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Debt, Diversification, and Valuation

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Abstract. The separate associations between financial leverage and valuation and between diversification and valuation have been widely researched. The joint function of leverage, diversification, and valuation, however, has received much less attention. Previous research shows that compared to specialized firms, diversified firms tend to have higher free cash flows and fewer high net present value investment opportunities. Consequently, the agency costs associated with potential overinvestment are greater for diversified firms. The literature also proposes that financial leverage should reduce agency costs. Consequently, we expect that the values of diversified firms increase with leverage. Our tests provide strong support for the hypothesis that the values of diversified firms increase with leverage. This tendency is not observed for specialized firms.

Key words: debt, leverage, diversification, valuation

JEL Classification:

1. Introduction

There has been much work on the diversification discount and why it exists. Very little attention, however, has been directed toward why financial leverage might impact upon this discount. In fact, one might expect that leverage will be more useful to the diversified (multi-business segment) firm than to the specialized firm because diversified firms are more apt to experience the agency costs associated with large free cash flows. Jensen (1986) shows that leverage may be used to reduce free cash flows and the agency costs associated with potential over-investment. We hypothesize that for diversified companies, the diversification discount is inversely related to leverage. We do not expect the same relationship to hold for specialized firms.

In this paper, using a sample of firms from *Compustat*, we find that the diversification discount is inversely related to leverage. The favorable effect of leverage, however, applies only to diversified firms. These results are robust to alternative specifications of leverage and alternative specifications of our model. We also find that the association of leverage and valuation is particularly strong for diversified firms that are smaller in size.

Section 2 presents the research hypothesis. In Section 3 we discuss the research design. We describe the data sources and sample selection in Section 4. Sections 5 and 6 present the empirical results and conclusions.

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2. Hypotheses

Diversified firms differ from specialized firms in two important aspects: cash flows and investment opportunities. Compared to specialized firms, diversified firms tend to generate high free cash flows (Whited, 2001). Moreover, the investment opportunities of diversified firms are limited compared to those of specialized firms (Lang and Stulz, 1994; Berger and Ofek, 1995).

The agency-based capital structure models predict that leverage should enhance the values of firms through the reduction of agency costs. Jensen (1986) focuses on the agency problems of overinvestment. Firms with high free cash flows and low investment opportunities have incentives to expand beyond their optimal size. Business expansion serves managers by (1) increasing the resources under their control, (2) providing promotional opportunities for middle managers and thereby serving as an integral component of the organization's motivational and reward system, and (3) enhancing managerial compensation which tends to increase with organizational responsibility and size. Given the incentives of managers to increase the sizes of their businesses, managers of firms with high free cash flow and limited investment opportunities find it difficult to resist the temptation to grow, even when expected returns fail to exceed the cost of capital. In Jensen's view, leverage reduces the agency problems of overinvestment because debt service reduces the free cash flow available for discretionary spending. Managers then have fewer opportunities to overinvest or otherwise waste excess cash.

As indicated previously, diversified firms tend to have larger cash flows and fewer high net present value investment opportunities than specialized firms. Therefore, the potential for leverage to reduce the agency costs associated with overinvestment should be higher for diversified firms than for specialized firms. Leverage can also help to control other value-reducing behavior such as the cross-subsidization of poorly performing subsidiaries that is typically associated with diversified firms (Shin and Stulz, 1998; Scharfstein and Stein, 2000).

Leverage can also impact negatively upon valuation. For example, the likelihood of bankruptcy increases with leverage. Bankruptcy costs should be relatively low for diversified firms, compared to specialized firms, however, due to the coinsurance effect associated with imperfectly correlated cash flows between business segments (Lewellen, 1971). Leverage also increases the likelihood of underinvestment as discussed in Stulz (1990) and Peyer and Shivdasani (2001). Underinvestment costs, however, should also be less of an issue for diversified firms because of their low growth opportunities compared to specialized firms.

In summary, the potential ability of leverage to reduce agency costs should be greater for diversified firms than for specialized firms as a result of higher cash flows and fewer investment opportunities. On the other hand, the negative effects associated with the costs of bankruptcy and underinvestment, should be lower for diversified firms. Therefore, we expect to find that leverage contributes to the value of diversified firms, but not for specialized firms.

3. Research design

This section discusses the research design. First, we present the empirical model which is based upon the specification of Berger and Ofek (1995). Then, we explain the measurement of the dependent variable, excess value. Excess value is a measure of the firm's market value relative to that of the average firm in its industry or industries. Following this, we discuss expansion of the basic model to control for other variables associated with excess value.

3.1. The model

Berger and Ofek (1995) examine the impact of diversification on valuation. They do this by fitting the following regression model:

$$\text{EV} = \alpha_1 + \beta_1 D + \beta_2\,\text{SIZE} + \beta_3\,\text{EBIT} + \beta_4\,\text{CAPEX} + \varepsilon \quad (1)$$

where

EV is excess value,
D is 1 for firms reporting multiple segments; otherwise 0,
SIZE is the natural logarithm of total assets,
EBIT is earnings before interest and taxes/sales,
CAPEX is capital expenditures/sales.

