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Special Feature

Information Revelation via Takeovers in Correlated Environments

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This paper studies the informational content of takeover bids in correlated environments and provides an explanation for the empirical result that industry rivals of takeover targets exhibit positive share-price reactions on the announcement of a bid. © **1997 by John Wiley & Sons Ltd.**

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INTRODUCTION

Corporate takeovers are a controversial subject. On one side of the issue stand those who view the transfer of corporate control as a mechanism by which the market system replaces inefficient management and allows assets to be more effectively deployed. Proponents of this view strongly favor unfettered takeover activity. They argue that an environment of low-cost corporate takeovers is needed to facilitate the efficient use of resources. Critics of takeovers question whether battles for corporate control produce net gains to society. They argue that any gains to a given party are simply redistributions resulting from losses to someone else. Since the gains to society are illusory and the costs are real, they argue, takover activity should be restricted. The sharp conflict in theories about the sources of takeover gains and the accompanying opposing views on the appropriate policy response have inspired considerable quantitative research. This research has revealed several empirical regularities. In this paper I tackle a stylized fact which is difficult to explain within existing takeover theories: Share prices of rivals to a takeover target increase significantly upon announcement of the bid. Abnormal returns do not appear to follow the pattern predicted by the market power hypothesis.

Early papers providing documentation of this industry wealth effect are Eckbo (1983) and Eckbo and Wier (1985). These papers test the market power hypothesis by examining the share price reactions of takeover targets and their industry rivals to horizontal merger announcements and subsequent antitrust challenges by the government. The authors recognize that exercise of market power benefits rival firms. So the announcement of a takeover bid should have a positive impact on the stock prices of rival firms while an antitrust challenge should have a negative impact. The authors find that the market prices of rival firms's shares increase at the time of the announcement of the bid. However, they find no decrease in the stock-prices following an antitrust challenge. In a related study Eckbo (1985) examines the relation between extent of abnormal returns to the rivals and change in industry concentration induced by a horizontal merger. He hypothesizes that if the takeover gains are attributable to the exercise of

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market power, then rivals of horizontal mergers should experience positive abnormal returns at the announcement of the bid and the extent of this abnormal returns should be positively correlated with the change in concentration. He finds positive abnormal returns to rivals but no support for a relationship between this industry wealth effect and the change in concentration.

Other papers providing evidence on industry effects are Chatterjee (1986, 1992) and Chevalier (1995). Chatterjee (1986) examines different types of acquisitions in order to discriminate among various takeover theories. He finds that the industry wealth effect reported by Eckbo (1983, 1985) and Eckbo and Wier (1985) for the case of horizontal mergers is also present in his sample of unrelated acquisitions. In a later paper, Chatterjee (1992) examines a sample of unsuccessful takeover bids. His primary interest is to discriminate between restructuring and synergy as two possible sources for takeover gains. He hypothesizes that if synergy is the main source of value in a takeover then rivals should suffer a reduction in market price at the announcement date. If the tender offer is subsequently rejected, rivals should gain back this depreciation in value. Chatterjee finds positive abnormal gains for rivals at the announcement date which persist in the postrejection period and rejects the synergy thesis. Chevalier (1995) tries to establish an empirical linkage between debt and product market competition by examining the share-price responses of rivals to the announcement of a supermarket chain's leveraged buyout (LBO) and the entry, exit and expansion behavior of supermarket chains following a LBO.[1] She finds that an LBO announcement increases the market value of the LBO chain's rivals and that supermarket chains were more likely to enter and expand in markets dominated by firms that undertook LBOs.

The reported findings on industry wealth effects have been taken as evidence for and against various hypotheses regarding the source of takeover gains. Eckbo (1983), for example, interprets his result as evidence for an efficiency-enhancing version of takeovers. He argues that 'the proposal announcement may disseminate information which enables the rivals to imitate the technological innovation motivating the acquisition' (p. 244). Jensen and Ruback (1983) interpret the same result as evidence against another efficient explanation of takeovers. They write: 'Eckbo's results ... are inconsistent with the target inefficiency hypothesis. His evidence indicates that the gains are more general, extending to rivals in the industry as well as to the specific target firm, and removal of inefficient target management is unlikely to be an industry-wide phenomenon' (p. 25).

