Bronwyn H. Hall

Corporate Restructuring and Investment Horizons in the United States, 1976–1987

Many observers of the corporate restructurings that reached major proportions in the United States in the 1980s have believed that the market for corporate control had a serious negative impact on companies' long-term investment, which in turn contributed to the United States's decline in global competitiveness. In the following study, the author looks carefully at the effects of financial restructurings on investment, especially at expenditures on R&D, in a large set of companies categorized according to their level of technology and the length of their investment horizon. She then compares the U.S. situation with that in the United Kingdom, Germany, and Japan. She concludes that, though many such events occasioned no change at all in investment strategies, restructuring pressures and declines in investment tended to concentrate in certain industries. She also finds that investment decisions were usually rational, given high interest rates and a tax environment that favored debt over equity.

How are the two topics in my title related? Corporate restructuring, whether financial or organizational, has been accused of shortening the investment horizons of U.S. managers. Critics argue that the fear of takeovers forces managers to concentrate on short-term earnings at the expense of long-term investments. They see this

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bias increasing during the wave of restructurings in the 1980s. Those making this argument often point to Japan and West Germany as examples of market economies that did not undergo much restructuring during the same period and note that those countries apparently invested at a much higher rate than the United States.

Despite the prevalence (and plausibility) of the view that takeover threats induced by the undervaluation or poor use of a firm's assets could lead to underinvestment in assets that have a longer payback period, evidence that this was generally the case has proved difficult to find. At the same time, restructurings evidently brought benefits in short-term productivity gains, profitability, and "focus" (a movement away from diversification toward concentration on the main line of business). In this article, I survey the evidence on the investment consequences of restructuring and briefly compare the U.S. experience with that of several other countries.

Corporate restructuring covers a range of activities, including changes in control, in financial structure, or in the firm's major lines of business. Many of these actions occur simultaneously, because they are sometimes more easily performed in tandem. For example, a change in ownership may be accompanied by the sale of lines of business to finance the purchase or by the retirement of equity and issuance of debt to restructure the balance sheet. In fact, because the transaction costs incurred in changing control of a public company are high, it is rare to find that event *not* accompanied by some other major change in the firm's structure. (Conversely, the need for small adjustments in the firm's structure will not be sufficient to induce a change in control).

The different motivations for restructuring have different implications for investment horizons, however: fear of a control change and the subsequent loss of employment may give managers a short-term bias, whereas leveraging (changing the financial structure) may induce a decline in investment simply because the cost of funds has risen owing to the reduction in free cash flow. A restructuring that entails divestiture of old or acquisition of new lines of business has no particular implications for investment: it may add to, reduce, or redirect spending on long-lived assets.[1]

[1] For evidence that acquisition and divestiture of lines of business during the 1980s was motivated to a great extent by the undoing of the conglomerate wave of the 1960s and 1970s (and was accompanied by productivity gains in the core line of business), see Sanjai Bhagat, Andrei Shleifer, and Robert Vishny, "Hostile Takeovers in the 1980s: The Return to Corporate Specialization," *Brookings Papers on Economic Activity: Microeco-*

For this reason, I deal here with changes in the *financial* structure, whether or not ownership changes accompany them. I divide these restructurings into two types: 1) substantial increases in leverage, either accompanied by a change in control (such as leveraged buyouts, a majority of which are also management buyouts, or going-private transactions) or with no change in control (a sharp increase in the debt-equity ratio); and 2) takeovers (whether friendly or hostile) unaccompanied by a change in the financial structure of the acquiring firm.

Defining a shortened time horizon for investment is more complicated. Although the concept clearly refers to the extent to which short-term considerations dominate over long-term performance in the firm's decision-making process, it is difficult to fashion a mathematically precise definition that satisfies all those who have thought about the problem.

One possible definition might make the time horizon a simple function of the internal rate of return (IRR) used by the firm in evaluating projects. For example, if we ask over what horizon a firm would be indifferent between $1,000 today and $10,000 in the future, the answer would be ten years if the required annual rate of return were 26 percent, and twenty-four years if it were 10 percent. These sets of numbers obviously imply quite different time frames over which the firm will look when evaluating the payback of a particular investment and different weights that it will place on short-term (fewer than five years) and longer-term considerations.

On the other hand, this definition may be too rigid when confronted with the way in which firms actually do capital budgeting, both because not all use the IRR approach and because companies use different rates of return for different projects. Fortunately, my examination of the implications of shorter time horizons for investment does not necessarily require a precise definition; it will be sufficient to keep in mind the relationship between short horizons and high discount rates and the relative importance of near-term and far-term factors.

Observers conventionally maintain that R&D investment has a longer time horizon than ordinary investment, but this assertion requires justification in light of what we know about the relative

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nomics 1990 (Washington, D.C., 1990), 1–72, and Frank R. Lichtenberg, "Industrial De-diversification and Its Consequences for Productivity," NBER Working Paper no. 3231 (1990).

depreciation rates of the two kinds of capital.[2] The rate of economic depreciation of ordinary capital is commonly thought to be in the range of 10–15 percent, whereas that for R&D capital is apparently somewhat higher, on the order of 25 percent.[3] This disparity implies that the time horizon for R&D investment actually should be shorter than that for ordinary investment.

The explanation for this puzzle lies in the intertemporal nature of the production function for knowledge capital: although it appears that the returns on R&D expenditures decline rather quickly, recent expenditures are in fact tightly linked to those made several years earlier, and the true payback period is much longer.[4] This hypothesis is supported by the evidence of apparently high adjustment costs and a slow rate of change for R&D investment.[5] In the absence of internal evidence on managers' actual planning horizons, I will assume that the behavior of R&D investment in particular and of investment in general serve as proxies for changes in corporate investment horizons.

Although I do not consider outlays for the education and training of workers here, there can be a significant relationship between restructuring and this form of long-term investment. Investments in

[2] See Gregg A. Jarrell, Ken Lehn, and Wayne Marr, "Institutional Ownership, Tender Offers, and Long-Term Investments," Securities and Exchange Commission (Washington, D.C., April 1985); Bronwyn H. Hall, "The Effect of Takeover Activity on Corporate Research and Development," in *Corporate Takeovers: Causes and Consequences*, ed. Alan J. Auerbach (Chicago, Ill., 1988): 69–100, and Hall, "The Impact of Corporate Restructuring on Industrial Research and Development," *Brookings Papers on Economic Activity: Microeconomics 1990* (Washington, D.C., 1990), 85–135, and Lisa K. Meulbroek, et al., "Shark Repellents and Managerial Myopia: An Empirical Test," *Journal of Political Economy* 98 (Oct. 1990): 1108–17, all of whom use R&D as a proxy for long-term investment.

[3] See Ariel Pakes and Mark Schankerman, "The Rate of Obsolescence of Patents, Research Gestation Lags, and the Private Rate of Return to Research Resources," in *R&D, Patents, and Productivity*, ed. Zvi Griliches (Chicago, Ill., 1984), 73–88, and Bronwyn H. Hall, "The Value of Intangible Corporate Assets: An Empirical Study of Tobin's Q," unpub. MS, NBER and University of California, Berkeley, 1988.

[4] When the production of capital from investment is additively separable, as is usually assumed for ordinary investment, a high depreciation rate implies a quick payback on investment, and vice versa. But if the production of knowledge capital from R&D investment is not additively separable, as seems likely, it is possible to show that a depreciation rate that is *measured* as high when a conventional perpetual inventory specification is used is consistent with very slowly decaying rates of return to lagged R&D expenditures.

[5] Jeffrey I. Bernstein and M. Ishaq Nadiri, "Research and Development and Intra-Industry Spillovers: An Empirical Application of Dynamic Duality," *Review of Economic Studies* 56 (April 1989): 249–69; Bernstein and Nadiri, "The Effect of Direct and Indirect Tax Incentives on Canadian Industrial R&D Expenditures," *Canadian Public Policy* 12 (1986): 438–48; and Bronwyn Hall, Jerry A. Hausman, and Zvi Griliches, "Patents and R&D: Is There a Lag?" *International Economic Review* 27 (1986): 265–83.

worker training are, of course, closely linked to expenditures in new technology and innovation, but changes in ownership and the accompanying shifts in employment documented here may discourage some firms from making investments in human capital. A firm that expects to be taken over or that downsizes under the threat of takeover may also fail to invest in its workers. My reading of the evidence in the debate over the winners and losers in corporate restructuring suggests that some of the private gains from this activity may come at the expense of the employees.[6] Even those who do not view workers as having property rights in the firm may be concerned if these transactions result in a loss of socially valuable human capital.

