

Bidding Wars Over R&D Intensive Firms: Knowledge, opportunism and the market for corporate control*

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Abstract

The knowledge-based theory of the firm (KBTF) suggests that the scope and existence of firms can be explained independent of opportunism, the driving force behind transaction cost economics (TCE). Moreover, this theory suggests that, as knowledge intensity increases, organizational boundary decisions are increasingly driven by knowledge management concerns, rather than by opportunism. Therefore, as R&D-intensity increases, the KBTF should gain explanatory power over TCE. However, this study finds that problems of opportunism increase with R&D intensity. Specifically, as R&D intensity increased, managers actively discouraged bidding wars (e.g., by granting lockup agreements), contrary to shareholder interests. Managers may even be able to buy the firm themselves at a discount since rivals are unlikely to emerge. Indeed, TCE seems to gain explanatory power as knowledge intensity grows.

Key Words: Knowledge; Opportunism; Competitive Advantage; Mergers & Acquisitions

The knowledge-based theory of the firm (“KBTF”) suggests analyzing knowledge management dilemmas apart from opportunism in identifying a firm’s optimal scope and boundaries. Indeed, this is what differentiates the KBTF from transaction cost economics (Connor & Prahalad, 1996; Kogut & Zander, 1992). However, I argue for an approach that melds knowledge management dilemmas with concerns about opportunism – the risk of opportunism increases along with knowledge intensity and cannot be analyzed separately.

Bidding wars are dramatic public contests over a firm’s scope and boundaries and are thus an appropriate context within which to study this question. Although rare, bidding wars represent key events for which management and shareholder interests differ. While bidding wars produce high premia for shareholders (Haunschild, 1994; Hayward & Hambrick, 1997), they cause great uncertainty for managers who want to retain control. Opportunistic managers might discourage bidding wars by granting favored status to a preferred buyer (including themselves), thereby eliminating competitive bidding that would assure shareholders a high premium.

Target managers may signal their wish to avoid a bidding war by granting a lockup agreement to their preferred buyer. This tells potential rival bidders that their bid would be unwelcome while helping the favored bidder should a bidding war occur. For example, Wachovia managers granted a large lockup agreement to stop rival bidders from breaking up their friendly merger with First Union. The merger allowed Wachovia managers to take the helm of a much larger company, but granted shareholders a paltry 6% premium. Ignoring the signal, Suntrust issued a competing bid and sued Wachovia to drop the lockup agreement. They argued that Wachovia managers acted against the interests of shareholders by thwarting rival bids (Mollenkamp, 2001).

Here, I argue that lockup agreements may be used more frequently by R&D-intensive targets since the signal is likely to be more effective at keeping potential bidders at bay. Managers in

knowledge-intensive firms may be especially able to deter unwanted bidders since buyers require their cooperation to understand, evaluate, and integrate the target (Coff, 1999). As such, lockups may go unchallenged because legal action is unlikely to secure target cooperation – making such transactions far less newsworthy than the Wachovia example above.

If opportunistic behavior increases with R&D intensity, it may suggest that the KBTF does not gain explanatory power over TCE as knowledge intensity increases. The following sections examine theoretically and empirically how knowledge affects dynamics in the market for corporate control with respect to bidding wars, lockup agreements and management buyouts.

KNOWLEDGE AND THE MARKET FOR CORPORATE CONTROL

Alternative Theories of the Firm

Connor and Prahalad (1996) identify the KBTF as a complement to traditional “opportunism-based” theories (e.g., transaction cost economics and agency theory) in explaining the existence and scope of firms. As such, the core question is whether activities should be integrated or externalized (e.g., outsourced or cooperative joint ventures). Transaction cost economics (“TCE”) suggests that these decisions depend on efforts to minimize costs associated with opportunism (Williamson, 1985). For example, firms may vertically integrate in response to concerns that independent suppliers will hold them up (raise their price) if transaction-specific investments prevent the buyer from changing to another supplier (Klein, Crawford & Alchian, 1978). Similarly, agency theory predicts governance structures at the top echelons of firms based on the risk of managerial shirking (Jensen & Meckling, 1976).