In an attempt to add a further piece to the puzzle of possible causes and consequences of takeovers I show in this paper that the tendency of share prices of close competitors to rise with the appearance of a bid for the target is explainable as a normal share price reaction when shareholders are not sure whether the bidder has inside information about the value of the target or not—a share price reaction which is independent of the main source of value in the considered transaction: A bidder who has inside information about the target firm's environment is more likely to make an offer if the firm's 'intrinsic' value is high rather than low. This implies that a takeover-bid communicates favourable information about the target firm's environment. However, since environments of different firms in an industry are correlated an informed bid for one firm reveals good news as well for other firms operating in the same branch.[2]

THE MODEL

I consider a simple model of an industry consisting of two firms labelled *A* and *B*. Each firm's standalone value (v^i) depends on the realization of a random variable ($\theta^i \in \Theta^i$) according to the known relationship

$$v^i = f^i(\theta^i) \qquad \forall i \in \{A, B\} \tag{1}$$

Each random variable θ^i has only two possible realizations: $\Theta^i = \{\theta^i_1, \theta^i_2\}$ for $i = A, B$, where $\theta^i_1 < \theta^i_2$. The higher realization implies a higher present discounted value of expected future profits and is therefore referred to as the 'favourable firm environment':

$$f^i(\theta^i_2) > f^i(\theta^i_1) \qquad \forall i \in \{A, B\} \tag{2}$$

The environmental variables θ^A and θ^B are drawn from a joint distribution $g(\cdot)$ on $\Theta^A \times \Theta^B$. This distribution exhibits positive but imperfect correlation. That is, defining $q^i_k \equiv \text{prob}(\theta^j_1 | \theta^i_k)$ for $i, j = A, B$, $i \neq j$ and $k = 1, 2$, it is assumed that

$$1 > q^i_1 > q^i_2 > 0 \qquad \forall i \in \{A, B\} \tag{3}$$

Each firm's owners, i.e. the (risk-neutral) shareholders, know the distribution $g(\cdot)$, but not the actual

realization of their firm's θ^i. A potential acquirer, the raider, investigates one of the firms. I denote the investigated firm by T (for target) and the second firm by R (for rival), where $T, R \in \{A, B\}$ and $T \neq R$. In the course of his investigation the raider discovers an improvement net of transaction costs, s. The variable s is privately observed by the raider and is drawn from an independent cumulative distribution $H(\cdot)$, with strictly positive density $h(\cdot)$, on $[\underline{s}, \bar{s}] \subset \mathbb{R}$, where $\underline{s} < 0$ and $\bar{s} > 0$. That is, the value of the target firm under the raider's control is assumed to be given by:

$$\hat{v}^T = f^T(\theta^T) + s \qquad \forall \theta^T \in \Theta^T \tag{4}$$

The raider may also learn θ^T. If he does, I call the scenario the 'informed raider case'. If he does not, I shall refer to it as the 'uninformed raider case'. On the basis of the information acquired in the course of his investigation, the raider decides whether or not to make a bid. To abstract from Grossman and Hart's (1980) free-rider problem, I assume that the raider can get the firm in the bid at a price which equals the expected value of the target in the absence of a takeover, as assessed by shareholders given the bid. In an unconditional-offer scenario this amounts to assuming that the successful raider is able to dilute the post-takeover value of not tendered shares by a rather large amount.