Berger and Ofek observe a significant negative coefficient on diversification which they interpret as a measure of the valuation discount for diversified firms. Since the interest in the present study is with the association of leverage and excess value conditional on diversification, we include leverage and an interaction term that relates diversification and leverage. We initially restrict the control variables to those identified by Berger and Ofek for comparison purposes and to maintain as many of the sample observations as possible. This regression model is:

$$\begin{aligned}\text{EV} = {} & \alpha_1 + \beta_1 D + \beta_2\,\text{DEBT} + \beta_3\, D * \text{DEBT} + \beta_4\,\text{SIZE} + \beta_5\,\text{EBIT} \\ & + \beta_6\,\text{CAPEX} + \varepsilon \end{aligned} \quad (2)$$

where

DEBT is the book value of long-term debt / book value of total assets, and $D * \text{DEBT}$ is the product of D and DEBT, the interaction term for diversification and leverage.

The long-term debt measure is consistent with the view that leverage effectively locks the firm into a long-term commitment (Jensen, 1986).

In model (2), the association between EV and leverage for specialized firms is reflected by β_2. For diversified firms, this association is reflected by $\beta_2 + \beta_3$. As discussed previously,

β_2 should have a negative sign. Since we hypothesize that leverage is more beneficial for diversified firms, we predict that β_3 will have a positive sign.

3.2. *Excess value*

Excess value is the difference between the natural logarithm of a firm's market value and the natural logarithm of its imputed value. Market value is the sum of the book value of debt and the market value of equity. For the specialized firm, imputed value is the company's sales multiplied by the industry median market value to sales ratio. For the diversified firm, we first calculate the imputed value of each business segment. The imputed value of the diversified firm is then calculated as the weighted sum of the imputed values of each segment. As in Berger and Ofek (1995), we weight the segment imputed values on the basis of sales. To ensure that the median is based upon a reasonably sized sample, each industry must include at least five firms in the measurement year for retention in the sample. Industry is based upon three-digit SIC codes when data is available; otherwise upon two-digit SIC codes.

3.3. *Managerial ownership and other control variables*

Previous research including Morck, Shleifer and Vishny (1988) and McConnell and Servaes (1990) finds that valuation increases with managerial ownership (at relatively moderate percentages of ownership). The theory underlying these papers suggests that managerial ownership, at least in moderate amounts, contributes to value by helping to align the interests of managers and other shareholders. Consequently, we control for the effect of managerial ownership. We measure managerial ownership, OWN, as the percentage of shares held by top executives reported by *Execucomp*.

Aggarwal and Samwick (2003) identify additional variables associated with valuation. These variables are dividend yield, net property plant and equipment to sales, the square of net property plant and equipment to sales, and cash flow to plant and equipment. Therefore, we include these variables for control purposes.

Tests that include managerial ownership and other control variables are reported separately because the data requirement substantially reduces the sample size and changes the characteristics of the sample. We fit three regression models to test for the relative importance of managerial ownership. The three expanded models are:

$$\begin{aligned}\text{EV} = \alpha_1 &+ \beta_1 D + \beta_2\,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4\,\text{SIZE} + \beta_5\,\text{EBIT} + \beta_6\,\text{CAPEX}\\ &+ \beta_7\,\text{DIVYIELD} + \beta_8\,\text{PPE} + \beta_9\,(\text{PPE})^2 + \beta_{10}\,\text{CFO} + \varepsilon \qquad (3)\end{aligned}$$

$$\begin{aligned}\text{EV} = \alpha_1 &+ \beta_1 D + \beta_2\,\text{OWN} + \beta_3 D * \text{OWN} + \beta_4\,\text{SIZE} + \beta_5\,\text{EBIT} + \beta_6\,\text{CAPEX}\\ &+ \beta_7\,\text{DIVYIELD} + \beta_8\,\text{PPE} + \beta_9\,(\text{PPE})^2 + \beta_{10}\,\text{CFO} + \varepsilon \qquad (4)\end{aligned}$$

$$\begin{aligned}\text{EV} = \alpha_1 &+ \beta_1 D + \beta_2\,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4\,\text{OWN} + \beta_5 D * \text{OWN}\\ &+ \beta_6\,\text{SIZE} + \beta_7\,\text{EBIT} + \beta_8\,\text{CAPEX} + \beta_9\,\text{DIVYIELD} + \beta_{10}\,\text{PPE}\\ &+ \beta_{11}\,(\text{PPE})^2 + \beta_{12}\,\text{CFO} + \varepsilon \qquad (5)\end{aligned}$$

where

OWN is the percentage of shares outstanding held by top executives,
$D * \text{OWN}$ is an interaction term between diversification and managerial ownership,
DIVYIELD is common dividends divided by the market value of equity,
PPE is net property plant and equipment to sales, and
CFO is cash from operating activities to net property plant and equipment.

Model (3) uses the specification of model (2) but with additional control variables. Model (4) substitutes managerial ownership for leverage to examine the relative importance of these variables. Both managerial ownership and leverage are included in model (5). To facilitate comparability between samples, our tests require the availability of managerial ownership data for all three models.

