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HIGH YIELD FINANCING AND EFFICIENCY-ENHANCING TAKEOVERS

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Executive Summary

This study analyzes the determinants of the risk of takeover from 1981 to 1997 based on a sample of 896 Fortune 500 firms using sophisticated methodology. The measure of firm efficiency includes both production costs and overhead expenses. If relatively inefficient firms are chosen as the targets in takeovers and the new owners reduce the costs of these inefficiencies, then the potential for gains from takeovers for the U.S. economy exists. Because firm-level costs are adjusted for the industry median, the study is able to capture the inefficiency implications of firms where it is clear that other firms in the same general product line are better controlling their costs. Indeed, high total cost per unit of revenue is a powerful determinant of the risk of takeover throughout the period under study. The impact of size on the risk of takeover, however, changed across time.

When financing was readily available, in particular during the period of the early 1980s, larger firms actually faced a higher risk of takeover. Since both costs and size are measured in terms of revenue, one can easily see that the cost savings associated with the takeover of a larger firm might result in larger dollar savings. Unfortunately, our analysis shows that regulatory actions against takeover financing changed this. Distinct from other active takeover periods, that of the 1980s was characterized by the use of high yield financing. Beginning in 1983, almost coincidental to the announcement of the first large takeover attempt financed completely with high yield debt, a bill was introduced in the U.S. Congress to eliminate the tax deduction for all debt used in takeovers. By the time of its passage in 1989, the bill was directed at only high yield financing.

After that, size began to have a strong negative effect on the risk of takeover. By 1990, once a firm reached a certain size threshold, being inefficient relative to other firms in its industry was no longer sufficient to put it at risk for takeover. This policy brief demonstrates how these and other regulatory changes established a size-efficiency tradeoff by which the risk of takeover decreased with size for larger, relatively inefficient firms in the late 1980s. This finding has serious implications for the efficiency enhancement gains available from takeovers after regulations were enforced against the use of high yield securities for financing corporate control activity.

I. Introduction

> "Thus the fact that shareholders are made wealthier by these transactions does not necessarily imply that the economy (or society) as a whole benefits from them. A crucial question is whether the gains to shareholders are social or merely private. In principle, the gains to shareholders could be offset by losses to other stakeholders such as bondholders or employees, so the gains are merely private. An alternative hypothesis is that a change in corporate control tends to result in more efficient utilization of the resources employed by the firm. Hence it moves the firm (and society) from a point below the production possibilities (and social welfare) frontier to a point on (or closer to) the frontier, and the gains to shareholders are social gains." (Lichtenberg 1992 p. 2)

Takeover activity in the last two decades has stimulated a vigorous debate about the consequences of corporate control activity for the health of the U.S. economy. Part of the debate over whether takeovers improve the allocation of resources focuses on the pre-takeover performance of targets. Whether targets function in ways that are relatively inefficient is crucial to our understanding of the overall economic impact of corporate control activity. If relatively inefficient firms are selected as takeover targets, then there is a real potential for economic gains from takeovers. A finding of relative inefficiency in targets suggests that buyers are selecting firms that can be improved.

The use of hazard analysis[1] in this study allows an examination of changes in the determinants of risk over time. If these changes in the risk of takeover are not accounted for, their presence can bias the results for identifying how target firms are selected. For three decades, most academic studies have reported that the probability of takeover falls with size. Researchers concluded that large firms were not subject to takeover, regardless of their performance. This called into question the ability of the market for corporate control to discipline large, inefficient firms.

We show that regulatory activity affecting the availability of financing for takeovers effected the risk-size profile. In the early 1980s, prior to regulatory interference, relatively larger firms had a higher risk of takeover. Our results show that risk as a function of size gradually changed over time. Size became a deterrent to takeover once restrictions were placed on the use of debt for financing. This result is not found in prior statistical studies of takeovers because few have examined changes in risk across time and across size.

In this study, cost per unit of revenue is used to measure efficiency at the firm level. Overall, the relative risk of takeover rises with cost. Furthermore, a firm with costs above the industry median has a risk of takeover more than twice that of a firm with costs at or below industry. Although relatively inefficient firms had a higher risk of takeover, a failure in one area of performance eventually could be offset with size. This size-efficiency trade-off was created when regulations were enforced against the use of high-yield securities in takeovers.

Section II of this paper outlines important events in the regulatory environment. Section III describes how efficiency was measured in this study. Section IV provides technical details about

the sample of firms and the data used for the statistical analysis. In section V, we present a model that accounts for the changes in risk across time, size and levels of efficiency. In section VI, we demonstrate the magnitude of the size-efficiency tradeoff linked to the regulatory changes. Section VII concludes.