In contrast, the knowledge-based theory of the firm was intended to shift the focus away from opportunism in explaining the existence and scope of firms (Connor & Prahalad, 1996; Foss, 1996; Kogut & Zander, 1992). Proponents assert that difficulties in the coordination and transfer

of knowledge add considerable explanatory power independent of opportunism. Connor and Prahalad (1996: 490) wrote, “We hold the probability of opportunistic behavior constant (at zero), in order to examine the opportunism-independent, knowledge-based influences of organizational mode more closely.” Thus, an underlying assumption of the KBTF is that the problems associated with opportunism can and should be examined in isolation from other knowledge management dilemmas.

The KBTF has its roots in information asymmetries outlined in the broader knowledge literature – especially those occurring across firm boundaries.¹ The knowledge literature begins with asymmetries at the individual level in the form of tacit knowledge cannot be conveyed to others (Polanyi, 1966). These asymmetries must be bridged in order to make productive use of the knowledge. Such transfers take place more efficiently when the activity is internalized because a shared culture and language helps firms transfer and combine knowledge to develop organizational capabilities (Kogut & Zander, 1992; Nonaka, 1994). Therefore, knowledge-based information asymmetries are believed to be most serious when managing across firm boundaries such as in the case of cooperative ventures where a common language and cognition are absent (Cohen & Levinthal, 1990; Simonin, 1999). Indeed, knowledge is held to be a major source of sustainable advantage since it is hard for rival firms to imitate or acquire (Grant, 1996).

Knowledge Intensity and Explanatory Power of the Theories of the Firm

The KBTF, then, should gain explanatory power (e.g., relative to TCE) as a firm’s knowledge intensity increases since knowledge is the central element of the KBTF. Put differently, as

¹I use the term “information asymmetry,” as it is used in the finance literature where it can refer to asymmetries of either tacit or explicit knowledge. While tacit knowledge may be of more interest here, the link allows us to draw on a vast body of financial economics literature addressing how information asymmetries affect markets.

knowledge intensity increases, boundary decisions should be driven increasingly by the need for a common culture and language to ease knowledge management costs (Kogut & Zander, 1992).

Here, knowledge intensity refers to the extent that knowledge is a key factor of production. For example, firms have been identified as knowledge-intensive if they draw on a heavily educated workforce (Coff, 1999) or invest heavily in research and development (Cohen & Levinthal, 1990). While all firms draw on knowledge as an input, knowledge is a factor of production that varies across firms much like capital or labor intensity.

This study focuses on complex or tacit knowledge associated with R&D intensity. R&D is a process by which firms transform tacit and complex knowledge into codified outputs like patents or products. While the value of past R&D outputs is known and reflected in a firm's stock price, future outputs depend on knowledge that is still tacit and/or complex. The KBTF, then, would lead us to predict that as R&D intensity increases, knowledge takes on an increasingly important role in determining the scope and boundaries of the firm – independent of opportunism.

However, there is reason to believe that the risk of opportunism increases with knowledge intensity. Indeed, information asymmetries are at the core of the agency theory literature as well as the knowledge literature. For example, it is widely recognized that managers (agents) may exploit their private knowledge to act against the interests of shareholders (principals) who have a limited ability to monitor their actions (Jensen & Meckling, 1976).

Accordingly, I argue that, as R&D intensity increases, both the knowledge management dilemmas and the threat of opportunism rise in concert since information asymmetries central to the knowledge literature enable opportunistic behavior. Thus, dilemmas of knowledge management and opportunism must be addressed together rather than through separate and independent theoretical analyses.

Profiting from Information Asymmetries in the Market for Corporate Control

Common agency-theoretic remedies to the risk of opportunism include offering agents performance-based incentives or monitoring their actions (Jensen & Meckling, 1976). However, severe information asymmetries, such as those explored in the knowledge literature, impede both remedies (Ouchi, 1980). Here, the market for corporate control has been offered as a mechanism to stem managerial opportunism with the threat of a hostile takeover (Jensen & Ruback, 1983).

The setting of corporate acquisitions is especially appropriate for this inquiry since such transactions define the firm's scope and boundaries – the central research question for a theory of the firm. This study explores the extent to which knowledge intensity increases the role of opportunism in such boundary decisions.

In the context of corporate acquisitions, knowledge produces information asymmetries about the target's value since tangible assets are easier to assess than knowledge (Coff, 1999). While some information asymmetries are always present, such imbalances are greater when knowledge is the primary asset. Thus, for R&D-intensive firms, future performance may depend more on the success of current research efforts than on its current product portfolio. Target managers, then, are well-positioned to know more about the firm's value than potential buyers.