4. Data and sample selection

We obtain firm-specific financial data from the annual database of Standard and Poor's 2003 *Compustat* Industrial and Merged Industrial Research files. Segment information is obtained from the *Compustat* Segment files and managerial ownership data is from *ExecuComp*. Our examination includes the period 1990 through 2001. Since we rely upon ExecuComp for managerial ownership data and this database is available only from 1992, tests that utilize managerial ownership information represent the period 1992 through 2001.

Following Berger and Ofek (1995), we exclude financial firms (SIC codes between 6000 and 6999) and firms with financial segments because EBIT is not available for these firms. Only firms incorporated in the U.S. and with sales exceeding $20 million are included. For diversified firms, we delete firm-years when the absolute sum of segment sales and assets are not within the range of 99% to 101% of total sales and total assets reported in annual files. We eliminate the top and bottom 0.5% of extreme excess values to remove influential observations. The resultant sample consists of 48,773 firm-years. Of this, 11,831 firm-years pertain to diversified firms.

Some papers (see, for example, Whited, 2001) question the ability of conventional valuation metrics and research designs to satisfactorily address the issue of whether diversification reduces value. The present investigation uses the excess value metric only to examine the association of leverage, diversification, and excess value. Even if the base level of excess value is subject to measurement error, we have no reason to expect serious bias in our examination of the association of the variables tested.

5. Results

5.1. Descriptive statistics

Table 1 summarizes key characteristics of the full sample. The data show negative mean and median excess values for diversified firms. These negative excess values are consistent

Table 1. Descriptive statistics

	Specialized firms		Diversified firms		Differences*	
	Mean	Median	Mean	Median	Mean	Median
EV	0.016	0.000	−0.096	−0.105	0.112***	0.105***
Segments	1.000	1.000	2.891	3.000	−1.891***	−2.000***
DEBT	0.194	0.124	0.225	0.200	−0.031***	−0.077***
SIZE	5.210	5.017	6.215	6.112	−1.005***	−1.095***
EBIT	0.056	0.076	0.073	0.079	−0.016***	−0.003**
CAPEX	0.102	0.040	0.090	0.044	0.013***	−0.004***
Cash flow	0.074	0.066	0.082	0.074	−0.008***	−0.008***
Firm-years	36,942		11,831			

This table summarizes key data. The sample is comprised of 48,773 firm-years of *Compustat* data for companies with sales exceeding $20 million for 1990 through 2001. Following Burger and Ofek (1995), financial firms are not included. EV is excess value as in Berger and Ofek (1995). Segments are the number of business segments as reported in Compustat. SIZE is the natural logarithm of total assets. DEBT is the book value of long-term debt to the book value of total assets. EBIT is EBIT to sales. CAPEX is capital expenditures deflated by total sales. CFO is cash from operating activities deflated by net plant. The t-test (Wilcoxon test) is used to compare differences in means (medians) between the specialized and diversified firms. All data are from *Compustat*.

***Indicates statistical significance at the 0.01 level, two-tailed tests.

**Indicates statistical significance at the 0.05 level, two-tailed tests.

with the results of previous studies. Differences in excess value between diversified and specialized firms are significant at the 1% level. The average number of segments for diversified firms is 2.9. This is nearly identical to the value reported by Berger and Ofek (1995).

We also observe that compared to specialized firms, diversified firms carry substantially more debt, are larger, and are more profitable, also consistent with Berger and Ofek. Capital expenditures as a percentage of sales are roughly the same for the two groups of firms with diversified firms showing high median values, but with lower means. The comparison of cash flows confirms that diversified firms have higher cash flows than specialized firms. This finding suggests that diversified firms have increased potential for overinvestment relative to specialized firms following the suggestion of Jensen (1986).

5.2. *Univariate examination of leverage and excess value conditional upon diversification*

We first examine the univariate association of leverage and excess value conditional upon diversification. To facilitate this examination, we partitioned the sample into thirds based on ascending leverage. Table 2 presents these partitions and the associated excess value metrics with diversified and specialized firms shown separately. The data in the first three columns relate to diversified firms while the last three columns show results for specialized firms. For the diversified firms, we observe that excess value increases monotonically with leverage. The positive association between excess value and leverage is consistent with

Table 2. The association of leverage and valuation for diversified and specialized firms

	Diversified firms		Specialized firms	
Leverage group	DEBT	EV	DEBT	EV
Low	0.011	−0.165	0.008	0.099
Mid	0.155	−0.135	0.146	−0.094
High	0.418	−0.016	0.458	0.025

This table illustrates the association of leverage, diversification, and excess value. Firms are grouped in order of increasing leverage (low third, mid third, top third). Excess value (EV) is as in Berger and Ofek (1995). DEBT is the book value of long-term debt to the book value of total assets. Specialized firms: 36,942 firm-year observations; diversified firms: 11,831 observations over the period 1990–2001. All data are from *Compustat.*

the agency theory prediction concerning the potential monitoring effects of leverage. The pattern of data differs for specialized firms. For specialized firms, the overall tendency is a reduction in excess value with increasing leverage. Excess value, for firms in the second partition, is substantially lower than for the first partition. For the high leverage partition, leverage is somewhat higher, but still less than the amount observed for the low leverage partition. These data suggest that the values of diversified firms increase with leverage, but that the values of specialized firms do not exhibit this relationship.