Restructuring and Investment

Several studies document the results of restructurings during the 1970s and 1980s. I focus first on those that look at R&D investment. They are of two types: large-scale empirical studies, and case studies of a few large firms undergoing restructuring or acquisition.[7]

I begin with my own study, the most comprehensive on the subject, although it is limited in some dimensions because it relies solely on public data.[8] It is based on a complete universe of publicly traded manufacturing firms (about 2,500) from 1976 to 1987. I identified every exit from this sample (about 1,200) during the eleven-year period and traced the reason for it. With this information, together with changes in the debt-equity ratios of survivors, I identified firms that experienced major restructuring.

Table 1 shows the overall statistics on these events during the period. The eleven-year totals of the significance of these transac-

[6] Bhagat, Shleifer, and Vishny, "Hostile Takeovers in the 1980s."

[7] For the former, see Hall, "Effect of Takeover Activity"; Hall, "Impact of Corporate Restructuring"; Frank R. Lichtenberg and Donald Siegel, "The Effects of Leveraged Buyouts on Productivity and Related Aspects of Firm Behavior," *Journal of Financial Economics* 27 (1990): 165–94; Lichtenberg and Siegel, "The Effect of Ownership Changes on the Employment and Wages of Central-Office and Other Personnel," *Journal of Law and Economics* 33 (1990): 383–408; and Abbie Smith, "Corporate Ownership Structure and Performance: The Case of Management Buyouts," *Journal of Financial Economics* 27 (1990): 143–64. For the latter, see Robert R. Miller, "Do Mergers and Acquisitions Hurt R&D?" *Research-Technology Management* 33 (March-April 1990): 11–15; Miller, "Effect of Restructuring on Technology Development," paper presented at the NAE Workshop on Financial and Managerial Impacts on Corporate Time Horizons; and Herbert I. Fusfeld, "Corporate Restructuring—What Impact on U.S. Industrial Research?" *Research Management* 30 (July-Aug. 1987): 10–17.

[8] Hall, "Impact of Corporate Restructuring."

Table 1
Corporate Restructuring in the Publicly Traded Manufacturing Sector, 1977–1987

Year	*Total Employment (000s)*	*Employment (000s) in*				
		Public Acquisitions	*Foreign Acquisitions*	*Private Acquisitions*	*LBOs*	*Leveraging*[a]
1977	20,917	66.0	1.3	10.4	0.6	30.7
1978	21,169	191.8	46.9	17.9	0.0	22.5
1979	21,999	311.3	11.9	15.5	1.3	58.7
1980	21,284	152.8	24.8	1.6	13.6	150.4
1981	20,880	310.0	15.6	42.4	19.4	142.6
1982	19,806	186.2	38.3	49.6	35.2	256.0
1983	20,138	298.0	0.0	14.9	33.1	33.9
1984	20,034	188.0	2.2	104.7	93.5	73.6
1985	19,279	382.7	111.4	52.1	132.9	146.9
1986	18,526	656.3	190.5	84.1	172.6	116.1
1987	17,898	179.9	201.4	63.9	226.2	113.5
Total		2,924.3	644.4	457.0	728.9	1,144.9
Average size (000 employees)		6.6	7.6	2.6	9.6	6.5

Source: All firms on Standard and Poor's Compustat Primary, Secondary, Tertiary Industrial, and Over-the-Counter Files for 1976–87 whose SIC codes lie between 2000 and 3999.

[a] Leveraging firms are those whose increase in long-term debt in any one year was greater than 100 percent of the sum of their debt and equity at the beginning of the year.

tions (measured by employment) suggest that about 30 percent of all firms were involved, or 3 percent a year. About half of this activity consisted of mergers or acquisitions between two public companies; only 9–11 percent were of the leveraging variety, but the importance of those transactions increased markedly during the second half of the period. In 1987, 2 percent of the employees in publicly traded manufacturing firms were employed by companies that went private through a leveraged buyout (LBO) or had experienced a substantial increase in leverage during the year. In my study, I used the sample of restructurings summarized in this table to investigate the simple correlation between corporate restructuring and changes in R&D intensity.

My major empirical findings were threefold. First, leveraged buyouts and other private acquisitions of publicly traded manufacturing firms had taken place overwhelmingly in the sectors where R&D investment and innovation have not been important, at least to the industry as a whole. The industries and firms in question were

those generating the steady cash flow necessary to service the added debt. They were largely smaller firms in consumer nondurable goods industries (food, textiles, the auto parts sector of the motor vehicle industry, the tire sector of the rubber and plastics industry, and miscellaneous manufacturing) or those that have been downsizing for some time under pressure from foreign competition and reduced innovative opportunities (textiles again, fabricated metals, and stone, clay, and glass). Together, these two groups accounted for more than 80 percent of the LBOs and going-private transactions (as measured by employment).

Research and development spending by the companies involved in the eleven years of LBO and other going-private transactions totaled $767 million, a small fraction of the $40 billion industrial R&D budget in 1982. Even if this R&D were cut drastically, it would have little impact on total R&D spending. In fact, although their R&D spending disappeared from my aggregate statistics after the firms went private (and ceased to report to the Securities and Exchange Commission), other evidence suggests that most did not radically reduce their spending as a result of the transactions.[9]

My results concerning the nontechnology-intensive character of LBOs and going-private transactions have gained support from other studies, which have also demonstrated improved operating efficiencies and reduced investment after the buyouts. The primary study of interest, by Frank Lichtenberg and Donald Siegel, relies on a different (confidential) source of data, the Census, and Annual Surveys of Manufacturing.[10] Using a much larger sample than other researchers, they found that LBO firms have higher total factor productivity after the buyouts than before them and higher total factor productivity than do other firms in their industries. The LBOs achieved this by a substantial reduction in the nonproduction work force (about 9 percent), while the production work force declined very slightly. The R&D of firms involved in buyouts was about 1 percent of sales, whereas that for the average large firm in the sample was 3.5 percent of sales. Thus, the difference in R&D intensities between the two groups of firms became slightly larger, but not significantly so, after the buyouts.

[9] Steven N. Kaplan, "Management Buyouts: Evidence on Post-Buyout Operating Changes," unpub. MS, University of Chicago Business School, 1989; and Lichtenberg and Siegel, "Effects of Leveraged Buyouts on Productivity."

[10] Lichtenberg and Siegel, "Effects of Leveraged Buyouts on Productivity."

Both Steven Kaplan and Abbie Smith report studies of large management buyouts (MBOs) during the early 1980s; their samples are a subset of the LBOs analyzed by Lichtenberg and Siegel.[11] These studies contain similar findings: there are sharp increases in profitability and cash flow after the buyouts, some cuts in capital expenditures, and much of the gain to pre-buyout shareholders can be identified with tax savings. Both report that R&D is largely immaterial (seven firms report it in the Smith sample, ten to twenty in the Kaplan sample); for these firms there are slight reductions after the buyout.[12]

In financial restructurings that involved no changes in control, I found that those transactions in which a firm moved to a higher debt position showed the most dramatic results of restructuring. There the size of the average decline in R&D intensity was about 0.8 percent of sales (from 3.4 to 2.6 percent) for 1982–87. These results contrast with those for leveraged buyouts, because many of these firms previously underwrote significant amounts of R&D. The result was robust in the sense that it appeared both in a conventional investment equation and in the pre- and post-transaction differences in R&D intensity.[13]

My third finding was less clear; the evidence was mixed as to whether reductions in R&D intensity followed acquisitions in the publicly traded manufacturing sector. Firms that made large acquisitions lost R&D intensity permanently (at least over the horizon for which it can be measured). The mix of firms making acquisitions also shifted toward firms with lower R&D intensities during the 1980s, so that the combined effect produced lower R&D intensities relative to the industry as a whole for post-acquisition firms later in the period. Although the statistical evidence for this decline was weak because of the great heterogeneity in firm behavior, the size of the effect was notable in economic terms: a mean of 3.4 to 2.9 percent for 1982–87. This drop turned out to be

[11] Steven N. Kaplan, "Management Buyouts: Evidence on Taxes as a Source of Value," *Journal of Finance* 44 (1989): 611–32; Kaplan, "Management Buyouts: Evidence on Post-Buyout Operating Changes"; and Smith, "Corporate Ownership Structure and Performance."

[12] The result cited is not actually in the Kaplan papers, which I reference because they describe the data on which the result is based. It was communicated to me privately by Steven Kaplan; it is a measure of the unimportance of R&D in the large-scale MBO sample that he did not mention it in print.

[13] To my knowledge, mine was the only research available at the time this article was written (early 1991), except for a few case studies, that looked at large financial restructurings unaccompanied by a change of control.

a manifestation of the same correlation between increases in leverage and declines in R&D intensity described previously.