II. Regulations Against Takeover Financing

In 1983, a bill was introduced in the U.S. House of Representatives for the express purpose of ending all large takeovers by eliminating the deduction for interest paid on debt used in acquisitions. With the introduction of HR 4170, Representative Byron L. Dorgan of South Dakota sought to "amend the Internal Revenue Code to deny any deduction for interest paid or incurred on loans in connection with corporate takeovers or attempted takeovers."[2] The bill was designed to impact only the takeover of large firms, as it would exempt firms with annual sales of less than $250 million. Although Representative Dorgan's bill was not approved, a similar bill was introduced virtually every year after that until it was passed. By 1987, support for the proposal had become strong enough that the Brady Commission listed consideration of the bill as a contributing factor to the stock market crash of October of that year (Lichtenberg 1992).

The version that finally passed was contained in the Revenue Reconciliation Act of 1989 as the new Section 163(i). Deeply discounted debt issues were, in effect, re-characterized as preferred stock for the treatment of distributions.[3] The outcome was to eliminate tax deductions for interest paid on high yield securities, raising the cost of financing for takeovers. The New York legislature also eliminated the deduction for interest on debt used in takeovers in 1989 (Yago 1991). Similar tax bills were under consideration in other states at the same time. Meanwhile, in

January 1986, the Board of Governors of the Federal Reserve System passed a rule limiting high yield securities issued by shell corporations to 50 percent of the value in takeovers. The impact of these events on the risk-size relationship has not been studied before.

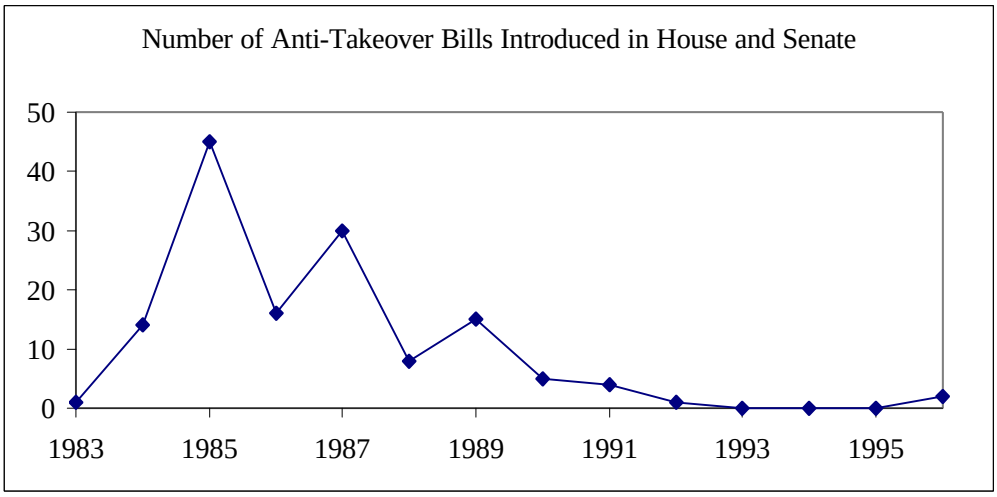
The impact of these regulations is not trivial. The term "junk bond" is applied to any debt issue with a "speculative grade" rating by one of the bond rating organizations (Standard & Poors, Moody's). Yago (1991) estimated that only 5 percent of publicly traded U.S. firms with annual sales over $35 million were awarded "investment grade" ratings during the 1980s. 25 percent of new corporate debt issued in 1989 was classified as "junk bonds." We reviewed Moody's list of corporate debt outstanding as of December 1989 to identify Fortune 500 firms used in this study who had been buyers in takeover. We found 60 such companies with below-investment-grade debt, or 34 percent of the sample firms that were buyers in takeovers before 1990.

From 1980 to 1989, high yield security financing was used in 8 percent of all mergers and acquisitions in the U.S.. In the same period, high yield securities accounted for 19 percent of the value of all mergers and acquisitions (Hogan and Huie 1992). The percent of cash payments financed by high yield securities could be substantially higher. The Hogan and Huie statistics don't differentiate mergers and acquisitions by method of payment. Also, some firms issued high yield securities for "possible future acquisitions" (Yago 1991) and some of this debt is placed privately, so that it is not included in public statistics. Therefore, accurate statistics for high yield security financing as a percent of all cash payments are not available.

Some definition of efficiency has been associated with U.S. government policy toward business combinations throughout the last three decades. Efficiency enhancement was added to the Federal Trade Commission Merger Guidelines in 1984 as a defense for mergers, regardless of size. This was in contrast to the "antitrust" period of regulation where size was a primary consideration for opposing business combinations. That size considerations would be put aside in favor of efficiency was a natural step toward motivating the buyers in takeovers. Enhancing the efficient allocation of resources in the economy would not motivate the rational management of any firm to be the buyer in a takeover unless profits could be realized in the transaction. If a buyer could realize gains by taking over and reducing the costs of a small firm, then those gains should be even greater in a larger firm.

