

# Financial leverage changes associated with corporate mergers

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## Abstract

We empirically examine whether firms increase financial leverage following mergers. Firms could increase financial leverage either because of an increase in debt capacity or because of unused debt capacity from pre-merger years. We find that financial leverage of combined firms increases significantly following mergers. A cross-sectional analysis shows that the change in financial leverage around mergers is significantly positively correlated with the announcement period market-adjusted returns. Further tests indicate that the increase in financial leverage is an outcome of an increase in debt capacity, although there is weak evidence that some of the increase in financial leverage is a result of past unused debt capacity. © 2000 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

This paper empirically examines whether merging firms increase their financial leverage following mergers. An increase in financial leverage could arise due to two

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potential reasons which are not mutually exclusive: (1) an increase in debt capacity, and (2) unused debt capacity of target and acquiring firms from pre-merger years. Lewellen (1971) postulates that merged firms can increase their financial leverage without increasing the pre-merger level of riskiness because of an increase in debt capacity that results from mergers. An increase in financial leverage benefits shareholders of merging firms through the tax deductibility of interest payments on corporate debt.

An increase in leverage following mergers might also enhance shareholder wealth through an expropriation of wealth from bondholders. An immediate consequence of a higher debt capacity following mergers is the co-insurance effect — existing bondholders are better off because debt becomes relatively safer. Shareholders can appropriate part or all of the benefits from bondholders by financing the merger with debt and increasing financial leverage of the merged firm (see Kim and McConnell, 1977; Shastri, 1990 for details).<sup>1</sup>

Existing evidence on changes in financial leverage or the associated tax motivation for mergers is inconclusive. While Auerbach (1988) concludes that tax factors were not a major force driving the takeover activity of the 1970s, Hayn (1989) finds some evidence of tax benefits from mergers. Although a detailed analysis of changes in financial leverage and the benefits from higher leverage in the context of mergers is not available, studies other than mergers provide evidence supporting the tax-based theories of financial leverage (see Givoly et al., 1992; Mackie-Mason, 1990).

A more powerful test of an increase in debt capacity hypothesis is to cross-sectionally correlate wealth gains to shareholders of merging firms with changes in financial leverage around mergers. If the present value of future benefits from expected increases in leverage are capitalized at the time of the merger announcement, we expect a positive correlation between announcement period market-adjusted returns and changes in financial leverage around mergers. While the evidence of positive market-adjusted returns may be consistent with many alternative explanations, a cross-sectional analysis provides direct evidence of benefits from financial leverage. We control for several other explanations by including additional control variables.<sup>2</sup>

Merging firms might also be able to increase financial leverage following mergers because target and acquiring firms have unused debt capacity from pre-merger years. We examine whether target or acquiring firms have unused debt capacity using two different benchmarks. First, we model financial leverage and then take the difference

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<sup>1</sup> In a similar discussion, Auerbach and Reishus (1988a) state, “Most hypotheses about optimal capital structure involve individual firms having interior optimal debt-equity ratios determined by the increasing costs to leverage, associated for example, with increasing expected bankruptcy costs, agency costs, or the probability of tax losses. It is, therefore, possible that the combinations would involve increased leverage.”

<sup>2</sup> As in Auerbach and Reishus (1988a,b,c) and Hayn (1989), we control for potential tax benefits from stepping up of target firm’s asset basis, unused net operating loss carryforwards, and investment tax credit carryforwards. We control for benefits from improvements in the operating performance as in Healy et al. (1992). We include the target and acquiring firms’ pre-merger market based performance to control for the disciplinary motive for mergers. We include quarterly senior debt rating changes for acquiring firms around mergers because benefits could arise as a result of expropriation of wealth from bondholders. Finally, we control for the choice of financing.

between firms' actual leverage and expected leverage to capture any unused debt capacity from pre-merger years. We also compare the pre-merger financial leverage of target and acquiring firms with those of matched firms as second measure of debt capacity.

Our empirical analysis provides evidence in support of the theory that an increase in financial leverage results from an increase in debt capacity. The results show that the mean (median) financial leverage, defined as the ratio of book value of total debt to the total value of the firm, increases significantly for the combined firm from 32.9% (30.7%) 1 year prior to the merger to 38.4% (36.6%) 1 year after the merger. That is, the mean (median) financial leverage increases by about 17% (19%) compared to the pre-merger financial leverage of the combined firm. The increased leverage is maintained for all the 5 post-merger years that we examine suggesting that the change in leverage is permanent rather than temporary. Since financial leverage does not decline after the merger, our results do not seem to support the predictions of Chowdhry and Nanda (1993) that debt is used strategically in mergers to deter entry and acquire target firms at a bargain price.

Cross-sectional regressions indicate an economically and statistically significant positive association between the weighted average market-adjusted returns of the target and acquiring firms around the announcement date and changes in financial leverage after controlling for possible benefits from potential wealth expropriation, pre-merger unused debt capacity, and other tax and non-tax reasons for mergers. We conclude that increases in leverage following mergers are associated with increases in debt capacity.

Since the argument of increased debt capacity is directly related to the merging firms' earnings correlation, we examine if changes in leverage around mergers are associated with the correlation between the pre-merger earnings streams of target and acquiring firms. Although the sign of the association is negative as predicted by the increasing debt capacity hypothesis, the results are statistically insignificant. Since earnings correlation is noisy, we use variations of the size variable to proxy for debt capacity. Presumably, the increase in debt capacity is likely to be higher when merging firms are similar in size and are large. The results are consistent with the expectations when we regress changes in leverage on these variables that are variations of the size variable.

We also find some weak evidence of unused debt capacity from pre-merger years. Our results indicate that target and acquiring firms are under-levered when we estimate a model of debt capacity using a number of explanatory variables and compare the firms' actual financial leverage with the predicted values. However, we find no evidence of unused debt capacity when size and industry are used as a proxy for a firm's debt capacity. Moreover, we find no evidence that the capital market incorporates benefits from unused debt capacity at the time of the merger announcement. Overall, our findings indicate that the increase in financial leverage results from an increase in debt capacity, although there is weak evidence that the increase also comes from unused debt capacity.

The rest of the paper is organized as follows. Section 2 motivates the argument for examining financial leverage changes associated with mergers. Section 3 describes the sample and presents summary statistics. Section 4 reports the results on changes in financial leverage and interest expense. Section 5 reports the results related to some of

the other motives for mergers. Section 6 presents a cross-sectional analysis of the announcement period market-adjusted returns, and Section 7 concludes the paper.

## 2. Potential sources of benefits associated with mergers

### 2.1. Increasing debt capacity hypothesis

Lewellen (1971) was the first to propose the increase in debt capacity as a possible motive for mergers.<sup>3</sup> Stapleton (1982) and Brealey and Myers (1991) similarly discuss the possibility of creating value through mergers by making debt safer. The central theme of these papers can be illustrated using the following example. If two firms, T (target firm) and A (acquiring firm), with the same expected earnings of  $\mu$  per dollar of investment and a variance of  $\sigma^2(T) = \sigma^2(A) = \sigma^2$  merge, then the mean expected earnings per dollar for the combined firm will be  $\mu$ , and its variance will be  $[\sigma^2(T) + \sigma^2(A) + 2\rho\sigma(T)\sigma(A)]/4$ , where  $\rho$  denotes the correlation coefficient between the earnings of the two merging firms, T and A.

Since  $\rho$  is almost always less than one, the variability of the merged firm's earnings is smaller than the weighted average of the variability of the earnings of the two merging firms (earnings variability is not reduced only when the earnings of the two merging firms are perfectly positively correlated). A direct implication of a reduction in the variability of the merged firm's earnings is a reduction in its expected bankruptcy costs. The net result is an increase in the debt capacity of the merged firm compared to the pre-merger debt capacity of target and acquiring firms. A merged firm can enhance its firm value by increasing its financial leverage because of the tax deductibility of interest payments generated from additional debt.<sup>4</sup> We designate this testable proposition as the increasing debt capacity hypothesis.

Since the optimal debt capacity of a firm is not observable, we use financial leverage of firms in similar industries as a surrogate for debt capacity. If firms from similar industries tend to converge to an equilibrium leverage in the long run, industry median/mean financial leverage could be used as a benchmark for optimal debt capacity. Moreover, financial leverage could change as a result of economy- or industry-wide factors. Therefore, industry-adjusted leverage should isolate firm specific changes from industry changes.

Previous researchers argue that firm size, among other factors, is an important determinant of debt capacity (Titman and Wessels, 1988). The optimal financial

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<sup>3</sup> Galai and Masulis (1976) and Kim and McConnell (1977) also discuss increasing debt capacity hypothesis.

<sup>4</sup> This is a partial equilibrium model as the taxes at the personal level (income or capital gains taxes) are ignored. In a more general setting, the benefits from interest deductions at the corporate level should be taken into account along with the taxes to the lenders from their interest income. For examples of these settings, see Miller (1977) and Gilson et al. (1988). An examination of financial leverage around mergers, nevertheless, provides evidence on the validity of the increasing debt capacity hypothesis.

leverage of larger firms is likely to be higher than those of smaller firms because larger firms tend to have a lower default risk. We use the financial leverage of industry and size matched firms as a second measure of debt capacity. Firms are matched on the combined size of the target and acquiring firms one year prior to the merger from their industries using market value of the firm as a proxy for size. If size is positively related to debt capacity, financial leverage of matched firms over pre-merger years will be higher than the pro-forma leverage of merging firms. This is because firms matched on the combined size of target and acquiring firms will be able to borrow more than the amount acquiring and target firms can individually borrow.