Table 2 summarizes the evidence from my earlier paper concerning R&D, acquisitions, and increases in leverage—and includes new results for ordinary investment for comparison that demonstrate clearly that the negative association between leverage and investment is not confined to R&D investment. The data in this table show the results of a conventional investment equation, estimated in levels and in a modified first-differenced form—to control for permanent differences across firms (see the notes to Table 2). The information in the table verifies the main findings I have described: a large negative impact on both kinds of investment from increases in leverage and an insignificant acquisition effect on R&D if leverage changes are controlled for. New is a slight hint of reductions in ordinary investment following an acquisition that is not accounted for by the leverage variables. This effect is measured very imprecisely, however (note the large standard errors in the investment equation), and seems to be somewhat sensitive to the specification (compare the first-differenced results).

The magnitude of the implied association between leverage and investment in Table 2 can be interpreted in this way: suppose a financial restructuring increases a firm's long-term debt by the size of the capital stock ($\Delta B/K = 1.0$). In the year of this event and the two years following, the total reduction in the investment-capital ratio will be 0.05 (the sum of the three coefficients in column 1 of Table 2), and in the R&D–capital ratio it will be 0.018. At the mean levels of these variables (0.11 and 0.038, respectively), these are enormous effects, implying reductions in the rate of investment on the order of 50 percent. Note that the percentage reduction in both types of investment is identical (the elasticities are the same), so there is no bias toward cutting R&D instead of ordinary investment.

Other researchers have examined the aftermath of acquisitions. Lichtenberg and Siegel looked at a very large sample of ownership changes at the plant level that included LBOs (about 10 percent of the sample) and acquisitions, both hostile and friendly.[14] Central office employment was reduced by 16 percent after the change, production employment by only 5 percent, leading to substantial increases in total factor productivity in the wake of these transactions

[14] Lichtenberg and Siegel, "Effect of Ownership Changes."

Table 2
Investment Regressions, 1977–1987
(14,200 observations)

	Ordinary Investment		*R&D Investment*	
Dep. Var.	I/K	Δ(I/K)	R/K	Δ(R/K)
Dep. Var.$_{-1}$	.404 (.008)	−.426 (.008)	.937 (.003)	−.094 (.008)
$(S/K)_{-1}$	.25 (.06)		−.08 (.02)	
$\Delta(S/K)_{-1}$		1.59 (.15)		−.05 (.03)
$(V/K)_{-1}$	3.80 (.13)		1.04 (.03)	
$(V/K)_{-2}$	−1.56 (.14)		−.80 (.03)	
$\Delta(V/K)_{-1}$		4.46 (.15)		.934 (.031)
	Leverage Changes for All Firms			
$(\Delta B/K)_{-1}$	−5.55 (.38)	−10.42 (.39)	−1.71 (.08)	−2.07 (.09)
$(\Delta B/K)_{-2}$	− .29 (.39)	− 7.63 (.44)	− .16 (.09)	− .39 (.10)
$(\Delta B/K)_{-3}$	.90 (.36)	−.76 (.38)	.12 (.09)	− .06 (.10)
	Leverage Changes for Acquiring Firms, Post-Acquisition (Relative)			
Intercept	− .33 (.36)	−1.86 (.38)	−.06 (.09)	− .12 (.09)
$(\Delta B/K)_{-1}$	−2.18 (1.02)	1.54 (1.09)	.18 (.24)	1.08 (.28)
$(\Delta B/K)_{-2}$	−1.33 (1.07)	0.91 (1.14)	−.04 (.25)	.23 (.30)
$(\Delta B/K)_{-3}$	−2.62 (1.33)	1.10 (1.45)	.05 (.32)	.36 (.35)
F–stat (4, 14,200) for acq. effects	9.01	6.00	0.40	4.42
Standard error	8.35	8.93	1.99	1.98

All regressions include year dummies. The dependent variable is measured in percent (100 times the investment-to–capital stock ratio). The numbers in parentheses are the standard errors of the estimated coefficients.

Definitions of variables:

I: Capital expenditures for the firm during the year;

R: R&D expenditures for the firm during the year, set to 0 if immaterial;

S: Sales for the firm during the year;

V: Market value of the firm (debt plus equity). V/K is Tobin's Q.

B: Long-term debt of the firm, adjusted for the effects of inflation, as described in Bronwyn H. Hall, "The Manufacturing Sector Master File: 1959–1987," NBER Working Paper no. 3366, Cambridge, Mass. (1990).

All ratio variables have been trimmed to remove obvious coding errors. The cutoffs used are approximately +/– three times the interquartile range of the data, which are the following numbers:

Variable	*Min*	*Max*
I/K	.005	2.0
R/K	none	1.0
S/K	.3	10.0
V/K	.1	10.0
B/K	.005	5.0
ΔB/K	−5.0	5.0

Table 2 (continued)
Investment Regressions, 1977–1987

Note: Investment equations based on an accelerator model of investment usually include a measure of current output as a proxy for expectations of demand. Those based on the Q theory of investment with adjustment costs include the ratio of the market value of the firm's assets to the book value as a proxy for the expectations of the profitability of the firm's capital stock. The potential existence of liquidity constraints (external finance having a higher cost than internal) also suggests a role for current cash flow or sales in the equation beyond that resulting from demand fluctuations. The equation that I estimated is an eclectic combination of these differing (although not inconsistent) schools of thought. The dependent variable is measured as a ratio both for theoretical reasons (linear homogeneity of the production function and adjustment cost function) and econometric reasons (potential heteroskedasticity of the disturbances in the equation). In the first-differenced form of the equation, I hypothesized that firms are heterogenous in investment rates in ways intrinsic to their technology and unaccounted for by the model. For example, the R&D investment rate in a fast-moving electronics firm may be quite different in a permanent sense from that of a firm in metal fabrication. If this fact is correlated with variables in the regression (such as the market value–book value ratio), the estimated coefficients of those variables will be biased. One possible solution is to estimate the model

$$\Delta y_{it} = \Delta X_{it}\beta + \Delta \varepsilon_{it} \text{ (where } \Delta y_{it} = y_{it} - y_{it-1})$$

rather than

$$y_{it} = \alpha_i + X_{it}\beta + \varepsilon_{it}$$

where i indexes firms and t indexes years of data on each firm, α_i is the "permanent" firm investment rate, y_{it} is the rate of investment for firm i in year t, and X_{it} are the various independent variables.

and echoing the results for my LBO sample. The important finding for present purposes is that R&D employment growth was sustained in the face of steep reductions in nonproduction employment. Another study, looking at the fifty largest mergers from 1979 to 1983 (including thirty-three R&D-performing firms), found that productivity improved, labor costs fell, and investment and R&D rates were maintained.[15] This work also documented the increase in leverage around the time of the mergers but did not distinguish between hostile and friendly acquisitions.

Unlike the previously described research, the interesting study by Sanji Bhagat, Andrei Shleifer, and Robert Vishny focused on hostile takeovers, whether LBOs or not.[16] The authors found that targets in hostile takeovers allocate lines of business to other firms in their particular industry; in other words, raiders act as temporary brokers who help move assets into a higher-valued use. The shareholder gains from such activities stem from 1) tax savings (although the authors found that previous results may be an overestimate, because the debt incurred in these transactions tends to be paid down quickly); 2) layoffs, particularly white-collar, accounting for 11–26 percent of the premium; and 3) in the oil, gas, and timber industries only, reductions in investment.

Study of Industrial Sectors

An examination of the variations across industries that use different technologies may reveal something about the interaction between corporate restructurings and long-term investment. Industries in manufacturing vary in the time they take to develop a new product or process in ways intrinsic to their technology, and we can make use of this fact to gain insight into the changes in investment strategies induced by corporate restructuring.

In this section of the article, I look at two questions: 1) In which industries did substantial LBO and leveraging activity occur? 2) How do the investment regressions presented in Table 2 vary across industries? To find the answers, I divided the manufacturing sector into four groups, guided by Alfred D. Chandler, Jr.'s categorization into high-, stable-, and low-technology sectors, as well as by an

[15] Paul M. Healy, Krishna G. Palepu, and Richard S. Ruback, "Does Corporate Performance Improve after Mergers?" NBER Working Paper no. 3348, 1990.

[16] Bhagat, Schleifer, and Vishny, "Hostile Takeovers in the 1980s."

