

The Design of Financial Policies in Corporate Spin-offs

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We examine differences in financial leverage between parent and spun-off firms that emerge from corporate spin-offs. Our tests control for past financing choices and the costs of adjusting capital structure, factors that can obscure cross-sectional patterns among firms' target leverage ratios. We find that firms that emerge from spin-offs with more financial leverage have a higher cash flow return on assets, lower variability of industry operating income, and a greater proportion of fixed assets. The positive relation between profitability and the use of financial leverage, in a setting that is free of pecking order effects, is particularly important because it contrasts with existing evidence. Our results indicate that the ability to cover debt payments and default-related costs are important determinants of the use of financial leverage, as implied by the trade-off theory of capital structure. We find no evidence that managerial incentives or governance characteristics affect the difference in leverage ratios in firms that emerge from spin-offs.

We believe that most finance scholars intuitively would argue that the level and variability of income are important determinants of leverage. However, there is little evidence to support this view. Most research finds a negative relation between profitability and leverage, as implied by the pecking order theory.¹ Indeed, Myers (1993) has described the strong inverse correlation between profitability and leverage as “the most telling evidence against the static trade-off theory . . .”²

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¹ See, for example, Long and Malitz (1985), Kester (1986), Friend and Lang (1988), Titman and Wessels (1988), Barton, Hill, and Sundaram (1989), Baskin (1989), Rajan and Zingales (1995), Wald (1999), and Bevan and Danbolt (2000).

² The *trade-off* theory of capital structure is based on the premise that managers balance the tax-related benefits of debt financing against its default-related costs. The *pecking order* hypothesis of capital

Spin-offs provide a special opportunity to investigate the influence of profitability and other asset characteristics on managers' design of capital structure. In a corporate spin-off, managers break up a company by allocating a segment of a firm's assets to a newly formed publicly traded company. Shares of the new company are distributed pro rata, as a stock dividend, to stockholders of the parent company. In addition to dividing the firm's assets, managers design the financial structures of the two companies and allocate debt to the parent and the spun-off unit. A well-documented example is the 1993 Marriott spin-off analyzed by Parrino (1997). In that case, managers created quite different capital structures for the firms that emerged with different asset characteristics.

We investigate the financial leverage of companies that emerge from corporate spin-offs. In particular, we test whether the difference in financial leverage in the two firms that result from a spin-off is explained by differences in profitability, in variability of industry operating income, in the nature of assets, and in tax status. We also explore the possibility that the agency costs of equity affect the design of financial policies and examine whether the allocation of leverage depends on differences in governance characteristics.

Our study complements other cross-sectional investigations of leverage ratios, such as Baskin (1989) and Rajan and Zingales (1995). An advantage of our study is that we control for the effects of past financing choices that arise due to the pecking order theory of Myers and Majluf (1984). Prior to the spin-off, both the parent firm and the subsidiary have the same financing history, a common history presumably affected by the pre-spin-off firm's pecking order. By analyzing the *difference* between the leverage ratios of the two firms subsequent to the spin-off, we eliminate historical or time-series effects. Thus our study provides evidence of how traditional notions of default-related costs and coverage influence capital structure, in a setting that is free of pecking order effects. As a result, we largely overcome the problem of distinguishing the trade-off theory from the pecking order theory, as discussed by Myers and Shyam-Sunder (1999). Furthermore, the capital structure change associated with a spin-off occurs as a by-product of the spin-off itself, and hence is not affected by adjustment costs that might take a firm away from its desired capital structure over time. Our research design therefore circumvents the difficulty of using cross-sectional data to investigate the determinants of target leverage ratios, namely that pecking order effects and adjustment costs can obscure important relations.

structure holds that managers face a lemons-type problem in external financing, and hence have a preference for internal financing. A prediction of the pecking order hypothesis is that profitable firms will have lower leverage since they can retain more earnings.

The 98 spin-offs in our sample occurred in the years 1979–1997 and distributed a substantial portion of the assets of the parent firm. At the first fiscal year-end following the spin-off, we measure the difference in financial leverage for each pair of firms that emerges from the spin-off. We relate differences in leverage in pairs of post-spin-off firms to differences in asset characteristics as well as to differences in attributes of the chief executive officer (CEO) and the board of directors.

Controlling for the influence of industry peers' financial leverage, our tests consistently show that firms with a higher ratio of property, plant, and equipment to total assets are allocated greater financial leverage. These findings are consistent with the argument of Myers (1977) that assets with lower liquidation costs, and therefore lower expected costs of financial distress, support more debt financing.

Our tests also show that the difference in financial leverage is positively related to the difference in profitability and is negatively related to the difference in variability of industry operating income. Our finding that cash flow or profitability is positively related to the use of financial leverage, in a setting that is free of pecking order effects, is important evidence consistent with the traditional trade-off theory of capital structure. Our results suggest that managers choose a target capital structure, taking into consideration the ability to cover interest payments and the costs of financial distress. We suspect that this relation is obscured in most cross-sectional tests of leverage ratios because over time information problems, adjustment costs, or simply managerial inertia move firms away from their target capital structures.

One concern about the robustness of our results is that managers' ability to transfer certain liabilities to the spun-off subsidiary may be constrained by characteristics of the parent firm's debt, such as covenants or the use of specific assets as collateral. These constraints link debt to particular tangible assets and can induce the observed relation between the difference in leverage and the difference in asset characteristics. We address this concern by investigating the allocation of debt not secured to specific assets and by analyzing changes in leverage over time, when financing constraints presumably become less binding. We conclude that our findings are not driven by constraints faced by managers in allocating leverage at the time of the spin-off.

Differences in proxies for managerial incentives and oversight, such as top managers' and directors' ownership stake, board composition, and board size, do not explain differences in financial leverage. In addition, the pre-spin-off CEOs do not take on an unusually low or high level of financial leverage in the firms they manage following a spin-off. We find no support for agency theories that imply capital structure choices serve managers' private interests.

1. Prior Literature

A number of studies examine the cross-sectional relation between firms' leverage ratios and various asset characteristics. In a recent review of capital structure research, Myers (2001) describes the consistent finding that higher leverage ratios accompany low profitability and a high proportion of tangible assets. Among the nine cross-sectional studies listed earlier, there are no exceptions to this pattern. By and large authors interpret the negative relation between leverage and profitability as support for the pecking order theory and inconsistent with the trade-off theory. The positive relation between leverage and tangible assets is viewed as support for an element of the trade-off theory, namely that expected default costs of debt are lower when firms have assets with lower liquidation costs. Less pervasive is evidence that corporate tax status explains leverage ratios.

A commonly held view is that the cross-sectional evidence, buttressed by evidence on stock price effects of security offerings, provides strong support for the pecking order theory. For example, Baskin (1989) concludes that, "The alternative theory of static optimal capital structure appears to have little power in explaining corporate behavior." Our study complements existing cross-sectional evidence by focusing on financing choices in a context where pecking order effects are largely absent. We believe our tests provide a special opportunity to examine whether the trade-off theory also explains financing policies.

Although our study is most closely linked to cross-sectional studies of capital structure, it is also related to Alderson and Betker's (1995) and Gilson's (1997) studies of the capital structures of distressed firms that reorganized under Chapter 11 of the U.S. Bankruptcy Code. Alderson and Betker find that firms with high liquidation costs of assets emerge from financial distress with relatively low debt ratios and with more flexible forms of debt. Gilson finds that tax status is an important determinant of capital structure, and that firms with more net operating loss carryforwards have less debt. Our study is similar in that we investigate situations in which managers must make explicit choices about how to design financial structure. However, our study differs in that spin-offs do not occur in the presence of financial distress.

Our article also contributes to the literature on corporate spin-offs. Although in most cases operating and strategic considerations appear to drive the parent firm's decision to spin off assets to shareholders, it is not uncommon for company documents to state that a spin-off would allow heterogeneous business units to establish capital structures that are better suited to the nature of their assets or growth prospects. The idea that spin-offs lead to potential gains from separating business units with

different optimal capital structures is also discussed in Hite and Owers (1983), John (1993), and Jongbloed (1998).³

Most research on spin-offs focuses on the valuation consequences of spin-offs or on subsequent performance.⁴ There is limited evidence on how spin-offs affect capital structures. Schipper and Smith (1983) report that the average ratio of book value of debt to total assets is 0.59 prior to the spin-off and is 0.51 for the spun-off subsidiary firms. In contrast, Michaely and Shaw (1995) provide evidence that spin-offs of master limited partnerships result in increases in leverage for the spun-off companies and reductions in leverage for the parent companies. These studies, however, do not examine the determinants of the differences between the capital structures of firms involved in spin-offs.

