

THE INFLUENCE OF ACTIVISM BY INSTITUTIONAL INVESTORS ON R&D

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Researchers have assumed that large ownership stakes held by institutional investors grant them power to influence R&D investments. We found that ownership alone was insufficient and that institutions resorted to activism to influence R&D investments. Institutional activism increased R&D inputs over both the short and long terms. The nature of the activism and the strategic context of the R&D investment moderated the relationship. Further, R&D inputs mediated the effect of activism on R&D outputs.

Prior success is no guarantee of future profitability, as firms often exploit existing capabilities rather than invest in new ones (Miller, 1993). This reality creates a significant dilemma for institutional investors such as the pension funds, insurance companies, mutual funds, and banks that jointly own over 50 percent of U.S. equity (Useem, 1996). Institutional investors have a fiduciary obligation to maximize long-term value (Davis & Thompson, 1994) and desire firms to be managed to deliver stable current returns and also make long-term investments (for instance, in R&D) to ensure future profitability. Managers, however, may favor short-term results and lack commitment to long-term investments (Hansen & Hill, 1991). A crucial question for institutional investors is how they can motivate managers to make adequate long-term investments.

Prior research has shown that managers tend to underinvest in R&D, but institutional investor ownership influences firms to invest in R&D (Baysinger, Kosnik, & Turk, 1991; Hansen & Hill, 1991; Kochhar & David, 1996; Zahra, 1996). These authors assumed that ownership stakes held by institutions formed a sufficient basis of power. However, ownership stakes alone are inadequate when institutional investors remain passive; to realize their power, institutional investors need to exert pres-

sure (Davis & Thompson, 1994). Interestingly, although institutional investors have traditionally been passive shareholders, over the past decade they have increasingly resorted to activism by confronting poorly managed firms with public criticism of their policies, initiation of shareholder proposals, negotiations with managers and, on rare occasions, the launching of proxy contests (Useem, 1996). Our study extends prior research by showing that passive ownership alone may not grant adequate power but that activism on the part of institutional investors exerts pressure on managers to increase long-term investments such as R&D.

THEORY

Investments in R&D projects involve temporal trade-offs: R&D expenditures are incurred over the near term with payoffs likely only over the long term. Basic financial theory suggests that the timing of costs and benefits is irrelevant; investments should be pursued if they have a positive net present value computed from discounting the present and future cash flows using an appropriate discount factor. Organizational stakeholders, however, may differ in their temporal preferences, and this can have important implications for R&D investments.¹ Managers tend to favor short-term pay-

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¹ Temporal trade-offs can arise in a variety of investments; in addition to R&D investments, firms may underinvest in human resources, customer-supplier relationships, and businesses with unattractive near-term returns that might prove to be profitable long-term investments

offs, but owners favor long-term investments (Hansen & Hill, 1991).

Although long-term investments can increase firm value for owners, such investments may be suboptimal from the perspective of managers (see Laverty [1996] for a review). Managers are likely to enjoy larger personal benefits from investments with faster payoffs that enable them to enhance their reputations speedily and thereby hasten career advancement. Returns from R&D projects often require considerable time and do not facilitate managerial short-term goals (Laverty, 1996). Institutional investors, on the other hand, are likely to favor R&D investments. Their enormous equity stakes (over 50 percent aggregate holdings) tend to lock institutions into their shareholdings, as attempts to sell can significantly drive down a stock's price (Davis & Thompson, 1994). Increasingly, institutions are precommitting to long-term holding strategies rather than engaging in short-term trading (Useem, 1996), and they are seeking long-term returns from their investments.² Institutional investors also have legal obligations to their beneficiaries to maximize their returns (Useem, 1996) and therefore favor R&D investments that are likely to improve long-term performance.

Thus, institutions and managers are likely to have conflicting preferences concerning R&D investments. A political perspective would suggest that these institutions and managers will engage in a struggle for dominance, and the balance of power that emerges determines the strategic outcomes (Mintzberg, 1983). Prior research has tended to focus on the structural basis of institutions' power—their stock ownership (e.g., Baysinger et al., 1991; Hansen & Hill, 1991; Kochhar & David, 1996; Zahra, 1996). We emphasize the importance of activism: the political dynamics that shift the balance of power (Mintzberg, 1983; Ocasio, 1994).

The legal structure of a corporation facilitates managerial autonomy over operating decisions

such as investment in R&D and provides shareholders little direct influence over matters of ordinary business. Managers can also entrench themselves by gaining undue influence over boards of directors and by adopting defenses to neutralize the threat of takeover (Walsh & Seward, 1990). Institutional investors, on the other hand, are constrained by legal regulations that limit their exercise of influence: although aggregate institutional ownership is high, ownership is fragmented as legal regulations require institutions to diversify holdings and limit ownership in individual firms, and filing requirements preclude the formation of larger blocks (David & Kochhar, 1996; Roe, 1991).

Proxy regulations restrict the direct influence of institutional investors, and entrenched managers can resist their demands. Thus, while institutions remain passive, ownership does not provide effective power (Black, 1992). Ownership can serve as a structural base of power, but shareholders may need to take overt actions to exercise influence. Prior research has demonstrated a positive association between institutional ownership and R&D inputs, implying that institutional investors use their ownership base to influence R&D (e.g., Hansen & Hill, 1991; Kochhar & David, 1996). Instead of simply assuming that ownership is synonymous with power, it is important to understand the underlying political process dynamics that shift the balance of power (Black, 1992; Mintzberg, 1983; Ocasio, 1994; Pound, 1992). Accordingly, the focus here is on the political activity—the activism—by which institutional investors exercise influence. Activism refers to actions taken by institutional investors to pressure managers; in other words, it is the means by which institutions engage in political ploys to leverage their ownership power. The most common actions are public announcements, shareholder proposals, direct negotiations with managers, and proxy contests.

