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Corporate Diversification: What Gets Discounted?

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ABSTRACT

Prior literature finds that diversified firms sell at a discount relative to the sum of the imputed values of their business segments. We explore this documented discount and argue that it stems from risk-reducing effects of corporate diversification. Consistent with this risk-reduction hypothesis, we find that (a) shareholder losses in diversification are a function of firm leverage, (b) all equity firms do not exhibit a diversification discount, and (c) using book values of debt to compute excess value creates a downward bias for diversified firms. Overall, the results indicate that diversification is insignificantly related to excess firm value.

A STREAM OF LITERATURE SUGGESTS that corporate diversification is associated with a substantial reduction in firm value. An underlying theme of this literature is that conglomerates tend to misallocate their investment funds by cross subsidizing poorly performing divisions. Berger and Ofek (1995), for example, document that conglomerates are prone to cross-subsidize investments in divisions with poor growth opportunities. Consistent with this finding, Rajan, Servaes, and Zingales (2000) model the presence of power struggles among the firm's divisions and show that diversification causes resources to flow to inefficient investments. Similarly, Scharfstein and Stein (2000) demonstrate how rent-seeking divisional managers can subvert the internal capital allocation decision. These studies depict conglomerates as organizations that divert funds from stronger divisions to weaker ones and thereby misallocate their investment capital.[1]

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[1] Recent papers on diversification offer alternative explanations for the diversification discount. Campa and Kedia (2000) suggest that prior studies suffer from endogeneity problems, while Whited (2001) indicates that the diversification discount stems from measurement error. Lamont and Polk (2001) document a relation between future cash flows, expected returns, and covariations between cash flows and returns, and the diversification discount. Chevalier (2000) and Graham, Lemmon, and Wolf (2002), on the other hand, focus on selection bias and the performance of recent acquisitions to explain the diversification discount. In contrast to these studies, we concentrate on the risk effects of diversification, and focus on how diversification, given a particular capital structure, impacts both debt and equity holders. The analysis indicates that firm risk and capital structure play a crucial role in understanding the nature of the diversification discount.

In contrast to prior literature, we concentrate on the risk effects of conglomeration and its subsequent impact on firm value. We hypothesize that while diversification reduces shareholder value, it enhances bondholder value due to a reduction in firm risk. Amihud and Lev (1981) argue that managers engage in corporate diversification, even if it reduces shareholder value, to reduce their human capital risk. The presumption is that corporate diversification lowers firm risk. In a contingent claims framework, lowering firm risk should lower shareholder value and increase bondholder value, with the value effects to shareholders depending on the amount of leverage in the firm.[2]

We empirically investigate the impact of conglomeration on firm value in two ways. First, we examine the effect of diversification on excess value using the Berger and Ofek (1995) procedure.[3] Excess value in this case is measured using the book value of debt, the market value of equity, and the imputed values for the firm's business segments. We interpret this measure as a metric of excess shareholder value because it relies on the book value of debt. Based on a sample of 18,898 firm-year observations for the period 1988 to 1999, we find that excess value is decreasing in diversification and that the diversification discount is most pronounced in those firms with greater than average debt levels. The fact that leverage is an important determinant in the diversification discount leads us to further examine this issue in a subsample of all equity firms (3,567 firm-year observations, with all equity firms defined as those with less than one percent in long-term debt). Notably, in this subsample, we do not find any evidence of a diversification discount. In aggregate, the results are consistent with the risk-reducing-effects argument and suggest that debt is an important determinant in understanding the diversification discount.

Second, we obtain the *market* values of both debt and equity for a subset of our sample and examine the bias in using book values of debt to compute excess value. Consistent with the hypothesis that diversification leads to lower firm risk, we find that book values of debt are a more downward biased proxy of the market value of debt for diversified firms, relative to undiversified firms. This suggests that measures of firm value based on book values of debt would systematically undervalue diversified firms. When considering the joint impact of diversification on debt and equity holders, we find that, on average, corporate diversification is insignificantly related to

[2] In this framework, the value of the option is the maximum of the difference between the value of the assets and the value of the debt and zero. Therefore, a lower level of debt is associated with a deeper in-the-money option, and therefore, a lower impact of volatility on the value of this call option.

[3] In this paper, the terms excess value (EV) and excess firm value (EFV) are not used interchangeably. We use EV to denote excess value using the Berger and Ofek (1995) measure, which is based on the *book* value of debt and the market value of equity. We argue that this measure primarily captures shareholder wealth effects. In contrast, we use EFV to denote a measure of excess value that is based on the market values of both debt and equity.

excess firm value.[4] The implication is that diversification reduces shareholder value, increases bondholder value, and has no impact on total firm value.