Daley, Mehrotra, and Sivakumar's (1997) study of spin-offs provides some evidence that is related to the main question examined in our study. They contrast cross-industry spin-offs, involving a parent and subsidiary in different lines of business, with own-industry spin-offs involving firms in the same industry. They find that cross-industry spin-offs lead to a small decline in the leverage ratio of the combined assets in the period between the spin-off and the ensuing fiscal year-end, but there is no change in leverage associated with own-industry spin-offs. This pattern is consistent with the argument that spin-offs that undo diversification, and therefore are likely to increase the variability of cash flows, lead to declines in financial leverage. We explicitly explore the role of cash flow variability, among other factors, in our study.

A contemporaneous study by Dittmar (2004) is closely related to ours. Dittmar uses a sample of spin-offs to study capital structure choices made around the time of a spin-off, as we do. While the two studies reach similar conclusions, we believe there are important differences between Dittmar's analysis and ours. Dittmar's main focus is on explaining the subsidiary's capital structure. She compares the subsidiary's capital structure to its predicted capital structure based on a cross-sectional analysis of firms that were not in the spin-off sample. As noted above, our focus is on explaining the difference between the parent and subsidiary's capital structure

³ Previous research identifies several additional motives for corporate spin-offs. Daley, Mehrotra, and Sivakumar (1997) and Desai and Jain (1999) identify gains from focusing operations as an important reason for spin-offs. Krishnaswami and Subramaniam (1999) argue that the advantage of spin-offs, relative to other methods of divestiture, is to correct the market's undervaluation of a firm's assets. Jongbloed (1998) explains that spin-offs can improve contracting with managers and overcome rent-seeking behavior among competing divisional managers. Hite and Owers (1983) and Schipper and Smith (1983) also cite the possible benefits of reduced regulatory constraints.

⁴ Hite and Owers (1983), Miles and Rosenfeld (1983), Schipper and Smith (1983), and Krishnaswami and Subramaniam (1999) focus on the stock price effects of announcements of spin-offs. Cusatis, Miles, and Woolridge (1993) examine long-run stock returns following spin-offs. Daley, Mehrotra, and Sivakumar (1997) study the stock price response to announcements of spin-offs as well as subsequent accounting performance. Desai and Jain (1999) study stock returns and operating performance following spin-offs. Burch and Nanda (1999) estimate and compare the excess value of firms prior to and following spin-offs.

following the spin-off, an emphasis that removes pecking order effects from consideration. Finally, our study differs from Dittmar's in that we investigate the effect of agency and governance variables on the allocation of leverage in spin-offs.

2. Potential Determinants of Financial Policy Choices in Spin-offs

2.1 Determinants implied by value maximization

Our primary tests presume that managers choose financial structures that are aligned with stockholders' interests. Given that a spin-off allocates shares of the spun-off firm pro rata to current stockholders, alignment of managers' and stockholders' interests implies that spin-offs maximize the combined equity value of the firms that emerge from a spin-off. In the trade-off theory, managers maximize value by balancing the tax benefits of debt financing against default-related costs.

We examine four potential determinants of capital structure based on the trade-off theory. The first is the amount of free cash flow available for the payment of interest, measured as operating income plus depreciation. We scale our measure of operating cash flow by assets net of cash holdings. All other things equal, firms that generate lower free cash flow face a higher likelihood of default and correspondingly higher costs of debt financing. Lower cash flow also means a greater probability of incurring financing costs to meet cash shortfalls or of foregoing profitable investment opportunities. To minimize these costs we expect that more debt is assigned to the company that generates more free cash flow.

The second determinant of capital structure is the variability of cash flows. In general, we expect firms with more variable cash flows to use less debt financing. Debt is costlier for firms with greater variability in cash flows because the likelihood of default, as well as the need for costly external financing, is greater. Greater variability leads not only to higher expected default costs, but also to higher agency costs associated with conflicts of interest between creditors and stockholders. For example, the underinvestment problem identified by Myers (1977) is worsened when debt is riskier. To minimize these costs, we expect a greater allocation of financial leverage to the firm in a spin-off with lower variability of cash flows.

Measuring the variability of the spun-off unit's prior cash flows is difficult because it is not possible to reliably assess the past performance of the spun-off subsidiary. Instead, we match each parent and spun-off subsidiary with the set of all firms in the Compustat database with the same three-digit SIC code. For these matched firms, we calculate the variability of operating income plus depreciation scaled by assets net of cash, using up to 10 years of data prior to the spin-off. We use the median

standard deviations of the industry-matched firms as proxies for the variability of cash flows of the parent and spun-off companies.

The third determinant of capital structure is the nature of the firm's assets, as represented by liquidation costs. Myers (1977) and Williamson (1988) argue that assets that lose more value in financial distress or liquidation are matched with more adaptable or flexible financing arrangements, such as equity. We test whether the relative liquidation costs of assets of the parent and subsidiary firms in our sample explain the allocation of debt between the two companies. As suggested by Alderson and Betker (1996), we use two proxies for liquidation costs, the ratio of fixed assets to total assets and the ratio of market value to book value of assets. We assume that high liquidation costs are associated with low ratios of fixed to total assets and high market to book ratios.

The fourth variable we investigate is a proxy for tax status. We test the idea that firms with higher tax rates benefit more from interest expense tax deductions and therefore employ more financial leverage. Because we do not have information from before the spin-off to estimate the marginal tax rates of both post-spin-off companies, we employ a proxy for tax status that is suggested by the work of Graham (1996). In particular, we define a tax dummy to be equal to one if at the first fiscal year-end following the spin-off a firm has no tax loss carryforwards and its pretax income is positive. Otherwise, the tax dummy has a value of zero. We predict that the tax benefits of debt are greater when a post-spin-off firm has a value of one for the tax dummy. However, we recognize that our tax variable is less than ideal because our measure of tax status is influenced in part by a firm's level of debt financing. Ideally we want a measure of tax status that is not affected by a firm's existing level of debt. Unfortunately, however, few of our sample firms are covered in John Graham's database of simulated marginal tax rates in the years immediately following the spin-offs.

2.2 Determinants implied by managerial self-interest

As shown by Dann and DeAngelo (1988) and Berger, Ofek, and Yermack (1997), financing policies can also be shaped by the self-serving behavior of managers. Jensen (1986) and Stulz (1988) describe the private benefits managers can derive from debt. If the oversight of managers is weak, or if the incentives of managers and stockholders are poorly aligned, firms may employ unusual amounts of financial leverage. Lower leverage is attractive to managers because low debt financing reduces the pressure to generate cash flow and therefore decreases the prospects of default and dismissal. Alternatively, entrenched managers may prefer a high degree of debt financing in order to increase their proportionate voting power in the firm and reduce the likelihood of a takeover.

We investigate the possibility that the design of capital structures in spin-offs reflects the personal interests of managers. Controlling for asset

characteristics, we test whether the amount of financial leverage assigned to the post-spin-off firm is related to whether the post-spin-off firm retains the pre-spin-off company's CEO. We also examine the role of managers' incentives, measured by the proportions of the firm's equity owned by the CEO and by all officers and directors, as well as the size and composition of the board of directors. Managerial concerns about personal exposure to default risk or job security imply that the firm that retains the pre-spin-off CEO will have lower leverage, lower equity ownership stakes of managers, and/or a weaker board of directors. However, managerial concerns about takeover threats lead to the opposite effects on leverage. Therefore we control for cases where the pre-spin-off company was the target of a control event in the 12 months before the spin-off. Control events include a tender offer, adoption of a takeover defense, or the purchase of a block of common stock. The data on stock ownership and board composition come from proxy statements for both the parent and the spun-off subsidiary approximately one year after the spin-off.