(Laverty, 1996). Following prior research on institutional investors, we focused on R&D investment (e.g., Baysinger et al., 1991; Hansen & Hill, 1991; Kochhar & David, 1996; Zahra, 1996).

² Not all institutional investors have a long-term orientation. Investment companies tend to have short-term horizons and frequently shuffle their portfolios, often changing their holdings on the basis of short-term criteria (Bushee, 1998). These institutions favor a short-term perspective and tend to reduce long-term investments (Zahra, 1996). Banks and insurance companies tend to have business relationships with firms. These institutions may not actively influence managers to enhance R&D investments in order to safeguard potential business

relationships (David & Kochhar, 1996; Kochhar & David, 1996). This study focused on activism by public pension funds. These institutions do not explicitly index their entire portfolios, but they generally trade less frequently and emphasize a buy-and-hold strategy (Bushee, 1998) and a long-term orientation. Furthermore, these institutions do not engage in any business relationships with firms and therefore do not have any conflicts of interest. Accordingly, public pension funds tend to exercise voice when dissatisfied with managers through activism (Davis & Thompson, 1994), and prior research has shown a positive association between ownership by these investors and R&D outputs (Kochhar & David, 1996; Zahra, 1996).

Activism highlights the dissatisfaction of shareholders and draws the attention of key stakeholders to the importance of shareholder demands and the inadequacy of managerial actions. Other shareholders can also examine a firm's managerial effectiveness and support the initiative of activist institutions by voting against management. Although managers can neutralize boards through control of director nominations (Walsh & Seward, 1990), activism may upset the relationship between managers and a pliant board. The human capital of directors depends on their performance as custodians of shareholder rights (Fama & Jensen, 1983). Public criticism by a prominent group of shareholders raises questions about directors' oversight of managerial activities and potentially undermines directors' reputations. Accordingly, when confronted with activism, directors may be more inclined to increase oversight and induce managers to be responsive to shareholders.

Unlike a hostile takeover, activism does not overturn managerial power. Through activism, institutions can only articulate their dissatisfaction; responses such as changes in R&D investments remain the prerogative of managers. The effects of activism can be understood from the "circulation of power" perspective articulated by Ocasio (1994). For example, managers and institutional investors often have divergent temporal preferences. Managers traditionally institutionalize their power through control of the proxy mechanism and the board of directors in a firm to gain the discretion to pursue their own preferences (that is, to underinvest in R&D to the detriment of shareholders). Observing these actions, institutional investors become concerned about long-term performance and resort to activism to challenge managers. Activism acts as a trigger to destabilize managerial power and makes managers more responsive to the needs of institutional investors through increased monitoring by owners and boards of directors. Through activism, managers are pressured to take actions to signal their commitment to owners—actions they would not otherwise have taken. Useem (1996) argued that although "managerial capitalism" insulated managers from owners in past decades, a new "investor capitalism" has been shifting the balance of power to institutional investors. Thus, managers become more sensitive to institutional pressures for long-term investments. Accordingly, managers respond to institutional activism by visibly demonstrating their commitment to long-term investments, by increasing R&D investments.

Hypothesis 1. Investment in R&D inputs increases after the occurrence of institutional activism.

The political dynamics by which institutions gain support from boards and exert pressure on managers can take time. Even if managers acquiesce, the deployment of R&D resources requires prior time-consuming development of objectives and identification of attractive projects. Accordingly, we expect that activism will have a stronger effect on R&D inputs over time compared to the time period immediately following activism, as hypothesized below:

Hypothesis 2. The effect of institutional activism on R&D inputs is stronger over the long-term than over the short term.

Moderators of the Activism–R&D Inputs Relationship

Although institutional activism may, in general, lead to an increase in R&D inputs, there are situations in which the relationship may hold more strongly than in others. We explore three potential moderators of the relationship between institutional activism and R&D inputs: the nature of activism, the strategic context of R&D investment, and the governance context.

Nature of activism. All forms of institutional activism may not be equally effective in extracting the appropriate response from managers. Proxy-based activism (shareholder proposals and proxy contests) is formally documented in proxy materials sent to all shareholders and is therefore more salient in communicating institutional investors' dissatisfaction to managers, directors, and other shareholders. Non-proxy-based activism, on the other hand, is verbal; the effects of media reports are likely to be more diffuse and are therefore less explicit and salient. Formal shareholder proposals require greater commitment by institutions than public announcements. The additional effort taken by institutions implies the extent of their dissatisfaction and calls for an appropriate response. Accordingly, proxy-based activism is likely to have stronger effects than non-proxy-based activism on R&D inputs.

Hypothesis 3. The effect of institutional activism on R&D inputs is stronger for proxy-based than for non-proxy-based activism.

Strategic context of R&D investment. As value-maximizing investors, institutions should be concerned with fostering R&D inputs in strategic contexts where managers underinvest in R&D despite

positive returns to additional R&D investments. When managers pursue an inappropriate R&D strategy, pressure from activist institutions may be more effective in enhancing R&D inputs. We identified two strategic contexts that enhance the effectiveness of R&D inputs following activism: the technology context of an industry, and the presence of profitable investment opportunities for a firm. First, in several high-technology industries like electronics and pharmaceuticals, a “technology-push” impetus arises when innovation is the primary driver of competitive advantage (Zahra, 1996). Prior research has shown that increased R&D investment by firms in high-tech industries improves firm value, especially if the firms had previously invested at a level less than the industry mean (Chan, Martin, & Kensinger, 1990). Second, firms with profitable growth opportunities may experience a “demand-pull” impetus for appropriate R&D investments. Prior research has shown that increases in R&D investments improve firm value for firms with growth opportunities (Szewczyk, Tsetsekos, & Zantout, 1996). Accordingly, we expected that institutional activism will lead to higher investments in R&D inputs in technological contexts that favor R&D investment:

Hypothesis 4. The effect of institutional activism on R&D inputs is stronger for a firm with favorable growth opportunities.