The results of our analysis contribute to the literature in three ways. First, we document the important roles of leverage and firm risk in understanding the diversification discount. In this context, evidence of a downward bias in the measure of excess value for diversified firms and the lack of a diversification discount in the subset of all equity firms indicate the importance of considering the risk effects of diversification. Second, from a corporate governance perspective, risk-based value shifting implies different concerns and remedies relative to discounts that stem from the destruction of total firm value (i.e., cross-subsidization and overinvestments in inefficient enterprises). Third, our analysis suggests that shareholder diversification discounts do not necessarily imply that the business segments of a conglomerate would be more efficient if they were split up; rather, diversification discounts represent the risk effects of diversification.

The remainder of the paper is organized as follows. Section I reviews the diversification literature and develops our risk-based hypothesis. Section II describes the data and the sample selection process. Sections III, IV, and V report the empirical analysis on the relation between corporate diversification and shareholder value, bondholder value, and total firm value. Section VI provides the conclusion.

I. Corporate Diversification and Firm Value

A. Prior Literature

The benefits and costs associated with diversification are extensively discussed in the literature. Weston (1970) and Chandler (1977) suggest that diversified firms have the ability to leverage economies of scale because they provide more efficient operations and more profitable lines of business than stand-alone firms. Lewellen (1971) argues that diversified firms enjoy greater debt capacity and debt tax shields relative to single-line firms due to lower risk. Finally, diversification can create internal capital markets, which may increase investment efficiency (e.g., Stein (1997)).

The negative impacts of corporate diversification are often described in terms of inefficient investments due to cross-subsidization between divisions (e.g., Berger and Ofek (1995)).[5] Rajan et al. (2000), for example, model the

[4] Berger and Ofek (1995) examine the relation between corporate diversification and debt capacity. They suggest that while the losses from industrial diversification can be mitigated by increased debt capacity and reduced tax payments, the benefits accruing to firm value due to debt-related impacts are economically insignificant. However, they do not consider the impact on the market value of firm's current debt claims.

[5] Berger and Ofek (1995) find a discount of 13 percent to 15 percent for diversified firms. Lins and Servaes (1999), on the other hand, examine the effects of diversification on firm value for firms operating in Germany, Japan, and the United Kingdom and find mixed evidence of a diversification discount.

distortions that internal power struggles generate in resource allocations among the divisions of a diversified firm. Their model suggests that as corporate diversity increases, resources can flow toward the most inefficient division, leading to inefficient investment and a loss in firm value. Other costs of diversification include investments in lines of businesses with poor investment opportunities (e.g., Stulz (1990)). Jensen (1986) argues that diversified firms invest more in negative cash flow projects than their segments would if operated independently. Meyer, Milgrom, and Roberts (1992) reinforce this argument, suggesting that stand-alone segments tend to produce lower losses than diversified firms due to the cross-subsidization of business segments with negative cash flows. Scharfstein and Stein (2000) suggest that rent-seeking behavior by divisional managers subverts internal capital markets and leads to inefficient investments.

Overall, the published literature on corporate diversification suggests that conglomeration is associated with greater agency costs. These agency costs are manifested in the form of accepting negative net present value projects, which reduce the value of the firm. Recent papers on diversification focus on other explanations for the discount such as selection bias, endogeneity problems, and measurement error (e.g., Chevalier (2000), Campa and Kedia (2000), and Whited (2001)). In contrast, we focus on the risk effects of diversification and the subsequent impact to equity and debt claimants.

B. The Impact of Firm Risk on Claimant Value

A common theme in the literature is that diversification is associated with lower firm risk due to the existence of multiple lines of business with imperfectly correlated returns (e.g., Amihud and Lev (1981)). Intuitively, a reduction in firm risk suggests a lower default premium and an increase in bondholder value. A contingent claims framework suggests that shareholder equity is a call option on the value of the firm exercised in states where the value of the assets is greater than the value of the debt claim. Reducing the riskiness of the firm reduces the value of the call option and thereby increases (decreases) bondholder (shareholder) value. In this context, shareholder value losses in diversification do not indicate a reduction in firm value, but instead represent the risk effects of imperfectly correlated cash flows.