3. Descriptive Statistics

3.1 Sample

The 98 spin-offs in our sample occurred in the period 1979–1997. Our initial list of spin-offs came from Daley, Mehrotra, and Sivakumar (1997), who analyzed spin-offs through 1991. We identified more recent spin-offs by searching *The Wall Street Journal Index* and obtaining a list of divestiture events from Securities Data Corporation.

Our sample firms satisfy three requirements. First, both the parent and the subsidiary firm must be included in the Compustat Annual Industrial File at the first fiscal year-end following the spin-off. Second, we must be able to identify the ex-dividend date and the terms of the spin-off. Third, we require that all shares of the subsidiary are distributed in the spin-off. We eliminate spin-offs that were preceded by a public offering of shares of the spun-off company and partial spin-offs in which the parent retains ownership of shares following the spin-off. In addition, we eliminated six observations for which a parent's or subsidiary's post-spin-off book value leverage ratio, which we define below, has a value less than -1.0 or greater than 1.0 .

Our sample is described in Table 1. The number of spin-offs per year, shown in the second column, ranges from 1 to 13. Nearly half of the spin-offs occurred in the last four years of our sample period. The third column shows that the pre-spin-off firms are quite large. The median value of the parent's assets prior to the spin-off is \$1.7 billion. There is, however, considerable variation in the sizes of the individual parent firms, ranging from \$15 million to \$60.8 billion. The last column shows that the fraction

Table 1
Sample spin-offs in the period 1979–1997

Year of spin-off	Number of spin-offs	Median assets of parent prior to spin-off (\$ millions)	Median proportion of assets spun off
1979	6	259	0.23
1980	3	185	0.51
1981	2	3526	0.31
1982	2	28	0.70
1983	1	230	0.04
1984	3	2813	0.07
1985	4	653	0.26
1986	3	15,966	0.29
1987	1	355	0.35
1988	8	600	0.26
1989	7	1015	0.13
1990	4	6385	0.09
1991	2	87	0.22
1992	3	505	0.41
1993	5	1939	0.19
1994	8	3112	0.19
1995	11	3514	0.21
1996	12	8137	0.12
1997	13	2366	0.23
Total sample	98	1706	0.22

Spin-offs through 1991 come from Daley, Mehrotra, and Sivakumar (1997). Spin-offs after 1991 come from a search of *The Wall Street Journal Index* and from a list of divestiture events from Securities Data Corporation. Sample firms satisfy four requirements. First, both the parent and the subsidiary firm are included in the Compustat Annual Industrial File at the first fiscal year-end following the spin-off. Second, the ex-dividend date and the terms of the spin-off can be identified. Third, all shares of the subsidiary are distributed in the spin-off and the spin-off was not preceded by a public offering of shares of the spun-off company. Fourth, both the parent's and subsidiary's post-spin-off leverage ratios are between -1.0 and 1.0 . Leverage ratio is long-term debt plus debt in current liabilities minus cash and equivalents, divided by the book value of assets net of cash and equivalents.

of assets spun-off is also substantial. At the median, 22% of the parent's assets were distributed in the spin-off. Similarly, Schipper and Smith (1983) and Daley, Mehrotra, and Sivakumar (1997) report that, on average, 25% of assets of parent firms were spun off. The parent company industry classifications, based on three-digit SIC codes, are quite diverse. Eighty-three different industries are represented in our sample. The maximum number of parent companies in any industry is five, in the electronic equipment industry, or SIC code 3660.

3.2 Analysis of differences in leverage

Research on capital structure focuses almost exclusively on the relative amounts of debt and equity financing. Consistent with this literature, typified by Titman and Wessels (1988) and Smith and Watts (1992), we define debt as long-term debt plus debt in current liabilities. We subtract cash and equivalents from debt because cash reserves offset the effects of financial leverage. We scale debt by either the book value or the market value of assets, both net of cash and equivalents. The market value of

assets is the sum of the market value of common stock and the book values of preferred stock and debt. We measure leverage of the parent and spun-off unit at the first fiscal year-end following the spin-off.

There are practical reasons to focus on book value rather than market value measures. First, accounting-based measures of leverage avoid induced correlations between market value leverage and determinants of leverage such as the ratio of market value to book value of assets and the ratio of cash flow to assets. Second, variation in the market value of assets between the spin-off and the first fiscal year-end potentially makes measurement of how debt was allocated between firms less precise. We also note that accounting rules that apply to spin-offs imply that the total book value of assets of the pre-spin-off firm is identical to the sum of the book values of assets held by the parent and the subsidiary immediately after the spin-off. For these reasons we use book value measures of leverage in most of our multivariate analysis.

Capital structure can also be characterized by coverage ratios, such as the amount of promised debt payments relative to the amount of cash flow available for payment of interest. Arguably financial managers are as concerned, if not more concerned, with their firm's ability to meet near-term debt payments as with their firm's leverage ratio. Therefore we also examine the allocation of commitments to pay interest, scaled by operating income. We use the inverse coverage ratio, defined as interest expense divided by operating income before depreciation at the end of the fiscal year of the spin-off, so that increases in our measure correspond to greater debt financing. We also examine an inverse coverage ratio that is an average of interest expense in the fiscal year of the spin-off and the subsequent two fiscal years, divided by an average of operating income before depreciation in the same three fiscal years. The latter measure is constructed because of our concern that a single year's measure may be dominated by noise introduced, for example, by large and nonrecurring restructuring expenses in the year of the spin-off. Nine firms with negative values of operating income before depreciation are excluded from our analysis of coverage ratios.

A potential shortcoming of any measure of coverage as a metric of financial policy is that operating income is expected to be a determinant of both the allocation of debt and the amount of interest paid by firms created in a spin-off. We expect firms that optimally have more debt also have more operating income to support those interest payments. This implies that both components of the coverage ratio are affected by the debt allocation, so that the firm allocated more debt in the spin-off need not have the higher inverse coverage ratio. In other words, our concern is that coverage ratios fail to separate the ability to carry debt from the debt itself, and therefore are not unambiguous measures of the allocation of leverage in a spin-off. We therefore focus our analysis on our

Table 2

Univariate comparisons of financial characteristics of post-spin-off parent and subsidiary firms

	Pre-spin-off company	Post-spin-off companies		<i>p</i> -value of test on paired differences	Proportion of positive/negative differences
		Parent	Spun-off unit		
Long-term debt plus debt in current liabilities minus cash/assets minus cash (98)	0.16 <i>0.14</i>	0.19 <i>0.15</i>	0.18 <i>0.12</i>	0.49 <i>0.53</i>	0.56/0.44
Long-term debt plus debt in current liabilities minus cash/market value of assets less cash ^a (94)	0.13 <i>0.16</i>	0.12 <i>0.12</i>	0.13 <i>0.11</i>	0.70 <i>0.50</i>	0.52/0.48
Interest/operating income before depreciation (83)	0.12 <i>0.16</i>	0.11 <i>0.20</i>	0.07 <i>0.15</i>	0.00 <i>0.11</i>	0.66/0.28
Cash and equivalents/assets minus cash (98)	0.05 <i>0.09</i>	0.06 <i>0.10</i>	0.05 <i>0.11</i>	0.90 <i>0.66</i>	0.52/0.48
Proportion of firms with positive dividends (93)	n.a. <i>0.77</i>	n.a. <i>0.78</i>	n.a. <i>0.33</i>	n.a. <i>0.00</i>	0.48/0.03
Dividends/operating income before depreciation (77)	0.09 <i>0.10</i>	0.11 <i>0.13</i>	0.00 <i>0.09</i>	0.00 <i>0.40</i>	0.75/0.10

^a The market value of assets is the book value of debt and preferred stock plus the market value of equity. The sample is 98 spin-offs in the years 1979 through 1997. Firm characteristics are measured at the first fiscal year-end following the spin-off. Sample sizes for specific characteristics are given in parentheses. We first report medians, and test differences using the signed-rank test. Means and *p*-values from the difference in means tests are in italics.

measure of debt to assets, because this ratio provides a clearer test of the trade-off theory of capital structure.

