac{a}{2}$ which, as shown in section-2, is his optimal bid without spin-offs. Consequently, though bidder-1 still pre-empts with spin-offs he does so with a lower opening bid. Also, the amount of pre-emption is a decreasing function of his bargaining power as the higher his bargaining power, the more he gets from spin-offs and thus reduces his incentive to avoid negotiating with the white knight.

We now analyze the bargaining between the target and the white knight, given the opening bid by bidder-1. The bargaining situation is as before except that the resulting value from the complete transaction (including the spin-off) to the white knight exceeds b in the event $b < a$. This value is as follows:

$$B(a,b) = \begin{cases} b \text{ if } b \geq a \\ b + (1 - \gamma')\,(a - b) \text{ if } a > b \end{cases} \tag{5.4}$$

The value to the white knight is equal to his private synergy value, b, whenever $b \geq a$, and is equal to his private synergy plus the amount that he can negotiate for with bidder-1 in connection with the spin-off.

Following (2.6), the white knight bid is

$$w(a,b) = w(a) + \gamma\big(B(a,b) - w(a)\big) \tag{5.5}$$

which determines the payoffs of the target and the white knight. This leads us to the following proposition.

Proposition 4:

When spin-offs are permitted, both bidder-1 and the white knight are better off than when there are no spin-offs. Whether the target is also better off depends on γ and γ'. For a given γ, there exists γ'^* such that the target is better off with spin-offs whenever $\gamma' < \gamma'^*$ and worse off otherwise.

Proof:

The result that both bidders are better off follows from the fact that bidder-1 makes a lower pre-emptive opening bid and that the total synergy to be divided is higher. The target's expected payoff with spin-offs is as follows. (The opening bid by bidder-1 with spin-offs, as given in 5.3, is denoted by w'.)

$$(5.6) \qquad V_t^{SO} = \int_0^1 \Big\{w'(a) + \int_a^1 \gamma\big(b - w'(a)\big)db + \int_{w'(a)}^{a} \gamma[b + (1-\gamma')(a-b) - w'(a)]db\Big\}da$$

The payoffs to the target, without spin-offs are:

$$(5.7) \qquad V_t^{NSO} = \int_0^1 \Big\{w(a) + \int_{w(a)}^1 \gamma\big(b - w(a)\big)db\Big\}da = \frac{1}{4} + \frac{\gamma}{4} \text{ by proposition-1}$$

From (5.3), and (5.6), V_t^{SO} is continuously decreasing in γ' (since w' is decreasing in γ'). Also, if $w'(a) = w(a)$, then $V_t^{SO} > V_t^{NSO}$. Therefore, for $\gamma' \to 0$, $V_t^{SO} > V_t^{NSO}$. By (5.3), whenever $\gamma' \to 1$, $w'(a) \to 0$. In this case, $V_t^{SO} < V_t^{NSO}$ for all $\gamma < 1$. This is because from (5.6), if $w' = 0$, then $V_t^{SO} = \frac{\gamma}{2}$. Therefore,

$$V_t^{SO} - V_t^{NSO} = \frac{\gamma}{4} - \frac{1}{4} < 0.$$

By continuity, there exists γ'^*, for which the proposition holds.

Q.E.D.

The target is worse off whenever the adverse effect on its payoffs due to the decrease in the pre-emption amount, dominates the increase in the synergy gains that it and the white knight can divide between themselves. Proposition-4 shows that the stronger the bargaining power of the white knight against bidder-1, the higher the pre-emption by bidder-1 and the larger the synergy gains that get divided between the white knight and the target. Therefore, the target's payoffs are positively related to the bargaining power of the White Knight against bidder-1 and, when this bargaining power is high, the target does better with spin-offs.

Conclusion

We show that under some circumstances target shareholders can do better under white knight agreements than by facilitating a competitive auction between bidders. In this respect we distinguish between a white knight and an "ordinary" second bidder who enters and competes in an English auction against the first bidder. In the white knight agreement, lockups and spin-offs play an important role in the bargaining game between the target and the white knight.

