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An Empirical Test of the Impact of Managerial Self-Interest on Corporate Capital Structure

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ABSTRACT

This paper provides a test of whether capital structure decisions are at least in part motivated by managerial self-interest. It is shown that the debt ratio is negatively related to management's shareholding, reflecting the greater nondiversifiable risk of debt to management than to public investors for maintaining a low debt ratio. Unless there is a nonmanagerial principal stockholder, no substantial increase of debt can be realized, which may suggest that the existence of large nonmanagerial stockholders might make the interests of managers and public investors coincide.

A RECENT PAPER BY Friend and Hasbrouck (F–H) [7] used data on holdings of stock owned by managerial insiders (officers and directors) to test the hypothesis that the corporate capital structure is determined at least in part by optimization of management interests even when these interests conflict with stockholders' interests. The value of the stock held by corporate insiders (MV) and the ratio of their holdings to the total value of their stock outstanding (FR) were used in that study as measures of the greater incentive to management than to other stockholders for maintaining a low debt ratio to avoid bankruptcy possibility. The regression results were supportive of the hypothesized inverse relationship between unscaled MV and debt, but a less satisfactory result was obtained when MV was scaled by logarithm or FR was used as a second measure of the relevant risk. The result less satisfactory than expected seems to question the ability of management in adjusting debt ratio by its own interests, especially when these conflict with stockholders' interests.

To effectively test the managerial-optimization hypothesis raised by F–H, this paper intends to address the effect of various constraints on management's ability or desire to reduce the specific risks to them implicit in a higher debt ratio that might otherwise be desired by public investors in view of the tax shield on interest paid on corporate debt or for other reasons. A simple theory was presented in Lang [15] that illustrates that, if management also loses its stake at bankruptcy, it may desire to use an amount of debt that is less than optimum (which maximizes firm's value) to reduce its bankruptcy risks implicit in a higher debt

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level. However, a higher debt than management desires is used to resolve conflicts from the zero ownership of the firm by management. As an implication of this theory, the higher the ownership of managerial insiders, the less the conflicts (which may serve as a favorable signal; see Jensen and Meckling [12] and John and Mishra [13]) and the greater the ability (less constraints) and desire (higher unique risk) of managerial insiders to adjust debt ratio by their own interests.

To analyze the effect of differences in management's ability and desire to reduce the level of debt, this paper classifies New York Stock Exchange firms into two equal groups—designated as "closely held" (CHC) and "publicly held" (PHC) corporations depending on the fraction of stock owned by management (officers and/or directors). Other things equal, management in closely held corporations would have higher unique risks than in publicly held firms and would have less constraints on its behavior so that a more negatively significant impact of its investment on debt ratio should be obtained.

The nonmanagerial principal stockholders are assumed to have sufficient investment in the firm to warrant the effort required for monitoring and to influence management appropriately. Their existence might reassure or signal the market that management is effectively being monitored by an investor whose interests would more closely coincide with those of dispersed investors in view of the difference in human wealth exposure (Shleifer and Vishny [23] and Easterbrook [4]). As a result, where corporations have large nonmanagerial investors, management may not be able to adjust debt ratio by its own interests, and the debt ratio would be expected to be higher than where such investors do not exist and may be closer to the optimal level from the viewpoint of diversified investors. In addition to the data on the level of holdings of stock owned by managerial insiders, we have information on whether corporations had nonmanagerial stockholders with holdings of ten percent or more of their outstanding stock. We are able for this paper to subdivide the closely held and publicly held corporations into subgroups depending on the existence of such major stockholders to test whether there is any evidence of their effective monitoring on management. (Hereafter, CHC1 and CHC0 are CHC with and without nonmanagerial principal stockholders, respectively. PHC1 and PHC0 are PHC with and without nonmanagerial principal stockholders, respectively.)

To summarize this paper's results, we find that corporations in CHC1 are characterized by a higher average debt ratio than for CHC0, and the level of debt decreases as the level of management investment (shareholding) in the firm increases in both CHC0 and CHC1 regardless of the existence of a nonmanagerial principal stockholder. Corporations in PHC1 are still characterized by a higher average debt ratio than for PHC0, but the negative impact of management's shareholdings on debt ratio is found only in PHC1. For corporations in PHC0, the debt ratio increases with its fraction of stock owned by insiders.