In Tables 2 and 3 we analyze the differences in financial and asset characteristics of pairs of firms that emerge from spin-offs. All variables are measured at the first fiscal year-end following the spin-off. That date follows the effective date of the spin-off, the ex-dividend date, by a median of 4 months and an average of 4.65 months. The length of this interval suggests that for some firms, financing events may have occurred between the spin-off and the point at which we measure capital structures of the two post-spin-off units. We address this issue below by identifying financing events that occurred between the ex-dividend date and the first fiscal year-end, and checking that our results are not affected by the inclusion of post-spin-off financing.

At the fiscal year-end before the spin-off, the median ratio of debt net of cash to book value of assets is 0.16 and median book value of debt is \$337 million. At the time of the spin-off, managers divide the pre-spin-off debt between the two firms that emerge from the spin-off. The focus of our article is to investigate whether the unit with the greater relative ability to carry debt is allocated a larger share. However, it is also possible that managers simply allocate higher or lower leverage to either the parent or to the subsidiary, regardless of their characteristics. We consider this second alternative in Table 2. We report median and mean leverage for

the group of parents and the group of spun-off units separately, but perform statistical tests on differences in leverage for each pair of firms involved in a spin-off. We find that the median and mean differences in leverage ratios of the parents and spun-off units are insignificantly different from zero. Following the spin-off, the median ratio of debt to the book value of assets is 0.19 for parent companies and 0.18 for the spun-off firms. The mean ratios are 0.15 and 0.12. Differences between market value measures of leverage are also insignificant. Similarly the median and mean ratios of cash and equivalents to assets do not differ between the parents and spun-off firms. We find, however, that inverse interest coverage ratios differ. The median ratio of interest to operating income before depreciation is 50% higher for the parent firms. In almost two-thirds of spin-offs, the inverse coverage ratio is higher for the parent.

We also look at dividend policies because, like leverage, dividend policies typically are viewed as a commitment to pay out cash. We find significant differences in dividend policy between parents and spun-off subsidiaries. Three-fourths of parent firms pay dividends by the first fiscal year-end following the spin-off, while only one-third of the spun-off companies pay any dividends. These proportions are virtually unchanged when we measure dividends paid in the first full fiscal year following the spin-off. Parents also pay greater dividends as a proportion of operating income before depreciation. These differences most likely reflect the fact that parent firms, with an established record of paying dividends, face large costs of cutting dividends as well as benefits of maintaining dividend payments to institutional investors who may have a preference for dividend-paying stocks.⁵ In contrast, the spun-off subsidiaries are newly formed publicly traded companies and therefore have greater flexibility to pay no dividends.

The insignificant differences in leverage ratios of parents and subsidiaries, reported in Table 2, eliminate the possibility that managers simply follow a rule of thumb and allocate the parent more or less financial leverage than the spun-off unit. However, this does not imply that spin-offs do not result in material differences in the capital structures of the two post-spin-off firms. Managers may allocate pre-spin-off debt based on the firms' relative ability to carry it. However, there is no *a priori* reason to suspect that subsidiaries and parents differ systematically along dimensions that affect leverage choice.

In Table 3 we use the difference in post-spin-off leverage to make an alternative classification of firms involved in each spin-off. We identify each firm that emerged from its spin-off with greater book value of

⁵ Del Guercio (1996) examines the effect of prudent man laws on investments made by institutional investors, and finds that bank managers overinvest in high-quality stocks. Dividend yield is used as one measure of a stock's quality.

leverage than its counterpart, and put these firms in one group, described in column 1. A second group, described in column 2, contains each firm that emerged from its spin-off with lower book leverage than its counterpart. As in Table 2, we report summary statistics for each group separately, but perform statistical tests on the pairwise differences. Thus this classification assigns no special status to whether the surviving firm is a parent or subsidiary, and simply looks at the difference in leverage. We also compute measures scaled by sales, instead of assets. These measures are very similar to those in Table 3, and therefore are not reported.

The classification used in Table 3 reveals that spin-offs result in large differences in capital structure. At the first fiscal year-end following the spin-off, row 1 of Table 3 shows that the median book value leverage ratio is 0.28 for the group of higher leverage firms and 0.06 for the lower leverage firms. Average book value leverage values are 0.28 for the higher leverage firms and -0.02 for the lower leverage firms, where a negative value means on average cash and equivalents exceed debt. Differences in summary statistics for market value leverage ratios are comparable, as shown in row 2. The median, but not the mean, of the inverse of the coverage ratio in the year of the spin-off is greater for the higher leverage firms. However, both the median and mean coverage ratios are significantly greater for the higher leverage firms when the ratio is based on three-year averages of interest expense and operating income before depreciation, a result not shown in the table. Consistent with these patterns in leverage, the higher leverage firms have lower holdings of cash and equivalents to operating assets, although this may be partly induced by measuring leverage net of cash and equivalents. There are no differences in dividend policy between the higher and lower leveraged firms, so we do not analyze dividend payouts further.

In panel B we compare asset characteristics of the firms that emerge from spin-offs with higher or lower leverage than their counterparts. Consistent with the trade-off theory, the higher leverage firms have higher cash flow scaled by assets minus cash and they have a larger proportion of assets in property, plant, and equipment.

We find that higher leverage firms have lower industry variance of operating income to assets. However, one concern is that our measure of industry volatility, calculated by matching sample firms to industry counterparts based on a single three-digit SIC code, is not a reliable indicator of volatility for firms that operate in multiple industries. To address this concern, we have collected segment data for our sample. We are able to find segment reports for 48 parent firms in our sample. Of these, 25 firms report only one segment in the first complete fiscal year following the spin-off. The mean number of segments reported is 1.8 and the maximum is 5. We classify these 48 firms into 25 single-segment and 23 multiple-segment firms, and examine whether the role of industry earnings volatility in

Table 3

Univariate comparisons of financial, asset, and industry characteristics of post-spin-off firms grouped by higher and lower financial leverage

	Post-spin-off firms with higher leverage	Post-spin-off firms with lower leverage	<i>p</i> -value of test on paired differences	Proportion of positive/negative differences
Panel A: Financial characteristics				
Long-term debt plus debt in current liabilities minus cash/book value of assets minus cash (98)	0.28 <i>0.28</i>	0.06 <i>-0.02</i>		
Long-term debt plus debt in current liabilities minus cash/market value of assets minus cash ^a (95)	0.16 <i>0.19</i>	0.00 <i>-0.04</i>		
Interest/operating income before depreciation (89)	0.14 <i>0.20</i>	0.07 <i>0.19</i>	0.01 <i>0.90</i>	0.64/0.34
Cash and equivalents/assets minus cash (98)	0.04 <i>0.06</i>	0.09 <i>0.15</i>	0.00 <i>0.00</i>	0.23/0.77
Proportion of firms with positive dividends (98)	n.a. <i>0.57</i>	n.a. <i>0.53</i>	n.a. <i>0.57</i>	0.28/0.23
Panel B: Asset and industry characteristics				
Cash flow ^b /assets minus cash (98)	0.13 <i>0.14</i>	0.11 <i>0.09</i>	0.02 <i>0.04</i>	0.62/0.38
Industry standard deviation of operating income to assets ^c (98)	0.038 <i>0.042</i>	0.047 <i>0.047</i>	0.06 <i>0.05</i>	0.33/0.48
Property, plant, and equipment/assets minus cash (97)	0.35 <i>0.40</i>	0.28 <i>0.34</i>	0.02 <i>0.03</i>	0.61/0.39
Market value of assets minus cash ^d /book value of assets minus cash (94)	1.47 <i>1.63</i>	1.26 <i>1.50</i>	0.08 <i>0.39</i>	0.61/0.39
Tax dummy ^d (98)	n.a. <i>0.68</i>	n.a. <i>0.58</i>	n.a. <i>0.14</i>	0.29 /0.18
Total assets, millions of dollars (98)	496 <i>2581</i>	488 <i>2013</i>	0.43 <i>0.61</i>	0.55/0.45
Leverage ratio minus the median leverage ratio of firms with the same three-digit SIC code (98)	0.07 <i>0.07</i>	-0.15 <i>-0.11</i>	0.00 <i>0.00</i>	0.99/0.01

^aThe market value of assets is the book value of debt and preferred stock plus the market value of equity.

^bCash flow is operating income plus depreciation.

^cThe industry standard deviation is calculated for firms with the same three-digit SIC code prior to the spin-off and is based on up to 10 years of data.