Yet the three branches of government didn't always work in the same direction. In addition to Congressional action against takeover financing, at least six separate bills were introduced into the House of Representatives and the U.S. Senate in 1985 and 1987 specifically designed to tax any profits realized in a takeover. The timing of other anti-takeover activity further confounded the impact of the regulations on financing.[4] The graph in Figure 1 shows the number of bills mentioning "takeover" that were introduced in the House and Senate during the period. The Federal Reserve rule and tax code changes were aimed at takeover financing, critical for approaching larger targets. Other congressional and state actions had the effect of raising the transaction costs of takeovers by erecting barriers to their timely execution. The combination undermined the effective workings of the market for corporate control. Increasing transaction costs drove up the minimum gains needed to motivate a buyer at the same time that financing constraints made it harder to take over larger firms.

Figure 1 Congressional Actions Against Takeovers



Source: Compiled from data available in History of Bills, GPO Access Gateway, New York State Library.

III. Measuring Efficiency

This study uses sales in constant 1980 dollars to measure size. The basis for our choice is that this measure can be stated in constant dollars with confidence. The book value of assets may fall with depreciation and amortization even though the underlying assets remain in use at the firm. Market values are subject to intra-firm variations that may be more closely associated with changes in performance than in firm size. Sales also measure the firm's contribution to national output. Therefore, we choose to measure size with sales.

Our main hypothesis regarding the pre-takeover performance of targets is that they have known inefficiencies that can be exploited in a takeover. These indicators of potential gains from improvement must be based on publicly available information. For purposes of the present research, efficiency is measured through the utilization of resources at the firm level. In order to make firms in different economic sectors comparable, the research employs a performance

adjustment based on industry. After removing the industry component, targets can be compared to a control group that is comparable in size.[5]

Although it has not been used to measure performance in prior research on takeovers, cost per unit of revenue is primitive to profit and market value. Firms with lower costs should have higher profit rates and firms with higher profit rates should have higher market values. We measure firm efficiency as total costs *divided by* total revenue. Cost per unit of revenue directly measures the efficient use of resources at the firm. It is not infected by many of the accounting practices that can be manipulated by management that make profits a questionable measure of performance in statistical analyses. Costs include only cost of goods sold (raw materials and labor) plus selling, general and administrative expenses (overhead). Frydman et. al. (1999) used the measure in a study of privatization effects in Eastern Europe. Where similar measures were used in takeover studies, the form and interpretation have been as a measure of cash flow or profitability.[6] Our measure and interpretation directly follows Frydman.

IV. Sample and Data Description

This study begins with all the firms that had a Fortune rank of 500 or less in any year from 1980 through 1997. The applicability of the results to a broader population of firms is improved by the inclusion of a full panel of data for firms that were not ranked every year. There were 1,092 different firms ranked by Fortune for which data was available. Cooperatives, subsidiaries and other non-publicly traded companies are excluded as they are not strictly subject to takeover as will be defined here. Financial firms are excluded because their accounting statements are not comparable to operating companies. Regulated firms (railroads and public utilities) are excluded

because of restrictions on pricing and rates of returns. After excluding these types of firms, there were 938 firms available for study.