Hypothesis 5. The effect of institutional activism on R&D inputs is stronger for a firm in a high-technology industry that has underinvested in R&D relative to its industry.

Governance context. The effectiveness of activism as an influence mechanism may depend on the governance context. Ownership structure (Brickley, Lease, & Smith, 1988) and boards of directors (Daily & Dalton, 1994) are potential monitoring mechanisms. Activism by institutional investors is likely to be particularly effective in obtaining managers’ compliance in the presence of other owners and directors favorable to institutions. Ownership by other activist institutions (typically pension funds like CalPERS) can leverage activism, as the actions of one activist institution are likely to be supported by other activist institutions (Daily, Johnson, Ellstrand, & Dalton, 1996). In addition, independent directors are more likely to pay attention to activist institutions. Independent directors lack business relationships that pose a conflict of interest and are therefore expected to provide better oversight (Daily & Dalton, 1994). Managers are likely to be more responsive to activist institutions

and increase R&D investments in the presence of these stakeholders:

Hypothesis 6. The effect of institutional activism on R&D inputs grows stronger as ownership by activist institutions increases.

Hypothesis 7. The effect of institutional activism on R&D inputs grows stronger as the proportion of independent directors increases.

Effect of Institutional Activism on R&D Outputs

It is also important to know whether institutional activism facilitates the generation of R&D outputs, or new products that can ultimately increase market share and performance. Activism can affect R&D outputs in two ways: indirect and direct. First, there may be an indirect effect of activism on R&D outputs, mediated through the increase in investment in R&D inputs (Hypothesis 1). Increases in R&D inputs provide more financial resources for innovation, and firms can use these resources to generate more new products. Prior research has documented a strong association between R&D inputs and outputs (Acs & Audretsch, 1987; Hitt, Hoskisson, Johnson, & Moesel, 1996). Thus, to the extent that activism enhances R&D inputs, and R&D inputs increase R&D outputs, R&D outputs should increase as a result of activism.

Second, activism may directly increase R&D outputs, independent of its effect on R&D inputs. In response to investor dissatisfaction articulated through activism, managers may act to find solutions that yield more innovative products even with the same investments in R&D inputs. With the pressure from institutional investors, top managers are also more likely to encourage managers of ongoing R&D projects to bring them to fruition, thereby increasing the likelihood that they will introduce new products to the market earlier. On the basis of these arguments, we propose the following paired hypotheses; the first states the indirect effect and the second, the direct effect.

Hypothesis 8a. R&D outputs increase after the occurrence of institutional activism through the mediation of increased R&D inputs.

Hypothesis 8b. R&D outputs increase after the occurrence of institutional activism, given controls for increases in R&D inputs.

METHODS

Sample

We adopted a panel data design to longitudinally examine changes in R&D inputs and outputs attrib-

utable to institutional activism in a set of firms. The sample was designed to include a sufficient number of firms targeted by institutional activism to permit comparison with nontargeted firms. Institutional investors tend to target large firms and thus, large firms composed our sample. The potential marginal gains for activist institutions are likely to be the highest for large targets, and the associated costs are likely to be fixed regardless of firm size. A sufficiently long period of time was examined to allow for changes in institutional activism to influence R&D inputs and outputs. Davis and Thompson (1994) traced the origins of the institutional activism movement to 1987, providing a start date for the study. The sample was drawn from the 100 largest industrial corporations listed in the Compact Disclosure database in 1986, and these firms were tracked from 1987 through 1993. Of these, 17 international companies were dropped from the sample because activism generally affects U.S. firms. In addition, one firm underwent a leveraged buyout, one was acquired, and R&D expenditures were missing for 8 remaining firms. The final sample therefore consisted of 73 firms. In our analysis, all of the regressors temporally precede the dependent variable. The dependent variables (obtained for the period 1987 through 1993) were regressed against independent variables (obtained for the period 1987–93) and lagged dependent and lagged control variables (obtained for 1986–92); we thus obtained 511 usable observations (73 firms \times seven years). Activism (the independent variable) occurs during the proxy season, typically from January to March, and R&D inputs (the dependent variable) is typically reported in December, providing a temporal lag. Sample details appear in Appendix A.

Measures

Dependent variables. R&D inputs was computed as the total expenditures in research and development expressed as a percentage of sales (Hitt et al., 1996). Data were obtained from COMPUSTAT. *R&D outputs* was the number of new products announced by a firm in a year (Hitt et al., 1996). We identified R&D outputs for firms in the sample by examining announcements in the *Wall Street Journal Index* (Kelm, Narayanan, & Pinches, 1995). To minimize biases, we had a team of three knowledgeable raters who were not involved in formulating the hypotheses independently evaluate the entire set of announcements. Their ratings were highly correlated with a within-group interrater reliability of 0.85 based on the measure developed by Shrout and Fleiss (1979), which allows for values from 0 (complete lack of

agreement) to 1 (complete agreement). Glick (1985) showed that ratings can be combined if interrater reliability exceeds 0.65. Accordingly, the combined ratings were used to develop the final measure.

