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**M&A AND R&D:
IS CORPORATE RESTRUCTURING
STIFLING RESEARCH AND DEVELOPMENT?**

Address to

National Academies of Sciences and Engineering
Academy Industry Program
of the
National Research Council

October 11, 1989

Joseph A. Grundfest
Commissioner

*The views expressed herein are those of Commissioner Grundfest and do not necessarily represent those of the Commission, of other Commissioners, or of the Commission's staff.

Summary

How is the current wave of corporate restructuring affecting America's R&D initiative? In an address to the National Academy of Sciences Academy Industry Program's symposium on Corporate Restructuring and Industrial Research and Development, Commissioner Grundfest considers this question in light of the available economic and financial evidence and reaches a conclusion at odds with much of the common wisdom in this area.

Commissioner Grundfest points that the greatest impediment to long-term R&D in the United States has absolutely nothing to do with restructuring. It is a cost of capital at least twice as high as Japan's that makes it expensive and risky for any U.S. firm to engage in long-term R&D. U.S. industry has also failed in its efforts to commercialize technology it has developed. "All too often the United States stands at the cutting edge of R&D only to watch Japanese and other foreign firms earn the lion's share of profits. This is not smart R&D. This is charity R&D that does a disservice to the corporation, to its stockholders, and to its scientists. . . ."

Shutting down restructuring activity will not invigorate U.S. R&D efforts. The vast majority of restructuring takes place in industries and among firms that do little if any R&D. "Bloomingdales didn't do much R&D before its takeover and it hasn't done much since." Moreover, even in situations in which restructured firms do engage in meaningful amounts of R&D, restructured firms tend to conduct less R&D than other firms in the same industry. Thus, it is the R&D laggards that are being restructured, not the R&D leaders.

The evidence on R&D expenditures following restructuring is mixed. Most studies find no decline in spending, and there is anecdotal evidence of increases in R&D budgets following certain takeovers and LBOs. A recent NSF study finds evidence of a decline in R&D expenditures following restructuring. Some of this decline may, however, be attributable to increased efficiency and elimination of nonproductive or duplicative R&D efforts.

Commissioner Grundfest also responds to critics who claim that the stock market invariably penalizes R&D expenditures. He points out that the market capitalization of Merck, an R&D intensive pharmaceutical firm in one of the most R&D intensive industries in the world, is greater than the market capitalization of General Motors. In addition, studies demonstrate that stock prices increase on average after announcements of increased R&D budgets and that the market has supported expensive long-term R&D projects, even though they have failed. Thus, the market appears to form its own views of the value of R&D projects and friction arises when the market's assessment of an R&D project is not as optimistic as management's.

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Joseph A. Grundfest*

It is an honor and privilege to be invited to address this distinguished gathering at the National Academy of Sciences. The privilege is particularly great because it affords an opportunity to consider a topic of substantial national concern: the relationship between America's research and development efforts and the growing wave of restructuring activity now sweeping our corporate sector.

It probably comes as little surprise that hordes of critics stand ready to condemn corporate restructuring in the United States as bad for workers, harmful to local communities, damaging to U.S. international competitiveness, and threatening to the financial stability of the U.S. economy.¹ The most damaging allegation against corporate restructuring may, however, be the charge that it stifles corporate R&D and forces management to

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¹See, e.g., M. Lipton, Corporate Governance in the Age of Finance Corporatism, 136 U. Pa. L. Rev. 1 (1987); L. Lowenstein, Management Buyouts, 85 Colum. L. Rev. 730 (1985); LBO's: Friend or Foe of Industrial Research?, 31 Research & Development 13 (Apr. 1989); What Are LBO's Doing to R&D?, Chemical Week, Feb. 15, 1989, at 26; Thurrow, U.S. Can't Compete if Finance Continues as the Master of Industry, L.A. Times, Nov. 17, 1985, Pt. 5, at 3.

adopt irrationally myopic strategies.² To my mind, this allegation is the most serious potential indictment because, if true, it suggests that restructuring is eroding America's industry at the point where it is most vulnerable: at its knowledge base.

The reality of today's marketplace is that a firm's knowledge capital measured in terms of its know-how, technical expertise, trade secrets, patents, productive processes, and accumulated research and development efforts is often far more important than its physical capital measured in terms of bricks and mortar, lathes, delivery trucks, or power plants.³ More and more, capital exists as software that is invisible to the eye rather than hardware that we can touch or feel. This knowledge capital is not easily inventoried by accountants or valued by appraisers. In many situations, it is not even easily described. Yet, while knowledge capital cannot easily be measured, without it our economy surely will not thrive.

Unfortunately, when it comes to evaluating our stock of knowledge capital the indications for the U.S. economy are quite

²See, e.g., J. Stein, Takeover Threats and Managerial Myopia, 96 J. Polit. Econ. 61 (1988); P. Drucker, A Crisis of Capitalism, Wall St. J., Sept. 30, 1986, at 32, col. 3; "Long-Term" Bandwagon Hot, Pensions & Investments Age, May 1, 1989 ("Business executives have argued that short-term pressures placed on many managers force . . . [executives] to take a short-term view.")

³See, e.g., B. Hall & F. Hayashi, Research and Development as an Investment, Nat. Bur. Econ. Res. Working Paper No. 2973, May 1989, at 2, 33.

depressing. At the most elementary level, our school children do not read, write, or add as well as school children in our strongest economic competitors.⁴ The test scores of entering college classes are in a long-term decline, having peaked in 1963 and having recovered only slightly from a 1980 trough.⁵ The adult literacy rate is a national disgrace.⁶ The educational situation in our country is in such shambles that many companies have to provide remedial literacy and arithmetic training on the job just so that they can have a work force competent to operate an efficient production process.⁷

The time has passed for the production line worker who knows only how to turn a wrench or drive a screw. Technology will not create high-paying, high-quality jobs for a nation of illiterates

⁴See A. McLaughlin, Education and Work: The Missing Link, N.Y. Times, Sept. 25, 1989, at A19, col. 1.; Vagelos, The Sorry State of Science Education, Scientific American, Oct. 1989 at 128.

