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# CORPORATE RESTRUCTURING AND INVESTMENT HORIZONS

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**ABSTRACT**

The recent wave of corporate restructuring in the United States has been accused of shortening the investment horizons of U.S. managers. This paper surveys the empirical and case study evidence on restructuring and investment behavior and reaches the following conclusions: 1) A large fraction of the restructurings were motivated by synergistic or other efficiency-enhancing reasons and have little to do with investment horizons. 2) However, massive shifts toward debt in the capital structure of manufacturing firms, often induced by hostile takeover threats, are accompanied by reduced investment of all kinds, particularly in a few industries which are characterized by "stable" technology and cost-based innovative strategies. 3) The evidence is consistent with optimizing behavior on the part of firms faced with a lower relative price of debt to equity and a higher overall cost of capital during the nineteen-eighties, but there all still doubts about whether the U.S. market for corporate control elicits the correct level of long run investment. Thus the paper concludes with a discussion of the evidence on cross-country differences in the financing of investment and the market for corporate control and suggestions for future research in this area.

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# CORPORATE RESTRUCTURING AND INVESTMENT HORIZONS

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## 1. Introduction.

How are these two topics related? Corporate restructuring, whether financial or otherwise, has been accused of shortening the investment horizons of U.S. managers in the recent past. Put simply, the argument is that takeovers or the fear of takeovers force managers to pay attention to short-term earnings at the expense of long-term investments, and that this bias increased during the wave of restructurings in the 1980s. Those making this argument often point to the Japanese or German experience during the same period as examples of market economies which have not experienced substantial restructuring, and yet have apparently invested at a much higher rate than the United States.

In spite of the prevalence and apparent plausibility of the view that takeover threats induced by the undervaluation or non-optimal utilization of a firm's assets could lead to underinvestment in assets which have a longer term payback period, it has proved difficult to find evidence that this is the case in general. At the same time, restructurings do appear to have had positive benefits in terms of short term productivity gains, profitability, and "focus" (a movement away from diversification towards concentration on the main line of business).[1] This paper will probe the question in somewhat

[1] Cite to Porter (?).

more detail, surveying the available evidence on the investment consequences of restructuring, and comparing the U.S. experience to that in several other countries.

I begin by considering the nature of corporate restructuring: what is it, and how is it done? I take the term to cover a whole range of activities, most of them large discrete events: changes in control (including ownership changes), changes in financial structure (the balance sheet), or changes in the major lines of business in which the firm operates. Many of these activities occur at the same time, since they are sometimes more easily performed in tandem. For example, a change in ownership may be accompanied by the selling off of lines of business to finance the purchase, or by the retirement of equity and issuance of debt in order to restructure the balance sheet. In fact, because of the transactions costs associated with the change of control of a public company, it is rare to find this event not accompanied by some other large discrete change in the firm's structure (since the need for small adjustments in the firm's structure will not induce a control change).

However, these different motivations for restructuring have different implications for investment horizons: fear of a control change and the subsequent loss of job may cause managers to have a short-term focus, while 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 involving the divestiture of old or the acquisition of new lines of business has no particular implications for investment: it may increase, decrease, or redirect spending

on long-lived assets.[2]

For this reason, this paper focuses on the first two types of restructuring: changes in financial structure, whether or not they are accompanied by ownership changes. I divide these restructurings into two basic types: 1) substantial increases in leverage, either (a) accompanied by a change in control (e.g., leveraged buyouts, a majority of which are also management buyouts, or going private transactions), or (b) with no change of control (a substantial increase in the debt-equity ratio); 2) takeovers not accompanied by a change in the financial structure of the acquiring firm, whether friendly or hostile.

Defining what we mean by a shortened time horizon for investment is somewhat trickier. Although is clear that the concept refers to the extent to which longer term performance of the firm dominates over short term considerations in the firm's decision making process, it is difficult to make a mathematically precise definition which will satisfy 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 used by the firm in evaluating projects. For example, if we ask over what horizon the firm would be indifferent between $1000 today and $10000 in the future, the answer would be 10 years if the required rate of return were 26 percent per year and 24 years if it were 10 percent. Clearly these sets of numbers imply quite different time frames over which the firm will look when evaluating the payback of a particular investment and the weight which it will place on

[2] See Bhagat, Shleifer, and Vishny (1990) and Lichtenberg (1990) 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 60s and 70s and was accompanied by productivity gains in the core lines of business.

short term (less 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 required IRR (Internal Rate of Return) approach and because different rates are used for different projects.[3] Fortunately, I do not necessarily require a precise definition of the concept in order to examine the implication of shorter time horizons for investment; it will be sufficient to keep the general relationship between short horizons, high discount rates, and the relative importance of near-term as opposed to far-term factors in mind.

It is by now common practice to maintain that R&D investment has a longer time horizon than ordinary investment,[4] but this does require some justification in the light of what we know about the relative depreciation rates of the two kinds of capital. The rate of economic depreciation of ordinary capital is commonly thought to be in the range of 10-15 percent, while that for R&D capital is apparently somewhat higher (Pakes and Schankerman 1984 and Hall 1988b find rates of the order of 25 percent). This implies that the time horizon for R&D investment should actually be shorter than for ordinary investment.

I think the explanation for this puzzle lies in the intertemporal nature of the production function for knowledge capital: although it appears that the returns to R&D expenditures decline rather quickly, the recent expenditures are in fact tightly linked to those made several years

[3] See Baldwin and Clark (this volume) for further discussion of capital budgeting techniques and Poterba and Summers (this volume) for survey evidence on firm decision making.

[4] See Jarrell, Lehn, and Marr (1985), Hall (1988a, 1990a), and Muelbroek et al (1990), all of whom use R&D as a proxy for long-term investment.

earlier, and the true payback period is much longer.[5] This hypothesis is supported by the evidence of apparently high adjustment costs and a slow rate of change for R&D investment.[6] In the absence of internal evidence on the actual planning horizons of managers, this paper will consider that the behavior of R&D investment in particular, and investment in general, serve as proxies for the changes in investment horizons of corporations.

Before leaving the topic of investment horizons, I note that one form of long-term investment on the part of firms, investment in the education and skills of its workers, is not explicitly considered here. Of course, this type of investment is closely linked to investments in new technology and innovation, but it is possible that changes in ownership and the accompanying changes in employment which are documented here discourage at least some firms from making investments in the human capital of their workers.[7] That is, a firm which expects to be taken over or which 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

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[5]When the production of capital from investment is additively separable, as is usually assumed for ordinary investment, a high deprecation rate implies a quick payback to investment, and vice versa. However, 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 which 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.