These results provide support for the proposition that, for CHC0 and CHC1, the debt ratio in the period covered is negatively related to management's shareholdings, reflecting the greater nondiversifiable risk of debt to management than to public investors for maintaining a low debt ratio. This finding is independent of the existence of nonmanagerial principal stockholders. In PHC1, the debt ratio is still negatively related to management's shareholdings but is

less significant than in CHC, reflecting a lesser desire and ability of management in PHC than in CHC to adjust debt ratio by its own interests. The existence of nonmanagerial principal stockholders seems to provide little evidence in affecting management's conservative behavior. In PHC0, the debt ratio increases as the fraction of management's shareholdings in the firm increases. As a result of this puzzling evidence, one plausible explanation may suggest that, in the absence of both signals, possible monitoring from principal stockholders, and sufficient ownership by managerial insiders, the need for other signals is more necessary. However, it is by no means clear to us theoretically why the positive impact of insider ownership on debt may serve as a signal or resolve conflicts.

Interestingly, the realized or average debt ratio after the possible signalling in PHC0 is the same as in CHC0, which may suggest that management in PHC0 only signals to reach the level of debt in CHC0. Unless there is a nonmanagerial principal stockholder, no significant increase of debt can be realized, as we can see from the significantly higher average debt ratio in CHC1 as opposed to CHC0, versus that in PHC1 as opposed to PHC0. There is some evidence to conclude that the existence of large nonmanagerial stockholders might make the interests of managers and public stockholders coincide. An alternative explanation may simply suggest that nonmanagerial stockholders have higher ability than dispersed stockholders to demand a higher debt to motivate management's quality totally apart from the tax-shield consideration. (See Grossman and Hart [9] and Lang [15].)

Section I of this paper describes the data sources, while Section II presents the results of an econometric analysis of these data. Section III concludes the paper.

I. Data Sources and Variables Used in Analysis

The symbols, data sources, and computational procedures used in the econometric analysis are described below:

DRT: Debt/asset ratio, which is defined on a book-value basis and excludes trade credit and short-term accruals from debt.

RPPEAB: Ratio of net property, plant, and equipment to book assets.

ROAM: Mean of earnings (before interest payments and taxes)/asset ratio defined on a book-value basis. It is used as a proxy for profitability of a firm.

ROAS: Standard deviation of earnings (before interest payments and taxes)/asset ratio used as a proxy for risk. It is a better measure of management's nondiversifiable risk than the more customary beta coefficient.[1]

[1] The risk-bearing costs of an undiversified portfolio depend not only on the weight of own firm shareholdings but also on characteristics of the return to shareholders. That is, these costs will be greater the more the risk in shareholder returns can be diversified away by small outside shareholders, but they must be borne by managers who hold undiversified portfolios. An additional variable, the unsystematic risk, may be included in regressions. A similar result for insider holdings is still obtained after we include the unsystematic risk measure.

If beta is incorporated into our model, a positive impact of equity beta on *DRT* is obtained. As a result of a higher leverage implying a higher equity beta, a similar result for insider holdings is still obtained.

LA: Log of total assets.

MV: Market value (*MV*) of equity in his or her own firm held by dominant managerial insider (officer and/or director) (millions of dollars).

FR: Fraction of equity held by dominant managerial insider.

FRO: Fraction of equity held by dominant nonmanagerial stockholder who is not an officer or director but holds more than ten percent of shares outstanding.

All the above variables except *ROAM* and *ROAS* are on a five-year average basis (1979–1983); *ROAM* and *ROAS* are on a ten-year basis (1974–1983). If there are any missing values of these variables for a firm within this period, that firm is excluded. We compute *DRT*, *ROAM*, *ROAS*, *LA*, and *RPPEAB* from the COMPUSTAT data base by excluding financial organizations and public utilities. In accordance with the Security Act of 1934, officers, directors, and principal stockholders (who hold over ten percent of shares outstanding) are required to report their holdings and transactions of securities of the corporations in which they are insiders and have had transactions during the month. We thus are able to extract holdings of managerial versus nonmanagerial insiders to construct *MV*, *FR*, and *FRO* from insider-holdings records filed with the U.S. SEC (National Archives and Record Service, General Services Administration, Washington, D.C.).[2] Only those firms that match the COMPUSTAT data set are extracted from the SEC tape. In the results presented in the tables, *MV*, *FR*, and *FRO* are computed only for the largest single insider, which might be expected to proxy the degree to which the insider's holding is an undiversified position. (Similar results to those presented are also obtained when holdings for all insiders in each firm are combined.) Since other information about the insider's portfolio is not available, we examine the market value of the holding (*MV*) on the reasonable assumption that the larger *MV* is, the larger the undiversified concentration of holdings in a single asset is. As an alternative measure, we also examine the fraction (*FR*) of total equity in the firm constituted by the largest insider's holdings. While neither *MV* nor *FR* is a complete measure of the relevant risk to management (which also depends on the other marketable and nonmarketable wealth of management), it can be shown that *MV* is a better measure of management's nondiversifiable risk, though *FR* is clearly a better measure of control.[3]