⁵See L. Feinberg, Student's Scores Drop in Test of Verbal Skills, Wash. Post, Sept. 12, 1989 at A18. See also Aptitude Test Scores Drop for Women and Minorities, L.A. Times, Sept. 11, 1989 at A2, col. 3.

⁶See A. McLaughlin, Education and Work, supra n. 4, ("Between 20 million and 40 million adults today have literacy problems"); S. Knell, An Investment in Human Betterment--Adult Literacy, Chi. Tribune, Sept. 18, 1989, at C13 ("There are an estimated 20 million to 30 million [illiterate] adults in the United States"); M. Spencer, Why Won't Johnny Learn? Look in the Mirror, L.A. Times, Sept. 9, 1989, at Part 9, page 1, col. 1 ("adult illiterary [is] running at a 20% rate").

⁷See J. Berger, Skills v. Jobs: The Classroom Mismatch, N.Y. Times, Sept. 26, 1989, at A1, col. 2; C. Skrzycki; The Company as Educator: Firms Teach Workers to Read, Write, Wash. Post, Sept. 22, 1989, at G1.

who cannot add. Until we turn this situation around, and start educating a work force smart enough to master the demands of modern production technology, it is hard to understand how we can expect to make progress against competitors who can read operating manuals that we can't and perform statistical analyses that we don't understand. Viewed from the shop floor, that's the cold reality of the world we face today.

Viewed from the corporate boardroom, our comparative situation may not be much better. Although corporate spending on research and development climbed steadily at an inflation adjusted rate of 5.8 percent per year in the decade preceding 1986, aggregate corporate spending on R&D has slowed substantially since then.⁸ When these figures are adjusted to reflect R&D/sales ratios and inflation the recent slowdown in aggregate R&D expenditure may not appear quite as foreboding.⁹ However,

⁸See, e.g., Testimony of Erich Bloch, Director, National Science Foundation, Before the House Ways and Means Committee, March 14, 1989, at 2 (hereinafter cited as "Bloch Testimony"); Business Talks a Better R&D Game Than It Plays, Bus. Wk., Aug. 21, 1989, at 20 (economists estimate that real outlays on research and development will increase by less than 1% in 1989, compared with 1.3% in 1988 and 3.7% in 1987); R. Cassidy, Research Funding for 1989 Won't Even Reach \$131 Billion, Research & Development, Jan. 1989, at 47; R. Winter, Research Spending in U.S. to Slow in 1989, Wall St. J., Dec. 21, 1988, at B3, col. 1.

⁹K. Flamm, Industrial Research and Corporate Restructuring: An Overview of Some Issues, September 1989, at 4-5 ("In the face of a declining sales base in 1985 and 1986, the relative size of the research efforts of American R&D-performing companies increased. When sales picked up in 1987, the interest of these companies' research efforts decreased.")

once we compare U.S. research expenditures with our Japanese and West German competitors, the picture turns dim again.

Non-defense corporate spending on research and development in the United States stood at about 1.9 percent of GNP as of year-end 1987.¹⁰ In Japan, the comparable measure of R&D spending ran at 2.7 percent of GNP and in West Germany it stood at 2.6 percent of GNP.¹¹ Most ominous, perhaps, is the fact that Japanese commercial R&D expenditures are growing at a far faster rate than U.S. expenditures for the same purpose.¹² Thus, not only are we falling behind at the most elementary levels of our knowledge base, if the trajectory of R&D expenditures as a percentage of GNP is a harbinger of future trends, then it appears that we may also be falling behind at the most advanced levels of our knowledge base.

¹⁰United States Department of Commerce, Statistical Abstract of the United States, 1989 at 578, Table 973 ("Statistical Abstract"); Missed Opportunities: R&D--A Bigger Push in Japan, Wall St. J., Nov. 14, 1988, at R21, col. 3. See also Clark & Malabre, Slow Rise in Outlays for Research Imperils U.S. Competitive Edge, Wall St. J., Nov. 10, 1988, at A1, col. 6. For purposes of the present analysis I am focussing on non-defense R&D because it is unlikely that restructuring activity has a meaningful effect on defense R&D spending levels. In addition, non-defense R&D expenditures are more directly related to the economy's international economic competitiveness than military R&D expenditures. See, e.g., Reich, The Quiet Path to Technological Pre-eminence, Scientific American, Oct. 1989, 41, 44 ("Several factors impede technology transfer from military to commercial applications . . . military R&D has become an inefficient means of generating commercial spin-offs. . . .")

¹¹Statistical Abstract, supra n. 10; Missed Opportunities, supra n. 10.

¹²Missed Opportunities, supra n. 10, at R22.

Simply put, we are in deep trouble. If we don't invest in our knowledge base--both at the top and at the bottom--we are going to lose out in the battle for international economic competitiveness. The question is not if we will lose out; the only question is when.

Faced with this serious predicament, wouldn't it be wonderful if we could find a quick, simple, and popular cure for at least part of this problem! Wouldn't it be wonderful if we could establish that corporate restructuring has become a millstone around the neck of America's R&D efforts! Wouldn't it be wonderful if we could just stop all this restructuring and thereby restore at least part of America's R&D vitality!

Yes, it would be wonderful, but it wouldn't be true. The best available evidence suggests that corporate restructuring has relatively little to do with our declining international position in the R&D race. Thus, even if we placed substantial constraints on takeovers, leveraged buyouts, spinoffs, stock-buybacks, leveraged recapitalizations, and other forms of corporate restructuring, I doubt that we would accomplish much, if anything, to restore the vitality of America's R&D efforts. The facts that lead me to this conclusion are not pretty, but with your indulgence I'd like to review them in some detail.