[6]Bernstein and Nadiri (19 ) and Hall, Hausman, and Griliches (1986).

[7]See Kochan and Osterman (this volume) for a fuller discussion of the differences between U.S., Japanese, and German corporate practices with respect to job tenure and firm-specific and firm-level training. Surely part of the national institutional difference here can be accounted for by the relatively more active market in corporate control in the United States, which would reduce the incentives for investment, at least at the management level.

activity may come at the expense of employees of the firms involved;[8] even those who do not view employees as having property rights in the firm may be concerned if there is a loss of socially valuable human capital owing to the transaction.

## 2. The Evidence on Restructuring and Investment.

There have by now been quite a few studies which document the results of restructurings which occurred during the 1970s and 1980s. I focus my attention on those which look at R&D investment first. These studies are of two types: large scale empirical studies (Hall 1988a, 1990a, Lichtenberg and Siegel 1990a, 1990b, and Smith 1989), and case studies of a few large firms undergoing restructuring or acquisition (Miller 1990a, 1990b and Fusfeld 1987).

I begin with my study (Hall 1990a), which is the most comprehensive on the subject although limited in some dimensions because it relies solely on public data. The study is based on a complete universe of publicly traded manufacturing firms (about 2500) from 1976 to 1987. I identified every exit from this sample (about 1200) during the eleven year period and traced the reason why the exit occurred. This information, together with changes in the debt-equity ratio of surviving firms, is used to identify firms experiencing the major restructuring events.

In Table 1, I show the overall statistics on these events during the period. The eleven year totals of the significance of these transactions (measured by employment) suggest that about 30 percent of all firms were involved, or 3 percent per year. About half of this is merger or

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[8] Bhagat, Shleifer, and Vishny (1990).

acquisition between two public companies; only 9-11 percent is of the leveraging variety, but the importance of the latter type of transaction increases markedly during the later half of the period. In 1987, two percent of the employees in publicly traded manufacturing firms were employed by a firm which went private through an LBO or experienced a substantial increase in leverage during the year. In my 1990a 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.

The major empirical findings of that paper were threefold: First, I found that 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 are those with the steady cash flow necessary to service the debt. They are largely smaller firms in the consumer nondurable 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 which 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 of industries accounted for over 80 percent of the LBOs and going private transactions (as measured by employment).

The total amount of research and development spending of the companies involved in eleven years worth of LBO and other "going private" transactions is 767 million dollars, a small fraction of the 40 billion dollar industrial R&D budget in 1982. Even if this R&D were to be cut drastically, it would

have little impact on total R&D spending. In fact, although this R&D disappeared from my aggregate statistics since the firms went private (and cease to report to the SEC), I cited evidence from Kaplan (1989b) and Lichtenberg and Siegel (1990b) that most of these firms did not reduce their spending greatly as a result of the transaction in any case.

My results concerning the non-technology intensive character of LBOs and "going private" transactions is now supported by several other studies, which employ samples involving many of the same firms although using different methodologies. These studies have also demonstrated increased operating efficiencies and reduced investment after the buyout. The primary study of interest is that by Lichtenberg and Siegel (1990b), which relies on a different (confidential) source of data, the Census and Annual Surveys of Manufacturing. Using a much larger sample than other studies, they found that LBOs have higher total factor productivity after the buyout than before it and higher total factor productivity than other firms in their industry. This was achieved by means of a substantial reduction in the nonproduction workforce (about 9 percent), while the production workforce declines very slightly. The R&D of firms involved in buyouts was about 1 percent of sales, while that for the average large firm in the sample was 3.5 percent of sales. The difference in R&D intensities between the two groups of firms becomes slightly larger, but not significantly so, after the buyout.

Both Kaplan (1989a, 1989b) and Smith (1989) report studies of large MBOs during the early 1980s; their samples are a subset of the LBOs analyzed by Lichtenberg and Siegel. These studies contain very similar findings: there are substantial increases in profitability and cash flow post-buyout, 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 (7 firms report it in the Smith sample, 10-20 in the Kaplan sample); for these firms there are slight reductions after the buyout.[9]

Turning to financial restructurings which do not involve changes in control, the second finding in my 1990a study was that the most dramatic results of restructuring were found in those transactions where a firm moves to a substantially higher debt position; here the size of the average decline in R&D intensity was about 0.8 percent of sales (from 3.4 percent to 2.6 percent) for the 1982 to 1987 period. These results are in contrast to those for leveraged buyouts, since many of these firms were doing significant amounts of R&D beforehand. 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. To my knowledge, mine is the only study, outside of a few case studies, to look specifically at large financial restructurings which are not accompanied by a change of control.

The third finding in my 1990a study was less clear: there was mixed evidence as to whether acquisitions in the publicly traded manufacturing were followed by reductions in R&D intensity. Firms which made large acquisitions experienced permanent (at least over the horizon for which it can be measured) declines in their R&D intensity relative to their pre-acquisition R&D intensity; the mix of firms making acquisitions also shifted toward firms with lower R&D intensities during the eighties, so that the combined effect was substantially lower R&D intensities relative to

[9] 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 measure of the unimportance of R&D in the large-scale MBO sample that he didn't even mention it in the reported results.

the industry as a whole for post-acquisition firms in the latter part of the period. Although the statistical evidence for this decline was weak because of the substantial heterogeneity in firm behavior, the size of the effect was large in economic terms, amounting to a one half of one percent decline in R&D intensity for those firms engaged in R&D (that is, from an overall mean of 3.4 percent to 2.9 percent) for the 1982 to 1987 period. This decline turned out to be associated with the acquisitions which were accompanied or financed by increases in leverage; that is, they were a manifestation of the same correlation between increases in leverage and falls in R&D intensity described previously.

Table 3 summarizes the evidence from my earlier paper concerning R&D, acquisitions, and increases in leverage and includes new results for ordinary investment for comparison. These new results demonstrate clearly that the negative association between leverage and investment is not confined to R&D investment. This table shows the results of a conventional investment equation, estimated in levels and in a modified first-differenced form (to control for permanent differences across firms).[10] The table

[10] Investment equations based on an accelerator model of investment usually include a measure of current output as a proxy for expectations of future 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 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 due to demand fluctuations. The equation which 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, it is hypothesized that firms are heterogeneous 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

verifies the main findings described above: a large negative impact on both kinds of investment from increases in leverage, and an insignificant acquisition effect for R&D, once leverage changes are controlled for. What is new is a slight hint of reductions in ordinary investment following an acquisition which is not accounted for by the leverage variables; however, this effect is measured very imprecisely (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 3 can be interpreted in the following way: suppose a financial restructuring occurs which increases the long-term debt of the firm 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 3) 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 of the order of 50 percent. Note that the percentage reduction in both types of

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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

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

rather than

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

where i indexes firms and t indexes years of data on each firm. $\alpha_i$ 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.

investment is the same (the elasticities are the same), so there is no bias toward cutting R&D rather than shorter-term investment.