Increasing debt capacity can also be measured by estimating a model of debt capacity as a function of firm-specific characteristics. Following Rajan and Zingales (1993) and Titman and Wessels (1988), we estimate a model of debt capacity by regressing financial leverage on size, market-to-book ratio of assets, return on assets, and fixed assets-to-total assets ratio. Yearly regressions are estimated using the entire population of firms listed on the Compustat (Industrial, Full Coverage and the Research tapes). Following this approach, a third measure of debt capacity for merged firms over post-merger years is obtained by using the regression coefficients and the firm-specific characteristics of the merged firm over these years.

## *2.2. Unused debt capacity*

It is possible that either the acquirer, or the target, or both have unused debt capacity from pre-merger years. The increase in financial leverage could result from utilization of past unused debt capacity rather than an increase in debt capacity. We investigate this possibility using different benchmarks as measures of debt capacity. First, we compare the pre-merger financial leverage of target and acquiring firms separately with those of industry and size matched firms. We find a matched firm for each target and acquiring firm in the sample from their respective industries.

Second, we separately estimate debt capacity for target and acquiring firms for pre-merger years. If actual financial leverage is less than the benchmark financial leverage, then at least part of the increase in financial leverage following mergers could be the result of past unused debt capacity. We include this variable in cross-sectional regressions to control for possible benefits from unused debt capacity.

## *2.3. Expropriation of wealth from bondholders*

Galai and Masulis (1976) argue that although merging firms are able to reduce risk because of the co-insurance effect, the total value of the merged firm remains unchanged. A reduction in risk increases the value of existing debt, but it also reduces equity value. Since equity is an option on the face value of outstanding debt, its value decreases with a decrease in variability. The increase in the value of debt is offset by the decrease in the value of equity.

Extending the work of Galai and Masulis, Shastri (1990) concludes that it is possible that under certain conditions for the merged firms' outstanding bond value to decline, and the equity value to increase. One implication of Shastri's study is that equityholders

could gain around mergers because of an expropriation of wealth from bondholders. In a related argument, Kim and McConnell (1977) emphasize that equityholders of merging firms can protect themselves from potential losses by increasing financial leverage of merged firms. If the increase in financial leverage is large enough, equity value could increase because of expropriation of wealth from bondholders.

Although an increase in the merged firms' financial leverage is likely to increase firm value because of the tax deductibility of interest payments from additional debt, part of the increase in firm value could also result from an expropriation of wealth from existing bondholders to equityholders. We examine the hypothesis of potential wealth transfer from bondholders to equityholders by analyzing debt ratings of acquiring firms' long-term bonds around mergers.<sup>5</sup> Downgrading of acquiring firms' long-term debt following mergers will be consistent with potential wealth transfers from bondholders to equityholders.

#### *2.4. Other potential benefits from increased financial leverage*

Other than the tax-bankruptcy paradigm, optimal capital structure theories also discuss the role of debt as a signal of firm quality, the use of debt as an anti-takeover device, and the use of debt in monitoring and reducing agency costs of equity. In particular, Jensen and Meckling (1976), Harris and Raviv (1990), and Stulz (1990) develop models of optimal capital structure that are based on agency costs while considering various costs and benefits of debt. Consistent with these models, Maloney et al. (1993) find that firms with higher levels of pre-merger debt will be involved in better acquisitions. Following Maloney et al. (1993), it can be argued that merging firms increasing their financial leverage around mergers are able to signal better acquisitions because of agency benefits or monitoring benefits of debt, which increases the market value. Hence, an increase in leverage is also consistent with debt serving the role as a monitoring device. We also include the target and acquiring firms' pre-merger market based performance to control for the disciplinary motive for mergers.

#### *2.5. Other potential tax and non-tax benefits from mergers*

We control for a number of other sources of benefits that have been examined by previous researchers. Controlling for these potential benefits as additional explanatory variables while analyzing cross-sectional regressions increases the power of the tests (Maddala, 1977). We control for tax benefits that arise from stepping up the target firm's asset basis and from the utilization of unused net operating losses and investment tax credit carryforwards (Auerbach and Reishus, 1988a,b,c; Hayn, 1989). We include

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<sup>5</sup> We thank an anonymous referee for suggesting this to us. We also collected senior debt ratings of target firms prior to the merger. Since target firms are invariably delisted following the merger, we are unable to compute changes in debt ratings of target firms following the merger. The pre-merger level of target and acquiring firms' debt ratings could also contain information about possible wealth expropriation from bondholders. Our results and conclusions do not change when we include level of debt ratings of target and acquiring firms prior to the merger in the regression analysis.

the pre-merger financial leverage of acquiring and target firms to control for the argument that pre-merger leverage has an influence on the selection of mergers. We use the past performance of target firms as a control for the disciplinary motive. Finally, we examine and control for improvements in post-merger operating cash flow performance (Healy et al., 1992).

### 3. Data and summary statistics

#### 3.1. Sample

The sample consists of 239 mergers completed between 1978 and 1987 and is compiled from the following data sources. The initial list of firms was obtained from three merger-related studies conducted by Healy et al., (1992), Opler and Weston (1993), and Ghosh and Lee (2000). Healy et al., (1992) analyze the 50 largest mergers from 1979 through 1984. To avoid restricting our study to large mergers only, we add the Opler and Weston (1993) sample of 216 mergers over the period 1978 through 1987 that includes both large and small mergers derived primarily from *Mergers and Acquisitions*. We include the 150 mergers between 1980 and 1985 from the Ghosh and Lee (2000) sample. Ghosh and Lee focus on large mergers that are followed by *Value Line*. We obtain the announcement dates, the consummation dates, and the terms of the purchase from the *Wall Street Journal Index and Mergers and Acquisitions*. Our conclusions are unaffected when we confine our analysis to any of the three subsamples.

The three sources described above overlap considerably. Our final sample consists of 239 firms for which data are available on both the CRSP (Center for Research in Security Prices) and the *Compustat* tapes. Of the entire sample of 239 mergers in Table 1, 122 (51%) are cash tender offers, 53 (22%) are cash and stock exchange offers, and the remaining 64 (27%) are pure stock exchange mergers. Our sample of mergers is not concentrated in any given year during the time period of our study. The results in this paper are based on this sample of 239 acquirers and their corresponding 239 targets.

#### 3.2. Target and acquiring firms wealth effects around the announcement period

We report the summary statistics on market-adjusted returns in Table 2. Market-adjusted returns are defined as the difference between daily returns and market returns, where the *CRSP* equally weighted index is used as a proxy for market returns. Since the results on market-adjusted returns have been previously examined in detail, we discuss them briefly. Shareholders of target firms gain substantially around the announcement of the merger. Our focus is to examine whether financial leverage changes explain the wealth effects experienced by stockholders around the announcement of mergers. For the event period from day  $-10$  to day  $+5$  (relative to the announcement date in the *Wall Street Journal*), the average market-adjusted returns for target firms are 24.8%. This average is about the same for the period from day  $-10$  to day  $+1$ . When we extend the window beyond day  $+5$ , the cumulative average market-adjusted returns do

Table 1  
Yearwise distribution and the method of payment of mergers

| 1978  | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | Total |
|---|------|------|------|------|------|------|------|------|------|-------|
| <i>Panel A: Yearwise distribution of the entire sample</i>                              |      |      |      |      |      |      |      |      |      |       |
| 7   | 18   | 21   | 36   | 22   | 32   | 32   | 36   | 22   | 13   | 239   |
| 3%  | 8%   | 9%   | 15%  | 9%   | 13%  | 13%  | 15%  | 10%  | 5%   | 100%  |
| <i>Panel B: Yearwise distribution of the sample classified by the Method of Payment</i> |      |      |      |      |      |      |      |      |      |       |
| Cash tender offers  |      |      |      |      |      |      |      |      |      |       |
| 5   | 8    | 10   | 19   | 5    | 7    | 20   | 21   | 11   | 6    | 122   |
| Combined cash tender and stock exchange offers  |      |      |      |      |      |      |      |      |      |       |
| 2   | 6    | 2    | 7    | 8    | 6    | 4    | 11   | 4    | 3    | 53    |
| Stock exchange mergers  |      |      |      |      |      |      |      |      |      |       |
| 0   | 4    | 9    | 10   | 9    | 9    | 8    | 4    | 7    | 4    | 64    |

Yearwise distribution and the terms of mergers for the 239 target and acquiring firms that merged between 1978 and 1987. Firms included in the sample are from the following three sources: (1) the Healy et al. (1992) sample of 50 target and corresponding acquiring firms that merged between 1979 and 1984; (2) the Opler and Weston (1993) sample of 216 firms that merged between 1978 and 1987; and (3) a sample of 150 mergers between 1980 and 1985 that were followed by *Value Line*, which is a sub-sample from Ghosh and Lee (2000). The firms in the above three sources overlap considerably. A firm is included in our sample only if data are available from the CRSP (Center for Research in Security Prices) and the *Compustat* tapes. The sample size for the remaining tables corresponds to the sample size reported below. The data on the method of payment is obtained from the *Wall Street Journal Index* and *Mergers and Acquisitions*.