The Cost of Capital

If corporate restructuring is not a major cause of the relative decline in U.S. research and development activity then

what is? One need not search hard or long for the answer to this question because the primary culprit is, I think, quite clear: it is the cost of capital.

The evidence is overwhelming that the cost of capital for R&D projects in the United States is far higher than it is in Japan or West Germany. Because our capital costs are far higher, it is more expensive to conduct R&D in the United States. Moreover, because our capital costs are higher, the projects we conduct must have faster payoff periods, and we cannot afford to undertake projects as risky as projects conducted in Japan or West Germany.

Just how much higher are our capital costs than Japan's or West Germany's? Recent estimates by staff of the Federal Reserve Bank of New York are truly frightening.¹³ After adjusting for inflation, tax rates, and other factors, the New York Fed study suggests that in 1988 the average annual effective cost of capital in the United States for a benchmark R&D project was 20.3 percent. The cost of capital in West Germany for the same benchmark project was 14.8 percent, and in Japan it was only 8.7 percent.¹⁴ Thus, capital for R&D purposes is now more than twice as expensive in the United States as in Japan. Unfortunately,

¹³R. N. McCauley and S. A. Zimmer, Explaining International Differences in the Cost of Capital, Federal Reserve Bank of New York, Quarterly Review 7, 16 (Summer 1989).

¹⁴Id.

the conclusion that U.S. capital costs are higher than foreign capital costs is borne out in several recent studies.¹⁵

These cost of capital figures are consistent with calculations of required breakeven periods for capital projects in the United States and Japan. For example, a recent Stanford study suggests that capital costs in the United States imply an average breakeven period for new investment projects of 5.7 years. In contrast, lower capital costs in Japan push the Japanese breakeven period out to 10.3 years.¹⁶ Under these circumstances, an eight-year research project that seems perfectly reasonable to a Japanese manager may be totally out of the question for a U.S. manager--not because the American lacks the wisdom, vision, or will, but simply because Americans can't rationally bear the cost of capital.

¹⁵B. D. Bernheim and J. Shoven, Taxation and the Cost of Capital: An International Comparison in C. E. Walker and N. A. Bloomfield, The Consumption Tax: A Better Alternative? (1987) at 78. Bernheim and Shoven's estimates indicate that the cost of capital calculated at the average interest and inflation rates for the 1980's, using 1985 tax codes, was 5.48 percent in the United States, 4.39 percent in West Germany, and only 2.76 percent in Japan. In addition, G. Hatsopoulos and S. Brooks, "The Gap in the Cost of Capital: Causes, Effects, and Remedies," in R. Landau and D. Jorgenson, Technology and Economics Policy (1986) estimate that the cost of capital in the U.S. is almost three times higher than in Japan. For other estimates see A. Ando and A. Auerbach, The Cost of Capital in the United States and Japan, 2 J. Japanese and Int. Economics 134 (1988); A. Ando and A. Auerbach, "The Corporate Cost of Capital in Japan and the United States: A Comparison", J. Shoven, Government Policy Towards Industry in the United States and Japan (1988); Corcoran and Wallich, The Analytical Economist: The Cost of Capital, Scientific American, Oct. 1989, at 79.

¹⁶Bernheim & Shoven, supra n. 15. See also L. Richman, How Capital Costs Cripple America, Fortune, August 14, 1989, at 50.

The implications of these high capital costs were well explained by Carl Ledbetter, formerly the president of ETA, the supercomputer division of Control Data that was recently shut down in response to competition from Hitachi, Fujitsu, NEC, and others.¹⁷ As Mr. Ledbetter put it, "If our capital costs had been lower, ETA could have survived."¹⁸ Touché.

If our capital costs were half of what they are today, our research and development efforts would mushroom. With lower capital costs we too could afford to be much more patient in waiting for R&D efforts to pay off; and we too could afford to take risks that are just too far-fetched when you're facing a hurdle rate of return of 20 percent per year.

The key then is to identify the cause of high capital costs in the U.S. markets and strike at those economic factors. The most recent evidence suggests that our capital costs are higher than Japan's predominantly because our savings rate is lower and because we have less macroeconomic stability as reflected in the volatility of price levels and interest rates.¹⁹ There is little or no support for the idea that corporate restructuring is a meaningful cause of high capital costs in the United States.

¹⁷Richman, supra n. 18, at 50.

¹⁸Richman, supra n. 16, at 50.

¹⁹See, e.g., McCauley and Zimmer, supra n. 13 ("Higher household savings in Japan and Germany and more successful policies for maintaining stable growth in Japan and stable prices in Germany have opened up the [capital cost] gap.")

Thus, even if we shut down all corporate restructuring activity we would still have a substantially higher cost of capital and we would still find ourselves falling behind Japan in the international R&D race. Moreover, if one wants to attribute causality, I think the better argument is that the high cost of capital in the U.S. causes both a decline in relative R&D intensity and an increase in corporate restructuring activity.²⁰ Restructuring and R&D are thus codetermined by interest rates and restructuring does not, in and of itself, determine R&D intensity. Put another way, increased restructuring activity does not cause a decline in R&D activity any more than an increase in R&D activity would cause a decline in restructuring.

Addressing this problem will not be easy. To bring down the cost of capital we must increase our domestic savings rate and restore macroeconomic stability over a substantial period of years. That's nowhere near as exciting, dramatic, or simple as putting an end to corporate restructuring, but I'm afraid that this painful prescription is the only one likely to do meaningful good.

²⁰High capital costs imply a greater scarcity value for capital. This higher price of capital suggests that the market will be less tolerant of managements that fail to earn adequate returns. Corporations that accumulate "free cash flow," *i.e.*, cash flow that could be reinvested outside the corporation more profitably than it can be reinvested in the corporation, are wasting valuable capital and are potential subjects for restructuring. See, e.g., Jensen, *The Agency Cost of Free Cash Flow*, 76 Amer. Econ. Rev. 490 (May 1986).