[2] Specifically, the managerial insiders included in this paper are chairmen of the board, other officers and/or directors, controlling persons, and principal stockholders who are officers and/or directors. The nonmanagerial insiders are those principal stockholders who are not officers and directors. The excluded categories include investment advisors and trustees. The year-end direct holding was constructed for a particular insider. We multiply the holdings by the closing stock price of the year to get *MV*; we divide these shares by the total shares outstanding to get *FR* and *OFR*. The limitation of the data concerns insiders who leave the insider population by virtue of retirement or other reasons. Since this information is not reported, it leads to a systematic upward bias in our insider-holding counts.

[3] It is proved that *MV* is more correlated with *MV/W* (*W* is the insider's wealth) than *FR*. The detailed proof is available upon request.

II. Econometric Analysis

To examine the effect of differences in management's ability and desire to reduce the level of debt, the whole sample is classified into two equal-size groups—designated as "closely held" (CHC) and "publicly held" (PHC) corporations depending upon the fraction of stock owned by managerial insiders.[4] As we mentioned in the introduction, the existence of large nonmanagerial investors may impose effective monitoring on the behavior of management, so we further subdivide CHC and PHC into two subgroups depending upon the existence of such major stockholders to test their monitoring ability. Hereafter, CHC1 and CHC0 are CHC with and without nonmanagerial principal investors, respectively. PHC1 and PHC0 are PHC with and without nonmanagerial principal stockholders, respectively.

The summary statistics of the above four groups are presented in Table I. In general, relative to PHC, CHC are mainly those firms of smaller size with very high managerial and nonmanagerial insiders' holdings, but the fractions of holding of nonmanagerial investors (i.e., *FRO*) in either PHC1 or CHC1 are lower than those of managerial insiders (i.e., *FR*) in the same groups.[5] If the monitoring from nonmanagerial investors is effective, then with a lower shareholding plus the difference in human capital exposure, the debt ratio would be expected to be higher to make the interests of managerial insiders and public investors coincide. This hypothesis is evidenced by a higher debt ratio of twenty-six percent in CHC1 as opposed to twenty-two percent in CHC0, and twenty-five percent in PHC1 as opposed to twenty-two percent in PHC0.[6] An alternative explanation may simply suggest that the nonmanagerial principal stockholders have higher ability than dispersed stockholders to demand a higher debt ratio to motivate management's quality. A large number of multivariate relationships for the debt ratio are estimated using ordinary least squares, and representative samples of the results are reported in Tables II and III.[7] To reduce the heteroscedastic possibility, *MV* is logarithmically scaled (*LMV*). In the regression analysis, *ROAM* (profitability), *ROAS* (risk), and *RPPEAB* (fixed assets ratio) suggest relations consistent with the findings of earlier studies. Profitability measures for the firm (such as return on assets) are employed in several of the earlier cross-sectional studies.[8] These measures have invariably been found to be

[4] We experimented with cutoff points ranging from 2.5 percent to 7.5 percent for the largest managerial insider or ranging from 5 percent to 15 percent for all managerial insiders combined and obtained similar results. We thus report only the one with the cutoff point of 13.825% for total insiders combined that separates samples into two equal size groups.

[5] *FRO* in PHC1 is only about 3.5 percent, which is less than ten percent, the cutoff point for investors to be the principal stockholders. The obvious reason is that, once an investor holds more than ten percent of shares outstanding at one time, he or she has to report his or her holdings and transactions in the subsequent periods if he or she has had transactions no matter what his or her fraction of the holdings.

[6] The higher debt ratio in CHC1 and PHC1, as opposed to that in CHC0 and PHC0, respectively, may be a statistical artifact. For corporations with high debt ratios, the shares outstanding would be relatively low; therefore, it would be easier to have shareholders who hold more than ten percent of shares outstanding.

[7] Similar results are still obtained if two-digit or three-digit industry dummies are incorporated into our regressions.

[8] See Carlton and Silberman [2] and Toy et al. [26].