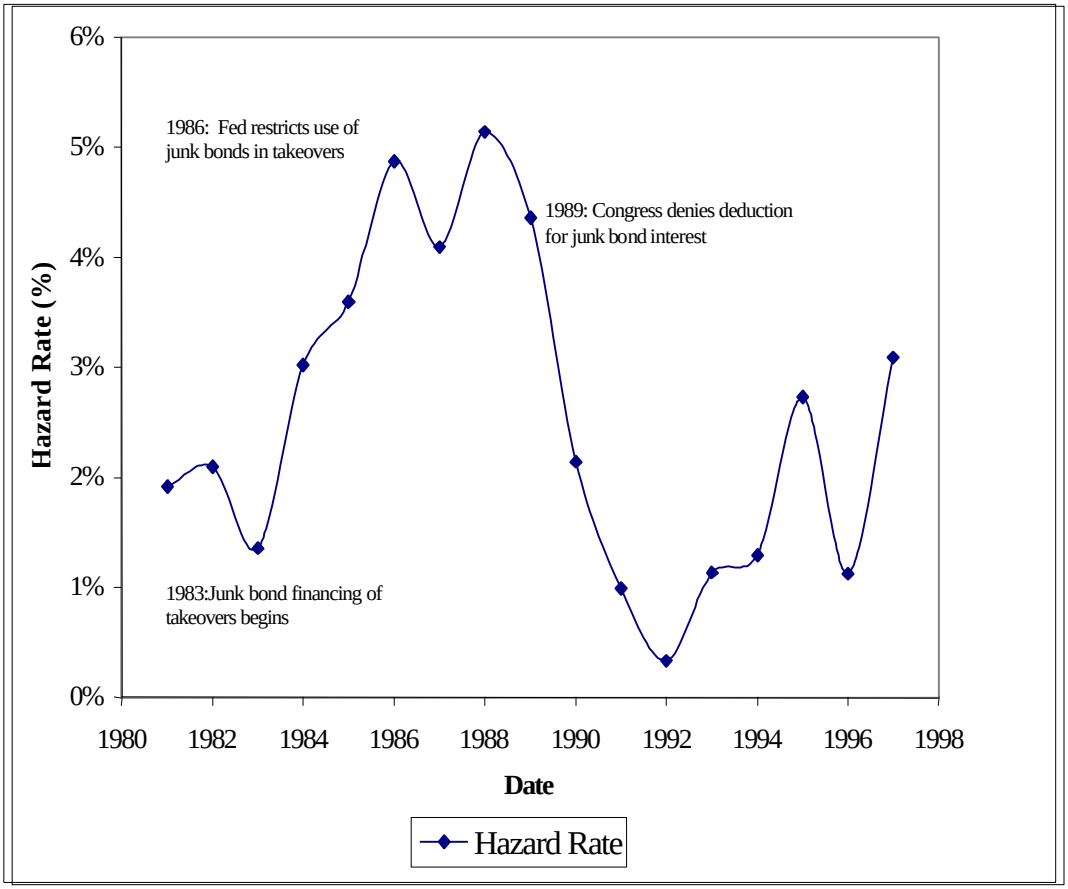
A takeover is a transaction in which one firm is subsumed into another, i.e., where a complete change of ownership occurs. Takeovers were tracked for each year from 1981 through 1997. There were 319 firms identified as targets. All performance data from 1980 through 1996 and the Standard Industrial Classification (SIC) industry codes are taken from the *Compustat* files, Standard & Poor's Directory of Corporations, Moody's Industrial Manuals and SEC reports. Industry adjustments are based on the median for each year of firms in the *Compustat* Industrial files with the same 2-digit SIC code, excluding firms known to have been involved in takeovers. We required a minimum of 10 observations for each industry-year for the industry adjustments. Lack of industry adjustments reduced the sample to 896 firms and 276 takeovers. The data set contains 10,784 observations.

Each firm is also assigned to one of six sectors: basic resources, cyclical consumer products, non-cyclical consumer products, energy, industrial and technology. The sectors follow the definitions used in the Dow Jones Stoxx Index and are used to control for sector-specific effects on firm performance and the probability of takeover. The difference between the 2-digit SIC-code industries and the sectors are worth noting. SIC industry codes, even at the 2-digit level, are specific enough that different codes are assigned, for example, to clothing wholesalers and clothing manufacturers. Sectors, on the other hand, would gather all firms in the clothing industry together (cyclical consumer products). The industry adjustment is meant to make firm performance comparable across industries. Wholesalers and manufacturers would face different

cost structures, so that an adjustment based on the SIC code would be appropriate for measures of performance. However, the overall analysis is intended to account for a broader range of effects. Checking for differences of effects on the risk of takeover at the sector level would be appropriate for this reason.

The number of targets as a percent of the number of firms under study is a simple way to describe the probability that a Fortune 500 firm would be taken over in any given year. In technical terms, this is known as the "hazard rate." This hazard rate is graphed in Figure 2, where significant regulatory events are indicated across time. The average annual hazard rate for the entire study period is 2.5 percent.

Figure 2: Takeovers of Fortune 500 Firms, 1981-1997



Date is year of takeovers used in hazard rate.
Hazard rate is [number of targets] / [total number of firms] per year.

V. The Firm Efficiency Model of Takeovers

This section presents the Firm Efficiency Model as a model for the determinants of takeovers. Before performance measures were added to the model, each measure was examined to account for changes in the effect of performance on risk across time. We also account for changes in the effect of performance on risk across ranges of size and efficiency in all periods. Finally, we account for any interaction between the two measurements.

The rigorous development of the hazard model is presented in Trimbath (2000). This statistical analysis yields a hazard ratio that relates the risk (probability) of takeover to firm size and efficiency. The following discussion explains the importance of these findings. Table 1 at the end of this section displays an explanation of the effect of increases in size and costs on the risk of takeover based on the results of the Firm Efficiency Model.