Table 3 summarizes the relationships between the variables. As expected, the interaction term and the two components, D and DEBT, are highly correlated. The correlation between

Table 3. Cross-correlation of variables

	EV	D	DEBT	$D*$ DEBT	SIZE	EBIT	CAPEX
EV	–	−0.060	−0.014	−0.049	0.225	0.389	0.306
D	−0.059	–	0.113	0.938	0.219	0.010	0.039
DEBT	0.022	0.054	–	0.234	0.179	0.046	0.119
$D*$ DEBT	−0.001	0.648	0.388	–	0.250	0.018	0.065
SIZE	0.204	0.241	0.305	0.193	–	0.320	0.208
EBIT	0.045	0.016	0.000	0.015	0.113	–	0.145
CAPEX	0.179	−0.020	0.133	0.026	0.103	−0.097	–

This table shows correlations between the variables included in model (2). The upper right portion of the table shows Spearman rank correlation coefficients; the lower left portion shows Pearson product moment correlation coefficients. Excess value (EV) is as in Berger and Ofek (1995). D is 1 if the firm has more than one reportable business segment; otherwise 0. DEBT is the book value of long-term debt to the book value of total assets. $D*$ DEBT, the product of D and DEBT, equals DEBT if more than one reportable business segment; otherwise 0. SIZE is the natural logarithm of total assets. EBIT is deflated by sales. CAPEX is capital expenditures deflated by sales. Specialized firms: 36,942 firm-year observations; diversified firms: 11,831 observations over the period 1990–2001. All data are from *Compustat.*

$D * \text{DEBT}$ and the other variables, however, is fairly low. The highest cross-correlation, between $D * \text{DEBT}$ and SIZE, is fairly moderate (Pearson: 0.19; Spearman: 0.25). The correlations between $D * \text{DEBT}$ and other variables do not exceed 0.07.

As an additional test for multicollinearity, we estimate the regression models without SIZE. The association of excess value and leverage, not reported here, is actually stronger without the size variable. Moreover, any multicollinearity problem will bias against finding results, and therefore should not be a concern.

5.3. Multivariate tests

We fit model (2) using both the Fama and MacBeth (1973) and fixed effects techniques to examine the association of leverage, diversification, and valuation. The more conventional formulation provides a benchmark to Berger and Ofek (1995) and related literature. Following Fama and MacBeth (1973), we estimate the cross-sectional regressions annually to reduce estimation errors attributable to inter-temporal correlation of regression residuals across firms. The Fama-MacBeth procedure also increases the precision of the slopes and reduces their year-by-year volatility.

Then, we estimate both one-way and two-way fixed effects models to control for both cross-sectional and temporal heterogeneity. The one-way fixed-effects model controls for cross-sectional heterogeneity under the assumption that there is no temporal heterogeneity. The two-way fixed-effects model controls for both cross-sectional and temporal heterogeneity. This approach also mitigates the omitted variable problem by explicitly incorporating firm-specific and time-specific factors.

Table 4, Panel A summarizes the results for both the Fama-MacBeth and one-way fixed effects approach. We first focus on DEBT and $D * \text{DEBT}$. The data shows that DEBT, the measure of leverage, is negative and highly significant for both specifications. This result indicates that for specialized firms, excess value decreases with DEBT. Previous studies including Morck, Shleifer and Vishny (1988) and McConnell and Servaes (1990) also report a negative association between leverage and valuation. Morck, Shleifer, and Vishny note that the negative sign is consistent with the predictions of pecking order theory, which implies that leverage is negatively correlated with the profitability of the firm, and hence with valuation.

Our main concern is with the diversified firms and $D * \text{DEBT}$, the interaction term. To estimate the impact of leverage on excess value for diversified firms, we sum the coefficients for DEBT and $D * \text{DEBT}$. With the Fama-MacBeth approach, the result is $(-0.181 + 0.338)$ or 0.157. The positive sign for the sum of the coefficients tells us that, for diversified firms, excess value increases with leverage. Analysis of the sum of the DEBT and $D * \text{DEBT}$ coefficients resulting from the fixed effects specification, $(-0.046 + 0.182)$ or 0.136, leads to the same conclusion. These results, in both cases, confirm the univariate results presented in Table 2, namely that leverage seems to favorably impact upon the values of diversified firms.

The data also show that the control variables, EBIT and CAPEX, are positively related to excess value for both models, consistent with Berger and Ofek (1995). The Fama-MacBeth model shows that SIZE is also positively related to excess value as documented in the

Table 4. Multivariate analysis

Variable	Fama-MacBeth		Fixed effects	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Panel A: Diversified and specialized firms				
Intercept	−0.566	−7.74***	0.381	1.22
D	−0.259	−32.92***	−0.166	−12.35***
DEBT	−0.181	−6.55***	−0.046	−2.86***
D ∗ DEBT	0.338	5.51***	0.182	4.19***
SIZE	0.095	7.01***	−0.005	−1.09
EBIT	0.404	3.67***	0.162	19.75***
CAPEX	0.613	9.41***	0.371	26.88***
Adj-R^2(%)	10.49		69.42	
Panel B: Diversified firms only				
Interecept	−0.658	−16.16***	0.034	0.14
DEBT	0.200	4.38***	0.139	3.39***
SIZE	0.061	6.91***	0.038	3.56***
EBIT	0.802	4.80***	0.063	5.03***
CAPEX	0.687	5.78***	0.269	9.93***
Adj-R^2 (%)	12.47		73.90	