RESULTS

A first question of interest is, which characteristics make a firm especially vulnerable to a takeover? Proposition 1 deals with this:

Proposition 1. In the uninformed raider case the probability of takeover is unaffected by the actual realization of θ^T. It depends, however, on θ^T in the informed raider case. In this case a firm in the favourable environment has a greater probability of being taken over than a firm in the unfavourable environment. That is, if $\text{prob}(t|\theta^T)$ denotes the probability that the target is taken over given θ^T, then $\text{prob}(t|\theta_2^T) > \text{prob}(t|\theta_1^T)$.

The selection bias in the bidding behavior of the informed raider recorded in Proposition 1 was first discovered by Grossman and Hart (1981) and is easily explained.[3] Since there is no device to price-discriminate between different types of raiders, the acquisition price is the same for $\theta^T = \theta_2^T$ and for $\theta^T = \theta_1^T$. However, the post-takeover value of the target is higher in the former than in the latter case. It follows that the raider's payoff from making a bid is nonnegative for a wider range of improvements if $\theta^T = \theta_2^T$ than if $\theta^T = \theta_1^T$. Hence, firms with a higher 'intrinsic value' (higher expected future profits) are more likely to be taken over. Given the positive correlation in environments (caused, for example, by the fact that the firms operate in the same market or own similar types of assets) this selection bias has consequences for the value of the rival firm as assessed by investors:

Proposition 2. A takeover-bid by an informed raider raises the market price of shares in the target's rival. A takeover bid by an uninformed raider leaves the market valuation of the target's rival unaffected.

The intuition for this result is easily provided. From Proposition 1 we know that the informed raider is more likely to make an offer if the target operates in the favourable rather than in the unfavourable environment. This is equivalent to the statement that the target is more likely to be in the favourable environment if a takeover bid occurs rather than if no such bid occurs. Since environments are positively correlated, the same is true for the rival firm. Hence, the fact that an informed bid takes place for the target firm reveals positive information for the rival firm. As a result, the share price of the rival firm is revalued upwards. The bidding behavior of an uninformed raider, on the other hand, exhibits no selection bias in respect to θ^T and therefore induces no revaluation effect. It is interesting to note that the value-revision effect of Proposition 2 is present not only in the (deterministic) informed raider case but also if investors have nondegenerate expectations regarding the relevance of our two polar cases:

Implication 1. Suppose that the event that the raider has inside information about the target firm's environment has strictly positive probability from the shareholders' perspective. Then a takeover bid for one firm raises the market price of shares of the second.

CONCLUSIONS

In this paper I have shown that a value revision in share prices of industry rivals on the date of the

announcement of a bid for the target is a normal price reaction in a situation of positively correlated environments and uncertainty about the informational status of the bidder—a reaction which is independent of the main source of takeover gains in the considered transaction: If there is asymmetric information about both, the extent of the improvement implemented by the bidder and the standalone value of the target firm, then the probability that the random improvement is large enough to make the bid profitable increases with the standalone value of the target (Proposition 1). Given this, if the standalone values of firms in an industry are correlated, then the good news for the target implies good news for the rivals and rival stock-prices will increase (Proposition 2).[4] I have derived my value-revision result from a particularly simple takeover model. However, since the selection bias recorded in Proposition 1 is a necessary feature of equilibrium behavior in any bidding game with the assumed asymmetry in information and not a specificum of the analyzed game form (cf Banks, 1990) and since the rest of the argument relies solely on the assumption that profits of firms are positively correlated within an industry, my result is quite robust with respect to changes in model description.

Notice that my explanation for the valuation effects for industry rivals is also compatible with other empirical findings mentioned in the introduction. Eckbo (1983) and Eckbo and Wier (1985), for example, report that merger challenges by antitrust enforcement agencies have no effects on rival firms. This is what one would expect if my explanation is valid: If, for example, the original takeover bid conveyed favourable information about the demand for the industry product (or about the value of assets typically owned by firms in the sector) then no new information concerning demand (or asset value) is revealed by an antitrust complaint. Eckbo's (1985) finding that there is no relationship between extent of industry wealth effects and change in concentration is obviously also consistent with my model just as Chatterjee's (1986) result that related non-horizontal and unrelated mergers produce similar industry wealth effects as horizontal ones and his observation (1992) that abnormal gains for rivals persist in the post-rejection period. And the fact (reported by Chevalier, 1995) that firms were more likely to enter and expand in markets where at least one company has previously got a takeover offer is also compatible with my explanation if the information conveyed by the bid reflects favourable market conditions (e.g. high and stable demand).