Table 3
Leveraging Events in Manufacturing by Industry Type, 1977–1987

	High-Tech[a]	*Stable-Tech*		*Low-Tech*	
		Long-Horizon	*Short-Horizon*		*Total*
		All Firms in 1982			
Number of firms	677	408	298	587	1,970
Employment (000s)	6,507	6,130	1,750	5,419	19,806
R&D expenditures (millions 82$)	22,525	14,886	2,181	2,482	42,073
		Leveraged Buyouts			
Number of firms	5	13	22	36	76
Employment (000s)	46.5	42.7	272.0	367.6	728.8
R&D expenditures (millions 82$)	63.8	37.2	285.8	71.2	458.0
Percent industry employment	0.7	0.7	15.5	6.8	3.7
Percent industry R&D	0.3	0.2	13.1	2.9	1.1
		All Going-Private Transactions[b]			
Number of firms	21	43	44	116	224
Employment (000s)	61.7	125.3	370.5	569.7	1,127.2
R&D expenditures (millions 82$)	81.7	69.0	351.3	95.5	597.5
Percent industry employment	1.4	2.0	21.2	10.5	5.7
Percent industry R&D	0.8	0.5	16.1	3.8	1.4
		Leverage Increases[c]			
Number of firms	34	48	25	70	177
Employment (000s)	260.1	640.6	74.5	153.7	1,128.9
R&D expenditures (millions 82$)	525.8	1,283.8	43.0	52.6	1,905.2
Percent industry employment	4.0	10.5	4.3	2.8	5.7
Percent industry R&D	2.3	8.6	2.0	2.1	4.5

[a] The division of the manufacturing sector into high-, stable-, and low-tech sectors follows the definitions of Alfred D. Chandler, Jr., in "Competitive Performances of U.S. Industrial Enterprises since the Second World War," in this issue of the *Business History Review*. Using my roughly two-digit classification from "The Impact of Corporate Restructuring on Industrial Research and Development: Microeconomics 1990," *Brookings Papers on Economic Activity* (Washington, D.C., 1990), 85–135, the sectors are the following:

Table 3 (continued)
Leveraging Events in Manufacturing by Industry Type, 1977–1987

High-Tech:	Pharmaceuticals (except Soap and Toiletries), Elec. Equipment, Electronics, Computing Equipment, Aircraft and Aerospace, Instruments [Note that Chandler includes Chemicals in the high-tech category, for reasons explained on pp. 26–28 of his article.]
Stable-Tech (Long-Horizon):	Chemicals, Petroleum, Primary Metals, Machinery, Autos and Transport Equipment (except Parts), Engines
Stable-Tech (Short-Horizon):	Rubber and Plastics, Stone, Clay, and Glass, Fabricated Metals, Soap and Toiletries, Motor Vehicle Parts
Low-Tech:	Food, Textiles, Lumber and Wood Products, and Misc.

[b] These are leveraged buyouts, plus approximately 150 transactions in which firms were taken private without being identified in the data sources as leveraged transactions. These are generally smaller firms.

[c] A leverage increase occurs when a firm increases its long-term debt in a single year by an amount that is 100 percent or more of the beginning-of-year sum of debt plus equity.

informal assessment of those industries that are likely to have long horizons for project development and those that can move faster.[17] The industrial sectors are listed in the notes to Table 3.

The distribution of leveraged buyouts and large leverage increases across the sectors shown in Table 3 is revealing. First, firms with either stable technology and short horizons or low technology are far more likely to experience an LBO than the others. This tendency may be partly a result of the slightly smaller size of these firms (except some young enterprises in the high-technology sector). This fact, however, supports the idea that to be profitable, leveraged buyouts require a low variation in cash flow and investment strategies.

In addition to the 76 positively identified LBOs in my sample, there were 148 transactions in which a firm was taken private through means not specified by the sources as an LBO.[18] These were generally smaller firms (they averaged 2,800 employees each, whereas LBO firms averaged 9,600), and they probably represented smaller transactions of the same type as a leveraged buyout. I show the totals for these firms plus the LBOs (all going-private transactions) in the third panel of the table. They are clearly quite similar and only reinforce the result: although only 36 percent of total manufacturing employment is in the stable, short-horizon and the low-technology sectors, 83 percent of the employment in firms going private during the period is in these two sectors. Moreover, these firms are even less R&D-intensive than the LBOs alone. For the U.S. manufacturing sector as a whole, R&D investment per employee averages 2,000 1982 dollars; for the firms that were taken private between 1977 and 1987, R&D investment per employee was 500 1982 dollars in the year or two before the transaction.

The second fact of interest is that stable, long-horizon firms were more than twice as likely as firms in the other three sectors to take on huge leverage increases. Moreover, unlike the other sectors, the highly leveraged firms in this group are almost as R&D-intensive

[17] Alfred D. Chandler, Jr., "The Competitive Performance of U.S. Industrial Enterprises since the Second World War," *Business History Review* 68 (Spring 1994): 1-72.

[18] See Bronwyn H. Hall, "The Manufacturing Sector Master File: 1959–1987," NBER Working Paper no. 3366, Cambridge, Mass. (1990), for more detail on data construction. The LBO sample consists primarily of those firms specifically identified by Kaplan, "Management Buyouts: Evidence on Taxes," and Kaplan, "Management Buyouts: Evidence on Post-Buyout Operating Changes," or Kenneth Lehn and Annette B. Poulsen, "Free Cash Flow and Stockholder Gains in Going Private Transactions," *Journal of Finance* 44 (1989): 771–87, as leveraged buyouts.

as the other firms in their sector. This suggests that the pressure to restructure is not uniform across sectors but is concentrated on sectors where investment is necessarily long-term because of its size or complexity and where the technology is not changing fast—the well-known "smokestack" industries.

Table 4 reinforces this view. The hypothesis that the coefficients are the same for all sectors is rejected at conventional levels of significance (see the F-statistics shown in the table). A major reason for rejection of equality for the two types of investment is the difference across sectors in investment behavior following increases in leverage: firms in the stable-technology sectors, particularly those in long-horizon industries, experience larger declines in investment than firms in the high- or low-technology sectors.[19] The higher level of financial restructuring activity in these sectors is therefore associated with declines in investment that are larger than would be predicted solely on the basis of the manufacturing sector as a whole. The post-leverage investment reductions seem to have been concentrated especially in the stable-technology sector in general and in the long-horizon segment in particular.

On the other hand, the declines in R&D following boosts in leverage are nearly the same proportionally and are larger in those sectors where R&D takes a greater share of investment. To the extent that R&D is a proxy for long-term investment, it appears that overall such investment is not being quite as adversely affected as total investment. It is important to remember, however, that the outstanding characteristic of R&D spending patterns is their sluggishness in the face of any kind of change. Note the coefficient of lagged R&D expenditures, which is nearly 1, and by itself explains 90 percent of the variance in R&D expenditures across firms. In view of this slowness to adjust, the declines in R&D spending following build-up of debt loom very large.

[19] Although the regressions could just as well be measuring increases in investment following declines in long-term debt, the results will in fact be dominated by the consequences of increased debt, since 80 percent of these firms experienced an increase in debt in any given year. I checked the result by estimating the regression with separate coefficients for increases and decreases in long-term debt, and found that the two coefficients were insignificantly different from each other, although the coefficient for investment changes following increases in debt was slightly larger in absolute value.

Table 4
Investment Regressions by Industrial Sector, 1977–1987

	High-Tech	*Stable-Tech*		*Low-Tech*	*Total*
		Long-Horizon	*Short-Horizon*		
Number of Observations	3,914	3,583	1,582	4,422	13,501
		Dep. Var. = Ordinary Investment			
$(I/K)_{-1}$	.418 (.016)	.362 (.019)	.239 (.023)	.288 (.017)	.354 (.009)
$(S/K)_{-1}$	1.083 (.217)	.133 (.165)	.741 (.238)	.103 (.126)	.406 (.086)
$(V/K)_{-1}$	1.78 (.18)	2.45 (.26)	2.43 (.35)	1.42 (.23)	2.18 (.11)
$(B_{-1}-B_{-4})/K_{-1}$	−2.82 (.49)	−5.15 (.66)	−3.97 (.73)	−0.77 (.54)	−2.81 (.29)
Standard Error	11.2	8.2	8.5	9.2	9.5
		F (45; 13,441) = 5.3			
%ΔI after 3 S.D. increase in B	−28(5)	−42(5)	−36(7)	−7(5)	−27(3)
		Dep. Var. = Research and Development			
$(R/K)_{-1}$	.927 (.007)	.952 (.007)	.965 (.007)	.977 (.005)	.953 (.003)
$(S/K)_{-1}$	−.252 (.064)	−.032 (.032)	−.019 (.015)	−.031 (.011)	−.100 (.018)
$(V/K)_{-1}$	.033 (.056)	.083 (.054)	.052 (.023)	.081 (.021)	.083 (.025)
$(B_{-1}-B_{-4}/K_{-1}$	−1.55 (.14)	−.743 (.116)	−.207 (.044)	−.184 (.045)	−.904 (.058)
Standard Error	3.33	1.60	0.55	0.81	2.04
		F (45; 13,441) = 10.36			
%ΔR after 3 S.D. increase in B	−24(2)	−24(4)	−13(3)	−19(5)	−27(2)

The last row in each panel of the table gives the percent reduction in investment that is predicted to occur in the year following a three-year increase in the debt-to-capital ratio, which is three standard deviations away from the mean ($\Delta^3 B/K$ approximately unity).