The Argument Beyond Capital Costs

Having argued that capital costs explain the lion's share of the R&D problem facing American industry, I could end right here and suggest that we stop blaming corporate restructuring for something that isn't its fault. While this approach has the virtue of being concise, it suffers from the vice of overlooking much additional evidence exploring the relationship between restructuring and R&D. To develop this perspective more fully, let's proceed on the obviously unrealistic assumption that capital costs have nothing to do with the R&D decision, and let's explore the evidence that focuses narrowly on the relationship between restructuring, stock market valuation, research and development activity, and the alleged myopia of America's capital markets.

The Sectoral Incidence of Restructuring Activity

If corporate restructuring activity truly has a major impact on aggregate R&D expenditures, we would expect to find that corporate restructuring occurs with some frequency in industries that engage in significant amounts of R&D. The data, however, fail to support this hypothesis. As explained by Professor Lawrence Summers of Harvard University, Governor Dukakis' chief economic adviser during his recent presidential campaign, "[m]ost LBOs occur in mature industries that do not spend a lot on research, so there is not yet much evidence to support claims

that R&D is severely cramped by LBOs."²¹ Indeed, most restructuring takes place in industries that are not R&D intensive, so the point extends beyond simple LBO transactions.²²

This observation can be made much more simply:

Bloomington didn't do much R&D before its takeover and it hasn't done much R&D since. The same holds true for takeovers, buyouts, and restructurings involving companies like Beatrice, United Airlines, Stop N' Shop, Allied Stores, Avin, Storer Cable, Columbia Pictures, Burlington Industries, and hundreds of others engaged in non-R&D intense lines of business. Indeed, an examination of all takeovers in 1988 suggests that more than 75 percent of the dollar value of M&A transactions occurred in industries such as retailing, food products, broadcasting, and insurance in which R&D is not perceived as a major competitive factor.²³

Measures aimed at hobbling takeovers and buyouts in the name of protecting America's R&D effort are therefore clearly overbroad because they would impose substantial restrictions on transactions that have nothing to do with R&D. Indeed, Professor Frank Lichtenberg of Columbia University has suggested that

²¹L. Summers, LBO Debt and Taxes, Across the Board, Vol. XXVI, No. 4, Apr. 1989, at 53, 54.

²²See, e.g., B. Hall, Leveraged Buyouts, Corporate Debt, and R&D Investment: Is There Any Connection? (work in progress, version of Sept. 1989) at 6.

²³1988 Profile; Merger Activity by Industry Area, Mergers and Acquisitions, at 54 (May/June 1989).

managers and administrators who typically lose jobs following restructurings may be raising false alarms about the general effects of takeovers on R&D.²⁴ Thus, the R&D argument may make good PR in the campaign against restructuring, but it is totally irrelevant to the large majority of restructurings where the argument might be applied.

R&D Intensity of Restructuring Targets

But suppose we pursue the argument further and eliminate from consideration companies like Bloomingdales where R&D isn't a meaningful issue. What then do we find? This question can be posed two ways. First, what difference is there in the R&D intensity of restructuring targets prior to restructuring activity--do they conduct more or less R&D than their industry peers? Second, what difference is there in R&D intensity of firms that have been restructured--do they conduct more or less R&D after the restructuring than before? Posed either way, the answer to the question is fascinating and again fails to support the argument that restructuring is a primary factor hobbling U.S. research and development activity.

Let's look first at the data describing the pre-restructuring R&D intensity of firms that conduct a meaningful amount of R&D. A recent study by economists at the SEC's Office

²⁴Testimony of Frank R. Lichtenberg in hearings on "Corporate Restructuring and Its Effects on R&D" before the Science, Research, and Technology Subcommittee of the House Committee on Science, Space, and Technology, July 13, 1989, at 2.

of Economic Analysis found that on average "takeover targets undertake less R&D than non-targets in the same industry."²⁵ This result is hardly novel and reaffirms earlier consistent findings at the SEC,²⁶ at Harvard,²⁷ and at the National Bureau of Economic Research that also show that much of the takeover activity in the U.S. market was directed "toward firms and industries that were relatively less R&D intensive and had a weaker technological base."²⁸

The implications of this result are quite significant. If companies that engage in above average amounts of R&D are setting themselves up to be targets of restructuring activity then we should find that, within industries, takeover activity is targeted at high R&D intensity firms. Instead, the data support exactly the opposite conclusion and it appears that industry laggards who fail to do as much R&D as their counterparts are more likely to be takeover targets than the industry's takeover leaders. Thus, the image of America's R&D leaders as being under

²⁵L. Meulbroek et al., Takeover Threats and Research & Development: Testing Stein's Model of Managerial Myopia, at 6 (1989), J. Polit. Econ. (forthcoming).

²⁶Securities and Exchange Commission, Office of the Chief Economist, Institutional Ownership, Tender Offers, and Long Term Investment, 1985.

²⁷S. Addanki, Innovation and Mergers in U.S. Manufacturing Firms: A First Look, Department of Economics, Harvard University, 1985 (cited in Hall, supra n. 22.)

²⁸B. Hall, The Effects of Takeover Activity on Corporate Research and Development at 93, cited in A. Auerbach, Corporate Takeovers: Causes and Consequences (1988).

the restructuring gun appears to be at odds with at least one large and inconsistent fact. The companies feeling the heat from restructuring activity appear to be those that have failed to invest as much in R&D as their industry counterparts--not the other way around.

R&D Changes After Restructuring

Having established that the bulk of restructuring activity occurs in industry segments that are not R&D intensive, and that the targets of restructuring activity tend to do less R&D than their industry peers, a meaningful question nonetheless remains: What happens to R&D at those companies that actually do R&D and that are subject to restructuring?