There are many ways that managers might exploit such information asymmetries. However, with respect to the market for corporate control, managers might take advantage in two primary ways. First, they might use their information advantage to sell the firm to a preferred or favored buyer. Second, they could initiate a management buyout to realize gains that are not reflected in the market's valuation of the firm. These are examined further below.

Profiting by favoring preferred bidders. While target shareholders welcome high purchase prices resulting from bidding wars, managers may fear the associated loss of control. In a bidding

war, the highest bidder may not be the one that target managers prefer. Indeed, many value creation opportunities arise from changes the buyer would implement – including firing managers. This may create a conflict of interest between target managers and shareholders as managers favor the buyer who would grant them the most autonomy over the highest bidder.

Therefore, in maximizing their own utility over that of shareholders, target managers may actively discourage bidding wars by forming a “sweetheart deal” with a preferred buyer that puts rival bidders at a disadvantage.² A lockup agreement, one such provision, grants a preferred bidder benefits should a rival emerge. They most often take the form of stock options granted at a favorable price. This affords the preferred bidder an advantage by effectively granting a toehold at a discount (Berkovitch & Khanna, 1990; Kahan & Klausner, 1996). While the favored bidder may have to pay a large premium for the remaining shares, the rival bidder would have to pay a large premium on all shares (including options granted to the favored bidder).

Many argue that lockup agreements allow targets to favor a particular bidder often in return for side payments or benefits that are not otherwise in the interests of shareholders (Coates & Subramanian, 2000; Kahan & Klausner, 1996). Indeed, the courts have, at times, put limits on the use of lockup agreements based on this belief – the most famous case being the invalidation of a lockup agreement that Paramount granted Viacom to impede QVC from bidding. At the time, a *Wall Street Journal* article noted “the death of lockup [lockup agreements] could be good news for shareholders [because target managers] could have a tougher time arranging transactions that benefit themselves at the expense of shareholders” (Stiemetz, 1994). While

²An alternative view, stewardship theory (Davis, Schoorman, & Donaldson, 1997), allows for managerial judgment in balancing the needs of all stakeholders. However, this would suggest that managers get an array of bids and choose the one that jointly maximizes the welfare of all stakeholders. Actively discouraging potential bidders from making offers is inconsistent with this view since the best offer may not be allowed to surface.

subsequent court decisions have allowed some lockup agreements, they remain suspect and may be subject to challenge in court by a determined rival bidder (as in the Wachovia example).

Lockup agreements may be considered as signals of a target manager's intention to oppose any rival bidders that might emerge (Kahan & Klausner, 1996). Thus, lockup agreements may be consistent with the use of signals described in game-theoretic models. Spence (1973) first introduced the concept formally using education as a credible signal of quality in imperfect labor markets. Others have used the concept of overt and costly actions as signals of credible commitment in a variety of contexts ranging from public policy to managerial behavior (Certo, Covin, Daily & Dalton, 2001; Kaestner, 1998; Leland & Pyle, 1976; North, 1999).

As the Wachovia example illustrates, firms that are not R&D-intensive may also use lockup agreements to signal their opposition to rival bidders. However, the frequency of using the signal should be associated with the target's actual ability to follow through on their threat and deter rival bidders. The strength of the signal depends on how much target managers' cooperation matters to a potential rival bidder. Suntrust chose to ignore Wachovia's signal by forging ahead with a bid and a court challenge, suggesting that the signal was not entirely effective.

However, the information asymmetries previously associated with R&D intensity may provide managers with potent tools to deter bidding wars since bidders require their cooperation. At the extreme, managers may threaten that they and the rest of the firm's core assets will quit rather than be acquired. This can be a very effective "scorched earth" defense – a hostile bidder is unlikely to realize value if the primary assets cannot be transferred. As such, the signal that management will not cooperate with other bidders may carry more weight and may be more effective at deterring rival bidders. Accordingly, it might be expected that lockup agreements will be used as a signal when they are most effective. Here, I hypothesize that managers in R&D-

intensive targets may especially see value in granting lockup agreements due to their effectiveness in deterring potential rival bidders.

Hypothesis 1: The likelihood that targets will grant lockup agreements increases with target R&D intensity.