Independent variables. Instances of institutional activism include (1) announced opposition to management, (2) initiation of a shareholder proposal, (3) announcement of direct negotiation with management, and (4) initiation of proxy contests. These actions were identified from a careful examination of the following: the *Corporate Governance Bulletin* (published by the Investor Responsibility Research Center), the *Wall Street Journal*, the *Institutional Investor*, *Pensions & Investments*, *Pensions Age*, and *Corporate Control Alert*. To minimize errors, we cross-verified media reports of shareholder proposals against the firms' proxy statements. Furthermore, to reduce potential rater biases, we used multiple raters to verify instances of activism. The team of three knowledgeable raters identified above evaluated the entire set of instances of activism. Their ratings had an interrater reliability of 0.99 and were combined. Although activism is by nature a discrete event, firms may experience multiple events of activism over a sample period. To examine the overall effect of activism on R&D inputs and outputs, we used a cumulative count variable, *cumulative institutional activism*. Each firm was assigned a value of 0 for this variable for 1986, and after the firm's first instance of activism (as defined above), the count was set to 1; after the second instance, it was set to 2, and so on. To examine the temporal impact of institutional activism on R&D inputs and outputs, we also measured instances of activism in a given year. *New institutional activism* was the number of such instances taking place in a given year (year, $t-1$), as distinguished from cumulative institutional activism, which refers to the cumulative number of such instances, occurring until the prior year (year, $t-2$).

Moderator variables. To account for the nature of activism, we distinguished between proxy-based and non-proxy-based activism. *Proxy-based-activism* included instances initiated through the formal proxy machinery, including shareholder proposals and proxy contest initiations. *Non-proxy-based-activism* included public announcements or instances of negotiation reported in the press. To assess strategic context, we used two variables: (1) *Hi-tech R&D* was a dummy variable that took on a value of 1 for firms in high-tech industries with firm R&D intensity below the industry average, based on the primary two-digit Standard Industrial Classification (SIC) code, and 0 otherwise (Chan et al., 1990), and (2) *growth opportunity* was a dummy variable with a value of 1 if Tobin's Q (the ratio of

market value of assets to their replacement value) exceeded 1 and 0 otherwise (Szewczyk et al., 1996). The governance context was described by: (1) *institutional ownership—activist institutions*, measured as the percentage of ownership by institutions that engage in activism (Daily et al., 1996), and (2) *independent directors*, the number of directors without affiliations to a firm as a proportion of the total number of directors, calculated with the procedure described by Daily and Dalton (1994).

Control variables. We controlled for the following organizational characteristics: *size*, *diversification*, *systematic risk*, *leverage*, *free cash*, *accounting performance* (measured as ROA), and *market performance* (measured as Jensen's alpha); for these governance characteristics: *institutional ownership*, *blockholder ownership*, *officer and director ownership*, *CEO age and long-term incentives*, and *takeover defenses*; and for one industry characteristic, *industry R&D inputs*. Details on the control variables appear in Appendix B.

RESULTS

We used a dynamic longitudinal analysis to examine changes in R&D inputs and outputs following instances of institutional activism. Bergh (1993) suggested that appropriate longitudinal research requires more than using a longitudinal sample. In particular, he argued that researchers should use a statistical methodology that (1) recognizes longitudinal data assumptions and (2) analytically accounts for temporal changes. By using fixed-effects models (Greene, 1993), we controlled for unobserved heterogeneity in R&D inputs and outputs among the firms in the sample. A partial adjustment model was used to model temporal changes (Tuma & Hannan, 1984) by including lagged dependent variables. Therefore, all the results presented here are based on longitudinal cross-lagged covariations *within* firms, rather than on cross-sectional comparisons *between* firms. The effects identified here thus go much further toward meeting standards of causality than prior cross-sectional findings.

Table 1 presents the correlation matrix and descriptive statistics. Tables 2 and 3 present the results of the panel data analysis. The coefficient of cumulative institutional activism is positive and statistically significant in model 1, supporting Hypothesis 1. To evaluate the long-term versus short-term effects of institutional activism, in model 2, we decompose cumulative institutional activism_{*i, t-1*} into its two components: new institutional activism_{*i, t-1*} (the level of activism during the year before the observation) and cumulative insti-

tutional activism_{*i, t-2*} (the cumulative level of activism up to two years before the observation). With new institutional activism, we tested whether activism had fast, abrupt, short-lived effects on R&D inputs, and with cumulative institutional activism_{*i, t-2*}, we tested whether activism had a long-lasting or long-term effect on R&D inputs. The coefficients for both new and cumulative institutional activism are statistically significant, suggesting that activism has both an immediate and a long-term effect on R&D inputs. The pattern of results indicates that the effect of activism begins as early as the year after an activism event (reflected by the significant effect of new institutional activism) and that this effect builds up and remains over the long term. The model suggests that one instance of activism increases R&D inputs by 0.05 percent points for the next year and builds up to a long-term effect of 0.25 percent points.³ These magnitudes represent, respectively, 9 percent and 44 percent of the within-firm standard deviation of the dependent variable (0.56). Clearly, firms do not greatly vary their R&D inputs over time, but it appears that institutional activism may have a meaningful effect on those variations, particularly over the long term. These results support the prediction of Hypothesis 2 regarding a stronger long-term effect. Model 3 separates activism into proxy-based and non-proxy-based and shows that the former increases R&D inputs but that the latter has no effect.⁴ The finding supports Hypothesis 3.

Models 4–7 provide tests of interaction effects of activism. To avoid undue multicollinearity between main effects and interaction effects and to facilitate interpretation of main effects, we mean-centered the variables involved in the interaction prior to calculating the interaction effect. A positive and statistically significant interaction between cumulative institutional activism and growth opportunity in model 4 provides support for Hypothesis 4, which states that activism enhances R&D inputs in firms with favorable growth opportunities. A positive and statistically significant interaction between cumulative institutional activism and hi-tech R&D in model 5 supports Hypothesis 5, which states that activism enhances

³ The long-term effect is calculated as $b/(1 - c)$, where b is the coefficient of the variable and c is the coefficient of the lagged dependent variable (Greene, 1993).

⁴ Interestingly, proxy-based activism is more highly correlated with lagged proxy-based activism than with lagged non-proxy-based activism, suggesting that when institutions target firms over a period of time they tend to use similar tactics.