^dThe tax dummy equals one if the firm has no tax loss carryforwards and its pretax income is positive at the first fiscal year-end following the spin-off. Otherwise, the dummy equals zero.

The sample is 98 spin-offs in the years 1979–1997. In each spin-off we identified the firm that had higher leverage than its counterpart at the first fiscal year-end following the spin-off; these firms are described in column 1. Firms with lower leverage than their counterparts are described in column 2. Leverage is long-term debt plus debt in current liabilities minus cash, divided by the book value of total assets minus cash. Firm characteristics are measured at the first fiscal year-end following the spin-off. Sample sizes for specific characteristics are given in parentheses. We first report medians, and test differences using the signed-rank test. Means and *p*-values from the difference in means tests are in italics.

explaining leverage allocations is similar for single-segment and multi-segment firms. Repeating the analysis in Table 3, we find that for multiple-segment firms, the industry earnings volatility is not significantly different for the higher and lower leverage firms to emerge from a spin-off.

However, for single-segment firms, the industry earnings volatility is lower at the 0.07 level of significance for higher leverage firms compared to lower leverage firms. The more reliable association for the single-segment firms lends credence to our proxy in Table 3 for volatility of operating income.

We investigate the tax status of firms that emerge from the spin-off. The proportion of firms with a tax dummy equal to one, indicating a higher tax-paying status, is not significantly greater for the higher leverage firms. To account for tax status beyond the year of the spin-off, we modify our tax status variable to equal one if cumulative pretax income is positive and net operating loss carryforwards equal zero over the three years following the spin-off. Using this alternative definition of the tax variable, the proportions of firms assigned a value of one increases to 0.73 for the higher leverage firms and 0.64 for the lower leverage post-spin-off firms. The paired differences of this alternative definition of the tax dummy variable are also insignificant. Thus, except for taxes, several factors implied by the trade-off theory of capital structure are related to the allocation of debt in spin-offs.

We find that the market to book ratio is greater for firms that emerge from spin-offs with higher leverage, although only the median difference is significant, and only at the 0.08 level. The positive relation between differences in book value of leverage and differences in market to book ratios of assets is unexpected if one views the market to book ratio as a measure of the costs of financial distress. Other researchers, such as Smith and Watts (1992), find a negative relation between market to book ratios and leverage, where leverage is measured using market values. In our regression analysis in the next section, we examine whether the association between leverage and the market to book value of assets becomes negative when we use a market value measure of leverage.

Practitioners, as well as some academics, suggest that the use of financial leverage is determined in part by industry norms. Matching or benchmarking industry peers' use of leverage can reflect strategic considerations in the product market. It can also reflect managerial rules of thumb that guide setting of capital structure. Managers may simply keep leverage within certain industry guidelines rather than devote much effort to designing a capital structure.

To investigate this issue, we examine the leverage ratios of firms in the same industries as firms that emerge from spin-offs. For each firm created in a spin-off, we calculate the median leverage ratio of firms with the same three-digit SIC code, using data from Compustat. We subtract the industry median from each sample firm's leverage ratio. The medians of the industry-adjusted leverage ratios, reported in the last row of Table 3, show the tendency to match industry leverage. We find that the higher leverage firms have an average industry-adjusted leverage ratio of 0.07 and the lower leverage firms have a negative average industry-adjusted leverage

ratio of -0.11 . The corresponding average leverage ratios for the median industry-matched firm, not shown in the table, are 0.21 for the industry matches to the higher leverage firms and 0.09 for the industry matches to the lower leverage firms. Thus, while the ordering of the post-spin-off leverage ratios corresponds to the ordering of the industry median leverage ratios, there is also a sizable firm-specific component of leverage ratios as reflected by the deviations from the median industry leverage ratios.

Next we turn to a multivariate analysis of the relation between differences in leverage and differences in asset and industry characteristics.

4. Regression Analysis

We undertake a regression analysis of the differences in leverage ratios between pairs of firms involved in a spin-off as of the first fiscal year-end following the spin-off. Independent variables are differences between asset characteristics of the same pairs of firms, measured at the same point in time. All variables are defined as a measure for the parent firm minus a measure for the corresponding spun-off unit.

The equation below specifies our regressions:

$$\Delta LEV_j = \alpha + \beta_1 \cdot \Delta CF_j + \beta_2 \cdot \Delta VAR_j + \beta_3 \cdot \Delta PPE_j + \beta_4 \cdot \Delta MKTBK_j + \beta_5 \cdot \Delta TAX_j + \beta_6 \cdot \Delta IND_j + \varepsilon_j \quad (1)$$

where α is the intercept;

β_1 – β_6 are coefficients for the independent variables;

ε is the error term;

Δ represents the difference in attribute between the parent and spun-off subsidiary in spin-off j ;

LEV is long-term debt plus debt in current liabilities minus cash, divided by assets minus cash;

CF is cash flow, defined as operating income plus depreciation, divided by assets minus cash;

VAR is the median variability in the industry of cash flow, divided by assets minus cash;

PPE is the ratio of property, plant, and equipment to assets minus cash;

$MKTBK$ is the ratio of market to book value of assets, both net of cash;

TAX is a dummy variable that equals one when a firm has no tax loss carryforwards and pretax income is positive; and

IND is the median leverage for the industry.

The regression in column 1 of Table 4 shows a significant positive relation between the difference in leverage ratios and the difference in cash flow scaled by assets, consistent with theories that relate the use of debt to default-related costs and the costs of external financing. The finding that the difference in leverage is related negatively to the difference

Table 4**Regression estimates of the relation between differences in financial leverage and differences in asset characteristics of parent and subsidiary firms**

Leverage is long-term debt plus debt in current liabilities minus cash, divided by book value of assets minus cash				
Constant	0.14 (0.13)	0.10 (0.29)	0.10 (0.29)	0.14 (0.13)
Cash flow ^a /assets minus cash	1.96 (0.00)	1.54 (0.00)		1.97 (0.00)
Industry standard deviation of operating income to assets ^b	-7.64 (0.03)	-6.91 (0.05)		-7.16 (0.05)
Property, plant, and equipment/assets minus cash	1.08 (0.00)			1.05 (0.00)
Market value of assets minus cash ^c /book value of assets minus cash		0.18 (0.03)		
Tax dummy ^d	-0.31 (0.04)	-0.28 (0.08)		-0.32 (0.04)
Median leverage ratio of firms with the same three-digit SIC code			1.21 (0.20)	0.38 (0.68)
Adjusted R^2	0.22	0.18	0.01	0.21
F-statistic (p -value)	7.78 (0.00)	6.11 (0.00)	1.66 (0.20)	6.20 (0.00)
Sample size	96	93	97	96

^aCash flow is operating income plus depreciation for the fiscal year of the spin-off.^bThe industry standard deviation is calculated for firms with the same three-digit SIC code prior to the spin-off and is based on up to 10 years of data.^cThe market value of assets is the book value of debt and preferred stock plus the market value of equity.^dThe tax dummy equals one if the firm has no tax loss carryforwards and its pretax income is positive at the first fiscal year-end following the spin-off. Otherwise, the dummy equals zero.The sample is 98 spin-offs in the years 1979–1997. All variables are measured at the first fiscal year-end following the spin-off. The numbers in parentheses are p -values.

in the industry median standard deviation of operating return on assets also supports these theories. Consistent with theories relating the liquidation costs of assets to the use of debt financing, firms that are allocated larger proportions of assets in property, plant, and equipment emerge from spin-offs with significantly higher leverage ratios. However, the negative coefficient on the tax dummy is inconsistent with a corporate tax motivation for the difference in leverage. In a regression not reported in Table 4, we find that the tax dummy is insignificant when it is defined to equal one if cumulative pretax operating income is positive in the three years following the spin-off and three-year net operating tax loss carryforwards are zero.

In column 2 we use an alternative measure of liquidation costs, the difference in market to book ratio of assets, which we expect to be inversely related to leverage. We find that the difference in market to book ratios is positively related to the difference in leverage, contrary to our expectations, but consistent with the univariate results in Table 3. One possible explanation for this result is that the market to book ratio is a proxy for variables other than the liquidation costs of assets, such as expected profitability of assets in place. Below we explore this issue further.