Table 2  
Market-adjusted returns around the merger announcement date

| Days relative to the announcement day | Market-adjusted returns for the firms in the sample |                 |  |
|---------------------------------------|---|-----------------|--|
|                                       | Acquirers (%)                                       | Targets (%)     | Weighted average (Acquirers + Targets) (%) |
| -1                                    | 0.0 (0.08)  | 8.3 (10.00)***  | 2.1 (4.56)***                              |
| 0                                     | -0.8 (-2.86)**                                      | 7.3 (8.09)***   | 1.0 (2.36)**                               |
| -1 to 0                               | -0.7 (-1.91)*                                       | 15.1 (13.88)*** | 3.1 (5.15)***                              |
| -1 to +1                              | -0.7 (-1.20)  | 16.0 (13.45)*** | 3.0 (4.45)***                              |
| -5 to +1                              | -0.2 (-0.35)  | 20.9 (14.69)*** | 4.8 (5.77)***                              |
| -10 to +1                             | -0.5 (-0.73)  | 23.9 (15.72)*** | 5.4 (6.45)***                              |
| -10 to +5                             | -0.7 (-0.87)  | 24.8 (15.17)*** | 5.3 (6.06)***                              |
| -20 to +1                             | -1.3 (-1.82)*                                       | 28.0 (16.41)*** | 5.7 (5.97)***                              |
| -120 to -7                            | -1.9 (-1.27)  | 8.9 (4.23)***   | 0.2 (1.52)                                 |

Market-adjusted returns for the acquirers and targets for different event windows around the merger announcement date for the sample of firms merged between 1978 and 1987 as described in Table 1. Market-adjusted returns are defined as the difference between the firm and market return, where market return is defined as the CRSP equally weighted index (EWRETD). Combined target and acquiring firm market-adjusted returns are computed as the weighted average abnormal returns of the acquirer and the target. Year-end market values of equity for acquirers and targets prior to the announcement year are used as weights. The announcement date (day 0) corresponds to the date of the first publication of the announcement of the merger in the *Wall Street Journal*. The *t*-statistics corresponding to market-adjusted returns are in parentheses.

\* Denotes 10% level of significance for a two-tailed test.

\*\* Denotes 5% level of significance for a two-tailed test.

\*\*\* Denotes 1% level of significance for a two-tailed test.

not change appreciably (results not reported). We report the regression results in Section 6 using the event window from day  $-10$  to day  $+5$ .

Market-adjusted returns for acquiring firms is approximately  $-1\%$ . The value-weighted portfolio gains accruing to the acquirers and targets is our measure of the total wealth gains accruing to all shareholders as a result of the merger.<sup>6</sup> The acquiring and target firm together experience a gain of  $5.3\%$  of their combined market value for the event window from day  $-10$  to day  $+5$ . In the ensuing cross-sectional regression analysis, we attempt to explain this gain in terms of changes in financial leverage, after controlling for other tax and nontax related benefits.

## 4. Financial leverage changes around mergers

In this section, we provide evidence of an increase in the financial leverage of the merged firm using numbers reported in the balance sheet and income statement. We argue that the observed increase in financial leverage associated with mergers is consistent with the increasing debt capacity hypothesis.

### 4.1. Changes in financial leverage

#### 4.1.1. Firm-specific financial leverage

Table 3 presents the main results on changes in financial leverage. Financial leverage is measured as the fiscal year-end ratio of debt to total firm value. Debt is defined as the book of long-term debt and debt included in current liabilities as reported in the Compustat tapes. Total firm value is computed as the book value of debt plus the market value of equity.<sup>7</sup> The pro-forma financial leverage of the combined firm for the pre-merger years is computed as the ratio of the sum of the debt and the sum of the market value of target and acquiring firms.<sup>8</sup> The change in financial leverage is defined

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<sup>6</sup> In the case of target firms receiving multiple tender offers, we use the first announcement date to measure market-adjusted returns. We are assuming that the market reaction on the announcement date of the first takeover attempt is an unbiased measure of market-adjusted returns to target shareholders. Few studies also measure market-adjusted returns from the announcement to the completion date of the merger. Our results and conclusions do not change when we use the latter period to define market-adjusted returns.

<sup>7</sup> We define total firm value as the sum of the book value of debt and the market value of equity. Excluding the book value of preferred stock from our definition does not bias our results because most of the firms in our sample do not have outstanding preferred stock. Our results and conclusions do not change when we add the book value of preferred stock.

<sup>8</sup> We isolated 17 mergers (about 7% of the sample) listed in the *Wall Street Journal* where acquiring firms owned some percentage of toehold ownership in target shares prior to the announcement of the merger. The effect of an acquirer's toehold in the target, however, is negligible in our sample. The mean (median) toehold is 1.3% (0.0%) of the outstanding target equity for the entire sample. When we incorporate the effect of this toehold in computing the pro-forma combined firm market value of equity in all our analyses, our results and conclusions do not change.

Table 3  
Financial leverage around mergers

| Year   | Raw values |            | Industry- and size-adjusted |            |
|--|------------|------------|-----------------------------|------------|
|  | Mean (%)   | Median (%) | Mean (%)                    | Median (%) |
| <i>Panel A: Yearwise analysis of financial leverage around mergers</i> |            |            |                             |            |
| -5   | 37.2%      | 36.8%      | -0.1%                       | -0.2%      |
| -4   | 34.8       | 34.3       | -2.5                        | -4.5       |
| -3   | 32.8       | 31.5       | -4.4                        | -3.6       |
| -2   | 32.3       | 28.3       | -5.3                        | -2.2       |
| -1   | 32.9       | 30.7       | -5.8                        | -4.4       |
| 1  | 38.4       | 36.6       | 2.4                         | 2.3        |
| 2  | 38.2       | 36.6       | 4.9                         | 6.3        |
| 3  | 38.9       | 38.4       | 7.2                         | 9.5        |
| 4  | 37.2       | 34.2       | 3.2                         | 3.1        |
| 5  | 36.9       | 35.8       | 0.6                         | 2.6        |
| <i>Panel B: 3-year averages before and after mergers</i>               |            |            |                             |            |
| Averages for Period -3 to -1   | 32.7       | 30.9       | -4.7                        | -3.0       |
| Averages for Period +1 to +3   | 39.4       | 36.2       | 5.2                         | 7.9        |
| Increase:  | 6.3        | 4.8        | 9.9                         | 9.8        |
| Test statistic ( $t/z$ -stat)  | (4.2)***   | (3.2)***   | (4.0)***                    | (5.6)***   |
| <i>Panel C: 2-year averages before and after mergers</i>               |            |            |                             |            |
| Averages for Period -2 to -1   | 32.6       | 28.4       | -5.1                        | -3.2       |
| Averages for Period +1 to +2   | 39.6       | 36.7       | 4.0                         | 7.4        |
| Increase:  | 7.0        | 6.2        | 9.1                         | 9.1        |
| Test statistic ( $t/z$ -stat)  | (4.9)***   | (2.9)***   | (4.3)***                    | (5.3)***   |

Financial Leverage is defined as debt to total firm value ratio for the combined firm — acquirer and target — for the sample of firms merged between 1978 and 1987 as described in Table 1. The total firm value is the sum of the fiscal year—end book value of debt and market value of equity. Debt is defined as the sum of long term debt and debt in current liabilities in the balance sheet. Year 0 corresponds to the fiscal year of the merger. Industry-adjusted numbers are computed for each firm and year as the difference between the sample firm value in that year and the median for other firms in the same industry. Industry- and size-adjusted numbers are computed for each firm and year as the difference between the sample firm value for any year and the control firm value for the same year.

\*\*\* Denotes 1% level of significance for a two-tailed test.

as the difference between the merged firms' financial leverage and the pro-forma financial leverage of the target and acquiring firms prior to the merger. We do not examine market values of debt since it is difficult to obtain reliable measures. However, we do not expect our results to be biased for this reason because the book and market values of debt are likely to be highly correlated. Our conclusions are not affected when we use book values for both debt and equity.

Year 0 is defined as the year of the consummation of the merger. The results in Table 3 show that the mean (median) debt to total firm value ratio of the combined firm increases significantly from 32.9% (30.7%) to 38.4% (36.6%). The mean (median) increase in leverage is 5.5% (5.4%) with a standard deviation of 15.3. The maximum

change in leverage is 64.9% while the minimum is  $-25.8\%$ . The properties of increase in leverage indicate a symmetric distribution. To avoid drawing conclusions from one set of changes, we also present results in panels B and C where the pre-merger and post-merger periods are defined using 3- and 2-year averages, respectively. The results in Panels B and C are all significant and similar to the increases in leverage defined over one year around mergers (the  $t$ - and  $z$ -statistics are between 2.9 and 7.6). The results are qualitatively similar and the conclusions are unchanged when we use different definitions of financial leverage using book and market values. For instance, when we measure leverage using book values of debt and equity, the mean (median) change in leverage is 7.6% (5.5%) with a standard deviation of 14.2. The maximum change in leverage is 60.4% while the minimum is  $-21.4\%$ .

Post-merger increase in financial leverage could occur because of an increase in debt, decrease in the market value of the firm, or both. We examine firms' market value and the book value of debt following the merger. We find that both debt and market values increase (results are not reported). An increase in financial leverage is therefore likely to be the result of merging firms taking on additional debt. We also find that most of the increase in debt after the merger is because of an increase in long-term debt, which is consistent with the increasing debt capacity hypothesis.