Takeovers, Hostile and Friendly

The historical evidence, consisting of a few large transactions, supports the findings of the large-scale empirical inquiries.[20] There are two major transaction classes: mergers between closely related large firms, which are usually followed by no change or an increase in R&D; and big increases in leverage or a leveraged buyout induced by the threat of a hostile takeover, which are generally followed by cuts in R&D spending.

In the first group are several transactions in the chemical industry. Monsanto acquired G. D. Searle in 1987, after which it supported R&D at the previous level with more emphasis on basic research. Hoechst took over Celanese in 1987 and increased the firm's engagement in long-term R&D. (Although Hoechst is a German firm, the U.S. laboratory remained fairly independent.) Chesebrough-Ponds bought up Stauffer Chemical in 1985. Unilever followed this merger two years later with a hostile takeover; although it disbanded the company, it apparently maintained the previous level of R&D in the remaining divisions. Du Pont Chemical acquired Conoco in 1982. After the acquisition, R&D for the parent firm increased both in amount and as a percent of sales.

The other main transactions in this group are General Electric's acquisition of the Radio Corporation of America (RCA) in 1987 (the main R&D facility, the Sarnoff Laboratory, was donated to SRI, although GE maintained a contract with it), and the Philip Morris acquisition of General Foods in 1985, which was followed by a rebuilding of R&D. These amalgamations were characterized by the closely linked nature of the companies' product lines. The only acquisition in this group that suffered unambiguous R&D reductions was the single unrelated partnership, the merger of Signal (in the electronics-aerospace industry) with Allied Chemical in 1985. This merger was followed by the disbanding of a new venture group and cuts in corporate-level R&D, although overall R&D may not have dropped.

Transactions in the rubber tire and in the stone, clay, and glass industries dominated the second group of transactions, leveraging or

[20] My primary sources for this evidence are Miller, "Do Mergers and Acquisitions Hurt R&D?" and "Effect of Restructuring on Technology Development," and Fusfeld, "Corporate Restructuring," plus testimony at a July 1989 hearing of the Science, Research, and Technology Subcommittee of the House Committee on Science, Space, and Technology.

LBO as a defense against a hostile takeover. Owens-Corning Fiberglas increased its leverage in 1986 as a defense against a hostile takeover attempt; following this move were a reduction in R&D and a general shrinkage of the firm. USG Corporation increased its leverage in 1987, again as a takeover defense, and shortened its R&D horizon from five to six years to three years. Owens-Illinois underwent a leveraged buyout in 1987 to avoid a hostile takeover; after the LBO it placed greater emphasis on R&D. James Goldsmith threatened Goodyear Tire and Rubber in 1987; it restructured by "de-diversification" and leverage and reduced R&D. Carl Icahn threatened Uniroyal in 1985; it responded by forming a joint venture with Goodrich to develop tires and cut its own R&D spending as a result (but its R&D intensity was never high to begin with).

There are two petrochemical companies in this second group. The first is Phillips Petroleum, which increased leverage in 1984 as a defense against a hostile takeover attempt by T. Boone Pickens. The firm made heavy cuts in R&D personnel, although they were not out of line with the shrinkage of the rest of the firm. It did emphasize short-term payoffs, but some analysts regard the previous level of R&D as wasteful and view the Phillips case as a good example of the free cash flow theory at work.[21] The second is Union Carbide, which restructured in 1985 to resist a takeover by GAF Corporation. As part of the restructuring, Carbide sold an R&D facility, but it moved R&D into the divisions and did not reduce its intensity.

Finally, we reach the only two cases that seem to represent hostile takeovers as a threat to high-technology R&D: Datapoint and the Polaroid Corporation. Asher Edelman's hostile takeover of Datapoint in 1985 appears to have been a technology disaster, because customers deserted the firm owing to a lack of confidence in the long-run viability of its technology. The company cut R&D and investment by almost 50 percent. But this is one case where increases in leverage were not the cause; the firm has also remained publicly traded. Because the firm was shrinking, R&D intensity did not fall significantly, and in 1987 Datapoint paid its first dividend. It is unclear whether to interpret this story as a successful shrinkage of an unprofitable technology company or as a failure to invest where good opportunities existed. In the case of Polaroid, aging technology and a high rate of R&D expenditure with little apparent payoff made

[21] See Allan E. Jacobs, "The Agency Cost of Corporate Control: The Petroleum Industry," unpub. MS, Massachusetts Institute of Technology (1986).

the firm vulnerable to hostile takeover attempts. In 1986, Polaroid increased leverage as a defense and reduced R&D intensity slightly, although management still claims that the leverage burden was not the reason for the cuts. Whether the shift in strategy has been successful remains unclear.

In explaining these restructurings (except for Datapoint and Polaroid), one is struck by several facts. First, the friendly mergers mainly involved firms in closely related businesses, and they were seldom followed by cuts in R&D investment. Second, the major reductions in R&D spending occurred when a firm raised its leverage as a defense against a hostile takeover. Third, most of these events took place in a few industries that are not normally thought of as high-technology.[22] In fact, the focus seems to be on what Chandler calls stable-tech industries and, in particular, on the subset for which technological innovation is process-oriented or directed toward cost reduction rather than toward product development. This area is also the focus of the strongest competition from foreign firms with lower costs, and the reason for the pressure on these industries to restructure may well have something to do with overinvestment.

When taken together with the statistical evidence of the previous section, the historical evidence is quite suggestive. It appears that the most negative event for investment was defending against a hostile takeover, which is usually accompanied by a debt-for-equity swap. Takeovers as a whole were frequently friendly, occurring between firms in highly related industries, and not followed by investment reductions. The case-study evidence is also consistent with the industrial sector–level results presented earlier: the market for corporate control and the pressures for reduced investment were centered on the stable-technology sector, particularly on those industries viewed as having long-horizon technologies.

At least for that sector, the capital markets clearly shared the raiders' view that companies' previous investment strategies were misdirected and excessive. (Were this not true, hostile bids would have been too low to change firm strategy.) In this, the takeovers were much like the LBOs and MBOs documented by Steve Kaplan

[22] Note that the case-study evidence ignores a few industries, in particular food and textiles, where substantial restructurings have occurred. These industries engaged in comparatively little investment in R&D, which was the focus of the evidence being collected. Even with a focus on R&D-performing firms, however, the case studies are dominated by firms in medium- or stable-technology, not high-technology, industries.

and Abbie Smith.[23] Except perhaps for doctrinaire adherents of efficient markets, however, the evidence is not persuasive enough to establish that all the investments foregone would have been unprofitable. "The path not taken" is difficult to evaluate.

The finding of reduced investment following leverage increases or takeover threats also agrees with two other pieces of evidence, which attempt to evaluate the frequent claim that the negative impact of mergers and acquisitions extends to firms that are not involved in them (via a kind of demonstration effect).

David Ashmore studied the behavior of thirty-seven potential targets (identified by a financial analyst who published the candidates in Grimm's) relative to a control group of untargeted firms.[24] He found that the targets reduced their R&D- and investment-to-sales ratios and boosted their debt in the year following public identification. The total effects were about 1.6 percent (a fall from 4 to 2.4 percent) in the R&D-sales ratio and 2 percent in the investment-sales ratio. It is unclear from Ashmore's work whether the heavier increases in debt of the potential targets were a combination of many firms with no change and a few with large changes from restructurings or represent a more even distribution of increased debt among the group.

In research that examined the effectiveness of "shark repellents" (anti-takeover legislation) as a test of Jeremy Stein's model of "managerial myopia," Lisa Meulbroek and her co-authors found that firms decreased R&D intensity relative to industry-wide levels after passage of the anti-takover amendment (her sample includes 203 firms, 16 non-manufacturing).[25] This conclusion rejects the theoretical proposition that the existence of protection from takeover will free managers to make long-term investments, although it does suggest that the reduction in R&D investment was part of a package of takeover defenses, which may have included additions to leverage. If it were not part of an anti-takeover strategy, we would expect to see no change in R&D behavior under the null hypothesis. The authors of

[23] Kaplan, "Management Buyouts: Evidence on Taxes"; Kaplan, "Management Buyouts: Evidence on Post-Buyout Operating Changes"; and Smith, "Corporate Ownership Structure and Performance."

[24] David Ashmore, "Examining the Effects of Takeover Pressure on Research and Development Intensity" (Senior Honors Thesis, Department of Economics, Harvard University, 1990).

[25] Jeremy C. Stein, "Takeover Threats and Managerial Myopia," *Journal of Political Economy* 96 (Feb. 1988): 61–80; Meulbroek, et al., "Shark Repellents and Managerial Myopia."

the study did not ask whether the firms' leverage grew at the same time, so we cannot tell whether this result is completely consistent with mine or with Ashmore's.