The results of our regression analysis are not robust to using inverse coverage ratios in place of leverage ratios. As reported earlier, we measure coverage two ways: using data from the fiscal year of the spin-off as well as three-year averages of interest expenses and operating income before depreciation. Regardless of the measure employed, we find no relation between the difference in the inverse of interest coverage and differences in characteristics of assets and cash flow. The *F*-statistics of these regressions are insignificant and are not reported in a table. As we discussed earlier, we suspect that the amount of interest payments is related to the level of operating income, which can make coverage an unreliable measure of financial leverage policy.

In the last two columns of Table 4 we present regressions that include an additional regressor designed to reflect the effects of industry leverage. For each sample firm, we define an industry leverage ratio as the median leverage ratio of firms with the same three-digit SIC code. The new regressor in Table 4 is the difference in median industry leverage of the parent and spun-off unit. The simple regression in column 3 and the multivariate regression in column 4 both show that the difference between leverage ratios of the post-spin-off companies is unrelated to the difference in industry leverage ratios. We conclude that managers of firms in our sample make deliberate financing policy choices rather than passively matching leverage to industry norms.

5. Additional Tests

5.1 Market value measures of leverage

We examine whether the results of our regression analysis are robust to defining leverage as liabilities scaled by market value rather than the book value of assets. In the first column of Table 5, the dependent variable is the difference in long-term debt plus debt in current liabilities minus cash and equivalents, divided by the market value of assets less cash and equivalents. Market value of assets is the sum of the market value of common stock and the book values of preferred stock and debt. Most of the coefficient estimates are similar to those in Table 4, where leverage is defined using the book value of assets. Operating cash flow is significant at the 0.03 level, while industry standard deviation of operating income is significant at the 0.08 level. The proportion of assets represented by property, plant, and equipment remains significant at the 0.01 level and the tax dummy is insignificant. However, the market to book value of assets is no longer significantly related to leverage when we use a market value measure of leverage. We suspect that the presence of pecking order effects in other studies leads to finding a negative relation, since a higher market to book ratio can also reflect higher expected profitability.

Table 5
Regression estimates of the relation between differences in financial leverage and differences in asset characteristics of parent and subsidiary firms for different definitions of leverage

	Leverage is long-term debt plus debt in current liabilities minus cash, divided by market value of assets minus cash, at the first fiscal year-end after the spin-off ^a	Leverage is long-term debt plus debt in current liabilities minus secured debt and cash, divided by book value of assets minus cash, at the first fiscal year-end after the spin-off	Leverage is long-term debt plus debt in current liabilities minus cash, divided by book value of assets minus cash, at the end of the first full fiscal year after the spin-off	Leverage is long-term debt plus debt in current liabilities minus cash, divided by book value of assets minus cash, at the end of the second full fiscal year after the spin-off
Constant	0.00 (0.96)	0.16 (0.08)	-0.03 (0.60)	0.01 (0.76)
Cash flow ^b /assets minus cash	0.52 (0.03)	2.13 (0.00)	0.54 (0.04)	0.67 (0.00)
Industry standard deviation of operating income to assets ^c	-2.77 (0.08)	-7.11 (0.04)	-3.70 (0.04)	-2.47 (0.05)
Property, plant and equipment/assets minus cash	0.72 (0.00)	1.06 (0.00)	0.54 (0.00)	0.51 (0.00)
Tax dummy ^d	-0.06 (0.38)	-0.34 (0.03)	-0.01 (0.88)	-0.07 (0.27)
Market value/book value of assets	0.01 (0.76)			
Adjusted R^2	0.20	0.23	0.12	0.27
F-statistic (p -value)	5.56 (0.00)	7.82 (0.00)	4.15 (0.00)	7.66 (0.00)
Sample size	92	94	81	66

^aThe market value of assets is the sum of the market value of common stock and the book values of preferred stock and debt.

^bCash flow is operating income plus depreciation.

^cThe industry standard deviation is calculated for firms with the same three-digit SIC code prior to the spin-off, and is based on up to 10 years of data.

^dThe tax dummy equals one if the firm has no tax loss carryforwards and its pretax income is positive at the first fiscal year-end following the spinoff. Otherwise, the dummy equals zero.

The sample is 98 spin-offs in the years 1979–1997. Independent variables are measured at the first fiscal year-end following the spin-off. The numbers in parentheses are p -values.

5.2 Contractual restrictions on the allocation of debt

Managers' flexibility to allocate debt between the two firms emerging from a spin-off may be constrained by contractually binding links between certain assets and debt. Links between assets and debt can be enforced through the use of secured debt. Constraints may also take the form of covenants, such as those that require firms to maintain a certain ratio of debt to total assets or those that restrict a firm's ability to pledge assets as collateral to additional lenders. Our concern is that the positive relation we find between the difference in the proportions of fixed assets and the difference in leverage ratios may simply reflect the constraints managers face, rather than deliberate policy choices.

We address this concern in two ways. To control for the effect of contractual ties between assets and liabilities, we remove secured debt from our measures of leverage and investigate how managers allocate nonsecured debt. Presumably managers have more flexibility in allocating nonsecured debt, so that a relation between differences in the proportions of fixed assets and leverage exclusive of secured debt would be stronger evidence of managers actively managing capital structure in corporate spin-offs. We identify secured debt using data from Compustat and use the Compustat definition of secured debt as all long-term debt secured by a mortgage, property, receivable, stock, or other asset such as a capitalized lease. The median level of secured debt is 5.1% of the parent's total debt and 7.8% of the subsidiary's total debt, where total debt is defined as long-term debt plus debt in current liabilities minus cash.

In the regression in column 2 of Table 5, secured debt has been eliminated from our measure of leverage. The regression results are robust to this exclusion. Moreover, the exclusion of secured debt increases the significance level of some coefficients. Perhaps in the presence of secured debt, managers allocate debt based on asset security, thus obscuring the link between factors such as cash flow and leverage. In the absence of secured debt, therefore, the links between these factors and leverage appear stronger.

However, we recognize that removing secured debt without also removing the assets tied to that debt may simply add noise to our analysis. We therefore delete all observations where the parent had more than 25% of its liabilities in secured debt and reestimate the regression on the remaining 61 spin-offs. The results, not reported in a table, are similar to those in Table 4. We conclude that our previous findings are not driven by a contractual link between fixed assets and secured debt.

The second way we investigate the effect of financing constraints is to look at changes in the use of leverage over time. Financing constraints imposed by covenants or secured debt may prevent managers from setting capital structures at optimal levels at the time of the spin-off.

However, financing constraints presumably become less binding over time. Therefore we analyze, but do not report in a table, leverage ratios for several years after the spin-off. If the differences in leverage we observe at the time of the spin-off persist, then it is more likely that managers were not constrained in allocating leverage at the time of the spin-off.

In the year of the spin-off, the median difference in leverage between the firms allocated greater leverage and the firms allocated less leverage is 0.22. At the end of the first fiscal year following the spin-off, the median difference in leverage ratios is 0.18 for the 82 surviving pairs of firms. At the end of the second fiscal year following the spin-off, the median difference in leverage is 0.17 for the 68 surviving pairs. Both of these differences in leverage are statistically significant at the 0.01 level. In fact, for the 42 pairs of firms that survive for five years following the spin-off, the median difference in leverage is statistically significant at the 0.03 level. The persistence of differences in leverage established in the fiscal year of the spin-off suggests that managers were not constrained in allocating leverage at the time of the spin-off.

In columns 3 and 4 of Table 5, we investigate this issue further using regression analysis. The independent variables, as in our earlier regressions, are differences in asset characteristics measured at the first fiscal year-end following the spin-off. However, the dependent variables measure the difference in leverage subsequent to the spin-off. In column 3, the dependent variable is the difference in leverage ratios measured at the end of the first full fiscal year following the spin-off, and the dependent variable in column 4 is measured at the end of the second full fiscal year. As in earlier regressions, the difference in these subsequent leverage ratios is related to the difference in cash flow divided by assets, to the difference in industry standard deviation of operating return on assets, as well as to the difference in the ratio of property, plant, and equipment to assets. The evidence suggests that contractual restrictions do not explain our findings, and that the assignment of capital structure in the year of the spin-off is not transitory.