Before leaving this topic, I briefly summarize the results of other researchers concerning the aftermath of acquisitions. Lichtenberg and Siegel (1990a) look at a very large sample of ownership changes at the plant level, which include LBOs (about 10 percent of the sample) and acquisitions, both hostile and friendly. Central Office employment is reduced by 16 percent after change, production employment by only 5 percent, leading to substantial increases in Total Factor Productivity post-change, as in the LBO sample alone. The important finding for present purposes is that R&D employment growth is sustained in the face of substantial reductions in non-production employment.

Healy, Palepu, and Ruback (1989) look at the 50 largest mergers for 1979 to 1983, and find that productivity improves, labor costs fall, and investment and R&D rates are maintained; there are 33 R&D-performing firms in their sample. This work also documents the increase in leverage around the time of the merger, but does not distinguish between hostile and friendly acquisitions.

Unlike the previous studies, the interesting study by Bhagat, Shleifer, and Vishny focuses on hostile takeovers, whether LBOs or not. They find that hostile takeovers ultimately end up allocating lines of businesses to other firms in the industry; in other words, the raider is acting as a temporary broker who assists the movement of assets into a higher-valued use. The shareholder gains from such activities are accounted for by the following factors: 1) tax savings, although they find that previous results may be an overestimate since the debt incurred in these transactions tends to be paid down quickly; 2) employment layoffs,

particularly white collar, accounting for 11-26 percent of the premium; 3) in the oil, gas, and timber industries, cuts in investment seem to have been an important source of gains, but they could not find evidence of investment cuts in other industries.

3. Industrial Sectors.

One way we might be able to learn something about the interaction between corporate restructurings and long-term investment is by examination of the differences across industries which use different technologies. That is, industries in the manufacturing sector vary in the length of time it takes to develop a new product or process in ways which are intrinsic to their technology and we can make use of this fact to develop insights into the changes in investment strategies induced by corporate restructuring. In this section of the paper I examine two questions: first, in which industries did substantial LBO and leveraging activity occur, and second, how do the investment regressions presented in Table 2 vary across industries. To do this, I divide the manufacturing sector into four groups of industries, guided by the Chandler (1991) triage into high, stable, and low technology sectors and an informal assessment of those industries which are likely to have long horizons for project development, and those which can move more quickly.

The industrial sectors are the following: 1) High technology consists of Pharmaceuticals (excluding Soap, Toiletries, and Cosmetics), Computing Equipment, Electrical Machinery, Electronics, Aircraft and Aerospace, and Instruments. 2) Low technology is Food, Textiles, Lumber, Furniture, and Paper, and Miscellaneous Manufacturing (which includes leather, toys, musical instruments, etc.). The third and fourth groups consist of

Chandler's stable technology sector plus the non-pharmaceutical component of the Chemical industry. I include the latter in this group both because it appears to belong with the Petroleum Refining industry, and because its R&D spending patterns are closer to the stable technology than the high technology industries. Thus the final two groups of industries are 3) Stable Long Horizon, which consists of Chemicals, Petroleum, Primary Metals, Engines and Construction Equipment, Non-electrical Machinery, and Automobiles (excluding motor vehicle parts); and 4) Stable Short Horizon, which consists of Rubber and Plastics, Stone, Clay, and Glass, Fabricated Metals, Soap, Toiletries, and Cosmetics, and Motor Vehicle Parts.

In Table 3, I show the distribution of Leveraged Buyouts and large leverage increases by these sectors. The results are very revealing: First, relative to the size of the industry, firms with stable short horizon or low technology are far more likely to undergo an LBO than the others. this may be partly due to the fact that these firms are also slightly smaller than those in the other sector (except for some young firms in the high technology sector). However, this fact is very supportive of the idea that leveraged buyouts require a low variance in cash flow and investment strategies in order to be profitable.

In addition to the 76 positively identified LBOs in my sample of firms, there are 148 transactions in which a firm is taken private through means which are not specifically identified in my sources[11] as leveraged buyouts. These are generally smaller firms (they average 2800 employees per firm, in contrast to LBOs, which average 9600 employees per firm) and probably

[11] See Hall (1990c) for more detail on data construction. The LBO sample consists primarily of those firms specifically identified by Kaplan (1989a, 1989b) or Lehn and Poulsen (1989) as leveraged buyouts.

represent smaller transactions of the same type as an LBO. 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 manufacturing employment is the stable short horizon and low technology sectors, 83 percent of the employment in firms which went private during the period is in these two sectors. In addition, 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 two thousand 1982 dollars; for the firms which were taken private between 1977 and 1987, R&D investment per employee was five hundred 1982 dollars in the year or two before the transaction.

The second fact of interest is that stable long horizon firms are more than twice as likely as firms in the other three sectors to undergo huge leverage increases, and, unlike the other sectors, the firms for which this occurs are almost as R&D-intensive as the other firms in the sector. This fact suggests that the pressure to restructure is not uniform across sectors but is concentrated on sectors where investment is necessarily long-term owing to its size or complexity, and where the technology is not rapidly changing (in fact, the well-known "smokestack" industries).

Table 4 reinforces this view. It shows a simplified version of the regressions presented in Table 2 for each of the four sectors and for the manufacturing sector as a whole. 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 both types of investment is the difference across sectors in

investment behavior following increases in leverage:[12] 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. The higher level of financial restructuring activity in these sectors is therefore associated with declines in investment which are larger than would be predicted solely on the basis of the manufacturing sector as a whole; in short, the post-leverage investment cuts seem to have ben particularly directed at the stable technology sector in general, and the long horizon segment in particular.

On the other hand, the declines in R&D following increases in leverage are nearly the same proportionally, and are larger in those sectors where R&D is relatively larger share of investment. To the extent that R&D proxies for long term investment, it appears that overall such investment is not taking quite as big a hit as total investment. It is very important to remember, however, that the outstanding characteristic of R&D spending patterns within the firm is their sluggishness in the face of any kind of change: note the coefficient of lagged R&D expenditures, which is nearly one, and explains ninety percent of the variance in R&D expenditures across firms all by itself. In view of this general slowness to adjust, the declines in R&D spending following increases in debt loom very large.