A. Size

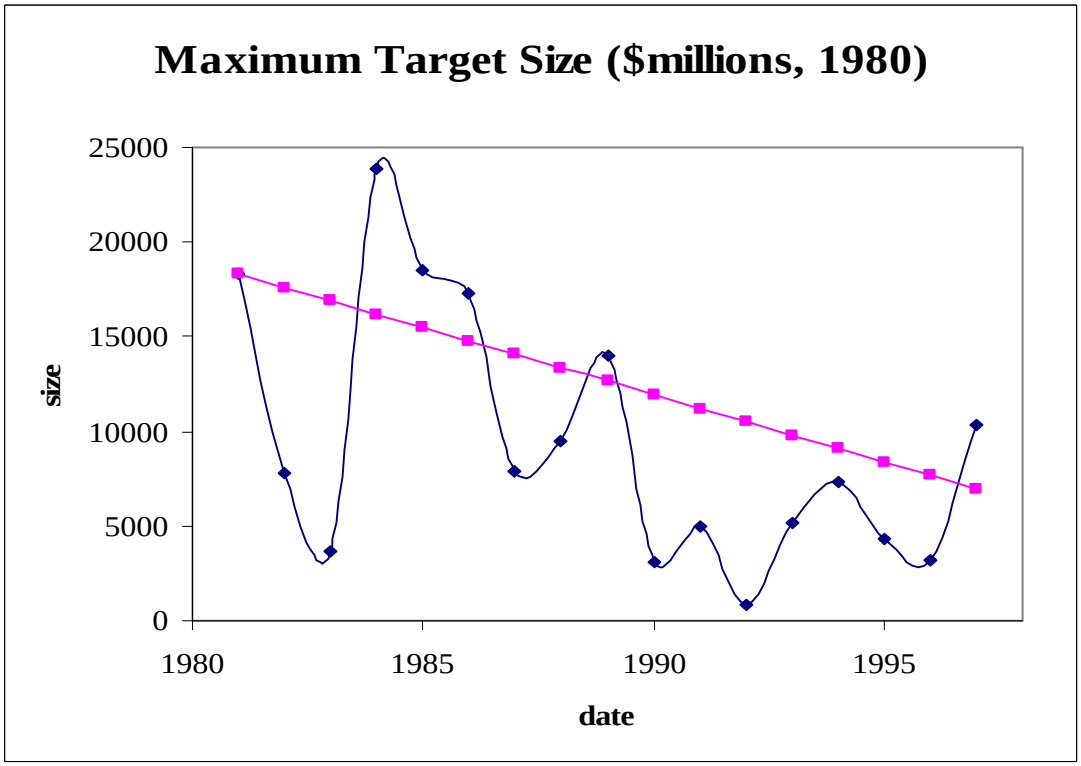
We begin with an examination of the risk-size relationship. Size became more important in later years. The effect on the risk of takeover from increases in size changes at 1986 and 1990. The risk of takeover increases with size in the 1981-1985 time period. From 1986-1989, there is a non-linearity in the risk-size relationship. For the smallest 50 percent of firms, the risk of takeover increases with size, but for the largest firms in the sample, risk falls as size increases. In 1990-1997, the effect of increased size is to reduce the risk of takeover for all firms. The decrease in takeover risk with increasing firm size for the period 1990-1997 is significantly greater than it was for the larger firms between 1986-1989.

The finding of significantly changing effects due to size on the risk of takeover across time and across the ranges of size is startling from the perspective of the academic literature on takeovers. Many researchers included measures in their models for the probability of takeover to "control for size." Moreover, several authors have reported small size as a significant determinant of the probability of takeover. Our own theory recognizes the importance of size in determining the potential gains. Bigger inefficient firms should yield bigger savings after the takeover if for no

other reason than that the same percentage of cost savings would yield a larger total dollar savings. Additionally, there may be economies of scale in firm restructuring so that the cost of improving one large firm is less than the cost of improving several small firms.

The breaks in the impact of size on takeovers at 1986 and 1990 coincide with two important regulatory changes that affected takeover financing: the 1986 Federal Reserve rule and the 1989 tax code changes. It appears that the regulations directed at takeover financing had a clear impact. This is evidenced by the gradual assertion of size as a deterrent to takeover. For the years 1981-1985, size was not a significant risk factor for very large firms. After the regulatory changes, size asserted itself as a deterrent to takeovers. The change began in 1986, when size was a deterrent to takeover for only the largest firms. Changes in tax rules for takeover financing and takeover profits were under consideration throughout this transition period. After 1989, size was a significant deterrent to takeover in all ranges of size. The impact is perhaps more obvious when we examine Figure 3, which shows that the maximum size of the firms taken over in each year drops dramatically after the regulations are enacted.

Figure 3 Decreasing size of targets across time



Size measured as revenue.

B. Costs

Next, we look at the relationship of risk and cost per unit of revenue, our measure of firm efficiency. Firms with the lowest industry adjusted costs have the lowest risk of takeover. In our model of takeovers, a firm is "inefficient" if its costs (as a fraction of sales) are higher than the industry standard. Therefore, we examined the effect of costs above and below industry on the risk of takeover. Looked at this way, there is a significant risk of takeover for firms with costs greater than their industry median while firms with costs below their industry median have a significantly reduced risk of takeover. The results show that the risk of takeover rises with costs and that once a firm's costs rise above the median for its industry, the risk of takeover jumps to double that of a firm with costs at or below the industry standard.

The effect of costs on risk does not change across time. Buyers selected relatively inefficient firms as takeover targets. This confirms our hypothesis that targets are chosen from firms that can be improved through efficiency-enhancing cost reductions.