We also analyze financial leverage changes around mergers using quarterly data in Table 4. Since the timing of the increase in leverage associated with mergers is not central to our paper, we do not analyze the quarterly results in any detail. In general, Table 4 results show that almost all of the increase in financial leverage takes place very close to the completion date of the merger, that is, between quarter  $-1$  and quarter  $+1$ .

#### 4.1.2. Industry and size-adjusted financial leverage

We also report industry- and size-adjusted financial leverage changes around mergers in Table 3 in the last two columns. If firm size and industry act as a surrogate for a firm's debt capacity, then the optimal financial leverage of the merged firm will be given by a "typical" industry and size matched firm. For every merger in our sample, we find a matched firm whose size (measured as the market value of firms) is closest to the size of the combined firm (market value of the target and acquirer), one year prior to the merger announcement, from the industry of the acquiring firms listed in the *Compustat's* Industrial annual tapes. We compute industry- and size-adjusted financial leverage by subtracting from each firm the financial leverage of the matched firm.

Consistent with the increasing debt capacity hypothesis, the results from Table 3 show that the mean and median financial leverage of the matched firm is higher than that of the combined firm for all the 5 pre-merger years. A negative number for the pre-merger years does not indicate unused debt capacity. It indicates the increase in debt capacity that target and acquiring firms can achieve by merging together. A size-matched firm is able to borrow more than the amount target and acquiring firms can borrow as individual firms for the pre-mergers years. Financial leverage of the sample and matched firms is statistically indistinguishable (the  $t$ - and  $z$ -statistics are not reported) following the merger. That is, merged firms fully utilize the increase in debt capacity by taking on more debt following the merger. In particular, the industry- and size-adjusted financial leverage increases significantly from a mean (median) of  $-5.8\%$  ( $-4.4\%$ ) to 2.4%

Table 4  
Financial leverage around mergers using quarterly data

| Quarter   | Raw values |            |
|---|------------|------------|
|   | Mean (%)   | Median (%) |
| <i>Panel A: quarterwise analysis of financial leverage around mergers</i> |            |            |
| –5  | 33.0%      | 28.6%      |
| –4  | 32.7       | 28.1       |
| –3  | 32.9       | 30.6       |
| –2  | 32.5       | 32.0       |
| –1  | 34.5       | 32.1       |
| 1   | 40.3       | 40.7       |
| 2   | 40.5       | 38.4       |
| 3   | 39.6       | 37.4       |
| 4   | 39.9       | 36.7       |
| 5   | 40.4       | 36.8       |
| <i>Panel B: Three-quarter averages before and after mergers</i>           |            |            |
| Averages for Period –3 to –1  | 33.3       | 32.8       |
| Averages for Period +1 to +3  | 40.5       | 39.3       |
| Increase:   | 7.2        | 4.1        |
| Test statistic ( $t/z$ -stat)   | (5.8)***   | (4.3)***   |
| <i>Panel C: Two-quarter averages before and after mergers</i>             |            |            |
| Averages for Period +1 to +2  | 33.6       | 32.5       |
| Averages for Period +1 to +2  | 40.8       | 39.6       |
| Increase:   | 7.2        | 3.3        |
| Test statistic ( $t/z$ -stat)   | (5.8)***   | (4.0)***   |

Financial Leverage is defined as debt to total firm value ratio around mergers for the combined firm, acquirer and target, for the sample of firms merged between 1978 and 1987 as described in Table 1. The total firm value is the sum of the fiscal quarter-end book value of debt and market value of equity. Debt is defined as the sum of long term debt and debt in current liabilities in the balance sheet. Year 0 corresponds to the fiscal quarter of the merger. The  $t$ -statistic tests the mean differences between two periods, and the  $z$ -statistic is from the nonparametric binomial test.

\*\*\* Denotes 1% level of significance for a two-tailed test.

(2.3%) from year –1 to year +1 (the  $t$ - and  $z$ -statistics for ratios in panels B and C are between 4.0 and 5.8).<sup>9</sup>

The results also indicate that the increase in financial leverage around mergers is not the result of a temporary financial decision. For instance, the median industry-adjusted

<sup>9</sup> We also compute industry-adjusted financial leverage numbers. The results support the argument that financial leverage increases are firm-specific, and are not caused by underlying industry increases. In particular, the industry-adjusted financial leverage increases significantly from a mean (median) of 2.0% (1.6%) to 10.6% (6.91%) from year –1 to year +1. The significance levels for the industry-adjusted changes in financial leverage are generally higher than those without industry adjustments (the  $t$ - and  $z$ -statistics for the industry-adjusted ratios in panels B and C are between 5.4 and 7.6). Fig. 1 plots the industry-adjusted mean and median financial leverage (debt to total firm value) around the merger year.

## Industry-adjusted debt analysis

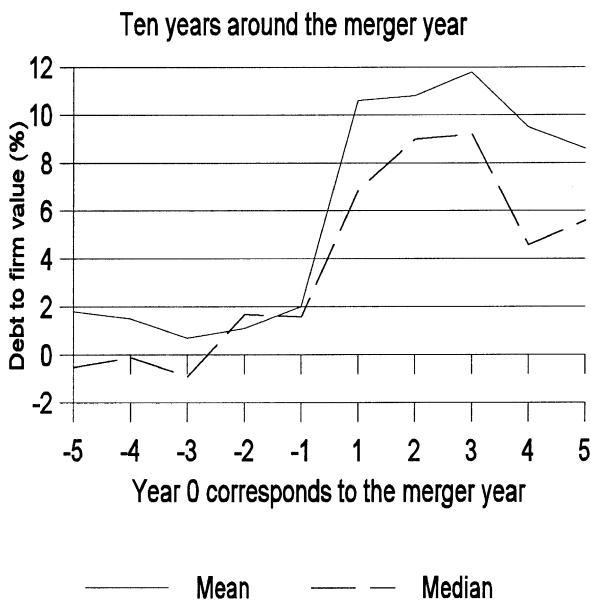


Fig. 1. Industry-adjusted debt to total firm value (expressed in percentage) analysis for the merged firms for ten years around the merger year. Debt is expressed as a percentage of total firm value, where total firm value is the sum of the fiscal year end book value of debt and market value of equity. Debt is defined as the sum of long-term debt and debt in current liabilities on the balance sheet. Industry adjusted numbers are computed for each firm and year by taking the difference between the sample firm value in that year and the median for the other firms in the same industry.

financial leverage increases sharply from  $-4.4\%$  in year  $-1$  to  $2.3\%$  in year  $+1$  and for all the 5 post-merger years, the median financial leverage varies between  $2.3\%$  to  $9.5\%$ . We conclude that the increase in financial leverage following mergers appears to be the result of a permanent change in the capital structure of the combined firm. Some theories predict that debt can be used strategically in the short-run to deter entry and acquire target firms at a bargain price (Chowdhry and Nanda, 1993). Since financial leverage does not decline after the merger, our results do not support their predictions.

We also model financial leverage and compare the estimated financial leverage with the actual financial leverage of the merged firm for post-merger years. We estimate debt capacity by regressing financial leverage on size, market-to-book ratio of assets, return on assets and fixed assets to total assets ratio for each year using the entire population of firms listed in the *Compustat* (Industrial, Full Coverage and the Research tapes). A measure of debt capacity for merged firms over post-merger years is obtained by using the regression coefficients and the firm-specific characteristics of the merged firm for those years.

The results in Table 5 (last column) indicate that merged firms have an excess debt capacity for all the 5 post-merger years. Tables 3 and 4 show that merged firms increase

Table 5  
Actual financial leverage relative to estimated financial leverage around mergers

| Year            | Actual financial leverage — estimated financial leverage |           |              |          |                |           |
|-----------------|--|-----------|--------------|----------|----------------|-----------|
|                 | Acquiring firms  |           | Target firms |          | Combined firms |           |
|                 | Mean   | Median    | Mean         | Median   | Mean           | Median    |
| -5              | -12.6%***  | -17.6%*** | -6.8%***     | -6.4%*** | -              | -         |
| -4              | -15.8%***  | -20.4%*** | -8.5%***     | -8.8%*** | -              | -         |
| -3              | -15.6%***  | -19.5%*** | -8.6%***     | -8.4%*** | -              | -         |
| -2              | -16.4%***  | -21.5%*** | -8.1%***     | -9.3%*** | -              | -         |
| -1              | -15.9%***  | -19.8%*** | -8.2%***     | -9.6%*** | -              | -         |
| Averages for    |  |           |              |          |                |           |
| Period -3 to -1 | -15.8%***  | -18.8%*** | -7.9%***     | -8.2%*** | -              | -         |
| Period -2 to -1 | -15.9%***  | -20.0%*** | -7.9%***     | -9.5%*** | -              | -         |
| 1               | -  | -         | -            | -        | -6.9%***       | -10.2%*** |
| 2               | -  | -         | -            | -        | -5.6%***       | -8.9%***  |
| 3               | -  | -         | -            | -        | -5.1%***       | -8.7%***  |
| 4               | -  | -         | -            | -        | -7.0%***       | -10.1%*** |
| 5               | -  | -         | -            | -        | -6.3%***       | -10.5%*** |
| Averages for    |  |           |              |          |                |           |
| Period +1 to +3 | -  | -         | -            | -        | -6.0%***       | -10.5%*** |
| Period +1 to +2 | -  | -         | -            | -        | -6.4%***       | -11.1%*** |

Financial Leverage is defined as debt to total firm value ratio for the combined firm (acquirer and target) for the sample of firms merged between 1978 and 1987 as described in Table 1. The total firm value is the sum of the fiscal year-end book value of debt and market value of equity. Debt is defined as the sum of long term debt and debt in current liabilities in the balance sheet. Year 0 corresponds to the fiscal year of the merger. A model of financial leverage is estimated on an annual basis using all Compustat firms. The predicted financial leverage for any firm in any given year is estimated using coefficients from the estimated model of financial leverage.