Focus on "Stable-Tech" Industries

Although the special nature of each firm's situation would lead one to expect wide divergence in the results from each transaction, the striking feature of the evidence on restructurings during the 1980s is its consistency. It is possible to draw a few simple conclusions from the accumulated evidence. First, changes in control occur for a wide variety of reasons, and there is no obvious association between the vast majority of them and long-term investment strategies. At least in manufacturing, many mergers and acquisitions appear to be driven by synergies and related competencies between the acquiring and acquired firms. Whether hostile or friendly, such takeovers are often efficiency-enhancing, at least in the short term: productivity increases, costs fall, and profitability rises following the transaction. They do not necessarily lead to cuts in any kind of investment strategies, although they may induce some needed redirection.

Particularly in the case of hostile takeovers, the evidence suggests that mismanagement of assets, excessive diversification, and possibly existing management's inability or unwillingness to break implicit or explicit contracts with labor or other stakeholders in the firm are more likely motivations than managerial myopia per se. And, for many acquisitions, especially friendly ones, the driving force is simply that the sum is worth more than the parts.[26]

On the other hand, massive changes in financial structure, possibly induced by threats of takeover, appear to be accompanied by reduced investment of all kinds; my regression results and several case studies document this relationship. The same result also holds for financial restructurings accompanied by control changes (such as LBOs and MBOs), but the extreme nature of the takeover transaction militates against its use in industries where long-term investments in innovation are appropriate.

Although the relationship between higher debt levels and

[26] See my results on mergers in Hall, "The Effect of Takeover Activity," and in Bronwyn H. Hall, "Research and Development at the Firm Level: Does the Source of Financing Matter?" unpub. MS, Berkeley, Calif., 1990; Lichtenberg and Siegel on ownership changes; and Bhagat, Shleifer, and Vishny on hostile takeovers.

reduced investment exists for all industries, it is particularly strong in the stable-technology sector and in the petrochemical industry. In fact, a majority of the most significant hostile takeover events in manufacturing have taken place in only a few industries: petrochemicals, rubber, and stone, clay, and glass. The cost-based nature of innovation strategies in these industries suggests that heightened foreign competition from lower-cost producers has been the driving force behind this wave and lends support to Michael Jensen's interpretation of restructuring based on free cash flow theory.[27]

Why have so many manufacturers increased their debt-equity ratios? One possible answer to this question has been well summarized by Margaret Blair, drawing on her work with Robert Litan: tax incentives (debt is a cheaper source of finance than equity) and the agency costs associated with free cash flow have always made it attractive to substitute debt for equity, particularly when investors face better investment opportunities than those presented by the firms whose shares they own.[28] Financial innovations (for example, junk bonds) during the 1980s made the debt-for-equity substitution easier, and the Tax Reform Act of 1981 made it more advantageous.[29] But this reasoning still leaves the origin of these innovations unexplained.

Why did financial and legal changes promoting debt over equity arise during the 1980s and not before? Blair shows that from 1980 onward the net return to capital in manufacturing fell below the real cost (measured by bond returns), after holding far above it for thirty years. This is a clear signal that cash in the manufacturing sector

[27] In the case of the petroleum-refining industry, there is another factor: much of the R&D investment is related to the exploration and development of oil reserves rather than to manufacturing activities. There is some reason to think of this as a special case driven by the expectations of future world oil prices; we may believe that the social return (at a national level) to this type of investment is higher than the private return, but not necessarily for the same reasons as hold for the rest of the manufacturing sector. See Michael Jensen, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review* 76 (1986): 323–29.

[28] Margaret Mendenhall Blair, "A Surprising Culprit Behind the Rush to Leverage," *The Brookings Review* 8 (Winter 1989–1990): 19–26; Blair and Robert E. Litan, "Corporate Leverage and Leveraged Buyouts in the Eighties," in *Debt, Taxes, and Corporate Restructuring*, ed. John B. Shoven and Joel Waldfogel (Washington, D.C., 1990), 43–99.

[29] See Katherine Schipper and Abbie Smith, "Effects of Management Buyouts on Corporate Interest and Depreciation Tax Deductions," *Journal of Law and Economics* 34 (Oct. 1991): 293–341; and Myron S. Scholes and Mark A. Wolfson, "The Effects of Changes in Tax Laws on Corporate Reorganization Activity," *Journal of Business* 63 (Jan. 1990): S141–64, for a discussion of the changes in relative tax rates on debt and equity in the 1981 and 1986 Tax Reform Acts and of their effect on leveraged buyout activity.

should be returned to shareholders rather than invested. She argues that the decline led to greater pressure for financial restructuring in order to tie managers' hands by forcing them to face the real (external) cost of capital rather than the artificially low (internal) cost. This argument implies that the observed financial restructurings, and the investment reductions associated with them, are symptoms of an underlying cause: high interest rates. The culprit is not the restructuring itself, but the shift in relative prices that caused it. Although we may find isolated cases of the apparent elimination of profitable investment strategies, for the most part the investments that have disappeared are those that did not have a sufficiently high expected profitability in the current economic environment.[30]

This is a persuasive argument, and many economists agree with its essential points.[31] But it also raises interesting questions and suggests further avenues for research. First, why did the net return to capital in manufacturing start falling? Is it solely because of increased foreign competition? Or have past failures to invest driven it lower? Second, can the increased cost of capital alone account for a shift toward restructuring and away from investment in some industries, without appealing to a simultaneous fall in the expected return to investment (or marginal product of capital)? Taken together with the cost of capital story, my findings that restructuring pressures and reduced investment were concentrated in certain industries, in particular those with stable technologies, suggest that further research should be directed toward the question of which variable—the cost of capital or the expected return on investment—can better help explain why these industries have experienced greater pressure.[32]

Before leaving this topic, I want to emphasize a question that the evidence does not answer. An important argument in the underinvestment debate is that asymmetric communication between managers and shareholders leads to underinvestment in order to produce higher current earnings. This argument is closely linked to

[30] See Robert N. McCauley and Steven A. Zimmer, "Explaining International Differences in the Cost of Capital: The United States and United Kingdom versus Japan and Germany," Federal Reserve Bank of New York Research Paper no. 8913 (1989), for a more detailed discussion of the impact of the cost of capital on long-term investments.

[31] Blair and Litan, "Corporate Leverage and Leveraged Buyouts in the Eighties."

[32] A major study of this question by Margaret Blair and Martha Schary was published after this article was written. See Blair and Schary, "Industry-Level Indicators of Free Cash Flow," and "Industry-Level Pressures to Restructure," in *The Deal Decade: What Takeovers and Leveraged Buyouts Mean for Corporate Governance*, ed. Margaret M. Blair (Washington, D.C., 1993), 99–135, 149–90.

the hostile takeover debate; as I have argued elsewhere, if the market is myopic in this way, takeovers will be induced that would not be value-maximizing in a world of perfect information.[33] In addition, investment may be reduced or redirected to prevent takeovers. This can occur even in the absence of managerial myopia, and is in fact the principal argument for a policy response to surges in hostile takeover activity.

The difficulty for empirical researchers who use publicly available data to investigate this hypothesis is that the information gap between managers and shareholders is surely only as large as the degree of undisclosed information—and the investment measures easily available to researchers are precisely those that management cannot conceal from investors, reductions undertaken to increase current earnings. Therefore, scholarly and analytical concern should be with redirections of investment toward shorter horizons and perhaps with such actions as skimping on maintenance or canceling long-term R&D projects; but these maneuvers constitute precisely the kinds of behavior that may be difficult for researchers to see. The implication of this argument is that, although the failure to find substantial investment and R&D declines in general following corporate restructuring activity and the well-documented positive announcement effects for both kinds of investment may be reassuring, it will be necessary to look more closely at particular firms before definitively rejecting the market myopia argument.[34]

International Differences

We have learned some important facts about the effects and motivations of restructurings from the research reported here and elsewhere. The results have more often been positive than negative for the firms involved and have frequently confirmed the hypotheses of those who argue that the market for corporate control is an important disciplinary device for managers in the United States. My survey of the evidence, however, has had very little to say about the economy-wide effects of the recent wave of restructurings. Even if

[33] Kenneth A. Froot, André F. Perold, and Jeremy C. Stein, "Shareholder Trading Practices and Corporate Investment Horizons," *Journal of Applied Corporate Finance* 5 (Summer 1992): 42–58; Hall, "Impact of Corporate Restructuring."

[34] J. Randall Woolridge, "Competitive Decline and Corporate Restructuring: Is a Myopic Stock Market to Blame?" *Journal of Applied Corporate Finance* 1 (Spring 1988): 26–36.

the redirection of firm strategies and investment has been profitable for the companies involved, we are still not sure that there is no better path to long-term productivity gains.