C. Combined Effect of Size and Costs

In 1981-1985, size was not a significant determinant of risk for the smallest 10 percent of firms or the largest 29 percent of firms. For firms at the extremes of size, high costs are the only determinant of the risk of takeover. Though those ranges of size are not included in the final model, some discussion of their cost performance is warranted here. Of the smaller firms, 3.3 percent of those with costs above industry median were taken over. The mean annual hazard rate in the period was 2.4 percent. Therefore, the hazard rate for small relatively inefficient firms was not substantially different from the average for the period. Very small firms may not have been subject to discipline by the market for corporate control because the potential gains were insufficient to motivate buyers to take action. Of the larger firms, 8.8 percent of those with costs above industry median were taken over. This substantially higher hazard rate suggests that the market for corporate control functioned quite well in disciplining the larger, relatively inefficient firms in 1981-1985.

In Section VI, we take a closer look at the combined effect of size and costs on the risk of takeover. By examining the rate at which firms could substitute size for efficiency after anti-financing takeover regulations, we draw a clear picture of the impact of those restrictions on the ability of the market for corporate control to discipline large inefficient firms.

D. Non-Cyclical Sector

Overall, none of the sectors has a significantly different risk of takeover than the full sample. Using the efficiency measure with size, however, firms in the non-cyclical consumer products sector had a significantly higher probability of takeover. This indicates an increased risk in that sector that is not explained by the model. To identify the source of the difference, separate measures were constructed for firms in the non-cyclical sector and all other firms. Only the non-cyclical firms with costs above the industry median had a significantly higher risk of takeover. When costs rise above the industry median, the risk of takeover for a firm in the non-cyclical consumer products sector is significantly higher than that of firms in other sectors. This strong positive effect of costs above industry decreases with time. By about 1990, the increased effect would be reduced to zero so that their risk is not different from firms in other sectors with costs above industry. This study had 38 targets from 1981 through 1989, no targets from 1990 to 1993, and 14 targets in 1994 through 1997, in the non-cyclical sector.[7]

Although it was not our intention to explain this increased risk for a particular sector, there is some evidence that firms in the non-cyclical sector relied more heavily on high yield security financing than other firms. Yago (1991) found that the food industry accounted for 1.4 percent of corporate high yield securities issued in 1983-1986 but only 0.5 percent of GNP, indicating that their participation in the high yield security market was disproportional to their participation in the economy as a whole. This could account for the increased risk in that sector before takeover financing regulations and the decrease in the significance of that risk through 1989.

This is particularly interesting as it addresses the argument that the increase in debt from takeovers had an adverse effect on U.S. corporations. Some economists believe that high yield security debt could be used more heavily in the non-cyclical sector with no adverse effect, as these firms were less vulnerable to economic fluctuations. A 1989 article in *U.S. News & World Report*[8] cited the work of Morgan Stanley economist Stephen Roach in reporting:

> "…most of the debt growth had occurred in businesses that historically suffer less than others during recessionary downdrafts. Sorting out LBO's [leveraged buyouts] by area, Roach found that food and tobacco firms, which boast steady incomes no matter what the economic climate, alone accounted for one-fifth of the deals from 1982 to 1987. Over 95 percent of the rise in interest expense came in sectors comprising just one-third of the nation's total output. 'American industry is not running amok,' says Roach. 'The debt is being carried by those who can handle it best.'"

Table 1 Key Results of the Firm Efficiency Model

	Explanation
Size	
1981 to 1985	For every $100 million increase in size, the probability of takeover rises 26 percent for relatively smaller firms, then rises more slowly at only 5 percent per $100 million increase in size.
1986-1989	For the smallest one-half of firms, the probability of takeover rises 21 percent for every $100 million increase in size. Once firms reach a threshold of size, however, the probability falls 1 percent for every $100 million increase in size.
1990-1997	For every $100 million increase in size, the probability of takeover falls 2 percent.
Costs	For a 1 percent increase in costs relative to sales, the probability of takeover rises 2 percent. For costs above industry, the probability jumps 240 percent.
Non-Cyclical Sector	For costs above industry in the non-cyclical sector, the probability of takeover rises 350 percent above that in other sectors in 1981, but declines to the level of all other sectors by 1990.

Technical Note: Results are from a regression estimated using the Cox proportional hazard model (Cox 1984) with robust standard errors (Lin and Wei, 1989). The model χ^2 is significant at the 1 percent level; all coefficients are statistically significant. Size and costs are adjusted for the relevant 2-digit SIC code industry median in year of observation. Size is measured as sales in $ millions (1980). Costs are costs/sales. Complete results available in Trimbath (2000).