As stated, lockup agreements may be seen as overt signals designed to discourage potential bidders from entering the contest. If hypothesis 1 is supported, it establishes an active role for target managers in discouraging bidding wars as R&D intensity increases. However, lockup agreements may not be the only means by which managers in R&D-intensive targets can thwart rival bidders. If target managers have not granted a lockup agreement, and a potential rival bidder makes an informal inquiry, they may still be able to discourage the rival from issuing a formal offer. When a potential buyer feels that target managers would not welcome a competing bid, this rival may withdraw rather than pressing forward under adverse circumstances. Buyers typically depend on target managers for information in assembling an offer and conducting due diligence. The failure to secure target cooperation may especially impede bidding wars over R&D-intensive firms since buyers then face severe information asymmetries. Indeed, this is a basic reason that the market for corporate control may be less efficient for knowledge-intensive firms.

Accordingly, while lockup agreements signal target managers' intentions, they only represent the tip of the iceberg in terms of their ability to prevent bidding wars. Indeed, it may be that most attempts to discourage bidding wars are not nearly as apparent as lockup agreements. Hence, as a target's R&D intensity increases, it may simply be less likely to be the subject of a bidding war.

Hypothesis 2: The likelihood of bidding wars decreases as target R&D intensity increases.

Profiting through management buyouts. Management buyouts may represent an opportunity for managers to pay a small premium for the firm and realize large gains that were

not apparent to the market. H. Ross Johnson is famous for initiating a management buyout of RJR Nabisco when he felt that the firm would be worth more if “busted up.” Rather than creating value for shareholders by breaking up the company, he sought to capture the value personally by buying the firm and realizing the restructuring gains as the new owner. This motivation appears to underlie many management buyouts. Perry and Williams (1994) found that managers manipulate accounting assumptions in the year before a buyout to reduce reported earnings. This depresses the stock price and allows them to buy the firm at a discount.

The traditional agency theoretic view suggests that competition in the market for corporate control should help to keep such opportunistic managers in check (Jensen & Ruback, 1983). In fact, Peck (1996) found that when a management buyout is announced, professional investors often become major blockholders of the target. They then act as “brokers” to assure that managers pay the appropriate price or that rival bidders are sought. This may effectively put the target firm into an auction setting, which assures that shareholders receive a high bid premium.

As Peck’s (1996) results suggest, when managers try to buy their firm, investors and raiders may see it as a signal that the firm is undervalued. In fact, this type of competition ultimately assured that RJR Nabisco’s shareholders received a high premium for their shares when KKR entered the contest. Bidding wars may lead to extraordinarily high premia for target shareholders if the winners’ curse phenomenon is present (Thaler, 1992).³ In this way, bidding wars prevent target managers from exploiting information asymmetries to the detriment of shareholders.

While management buyouts may signal to the market that the firm is undervalued, the signal should be more meaningful when there is reason to believe that managers have critical private knowledge. In other words, this signal should be much more attractive to potential bidders when

³This happens when bidders base offers on estimates of the target’s value. If all estimates are unbiased, the winning bid may be based on an overly optimistic estimate. Hence, the winner is cursed by overbidding.

it emanates from knowledge-intensive firms plagued by asymmetric information. Thus, a management buyout in an R&D-intensive firm might especially draw in other bidders since the signal would carry more information. This implies a positive interaction between management buyouts and R&D intensity when predicting bidding wars.

Hypothesis 3: Management buyouts are positively associated with bidding wars as target R&D intensity increases.

DATA AND METHODS

The sample for this study was drawn from Securities Data Corporation's (SDC) mergers & acquisitions database, which contains all publicly announced transactions totaling over \$1 million. The database provides descriptive data for the buyer and the target, along with basic transaction parameters. I selected all attempted acquisitions in the years 1980-1999 for which the target's R&D expenditures and control variables were available (1,856 observations).

Dependent Variables

Lockup agreements. Hypothesis 1 predicts the existence of a lockup agreement favoring one bidder over others. SDC provided an indicator variable of any lockup agreement. Here, agreements stipulating both lockup options and lump-sum payments were coded as lockup agreements while other cases were recorded as zero. Either may discourage bidding wars by granting an advantage to a favored bidder.