This table reports results of Fama-MacBeth and one-way fixed effects regressions for excess value (EV) on diversification and leverage for the sample of specialized and diversified firms controlling for size, profitability, and capital expenditures. Panel A shows data for the full sample; Panel B shows data for the diversified firms only. For the Fama-MacBeth approach, the coefficients are the average of 12 yearly regressions. The model used in Panel A is:

$$EV = \alpha_1 + \beta_1 D + \beta_2 \, DEBT + \beta_3 D * DEBT + \beta_4 \, SIZE + \beta_5 \, EBIT + \beta_6 \, CAPEX + \varepsilon \quad (2)$$

Panel B reports results for model (2) without *D* and D ∗ DEBT. Excess value is as in Berger and Ofek (1995). *D* is 1 if the firm has more than one reportable business segment; otherwise 0. DEBT is the book value of long-term debt to the book value of total assets. *D* ∗ DEBT, the product of *D* and DEBT, equals DEBT if more than one reportable business segment; otherwise 0. SIZE is the natural logarithm of total assets. EBIT is deflated by sales. CAPEX is capital expenditures deflated by sales. Specialized firms: 36,942 firm-year observations; diversified firms: 11,831 observations over the period 1990–2001. All data are from *Compustat.*

***Indicates statistical significance at the 0.01 level, two-tailed tests.

previous literature. SIZE, however, shows no relationship to excess value with the fixed effects specification. This observation likely results from the fact that firm size proxies for different firm-related characteristics. Since the one-way fixed effects model explicitly controls for cross-sectional heterogeneity, the power of firm size in explaining cross-sectional differences decreases. The results for the two-way fixed effects model are similar in tone to those shown for the one-way model and are not reported.

Panel B reports on tests of the sample of diversified firms only. This model is the same as model (2) except for exclusion of *D* and *D* ∗ DEBT, the interaction term. The results, both for the Fama-MacBeth approach and the fixed effects model, show a strong positive association between debt and excess value for these firms. These results confirm those reported for the full sample.

5.4. Endogeneity and simultaneous equations

Our research hypothesis is that leverage increases the value of diversified firms through its ability to reduce agency costs. It is possible, however, that leverage and excess value are endogenously determined. This will result if firms with greater excess values have higher growth opportunities and therefore greater investment capital requirements. If we assume that pecking order theory reasonably describes firms' financing decision-making, we should observe firms with higher excess values to have higher leverage. If this relationship is more prevalent with diversified firms as opposed to specialized firms, then we may find a positive relationship between excess value and leverage for diversified firms. Thus, if both the pecking order and free cash flow rationales make equal contributions in explaining the relationship between leverage and firm value, the empirical study suffers from simultaneity bias. We control for the potential endogeneity bias using a simultaneous equation approach. The simultaneous equation system is as follows:

$$\begin{aligned} \text{EV} = \alpha_1 &+ \beta_1 D + \beta_2 \,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4 \,\text{SIZE} + \beta_5 \,\text{EBIT} \\ &+ \beta_6 \,\text{CAPEX} + \beta_7 \,\text{LagEV} + \varepsilon \qquad (6) \\ \text{DEBT} = \gamma_1 &+ \phi_1 D + \phi_2 \,\text{EV} + \phi_3 D * \text{EV} + \phi_4 \,\text{SIZE} + \phi_5 \,\text{EBIT} + \phi_6 \,\text{CAPEX} \\ &+ \phi_7 \,\text{MDEBT} + \delta \qquad (7) \end{aligned}$$

In our model, the two endogenous variables are EV (excess value) and DEBT (leverage) and the control variables are SIZE, EBIT and CAPEX. We use LagEV (excess value for the previous year) as the predetermined variable for EV in equation (6) and MDEBT (the mean value for leverage associated with the two-digit SIC code) for DEBT in equation (7). These instrumental variables should be appropriate because each instrumental variable is highly correlated with its corresponding independent variable, but uncorrelated with the other independent variable. For example, the correlation between lagged excess value and excess value is 0.827, while the correlation between lagged excess value and leverage is only 0.015. Similarly, the correlation between the mean industry leverage and firm-specific leverage is 0.385, while the correlation between the mean industry leverage and excess value is merely −0.002.

Following the procedure in Palia (2001), we estimate the simultaneous equation system using a two-stage least square approach. In the first stage, we estimate equation (7) using a Fama-MacBeth approach and obtain the fitted value of DEBT. The fitted value of DEBT is then used as the instrument for DEBT in equation (6) in the second stage estimation. Since our focus is with equation (6), in Table 5 we only report the regression results for the second stage. Table 5 shows that our main results remain unchanged after taking into consideration the endogeneity between excess value and leverage. The coefficient on D ∗ DEBT is significantly positive (0.305, t-stat = 2.38). Moreover, the overall impact of leverage on the excess value of diversified firms is also positive (−0.130 + 0.305 = 0.175).