At this point we encounter a hailstorm of anecdotal evidence suggesting that R&D expenditures are viciously slashed in the wake of corporate restructuring efforts.²⁹ For example, one economist claims that "one of the things that gets squeezed [in a restructuring] is R&D, because that's an investment in the future. . . . Whatever costs are postponable are likely to go by the boards."³⁰ Parsing the evidence on this score is quite an interesting exercise because even if there is a post-restructuring

²⁹See, e.g., Statement of Dr. Julie Fox Gorte, Project Dir., Office of Technology Assessment, Before the Subcommittee on Science, Research and Technology, Committee on Science, Space, and Technology, U.S. House of Representatives, July 13, 1989, at 5-10.

³⁰C. Skrzycki, Impact on R&D is Newest Worry About LBO's, Wash. Post, Dec. 18, 1988, at H1, col. 3 (quoting Walter Adams, Professor of Economics at Michigan State University).

decline in R&D/sales ratios, that decline could reflect greater efficiency resulting from economies of scale. A decline in R&D expenditures could also reflect a decision to kill R&D projects that have become white elephants. However, before pursuing these avenues of inquiry, let's take a step back and explore the evidence about post-restructuring R&D expenditures. Does R&D expenditure increase, decrease or stay about the same following a corporate restructuring?

The evidence on this score is more mixed than for the other points I have discussed. However, based on the current state of the research I would characterize the data as either supporting the "no difference" conclusion or as too uncertain to support any conclusion. Lichtenberg and Siegel, for example, found that "the average R&D intensity of firms involved in LBO's increased at least as much from 1978 to 1986 as did the average R&D intensity of all firms responding to the NSF/Census survey of industrial R&D."³¹ In earlier research the same authors found that R&D employment does not change following restructuring, even though there is a substantial decline in nonproduction employment, of managers and administrators who work at corporate headquarters.³²

³¹F. Lichtenberg & D. Siegel, The Effects of Leveraged Buyouts on Productivity and Related Aspects of Firm Behavior, Nat. Bur. Econ. Res., Working Paper No. 3022, June 1989, summary.

³²F. Lichtenberg & D. Siegel, The Effects of Takeovers on the Employment and Wages of Central Office and Other Personnel, Nat. Bur. Econ. Res., Working Paper No. 2895, Mar. 1989.

Similarly, Bronwyn Hall examined all takeovers of publicly traded manufacturing firms between 1976 and 1986 and concluded that the data "provide very little evidence that acquisitions cause a reduction in R&D spending." In the aggregate the firms involved in mergers were in no way different in their pre- and post-merger R&D performance from those not so involved. At the individual industry level, however, the results were too imprecisely measured to draw solid conclusions."³³

Abbie Smith, in a study of 58 management buyouts (MBOs) completed between 1977 and 1986, finds a "substantial increase in profitability following the MBO."³⁴ She concludes, however, that these increased profits are apparently not due to "pervasive cutbacks in 'discretionary expenditures' such as maintenance and repairs, advertising, or research and development which might lead to a longer run decline in cash flows."³⁵ In particular, Smith finds that the "median ratio of R&D expense to sales increases from .012 in the year preceding the MBO to .018 in the year following the MBO, with a median change of 0.00 for the seven firms with available data."³⁶

Moreover, there is anecdotal evidence that R&D expenditures may actually increase in some situations following a takeover or

³³Hall, supra n. 28, at 93.

³⁴A. Smith, Corporate Ownership Structure and Performance: The Case of Management Buyouts, Univ. Chi. June 1989, at 1.

³⁵Id. at 2.

³⁶Id. at 24.

restructuring. For example, after Hoechst's purchase of Celanese Corporation, R&D spending increased by ten percent annually.³⁷ Data prepared by Kohlberg, Kravis & Roberts, America's leading leveraged buyout firm, also confirms that R&D expenditures decline prior to leveraged buyouts and suggests that KKR, at least, budgets for aggregate increases in R&D expenditure.³⁸

On the other side of the ledger, however, stands a recent NSF study that examined R&D expenditures at the 200 largest R&D performing firms in the United States."³⁹ These firms account

³⁷Testimony of Dr. Julie Fox Gorte, supra n. 29, at 93.

³⁸Kohlberg, Kravis & Roberts, Presentation on Leveraged Buyouts at 8-1 (Jan. 1989).

³⁹National Science Foundation, Corporate Mergers Implicated in Slowed Industrial R&D Spending, Washington, March 1989 ("NSF Study"); Testimony of Erich Bloch, Director, National Science Foundation, House Ways & Means Committee, March 14, 1989 ("Bloch Testimony").

I exclude from consideration the findings of the Ravenscraft-Scherer studies which, based on 1977 data, find that "lines of business originating from mergers had significantly lower company-financed R&D to sales ratios" than similar companies without a merger history. D. Ravenscraft & F.M. Scherer, The Long Run Performance of Mergers and Takeovers, at 44, in M.L. Wiedenbaum & K.W. Chilton, Public Policy Toward Corporate Takeovers (1988). See also D. Ravenscraft & F.M. Scherer, Mergers, Sell-Offs & Economic Efficiency (1987). These findings do not shed much light on the current controversy because the data result primarily from a conglomerate restructuring wave that is substantially different from current restructuring phenomena. Moreover, the low R&D intensity found at merged plants may simply reflect the finding that industry laggards in R&D are more likely to be involved in restructuring and may not support the hypothesis that restructuring causes a reduction in R&D efforts.

In addition, shortly before the date of delivery of this address I received a copy of Hitt, Hoskisson, Ireland & Harrison, Acquisitive Growth Strategy and Relative R&D Intensity: The

(continued...)

for almost 90 percent of industrial R&D spending in the U.S. Within this sample, the NSF identified 33 firms that were merged into 16 companies as well as eight free-standing firms that were involved in LBOs.