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

4. Case Studies.

The case study evidence, which consists of a few large transactions, tends to support the findings of the large-scale empirical studies.[13] There are two major classes of transactions: the first is mergers between highly related large firms, which are usually followed by no change or an increase in R&D; the second consists of major increases in leverage or a leveraged buyout induced by the threat of hostile takeover. These are generally followed by cuts in R&D spending.

In the first group are several transactions in the petro-chemical industry: 1) G.D. Searle was acquired by Monsanto in 1987, after which R&D was supported at the previous level with more emphasis on basic research. 2) Celanese was taken over by Hoechst in 1987; this firm was more willing to engage in long-term R&D. Although Hoechst is a foreign firm, the laboratory in the United States remained fairly independent. 3) Stauffer Chemical was taken over by Chesebrough-Ponds in 1985. This was followed by a hostile takeover by Unilever in 1987; although the company was disbanded, the previous level of R&D was apparently maintained in the remaining divisions. 4) Conoco was acquired by DuPont Chemical in 1982. After the acquisition, R&D for the parent firm increased in amount and as a percent of sales.

Outside the petro-chemical industry,the other main acquisitions in this group are the General Electric acquisition of RCA in 1987 (the main R&D laboratory, the Sarnoff Laboratory was donated to SRI, although GE maintained a contract with the laboratory), and the Phillip Morris acquisition of General Foods in 1985, which was followed by a rebuilding of

[13] My primary sources for this evidence are Miller (1990a, 1990b) and Fusfeld (1987) plus testimony at a July 1989 Hearing of the Science, Research, and Technology Subcommittee of House Committee on Science, Space, and Technology on Corporate Restructuring and R&D.

R&D. These acquisitions are characterized by their highly related nature; the only acquisition in this group which was followed by unambiguous reductions in R&D is the most unrelated of them, the merger of Signal (the electronics-aerospace industry) with Allied Chemical in 1985. This merger was followed by the disbandment of a new venture group and cuts in corporate level R&D, although overall R&D may not have dropped.

The second group of transactions, leveraging or LBO as a defense against a hostile takeover, is dominated by transactions in the Rubber Tire and Stone, Clay, and Glass industries: 1) Owens-Corning-Fiberglass increased its leverage in 1986 as a defense against a hostile takeover attempt; this was followed by a reduction in R&D and a general shrinkage of the firm. 2) USG Corporation increased its leverage in 1987, again as a takeover defense, and shortened its R&D horizon from 5-6 years to 3 years. 3) Owens-Illinois underwent an LBO in 1987 to avoid a hostile takeover; after the LBO, R&D was emphasized more. 4) Goodyear Tire and Rubber Co. was threatened by James Goldsmith in 1987; it restructured by de-diversification and leverage and reduced R&D. 5) Uniroyal Tire was threatened by Carl Icahn in 1985; it responded by forming a joint venture with Goodrich to develop tires, and cut its own R&D spending as a result of this, but its R&D intensity was never high to begin with.

There are two petro-chemical companies in this second group: the first is Phillips Petroleum, which leveraged in 1984 as a defense against a hostile takeover attempt by Boone Pickens. The firm made substantial cuts in R&D personnel, although not out of line with the shrinkage of the rest of the firm. Short-term payoffs were emphasized, although some analysts regard the former level of R&D as wasteful, and view the Phillips case as a good

example of the free cash flow theory at work.[14] The second is Union Carbide, which restructured in 1985 to resist a takeover by GAF Corporation. As part of the restructuring they sold an R&D facility, but moved the R&D into the divisions and did not reduce the intensity.

Finally we reach the only two cases in the case study literature which seem to represent high technology being threatened by hostile takeovers: Datapoint and the best-known, Polaroid Corporation. The hostile takeover of Datapoint by Asher Edelman in 1985 appears to have been a technology disaster, since the customers deserted the firm owing to a lack of confidence in the longrun viability of its technology. R&D and investment were cut by almost fifty percent, but this is one case where increases in leverage were not the cause; the firm has also remained in the publicly traded sector. Because the firm was shrinking, the R&D intensity did not fall much, and in 1987 Datapoint paid it first dividend. It is not clear whether to interpret this as a successful shrinkage of an unprofitable technology company or a failure to invest where there were good opportunities.

In the case of Polaroid, aging technology and a high rate of R&D expenditure with little apparent payoff made the firm vulnerable to hostile takeover attempts. In 1986, leverage was increased as a defense, and R&D intensity reduced slightly, although management claims that leverage was not the reason for the reduction. It still is not clear whether the shift in strategy has been successful.

In reading over the descriptions of these restructurings (except for Datapoint and Polaroid), one is struck by several facts: first, the

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[14] cites? e.g., Jacobs.

friendly mergers happened mainly between highly related firms and were seldom followed by cuts in R&D investment. Second, the major reductions in R&D spending occurred when a firm was defending against a hostile takeover by increasing its leverage. Third, the majority of these events took place in a few industries, not those normally thought of as high technology.[15] In fact, the focus seems to be on what Chandler (1991) calls "stable technology" industries, and in particular, on the subset for which technological innovation is "process" oriented or directed toward cost reduction rather than product development. This is precisely the area where one expects the strongest competition from foreign firms with lower costs, and one cannot help thinking that the reason the pressure to restructure has been directed towards these industries has something to do with overinvestment.

When taken together with the statistical evidence of the previous section, the case study evidence is very suggestive. It appears that the most negative event for investment is the defense of a hostile takeover, which is usually accompanied by a debt for equity swap. Takeovers as a whole are frequently friendly, between firms in highly related industries, and not followed by investment cuts. 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 are centered on the stable technology sector, particularly on those

[15]Note that the case study evidence ignores a few industries, in particular Food and Textiles, where substantial restructurings have occurred. This is because the focus of this evidence was the question of R&D investment, and little is done in those industries. What is interesting is the fact that even when we focus on R&D-performing firms, the case studies are dominated by firms in medium or stable technology industries rather than high technology.

industries which are viewed as having "long horizon" technologies.

It is clear that, at least for this sector, the raiders' view that the previous investment strategies were misdirected and excessive was shared by the capital markets (were this not true, the hostile bid would not have been large enough to succeed in changing the firm's strategy). In this, they are much like the LBOs and MBOs documented by Kaplan (1989a, 1989b) and Smith (1989). Unfortunately, unless one is a doctrinaire believer in efficient markets, this evidence is not enough to persuade one that all the investments foregone were unprofitable. "The path not taken" is difficult to evaluate.