My explanation for the valuation effects for industry rivals suggests two potentially testable implications. First, since earnings prospects are more likely to be closely related among firms which have a large percentage of their revenues in the same line of business such firms should exhibit larger excess returns than firms with a lower percentage of revenues in the same line of business. Second, there is some evidence that small corporations are more reluctant to make earnings-relevant information accessible to investors than large ones. A takeover offer for a target of a given size (measured by asset value) should therefore induce smaller relative wealth gains for large rivals than for small ones. Similarly, the valuation effect for rivals of a given size should be larger, the smaller the target firm.

Finally, my analysis provides some clue to the debate about the source of takeover gains. My analysis indicates that, on average, at least a part of the takeover gain is attributable to the fact that the bidder has inside information indicating that the target is undervalued on the stock market relative to its true standalone value. Notice that the undervaluation motive need not to be the most important motive in any concrete transaction. To generate industry wealth effects it suffices that some bids are profitable at least in part because the bidder has an informational advantage over outside investors.

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NOTES

1. Chevalier reports that the vast majority of the LBOs covered by her study were undertaken in response to unwanted takeover attempts.
2. Since firms operating in the same industry are likely to use similar inputs and to compete in the same output market my assumption of positively correlated earnings prospects or 'environments' seems plausible. Evidence which supports this assumption is provided by Firth (1976), Foster (1981) and Clinch and Sinclair (1986). These papers investigate the effect of one firm's earnings release on the share prices of industry rivals and find that rival firms experience significant abnormal returns at the earning announcement date. The abnormal returns are 'directional', that is, a release that results in a positive (negative) change in the announcing firm's share price is associated with a positive (negative) change in the share price of rival firms.

3. The formal proofs of Propositions 1 and 2 are in the Appendix.
4. Notice that the wealth gains for industry rivals in my model are not caused by a revision in investors' expectations about rival firms' prospects for takeovers but rather by a revision in their beliefs about rivals' earnings prospects.

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Appendix

Proof of Proposition 1: In the uninformed raider case all players are symmetrically informed on the target's current worth. Since the acquisition price is (by assumption) equal to this worth, the raider will make a bid if and only if $s \geqslant 0$. Thus, in this case, the probability of takeover is independent of the actual realization of θ^T and given by $1 - H(0)$. In the informed raider case the acquisition price p^* is given by $p^* = \min p$ so that $p = E[f^T(\theta^T) | f^T(\theta^T) + s - p \geqslant 0]$, where the conditional expectation is taken with respect to the priors $g(\cdot)$ and $h(\cdot)$.[1] The raider will make a bid if and only if $f^T(\theta^T) + s - p^* \geqslant 0$. Define $\hat{s}(\theta_k^T, p^*)$ as that level of s for which this profitability condition is met with equality, given p^* and θ^T. Take the convention that $\hat{s}(\theta_k^T, p^*) = \bar{s}$ if $p^* - f^T(\theta_k^T) \geqslant \bar{s}$ and $\hat{s}(\theta_k^T, p^*) = \underline{s}$ if $p^* - f^T(\theta_k^T) \leqslant \underline{s}$. Obviously, the lower $\hat{s}(\theta_k^T, p^*)$, the greater the probability of takeover. Since $f^T(\theta_2^T) > f^T(\theta_1^T)$, it follows that $\hat{s}(\theta_1^T, p^*) \geqslant \hat{s}(\theta_2^T, p^*)$ for each p^*. The inequality is strict if $\bar{s} > \hat{s}(\theta_2^T, p^*)$ and $\hat{s}(\theta_1^T, p^*) > \underline{s}$. As $p^* \leqslant f^T(\theta_2^T)$ and $\bar{s} > 0$, the first of these requirements is fulfilled. That the second restriction is also met follows from $p^* \geq E_\theta[f^T(\theta^T)]$, $f^T(\theta_2^T) > f^T(\theta_1^T)$ and $\underline{s} < 0$. ■