Table I

Summary Statistics[a]

	CHC0		CHC1		PHC0		PHC1	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
DRT	0.227	0.148	0.264	0.142	0.220	0.120	0.249	0.132
ROAM	0.125	0.067	0.110	0.058	0.127	0.065	0.125	0.052
ROAS	0.060	0.037	0.054	0.037	0.045	0.029	0.047	0.037
RPPEAB	0.305	0.154	0.348	0.181	0.364	0.168	0.343	0.155
LA	4.437	1.404	4.926	1.481	6.119	1.687	6.330	1.413
MV	38.305	118.480	56.342	140.440	11.386	28.577	46.395	152.290
FR	0.174	0.128	0.199	0.131	0.022	0.023	0.045	0.033
FRO	0.000	0.000	0.115	0.107	0.000	0.000	0.035	0.052

[a] CHC0: Closely held corporations with no nonmanagerial principal stockholders. Sample size = 210.
CHC1: Closely held corporations with nonmanagerial principal stockholders. Sample size = 282.
PHC0: Publicly held corporations with no nonmanagerial principal stockholders. Sample size = 388.
PHC1: Publicly held corporations with nonmanagerial principal stockholders. Sample size = 104.

Table II

Regressions of Closely Held Corporations[a]

	ROAM	*ROAS*	*RPPEAB*	*LA*	*LMV*	*FR*	R^2
Regressions of CHC0							
1.	−0.618	0.012	0.284	0.056	−0.042	0.047	0.350
	(−4.0)	(0.048)	(4.88)	(3.90)	(−3.15)	(0.48)	
2.	−0.645	−0.0005	0.283	0.052	−0.037		0.352
	(−4.50)	(−0.002)	(4.87)	(4.86)	(−4.14)		
3.	−0.899	−0.189	0.286	0.016		−0.180	0.321
	(−6.97)	(−0.76)	(4.82)	(2.31)		(−2.66)	
Regressions of CHC1							
1.	−0.537	−0.382	0.193	0.060	−0.062	0.114	0.291
	(−3.7)	(−1.87)	(4.39)	(4.73)	(−5.27)	(1.52)	
2.	−0.608	−0.385	0.202	0.048	−0.050		0.288
	(−4.42)	(−1.88)	(4.63)	(4.82)	(−5.71)		
3.	−0.923	−0.488	0.195	0.00		−0.149	0.223
	(−7.06)	(−2.30)	(4.23)	(0.0)		(−2.57)	

[a] 1. The dependent variable is *DRT* in all specifications.
2. R^2 is adjusted for degress of freedom.
3. t-Statistic of $DRT_{CHC1} - DRT_{CHC0} = 2.61$.
t-Statistic of $DRT_{PHC1} - DRT_{PHC0} = 2.02$.
t-Statistic of $DRT_{CHC1} - DRT_{PHC1} = 0.97$.
t-Statistic of $DRT_{CHC0} - DRT_{PHC0} = 0.59$.

Table III

Regressions of Publicly Held Corporations[a]

	ROAM	*ROAS*	*RPPEAB*	*LA*	*LMV*	*FR*	R^2
Regressions of PHC0							
1.	−0.854	−0.423	0.172	0.0006	0.005	0.685	0.293
	(−9.16)	(−2.17)	(5.18)	(0.11)	(−0.86)	(2.02)	
2.	−0.930	−0.425	0.175	−0.006	0.003		0.287
	(−10.9)	(−2.17)	(5.26)	(−1.57)	(0.80)		
3.	−0.894	−0.418	0.173	−0.003		0.477	0.293
	(−11.0)	(−2.14)	(5.20)	(−0.68)		(2.00)	
Regressions of PHC1							
1.	−0.844	−0.423	0.058	0.025	−0.034	0.461	0.305
	(−2.81)	(−1.33)	(0.75)	(1.61)	(−2.24)	(0.80)	
2.	−0.986	0.463	0.058	0.016	−0.025		0.308
	(−4.08)	(−1.48)	(0.75)	(1.49)	(−2.69)		
3.	−1.33	−0.552	0.056	−0.004		−0.577	0.277
	(−6.27)	(−1.73)	(0.71)	(−0.41)		(−1.66)	

[a] See footnotes to Table II.

strongly negatively related to leverage. The mechanism at work here is presumably retention: more profitable firms borrow less. The positive impact of *RPPEAB* on debt ratio bears on the collateral value of assets with an obvious link to debt capacity.[9] Risk measure, *ROAS*, may suggest a negative impact on leverage: a risky firm borrows less. The consistent evidence is found in this paper.[10] Firm

[9] The positive impact of *RPPEAB* on *DRT* was found by Long and Malitz [16] and Gonedes, Lang, and Chikaonda [8].