5.3 Controlling for financing events between the effective date of the spin-off and the first fiscal year-end following the spin-off

Financing events between the spin-off and the first fiscal year-end have the potential to reduce the precision of our analysis of the design of capital structures in spin-offs. For example, although pecking order considerations are eliminated by investigating differences in leverage ratio at the time of the spin-off, these effects may influence financing choices made subsequent to the spin-off. Therefore we identify firms that made a public issue of debt or equity or a repurchase of shares between the spin-off and the first fiscal year-end.

As noted above, the median interval between the spin-off and the first fiscal year-end is 4 months and the mean is 4.65 months. We identify 16 cases where a post-spin-off company issued debt or equity publicly or repurchased shares during that interval, using reports in *The Wall Street Journal* or *The New York Times*. We reestimated our basic regression model, column 1 of Table 4, for the spin-offs without subsequent financing events, and the results are essentially the same as for the full sample. In addition, a Chow test shows that the regressions for the subsamples of spin-offs with and without subsequent financing events are not significantly different from one another. Finally, in a regression using the entire sample, we find that dummy variables for subsequent financing interacted with the independent variables are statistically insignificant. We conclude therefore that financing events following the spin-off do not influence our evidence on the determinants of differences in leverage at the first fiscal year-end.

5.4 Grouping by higher minus lower leverage

In our regressions, an alternative specification is to analyze differences in firms that emerged from spin-offs with higher and lower leverage, as opposed to differences between parents and spun-off units. We estimate, but do not report in a table, regressions in which all variables are defined as the differences between firms that emerged from spin-offs with higher leverage and firms that emerged with lower leverage. As we expected, the explanatory power of the regression is reduced. The differences in ratios of property, plant, and equipment to assets and cash flow to assets are still significantly related to the difference in leverage ratios. However, the difference in industry standard deviation of operating return on assets is insignificant.

As an additional test, we explore an alternative specification that is more robust to nonlinear relations in the data. We form two subsamples of spin-offs defined by the magnitude of difference in leverage between the post-spin-off firms. The difference in leverage ratios is 0.30 or greater in the group of 36 spin-offs with large differences in leverage and is 0.10 or less in the group of 26 spin-offs with small differences in leverage. Row 1 of Table 6 reports median differences in leverage of 0.54 and 0.04 for these two subsamples. We expect that relations between differences in leverage ratios and asset characteristics will be more pronounced in the subsample with large differences in leverage. For example, the median difference in property, plant, and equipment to assets is 0.11 and statistically significant when the differences in leverage are large. The median difference in property, plant, and equipment is -0.05 and statistically insignificant when the differences in leverage are small. Similarly, for both cash flow scaled by assets and industry standard deviation of operating income, there is a statistically significant difference in the subsample with large

Table 6
Comparisons of groups of spin-offs defined by differences in financial leverage

	Large differences in leverage		Small differences in leverage	
	Difference of higher and lower leverage firms	<i>p</i> -value of difference	Difference of higher and lower leverage firms	<i>p</i> -value of difference
Long-term debt plus current debt minus cash/book value of assets minus cash	0.54 <i>0.61</i>		0.04 <i>0.05</i>	
Long-term debt plus current debt minus cash/market value of assets minus cash ^a	0.38 <i>0.51</i>		0.05 <i>0.03</i>	
Cash flow ^b /assets minus cash	0.07 <i>0.07</i>	0.04 <i>0.06</i>	-0.01 <i>-0.02</i>	0.43 <i>0.59</i>
Industry standard deviation of operating income to assets ^c	-0.0051 <i>-0.0074</i>	0.00 <i>0.00</i>	-0.0003 <i>-0.0035</i>	0.45 <i>0.46</i>
Property, plant, and equipment/assets minus cash	0.11 <i>0.18</i>	0.00 <i>0.00</i>	-0.05 <i>-0.07</i>	0.21 <i>0.11</i>
Tax dummy ^d	n.a. <i>0.11</i>	n.a. <i>0.35</i>	n.a. <i>-0.11</i>	n.a. <i>0.38</i>

^aThe market value of assets is the sum of the market value of common stock and the book values of preferred stock and debt.

^bCash flow is operating income plus depreciation.

^cThe industry standard deviation is calculated for firms with the same three-digit SIC code prior to the spin-off, and is based on up to 10 years of data.

^dThe tax dummy equals one if the firm has no tax loss carryforwards and its pretax income is positive at the first fiscal year-end following the spin-off. Otherwise, the dummy equals zero.

We measured the difference in leverage in each pair of firms involved in a spin-off at the first fiscal year-end after the spin-off. The group of spin-offs with large differences in leverage contains 36 spin-offs in which the differences in leverage ratios are greater than 0.30. The group of spin-offs with small differences in leverage contains 26 spin-offs in which the differences in leverage ratios are less than 0.10. Leverage is long-term debt plus debt in current liabilities minus cash, divided by book value of assets minus cash. Financial and asset characteristics are measured at the first fiscal year-end following the spin-offs. We first report medians, and test differences using the signed-rank test. Means and *p*-values from difference in means tests are in italics.

differences in leverage, but not in the subsample with small differences in leverage.⁶

The tests reported in this section demonstrate that our main findings are robust. The difference in proportions of fixed assets consistently explains the difference in leverage ratios of the companies created by a spin-off. Our results suggest that managers match the use of leverage to the nature of assets, as predicted by factors that determine the expected costs of leverage. Our tests also show that differences in operating cash flow and

⁶ We investigated whether large differences in leverage are more likely to occur in spin-offs involving separation of substantially different assets (so-called cross-industry spin-offs). We examined this issue by determining whether the spun-off subsidiary was in the same industry as the parent, based on three-digit SIC codes. Approximately 80% of our sample represents cross-industry spin-offs, compared with 70% of cross-industry spin-offs reported in the Daley, Mehrota, and Sivakumar (1997) sample. Seventy-five percent of the firms with large differences in leverage represent cross-industry spin-offs. By comparison, 86% of the firms with small differences in leverage represent cross-industry spin-offs. The fractions are not statistically different at the 10% confidence level.

variability of industry operating income are related to differences in leverage ratios. However, when we investigate differences between firms that emerge with higher leverage and firms that emerge with lower leverage, differences in industry volatility are insignificant. Although our tests do not demonstrate a link between differences in the inverse coverage ratio and differences in asset characteristics, we believe, as noted above, that coverage is not an unambiguous measure of financial policy because it simultaneously reflects both the ability to carry debt and characteristics of the debt itself. Overall we believe our findings indicate that managers match the use of leverage to the level and variability of cash flow. However, we find no evidence that higher tax-paying status leads to greater financial leverage. It is also possible that managers choose financial leverage to serve their private interests. We turn to this possibility next.

6. Managerial Incentives and Governance Characteristics

Conflicts of interest between stockholders and risk-averse managers can influence a firm's use of financial leverage. Managers' concerns with protecting their job status and the value of their human capital can lead to a nonoptimal amount of debt. One hypothesis is that managers use too little debt to reduce the threat of financial distress. The alternative is that managers use too much debt to reduce the threat of a takeover.

Berger, Ofek, and Yermack (1997) investigate the relation between the use of debt financing and measures of managerial entrenchment. They find that the ratio of total debt to total assets is positively related to stock ownership of the CEO, consistent with the argument that managers may increase the use of debt in order to consolidate their voting power and reduce the probability of takeover. However, Berger, Ofek, and Yermack interpret the bulk of their evidence as consistent with the argument that entrenched managers avoid debt. They find that the ratio of total debt to total assets is negatively related to board size. They also find that leverage increases after threats to managerial security such as unsuccessful tender offers and the addition of a holder of a large block of stock to the board.

We investigate whether the allocation of debt in spin-offs is related to measures of managerial entrenchment such as board size, the proportion of inside directors, and stock ownership of the CEO. Larger boards of directors are less effective in monitoring managers, as suggested by the evidence in Yermack (1996), and therefore may not object to the design of capital structures with less debt. Similarly boards with a greater proportion of insider members presumably are less vigilant in monitoring management, as suggested by Byrd and Hickman (1992) and others, and may be associated with lower levels of debt. Finally, CEOs who own a small proportion of the firm's equity may have incentives that are not closely aligned with outside shareholders, and are more likely to have less debt.