Table 5. Simultaneous equations

Variable	Mean coefficient	t-statistic
Intercept	−0.266	−6.33***
D	−0.088	−2.92**
DEBT	−0.130	−2.77**
D ∗ DEBT	0.305	2.38**
SIZE	0.035	5.08***
EBIT	0.188	8.07***
CAPEX	0.156	6.87***
LagEV	0.790	51.71***
Adj-R^2 (%)	70.39	

This table summarizes the results of simultaneous equations in which excess value (EV) and leverage (DEBT) are endogenous variables. We estimate the simultaneous equations using a two-stage-least-squares approach. The simultaneous equation system is:

$$\text{EV} = \alpha_1 + \beta_1 D + \beta_2\,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4\,\text{SIZE} + \beta_5\,\text{EBIT} + \beta_6\,\text{CAPEX} + \beta_7\,\text{LagEV} + \varepsilon \quad (6)$$

$$\text{DEBT} = \gamma_1 + \phi_1 D + \phi_2\,\text{EV} + \phi_3 D * \text{EV} + \phi_4\,\text{SIZE} + \phi_5\,\text{EBIT} + \phi_6\,\text{CAPEX} + \phi_7\,\text{MDEBT} + \delta \quad (7)$$

Excess value is as in Berger and Ofek (1995). D is 1 if the firm has more than one reportable business segment; otherwise 0. DEBT is the book value of long-term debt to the book value of total assets. D ∗ DEBT equals DEBT if more than one reportable business segment; otherwise 0. SIZE is the natural logarithm of total assets. EBIT is deflated by sales. CAPEX is capital expenditures deflated by sales. LagEV is the instrumental variable for EV, which is defined as the excess value for the previous year. MDEBT is the instrumental variable for DEBT, which is defined as the mean two-digit SIC industry leverage. The coefficients are for equation (6), the second stage regression. Specialized firms: 36,942 firm-year observations; diversified firms: 11,831 observations over the period 1990–2001. All data are from *Compustat.*

***Indicates statistical significance at the 0.01 level, two-tailed tests.

**Indicates statistical significance at the 0.05 level, two-tailed tests.

*Indicates statistical significance at the 0.10 level, two-tailed tests

5.5. *Additional control variables*

We now consider the impact of managerial ownership and additional control variables on the relation between leverage and excess value conditional on diversification. As indicated previously, we report these tests separately because the data source is *ExecuComp*, which reports ownership data only for a small portion of *Compustat* firms and only for relatively recent years.

Table 6 summarizes results for the tests of models (3), (4), and (5). Model (3) adds additional control variables to model (2). Model (4) substitutes managerial ownership for leverage to examine the relative importance of the two variables and model (5) includes both managerial ownership and leverage. In order to provide a common sample for comparison of the results for the three models, all tests include only observations for which managerial ownership data is available (beginning in 1992). This restriction substantially reduces the size of the sample.

Table 6. Multivariate analysis with managerial ownership and additional variables

	Model (3)		Model (4)		Model (5)	
Variable	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Intercept	0.200	1.93*	0.195	1.98*	0.164	1.59
D	−0.297	−11.69***	−0.227	−8.03***	−0.291	−13.34***
DEBT	−0.713	−9.89***	–	–	−0.710	−9.73***
D*DEBT	0.352	2.90**	–	–	0.358	3.05**
OWN	–	–	0.003	4.85***	0.004	4.80***
$D *$ OWN	–	–	−0.000	−0.15	0.001	0.24
SIZE	0.011	0.63	−0.009	−0.52	0.013	0.75
EBIT	0.625	3.43***	0.694	3.59***	0.605	3.47***
CAPEX	0.722	4.10***	0.832	4.91***	0.730	4.07***
DIVYIELD	−5.248	−5.50***	−4.982	−6.07***	−5.293	−5.56***
PPE	0.235	4.66***	0.107	2.32**	0.235	4.57***
PPE^2	−0.064	−7.50***	−0.051	−5.87***	−0.064	−7.66***
CFO	0.005	2.63***	0.006	2.93***	0.005	2.47***
Adj-R^2 (%)	11.90		10.30		12.04	

This table summarizes regressions of excess value (EV) on leverage and managerial ownership. Results are for Fama-MacBeth regressions.

$$\begin{aligned} \text{EV} = \alpha_1 &+ \beta_1 D + \beta_2 \,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4 \,\text{SIZE} + \beta_5 \,\text{EBIT} + \beta_6 \,\text{CAPEX} \\ &+ \beta_7 \,\text{DIVYIELD} + \beta_8 \,\text{PPE} + \beta_9 \,\text{PPE}^2 + \beta_{10} \,\text{CFO} + \varepsilon \end{aligned} \tag{3}$$

$$\begin{aligned} \text{EV} = \alpha_1 &+ \beta_1 D + \beta_2 \,\text{OWN} + \beta_3 D * \text{OWN} + \beta_4 \,\text{SIZE} + \beta_5 \,\text{EBIT} + \beta_6 \,\text{CAPEX} \\ &+ \beta_7 \,\text{DIVYIELD} + \beta_8 \,\text{PPE} + \beta_9 \,\text{PPE}^2 + \beta_{10} \,\text{CFO} + \varepsilon \end{aligned} \tag{4}$$

$$\begin{aligned} \text{EV} = \alpha_1 &+ \beta_1 D + \beta_2 \,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4 \,\text{OWN} + \beta_5 D * \text{OWN} + \beta_6 \,\text{SIZE} \\ &+ \beta_7 \,\text{EBIT} + \beta_8 \,\text{CAPEX} + \beta_9 \,\text{DIVYIELD} + \beta_{10} \,\text{PPE} + \beta_{11} \,\text{PPE}^2 + \beta_{12} \,\text{CFO} + \varepsilon \end{aligned} \tag{5}$$