We should not be sanguine about the U.S. economic structure and its promotion of long-term investment. Besides the obvious macroeconomic problems that have led to high interest rates and to the subsidy of debt at the expense of equity inherent in the tax system, the atmosphere of insecurity attending the market for corporate control may cause more injury to long-term investment strategies than studies have found to date. Moreover, even if the recent wave of corporate restructuring were not the cause of investment declines, the question would remain whether the market system for corporate control operating in the United States can generate the correct level of long-term investment from the point of view of society.[35] The existence of an active market for corporate control, which appeared well before 1980, may already have created a climate where such investments are discouraged or not valued.[36]

This argument led me to investigate the experience of other large industrial economies in organizing markets for corporate control. Roughly speaking, in the United States and the United Kingdom, takeovers perform an important function in the allocation of corporate control, whereas in Japan, Germany, and France management discipline is not perceived as a major role of the stock market.

A simple way to characterize the difference between the two systems uses Albert Hirschman's exit/voice dichotomy: in the United States and the United Kingdom, shareholders who are dissatisfied with management's performance tend to dispose of their shares, often to a higher bidder who may change the management team or

[35] In this connection, see the recent paper by Duncan Foley and William Lazonick, "Corporate Takeovers and the Growth of Productivity," Working Paper no. 91-01, Barnard College, Department of Economics (1990), which uses an endogenous growth model (a model where innovation spills over to other firms) together with market mispricing of innovative firms to show that lower takeover costs can lead to an equilibrium growth rate for labor productivity that is lower than the one that would be associated with higher takeover costs.

[36] But see the discussion in Hall, "The Impact of Corporate Restructuring," which cites Zvi Griliches, "Market Value, R&D, and Patents," *Economic Letters* 7 (1981): 183–87, Iain Cockburn and Griliches, "Industry Effects and Appropriability Measures in the Stock Market's Valuation of R&D and Patents," NBER Working Paper no. 2465 (1987), Hall, "The Value of Intangible Corporate Assets," Jarrell, Lehn, and Marr, "Institutional Ownership," and Woolridge, "Competitive Decline and Corporate Restructuring," for evidence that the stock market, at least, appears to value R&D investments positively.

otherwise reorganize.[37] In the Japanese and German systems, and to a lesser extent in the French, major shareholders (particularly banks and, in Japan, other firms in long-term relationships with the company in question) tend to keep their shares for a long time, hold seats on the supervisory boards, and voice their opinions when they think that management is not pursuing the right strategy, or when the firm is in financial distress.[38]

Although the level of takeovers appears to be almost as high in Germany and France as in the United Kingdom, the incidence of both hostile takeovers and LBOs is much lower.[39] Julian Franks and Colin Mayer attribute this difference both to Germany's stricter regulations on employment of management and others and to the somewhat weaker shareholder rights in France and Germany. Franks and Mayer also cite wide institutional differences among the three countries, centering on the role of banks in Germany as monitoring organizations. Banks own large shareholdings in other corporations, have voting rights associated with the bearer shares of private investors, and sit on the supervisory boards of German corporations (*Aktiengesellschäften*, or AGs). The banks' role in monitoring firm behavior finds a parallel in Japan.[40]

Franks and Mayer conclude from their study that the use of takeovers as a means of transferring corporate control may be costly, both in the resources expended at the time of the takeover and in

[37] Albert O. Hirschman, *Exit, Voice, and Loyalty: Responses to Decline of Firms, Organizations, and States* (Cambridge, Mass., 1970).

[38] The evidence for this distinction is in J. S. S. Edwards and Klaus Fischer, "Banks, Finance and Investment in West Germany since 1970," Working Paper no. 497, CEPR, London (1991); Franklin R. Edwards and Robert A. Eisenbeis, "Financial Institutions and Corporate Investment Horizons: An International Perspective," unpub. MS (1991); Julian Franks and Colin Mayer, "Capital Markets and Corporate Control: A Study of France, Germany, and the UK," *Economic Policy* 10 (April 1990): 189–232; W. Carl Kester, "Governance, Contracting, and Investment Horizons: A Look at Japan and Germany," *Journal of Applied Corporate Finance* 5 (Summer 1992): 83–98; Colin Mayer and Ian Alexander, "Banks and Securities Markets: Corporate Financing in Germany and the U.K.," Working Paper no. 433, CEPR, London (1990), and Takeo Hoshi, Anil Kashyap, and David Scharfstein, "The Role of Banks in Reducing the Costs of Financial Distress in Japan," NBER, Working Paper no. 3435 (1990).

[39] The United Kingdom has experienced the same explosive growth in LBO activity as the United States, with the total annual value of transactions rising from less than £100 million before 1980 to £3.7 billion in 1988. This tremendous growth has been achieved with a somewhat lower use of debt than in the United States.

[40] Franks and Mayer, "Capital Markets and Corporate Control: A Study of France, Germany, and the UK." On Japan, see James E. Hodder, "Corporate Capital Structure in the U.S. and Japan: Financial Intermediation and Implications of Financial Deregulation," unpub. MS, Stanford University (1985); and Hoshi, Kashyap, and Scharfstein, "The Role of Banks."

the short-term thinking they claim the process engenders. They also argue that "changes in ownership undermine the ability of firms to sustain a reputation for long-term relationships."[41] Alternative institutions for monitoring firms' investment strategies may be preferable to the continuous auction implied by the takeover market, because they would be less costly with respect to the development of long-term relationships and investments.

This conclusion gains some support from Takeo Hoshi, Anil Kashyap, and David Scharfstein, who show that investment at the firm level in Japan is responsive to liquidity (cash flow) when the firm lacks a long-run banking relationship or does not belong to a *keiretsu*, but not otherwise.[42] They interpret this to mean that banks with large shareholdings in firms can monitor them more closely than outside investors, and that the banks' position mitigates the asymmetric information problem arising when firms seek external finance. The authors support this interpretation with a finding that firms in *keiretsu*s or with strong ties to a main bank invest and sell more than other firms when they are in a financially distressed state.

Although Japan and Germany have in common the absence of a strong market for corporate control, the nature of the relationships between firms and their banks differs somewhat. The supervisory role that banks play for large German firms is apparently weak: although banks hold proxy rights for roughly half the shares in the one hundred major AGs, the typical supervisory board meets only twice a year, and the banks hold only 10 to 20 percent of the seats on a board.[43] In addition, unlike their counterparts in Japan, German banks are not a major source of finance for firms. Colin Mayer reports the following percentage shares of bank lending in the net financing of non-financial enterprises in 1970–85: United Kingdom, 7.6; Germany, 12.1; United States, 24.2; France, 37.3; and Japan, 50.4.[44] The German banks appear to be most engaged in the lending

[41] Franks and Mayer, "Capital Markets and Corporate Control: A Study of France, Germany, and the UK," 213.

[42] Takeo Hoshi, Anil Kashyap, and David Scharfstein, "Bank Monitoring and Investment: Evidence from the Changing Structure of Japanese Corporate Banking Relationships," unpub. MS, NBER (1990), and Hoshi, Kashyap, and Scharfstein, "The Role of Banks."

[43] Edwards and Fischer, "Banks, Finance, and Investment in West Germany."

[44] Colin Mayer, "Financial Systems, Corporate Finance, and Economic Development," in *Asymmetric Information, Capital Markets, and Investment*, ed. G. Hubbard (Chicago, Ill., 1990), Table 12.1, pp. 307–32. I have reproduced some of these figures in my Table 5, along with some of my own for U.S. and Japanese manufacturing. Net financing is shown as a proportion of capital expenditures and stock building.

to and monitoring of small and medium-sized firms.[45] The most important feature of the system may not be the actual monitoring performed by the banks, but rather the institutional features of the German system, which make hostile takeovers difficult (and very uncommon). These features include 50 percent representation for employees on supervisory boards, 75 percent approval by the shareholders required for removal of a supervisory board, and five-year appointments of managers.

It would be quite interesting to repeat the Hoshi, Kashyap, and Scharfstein test of differences in liquidity constraints using data on German firms; although an institution analogous to the *keiretsu* does not exist in Germany, there are variations in the extent of bank involvement on the supervisory boards of firms.[46] I am unaware of any current research of this kind, although there has been similar work on data for the United States and the United Kingdom that attempts to measure the importance of liquidity constraints for investment at the firm level by classifying firms into financing regimes based on their policies for issuing dividends and new shares.[47] Although both sets of authors have rejected investment models that do not incorporate liquidity constraints with their data, this work is still too preliminary and fragile to be relied on.

Despite the well-documented differences in the role of banks in monitoring firm behavior across different national institutional structures, the most striking features of these international comparisons are the importance of retained earnings as a source of finance for investment and the unimportance of long-term bonds (except in the United States, where one-third of the debt is in bonds). In Table 5 I have assembled some numbers (both from my own data and from those of other researchers) that describe the marginal sources of finance in four countries for the non-financial corporate sector as a whole and for approximately the one hundred largest manufacturing firms in each country.