Interestingly, in the NSF sample the average R&D outlay for the 16 merged firms was \$575 million per year, whereas the average R&D outlay for the eight LBOs was only \$75 million per year.⁴⁰ This statistic supports the view that LBO transactions tend to concentrate in mature, stable industries with "reliable and stable cash flows necessary to amortize the acquisition debt. . . . LBOs in research industries are rare."⁴¹ The market thus does not want to load debt onto R&D intensive firms because,

³⁹(...continued)

Effects of Leverage, Diversification, and Size (Texas A&M, Baylor, and Clemson University, May 1989) ("Hitt Study"). The Hitt Study examined 191 mergers of publicly traded firms conducted between 1970 and 1986. Conglomerate acquisitions were the dominant form of transaction. Id. at Table 1. Conglomerate acquisitions are, however, quite different from current restructuring efforts, and many of the factors that caused conglomerate acquisitions to fail provide incentives for current restructuring activity. See also, Porter, From Competitive Advantage to Corporate Strategy, 64 Harvard Bus. Rev. 43 (1987) (documenting the failure of conglomerate acquisitions by large corporations during the period 1950-1986). In particular, spin-offs, bust-ups, and downsizings are all aimed at undoing many of the inefficiencies associated with the conglomerate form. The Hitt Study found that in conglomerate acquisitions "acquisitive growth, leverage, diversification and size were negatively related to R&D intensity, adjusted for industry R&D intensity." Hitt Study, Abstract.

⁴⁰Bloch Testimony at 3-4. (Derived from a NSF Study statistic reporting that the 16 merged firms spent \$9.2 billion on R&D and the eight LBO's spent \$600 million.)

⁴¹Merrill Lynch, Leveraged Buyouts in Perspective, at 7 (March 1989).

among other reasons, debt capital is relatively more expensive than equity for R&D applications.⁴²

The NSF study found, however, that these 24 restructured companies reported a 5.3 percent reduction in R&D spending while all other companies in the NSF sample reported a 5.4 percent increase.⁴³ All eight of the LBO firms reduced their R&D expenditures, and the aggregate decline in R&D expenditure at these firms was 12.8 percent.⁴⁴ Indeed, even in the chemical and pharmaceutical industry, where merged companies reported a 5.4 percent increase in spending, the rest of the industry reported a 9.8 percent increase, suggesting that after restructuring the affected firms were not keeping pace with industry R&D developments.⁴⁵

Why do the NSF results differ from the other findings that indicate no statistically significant change in R&D following restructuring? One answer is that comparing the NSF study to the other studies is a bit like comparing apples to oranges. Aside from the obvious fact that samples and time periods differ, it should be noted that the other studies measure changes in R&D intensity, typically expressed in terms of an R&D/sales ratio,

⁴²See, e.g., B. Hall, How Is R&D Financed?, Univ. Calif., Berkeley, 1989.

⁴³NSF Report at 3. These changes are measured in constant dollars over the period 1986 to 1987.

⁴⁴Id. at 5.

⁴⁵Id.

while the NSF study measures aggregate R&D expenditures. One of the consequences of restructuring is typically a downsizing of the firm's scale as it focuses on more profitable market niches. Thus, in order to compare the NSF results with prior research, it may be necessary to recalculate the NSF findings in terms of research intensity.⁴⁶

A second potential explanation of the reduction in aggregate expenditures is, as the NSF study itself notes, that "firms may simply be eliminating duplication and inefficiency within their R&D programs."⁴⁷ Here, there is at least some anecdotal evidence supporting the view that post-restructuring reductions in aggregate outlays do not necessarily imply a weakened R&D initiative.

For example, in 1986 Exxon spun off its Reliance Electric division to a management-led LBO. Management recognized that Reliance had been spending \$30 million a year on overlapping research efforts and proceeded to rationalize its expenditures so that it didn't "have three people working on the same thing."⁴⁸ This rationalization chopped R&D expenditures by \$25 million in 1987, or 17% of the firm's total budget.⁴⁹ At the same time,

⁴⁶Accord, B. Hall, Leveraged Buyouts, Corporate Debt, and R&D Investment: Is There Any Connection? Univ. of Calif., Berkeley (Work in Progress, Version of Sept.1989, at 7).

⁴⁷NSF Study at 4.

⁴⁸A. Ramirez, What LBOs Really Do to R&D Spending, Fortune, March 13, 1989, at 98.

⁴⁹Id.

however, Reliance increased spending on related productivity tools, such as computer software and custom chips, which may not show up in R&D statistics. As one of Reliance's vice presidents explains, "We are executing projects faster, more efficiently, and experiencing less waste because we have to. Our livelihood depends on it. We're now competitive after the LBO, no question about it."⁵⁰

Restructuring can also cause changes in the focus of research even if it does not change aggregate expenditures. Japan has built its enviable commercial position not by concentrating on basic research but by emphasizing superior commercialization. The world's videorecorder, semiconductor and televisions markets are all built on basic U.S. research and Japanese commercialization. Given a choice between being a hero for doing profitless basic research or, at the margin, moving resources more vigorously into profitable commercialization it may well make sense to reallocate resources towards the commercialization end of the R&D spectrum.

Several companies have recently reached just that decision. Xerox's Palo Alto Research Center spawned several successful innovations that have failed to earn Xerox a fraction of what they could have. Xerox's inability to capitalize on its development of Ethernet, of the laser printer, and of the icon-based operating system popularized by Apple Computer is perhaps

⁵⁰Id. (quoting Peter Tsivitse, vice president, Reliance Electric).

the most poignant example of a company that did its "R" brilliantly only to watch the profits slip away as a result of poor "D".⁵¹ To minimize the chance of this happening again, Xerox has taken strong steps to assure that the research for which it is paying develops products that return value to the corporation and to its shareholders.

Success in the marketplace thus requires a balance between "R" on the one hand and "D" on the other. Without great research, there is nothing to commercialize. Without great commercialization, you never earn the fruits of your research.