A natural question is whether the amount of debt capital in a diversified firm is a factor in explaining the diversification discount. To address the plausibility of this risk-based hypothesis, we use the Black and Scholes (1973) option-pricing model with parameter values based on evidence from prior empirical studies. Specifically, we calculate the value of the option using market-based data for debt maturity, leverage, and volatility in single-segment and multisegment firms. We find that the average diversified firm has about 12 percent equity discount and that as leverage increases, the wealth loss to shareholders becomes substantially higher. The calculations also show that shareholders of diversified firms with lower debt levels are

less affected by diversification (lower risk) since their option is deeper in the money. These results suggest that the amount of debt capital in a diversified firm is an important factor in the documented diversification discount.[6]

C. Testable Implications

The central question in the diversification literature is whether the value of a diversified firm is less than its value if broken up, traded, and operated as stand-alone entities. In this context, prior empirical work focuses on shareholder value and suggests that the break-up value is greater than the current value of the firm. However, since diversification is associated with lower firm risk, the risk-based hypothesis indicates that diversification lowers shareholder value and increases bondholder value, with the shareholder loss being a function of firm leverage. This implies that diversification has little, if any, impact on total firm value.

We address four testable implications of the risk-based hypothesis and analyze the following questions: (a) Do conglomerates with low levels of debt exhibit a diversification discount? (b) Are the documented shareholder diversification discounts related to firm leverage? (c) Is the bias from using book values of debt, rather than market values, to measure excess firm value related to corporate diversification? and (d) What is the impact of corporate diversification on total firm value when *both* stockholders and bondholders are considered?

II. Data and Sample Selection

A. Sample Selection

The primary sample used in the analysis is derived from the Disclosure WorldScope database (DWS). The DWS database provides accounting and financial market data on over 6,700 U.S. firms. This includes information such as balance sheets, income statements, statements of cash flows, financial footnotes, and financial market data dating back 7 to 12 years. For a firm-year observation to be included in our primary sample, data must be available on the market value of equity, total sales, and the number of business segments in which a firm reports operations. Similar to prior research, we exclude financial and smaller firms with sales below $50 million. This procedure produces a sample of 18,898 firm-year observations and covers 2,856 firms from 1988 to 1999.

We also use the Lehman Brothers Fixed Income database (LBFI) to obtain market values of debt for a subset of our sample. The LBFI database provides information on those bonds that are included in the Lehman Brothers bond indices. The database contains security information such as market value, coupon, yield, credit rating, and maturity on a wide range of corpo-

[6] A detailed explanation of this approach using the Black and Scholes option-pricing model can be obtained from the authors upon request.

rate debt issues. The database is comprised of bonds of differing maturities, differing subordination levels, and both investment- and noninvestment-grade debt. Beginning in 1992, Lehman Brothers began publishing below-investment-grade indices grouped by broad credit rating categories to provide a more representative sample of outstanding publicly traded debt. By 1993, the database consisted of more than 10,000 traded bonds, including both investment- and noninvestment-grade debt. The LBFI database is frequently used in the fixed income literature (e.g., Duffee (1998) and King and Mauer (2000)) and, while the database does not contain the entire universe of traded debt, we have no reason to suspect any systematic bias within the sample.

To be included in the subsample that uses the market values of debt, we require that the database provide information on the amount of debt outstanding, yield, duration, and age of the firm's tradable debt securities. Applying these criteria yields a subset of 2,487 firm-year observations on 696 U.S. firms for the period 1993 through 1997.

B. Variable Measures

B.1. Measuring Firm Diversification

Prior literature on corporate diversification uses two approaches to proxy for corporate diversification. The first proxy is a binary variable that takes a value of one when firms operate in multiple industries. This proxy is measured using business segment data reported by firms based on the standard industry classification system (SIC codes). The second proxy for diversification is the number of business segments in which a firm operates. For consistency with prior literature, we use both approaches in our analysis.

B.2. Measuring Excess Value

Our analysis is predicated on measuring excess value (EV). We estimate EV using the industry multiplier approach described in Berger and Ofek (1995). That is,

$$EV = LN\left[\frac{ACTUAL\_VALUE}{IMPUTED\_VALUE}\right] \tag{1}$$

where $ACTUAL\_VALUE$ is the sum of the market value of equity and the book value of debt, and $IMPUTED\_VALUE$ represents the sum of the imputed stand-alone values for each individual business segment. We follow Berger and Ofek and compute the imputed value of each business segment by multiplying the segment sales by the median market to sales ratio of comparable single

industry firms. This comparable market-to-sales ratio (*MSR*) is matched using four-digit, three-digit, and two-digit SIC codes computed as

$$MSR = \frac{[MKE + BKD]}{TSALES} \tag{2}$$

where *MKE* is the market value of equity, *BKD* is the book value of debt, and *TSALES* is total sales. The *MSR* ratio is computed for each industry and used to develop the market value of each business segment of a firm. The imputed value of a business segment represents the value of the segment as a stand-alone firm and the sum of all business segments is the imputed value of the firm (if broken up). Additional tests using market values of debt are provided in Sections IV and V of the paper.