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

Ashmore (1990) studied the behavior of 37 potential targets (identified by a financial analyst who published the candidates in Grimm's) relative to a control group of firms who were not targets. He found that the targets reduced their R&D and investment to sales ratios, and increased their debt in the year following identification by Grimm's. The total effects were about 1.6 percent (a fall from 4 to 2.4 percent) in the R&D-sales ratio and 2.0 percent in the investment-sales ratio. It is not clear from his work whether the larger increases in debt of the potential targets are a combination of many firms with no change and a few with large changes from restructurings.

In a study which examines the effectiveness of shark repellents as a test of Stein's (1988) model of managerial myopia, Muelbroek et al (1990)

find firms decrease R&D intensity relative to industry R&D intensity following the passage of an antitakeover amendment (203 firms; 16 non-mfg). This finding rejects the theoretical proposition that the existence of protection from takeover will free managers to make long-term investments, although it suggests that the reduction in R&D investment was part of a general package of takeover defenses, which may include leverage increases. If it were not part of an antitakeover strategy, we would expect to see no change in R&D behavior under the null hypothesis. Unfortunately, they do not ask whether the leverage of the firm increased at the same time, so we cannot tell whether this result is completely consistent with mine or Ashmore's.

5. Discussion.

The striking feature of the evidence on restructurings during the 1980s is its consistency, in spite of the obvious fact that every firm's situation is "special", and that we expect substantial divergence in the results from each transaction. I believe it is now possible to draw a few simple conclusions from the accumulated evidence. The first is that 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 of them appear to be driven by synergies and relatedness between acquiring and acquired firms. Whether hostile or friendly, they are frequently efficiency-enhancing at least in the short-term, in the sense that productivity increases, costs fall, and profitability rises following the transaction. They do not necessarily lead to cuts in investment strategies of any kind, although they

may involve some needed redirection.

Particularly in the case of hostile takeovers, the evidence suggests mismanagement of assets, excessive diversification, and possibly an inability or unwillingness of the existing management to break implicit or explicit contracts with labor or other stakeholders in the firm as the motivation, rather than managerial myopia per se. Of course, for many acquisitions, especially friendly ones, the driving force is simply that the sum is worth more than the parts. Here I would cite my own results on mergers (Hall 1988a and 1990b), Lichtenberg and Siegel on ownership changes, Bhagat, Shleifer, and Vishny on hostile takeovers, and many others.

On the other hand, massive changes in financial structure possibly induced by threats of takeover do appear to be accompanied by reduced investment of all kinds; this is documented both in my regression results and by several case studies. This fact also holds for financial restructurings accompanied by control changes (such as LBOs and MBOs), but in this case the extreme nature of the transaction mitigates against it being used in industries where long-term investments in innovation are appropriate.

Although this relationship between increased debt levels and reduced investment exists for all industries, it is particularly strong in what Chandler calls the "Stable Technology" sector and the Petro-chemical industry. In fact, the major hostile takeover events in manufacturing have taken place primarily in only a few industries: Petro-chemical, Rubber, and Stone, Clay, and Glass. The cost-based nature of innovation strategies in these industries suggest that increased foreign competition from lower cost producers has been the driving force behind this wave and lends support to

Jensen's free cash flow theory interpretation of restructuring.[16]

Why have these large increases in debt-equity ratios occurred in many manufacturing firms? One possible answer to this question has been well-summarized by Blair (1990), drawing on work by Blair and Litan (1990): 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 the firms whose shares they own. Financial innovations (e.g., junk bonds) during the 1980s made this substitution easier and the Tax Reform Act of 1981 made it more advantageous;[17] however, that leaves the origin of these innovations unexplained. Why did they arise during the eighties and not before? Blair shows that from 1980 onward the net return to capital in manufacturing has fallen below the real cost (measured by bond returns), after being substantially above it for thirty years prior. This is a clear signal that cash within the manufacturing sector should be returned to shareholders rather than invested, and she argues that it led to an increased 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 financial restructurings which we

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[16] In the case of the petroleum refining industry, there is another factor: much of the investment activity in this industry, particularly R&D investment, is related to the exploration and development of oil reserves rather than 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 the rest of the manufacturing sector.

[17] See Schipper and Smith (1989) and Scholes and Wolfson (1990) for a discussion of the changes in relative tax rates on debt and equity in the 1981 and 1986 Tax Reform Acts and their effect on leveraged buyout activity.

observe, and the investment reductions associated with them, are both symptoms of an underlying cause: high real interest rates. The culprit is not the restructuring per se, but the shift in relative prices which caused it. Although we may find isolated cases of the apparent elimination of profitable investment strategies, for the most part those which have disappeared do not have a high enough expected profitability in the current economic environment.[18]

This is a persuasive argument and many economists agree with its essential points (cites this volume?, Winter 1991), but it 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 has a failure to invest in the past driven it lower? Second, perhaps the increased cost of capital alone can 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 are concentrated in certain industries, in particular those with stable technologies, suggest that further research should be directed at the question of whether the cost of capital or expected return to investment in these industries can help explain why they have experienced greater pressure. Blair and Schary (1991) have begun research on this question, but their results are still preliminary.

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[18] The cost of capital is addressed in more detail by several authors in this volume (Malkiel, Kester and Luhrman,...). Also see McCauley and Zimmer (1989) for a more detailed discussion of the impact of the cost of capital on long-term investments.

Before leaving this topic, it is important to emphasize again a question which the existing evidence does not answer. As Froot, Perold, and Stein (this volume) highlight, a major argument in the underinvestment debate is that asymmetric information between managers and shareholders leads to underinvestment in order to produce higher current earnings. This argument is closely linked to the hostile takeover debate: as I have argued in Hall (1990b), if the market is myopic in this way, takeovers will be induced which would not be value-maximizing in a perfect information world, and, 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 increases 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. That is, the investment measures easily available to us are precisely those for which management will be unable to conceal from investors reductions that are undertaken to increase current earnings. Therefore, our concern should be with redirections of investment toward shorter horizons and perhaps with such things as skimping on maintenance or canceling long term R&D projects, but these are precisely the kind of behavior which may be difficult for us, as researchers, to see. The implication of this argument is that while 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 (e.g., Woolridge 1988) may be reassuring, it will be necessary to look more closely within specific firms before

definitively rejecting this particular market myopia argument.

6. International Comparisons.

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 discipline device for managers in the United States. However, the survey of the evidence in sections 2 through 4 of this paper has had very little to say about the economy-wide effects of the recent wave of restructurings. That is, even if the redirection of firm strategies and investment has been profitable for the firms involved, we are still not sure whether there might be a better path to long term productivity gains.