\*\*\* Denotes 1% level of significance for a two-tailed test.

financial leverage following mergers. Our model of financial leverage predicts that merged firms could increase financial leverage even more if they wanted to. If the model is misspecified because of omitted variables, our results are likely to be biased. We therefore interpret these results with caution.

#### 4.2. Pre-merger financial leverage of acquirers and target firms

The observed increase in financial leverage can result either from an increase in the debt capacity of the combined firm or because the target or the acquirer has unused debt capacity from pre-merger years. Table 6 presents the pre-merger debt to total firm value ratios separately for acquirers and targets in Panels A and B, respectively. We also report industry- and size-adjusted debt to total firm value ratios for acquirers and targets. Industry and size-adjusted ratios are computed as the difference between the firms' and the matched firms' ratios. For each target and acquiring firm, we match firms on the basis of market values of target and acquiring firms 5 year prior to the merger from their respective industries.

Table 6  
Financial leverage for acquiring and target firms for the pre-merger years

| Year   | Raw values |            | Industry- and size-adjusted  |                                |
|--|------------|------------|------------------------------|--------------------------------|
|  | Mean (%)   | Median (%) | Mean ( <i>p</i> -values) (%) | Median ( <i>p</i> -values) (%) |
| <i>Panel A: Debt to market value for acquiring firms</i> |            |            |                              |                                |
| – 5  | 35.2%      | 32.5%      | – 0.4% (0.88)                | – 0.3% (0.92)                  |
| – 4  | 33.1       | 31.1       | – 1.5 (0.58)                 | – 0.9 (0.50)                   |
| – 3  | 31.1       | 29.2       | – 2.3 (0.40)                 | – 0.7 (0.43)                   |
| – 2  | 29.9       | 28.1       | – 6.1 (0.03)                 | – 3.2 (0.06)                   |
| – 1  | 29.4       | 27.2       | – 4.7 (0.06)                 | – 0.2 (0.02)                   |
| Averages for   |            |            |                              |                                |
| Period – 3 to – 1  | 30.2       | 28.2       | – 4.0 (0.11)                 | – 1.0 (0.20)                   |
| Period – 2 to – 1  | 29.7       | 27.5       | – 5.0 (0.05)                 | – 2.5 (0.11)                   |
| <i>Panel B: Debt to market value for target firms</i>    |            |            |                              |                                |
| – 5  | 36.5%      | 38.4%      | 1.6% (0.53)                  | 0.6% (0.70)                    |
| – 4  | 34.5       | 35.2       | 3.0 (0.20)                   | 0.5 (0.46)                     |
| – 3  | 32.9       | 31.1       | 2.7 (0.23)                   | 2.0 (0.31)                     |
| – 2  | 32.9       | 29.1       | 2.0 (0.40)                   | 2.0 (0.35)                     |
| – 1  | 32.6       | 29.8       | – 0.6 (0.83)                 | 1.7 (0.97)                     |
| Averages for   |            |            |                              |                                |
| Period – 3 to – 1  | 32.1       | 30.1       | 0.8 (0.72)                   | 0.5 (0.82)                     |
| Period – 2 to – 1  | 32.2       | 29.9       | 0.4 (0.88)                   | 0.2 (0.86)                     |

Financial Leverage is defined as debt to total firm value ratio for acquirers and their corresponding targets prior to merger for the sample of firms merged between 1978 and 1987 as described in Table 1. The total firm value is the sum of the fiscal year-end book value of debt and market value of equity. Debt is defined as the sum of long term debt and debt in current liabilities in the balance sheet. Year 0 corresponds to the fiscal year of the merger. Industry- and size-adjusted numbers are computed for each firm and year as the difference between the sample firm value for any year and the control firm value for the same year.

The mean and median industry and size-adjusted financial leverage for acquiring firms is negative for all pre-merger years and the results are different from zero only for years – 1 and – 2 in Table 6. Our results indicate that acquiring firms have the same financial leverage as their peer firms five years prior to the merger. However, they appear to be under-levered over the 2-year period prior to the merger. Results from Panel B indicate that target firms do not have any unused debt capacity prior to mergers. Industry and size-adjusted financial leverage is not statistically significant for any of the five pre-merger years for target firms.

We get conflicting results on unused debt capacity depending on the benchmark we use. When we use either industry median firms as benchmarks or size-matched firms from the industry of target and acquiring firms as benchmarks, we find no evidence of unused debt capacity (Table 6). However, we find that both target and acquiring firms are under-levered over pre-merger years when we model debt capacity (Table 5). Since our model might be misspecified because of omitted variables, we interpret the results with caution. Overall, there is weak evidence that some of the increase in financial leverage is a result of past unused debt capacity.

### 4.3. Changes in interest expense around mergers

In Section 4.1, we report that financial leverage, on average, increases following mergers. We validate our main finding about the change in financial leverage around mergers by using income statement numbers, rather than relying on balance sheet numbers which are affected by off-balance-sheet financing (see Cottle et al., 1988, ch. 22). We therefore examine the interest expense ratio which is defined as interest expense divided by operating cash flow. In general, the first claim on a firm's cash flow is by the debtholders in the form of interest payments. If the percentage of cash flow going to the debtholders increases, it would confirm that the financial leverage has increased.

We find that the median industry-adjusted interest expense ratio increases (results not reported) significantly from  $-1.1\%$  in year  $-1$  to  $2.1\%$  in year  $+1$  relative to the merger year. The ratio remains at about that level for five years after the mergers. The raw values exhibit a similar significant increase. The  $p$ -values for the above results are less than 0.01. Overall, the interest expense analysis supports the earlier conclusion of an increase in financial leverage.

## 5. Other motives for mergers

We also examine five other motives for mergers that other researchers have examined: potential benefits from stepping up of the target firm's asset basis; potential benefits from unused net operating loss carryforwards (NOL) and/or investment tax credits (ITC) of the combined firm; pre-merger leverage of the combined firm; benefits from improvements in operating performance following mergers and the disciplinary motive for mergers. What follows is a brief discussion of this analysis. To increase the power of our tests, we include proxies for all these motives as control variables in the cross-sectional regression analysis along with the change in leverage.

### 5.1. Potential benefits from the stepping up of the target firm's asset basis

If the fair market value of the target firm's assets is greater than its tax basis, the acquiring firm can elect to step-up or increase its tax basis to the fair market value after the merger. Acquiring firms benefit from the increase in the tax basis because of increased depreciation deductions. The benefits from step-up, however, are partially offset by a depreciation recapture tax on the lower of the capital gain recognized from the sale of the target firm's assets and its accumulated depreciation. Since step-up benefits are available in the case of taxable transactions, the acquirer has to use some portion of cash as part of the consideration paid to target firms, and violate the judicial continuity of interest test of tax-free reorganizations, to take advantage of step-up benefits (Gilson and Black, 1995).

The computation of the present value of the step-up benefit depends on many tax-related rules and is generally determined by researchers after making a number of assumptions. As Auerbach and Reishus (1988b) note, "the detailed asset information required for such calculations is not normally available publicly." We compute the

potential benefits from stepping up the target firm's asset basis using Kaplan's (1989) algorithm to compute the step-up benefits in the context of management buyouts.<sup>10</sup> Similar to Kaplan (1989) and Hayn (1989), our proxy for the step-up benefits is an estimate of the upper bound of the present value of future benefits available from increased depreciation deductions.

We find that about one-third of the firms in our sample (72 out of the 239 targets) would have potentially benefited from stepping up of the target firm's assets. For this subsample of 72 firms, the mean (median) maximum potential step-up benefit is 2.92% (1.82%) of the market value of equity of the combined firm. Consistent with the previous research, our results show that the potential step-up benefits are confined to a few cases and the benefits appear to be small relative to the market values of the acquiring and target firm.

### 5.2. Potential benefits from unused NOL and ITC

A merger can qualify as tax-free if it complies with the reorganization provisions of the Internal Revenue Code (IRC). In tax-free mergers, the acquiring firm retains the tax attributes of the target firm, including NOL and ITC carryforwards and is able to reduce the present and future tax liability of the combined firm after the merger. Under the provisions of IRC, if the acquiring firm elects to utilize the target firm's pre-merger NOL and ITC carryforwards, it cannot utilize any potential benefits from the stepping up of the target firm's asset basis (Smirlock et al., 1985; Gilson and Black, 1995).

Following Auerbach and Reishus (1988c) and Hayn (1989), we estimate the upper bound of the potential benefits from unused NOL and ITC carryforwards by multiplying the statutory corporate tax rate with the amount of NOL carryforwards and adding the amount of unused investment tax credit carryforwards reported in the financial statements one year prior to the announcement.<sup>11</sup> Since these benefits are mostly available in tax-free mergers, we assume that acquiring firms in our sample are able to retain the NOL and ITC attributes of target firms only when stocks are used to finance a merger.