Bidding wars. Hypotheses 2 and 3 predict the likelihood of bidding wars. This variable was defined similarly to prior measures of rival bidders (Haunschild, 1994; Hayward & Hambrick, 1997) – transactions in which more than one party issued a formal bid. This dummy variable was coded based on the following four steps. First, SDC coded whether a rival was present. Second, the database was indexed by target and coded as a bidding war when rivals were found. Third, all

management buyouts were researched in archives of 6000 newspapers (using Dow Jones Interactive news retrieval service) to identify rival bidders. Finally, a random sample of 150 cases was selected and researched in news archives to see if any were miscoded. No incorrectly coded observations of bidding wars were found, suggesting that the data were accurate.

Note that this does not capture informal expressions of interest or bids that were withdrawn before any public announcement was made. These situations do not represent actual bidding wars since the rival bidder withdrew early on.

Independent Variables

Management buyouts. Hypothesis 3 predicts variation in how potential bidders might respond to an announcement of a management buyout (MBO). SDC reported directly whether managers participated in the transaction. There were additional cases in which buyers were listed as “private investors.” In both situations, news archives were searched (as described above) to identify the extent and nature of management participation. Transactions were coded as MBOs if news accounts confirmed that: 1) management’s bid was not a defensive response to another bid, and 2) management would gain control of the firm if their bid succeeded.

The first criteria ruled out settings in which target managers bid against a hostile buyer in order to retain control of the firm. Clearly, these are not opportunistic MBOs that attracted rival bidders; rather, the rival bidder made the first move and there is no conflict with shareholder interests. The second criterion rules out situations in which managers are offered a small ownership stake as an incentive to stay. Here, management’s participation also would not reflect an opportunistic MBO.

Target R&D intensity. R&D intensity (R&D expenditures/sales) has been used in many studies over the years (Baysinger & Hoskisson, 1989; Etilie, 1998). Of particular interest is its

use as an indicator of knowledge intensity (Cohen & Levinthal, 1990). R&D in progress is an important source of information asymmetries when evaluating a firm's prospects. Past R&D efforts that are codified in patents and products are fully reflected in the firm's stock price. However, the bid premium depends on advances that are still in their early stages – about which investors are uninformed. While this does not capture all forms of knowledge intensity, it is a well-accepted measure that is useful for this inquiry. R&D intensity was available for 2313 transactions from Compustat.

Control variables. Control variables were used to account for a variety of contextual factors reflecting target attributes, transaction attributes, and the timing of the deal. There were ten controls used: 1) whether the buyer owned a toehold, 2) whether the transaction involved a raider, 3) whether the transaction was a tender offer, 4) the target's assets, 5) the target's sales growth, 6) the target's EBITDA, 7) the target's market performance, 8) the target's inside ownership, 9) the target's portion of inside directors, and 10) the target CEO's incentive intensity. All but the last four were provided in the SDC database.

Toeholds refer to the buyer's initial stake in the target (% owned). If the buyer already owns a stake, other bidders would be at a disadvantage since they would have to purchase more stock at a high premium. This might prevent rival bidders from emerging to challenge the initial bidder.

SDC coded transactions as “unfriendly” when targets openly resisted. Buyers who conducted unfriendly transactions were coded as raiders (dummy variable) to reflect their past behavior in other transactions. Management buyouts might attract raiders if there were agency problems.

Tender offers (dummy variable) are public appeals to shareholders. Since the SEC dictates that such offers be open for specified periods, the transaction is public knowledge before completion. Therefore, potentially competing bidders have plenty of time to digest the

information and develop their own bids to enter the contest, and bidding wars are more likely to result from tender offers.

The target's assets (\$millions) might also determine whether rival bidders are attracted. A large target would tend to be a more complex transaction where information is more likely to become public before all of the kinks are worked out. This might allow rival bidders the time required to put together a bid. In addition, more analysts follow large targets, enhancing the information available to develop a bid quickly.

Target sales growth (3 years before the transaction), earnings before taxes, depreciation and amortization (EBITDA), and Alpha are all measures of the target's performance. Alpha refers to Jensen's Alpha, a common market-based performance measure used in the finance literature (Barney, 1997; Jensen, 1968). This was calculated using CRSP data on the target's market performance. On one hand, sound performance may attract bidders (though not raiders). On the other hand, poorly-performing targets are sometimes auctioned off to raise cash.