Thus, the discussion in the previous section does not imply that we should be sanguine about our current economic structure and its promotion of long-term investment; besides the obvious macro-economic problems which have led to high interest rates and the inherent subsidy of debt relative to equity in our tax system, it is conceivable that the atmosphere of insecurity which attends the market for corporate control in this country has a more negative effect on long-term investment strategies than has been found in the studies to date.

In any case, even if we do not believe that the recent wave of corporate restructuring has been the cause of investment declines, there remains the question of whether our market system for corporate control is capable of generating the correct level of long-term investment from the

point of view of society as a whole.[19] The existence of an active market for corporate control, which was true well before 1980, may already have created a climate where such investments are discouraged or not valued.[20] This argument leads me to investigate the experience of other large industrial economies.

In this section of the paper, I look briefly at the organization of the market for corporate control in several other countries (Japan, Germany, France, and the U.K.) in order to evaluate alternative systems for achieving the goal of a profitable and productive industry. Roughly speaking, these countries (including the United States) can be divided into two groups: the U.S. and the U.K., where takeovers perform a major function in the allocation of corporate control; and Japan, Germany, and France, where 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 Hirschman's (ref?) exit/voice dichotomy: in the U.S. and U.K., shareholders who are dissatisfied with management's performance tend to sell their shares, often to a higher bidder who may change the management team or otherwise reorganize. That is, the shareholders "exit" when things don't go the way they want. In the Japan and German systems, and to a lesser extent, the French, there are major shareholders (particularly banks and, in Japan, other firms in long term relationships with the firm in question) who tend

[19] In this connection, see the recent paper by Foley and Lazonick (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 costs of takeover can lead to an equilibrium growth rate for labor productivity which is lower than the one which would be associated with higher takeover costs.

[20] But see the discussion in Hall (1990a), which cites Griliches (1981), Cockburn and Griliches (1987), Hall (1988b), Jarrell, Lehn, and Marr (1985), and Woolridge (1988) for evidence that at least the stock market appears to value R&D investments positively.

to hold their shares for a long time, have seats on the supervisory boards, and use "voice" when they feel that the management of the firm is not pursuing the right strategy, or when the firm is in financial distress.

The evidence for this distinction is in Edwards and Fischer (1991), Edwards and Eisenbeis (1991), Franks and Mayer (1990), Kester (1991), Mayer and Alexander (1990), and Hoshi, Kashyap, and Scharfstein (1990). For example, although the level of takeovers appears to be almost as high in Germany and France as in the UK, the incidence of hostile takeovers (which are generally more likely to be a form of management discipline) is much lower, as is the incidence of LBOs.[21] Franks and Mayer attribute this both to the fact that the regulations concerning the employment of management and others are stricter in Germany and to the fact that shareholders rights seem to be somewhat less in both France and Germany.

Franks and Mayer also cite substantial institutional differences between the three countries, centering on the role of banks in Germany as monitoring organizations. Banks have significant shareholdings in other corporations, also have voting rights associated with the bearer shares of private investors, and they sit on the supervisory boards of Akteingesellschafts (German corporations or AGs for short). This role for banks in the monitoring of firm behavior is paralleled in Japan, according to several writers (Hodder 1985, Hoshi, Kashyap, and Scharfstein 1990).

The conclusion which Franks and Mayer draw from their study is that the

[21]The U.K. 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 pounds before 1980 to 3.7 billion pounds in 1988. This tremendous growth has been achieved with a somewhat lower use of debt than in the United States. The timing of the increase raises interesting questions about the tax motivation story for LBOs, since the U.K. has not experienced changes in the tax law at the same time as the U.S.

use of takeovers as a means of transferring corporate control may be costly, both in the resources used at the time of takeover and in the short-term thinking which they claim it engenders. They also argue that "changes in ownership undermine the ability of firms to sustain a reputation for long-term relationships." Alternative institutions for monitoring the investment strategies of firms may be preferred to the continuous auction implied by the takeover market because they are less costly with respect to the development of long-term relationships and investments.

This conclusion is supported somewhat by the results in Hoshi, Kashyap, and Scharfstein (1988, 1990), who show that investment at the firm level in Japan is responsive to liquidity (cash flow) when the firm does not have a longrun banking relationship or does not belong to a keiretsu, but not otherwise. They interpret this to mean that banks with large shareholdings in firms are capable of monitoring them more closely than outside investors and that this mitigates the asymmetric information problem that arises when firms seek external finance. They support this with a finding that firms in keiretsus or with strong ties to a main bank invest and sell more than other firms when they are in a financially distressed state.

It is important to realize that 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 seem to be somewhat different. Edwards and Fischer (1991) document the apparent weakness of the supervisory role which banks play for large German firms: although they hold proxy rights for roughly half the shares in the 100 major AGs the supervisory board typically meets only twice a year, and the banks have only 10-20 percent of the seats on the board. In addition, unlike Japan, banks are not a major source of finance for firms; Mayer (1990) reports the

following shares of bank lending in the net financing of nonfinancial enterprises 1970-1985: UK 7.6, Germany 12.1, US 24.2, France 37.3, and Japan 50.4.[22] Where the German banks appear to be most important is in the lending to and monitoring of small and medium-sized firms (Mayer and Alexander 1990). The most important feature of the system may not be the actual monitoring performed by the banks, but the institutional features (for example, employee representatives have 50 percent of the seats on the supervisory boards, removal of the supervisory board requires approval of 75 percent of the shareholders, and managers are appointed for five year terms) of the German system, which tend to make hostile takeovers difficult (and very uncommon).

It would be quite interesting to repeat the Hoshi, Kashyap, and Scharfstein test of differences in liquidity constraints with data on German firms; although the keiretsu institution does not exist in Germany, variation in the extent of bank involvement on the supervisory boards of firms does (Edwards and Fischer 1991). I am unaware of any current research of this kind, although there has been similar work on the U.S. and U.K. data which attempts to measure the importance of liquidity constraints for investment at the firm level by classifying firms into financing regimes based on their dividend and new share issue policies (Hall 1991 for the U.S., Bond and Meghir 1990 for the U.K.). Although both sets of authors have rejected investment models which do not incorporate liquidity constraints with their data, this work is still too preliminary and fragile

[22] Mayer (1990), Table 12.1. I have reproduced some of these figures in Table 5 of this paper, 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. The data are from the OECD Financial Statistics and have been adjusted to make them as comparable as possible.

to be relied on.

In spite of the well-documented differences in the role of banks in monitoring firm behavior across different national institutional structures, the most striking feature of these international comparison studies is the importance of retained earnings as a source of finance for investment, and the relative unimportance of long-term bonds (except in the U.S., where a third of the debt is bonds). In Table 5, I have assembled some numbers (both from my own data and from those of other researchers) which describe the marginal sources of finance in four countries for the non-financial corporate sector as a whole, and for the approximately 100 largest manufacturing firms in each country.