TABLE 1
Descriptive Statistics and Correlations^a

Variable	Mean	Between		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
		s.d.	s.d.																								s.d.
1. R&D inputs	3.67	3.36	0.09	0.31	-.01	-.04	.06	-.02	.14																		
2. R&D outputs	1.55	2.90	0.11	0.07	-.35	-.08	-.16	.17	-.32	-.01																	
3. Industry R&D inputs	3.57	3.22	0.03	0.03	.39	.18	.14	.00	.72	.11	-.40																
4. Size	9.27	0.84	0.03	0.18	-.03	.30	-.16																				
5. Accounting performance	0.10	0.07	0.06	0.03	.44	.07	.33	-.04																			
6. Market performance	0.10	0.32	0.09	0.31	-.01	-.04	.06	-.02	.14																		
7. Leverage	0.25	0.13	0.11	0.07	-.35	-.08	-.16	.17	-.32	-.01																	
8. Free cash	0.07	0.04	0.03	0.03	.39	.18	.14	.00	.72	.11	-.40																
9. Diversification	0.87	0.52	0.49	0.19	-.20	-.12	.00	-.05	-.01	.01	.28	-.06															
10. Systematic risk	1.28	0.43	0.26	0.35	.07	.06	.07	-.19	.03	.20	.13	.01	.04														
11. Growth opportunity	0.37	0.48	0.41	0.25	.42	.19	.37	-.03	.62	.16	-.23	.46	.03	-.01													
12. High-tech R&D	0.11	0.32	0.29	0.12	.17	.04	.43	-.04	.12	.01	.02	-.04	.11	.00	.11												
13. Institutional ownership —Activist institutions	0.04	0.01	0.01	0.01	-.03	-.03	.08	-.11	-.08	-.03	.12	-.04	.05	.02	-.08	.05											
14. Institutional ownership	0.51	0.12	0.11	0.05	.13	.00	.14	-.36	.00	.16	.08	-.02	.02	.04	.01	.09	.39										
15. Blockholder ownership	0.09	0.12	0.11	0.05	-.10	-.12	-.16	-.06	-.22	.01	.05	-.08	-.05	-.12	-.28	-.12	-.06	.04									
16. Officers and directors ownership	0.03	0.07	0.06	0.03	-.02	.04	-.03	-.07	-.11	-.03	-.13	.09	.00	.06	-.05	-.06	.02	-.02	.46								
17. Independent directors	0.60	0.16	0.15	0.06	.06	-.09	.06	-.12	.05	.05	.08	-.05	-.01	.04	.01	.23	.01	.09	.00	-.10							
18. CEO age	58.95	5.13	3.37	3.88	-.01	-.07	-.03	.04	-.06	-.07	.06	-.06	-.01	-.01	-.17	.04	.04	.02	.00	-.14							
19. Long-term incentives	0.32	0.24	0.17	0.18	.14	.14	.05	.21	.09	-.02	-.01	.08	-.12	-.01	.04	.03	-.05	-.05	-.04	.01	.03						
20. Takeover defenses	3.69	1.86	1.84	0.33	-.09	-.35	-.04	-.27	.06	.01	-.02	-.09	.06	-.07	.03	-.01	.18	.03	-.10	-.14	.16	.03	-.20				
21. Cumulative institutional activism	2.05	3.04	2.57	1.65	.03	-.06	-.03	.07	-.13	-.04	.08	-.07	-.01	-.11	-.15	.06	.13	.14	-.06	-.12	.22	.00	.12	.21			
22. New institutional activism	0.54	1.08	0.59	0.91	.00	.02	.00	.03	-.12	-.06	.07	-.07	.02	-.02	-.10	.00	.09	.02	-.06	-.04	.08	.04	.08	.10	.56		
23. Proxy-based activism	1.04	1.70	1.32	1.08	.04	-.13	.05	-.03	-.05	-.04	.03	-.07	.00	-.15	-.04	.04	.11	.20	-.02	-.10	.21	.03	.06	.25	.83	.45	
24. Non-proxy-based activism	0.99	1.87	1.67	0.85	.01	.03	-.08	.15	-.16	-.02	.10	-.05	.00	-.03	-.21	.04	.12	.03	-.10	-.11	.15	-.03	.15	.12	.85	.50	.41

^a For correlations greater than .09, $p < .05$; for correlations greater than .12, $p < .01$; for correlations greater than .15, $p < .001$.

TABLE 2
Results of Panel Data Analyses for R&D Inputs^a

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
R&D inputs	0.76***	0.76***	0.74***	0.73***	0.73***	0.76***	0.76***
Industry R&D inputs	0.05	0.05	0.04	0.04	0.05	0.05	0.05
Size	0.17	0.17	0.13	0.14	0.22	0.16	0.17
Accounting performance	4.31***	4.23***	4.14***	3.99***	3.74***	4.18***	4.16***
Market performance	-0.08	-0.08	-0.06	-0.07	-0.10	-0.09	-0.09
Leverage	0.75**	0.74**	0.72*	0.74*	0.75*	0.78*	0.78*
Free cash	0.16	0.23	0.43	0.25	0.35	0.37	0.40
Diversification	-0.04	-0.04	-0.01	-0.03	-0.01	-0.02	-0.02
Systematic risk	-0.02	-0.02	-0.00	-0.04	-0.04	-0.03	-0.03
Growth opportunity	0.03	0.03	0.01	0.05	0.02	0.04	0.04
High-tech R&D	0.53***	0.53***	0.51***	0.49**	0.48**	0.53***	0.52***
Institutional ownership—Activist institutions	4.02	4.16	4.00	3.77	3.35	3.68	3.76
Institutional ownership	-0.02	-0.03	-0.22	-0.06	0.04	0.07	0.07
Blockholder ownership	-0.57	-0.57	-0.63	-0.63	-0.55	-0.62	-0.62
Officer and director ownership	0.39	0.39	0.48	0.52	0.51	0.36	0.34
Independent directors	-0.61	-0.61	-0.53	-0.42	-0.35	-0.60	-0.58
CEO age	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Long-term incentives	-0.02	-0.02	0.00	0.02	0.01	-0.01	-0.01
Takeover defenses	-0.04	-0.03	-0.01	-0.03	-0.04	-0.04	-0.04
Cumulative institutional activism, $t - 1$	0.06***			0.07**	0.06***	0.06***	0.06***
Cumulative institutional activism, $t - 2$		0.06***					
New institutional activism		0.05*					
Proxy-based activism			0.11***				
Non-proxy-based activism			-0.01				
Cumulative institutional activism \times growth opportunity				0.08***			
Cumulative institutional activism \times high-tech R&D					0.13***		
Cumulative institutional activism \times institutional ownership—activist institutions						0.09	
Cumulative institutional activism \times independent directors							0.01
R^2	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Additional variance reduction explained ^b	0.23	0.23	0.25	0.25	0.27	0.23	0.23
F -test of significance for regression model	405.44***	400.66***	411.92***	412.03***	419.68***	398.38***	398.41***
Degrees of freedom	412	411	411	411	411	411	411
F -test of significance for model relative to model 1		0.29	11.73***	13.95***	21.77***	0.02	0.04