Finally, there were three additional controls for forms of monitoring and incentives that may compensate for or work with the market for corporate control (Daily & Schwenk, 1996; Rediker & Seth, 1995). These included: the percent of outstanding shares owned by top managers (inside ownership), the percent of directors who were also on the top management team (inside directors), and incentive intensity is the CEO's incentive compensation (bonus, stock options, etc.) divided by his/her total compensation. These are common controls used in governance research (Westphal & Zajac, 1998). In general, agency theory suggests that as inside ownership and incentive intensity increase, managers' interests become more aligned with shareholders (Jensen & Meckling, 1976). In contrast, as insider board representation increases, the board may be relatively less effective at monitoring and overseeing managers. These mechanisms presume

that the firm is a going concern – it is less obvious how they would work during a bidding war. For example, incentives might be moot if buyers offer greater incentives in return for smaller bid premia. Nevertheless, these alternative governance mechanisms are relevant controls.

All three variables were log transformed to accommodate their skewed distributions. These variables were collected from Execucomp, Compact Disclosure, and ultimately, from proxy statements where other data sources failed. This resulted in dropping 457 observations due to missing data.

Empirical Model

Since the dependent variables (BiddingWar and Lockup) are binary, the most straightforward mode of analysis is to apply a logistic or probit model. However, as shown in Table 1, positive outcomes are quite rare (8% and 12%, respectively). In the case of such a rare event, complementary log-log regression is preferred (Long, 1997).

Insert Table 1 About Here

RESULTS

As predicted, R&D intensity is negatively associated with bidding wars and positively associated with lockup agreements. Of the control variables, bidding wars were positively associated with MBOs, raiders, tender offers, and large targets generating cash flow (EBITDA and Alpha). In contrast, bidding wars were negatively associated with toeholds, sales growth, inside directors, and incentive intensity. With the possible exception of incentive intensity, all significant correlations were in the anticipated direction.

Complementary Log-Log Regression on Lockup Agreements

Table 2 shows regression models testing all hypotheses. Model A predicts the likelihood of lockup agreements – the dependent variable for hypothesis 1. The model was significant (Wald

Chi Square = 166/11df, $p < .001$) with a pseudo R-squared statistic of .117. Finally, eight of the ten control variables were significant.

With respect to R&D intensity, the coefficient is positive and significant at the .001 level, as predicted. This suggests support for hypothesis 1 – managers in R&D-intensive firms appear to actively discourage bidding wars by granting lockup agreements to preferred bidders. As argued earlier, these may serve as a signal to would-be bidders that they are not welcome.

Insert Table 2 about Here

Complementary Log-Log Regression on Multiple Bidders

Models B and C in Table 2 predict the likelihood of bidding wars. Model B tests the main effect of R&D intensity suggested in hypothesis 2. Again, most of the control variables are significant, along with the model's Wald Chi Square statistic (267/13df, $p < .001$). Finally, the model has a pseudo R-squared statistic of .213.

Here, the main effect of R&D intensity was significant at the .001 level in the predicted direction. That is, bidding wars are generally less likely for R&D-intensive targets. This supports hypothesis 2, which suggests that managers may be especially successful in discouraging bidding wars for such firms. MBO is also included as a control since I have suggested that these might attract rival bidders (such as KKR in the case of RJR Nabisco). Consistent with this explanation, the coefficient for MBO is significant and positive.

Model C adds the interaction between R&D intensity and MBO to test hypothesis 3. I had argued that management buyouts may have great signal value for knowledge-intensive targets and might attract rival bidders. Here, the main effect for R&D intensity remains significant in the predicted direction (consistent with hypothesis 2). However, the interaction with MBO is insignificant and the model fit is not improved. Hence, hypothesis 3 is not supported –

management buyouts of R&D-intensive firms do not appear to attract rival bidders above and beyond the general effect of MBOs. In fact, while insignificant, the coefficient for the interaction is actually negative, rather than positive as predicted.

Robustness Tests

There were a number of steps taken to assure the robustness of the results. First, a variety of control variables were tested, including: the number of other transactions conducted by the buyer, the target's industry (primary SIC), the target's beta, the year of the transaction, the S&P 500 index at the time of the announcement, target sales, and the number of firms in the target's industry. None of these were significant and they did not affect the results. Accordingly, they were dropped for a more parsimonious presentation of the findings.