It is my subjective assessment, based on recent developments in Japan and elsewhere, that a shift in our emphasis toward commercialization might be the most profitable change American industry could make in allocating its R&D. If that is a direction in which restructuring is driving American's R&D efforts, it's hard to conclude that it's all for the bad."⁵²

Evidence of reduced or dramatically changed R&D expenditure therefore does not, in and of itself, suggest a weakening of a

⁵¹Pitta, Bean Counters Invade Ivory Tower, Forbes, Sept. 18, 1989, at 198.

⁵²Accord, Reich, The Quiet Path to Technological Preeminence, Scientific American, Oct. 1989, at 41. ("If the U.S. is to regain its technological prominence, it must improve the capacity of Americans to use technology. This quiet path back to competitiveness depends less on ambitious government R&D projects . . . than on improving the way by which technological insight--whenever they may be discovered around the globe--are transformed by American workers into high quality products.") This may be one of the few points regarding economic policy on which Reich and I agree.

company's commitment to R&D. Nor does it necessarily suggest a reduction in the effectiveness of a company's R&D program. Instead, what we need to measure is how "smart" we are in spending our R&D dollars because the elimination of a "dumb" R&D dollar resulting from waste, duplication, or bad planning means something quite different than the elimination of a "smart" R&D dollar that reflects that a potentially profitable gamble on the scientific unknown.

The Stock Market and R&D Expenditures

But how do we tell "smart" R&D from "dumb" R&D? The short answer is that there is no easy answer. R&D is a gamble on the unknown. It will always be impossible to know whether two guys wearing white coats in a Topeka lab will, if left alone for a decade, come up with cold fusion or superconductivity.

While there is no easy answer to this question, many critics of restructuring and of the stock market would be quick to conclude that the stock market is incapable of judging the value of R&D projects and invariably penalizes companies who commit to substantial, long-term R&D expenditures.⁵³ Therefore, however one judges R&D, one should surely ignore the stock market's valuation, at least according to these critics.

But is this highly negative view of the stock market's response to R&D supported by the evidence? To pose the issue most starkly, let me begin by asking you a question: Which

⁵³See, e.g., the materials cited in notes 1 and 2, supra.

company does the stock market value more highly, Merck, a research intensive pharmaceutical firm whose 1988 sales of \$5.9 billion, or General Motors, the automotive giant with 1988 sales of \$110 billion are nineteen times as large as Merck's sales? Believe it or not, as of December 31, 1988, the stock market valued Merck's stock at \$26.433 billion, about \$400 million more than General Motors stock, which was trading at an aggregate value of \$26.027 billion.⁵⁴

But how can that be? After all, Merck is one of the most R&D intensive companies in one of the most R&D intensive industries in the world. In 1988 Merck spent \$669 million on R&D: that's 11.3% of its sales, 34.9% of its profits, and \$15,962 per employee.⁵⁵ These expenditures are for R&D projects that are wildly expensive,⁵⁶ more likely to fail than to succeed, and certain not to yield revenues in the United States for about eight to ten years from inception.⁵⁷ Yet Merck's stock trades at

⁵⁴The World's 100 Largest Public Companies, Wall St. J., Sept. 22, 1989, at R14.

⁵⁵R&D Scoreboard, Business Week, Innovation 1989, at 198.

⁵⁶The the average cost of developing a new drug (new molecular entity) through approval by the Food and Drug Administration is \$125 million measured in 1986 dollars. Pharmaceutical Manufacturers Association, Facts at a Glance, 13 (1989).

⁵⁷Id. at 15, 18.

a price-earnings ratio of 23, more than triple the multiple of seven accorded GM's shares.⁵⁸

If the critics are right, and if the stock market is simply too impatient or myopic to wait for the payoff from R&D, then Merck's shares should be trading at an aggregate value far below General Motor's. But Merck's shares aren't trading below General Motors, and that fact takes at least some of the wind out of the sails of market critics.

While this simple comparison of Merck and General Motors is not enough to sustain any broad hypothesis about stock market behavior, it is enough, I think, to force critics of takeovers to take pause and to reconsider some of their prejudices. Apparently, the relationship between R&D expenditure and stock price valuation is much more sophisticated than a simple "increase your R&D and the market will knock your stock price down" correlation. Indeed, I suspect that the easiest way for Merck to slash its stock price would be for it to cut back dramatically on its R&D.

Further support for the view that the stock market does not invariably penalize increased R&D expenditures is found in a recent study by Randall Woolridge who examined the stock price effects of announced changes in R&D budgets.⁵⁹ Woolridge found

⁵⁸New York Stock Exchange Composite Transactions, Wall St. J., Oct. 9, 1989, at C4.

⁵⁹J. R. Woolridge, Competitive Decline: Is A Myopic Stock Market to Blame?, 1 J. Applied Corp. Fin. 26 (1988).

that in the two days following announcement of increased R&D budgets by 45 companies the value of those companies' shares increased by an average of 1.2 percent, net of overall market changes.⁶⁰

For example, after Dupont announced on August 12, 1983, that it would spend an additional \$100 million on R&D to improve automotive and industrial coatings, its stock price rose 2.54%. The market did not penalize DuPont with a decline. Similarly, a study by SEC economists found that a sample of 62 R&D announcements were associated with significantly positive stock price returns.⁶¹ A study of the stock price effect of 658 announcements of changes in planned corporate capital expenditures also found that announcements of increased capital expenditures are correlated with significantly positive stock price effects while reductions in capital expenditures are correlated with declines.⁶²

No doubt, these average statistics mask significant mistakes on both sides of the R&D fence. For example, when Federal Express in 1984 announced its plan to spend \$1.2 billion over ten

⁶⁰Id.: at 31.

⁶¹G. Jarrell, K. Lehn & W. Marr, Institutional Ownership, Tender Offers, and Long Term Investments, Office of the Chief Economist, Securities and Exchange Commission (April 19, 1985).