My attempt to compute these numbers for Japan and the United States revealed that noncomparability in accounting methods across countries may render this kind of comparison extremely difficult to perform. For example, I am unable to determine gross debt and equity changes from the Japanese data available to me, which does not identify a full statement of change in financial position. In the U. S. data for most firms, the net sources and uses of funds are not equal to zero, even approximately. which means there are some sources or uses overlooked in the data. Also in the United States, a large fraction of net finance does not come from any of the conventional sources, but comes from the net sale of investment and plant and equipment, as well as from the "other" category of the sources of funds. This fraction has increased between the seventies and the eighties, another symptom of the restructuring and divestitures which have taken place.

Besides the importance of retained earnings in all countries, the second feature which stands out in Table 5 is that for the non-financial corporate sector as a whole, the pattern of financing in the U.S. looks more

like Japan than the U.K.: the United States and Japan rely far more heavily on debt than do the U.K. and Germany. If true, the fact that average incremental financing proportions do not reveal a dichotomy between the U.S. and U.K. on the one hand, and Japan and Germany on the other suggests that the story is not a simple one: were it simply the case that U.S. firms could not finance investment externally, we would expect the financing proportions to differ, but in fact, the U.S. looks more like Japan, except that a larger proportion comes from new equity rather than new debt.[23] For differences, we must look to the uses of funds, rather than the sources. Here I am hampered by the incompleteness of the Japanese data, although the German data does suggest that far less of the money goes to finance acquisitions than in the U.K.(Mayer and Alexander 1990).

To sum up, the international evidence in this section, although incomplete, puts us back where we started: there is a strong feeling that long-term investment strategies are difficult to implement in an environment where managers fear losing their jobs or firms if they experience bad draws for a couple of years, but little hard evidence. The primary evidence that there is a better way is Japan, but it does not seem realistic to argue that if shareholders rights were reduced in the United States without changing anything else that this would have a significant effect on investment strategies. There are surely other reasons why Japan is different.

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

## 7. Policy Implications and Future Research.

The evidence assembled here tells us that if corporate restructuring discourages investment, it does so by increasing the cost of funds 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 the observable investment strategies, many restructurings in the U. S. manufacturing sector in the last ten years have had no impact on investment strategies, while some, particularly in the stable technology sector, have clearly been induced by a twin desire to use a cheaper source of finance (debt) and reduce investment in sectors which have become unprofitable in the face of high capital costs. Such an action is privately rational in a world with high interest rates and a subsidy of debt relative to equity. The question remains, is it socially rational? Are there politically acceptable (feasible) policies which would inhibit such behavior?

I do not believe that the evidence on investment horizons and corporate restructuring implies or justifies specific strong policy recommendations. The market for corporate control is an important management discipline device and the reduction of shareholder rights by antitakeover legislation without the substitution of an alternative supervisory mechanism would be likely to allow firms to diverge even further from the private (or public) value-maximizing path. It does not seem believable that managers, as a class, are more likely to incorporate the social welfare function in their planning than shareholders. To put it another way, although it may be the case that the Japanese or German system of corporate governance results in longer investment horizons, I do not think that halfway measures or partial moves in that direction would be successful in producing such a result, and a wholesale installation of the entire bank monitoring and interlocking corporate system

in the United States is simply not feasible for complex historical, legal, and political reasons. The one institutional change that might succeed is a relaxation of the restrictions on shareholdings by banks (see Edwards and Eisenbeis, this volume).

On the other hand, this paper (and others) have pointed to two features of the U.S. economy which seem to have increased the incentives to increase leverage and reduce investment in the recent past: the implicit subsidy in the corporate tax system towards debt finance, and the level of interest rates (or the cost of capital) during the nineteen-eighties. I think that both the modern theory of corporate capital structure and the evidence here suggest that the tax effect will tilt the firm toward the use of more expensive external finance for investment, and the interest rate effect will cut both the level and the horizon of that investment. Policies which change these prices, rather than institutional structures, are more likely to succeed in lengthening investment horizons. It is not that institutional structures are unimportant, but they are extremely difficult to modify in ways whose results are predictable, and without incurring substantial transactions costs. In any case, there is evidence that the Japanese and German systems of corporate finance and governance are moving towards ones that look more like ours (Kester 1991, Hoshi, Kashyap, and Scharfstein 1988, Hodder 1985), which suggests that some sort of hybrid system is better, at least on evolutionary grounds.

There are several areas in which future research on this topic should be conducted, and questions which should be probed more thoroughly. With the existing data, it should be possible to refine the investigation of major leveraging

events, now that these have been identified as associated with the majority of investment declines: first, the identification of such events and the causes (such as takeover threats) of them could be greatly improved. Second, the consequences of the reductions in investment or other redirections ought to be examined over a longer term than has been done to date; we now should have available over five years of data for restructurings during the 1984-1986 period.

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

Finally, I think the empirical evidence on international comparisons has barely scratched the surface of the question to date. Neither the sources and uses of funds comparisons, which seem to suffer from severe measurement difficulties nor the role of banks in monitoring firms (compare the conclusions in Franks and Mayer 1990 with those in Edwards and Fischer 1991 concerning the role of banks in Germany) seem to be completely understood. With the exception of Hoshi, Kashyap, and Scharfstein on Japan, little has been done to relate this work to investment strategies across companies at the level of the individual firm. Further work of this kind would shed more light on the question of the optimal form of corporate governance systems.

TABLE 1

CORPORATE RESTRUCTURING IN THE PUBLICLY TRADED MANUFACTURING SECTOR*

| Year | Total Employment (1000s) | Employment (1000s) in Public | Foreign Acquisitions | Private | LBOs | Leveraging** |
|---|---|---|---|---|---|---|
| 77 | 20917. | 66.0 | 1.3 | 10.4 | 0.6 | 30.7 |
| 78 | 21169. | 191.8 | 46.9 | 17.9 | 0.0 | 22.5 |
| 79 | 21999. | 311.3 | 11.9 | 15.5 | 1.3 | 58.7 |
| 80 | 21284. | 152.8 | 24.8 | 1.6 | 13.6 | 150.4 |
| 81 | 20880. | 310.0 | 15.6 | 42.4 | 19.4 | 142.6 |
| 82 | 19806. | 186.2 | 38.3 | 49.6 | 35.2 | 256.0 |
| 83 | 20138. | 298.0 | 0.0 | 14.9 | 33.1 | 33.9 |
| 84 | 20034. | 188.0 | 2.2 | 104.7 | 93.5 | 73.6 |
| 85 | 19279. | 382.7 | 111.4 | 52.1 | 132.9 | 146.9 |
| 86 | 18526. | 656.3 | 190.5 | 84.1 | 172.6 | 116.1 |
| 87 | 17898. | 179.9 | 201.4 | 63.9 | 226.2 | 113.5 |
| Total | | 2924.3 | 644.4 | 457.0 | 728.9 | 1144.9 |
| Average size (1000s employees) | | 6.6 | 7.6 | 2.6 | 9.6 | 6.5 |

*The sample is all firms on Standard and Poor's Compustat Primary, Secondary, Tertiary Industrial, and Over-the-Counter Files for 1976 through 1987 whose SIC code is between 2000 and 3999.