My attempt to compute these numbers for Japan and the United States revealed that inconsistencies in accounting methods across countries can render this comparison extremely difficult to make.

[45] Mayer and Alexander, "Banks and Securities Markets."

[46] Edwards and Fischer, "Banks, Finance, and Investment in West Germany."

[47] Bronwyn H. Hall, "Research and Development Investment at the Firm Level: Does the Source of Financing Matter?" unpub. MS, University of California, Berkeley, and ENSAE-CREST (1991); Stephen Bond and Costas Meghir, "Dynamic Investment Models and the Firm's Financial Policy," Working Paper no. W90/17, Institute for Fiscal Studies, London (1990).

Table 5
Sources of Investment Financing

	United States	*United Kingdom*	*Japan*	*West Germany*
	Gross Sources: Non-Financial Corporate Sector			
Period	1970-85	1970–85	1970–85	1970–85
Ret. Earn.[a]	66.9	72.0	33.7	55.2
New Debt	41.2	25.0	62.1	24.0
New Equity	0.8	4.9	3.5	2.1
Other	–8.8	–2.0	0.7	18.6
	Net Sources: Non-Financial Corporate Sector			
Period	1970–85	1970–85	1970–85	1970–85
Ret. Earn.	85.9	102.4	57.9	70.9
New Debt	34.6	5.4	41.3	9.0
New Equity	1.1	–3.3	4.6	0.6
Other	–21.5	–4.4	–3.8	19.4
	Gross Sources: Largest 100 Firms[b]			
Period	1982–87	1982–88	NA	1982–88
Ret. Earn.	51.5	58.2		89.6
New Debt	30.2	27.5		2.2
New Equity	10.1	14.3		8.2
Other	8.1	NA		NA
	Net Sources: Largest 100 Firms[b]			
Period	1982–87	1982–88	1982–86	1982–88
Ret. Earn.	79.1	112.9	50.9	137.9
New Debt	3.2	–1.6	19.0	–27.8
New Equity	3.1	–11.3	30.0	–10.2
Other	14.6	NA	NA	NA

[a]The variables' definitions vary somewhat across different countries because of different accounting conventions. All variables are shown as percentages of the total in any given column.

[b] In the U.S. and Japanese data, these are the (approximately) one hundred largest manufacturing firms. For the U.K. and German data, these are the one hundred largest non-financial corporations. Source: OECD *Financial Statistics*.

For example, I am unable to determine gross debt and equity changes from the available Japanese data, which do not identify a full statement of changes in financial position. In the U.S. data for most firms, the net sources and uses of funds do not equal zero, even approximately, which means some sources or uses are overlooked. Also in the United States, a large fraction of net finance does not come from conventional sources, but rather from the net sale of investment and plant and equipment, as well as from the "other"

category. This fraction grew during the 1970s and 1980s, another symptom of the restructuring and divestitures that were taking place.

In addition to the importance of retained earnings as a source of funds in all countries, the second feature that stands out in Table 5 is that, for the non-financial corporate sector as a whole, the pattern of financing in the United States looks more like that of Japan than that of the United Kingdom: the United States and Japan rely far more heavily on debt than do the United Kingdom and Germany. If that is true, the fact that *average* incremental financing proportions reveal no dichotomy between the United States and the United Kingdom on the one hand, and between Japan and Germany on the other suggests that the story is not a simple one. Were it merely the case that U.S. firms could not finance investment externally, we would expect the financing proportions to differ. But in fact the United States looks more like Japan, except that the larger proportion of financing comes from new equity instead of new debt.[48] For differences, we must look to the uses of funds rather than to the sources. Here I am hampered by the incompleteness of the Japanese data, although the German data suggest that far less of the money there goes to finance acquisitions than in the United Kingdom.[49]

So the international evidence, though incomplete, puts us back where we started: there is the strong impression, but little hard evidence, that long-term investment strategies are difficult to implement in an environment where managers fear losing their jobs or firms if they experience poor returns for a couple of years. The primary evidence of a better way is Japan, but it does not seem realistic to argue that, if shareholder rights were reduced in the United States without any other changes, investment strategies would be significantly affected. There are surely other reasons why Japan is different.

Conclusions and Policy Implications

The evidence assembled here indicates that, if corporate restructuring discourages investment, it does so by increasing the cost of funds

[48] Another piece of evidence on this question is the payout ratio, the fraction of zero-dividend operating income paid out as dividends. Mayer and Alexander, "Banks and Securities Markets," report that this number averages 13 percent for large German non-financial corporations and 31 percent for the United Kingdom. In my U.S. sample, the number is almost exactly the same as that for Germany.

[49] Ibid.

to the firm in order to force managers to pay out cash, and not by a change of control alone. That is, to the extent we are able to judge from observable behavior, many restructurings in the U.S. manufacturing sector in the last ten years have had no impact on investment strategies, whereas others, particularly in the stable-technology sector, have clearly been induced by the twin desires to use a cheaper source of finance (debt) and to reduce investment in unprofitable sectors in the face of high capital costs. Such activity is privately rational in a world with high interest rates and subsidy of debt relative to equity. The question remains, is it socially rational? Should the United States introduce policies designed to inhibit such behavior?

I do not believe that the evidence on investment horizons and corporate restructuring implies or justifies strong policy recommendations. The market for corporate control is an important disciplinary device on management, and the reduction of shareholder rights by anti-takeover legislation without the substitution of an alternative supervisory mechanism would be likely to allow firms to diverge even further from the path of private (or public) value-maximization.

Managers, as a class, are no more likely to incorporate the social welfare function in their planning than shareholders are. To put it another way, although the Japanese or German systems of corporate governance may perform better in the dimension of extending investment horizons, I do not think that halfway measures or partial moves in that direction would be successful in producing the desired result, and a wholesale installation of their entire bank-monitoring and interlocking corporate system in the United States is simply not feasible for complex historical, legal, and political reasons.[50]

On the other hand, this article has highlighted two features of the U.S. economy that seem to have boosted the incentives to increase leverage and reduce investment in the recent past: the implicit bias in the corporate tax system toward debt finance, and the level of interest rates (or the cost of capital) during the 1980s. Both the modern theory of corporate capital structure and the evidence presented here suggest that the tax effect will tilt the firm toward the

[50] One institutional change that has some merit is a relaxation of the restrictions on shareholding by banks. See Edwards and Eisenbeis, "Financial Institutions and Corporate Investment Horizons."

use of more expensive external finance for investment, and the interest-rate effect will reduce both the level and the horizon of that investment.

It is therefore toward these prices, not toward institutional structures, that I would direct policy attention. Institutional structures are of course important, but they are extremely difficult to modify in ways whose results are predictable and without incurring heavy transaction costs. Moreover, there is evidence that the Japanese and Germans are moving toward corporate finance and governance systems that look more like those of the United States, which suggests that some sort of hybrid system is better, at least on evolutionary grounds.[51]

To refine these policy conclusions further, future research on this topic should be conducted in several areas, and several questions should be probed more thoroughly. With the existing data, it should be possible to refine the investigation of major leveraging events, now that they have been identified as associated with the majority of investment declines. First, the identification of such events and their causes (such as takeover threats) could be greatly improved. Second, the consequences of reductions in or other redirections of investment ought to be examined over a longer term than has been done to date; we will soon have available nearly a decade of data about restructurings that occurred during 1984–86.

A second area of investigation centers on the results in Tables 3 and 4, which call for a more detailed industry-level investigation of certain sectors that evidently experienced the most pressure from restructuring. Does the cost-of-capital approach explain what happened in these sectors? Are the surviving firms stronger? What has happened to their investment strategies? To the extent possible, this research should also address the "unobservable investment" question in more detail.

Finally, the empirical evidence on international comparisons has barely scratched the surface of the unanswered questions. Neither comparisons of the sources and uses of funds, which seem to suffer from severe measurement difficulties, nor the national differences among the roles of banks in monitoring firms seem to be completely understood; and little work has been done to relate the existing

[51] Kester, "Governance, Contracting, and Investment Horizons"; Hoshi, Kashyap, and Scharfstein, "Bank Monitoring and Investment"; and Hodder, "Corporate Capital Structure in the U.S. and Japan."

research to investment strategies across companies at the firm level.[52] Further work of this kind would shed more light on the optimal form of corporate governance systems.

[52] Compare the conclusions in Franks and Mayer, "Capital Markets and Corporate Control: A Study of France, Germany, and the UK," with those in Edwards and Fischer, "Banks, Finance, and Investment in West Germany" (concerning the role of banks in Germany); on Japan, see the two papers by Hoshi, Kashyap, and Scharfstein.