C. Data Description

Table I provides descriptive statistics for our sample. Of particular interest in our analysis is the relative performance of multisegment and single-segment firms. The sample consists of 18,898 observations, of which, 10,823 are from single-segment firms and 8,075 from multisegment firms.

Panel A of Table I provides the mean, median, and standard deviation for excess value, number of segments, natural log of total assets, income-to-sales ratio, capital-spending-to-sales ratio, and firm leverage.[7] Consistent with Berger and Ofek (1995), we find that multisegment firms have a substantial diversification discount relative to single-segment firms. Multisegment firms also employ more leverage than single-segment firms (about 4.3 percent on average), which suggests that the diversification decision is related to firm debt usage.

Panel B of Table I provides correlation data between excess value and firm characteristics such as number of business segments, size, income, capital spending, and leverage. Consistent with previous studies, we find a significant and negative correlation between excess value and corporate diversification (proxied by the number of segments in which the firm operates). We also find a negative relation between excess value and both leverage and firm size.

Panel C of Table I provides descriptive statistics for the all-equity subsample (defined as firms with long-term debt to total capital ratios below one percent). This sample consists of 1,072 firms and 3,567 observations, of which 1,233 are multisegment observations and 2,334 are single-segment observations. Consistent with the risk-effects argument, we do not find evidence of a diversification discount in the all-equity subsample. In fact, both single-segment and multisegment all-equity firms appear to sell at a *premium* relative to their industry proxies. This issue is explored further in a multivariate framework.

[7] Leverage is computed as the ratio of long-term debt to total capital.

Table I

Sample Statistics

Panel A provides descriptive statistics for the data used in the analysis. Included are the mean, median, and standard deviation for each variable. The data set is comprised of 18,898 firm-year observations from 1988 through 1999. Panel B provides correlation data between the Berger and Ofek (1995) measure of excess value and both diversification and leverage. Panel C provides descriptive statistics for the subset of all equity firms. Included are the mean, median, and standard deviation for the variables used in the analysis. All-equity firms are defined as those with a long-term debt to total capital ratio below one percent. The subset is comprised of 3,567 firm-year observations from 1988 to 1999. Multisegment firms account for 1,233 of the observations, while the remaining 2,334 observations are from single-segment firms.

Panel A: Descriptive Statistics

Variables	Mean	Median	Standard Deviation
Excess value (*EV*)			
Single-segment firms	−0.007	−0.050	0.554
Multisegment firms	−0.071	−0.139	0.535
Number of segments (*NSEGS*)			
Single-segment firms	1.000	1.000	0.000
Multisegment firms	2.947	3.000	1.122
Natural log of total assets (*SIZE*)			
Single-segment firms	12.451	12.214	1.544
Multisegment firms	12.992	12.746	1.766
Income-to-sales ratio (*INCOME*)			
Single-segment firms	0.028	0.044	0.702
Multisegment firms	0.001	0.045	3.553
Capital-spending-to-sales ratio (*CAPSPEND*)			
Single-segment firms	8.872	4.570	21.389
Multisegment firms	8.9793	5.120	23.430
Firm leverage (*LEVER*)			
Single-segment firms	25.412	21.310	23.617
Multisegment firms	29.745	29.620	23.237

Panel B: Correlation Data

	NSEGS	*MULTISEG*	*SIZE*	*INCOME*	*CAPSPEND*	*LEVER*
Excess value	−0.059	−0.045	−0.047	0.028	0.067	−0.257