Similar to the findings of Auerbach and Reishus (1988c) and Hayn (1989), a majority of the firms in our sample do not have NOL and/or ITC carryforwards. We find that in 31 out of the entire sample of 239 mergers, the acquirer or target has NOL and/or ITC

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<sup>10</sup> The increase in tax basis of the target firm is defined as the difference between the new and old tax basis of its assets, where the new tax basis is the sum of the market value of equity and liabilities (including any recapture tax), less deferred taxes, and the old tax basis is the sum of the book value of equity and liabilities, less deferred taxes. The present value of the step-up benefits is estimated as 26% of the increase in tax basis of the target firm less any recapture tax. Consistent with Kaplan (1989), we assume that the present value of the increased depreciation deductions are worth US\$0.26 to the acquiring firm for each dollar increase in the tax basis of the target firm. For further details, see Kaplan (1989).

<sup>11</sup> While the net operating loss carryforward is a deduction, the unused investment tax credit is a tax credit. Also, if a firm has an NOL carryforward, it must also carry forward the ITC. The ITC carryforward numbers were collected manually from the footnotes in the financial statements because the *Compustat* tapes do not provide investment tax credit carryforwards.

carryforwards. However, 15 of these 31 mergers were probably not able to take advantage of these carryforwards because they used cash as the method of payment. The mean (median) value of the potential benefits from NOL and ITC carryforwards, as a percentage of the market value of the combined firm, is 2.45% (1.27%) for the subsample of 16 mergers where the combined firm was able to take advantage of the carryforwards. Overall, it appears that there is some benefit from NOL and ITC, but only for a small subsample of firms.

### 5.3. *Debt-monitoring hypothesis*

Grossman and Hart (1982), Jensen (1986), Jensen and Meckling (1976), Harris and Raviv (1990), and Stulz (1990) argue that debt mitigates the agency problems between stockholders and managers. Maloney et al. (1993) document a positive relation between acquiring firms' returns around merger announcements and their pre-merger leverage. In the ensuing cross-sectional analysis to explain market-adjusted returns, we include unused debt capacity of acquiring and target firms from pre-merger years. This variable could capture two effects. The increase in financial leverage following mergers results from unused debt capacity of target and acquiring firms, rather than an increase in debt capacity and is therefore positively related to market-adjusted returns. On the other hand, if lower financial leverage reflects entrenched managers, then entrenched managers are likely to be involved in value-decreasing merger decisions which implies that the coefficient on unused debt capacity will be negative.

### 5.4. *Operating efficiency gains*

Healy et al. (1992) examine the post-merger performance for the 50 largest mergers between 1979 and mid-1984 and find that merged firms show significant improvements in their operating cash flow performance. Moreover, they find that the increase in operating cash flow is positively related to the announcement period market-adjusted returns.

We replicate the Healy et al. (1992) study to examine if the operating performance increases for the merged firms. The results show that relative to the industry performance, the mean (median) operating cash flow performance of merged firms increased from 1.7% (1.3%) in year  $-5$  to 5.5% (3.2%) in year  $+5$ . Consistent with Healy et al. (1992), our analysis also indicates that mergers tend to occur in declining industries. In the cross-sectional regression analysis, we define the change in operating cash flow performance as the difference between the average of years  $+1$  and  $+2$  and years  $-1$  and  $-2$ .<sup>12</sup>

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<sup>12</sup> Healy et al. (1992) use a detailed research design to compute merger-induced changes in cash flow after accounting for industry changes in performance and pre-merger persistence. We do not use their variable because in a recent paper Ghosh (1999) finds no evidence of improvements in performance following mergers using performance and size-matched firms as a benchmark.

### 5.5. Disciplinary motive for mergers

Manne (1965) and Jensen (1986) argue that the market for corporate control is able to discipline poorly performing target firms. If internal corporate governance mechanisms are unable to mitigate agency problems, acquisitions can help to mitigate these problems. To examine and control for this hypothesis, we include a market-based measure of performance for target firms — market-adjusted returns of target firms over the 6-month period ending 1 month prior to the announcement date. We also use target firms' market-to-book value of assets as a second measure of performance.

## 6. Cross-sectional analysis of market-adjusted returns

In this section, we use cross-sectional regression analysis to examine if the increase in financial leverage is able to explain the wealth effects associated with mergers, after controlling for the other potential tax and non-tax motives driving mergers.

### 6.1. Cross-sectional analysis to explain announcement period market-adjusted returns

A more powerful test of the increasing debt capacity hypothesis is to cross-sectionally correlate merger-related market-adjusted returns with changes in financial leverage. If merger announcements signal future increases in financial leverage, then an efficient stock-market will capitalize expected benefits from future increases in leverage at the time of the merger announcement. We, therefore, expect a positive relation between financial leverage and market-adjusted returns. We use value-weighted portfolio market-adjusted returns of acquiring and target firms as the dependent variable, where market values of the acquirer and target prior to the announcement date are used as weights. The primary explanatory variable measuring the increasing debt capacity hypothesis is the change in debt to total firm value ratio ( $\Delta$ Leverage).  $\Delta$ Leverage is defined as the difference between the average of years +1 and +2 and years -1 and -2 (the results are stronger when we define  $\Delta$ Leverage as the difference between year +1 and year -1).

We include two potential sources of tax benefits, the step-up in the basis of the target assets (Stepup) and benefits from any unused pre-merger NOL or ITC carryforwards (Nolitic). The change in Standard and Poor's debt ratings of acquiring firms' long-term debt around the merger is included to control for expropriation of wealth from bondholders to equityholders.<sup>13</sup> Since ratings changes might be asymmetric with respect

<sup>13</sup> Standard and Poor's regularly issues corporate bond ratings to assess the creditworthiness of a firm's senior long-term debt. The highest rating assigned is AAA. Bonds rated BB, CCC, CC and C are regarded as speculative with respect to the issuers capacity to pay interest and repay the loan. D indicates that bonds are in default and payments of principal and interest are in arrears. We coded bond ratings from 2, corresponding to a AAA ranking, to 24, corresponding to a rating of C. The mean rating one year prior to the merger for the acquiring firms' long-term debt is 3.89. This rating declined to 5.38 for the year after the merger. The change in bond ratings over the period one year before to one year after the merger is -1.67 (*t*-statistic of 6.33). Our results suggest that bondholders of acquiring firms on average are worse off after the merger.

to upgrades and downgrades, we include separate dummy variables to indicate ratings upgrade ( $+\Delta\text{Ratings}_A$ ) and ratings downgrade ( $-\Delta\text{Ratings}_A$ ) for acquiring firms. We also include variables that capture pre-merger unused debt capacity (Under-levered) of target and acquiring firms. Under-levered is 2-year average ( $-1$  and  $-2$ ) residual between actual and estimated financial leverage. We control for improvements in operating performance around mergers (over 2 years) by including the change in operating cash flow divided by total firm value ( $\Delta\text{Cash flow}$ ). We also include the past performance of target firms to incorporate the disciplinary motive for mergers. Past performance is proxied by market-adjusted returns over the 6-month period ending 1 year prior to the merger announcement, and market-to-book ratio of assets. To the extent that the capital market incorporates these benefits in a firm's stock price at the time of the merger announcement, we expect positive coefficients on all these variables.

We also control for the method of financing. We include two dummy variables Cash and Mixed to control for the finding that cash mergers, and mergers financed with cash and stock are associated with higher market-adjusted returns than stock mergers.

Table 7 presents three regression results. Regression 1 includes all the pre-defined explanatory variables other than the wealth expropriation variable and the under-levered variables. Regression 2 replaces the leverage variable with the wealth expropriation variable and the under-levered variables. Regression 3 includes all the pre-defined explanatory variables. Consistent with the increasing debt capacity hypothesis,  $\Delta\text{Leverage}$  is statistically significant ( $t = 2.99$  and  $2.65$ ). Our results also indicate that the wealth expropriation is not an important variable in explaining market-adjusted returns (Regressions 2 or 3). It is possible that wealth expropriation from bondholders is an important source of gain for equityholders around mergers, but our proxy variable fails to pick up that effect (our results are generally robust to other event window specifications of market-adjusted returns presented in Table 2).

The magnitude of the coefficient for  $\Delta\text{Leverage}$  variable is 0.18 (in Regression 3) and appears to be economically significant.<sup>14</sup> If the present value of the tax benefits from permanent debt can be represented as the corporate tax rate multiplied by the debt (Brealey and Myers, 1991, p. 423), then the coefficient of 0.18 represents the effective corporate tax rate. There are at least two caveats in this interpretation. First, to the extent that the benefits from mergers are already impounded in the stock price, our analysis understates the coefficient. The results are then biased against a significant coefficient. Second, if other variables such as personal taxes, etc. (Miller, 1977; DeAngelo and Masulis, 1980; Gilson et al., 1988) reduce the present value of tax benefits from debt, the coefficient will again be smaller than the effective tax rate.

Of the two tax related coefficients, Stepup is highly significant in all the three regressions, while Nolitc is insignificant. The unused debt capacity variables, (Under-levered) are insignificant for target and acquiring firms. The cash flow hypothesis

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<sup>14</sup> We find from Table 3 that the increase in leverage using the average leverage from years  $+1$  and  $+2$  and the years  $-1$  and  $-2$  is 6.3%. Using a coefficient of 0.18 from Table 7 (coefficient on  $\Delta\text{Leverage}$  in Regression 3), the benefit to shareholders of combined firms is 1.7% ( $6.3\% * 0.18$ ). This benefit is about 36% of combined firms' market-adjusted returns using the period day  $-10$  to day 5 in Table 2. Thus, 1.7% appears to be economically significant.