For tractability, we make some simplifying assumptions. We restrict the analysis to only two bidders in order to emphasize the effectiveness of the white knight agreement whenever competition for the target is low. It is possible to extend the analysis to include more bidders, and our conjecture is that the white knight agreement still dominates in many cases. For example, if all existing bidders compete in an English auction prior to the target's negotiations with a white knight, then the basic structure and conclusions of the model hold.

Extending the model to multiple periods with sequential arrival of bidders, will also not affect the main conclusions of the paper. The target would still like to obtain the highest possible payoffs in each period before deciding whether to accept the final bid or to wait for another period.

Finally, it may be worth noting, that though it is believed that management may use white knights to remain entrenched, it is difficult to rationally support this claim. Once the target is taken over by another firm, the new firm will eliminate any source of inefficiency. In addition the manager has recourse to other instruments like poison pills, super majority provisions, etc., for maintaining control. With these instruments, the target probably has a better probability of remaining in control. A comparison of different defensive strategies from this aspect may make an interesting topic for future research.

Footnotes

1. In the Finance literature, distinction is sometime made between spin-offs and voluntary divestiture as modes of sell-offs. Spin-offs occur when the existing shareholders own the sold asset but as a new entity, while voluntary divestiture is when the asset is sold to another firm in which the existing shareholders have no interest. We do not make this distinction here and use the term to mean any form of voluntary sell-offs of existing assets.

2. The source of synergy is not important to the analysis as long as it is due to only one firm which we refer to as the target. This means that synergies are generated only when other firms combine with the target. The source of synergy can be superior production technology, tax advantages, replacement of bad management, etc.

3. In an English auction, the highest value bidder buys the target for the value of the second highest bidder. Baron (1986), Berkovitch and Khanna (1985), Fishman (1985), Khanna (1985) and Shleifer and Vishny (1986) all use this mechanism to describe the outcome of competitive bidding in acquisition markets.

4. P is not the actual amount paid because a payout by the target changes its value for all bidders. Thus, if the target pays any amount, say \$X, the winner will bid the original value of the second highest bidder less \$X. In order for the target to get the pay-offs resulting from the white knight agreement, the amount actually paid by the target is such that, in expectation, the target will get the original value of the second highest bidder less P.

5. It is possible that, when some of the assumptions of the model are relaxed, the target may have an incentive to switch to Scenario-1 after observing a high opening bid. However, if the White Knight agreement still dominates Scenario-1 for the target, it can commit to the agreement by giving lock ups to a third party, like an investment banker, who has an incentive to search for and mediate between a White Knight and a target. Such lock ups result in a loss for the target if it does not follow through with the White Knight agreement.

References

Alexander, C. J., P. George Benson and Joan M. Kampmeyer (1984). "Investigating the Valuation Effects of Announcements of Voluntary Corporate Selloffs." The Journal of Finance.

Baron, D. (1986). "An Efficiency Analysis of Proposed Rules to Limit Resistance to Tender Offers," Research Paper No. 903, Stanford University.

Berkovitch, Elazar and Naveen Khanna (1985). "A Theory of Acquisition Markets: Mergers vs. Tender Offers." Working paper, Northwestern University.

Binmore, K., Ariel Rubinstein and Asher Wolinsky (1986). "The Nash Bargaining Solution in Economic Modeling." The Rand Journal of Economics, Vol. 17, No. 2.

Fishman, Michael (1985). "A Theory of Preemptive Takeover Bidding." Unpublished paper, Northwestern University.

Hite, Galien L., and James E. Owens (1983). "Security Price Reactions Around Corporate Spin-off Announcements." Journal of Financial Economics, Vol. 12.

Khanna, Naveen (1985). "Optimal Bidding for Tender Offers." Unpublished paper, The University of Michigan.

Roth, Alvin E. (1979). "Axiomatic Models of Bargaining." Lecture Notes in Economics and Mathematical Systems No. 170, Springer-Verlag.

Rubenstein, A., 1982. "Perfect Equilibrium in a Bargaining Model." Econometrica, Vol. 50, No. 1.

Shleifer, Andrei and Robert Vishny (1986). "Greenmail, White Knights and Shareholder's Interests." The Rand Journal of Economics, Vol. 17, No. 3, Autumn.