^a Hypotheses 1–7 were tested in the models shown. The dependent variable was calculated for year t , and all other variables were calculated for year $t - 1$, except for cumulative institutional activism, which was also calculated for year $t - 2$.

^b Computed as $1 - (\text{error variance of full model})/(\text{error variance of reduced model with only dummy variables and R\&D inputs})$.

* $p < .05$

** $p < .01$

*** $p < .001$

R&D inputs in hi-tech industry firms that underinvest in R&D. The impact of activism is reasonably large in both the main and moderator effects. For example, if within-firm standard deviations are used to evaluate magnitudes, a one-standard-deviation change in cumulative activism leads to a long-term change of 60 percent of the standard deviation of R&D inputs. The long-term effect on R&D inputs of a one-standard-deviation change of activism takes on values of 43 percent and 77 percent of the standard deviations when evaluated at levels of the moderator variable (hi-tech R&D) one standard deviation below

and above the mean, respectively. Overall these results suggest that activism has a meaningful effect on R&D inputs.

The interaction terms for both activist institutional ownership (model 6) and independent directors (model 7) are not statistically significant, thus failing to support Hypotheses 6 and 7.

We used Poisson regression with fixed effects for firms to estimate R&D outputs (as R&D outputs is a count variable, ordinary least squares methods were not appropriate; Greene [1993]). Table 3 presents the results of analyses testing

TABLE 3
Results of Panel Data Analyses for R&D Outputs^a

Variable	Model 8	Model 9
R&D outputs ^b	-0.01	-0.01
No R&D outputs ^c	-0.15	-0.15
R&D inputs	0.20*	0.20*
Industry R&D inputs	-0.08	-0.08
Size	1.23***	1.29**
Accounting performance	0.08	0.23
Market performance	-0.09	-0.09
Leverage	0.47	0.46
Free cash	-1.06	-1.25
Diversification	0.70*	0.69*
Systematic risk	0.63***	0.62***
Growth opportunity	0.21	0.22
High-tech R&D	0.03	0.04
Institutional ownership—Activist institutions	0.87	1.29
Institutional ownership	0.97	0.97
Blockholder ownership	-1.25	-1.30
Officer and director ownership	-2.26	-2.31
Independent directors	-0.20	-0.16
CEO age	-0.02	-0.02
Long-term incentives	-0.25	-0.26
Takeover defenses	-0.12	-0.11
Cumulative institutional activism		0.02
Log likelihood of model	-429.28***	-429.17***
Likelihood ratio test of model vs. previous model		0.22
Degrees of freedom for likelihood test		1

^a Hypotheses 8a and 8b were tested in the model shown. The dependent variable was calculated for year t , and all other variables were calculated for year $t - 1$.

^b Logarithm.

^c Dummy variable.

* $p < .05$

** $p < .01$

*** $p < .001$

Hypothesis 8 using the fixed-effect Poisson regression model. The indirect effects of activism on R&D outputs through R&D inputs statistically imply that the independent variable (activism) would have a significant effect on the mediator (R&D inputs) and that the mediator would have a significant effect on the dependent variable (R&D outputs). First, the dependent variable (R&D outputs) was regressed on the mediator (R&D inputs; model 8, Table 3), and the mediator variable (R&D inputs) was regressed on the independent variable (cumulative activism; model 1, Table 2). Both of these relationships are statistically significant, indicating that the mediator (R&D inputs) is significantly and separately linked to both the independent and dependent variables, thus supporting the mediation (indirect) relationship (James & Brett, 1984) proposed in Hypothesis 8a. The effect of cumulative institutional activism, after we controlled for R&D inputs, is not statistically significant in model 9, thus failing to support Hypothesis 8b, which predicts a direct effect

of activism on R&D outputs. The insignificant likelihood ratio test comparing model 9 with model 8 also corroborates the lack of a direct effect of activism on R&D outputs.

DISCUSSION

These findings help advance research understanding of the role of institutional investors in fostering long-term investments. First, activism is positively associated with R&D inputs. Second, this association is stronger in strategic contexts where R&D investments are likely to enhance firm value—that is, in firms with favorable growth opportunities and in firms in high-technology industries that underinvest in R&D. Third, the nature of activism affects R&D inputs; proxy-based activism is more effective in increasing R&D inputs than is non-proxy-based activism. Fourth, we studied the temporal effects of activism and found it had an immediate as well as a long-term effect on R&D inputs. Fifth, the pres-

ence of favorably disposed stakeholders (activist institutional owners, independent directors) did not moderate the association between activism and R&D inputs. Finally, activism did not have a direct effect on R&D outputs, but it had an indirect effect through R&D inputs.