Second, since not all firms report R&D intensity, I tested whether there was a reporting bias in the data. Accordingly, the hypotheses were tested with a sample of 13,714 targets, using industry R&D intensity to substitute for missing cases of firm-level R&D intensity. As such, no observations were deleted due to a reporting bias. The results again proved to be robust, suggesting that reporting bias did not influence the findings.

Finally, while inter-correlations among variables are not generally large, steps were taken to assure that multicollinearity was not a factor. Further analysis included dropping correlated control variables, substituting alternative controls (e.g., assets instead of sales), and ridge regression models. Again, the findings were robust to these changes.

DISCUSSION AND CONCLUSION

This study has explored the implications of knowledge intensity in the market for corporate control. In so doing, it has melded the strategic importance of knowledge-based assets with the focus on opportunism in the TCE literature. These literatures have been largely separate and this

study contributes by integrating these perspectives. Indeed, the focus in the strategy literature has been almost entirely on the strategic benefits to be gained through knowledge-based assets rather than the associated opportunism-based dilemmas (Barney, 1991; Connor & Prahalad, 1996).

In this article, I have argued that the asymmetric information created by such assets may cause governance dilemmas for which the market for corporate control is often suggested as a solution. Specifically, managers may use their information advantage to profit through a management buyout or by discouraging bidding wars. These actions represent specific settings in which the interests of shareholders diverge from those of managers. Shareholders generally benefit from bidding wars while the associated loss of control may concern managers.

The findings for lockup agreements suggest that target managers may play an active role in thwarting bidding wars. That is, R&D-intensive targets are more likely to grant favored bidders lockup agreements, putting potential rivals at a disadvantage. Although the benefits to management (retaining control, etc.) are hard to quantify, the avoidance of bidding wars may impose significant costs on shareholders. At a minimum, this may explain why bid premia are lower for knowledge intensive targets (Alessandri, McDaniel, York, & Bettis, 2001; Coff, 1999b). This may only scratch the surface since target managers may impede bidding wars by threatening not to share private knowledge.

While these behaviors are hard to observe directly with the secondary data sources used here, they are consistent with findings. Indeed, further analysis revealed that bidding wars are especially unlikely over R&D-intensive firms; even in the case of a management buyout. Hostile bidders seem hesitant to challenge managers in an R&D-intensive target – perhaps even if it appears that managers are benefiting at shareholders' expense.

Conclusion and Directions for Future Research

These results suggest that the market for corporate control may ultimately be less efficient for R&D-intensive firms. Since bidding wars are actively discouraged (e.g., through lockup agreements and perhaps other measures as well), shareholders may not always receive the best price. This lack of intense competition over R&D-intensive targets may suggest a pattern of lower efficiency in the market for corporate control where such firms are concerned. This may have very important implications for the relative roles of TCE and the KBTF in explaining and predicting organizational boundary decisions.

The finding is especially noteworthy since the market for corporate control is a last resort for when other forms of control fail. In the case of knowledge-intensive firms, team production and information asymmetries may make monitoring and incentives relatively ineffective. In this context, a relatively ineffective market for corporate control is especially significant.

Further empirical exploration. Of course, knowledge is hard to observe directly. While I have presented these findings as having implications for the knowledge literature, the measure used is somewhat coarse-grained in its ability to actually measure knowledge. Of course, R&D expenditures are not the only indicator of knowledge intensity (Autio, Sapienza, & Almeida, 2000). There are also many other potential inputs that have not been explored here (professionals, human capital, social capital, etc.). It remains to be seen whether observations from this study apply to other measures of knowledge intensity. Godfrey and Hill (1995: 530) argue that the best way to cope with unobservables in theory is “for scholars to focus on observable variables that determine the degree of unobservability of a rare and valuable resource.” This study advances the literature consistently with this pattern of inquiry by using R&D as a proxy for underlying processes that are hard to observe directly.

Additional theory development. I have argued that this activity in the market for corporate control reflects agency problems implicit in knowledge-based assets. For example, if R&D intensity aggravates information asymmetries, it may be the source of many opportunistic and information-based dilemmas in market transactions and in corporate governance. Indeed, the fact that targets continue to use lockup agreements, a bold and public expression, suggests that this may only be the “tip of the iceberg.” What other forms might opportunism take? How else might managers use information asymmetries for personal gain? This study suggests that we might look for specific information asymmetries and explore how employees may exploit them. This may cast a new lens on research examining problems of knowledge creation and knowledge transfer.