VI. The Size-Efficiency Trade-off

The results so far tell us that firms were selected for takeover if they were relatively inefficient. Costs in our study include not only the cost of raw materials and labor but also overhead expenses. Improvements to the targets might not require the introduction of new technologies or large investments in new capital, as they may be available in the reduction of overhead. We've also shown that anti-financing takeover regulations protected large firms from takeover. Prior to government interference, risk increased with size, suggesting that the potential gains from cost reduction might be greater in larger firms. These greater gains could provide the necessary motivation for the buyers in takeovers. Now we take a closer look at the combined effect of size and costs on the risk of takeover for further evidence of the impact of government interference in the market for corporate control. The examination required performing certain econometric analyses on the results of the Firm Efficiency Model.[9] The complete analysis is available in Trimbath (2000). The following summarizes those findings and discusses how firms were able to trade size for efficiency in the post-regulatory period.

In years 1981-1985, a period including the early stages of the junk bond era of takeover financing and a federal antitrust atmosphere favorable to large takeovers, firms had to reduce size when costs increased to maintain a constant level of risk. As a firm's size increased, so did the potential gains to a buyer in an efficiency-enhancing takeover. In the relevant range of size, for the same level of costs the bigger firm faced a higher risk of takeover. This began to change with the introduction of restrictions on takeover financing in 1986.

From 1986 to 1989, the tradeoff between efficiency and size remained about the same for smaller firms. The smallest 50 percent of firms still had to become relatively more efficient as they grew in order to avoid an increased risk of takeover. There are indications that, as the firm's costs rise, the change in size needed to maintain a constant level of risk will decline. This is of interest because it demonstrates that increasing size could generate takeover benefits from relatively smaller increases in inefficiency. As firms become ever more inefficient, smaller and smaller increases in size will result in increased levels of risk. At higher levels of relative inefficiency, the potential gains to a buyer from improvements in the target are sufficient to induce a takeover without requiring large increases in size.

For the largest 50 percent of firms in 1986 to 1989, however, size began to be a deterrent to takeover even with increasing inefficiency. For the same level of costs, the bigger firm had a lower risk of takeover. As firms became larger, they could become relatively more inefficient while maintaining the same level of risk as a smaller firm maintains. Size is clearly a deterrent to takeover in this period for the largest firms. This change created a "cutoff" size above which a large relatively inefficient firm had a reduced risk of takeover. Firms with costs above the industry standard could still have a low relative risk of takeover once they exceed $12 billion in sales (industry-adjusted, 1980 dollars). In this study, there were 11 firms with industry-adjusted sales of more than $12 billion from 1986-1989. Although their costs were up to 13 percent above industry median, only one became a target.

The turnaround that began in 1986 was completed by 1989 when new tax legislation raised the cost of financing for large takeovers. Now every firm has a lower risk of takeover than a

relatively smaller firm does with the same level of industry-adjusted costs. The minimum size at which a firm with costs above industry median can still have a low relative risk of takeover is significantly lower in this period than it was in 1986-1989. The new "cutoff" is only $5 billion. Of the 53 firms in this study with industry adjusted sales over $5 billion and costs above industry median during the years 1981-1989, four were taken over by 1986. The hazard rate for these large inefficient firms was 7.1 percent, compared to the overall annual average rate of 3.4 percent for the period. Between 1990 and 1997, 37 firms had sales of more than $5 billion and costs above industry median. None of them became targets. Table 2 gives the estimated relative risk for the four large firms that were taken over by 1986 as if they had survived to 1990. These firms were about three times as likely to be taken over as a firm with size and costs at the industry median. Had they survived to 1990, with the same performance, their probability of takeover would have fallen, on average, to about 50 percent.

Table 2 Estimated Relative Risk for Actual Targets, 1985 versus 1990

Target (*Buyer*)	Size[2]	Costs[3]	Estimated risk in[1]: 1985	1990	Date of observation[4]
Cities Service Co (*Occidental Petroleum Corp*)	7756	0.090	3.07	0.70	1981
General Foods Corp (*Philip Morris Co*)	7842	0.011	2.70	0.61	1984
RCA Corp (*General Electric*)	7882	0.023	2.76	0.62	1985
Safeway Inc (*Kohlberg Kravis and Roberts*)	16647	0.004	2.68	0.11	1985

1. Risk estimated using coefficients from the hazard model described in Table 1. Risk is measured relative to a firm at its industry median for size and costs.
2. Size measured as sales in $ millions (1980) and adjusted for 2-digit SIC code industry median in year of observation.
3. Costs are the ratio of costs/sales, adjusted for 2-digit SIC code industry median in year of observation.
4. Takeovers were completed in year following date of observation.

We also found a significant positive correlation between size and costs for firms that were not taken over that increases in successive periods.[10] The positive correlation indicates that costs increased as a proportion of sales as firms became larger. That this correlation is stronger in later years supports our contention about the impact of anti-financing takeover regulations on the ability of the market for corporate control to discipline larger, inefficient firms. Not only did these firms have a lower risk of takeover, but the relationship of size and inefficiency among the Fortune 500 firms increased in the post-regulatory period.