These results demonstrate that institutional investors are not passive owners but instead exercise influence through activism that successfully pressures firms to make appropriate long-term investments. Institutional ownership is not positively associated with R&D inputs, suggesting that passive ownership is not sufficient to foster long-term investments; rather, passive ownership can facilitate managerial entrenchment as managers become complacent that institutional investors will not question their actions. Thus, ownership alone may not be sufficient, and activism is necessary to enact power. Researchers should focus on the effects of activism to understand the governance role played by institutional investors. Although prior research has largely examined ownership as a proxy for power, our work shows the importance of directly measuring behavior by studying activism.

We found no direct association between activism and R&D outputs. Our results suggest, however, that the effect of activism on R&D outputs is indirect, mediated through R&D inputs. It is easier for managers to respond to activism by increasing R&D inputs, which are discretionary expenditures under the direct control of managers. R&D outputs, on the other hand, are subject to other exogenous factors beyond the direct control of managers, and they are therefore less amenable to change. Activism does, however, indirectly affect R&D outputs through R&D inputs. Increased R&D inputs following activism eventually lead to more new product generation. Our results are consistent with Fiol's (1996) metaphor of innovation generation as a sponge. Institutional activism is useful in filling the organizational sponge with the necessary investments to generate new products. However, it is unrealistic to expect to "squeeze out more than you've got" (Fiol, 1996: 1018); activism can squeeze the sponge to generate R&D outputs only to the extent that it fills the sponge with R&D investments.

Our results are consistent with the view that institutional investors resort to activism to maximize long-term value. We found that activism increased R&D inputs, especially in strategic contexts where R&D investments were likely to enhance firm value, and this increase in R&D inputs following activism ultimately resulted in more R&D outputs. Given that prior research has demonstrated that R&D inputs and outputs improve accounting and market performance (Chan et al., 1990; Chaney, Devinney, & Winer, 1992;

Franko, 1989), we should expect activism to result in long-term improvements in performance. Recent empirical studies, on the contrary, have shown that activism has no effect on either accounting or market performance (Black, 1998; Daily et al., 1996; Karpoff, Malatesta, & Walkling, 1996; Smith, 1996; Wahal, 1996). Although institutions can express dissatisfaction and articulate the need for a shift in strategy, changes in strategy are the ultimate prerogative of managers. Managers have a variety of potential responses to institutional activism, ranging across "acquiesce, compromise, avoid, defy, manipulate" (Oliver, 1991). Accordingly, to understand the potential performance effects of activism, it is important to recognize how managers respond to activism. Our study provides some insights and directions for further research.

First, the nature of activism may affect managerial responses. We find that proxy-based activism is more effective than non-proxy-based activism in enhancing R&D intensity. Proxy-based activism is direct and explicit in drawing the attention of managers, directors, and other shareholders. A campaign of activism likely takes considerable time and effort on the part of institutional investors, who must identify targets and take actions to exert pressure on managers. Our results suggest that institutions can maximize their effects by focusing their resources on proxy-based activism rather than on announcements. Research examining the performance effects of activism would benefit from a more direct consideration of its nature.

Second, the circumstances under which activism elicits favorable managerial responses—in particular, the appropriate strategy and governance context—need to be considered to identify the potential moderators of the relationship between activism and performance. We found that managers responded with increased R&D inputs when the existing R&D strategy was inappropriate and a change was clearly warranted. Evidently, maintaining the status quo in that context becomes indefensible for managers, and they are more likely to respond favorably to institutional activism. Performance improvements are likely in firms that have pursued inappropriate strategies if managers at these firms can be induced to change those strategies in response to institutional activism. Our study addressed moderators related to underinvestment by firms. In addition, overinvestment may also be problematic. For example, firms that are excessively diversified and firms that retain free cash are likely to benefit from restructuring. Activism directed at such firms may be more likely to result in changes in strategy and concomitant performance improvements. Research on the performance ef-

fects of activism should explicitly address potential strategy-related moderators.

Interestingly, we found no evidence that stakeholders favorable to activist institutions supported the initiatives of these institutions and thereby augmented the pressure on managers to make long-term investments. Although strong governance mechanisms can support activist institutions, if these governance mechanisms are operating properly, intervention by these institutions may not be necessary, as the mechanisms can substitute for intervention (Rediker & Seth, 1995). The relationships between governance mechanisms are likely complicated, however, as some monitoring (for instance, through activism) may be necessary to complement and bolster existing governance mechanisms. The relationships among multiple governance mechanisms and their effects on R&D investments warrant further study.

Third, the causal chain leading from activism to performance may include several intermediate links. Prior research has generally examined the direct effects of activism on performance. Implicit in this research is the assumption that managers respond to activism with changes in governance and strategy, and these changes ultimately lead to performance improvements. Researchers need to pay close attention to the intermediate links, or mediators, between activism and performance to understand the changes in strategy that result from activism. Activism is unlikely to result in performance improvements unless managers make changes to strategies that drive performance. Our results suggest the importance of examining potential mediators, and we studied two mediators, R&D inputs and R&D outputs. Researchers need to pay careful attention to other potential mediators, such as changes in governance structures and firm strategies, to gain a more complete understanding of the performance effects of activism.

Finally, given the political nature of activism, it may take considerable time for it to provide power and for managers to respond. We used a longitudinal design and found that managers began to respond to activism within a year of its occurrence by increasing R&D inputs and that this change built up and persisted over time. Our approach suggests the importance of modeling the temporal effects of activism. In terms of our study, activism results in increased R&D inputs, which in turn increase new product announcements over time. It may take considerable time before these new products become profitable. Accordingly, the temporal effects need special consideration when one examines the performance effects of activism.