Panel C: Descriptive Statistics for All-Equity Firms

Variables	Mean	Median	Standard Deviation
Excess value (*EV*)			
Single-segment firms	0.153	0.210	0.570
Multisegment firms	0.167	0.190	0.567
Number of segments (*NSEGS*)			
Single-segment firms	1.000	1.000	0.000
Multisegment firms	2.745	2.000	0.971
Natural log of total assets (*SIZE*)			
Single-segment firms	11.661	11.530	1.124
Multisegment firms	11.795	11.639	1.212
Income-to-sales ratio (*INCOME*)			
Single-segment firms	0.046	0.064	1.125
Multisegment firms	0.054	0.065	0.337
Capital-spending-to-sales ratio (*CAPSPEND*)			
Single-segment firms	6.141	4.045	8.802
Multisegment firms	6.878	4.060	12.904
Leverage (*LEVER*)			
Single-segment firms	0.001	0.000	0.002
Multisegment firms	0.001	0.000	0.002

III. Excess Value and Diversification Based on the Book Value of Debt and the Market Value of Equity

A. Multivariate Testing

We begin this section by replicating the analysis of previous studies on the impact of diversification on excess value using our primary sample. Specifically, we investigate the relation between corporate diversification and excess value using the regression specified in Berger and Ofek (1995) and Lins and Servaes (1999). We use the following specification for each firm, q, using annual observations, and we control for nonspherical disturbances with a random effects model.

$$EV_q = B_0 + B_1(Multisegment_q) + B_2(SIZE_q) + B_3(INCOME_q) + B_4(CAPSPEND_q) + \epsilon_q \quad (3)$$

where

EV = excess value based on the Berger and Ofek measure;
Multisegment = variable which is coded one for multisegment firms;
SIZE = natural log of total assets;
INCOME = net income before extraordinary items scaled by total sales;
CAPSPEND = ratio of capital expenditures to total assets.[8]

Column 1 of Table II provides the regression results from our primary specification. Consistent with prior literature, the coefficient estimate on the multisegment dummy is negative and significant at the one percent level, suggesting that excess value is negatively related to corporate diversification. As this measure of excess value is computed using the market value of equity and the *book* value of debt, we interpret this evidence to indicate that corporate diversification is associated with lower shareholder value.

Next, we focus on the all-equity firms sample. The risk-based hypothesis suggests that the diversification discount should be negligible in all (or near) equity firms. We repeat the analysis in equation (3) using the all equity subset. Column 2 of Table II reports the results of performing the all-equity firms analysis. Strikingly, we do not find evidence of a diversification discount in the all-equity subset. This finding is consistent with the risk reduction hypothesis.

To further investigate the impact of leverage on the relation between diversification and excess value, we repeat the test specified in equation (3) using the full sample (18,898 firm-year observations) and an interaction term. Specifically, we include firm leverage (*LEVER*) and an interaction term, *DIV_LEV*, equal to *Multisegment* times *LEVER*. Leverage is measured as

[8] For scaling purposes, we multiply this ratio by 1,000 in our analysis.

Table II

Excess Value, Corporate Diversification, and Firm Leverage

This table provides results from regressing excess value (*EV*) on corporate diversification and various control variables. *EV* is computed using the Berger and Ofek (1995) measure, which is the natural log of the firms actual value divided by its imputed value. This is measured using the market value of equity and the book value of debt. That is,

$$EV_q = B_0 + B_1(Multisegment) + B_2(SIZE_q) + B_3(INCOME_q) + B_4(CAPSPEND_q) + \epsilon_q,$$

where *EV* is excess value, *Multisegment* is an indicator variable for diversified firms, *SIZE* is firm size, *INCOME* is net income scaled by total sales, and *CAPSPEND* is capital spending scaled by total sales. Column 1 gives the results using the entire sample of observations. Column 2 gives the results using only the all-equity firm sample. Column 3 allows for an interactive variable for leverage and diversification using the entire sample. The final column provides evidence from a two-stage least squares regression.

Variables	Excess Value	All-Equity Firms	Interaction Variable	Instrumental Variables
	(1)	(2)	(3)	(4)
Intercept	0.199*	−0.147	0.029	−0.139*
	(5.725)	(−1.521)	(.862)	(−3.908)
Multisegment indicator	−0.045*	0.006	−0.010	−0.014
	(−4.960)	(0.295)	(−.705)	(−0.777)
SIZE	−0.017*	0.023*	0.007*	0.032*
	(−6.038)	(2.785)	(2.449)	(6.781)
INCOME	0.048***	0.017	−0.002***	−0.002***
	(1.817)	(0.813)	(−1.894)	(1.806)
CAPSPEND	0.002*	0.006*	0.002*	0.002*
	(4.509)	(3.875)	(6.109)	(5.040)
LEVER			−0.006*	−0.010*
			(−22.539)	(12.948)
*Multisegment***LEVER* (*DIV_LEV*)			−0.002*	−0.001*
			(−3.380)	(−2.281)
Adjusted R^2	0.013	0.014	0.072	0.068

* and *** Significance at the 1 percent and 10 percent levels, respectively. The reported standard errors are from a random effects model to correct for nonspherical disturbances.

the ratio of the book value of long-term debt to the total value of the firm.[9] The risk-reduction hypothesis suggests that the coefficient estimate for *DIV_LEV* should be negative, as the value loss occurs in those firms with greater leverage. The agency costs and synergy arguments in prior literature suggest opposing effects on the remaining relation between diversification and excess equity value.