Finally, there is the question of how firms cope with these dilemmas. In this case, the market for corporate control did not appear to bring the problems in check. This raises the question of how firms cope with these and other governance problems stemming from knowledge-based assets. This is especially daunting since knowledge intensive firms are most likely to experience failures in the most common methods of control (monitoring and incentives). What tools are left for firms to manage knowledge creation processes? Here, a more sophisticated theory of the firm might integrate insights from the knowledge literature and transaction cost economics rather than trying to address them separately. This connection between knowledge management dilemmas and opportunism advances research on knowledge-based theories of competitive advantage (e.g., the resource-based view) and offers fertile ground for additional contribution.

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TABLE 1
Descriptive Statistics

	Mean/s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. BiddingWar	.08 (.26)	1.00												
2. Lockup	.12 (.33)	.05**	1.00											
3. R&D intensity	.00 (1.00)	-.07***	.13***	1.00										
4. MBO	.05 (.22)	.08***	-.06**	-.11***	1.00									
5. Toehold	5.37 (16.94)	-.06***	-.11***	-.06***	.09***	1.00								
6. Raider	.03 (.18)	.15***	-.02	.00	-.03†	-.02	1.00							
7. Tender	.29 (.46)	.19***	.09***	.02	-.04*	-.02	.23***	1.00						
8. Assets	3.70 (1.79)	.15***	.13***	-.09***	.01	.06**	.16***	.20***	1.00					
9. Sales Growth	4.65 (.32)	-.10***	.07***	.15***	-.05**	-.03	-.06**	-.07***	-.02	1.00				
10. Tebitda	9.13 (.03)	.05**	-.01	-.09***	-.01	-.03†	.05**	-.05**	.34***	-.09***	1.00			
11. Alpha	.05 (.00)	.04*	.00	-.06**	.01	-.01	-.02	-.01	-.10***	-.11***	.00	1.00		
12. Inside Ownership	-2.48 (1.17)	.01	.04†	.33***	-.01	-.10***	.00	.09***	-.31***	.08***	-.17***	.00	1.00	
13. Inside Directors	-1.14 (.70)	-.05**	.02	.08***	.03	-.03†	-.07***	-.08***	-.27***	.09***	-.12***	.01	.24***	1.00
14. Incentive Intensity	7.00 (.59)	-.04*	.12***	.02	-.19***	.01	.01	-.15***	.49***	.01	.28***	-.06***	-.37***	-.17***

† p<.10
* p<.05
** p<.01
*** p<.001

TABLE 2
Complementary Log-Log Regressions^a

	A Model of P(Lockup Agreement)	B Model of P(BiddingWar) Main Effects	C Model of P(BiddingWar) Interaction
Controls			
Lockup		.474* (.201)	.464* (.201)
MBO		.569* (.281)	.404 (.343)
Toehold	-.102*** (.025)	-.021* (.009)	-.021* (.009)
Raider	-.794* (.376)	.578* (.268)	.576* (.268)
Tender	.440** (.134)	.930*** (.180)	.930*** (.180)
Assets	.263*** (.046)	.483*** (.078)	.486*** (.078)
Sales Growth	.361** (.139)	-1.479*** (.323)	-1.482*** (.323)
Tebitda	-3.095 (1.924)	-11.826* (4.598)	-11.760* (4.580)
Alpha	29.776† (17.296)	45.669† (24.027)	46.952* (23.943)
Inside Ownership	.189** (.069)	.048 (.082)	.051 (.082)
Inside Directors	.101 (.111)	-.036 (.115)	-.032 (.118)
Incentive Intensity	.449*** (.111)	-.629** (.201)	-.628** (.201)
Hypothesized Effects			
R&D intensity	.284*** (.070)	-.324*** (.093)	-.309*** (.094)
R&D*MBO			-.247 (.340)
N	1856	1856	1856
Wald Chi Square/df	165.79/11***	266.53/13***	265.68/14***
Pseudo R-squared	.117	.213	.214
Log Likelihood	-786.566	-482.371	-482.124

^a Values in parentheses are robust standard deviations (White, 1980).

† p<.10
* p<.05
** p<.01
*** p<.001

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