Table 7  
Cross-sectional analysis of market-adjusted returns on market-based measure of leverage

| Explanatory variables                   | Predicted sign | Regression 1        | Regression 2      | Regression 3      |
|---|----------------|---------------------|-------------------|-------------------|
| Constant                                |                | 0.048 (1.99)* *     | 0.049 (1.05)      | -0.046 (1.06)     |
| <i>Debt Capacity Hypothesis</i>         |                |                     |                   |                   |
| $\Delta$ Leverage                       | +              | 0.179 (2.99)* * *   |                   | 0.175 (2.65)* * * |
| <i>Under-utilized Debt Hypothesis</i>   |                |                     |                   |                   |
| Under-levered <sub>T</sub>              | -              | -0.010 (-0.50)      | 0.009 (0.11)      |                   |
| Under-levered <sub>A</sub>              | -              | -0.009 (-0.21)      | 0.004 (0.10)      |                   |
| <i>Expropriation Hypothesis</i>         |                |                     |                   |                   |
| + $\Delta$ Ratings <sub>A</sub> (dummy) | -              | -0.087 (-1.00)* * * | -0.038 (-0.46)    |                   |
| - $\Delta$ Ratings <sub>A</sub> (dummy) | -              | -0.023 (-0.29)* * * | 0.039 (0.53)      |                   |
| <i>Tax Hypothesis</i>                   |                |                     |                   |                   |
| Stepup                                  | +              | 0.726 (3.42)* * *   | 0.640 (2.66)* * * | 0.694 (3.09)* * * |
| Nolite                                  | +              | -0.263 (-1.33)      | -0.083 (-0.36)    | -0.218 (-0.98)    |
| <i>Cash Flow Hypothesis</i>             |                |                     |                   |                   |
| $\Delta$ Cash flow                      | +              | 0.113 (0.78)        | 0.109 (0.63)      | 0.120 (0.74)      |
| <i>Disciplinary Hypothesis (Target)</i> |                |                     |                   |                   |
| Market-adjusted return (-6, -1)         | -              | -0.068 (-2.25)* *   | -0.061 (-1.70)*   | -0.069 (-2.17)* * |
| Market-to-book ratio                    | -              | -0.034 (-2.36)* *   | -0.030 (-1.54)    | -0.031 (-1.70)*   |
| <i>Control Variables</i>                |                |                     |                   |                   |
| Cash (dummy)                            | +              | 0.030 (1.22)        | 0.030 (1.09)      | 0.029 (1.12)      |
| Mixed (dummy)                           | +              | 0.047 (1.74)*       | 0.046 (1.47)      | 0.045 (1.55)      |
| F-value                                 |                | 4.478 * * *         | 2.131 * * *       | 2.829 * * *       |
| Adj R <sup>2</sup>                      |                | 0.350               | 0.196             | 0.310             |

Market-adjusted returns is expressed as a fraction of total firm value of acquiring and target firms over the event window day -10 to day +5 where the announcement date is day 0.  $\Delta$ Leverage and  $\Delta$ Cash flow are changes in the ratio of total debt to firm value and cash flow to firm value, respectively, of the combined firm using two years pre- and post-merger averages. +  $\Delta$ RATINGS<sub>A</sub> and -  $\Delta$ RATINGS<sub>A</sub> are two dummy variables that indicate if senior debt ratings (as predicted by Standard and Poor's) improved or declined for the acquiring firm from 1 year before to 1 year after the merger. Market-adjusted return (-6, -1) denotes the 6-month period ending 1-month prior to the announcement. Stepup and Nolite measure tax benefits from stepping up of target assets and benefits from using unused net operating loss carryforwards and investment tax credits, respectively. Cash and Mixed are two dummy variables that equal one if the acquisition is financed using cash or a combination of cash and stock, respectively. Subscripts A and T denote acquiring and target firms, respectively.

\* Denotes 10% level of significance, respectively, for a two-tailed test.

\* \* Denotes 5% level of significance, respectively, for a two-tailed test.

\* \* \* Denotes 1% level of significance, respectively, for a two-tailed test.

variable,  $\Delta$ Cash flow, takes its expected sign, but it is not significant in any of the three regressions, which is consistent with the findings of Ghosh (1999). Consistent with the disciplinary motive for mergers, we find that both pre-merger market-adjusted returns and market-to-book ratio of target firms are significant for all the three regressions.

Table 8

Cross-sectional analysis of market-adjusted returns on book-based measure of leverage

| Explanatory variables                   | Predicted sign | Regression 1    | Regression 2    |
|---|----------------|-----------------|-----------------|
| Constant                                |                | 0.031 (0.95)    | -0.051 (1.18)   |
| <i>Debt Capacity Hypothesis</i>         |                |                 |                 |
| $\Delta$ Leverage                       | +              | 0.168 (2.87)*** | 0.172 (2.65)*** |
| <i>Under-utilized Debt Hypothesis</i>   |                |                 |                 |
| Under-levered <sub>T</sub>              | -              |                 | -0.024 (-0.50)  |
| Under-levered <sub>A</sub>              | -              |                 | -0.016 (-0.42)  |
| <i>Expropriation Hypothesis</i>         |                |                 |                 |
| + $\Delta$ Ratings <sub>A</sub> (dummy) | -              |                 | -0.012 (-0.14)  |
| - $\Delta$ Ratings <sub>A</sub> (dummy) | -              |                 | -0.013 (-0.18)  |
| <i>Tax Hypothesis</i>                   |                |                 |                 |
| Stepup                                  | +              | 0.683 (3.20)*** | 0.656 (2.93)*** |
| Nolite                                  | +              | -0.236 (-1.18)  | -0.208 (-0.98)  |
| <i>Cash Flow Hypothesis</i>             |                |                 |                 |
| $\Delta$ Cash flow                      | +              | 0.195 (1.32)    | 0.187 (1.14)    |
| <i>Disciplinary Hypothesis (Target)</i> |                |                 |                 |
| Market-adjusted return (-1)             | -              | -0.057 (-1.89)* | -0.061 (-1.93)* |
| Market-to-book ratio                    | +              | -0.028 (-1.94)* | -0.033 (-1.79)* |
| <i>Control Variables</i>                |                |                 |                 |
| Cash (dummy)                            | +              | 0.030 (1.23)    | 0.029 (1.12)    |
| Mixed (dummy)                           | +              | 0.051 (1.89)*   | 0.044 (1.52)    |
| F-value                                 |                | 4.346***        | 2.834***        |
| Adj R <sup>2</sup>                      |                | 0.344           | 0.301           |

Market-adjusted returns is expressed as a fraction of total firm value of acquiring and target firms over the event window day -10 to day +5 where the announcement date is day 0.  $\Delta$ Leverage and  $\Delta$ Cash flow are changes in the ratio of total debt to book value of assets and cash flow to firm value, respectively, of the combined firm using two years pre- and post-merger averages. +  $\Delta$ RATINGS<sub>A</sub> and -  $\Delta$ RATINGS<sub>A</sub> are two dummy variables that indicate if senior debt ratings (as predicted by Standard and Poor's) improved or declined for the acquiring firm from 1 year before to 1 year after the merger. Market-adjusted return (-6, -1) denotes the 6-month period ending one month prior to the announcement. Stepup and Nolite measure tax benefits from stepping up of target assets and benefits from using unused net operating loss carryforwards and investment tax credits, respectively. Cash and Mixed are two dummy variables that equal one if the acquisition is financed using cash or a combination of cash and stock, respectively. Subscripts A and T denote acquiring and target firms, respectively.

\* Denotes 10% level of significance, respectively, for a two-tailed test.

\*\*\* Denotes 1% level of significance, respectively, for a two-tailed test.

The dummy variables for the method of financing Cash, Stock (the intercept), or Mixed, are either generally insignificant or weakly significant. Overall, the results are unaffected when we estimate cross-sectional regressions using White's (1980) procedure incorporating adjustments for possible heteroscedasticity. The adjusted  $R$ -square for regression 3 is 31% when all the explanatory variables are included. The results are generally consistent with the hypothesis that part of the wealth gains around merger announcements are the result of future benefits from changes in financial leverage.

Table 7 uses the market measure of leverage — financial leverage is defined as the book value of long-term debt and debt in current liabilities divided by the market value of the firm. We replicate the results of regressions 1 and 3 in Table 7 using a book measure of leverage, where financial leverage is defined as the book value of long-term debt and debt in current liabilities divided by the book value of assets (Table 8). Our results and conclusions remain the same in Table 8. In particular,  $\Delta$ Leverage is highly significant ( $t = 2.87$  and  $2.65$ ) and the coefficients are 0.17.

## 6.2. Additional evidence on the increasing debt capacity hypothesis

The financial motivation to merge is stronger for merging firms with weakly correlated cash flows. To capture this effect, we use a correlation variable that captures the pre-merger cash flow correlation between the target and acquirer. The increase in financial leverage will be higher for merging firms with lower cash flow correlation. We find that although the cash flow correlation variable takes its expected negative sign, the results (not reported) are not significant in the regression of  $\Delta$ Leverage on cash flow correlation. We attribute the insignificance to measurement problems inherent in estimating a cash flow correlation from a quarterly or annual observations. However, it is also possible that  $\Delta$ Leverage is not a proxy for increasing debt capacity. To the extent our proxy variables do not capture expropriation of wealth from bondholders and unused debt capacity,  $\Delta$ Leverage could be driven by either of these two effects.