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

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) | |
| Δ(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) | |
| Δ(V/K)$_{-1}$ | | 4.46 (.15) | | .934 (.031) |
| | Leverage Changes for All Firms | | | |
| (ΔB/K)$_{-1}$ | -5.55 (.38) | -10.42 (.39) | -1.71 (.08) | -2.07 (.09) |
| (ΔB/K)$_{-2}$ | -.29 (.39) | -7.63 (.44) | -.16 (.09) | -.39 (.10) |
| (ΔB/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) |
| (ΔB/K)$_{-1}$ | -2.18 (1.02) | 1.54 (1.09) | .18 (.24) | 1.08 (.28) |
| (ΔB/K)$_{-2}$ | -1.33 (1.07) | 0.91 (1.14) | -.04 (.25) | .23 (.30) |
| (ΔB/K)$_{-3}$ | -2.62 (1.33) | 1.10 (1.45) | .05 (.32) | .36 (.35) |
| F-stat (4,14200) for acq. effects | 9.01 | 6.00 | 0.40 | 4.42 |
| Standard error | 8.35 | 8.93 | 1.99 | 1.98 |

See the next page for notes and a description of the variables.

TABLE 2, continued.

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.

Variable Definitions:

I -- Capital expenditures for the firm during the year.
R -- R&D expenditures for the firm during the year, set to zero 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 Hall (1990c).

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 3

LEVERAGING EVENTS IN MANUFACTURING BY INDUSTRY TYPE
1977-1987

| | High Tech* | Stable Tech Long Hor. | Stable Tech Short Hor. | Low Tech | Total |
|---|---|---|---|---|---|
| | | All Firms in 1982 | | | |
| Number of Firms | 677 | 408 | 298 | 587 | 1970 |
| Employment (1000s) | 6507 | 6130 | 1750 | 5419 | 19806 |
| R&D Expenditures (Millions 82$) | 22525 | 14886 | 2181 | 2482 | 42073 |
| | | Leveraged Buyouts | | | |
| Number of Firms | 5 | 13 | 22 | 36 | 76 |
| Employment (1000s) | 46.5 | 42.7 | 272.0 | 367.6 | 728.8 |
| R&D Expenditure (Millions 82$) | 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** | | | |
| Number of Firms | 21 | 43 | 44 | 116 | 224 |
| Employment (1000s) | 61.7 | 125.3 | 370.5 | 569.7 | 1127.2 |
| R&D Expenditure (Millions 82$) | 81.7 | 69.0 | 351.3 | 95.5 | 597.5 |
| Percent Industry Employment | 1.4 | 2.0 | 21.2 | 10.5 | 5.7 |
| Percent Industry R&D | 0.8 | 0.5 | 16.1 | 3.8 | 1.4 |
| | | Leverage Increases*** | | | |
| Number of Firms | 34 | 48 | 25 | 70 | 177 |
| Employment (1000s) | 260.1 | 640.6 | 74.5 | 153.7 | 1128.9 |
| R&D Expenditure (Millions 82$) | 525.8 | 1283.8 | 43.0 | 52.6 | 1905.2 |
| 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 |

The notes to the table are on the following page.

TABLE 3 (continued)

*The division of the manufacturing sector into High, Stable, and Low Tech sectors follows the definitions of Chandler (this volume). Using my (Hall 1990a) roughly two-digit classification, the sectors are the following:

| | |
|---|---|
| High Tech: | Pharmaceuticals (except Soap and Toiletries), Elec. Equipment, Electronics, Computing Equipment, Aircraft and Aerospace, Instruments. |
| Stable (Long Hor.): | Chemicals, Petroleum, Primary Metals, Machinery, Autos and Transport Equipment (except parts), Engines. |
| Stable (Short Hor.): | 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. |

**These are leveraged buyouts plus approximately 150 transactions where a firm was taken private without being identified in the data sources specifically as a leveraged transaction. These are generally smaller firms.

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

TABLE 4

INVESTMENT REGRESSIONS BY INDUSTRIAL SECTOR

1977-1987

| | High Tech* | Stable Tech | | Low Tech | Total |
|---|---|---|---|---|---|
| | | Long Hor. | Short Hor. | | |
| Number of Observations | 3914 | 3583 | 1582 | 4422 | 13501 |
| | 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) |
| Std. Err. | 11.2 | 8.2 | 8.5 | 9.2 | 9.5 |
| | F(45,13441) = 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) |
| Std. Err. | 3.33 | 1.60 | 0.55 | 0.81 | 2.04 |
| | F(45,13441) = 10.36 | | | | |
| %ΔR after 3 S.D. increase in B | -24(2) | -24(4) | -13(3) | -19(5) | -27(2) |

*The sectors are defined in the notes to Table 3.

**The variables are defined in the notes to Table 2.

***The last row in each panel of the table gives the percent reduction in investment which 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).

TABLE 5

SOURCES OF INVESTMENT FINANCING

| | United States | United Kingdom | Japan | West Germany |
|---|---|---|---|---|
| | Gross Sources: Non-Financial Corporate Sector | | | |
| Period | 70-85 | 70-85 | 70-85 | 70-85 |
| Ret. earn.* | 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 | 70-85 | 70-85 | 70-85 | 70-85 |
| 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** | | | |
| Period | 82-87 | 82-88 | | 82-88 |
| 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 | N.A. | | N.A. |
| | Net Sources: Largest 100 Firms** | | | |
| Period | 82-87 | 82-88 | 82-86 | 82-88 |
| 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 | N.A. | N.A. | N.A. |

Notes:

*The definitions of the variables and the sources of the data are given in the Appendix. 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.

**In the U.S. and Japanese data, these are the (approximatey) 100 largest manufacturing firms. For the U.K. and German data, these are the 100 largest nonfinancial corporations.

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