⁶²J. McConnell & C. Muscarella, Corporate Capital Expenditure Decisions and the Market Value of the Firm, 14 J. Fin. Econ. 399 (1985). The sample in this study had only eight announcements of changes in R&D expenditures and did not generate statistically significant results for this subsample.

years to develop its Zapmail service, the stock market was as enthusiastic as Federal Express' management and the company's shares rose 2.27%.⁶³ Time proved that Federal Express and the stock market were both wrong about the promise of Zapmail--but the market's initial response was hardly hostile to management's long-term and expensive technology gamble.

Similarly, Genentech was able to raise \$40 million in its initial public offering at a time when it had no meaningful revenues--much less profits.⁶⁴ All Genentech had was the dream that one day it might be able to develop useful products that might gain FDA approval and that might earn a profit for investors. The dream was, however, a distant one viewed from Genentech's initial public offering and, as events have subsequently proved, the gamble has not worked out as well as many scientists and investors had hoped.⁶⁵

Thus, there are several examples of situations in which the market has been willing to reward high-intensity R&D companies with rich stock-price multiples and start-up funding. However, these are not the situations in which friction is likely to arise. Friction arises when management wants to pursue an R&D

⁶³Woolridge, supra n. 59, at 33.

⁶⁴See Investment Dealers Digest, Oct. 21, 1980, at 10.

⁶⁵See, e.g., C. Bartlett, Jr., Special Situations, Forbes, June 26, 1989, at 266; R. Stern & P. Bornstein, Why New Issues Are Lousy Investments, Forbes, Oct. 2, 1985, at 152, 154; Waiting for a Payoff in Biotech Stocks, Fortune, Nov. 26, 1984, at 185, 186.

project or capital expenditure plan that the stock market won't support. In that situation managers often scream that the stock market is crazy and that it is only because of the market that they can't engage in valuable new investment.

But when management and the market disagree is it invariably true that the market is crazy and management wise? I think not, and there are several examples of projects in which management was willing foolishly to spend hundreds of millions of dollars despite the market's clear warnings to the contrary. My personal favorite example of a management that wouldn't listen to or learn from the market is the management of Unocal and its devotion to a shale oil conversion project that could be feasible only at sky-high oil prices. What Unocal's management overlooked, however, was that before the price of oil could rise to \$50 or \$60 a barrel, there would be so many other alternate sources of energy and conservation called on line that the demand for high-priced shale oil might be problematic even if the technology was feasible. Neither the market nor I believed that this project made any sense. Nonetheless, Unocal's management pumped enough money into this project--both taxpayer dollars and shareholder dollars--that its expenditures substantially depressed its stock price and became a major magnet for Boone Pickens's attempted takeover of the company."⁶⁶

⁶⁶See, e.g., Coming Up Dry: Unocal Struggles On With Attempt to Get Crude Oil From Shale, Wall St. J., May 14, 1989, at 1; Synfuels Corp. Issues New Grant, Defies DOE; \$550 Million Approved for Oil Shale Profits, Wash. Post, Oct. 17, 1985, at (continued...)

No doubt, there have also been and will continue to be situations in which managements would have gone on to support successful R&D projects but for the market's skepticism. Similarly, there are probably R&D projects the market would have supported, but for management's lack of vision or courage in proposing them.

However, my goal tonight is not to prove that markets are always right and that managements are always wrong. Instead, my goal is simply to get across the message that markets are not always wrong and managements are not always right. In particular, managements could often do themselves and their companies a great service if they just took some time to appreciate why the markets value some forms of long-term investment and penalize others. That simple step of market appreciation could probably work wonders for R&D budgeting, capital budgeting, and several other critical corporate decisions.⁶⁷

⁶⁶(...continued)

A21; Lawsuit is Filed to Void Accords for Unocal Plant, Wall St. J., June 6, 1986, at A9. In addition, McConnell & Muscarella, supra, n. 62, observe that in the late 1970's announcements of increased expenditures on oil and gas exploration were correlated with stock price declines. The market was apparently signalling that exploration expenditures were not profitable given the outlook for petroleum prices and the availability of reserves that could be purchased at lower cost. This divergence between market valuations and management expenditure plans can help explain much of the takeover activity in the oil and gas industry in the early 1980s. By the way, in this situation it appears that the market's valuation did a better job than management's plans.

⁶⁷See generally, A. Rappaport, Creating Shareholder Value (1987).

Conclusion

In sum, America needs to do more, much more, to strengthen and preserve its critical position in R&D. Stifling restructuring is not, however, the answer to America's R&D problem. Even if we brought restructuring to a screeching halt our capital costs would remain far above our international competitors'. Moreover, most of the restructuring we would prevent involves companies that do little or no R&D and many of the companies that would be restructured are R&D laggards who spend less on innovation than their industry peers.

What then are we to do? A two step program appears necessary.

First, we should take strong and immediate steps to reduce the cost of capital for R&D projects. Most fundamentally, America needs to increase its savings rate so that more domestic capital is available for R&D and for other investment projects. On a more targeted basis, R&D tax credits and reduced capital gains tax rates can also help lower the effective cost of capital for R&D projects.

Second, we must focus more of our efforts on commercialization. Japan is eating our lunch not only because its capital costs are lower, but because it has mastered the art of commercialization. All too often the United States stands at the cutting edge of R&D only to watch Japanese and other foreign firms earn the lion's share of the profits. This is not smart R&D. This is charity R&D that does a disservice to the

corporation, to its stockholders, and to its scientists who won't be able to do future R&D for that company any more unless it starts earning some profits from its past R&D efforts.

Neither of these two steps is easy. Neither is dramatic. Neither will satisfy critics of restructuring who want to stop change with any argument they can find.

Either of these two steps will, however, help restore America's competitive R&D edge. If that's what we really care about, then that's clearly the direction we should go.