Institutional activism is a relatively recent phe-

nomenon suggested to be important for the governance of managerial actions. The research reported here suggests the importance of temporal effects. Thus, given the recency of activism, more research is necessary to understand its long-term effects, especially on firm performance. This study provides an important first step in explaining the phenomenon and provides a basis for several future research directions. Given the size of equity owned by institutions, their activism and its effect on managerial behavior and firm value over time are potentially critical elements of the strategic landscape.

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APPENDIX A

Firms in Sample

Firm	Cumulative		R&D	Firm	Cumulative		R&D
	Activism, 1987-93		Inputs in 1993		Activism, 1987-93		Inputs in 1993
Abbott Laboratories	0	0	10.48	International Paper Company	2	11	0.69
Allied Signal Inc.	0	3	2.65	Johnson & Johnson	0	0	8.36
Aluminum Company of America	5	10	1.44	Kerr-McGee Corporation	2	8	0.58
American Brands Inc.	3	5	0.48	Kimberly-Clark Corporation	0	2	2.27
American Cyanamid Company	3	15	13.93	Lilly (Eli) & Company	0	0	14.79
American Home Products Corporation	1	5	7.98	Litton Industries Inc.	0	0	1.54
Amoco Corporation	0	5	1.15	Lockheed Corporation	0	8	3.44
Anheuser-Busch Companies Inc.	3	3	0.00	LTV Corporation	0	0	0.00
Armco Inc.	0	2	1.01	McDermott International Inc.	0	0	0.69
Ashland Oil Inc.	0	0	0.15	McDonnell Douglas Corporation	0	1	2.36
Atlantic Richfield Company	0	2	0.63	Merck & Company	0	1	11.17
Baxter International Inc.	0	2	3.80	Minnesota Mining & Mfg Company	0	2	7.35
Bethlehem Steel Corporation	0	1	0.55	Mobil Corporation	0	0	0.53
Boeing Company	0	2	6.53	Monsanto Company	4	5	7.92
Boise Cascade Corporation	2	16	0.29	Motorola Inc.	0	1	8.97
Bristol Myers Squibb	0	3	9.88	Pepsico Inc.	0	2	0.45
Caterpillar Inc.	0	10	2.75	Pfizer Inc.	0	4	13.03
Chevron Corporation	0	1	0.64	Philip Morris Companies Inc.	0	3	0.83
Chrysler Corporation	0	7	2.91	Phillips Petroleum Company	0	0	0.76
Cooper Industries Inc.	0	1	0.67	PPG Industries Inc.	0	0	3.50
Deere & Company	0	0	3.53	Procter & Gamble Company	0	2	3.14
Digital Equipment	0	3	10.65	Raytheon Company	2	5	3.04
Dow Chemical	0	7	6.95	Reynolds Metals Company	0	0	0.68
Dresser Industries Inc.	0	1	1.93	Rockwell International	0	0	5.42
du Pont (E.I.) de Nemours	0	5	3.46	Scott Paper Company	0	4	1.31
Eastman Kodak Company	0	8	7.95	Sun Company Inc.	0	0	0.12
Emerson Electric Company	0	1	3.33	Texaco Inc.	3	11	0.56
Exxon Corporation	0	1	0.61	Textron Inc.	0	0	2.15
Ford Motor Company	0	2	4.63	TRW Inc.	3	4	6.47
General Dynamics Corporation	0	4	1.04	Union Carbide Corporation	0	1	3.00
General Electric Company	0	0	2.17	Unisys Corporation	4	7	6.65
General Motors Corporation	7	11	4.44	United Technologies Corporation	2	9	5.39
Goodyear Tire & Rubber Company	1	5	2.75	Unocal Corporation	0	1	0.40
Grace (W.R.) & Company	0	6	3.06	Westinghouse Electric Corporation	0	17	1.95
Hewlett-Packard Company	0	0	8.67	Weyerhaeuser Company	1	2	0.47
Honeywell Inc.	4	10	5.66	Xerox Corporation	0	1	5.12
International Business Machines	0	7	7.07				

APPENDIX B

Control Variables

The control variables were defined as follows. Research precedents and sources of data are noted in parentheses.

Size was the logarithm of firm sales (Hundley, Jacobson, & Park, 1996; COMPUSTAT).

Diversification was total diversification based on the entropy measure (Hoskisson et al., 1993; COMPUSTAT).

Systematic risk was the beta obtained from the CAPM model (Wedig, 1990; CRSP).

Leverage was the ratio of debt to total assets (Kochhar & David, 1996; COMPUSTAT).

Free cash was the ratio of sales less interest expense, tax, and dividends to total assets (Fazzari, Hubbard, & Peterson, 1988; COMPUSTAT).

Accounting performance was the ratio of net income to sales (ROA; Hundley, Jacobson, & Park, 1996; COMPUSTAT).

Market performance was the intercept obtained from the CAPM model (Jensen's alpha; Hoskisson, Hitt, Johnson, & Moesel, 1993; Hundley et al., 1996; CRSP).

Institutional ownership was ownership by institutional investors not included under activist institutions (Compact Disclosure).

Blockholder ownership was the percentage of ownership by large block shareholders with greater than 5 percent ownership (proxy statements).

Officers and director ownership was the percentage of ownership by officers and directors (proxy statements).

CEO age was in years (proxy statements).

Long-term incentives was the ratio of long-term pay (stock options, share grants, and performance units) to

total pay (Henderson & Fredrickson, 1996; proxy statements).

Takeover defenses was the cumulative count of takeover defenses adopted (Sundaramurthy, 1996; Investor Responsibility Research Center).

Industry R&D inputs was R&D expenses as a percentage of sales, aggregated across all firms in the same industry (Hitt et al., 1996; COMPUSTAT).

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