Proof of Proposition 2: The statement for the uninformed raider case follows immediately from Proposition 1. Here I concentrate on the informed raider case. Let t stand for the event 'a takeover bid occurs for the target' and n for the event 'no takeover bid occurs for the target'. From Proposition 1 we know that: $\text{prob}(t|\theta_2^T) \equiv a > b \equiv \text{prob}(t|\theta_1^T)$. Now I show that this inequality in conjunction with Assumption 3 implies: $\text{prob}(\theta_2^R|t) > \text{prob}(\theta_2^R|n)$. The statement then follows from this and the fact that the value of the rival firm is higher if $\theta^R = \theta_2^R$ than if $\theta^R = \theta_1^R$.

Put $m_{kl} \equiv$ common probability that $(\theta^T, \theta^R) = (\theta_k^T, \theta_l^R)$; that is, $m_{kl} = g(\theta_k, \theta_l)$ if $T = A$ and $m_{kl} = g(\theta_l, \theta_k)$ if $T = B$. By Assumption 3 we have: $1 > m_{11}m_{22} > m_{12}m_{21} \geqslant 0$, so that $am_{11}m_{22} + bm_{12}m_{21} > am_{12}m_{21} + bm_{11}m_{22}$. This is equivalent to $[am_{11}m_{22} + bm_{12}m_{21} - abm_{12}m_{21} - abm_{11}m_{22} > am_{12}m_{21} + bm_{11}m_{22} - abm_{12}m_{21} - abm_{11}m_{22}] \Leftrightarrow [a(1-b)m_{11}m_{22} + (1-a)bm_{12}m_{21} + a(1-a) \times m_{21}m_{22} + b(1-b)m_{11}m_{22} > (1-a)bm_{11}m_{22} + a(1-b)m_{12}m_{21} + a(1-a)m_{21}m_{22} + b(1-b) \times m_{11}m_{12}] \Leftrightarrow [(bm_{12} + am_{22})/(bm_{11} + am_{21}) > ((1-b)m_{12} + (1-a)m_{22})/((1-b)m_{11} + (1-a)m_{21})] \Leftrightarrow [(bm_{12} + am_{22})/(b(m_{11} + m_{12}) + a(m_{21} + m_{22})) > ((1-b)m_{12} + (1-a)m_{22})/((1-b)(m_{11} + m_{12}) + (1-a)(m_{21} + m_{22})]$. Thus, $\text{prob}(\theta_1^T, \theta_2^R|t) + \text{prob}(\theta_2^T, \theta_2^R|t) > \text{prob}(\theta_1^T, \theta_2^R|n) + \text{prob}(\theta_2^T, \theta_2^R|n)$, or $\text{prob}(\theta_2^R|t) > \text{prob}(\theta_2^R|n)$. ■

NOTE

1. That such a price exists follows from the intermediate value theorem of calculus. To see this, first note that $E^c \equiv E[\, f^T(\theta^T) | \, f^T(\theta^T) + s - p \geqslant 0]$ is a continuous function of $p \in (-\infty, f(\theta_2^T) + \bar{s}]$. For $p \leqslant f^T(\theta_1^T) + \underline{s}$ we have $E^c = E[\, f^T(\theta^T)] > p$, where the unconditional expectation is taken with respect to the prior $g(\cdot)$, and for $p = f^T(\theta_2^T) + \bar{s}$ we have $E^c = f^T(\theta_2^T) < p$.