VII. Conclusion

Economists now accept that the risk of takeover falls as size increases. Failure to recognize the change in risk across time led to an over-emphasis in the economics literature on the potential for large, inefficient firms to escape disciplinary takeovers. Our analysis shows that there was no

tradeoff between size and efficiency in the early 1980s. As regulatory changes took effect in the mid- to late-1980s, however, there was increasing opportunity for a firm to reduce the risk of takeover without improving efficiency simply by achieving a sufficiently large size.

Evidence about size and inefficiency is provided in this study by comparing the effect of size on the risk of takeover for firms with relatively high costs during and after the introduction of regulations on takeovers financed with high yield securities. When financing was available and the regulatory atmosphere was just beginning to change, only the top 1 percent of firms were large enough to have costs above the industry standard and not face an increased risk of takeover. After the regulations were fully enacted this was true for the top 30 percent. What economists suspected was true during the 1980s actually did not take place until nearly the end of the decade.

One might argue that many large but efficient firms were falling prey to unnecessary hostile takeovers prior to the regulatory changes. Although the analysis here might suggest that the regulatory changes created additional protection for large efficient firms, this was not the case. There were 54 takeovers after 1989 of firms with size above and costs below industry median. The majority of those takeovers were not resisted by the target firm ("friendly" takeovers). Of the four very large firms taken over before the regulatory changes, only Cities Services and RCA rejected the first bid received from the buyer. Moreover, they had the highest industry adjusted costs of that group. We can't answer the question of whether or not Cities Services and RCA would have been taken over had they survived beyond 1989. However, the results presented here are not changed if we exclude targets that did or did not resist the takeover offer (Trimbath 2000).

Despite the concerns of policy makers that takeovers created too much debt, many of those financed with the high-yield securities that were targeted for regulation were in a sector of the economy that could best afford to carry the debt. In fact, our results show that firms in that sector had an increased risk of takeover specifically if they functioned in relatively inefficient ways, with costs above the industry standard.

Our analysis presents evidence that all relatively inefficient firms had a higher risk of takeover in the early years studied and that larger relatively inefficient firms had a reduced risk of takeover in the later years. In addition, it can be shown that the post-takeover gains from improved firm efficiency were significantly lower in the post-regulatory period (Trimbath 2000). Whereas firms combined in a takeover before the regulatory restrictions enjoyed a 2.7 percent reduction in costs, the gain in the later years of the study is only 1 percent. Considering the average target firm in this study, that means that the U.S. economy benefited an average of $46 million just in cost reductions from each takeover completed before the regulations and only $15 million on average after government interference in the market for corporate control. These cost savings may have been passed on to consumers in the form of lower product prices. The economic loss to the U.S. economy is even higher if we consider the large inefficient firms that did not experience a change in ownership and control and therefore continued to function in inefficient ways. Our analysis of Fortune 500 firms indicates that the elimination of high yield security financed takeovers had a deleterious effect on the ability of the market for corporate control to discipline large inefficient firms.

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[1] The methodology is also referred to as survival analysis or event-history analysis. Hazard analysis is described in Cox (1984). Its application to the sample in this study is described in Trimbath (2000).

[2] Congressional Record, May 25, 1983, page 14004.

[3] "Corporate Organizations and Reorganizations," Robert A. Rizzi, *Journal of Corporate Taxation*, Autumn 1991, Vol. 18, Issue 3, p. 268-274.

[4] State legislatures were virtually barred from interfering with federal antitrust regulations covered by the Williams Act after the 1982 Supreme Court decision in Edgar v. MITE Corp. [457 U.S. 624 (1982)]. This ruling on an Illinois anti-takeover statute rendered similar statutes unconstitutional in 38 states. It was not until the 1987 Supreme Court decision in CTS Corp. v. Dynamics Corp. [481 U.S. 69 (1987)] upholding an Indiana anti-takeover statute that states regained constitutional ground to maneuver. An "explosion" of anti-takeover laws followed in the states (Roe 1993).

[5] Because we use the Fortune 500 as the sample, the industry adjustment on size is relatively small. Size and industry-adjusted size are almost perfectly correlated (0.999).

[6] In those cases, it is usually defined as 1 *minus* (costs per unit of revenue). See, for example, Ravenscraft and Scherer (1987).

[7] This sector includes cosmetics and personal care, food retailers and wholesalers, consumer and household products and services, medical supplies, tobacco, health care providers, beverages, and pharmaceuticals.
[8] U.S. News & World Report, Feb 13, 1989, Vol.106, No.6, p,61(1)
[9] The findings derive from the calculation of iso-risk curves in the sales-costs plane.
[10] The correlation coefficients of size and costs for the non-target firms in the study are 0.12, 0.19 and 0.21 across the three periods discussed in this paper. All three coefficients are significant at the 1 percent level.

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