[9] A concern with this approach is that the debt is measured with error. However, under the assumption that the ordinal ranking between market and book values is similar, both approaches yield similar results. An alternative approach is to use a measure of firm risk instead of leverage. Consistent with the leverage results, we find that explicitly including risk in the analysis also reduces the coefficient estimate on multisegment firms.

The results of performing the regression with the interaction term for diversification and leverage are reported in Column 3 of Table II. We find that the interaction term is significantly and negatively related to excess value. We also find that the relation between excess value and diversification (i.e., the B_1 coefficient estimate) is insignificantly different from zero. We interpret the results to suggest that firms with greater leverage account for the diversification discount documented in the literature. This is consistent with the hypothesis that diversification is associated with risk-based impacts on claimant wealth. In aggregate, this evidence implies that while shareholders lose, bondholders gain in diversification.

B. Robustness

A potential concern in the multivariate regression testing is a simultaneous equation bias. That is, the correlation data and the arguments of Lewellen (1971) suggest that leverage may be an important factor in the decision to diversify. Thus, while the regression using all-equity firms is robust, the test using the full sample may be problematic. One approach to this endogeneity concern is the use of instrumental variables for firm leverage and diversification in a two-stage least squares framework. Similar to Agrawal and Knoeber (1996), we use industry, firm size, and profitability to develop the leverage instrumental variable, and use size, industry, ownership, and investment opportunity set for the diversification instrumental variable. Using these instrumental variables, we repeat the analysis reported in Column 3 of Table II and find similar signs on the coefficient estimates. This testing is reported in Column 4 of Table II and implies that the OLS results are robust.[10]

IV. Corporate Diversification and Book Value Bias

A potential explanation for the impact of leverage on the diversification discount is that debt claimants are also affected by diversification. In this context, we posit that the book value of debt is a more downward biased estimate of the market value of debt for diversified firms (relative to undiversified firms), due to the risk-reducing effects of imperfectly correlated segments. We test this hypothesis directly by examining the impact of using book rather than market values of debt when computing excess value.[11] We measure the bias in using book rather than market values, denoted by book bias, as the book value minus the market value of debt. That is,

$$BookBias = BDEBT - PDEBT, \tag{4}$$

where *BDEBT* is the book value of the debt per \$1,000 par value and *PDEBT* is the market value of the firm's traded debt (per \$1,000 par value). Our

[10] We also repeat the analysis using additional control variables (such as profitability, research and development, firm internationalization, and historical growth) and find similar results as those reported in Table II.

[11] We thank the referee for pointing this out.

Table III

Descriptive Statistics: Book Value Bias and Corporate Diversification

Panel A shows the bias in using book values of debt (*BookBias*) to proxy for market values in computing excess firm value. *BookBias* is computed as the book value of debt minus the market value of debt (per $1,000 par value). The subset is comprised of 2,487 firm-year observations. Panel B provides correlation data between the book value bias (BookBias), corporate diversification, firm leverage, and bond age.

Panel A: Book Value Bias

	Mean	Median	Standard Deviation
Single-segment firms	−15.65	−25.46	83.70
Multisegment firms	−26.73	−18.27	92.02

Panel B: Correlation Data

	Multisegment	*LEVER*	*AGE*
BookBias	−0.088	0.082	0.209

expectation is that book value bias differs between diversified and undiversified firms.

Panel A of Table III shows the book value bias for both single-segment and multisegment firms. Based on a subsample of 2,487 firm-year observations from the Lehman Brothers Bond database subset, we find that the average multisegment firm has a book value bias of $−26.73, while the single-segment firm has a book value bias of $−15.65 per $1,000 par value. Panel B provides the correlation between the book value bias and corporate diversification, proxied by multisegment indicator. The results suggest that multisegment firms have a downward book bias of about 0.088. The implication is that the bias in using book values of debt to compute excess firm value is associated with corporate diversification.