Excess value is as in Berger and Ofek (1995). D is 1 if the firm has more than one reportable business segment; otherwise 0. DEBT is the book value of long-term debt to the book value of total assets. $D *$ DEBT, the product of D and DEBT, equals DEBT if more than one reportable business segment; otherwise 0. SIZE is the natural logarithm of total assets. EBIT is deflated by sales. CAPEX is capital expenditures deflated by sales. OWN is the percentage of shares help by top executives; $D *$ OWN equals OWN if more than one reportable business segment; otherwise 0. DIVYIELD is common dividends to the market value of equity. PPE is net plant to sales. CFO is cash from operating activities to net plant. Specialized firms: 4,716 firm-year observations; diversified firms: 1,654 observations over the period 1992–2001. All data are from *Compustat* and *Execucomp.*

***Indicates statistical significance at the 0.01 level, two-tailed tests.

**Indicates statistical significance at the 0.05 level, two-tailed tests.

The data for model (3) show that, as in the test of model (2), DEBT is negatively correlated with excess value and the coefficient for $D *$ DEBT is positive. When we sum the coefficients for DEBT and $D *$ DEBT, we obtain a negative sign. These results indicate that excess value for specialized firms decreases with leverage, while for diversified firms, excess value shows less of a tendency to decrease with leverage. Leverage mitigates, but does not eliminate, the reduction in excess value for diversified firms. In other words, while leverage appears to be beneficial, it does not completely offset the diversification discount for this particular subsample of diversified firms. We return to this result later. The data also show that with the exception of size, the control variables in model (3) are all highly significant. Size is not significant because the sample includes only firms for which *ExecuComp* includes managerial ownership data and these tend to be larger firms.

Model (4) substitutes managerial ownership for leverage. Confirming previous studies, we observe a positive association between managerial ownership and excess value. With respect to $D * \text{OWN}$, the small value and lack of statistical significance reveals that the association of managerial ownership and excess value does not differ with diversification. With the exception of size, the control variables are all highly significant.

Model (5) includes both leverage and managerial ownership. The results, for this sample of larger firms, are very similar to those obtained with models (3) and (4). Leverage continues to be important after controlling for managerial ownership and $D * \text{DEBT}$ continues to be positive and significant.

We now return to the model (3) and model (5) results which indicate that leverage exerts less of a positive influence upon diversified firms than indicated in the initial tests. One possibility is that the addition of dividend yield and other variables identified in Aggarwal

Table 7. Multivariate analysis with additional variables excluding managerial ownership

Variable	Coefficient	t-statistic
Intercept	−0.558	−7.25***
D	−0.248	−25.16***
DEBT	−0.211	−6.48***
$D *$ DEBT	0.308	4.12***
SIZE	0.089	6.31***
EBIT	0.436	3.30***
CAPEX	0.482	8.62***
DIVYIELD	−0.449	−2.86**
PPE	0.118	9.06***
PPE^2	−0.011	−4.37***
CFO	0.001	1.48
Adj-R^2 (%)	11.96	

This table summarizes Fama-MacBeth regressions of excess value (EV) on leverage. The sample is not limited to firms for which managerial ownership data is available and consequently is similar to that examined in Tables 1–5.

$$\text{EV} = \alpha_1 + \beta_1 D + \beta_2\,\text{DEBT} + \beta_3 D * \text{DEBT} + \beta_4\,\text{SIZE} + \beta_5\,\text{EBIT} + \beta_6\,\text{CAPEX} + \beta_7\,\text{DIVYIELD} + \beta_8\,\text{PPE} + \beta_9\,\text{PPE}^2 + \beta_{10}\,\text{CFO} + \varepsilon \quad (3)$$

Excess value is as in Berger and Ofek (1995). D is 1 if the firm has more than one reportable business segment; otherwise 0. DEBT is the book value of long-term debt to the book value of total assets. $D *$ DEBT, the product of D and DEBT, equals DEBT if more than one reportable business segment; otherwise 0. SIZE is the natural logarithm of total assets. EBIT is deflated by sales. CAPEX is capital expenditures deflated by sales. DIVYIELD is common dividends to the market value of equity. PPE is net plant to sales. CFO is cash from operating activities to net plant. Specialized firms: 31,986 firm-year observations; diversified firms: 10,869 observations over the period 1990–2001. All data are from *Compustat.*

***Indicates statistical significance at the 0.01 level, two-tailed tests.

**Indicates significance at the 0.05 level, two-tailed tests.

and Samwick (2003) reduce the significance of the $D * \text{DEBT}$ variable. The other relates to the nature of the firms included in the reduced sample. The number of firm-years used to fit model (2) totals 48,773. When we introduce the managerial ownership variable, the sample is reduced to only 6,370 firm-years as reported in tests of models (3) through (5). Thus, approximately five-sixths of the sample is lost due to the managerial ownership data requirement.