Table 7

Univariate comparisons of governance characteristics of post-spin-off firms grouped by higher and lower financial leverage

	Post-spin-off firm with higher leverage	Post-spin-off firm with lower leverage	<i>p</i> -value of test on difference	Proportion of positive/negative differences
Retention of pre-spin-off CEO (97)	n.a. <i>0.35</i>	n.a. <i>0.42</i>	n.a. <i>0.64</i>	0.35/0.39
Board size (97)	8 <i>8.73</i>	7 <i>8.28</i>	0.41 <i>0.35</i>	0.46/0.37
Proportion of inside directors (97)	0.29 <i>0.30</i>	0.29 <i>0.29</i>	0.43 <i>0.50</i>	0.52/0.42
Proportional stock ownership of CEO (92)	0.003 <i>0.032</i>	0.005 <i>0.048</i>	0.04 <i>0.78</i>	0.37/0.63
Directors' and officers' proportional stock ownership (94)	0.041 <i>0.131</i>	0.048 <i>0.135</i>	0.33 <i>0.51</i>	0.44/0.56

The sample is 98 spin-offs in the years 1979–1997. In each spin-off we identified the firm that had higher leverage than its counterpart at the first fiscal year-end following the spin-off; these firms are described in column 1. Firms with lower leverage than their counterparts are described in column 2. Leverage is long-term debt plus debt in current liabilities minus cash, divided by book value of assets minus cash, at the first fiscal year-end following the spin-offs. Governance data come from proxy statements dated approximately one year after the spin-off. Sample sizes for specific variables are in parentheses. We first report medians, and test differences using the signed-rank test. Means and *p*-values from difference in means tests are in italics.

A positive relation between debt and stock ownership may arise if managers increase their use of leverage in order to consolidate their voting control.

We also examine the relation between leverage and the retention of the pre-spin-off firm's CEO. Presumably the CEO of a firm that undertakes a spin-off is centrally involved in shaping the companies that emerge from a spin-off. A systematic negative relation between the retention of the CEO and leverage would be consistent with the results of Berger, Ofek, and Yermack (1997). To investigate whether some firms employ too much leverage in response to a takeover threat, we examine the five cases where the spin-off was preceded within 12 months by an event that raised the prospect of a takeover of the firm. Our prediction is that in these cases the retention of the pre-spin-off CEO will be associated with greater financial leverage following the spin-off.

Table 7 compares governance characteristics of the higher and lower leverage firms that emerge from spin-offs. We find virtually no difference in financial leverage between the firm that retains the pre-spin-off CEO and the other firm created in each spin-off. The incumbent CEO is retained by the firm with less financial leverage in 35% of the spin-offs and is assigned to the firm with greater financial leverage in 42% of the spin-offs. The companies that emerge from a spin-off with higher leverage have a lower CEO ownership stake. This ordering is consistent with the idea that smaller ownership stakes lead managers to employ too much financial leverage. None of the other differences in governance characteristics are statistically significant.

We regress differences in leverage ratios on differences in asset characteristics as well as in governance characteristics for the firms that emerge from spin-offs, but do not report the results in a table. None of the variables associated with governance or management characteristics are reliably related to differences in leverage.

We identify six cases in which debt was downgraded in the 12 months following the spin-off. We isolate these observations because they potentially represent cases where managers' private interests led them to burden one company with debt and to transfer wealth from debt holders. For example, this is the conclusion Parrino (1997) reaches with respect to the Marriott spin-off in 1993. If managers use spin-offs to further their own interests, the effects should be most visible among these firms. For example, we would expect the surviving firm with lower leverage to retain the CEO, and the surviving firm with greater leverage to have more effective governance procedures in place. However, in all six cases debt was downgraded in the higher leverage firm, and that firm retained the pre-spin-off CEO. We also find that CEO retention has no effect on the post-spin-off difference in leverage. Spin-offs followed by a debt downgrade end up with larger boards in the firm with greater leverage, an ordering that is the opposite of what we would expect if there are incentive problems. Thus among these six spin-offs we find no evidence that personal interests of managers are related to the allocation of leverage.

In addition, we identify five cases where within 12 months preceding the spin-off some type of control event took place, such as a takeover offer, the adoption of a takeover defense, or the purchase of a large block of stock by an outsider. As argued earlier, managers faced with a control threat might adopt higher amounts of leverage to protect themselves from a change in control. However, in these cases the retention of the pre-spin-off CEO does not result in higher leverage. We reestimate a regression on differences in financial characteristics and in governance characteristics with the addition of a dummy variable for retention of CEO in cases with a prior control event. We expect a positive coefficient on the dummy if takeover threats lead firms to increase financial leverage. Again, we find no effect of CEO retention on the difference in post-spin-off leverage.

We conclude that the design of capital structures in our sample of spin-offs is not explained by measures of agency problems such as the CEO's ownership stake or board characteristics or by retention of the pre-spin-off CEO. One feature of our sample that should be noted is that on average the pre-spin-off firms had relatively low amounts of financial leverage and had limited opportunities to concentrate managerial voting power.⁷

⁷ One approach to measure the financial pressure faced by the sample firms is to estimate the probability that interest exceeds operating cash flow for the post-spin-off companies. Assuming that a firm's

We also recognize that if managerial agency problems are less important among firms whose managers voluntarily undertake a significant restructuring of assets, it is not surprising that managerial incentives do not explain the allocation of leverage.

7. Conclusion

In corporate spin-offs, managers must allocate the parent firm's liabilities between the two post-spin-off companies to complement the allocation of assets. We relate differences in capital structure in pairs of firms that emerge from spin-offs to differences in the firms' characteristics. Because we focus on differences in capital structure, we remove historical or time-series effects. Therefore spin-offs provide a unique opportunity to analyze the design of capital structure in a setting that is free of pecking order effects.

We find that the difference between the leverage ratios of the two post-spin-off firms is related to the difference in the characteristics of their assets. Although we are unable to explain differences in coverage ratios, we suspect that coverage ratios are at best ambiguous measures of the allocation of debt in spin-offs. The proportion of assets represented by property, plant, and equipment is positively related to the amount of financial leverage a company is assigned in a spin-off. This implies that liquidation costs of assets influence a firm's choice of financial leverage. Market to book ratio of assets, an alternative variable for asset characteristics, however, is positively related to book value measures of leverage, but unrelated to market value measures of leverage. We find no support for a corporate tax effect.

More importantly, we find evidence that the ratio of cash flow to assets and the industry variability of operating income to assets explain differences in leverage following a spin-off. The findings indicate that managers match assets and liabilities, and in particular that managers focus on characteristics that affect the expected costs of financial distress in setting capital structure policies. We believe evidence that the level and variability of cash flow determine the design of capital structure is particularly noteworthy. We suspect that most finance scholars intuitively argue that the level and variability of cash flow are important determinants of leverage, even though there is little evidence to support this view. In fact, most research finds a negative relation between profitability and leverage, as implied by the pecking order theory. In the design of capital structure in spin-offs, a setting free of pecking order effects, cash flow or profitability is related positively to the use of financial leverage. We

operating income before depreciation is normally distributed with a standard deviation equal to its industry's cross-sectional standard deviation, we estimate the average and median probability of default in a given year to be less than 0.01.

provide evidence that the ability to cover debt payments determines the design of capital structure, and conclude that the static trade-off theory is relevant to understanding corporate financing policies.

The contrast between our study and many others that show a negative relation between leverage and profitability suggests that evidence consistent with the trade-off theory is difficult to detect in the presence of pecking order and other time-series effects. Cross-sectional studies of capital structure are inherently complicated by the fact that leverage ratios of firms reflect the cumulative effect of sequential decisions and are influenced by pecking order effects as well as by costs of adjusting capital structure. Leverage ratios wander in response to the sequence of financing choices and are adjusted toward target leverage ratios only periodically. Spin-offs represent a unique opportunity to observe such adjustment, and our evidence therefore provides important insights into the determinants of target capital structure.

We do not find evidence that the allocation of financial leverage is explained by conflicts of interest between managers and stockholders. For example, the allocation of debt is not influenced by differences in board size, board composition, the CEO's ownership of stock, or by which company retains the pre-spin-off firm's CEO. It does not appear that managerial agency problems influence the design of capital structure in our sample of spin-offs.

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