To further investigate whether using book values of debt creates a downward bias for diversified firms, we explore the cross-sectional relation between book value bias and corporate diversification in a multivariate framework. That is,

$$BookBias_q = A_0 + A_1(Multisegment_q) + A_2(LEVER_q) + A_3(AGE_q) + \epsilon_q, \quad (5)$$

where

BookBias = book value bias (book value of debt minus the market value of debt, per $1,000 dollars of debt);
LEVER = firm leverage using market values of equity and traded debt;
AGE = a dummy variable to indicate bonds that have been outstanding for more than three years.

Table IV

Book Value Bias and Corporate Diversification

This table provides results from regressing book value error (*BVE*) on corporate diversification, firm leverage, and bond age. The test specification is

$$BVE_q = A_0 + A_1(Multisegment_q) + A_2(LEVER_q) + A_3(AGE_q) + \epsilon_q,$$

where *MULTI_SEG* is a dummy variable to denote diversified firms, *LEVER* is firm leverage, and *AGE* is a dummy variable to indicate bond age over three years.

Variables	Sign	*BookBias*
	(1)	(2)
Intercept		−42.178*
		(−3.299)
Multisegment	−	−15.282**
		(−2.061)
LEVER	+	43.957***
		(1.931)
AGE	+	39.948*
		(7.839)
Adjusted R^2		0.152

*, **, and *** Significance at the 1 percent, 5 percent, and 10 percent levels, respectively. The reported standard errors are from a random effects model to correct for nonspherical disturbances.

The principal variable of interest in this analysis is the A_1 coefficient estimate. We expect both firm leverage and bond age to be positively related to the book value bias. Column 1 in Table IV reports the expected sign of the potential control variables, while Column 2 provides the results. Column 2 shows a negative and significant relation (at the five percent level) between book value bias and corporate diversification. The negative sign suggests that value measures based on book values of debt are more downward biased for diversified firms (relative to undiversified firms). The control variable coefficient estimates have the expected signs and are significantly different from zero at standard levels.

We also repeat the analysis in equation (5) using the number of segments in which a firm reports operations as the measure of diversification and find similar results.[12] Including additional potential control variables such as profitability, research and development, capital spending, firm internation-

[12] We also repeated the analysis using the yield spread, or the difference between the weighted-average yield to maturity on the firms outstanding traded debt and the yield to maturity on the similar maturity Treasury security, to measure these value impacts. Consistent with the results in Table III, we find significant evidence of a positive wealth impact for bondholders in corporate diversification. We also considered additional measures of diversification and found similar results. Likewise, using the *R*-Student statistic to identify observations that are more than three standard deviations from the norm (and then removing them) we repeat the analysis in equation (5). The results are consistent with those reported.

alization, firm size, maturity, credit ratings, and historical growth also lead to similar results. In aggregate, these results are consistent with the hypothesis that using book values of debt understates the excess value of a diversified firm.

V. Excess Firm Value and Diversification Based on the Market Values of Both Debt and Equity

In the final stage of the analysis, we use the subset sample with the market values of both debt and equity to further investigate the diversification discount. Our prior testing implies that while shareholders lose, bondholders gain in diversification. This suggests examining the value impacts of corporate diversification on firm value when both shareholders and bondholders are included. We use the excess value measure (EFV) in Berger and Ofek (1995) with market values for both debt and equity.[13]

Table V reports the descriptive statistics for this subset of the sample. The excess value data does not indicate the presence of a diversification discount after considering the impact to both debt and equity holders. In general, we find that this subsample is similar to the full sample in terms of the relation between single-segment and multisegment firms.[14] However, this subsample consists of larger firms and it is more homogenous than the full sample.[15]

In Table VI we provide the multivariate testing using this subsample. Consistent with prior research, we use the following test specification:[16]

$$EFV_q = C_0 + C_1(Multisegment) + C_2(SIZE_q) + C_3(INCOME_q) + C_4(CAPSPEND_q) + C_5(LEVER_q) + \epsilon_q. \quad (6)$$

[13] Specifically, we use the market values of debt and equity to compute the current value of each firm. The break-up value is computed as in Berger and Ofek (1995), which also introduces error into the testing. Under the assumption that both single- and multisegment firms are distributed uniformly (or at least similarly) across industries, this does not introduce a directional bias into the analysis. To address this concern more directly, we performed two additional tests. First, in the all-equity subset, we repeat the analysis using only firms with less than 10 percent debt to compute the break-up value, which should minimize this error. Second, in the testing using market values of debt and equity, we repeat the analysis using market values of debt and equity to compute the break-up values. Due to data restrictions, this was done using two-digit SIC codes and three firms per industry for 22 industries to compute the break-up values. We find similar results to those reported using both of these approaches.