We tested for the importance of the difference in sample composition by fitting model (3), which does not include managerial ownership, for the full sample of firms with sufficient data to fit the model. While some observations are lost due to the introduction of additional control variables, the resultant sample does include 42,855 firm-years. Thus, most of the sample used to fit model (2) is maintained and the basic characteristics of the firms are similar to those examined in Tables 1–5.

The results of these tests, summarized in Table 7, show that size and the other control variables are highly significant for this more representative sample of *Compustat* firms. More importantly, we observe that the sum of the coefficients on DEBT and $D * \text{DEBT}$ is also strongly positive as with the earlier tests that did not include the additional control variables. These results show that the tests that include managerial ownership differ from the earlier results because the composition of the sample is very different. We observe that the association of leverage and excess value is particularly applicable to smaller firms and firms with other characteristics that are not present in the *ExecuComp* sample. Our tests of the joint association of leverage and managerial ownership on valuation apply only to a subset of *Compustat* firms and the results cannot be generalized to the larger population of *Compustat* firms. Unfortunately, we are not able to test for the importance of managerial ownership for this larger sample for which ExecuComp data is not available.

6. Summary and conclusions

This paper reports on an examination of the relationship between leverage, and valuation for diversified firms. The interest is in whether the values of these firms increase with leverage. Agency theory suggests that the association of leverage and valuation should be particularly strong for diversified firms. Managers have incentives to increase the sizes of their businesses even when expected returns fail to exceed the cost of capital. Diversified firms, which tend to have high free cash flows and limited investment opportunities, are particularly susceptible to the temptation to invest in low return projects than specialized firms. In the agency theory framework, leverage has potentially beneficial effects upon valuation through its ability to absorb free cash flow and thereby reduce potential agency costs. Leverage should also help to control other value-reducing behavior such as the cross-subsidization of poorly performing subsidiaries.

While leverage also has negative implications for valuation, these problems should be more applicable to specialized firms than to diversified firms. Therefore, the theory suggests a higher association between leverage and valuation for diversified firms than for specialized firms.

Our large sample focuses upon the excess value metric for diversified and specialized firms for the period 1990 through 2001. The data show a strong positive association between leverage and the values of diversified firms. The values of specialized firms do not increase with leverage.

The results are robust to alternative regression procedures, the potential influence of endogenity, and the influence of numerous control variables cited in the literature. We also find that the association of leverage and excess value is stronger for smaller firms. The lower association of leverage and valuation for large, diversified firms may be due to the effects of increased visibility and alternative mechanisms such as the actions by CALPERS that help to align manager and shareholder interests.

References

Aggarwal, R. K. and A. A. Samwick, "Why do Managers Diversify their Firms? Agency Reconsidered." *The Journal of Finance* 58, 71–118, (2003).

Berger, Philip G. and Eli Ofek, "Diversification's Effect on Firm Value." *The Journal of Financial Economics* 37, 39–65, (1995).

Fama, Eugene F. and James D. MacBeth, "Risk, Return, and Equilibrium: Empirical Tests." *Journal of Political Economy* 81, 607–636, (1973).

Jensen, Michael C., "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers." *American Economic Review* 76, 323–329, (1986).

Lang, Larry H. P. and Rene M. Stulz, "Tobin's Q, Corporate Diversification, and Firm Performance." *Journal of Political Economy* 102, 1248–1280, (1994).

Lewellen, Wilbur G., "A Pure Financial Rationale for the Conglomerate Merger." *The Journal of Finance* 26, 521–537, (1971).

McConnell, John J., and Henri Servaes, "Additional Evidence on Equity Ownership and Corporate Value." *Journal of Financial Economics* 27, 595–612, (1990).

Morck, Randall, Andrei Shleifer and Robert W. Vishny, "Management Ownership and Market Valuation." *Journal of Financial Economics* 20, 293–315, (1988).

Palia, Darius, "The Endogeneity of Managerial Compensation in Firm Valuation: A Solution." *The Review of Financial Studies* 14, 735–764, (2001).

Peyer, Urs C. and Anil Shivdasani, "Leverage and Internal Capital Markets: Evidence From Leverage Recapitalizations." *Journal of Financial Economics 59*, 477–515, (2001).

Scharfstein, David S. and Jeremy C. Stein, "The Dark Side of Internal Capital Markets: Divisional Rent-seeking and Inefficient Investment." *The Journal of Finance* 55, 2537–2564, (2000).

Shin, *Hyun–Han* and Rene M. Stulz, "Are Internal Capital Markets Efficient?" *Quarterly Journal of Economics* 113, 531–552, (1998).

Stulz, Rene M., "Managerial Discretion and Optimal Financing Policies." *Journal of Financial Economics* 26, 3–27, (1990).

Whited, Toni M., "Is it Inefficient Investment that Causes the Diversification Discount?" *The Journal of Finance* 56, 1667–1691, (2001).