Since estimating earnings correlation is problematic due to insufficient data, we use variations of the size variable to proxy for debt capacity. Presumably, the increase in debt capacity will be higher when target and acquiring firms are similar in size and are large firms. We use the absolute value of the logarithmic transformation of the ratio of acquiring and target firms' size (Ratio) as a proxy for similarity in merging firms' size. The lower is the value of this variable, the more similar are the two merging firms, and the greater is the increase in debt capacity. The log of the market value of acquiring and target firms ( $FV_A$  and  $FV_T$ ) proxies for size. Consistent with the expectations, we find that the coefficient of Ratio is significantly negative and the coefficients of the two size variables are positive and significant when we regress change in leverage on these three variables.

## 7. Conclusions

We provide strong empirical evidence of a statistically and economically significant increase in financial leverage of combined firms following mergers. Moreover, we

examine whether the increase in financial leverage results from an increase in debt capacity. If firm size and industry are surrogates for firms' debt capacity, then the optimal financial leverage of the target and acquiring firm will be given by a "typical" firm that represents the industries of the two merging firms and is close to their combined firm size. Consistent with an increase in debt capacity hypothesis, we find that the industry- and size-adjusted financial leverage increases significantly from  $-5.8\%$  in year  $-1$  to  $2.4\%$  in year  $+1$ . A negative number for year  $-1$  does not reflect unused debt capacity from pre-merger years, rather it indicates the increase in debt capacity that target and acquiring firms can achieve by combining together. Moreover, since the financial leverage of merged firms is statistically indistinguishable from those of matched firms for post-merger years, it appears that merged firms fully utilize the increase in debt capacity by taking on more debt.

It is possible that the increase in financial leverage is the result of exhausting unused debt capacity from pre-merger years, rather than an increase in debt capacity. We find some weak evidence of unused debt capacity from pre-merger years when we estimate debt capacity based on a model that uses a number of explanatory variables. However, we consider this as weak evidence of unused debt capacity because there is no evidence of unused debt capacity when we use industry and size matched firms as benchmarks. Moreover, unused debt capacity is not correlated with wealth gains around merger announcements.

A more powerful test of the increasing debt capacity hypothesis is to correlate the merger-related stock market performance with the change in financial leverage. In the cross-sectional analysis, we control for the expropriation of wealth from bondholders, the two potential sources of tax benefits (step-up and unused NOL and/or ITC), pre-merger unused debt capacity of acquiring and target firms, change in operating performance of the merged firm, the method of payment used in mergers, and target firms' market-based performance that have been previously examined and documented as important.

The cross-sectional analysis shows that the announcement period market-adjusted returns are positively related to increases in financial leverage following mergers. The results support the argument that the stock market incorporates future benefits from anticipated financial leverage increases around the announcement date. Our results are consistent with many models (Harris and Raviv, 1991, Table 2; Masulis, 1988) where the stock price is expected to increase following the announcement of leverage-increasing capital structure changes. It appears that a merger announcement can also be interpreted as an indirect leverage-increasing announcement. What distinguishes a merger from other leverage-increasing methods is an interesting area for further exploration. Many other corporate restructuring announcements (such as divestitures, spin-offs, etc.) are known to be associated with wealth effects. However, the link between these announcements and capital structure changes are not known and can be studied in a framework similar to the one used above. Similarly, change in capital structure and its link to manager's equity ownership (Harris and Raviv, 1988) may also be examined in a more elaborate study. We expect that our study will provide a useful step in understanding capital structure changes and myriad corporate announcements affecting stock returns.

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## References

- Auerbach, A.J., 1988. Introduction. In: Auerbach, A. (Ed.), *Mergers and Acquisitions*. University of Chicago Press, Chicago, IL.
- Auerbach, A.J., Reishus, D., 1988a. The effects of taxation on merger decision. In: Auerbach, A. (Ed.), *Corporate takeovers: Causes and Consequences*. University of Chicago Press, Chicago, IL.
- Auerbach, A.J., Reishus, D., 1988b. The impact of taxation on mergers and acquisitions. In: Auerbach, A. (Ed.), *Mergers and Acquisitions*. University of Chicago Press, Chicago, IL.
- Auerbach, A.J., Reishus, D., 1988c. Taxes and merger decision. In: Coffee, J., Lowenstein, L., Rose-Ackerman, S. (Eds.), *Knights, Raiders and Targets: The Impact of the Hostile Takeovers*. Oxford Univ. Press, New York, NY.
- Brealey, R.A., Myers, S.C., 1991. *Principles of Corporate Finance*. McGraw-Hill, New York, NY.
- Chowdhry, B., Nanda, V., 1993. Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms. *Journal of Finance* 58, 731–745 (June).
- Cottle, S., Murray, R.F., Block, F.E., 1988. *Graham and Dodd's Security Analysis*. McGraw-Hill, New York, NY.
- DeAngelo, H., Masulis, R.W., 1980. Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics* 8, 3–27 (March).
- Galai, D., Masulis, R.W., 1976. The option pricing model and risk factor of stock. *Journal of Financial Economics* 3, 53–81 (March).
- Ghosh, A., 1999. Does operating performance really improve following corporate acquisitions, Working paper, Baruch College (CUNY), New York, NY.
- Ghosh, A., Lee, C.J., 2000. Abnormal returns and expected managerial performance of target firms. *Financial Management*, Forthcoming.
- Gilson, R.J., Black, B.S., 1995. *The Law and Finance of Corporate Acquisitions*. Foundation Press, Westbury, NY.
- Gilson, R.J., Scholes, M.S., Wolfson, M.A., 1988. Taxation and the dynamics of corporate control: the uncertain case for tax-motivated acquisitions. In: Coffee, J., Lowenstein, L., Rose-Ackerman, S. (Eds.), *Knights, Raiders and Targets: The Impact of the Hostile Takeovers*. Oxford Univ. Press, New York, NY.
- Givoly, D., Hayn, C., Ofer, A.R., Sarig, O., 1992. Taxes and capital structure: Evidence from firms' response to the tax Reform Act of 1986. *Review of Financial Studies* 5, 331–355 (Summer).
- Grossman, S., Hart, O., 1982. Corporate financial structure and managerial incentives. In: McCall, J.J. (Ed.), *The Economics of Information and Uncertainty*. University of Chicago Press, Chicago, IL.
- Harris, M., Raviv, A., 1988. Corporate control contests and capital structure. *Journal of Financial Economics* 20, 55–86 (January/March).
- Harris, M., Raviv, A., 1990. Capital structure and the informational role of debt. *Journal of Finance* 45, 321–349 (June).
- Harris, M., Raviv, A., 1991. The theory of capital structure. *Journal of Finance* 46, 297–355, (March).
- Hayn, C., 1989. Tax attributes as determinants of shareholder gains in corporate acquisitions. *Journal of Financial Economics* 23, 121–153 (June).

- Healy, P.M., Palepu, K.G., Ruback, R.S., 1992. Does operating performance improve after mergers? *Journal of Financial Economics* 31, 135–175 (April).
- Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance and takeovers. *American Economic Review* 76, 323–329 (May).
- Jensen, M.C., Meckling, W.H., 1976. Theory of the firms: Managerial Behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305–360 (May).
- Kaplan, S., 1989. Management buyouts: evidence on taxes as a source of value. *Journal of Finance* 44, 611–632 (July).
- Kim, H.E., McConnell, J.J., 1977. Conglomerate mergers and the co-insurance of corporate debt. *Journal of Finance* 32, 349–363 (May).
- Lewellen, W.G., 1971. A pure financial rationale for the conglomerate merger. *Journal of Finance* 26, 521–537 (May).
- Mackie-Mason, J.K., 1990. Do taxes affect corporate financing decisions? *Journal of Finance* 45, 1471–1493 (December).
- Maloney, M.T., McCormick, R.E., Mitchell, M.L., 1993. Managerial decision making and capital structure. *Journal of Business* 66, 189–217 (April).
- Maddala, G.S., 1977. *Econometrics*. McGraw-Hill, New York, NY.
- Manne, H.G., 1965. Mergers and the market for corporate control. *Journal of Political Economy*, 110–120 (April).
- Masulis, R.W., 1988. *The Debt/Equity Choice*. Ballinger, Cambridge, MA.
- Miller, M., 1977. Debt and Taxes. *Journal of Finance* 32, 261–276 (May).
- Opler, T., Weston, F.J., 1993. The impact of takeovers on firm performance: Evidence from the eighties. Working paper. Dallas, TX: Southern Methodist University.
- Rajan, R.G., Zingales, L., 1993. What do we know about capital structure? Some evidence from international data. *Journal of Finance* 50, 1421–1460 (December).
- Shastri, K., 1990. The differential effects of mergers on corporate security values. *Research in Finance* 8, 179–201.
- Smirlock, M., Beatty, R., Majd, S., 1985. Taxes and mergers — a survey. *Monograph Series in Finance and Economics* 3, 1–42.
- Stapleton, R.C., 1982. Mergers, debt capacity, and valuation of corporate loans. In: Keenan, M., White, L. (Eds.), *Mergers and Acquisitions*. Lexington Books, Lexington, MA.
- Stulz, R.M., 1990. Managerial discretion and optimal financial policies. *Journal of Financial Economics* 26, 3–28 (July).
- Titman, S., Wessels, R., 1988. The determinants of capital structure choice. *Journal of Finance* 40, 1–19 (March).
- White, H., 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica* 48, 817–838.