[14] By construction, this sample differs from the full sample in terms of capital structure, as this sample does not include any all-equity firms. Comparing the firms with leverage in both samples suggest the groups are similar.

[15] Consistent with the risk-based hypothesis, repeating the analysis (for this subset) using the book values of debt indicates a significant diversification discount.

[16] We also tried other control variables such as historical growth, research and development, and trading volume, liquidity, and duration and found similar results. Excluding leverage (as in equation (3)) also lead to similar results.

Table V

Market Values of Debt and Equity: Subset Statistics

This table provides descriptive statistics for the subset of 696 firms with market values for both debt and equity. The subset is comprised of 2,487 firm-year observations.

Variables	Mean	Median	Standard Deviation
Excess firm value (*EFV*)			
Single-segment firms	0.742	0.159	4.586
Multisegment firms	0.706	0.462	1.237
Number of segments (*NSEGS*)			
Single-segment firms	1.000	1.000	0.000
Multisegment firms	3.113	3.000	1.163
Natural log of total assets (*SIZE*)			
Single-segment firms	14.340	14.470	1.206
Multisegment firms	14.848	14.668	1.369
Income-to-sales ratio (*INCOME*)			
Single-segment firms	0.020	0.030	0.346
Multisegment firms	0.036	0.041	0.087
Capital-spending-to-sales ratio (*CAPSPEND*)			
Single-segment firms	14.3002	10.093	27.134
Multisegment firms	19.871	15.029	31.179

As shown in Table VI, we find that excess firm value is insignificantly related to corporate diversification. The implication is that while diversification reduces shareholder value, it enhances bondholder value, and overall there is no significant impact on excess firm value.

To explore whether the results stem from our choice of the diversification measure, we repeat the analysis using a variety of alternative measures. Consistent with the primary results, we find similar evidence using the number of industries to proxy for diversification. We also repeat the analysis using the ratio of sales outside the primary four-digit SIC code to total sales as our diversification proxy. Consistent with the risk-reduction hypothesis, we do not find evidence of an association between diversification and excess firm value.

VI. Conclusion

Prior literature documents that diversified firms sell at a discount relative to the sum of imputed values for their business segments. However, theoretical arguments suggest that corporate diversification has both a positive and a negative impact on shareholder value. Empirical research on the value impacts of corporate diversification suggests that firm value is decreasing in diversification. We explore the source of these value losses to shareholders and argue that they stem from risk-reducing effects of corporate diversification. Viewed in a contingent claims framework, shareholder equity is analogous to a call option on the value of the firm exercised in

Table VI

Excess Firm Value and Corporate Diversification

This table provides results from regressing excess firm value (*EFV*) on corporate diversification and various control variables.

Variables	Excess Firm Value Based on Market Values of Both Debt and Equity
Intercept	3.794*
	(3.545)
Multisegment	−0.117
	(−0.523)
SIZE	−0.146**
	(−2.071)
INCOME	0.423
	(0.789)
CAPSPEND	0.001***
	(1.697)
LEVER	−2.176*
	(−3.008)
Adjusted R^2	0.021

*, ** and *** Significance at the 1 percent, 5 percent, and 10 percent levels, respectively. The reported standard errors are from a random effects model to correct for nonspherical disturbances.

those states where the value of the assets is greater than the value of the debt claim. Reducing the riskiness of the firm reduces the value of the call option and thereby increases (decreases) bondholder (shareholder) value. Therefore, we explore whether the value loss to shareholders is a function of firm leverage, whether using book values of debt creates a downward bias in the measure of excess value for diversified firms, and whether diversification has an impact on total excess firm value (using market values of both debt and equity).[17]

Consistent with the risk-reduction hypothesis, we find that the equity holder losses in diversification are related to firm leverage, all-equity firms do not exhibit a diversification discount, and that the bias from using book values of debt (in the measure of excess value) is related to corporate diversification. Finally, our analysis indicates that, on average, the relation between diversification and excess firm value is not significantly different from zero. In aggregate, our results suggest that the losses to shareholders due to diversification stem from the risk-reducing effects of diversification.

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[17] Another implication of this hypothesis is that unexpected changes in diversification may result in a wealth shift from shareholders to bondholders.

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