[10] The studies by Baxter [1], Ferri and Jones [5], and Long and Malitz [16] all suggest the expected negative relationship. Scott [22] finds this relationship ambiguous; Flath and Knoeber [6] suggest that there is no relationship between the variations in a firm's earnings, measured in several ways, and its debt. Gonedes, Lang, and Chikaonda [8] find insignificant impact of equity beta on debt.

size is hypothesized to be positively related to leverage on the grounds that larger firms have better access to credit markets. In CHC, the size variable *LA* is positively significant, but less likely so in PHC. It is suggested that when a firm grows bigger, it tends to rely more on debt financing in CHC, but this effect is ambiguous in PHC.[11]

In Table II (regressions for CHC), *LMV* and *FR* possess significant negative impact on debt ratio in both CHC1 and CHC0.[12] This evidence suggests that management in CHC would have higher ability and desire to adjust debt ratio according to its own interest (personal investment in the firm) despite the existence of nonmanagerial investors.

In Table III (regressions for PHC), *LMV* is less negatively significant in PHC1 than in CHC, and *FR* is insignificant, reflecting a lesser desire and ability of management in PHC than in CHC to adjust debt by its own interests. In PHC0, *LMV* is insignificant while debt ratio increases with the fraction of stock owned by managerial insiders (*FR*). One plausible reason may suggest a greater need of low-ownership management to signal dispersed investors about its quality. Interestingly, the average debt ratio in PHC0 is equivalent to that in CHC0; it may suggest that management in PHC0 only signals to reach the level of debt in CHC0. Unless there exist nonmanagerial principal stockholders, no substantial increase of debt can be realized. (Debt ratio is twenty-six percent in CHC1 as opposed to twenty-two percent in CHC0, and twenty-five percent in PHC1 as opposed to twenty-two percent in PHC0.)

Further evidence on the relationship among these variables is given in Table IV, which presents sample means for quartile subgroups ranked in order of descending values of *DRT*. The pattern of *MV* means in CHC (both CHC0 and CHC1) is suggestive of a monotonic relationship, while it is less suggestive of such a relationship for *FR*. The pattern of *MV* in PHC1 is suggestive of a jump relationship is found for *FR*. In the case of PHC0, both *MV* and *FR* suggest a concave relationship, but firms in the highest debt-ratio group (group 1) are characterized by the highest *FR*. This further evidence is quite consistent with characterized by the highest *FR*. This further evidence is quite consistent with our previous linear regression results, which may enhance our previous findings.

These results are generally consistent with our hypothesized relationship between insider holdings and capital structure policy, but it remains to be considered whether these findings might have risen as a consequence of some methodological shortcomings. The dependent variable *DRT* is the ratio of debt *D* to book asset *A*. In fact, a more relevant measure might be D/Vu, where Vu is the unlevered market value of the firm. If D/Vu is the true dependent variable in our specification, use of D/A will lead to a measurement error correlated with market value of the firm, and therefore the market value of insider holdings, leading to estimates of *LMV* biased upward.[13] Even if we recognize the upward

[11] Positive size dependencies were found by Ferri and Jones, no effect found by Remmers et al. [21], and a negative effect found by Gupta [10].

[12] *LMV* and *FR* are used as the proxies for the true nondiversified risk measure MV/W, where W is the insider's wealth. A multicollinearity problem is introduced once *LMV* and *FR* are introduced in one regression, which may lead the coefficient of *FR* to be positive.

[13] Suppose that the true relationship between leverage and the insider holding variable is $D/Vu = MV$ and the relationship actually estimated is $D/A = aMV + u$, where $u = (D/A - D/Vu)$. If cov $(MV, Vu) > 0$, cov $(MV, u) > 0$, leading to estimates of a biased upward.

Table IV

Quartile Groups in the Descending Order of *DRT*

CHC0			CHC1			PHC0			PHC1		
DRT	*MV*	*FR*	*DRT*	*MV*	*FR*	*DRT*	*MV*	*FR*	*DRT*	*MV*	*FR*
1. 0.463	15.30	0.140	0.454	32.67	0.177	0.378	9.889	0.029	0.427	12.75	0.039
2. 0.270	27.41	0.138	0.304	40.33	0.196	0.250	8.636	0.019	0.272	11.19	0.047
3. 0.168	28.30	0.190	0.210	59.61	0.206	0.178	11.080	0.020	0.199	79.05	0.042
4. 0.043	82.60	0.230	0.087	93.23	0.216	0.075	15.930	0.021	0.097	82.58	0.053

bias of *LMV* in CHC and PHC, the differential effect of *LMV* in CHC from that in PHC may still hold because we can conceive no plausible reason why this bias should be different in CHC and PHC. To correct the biases of *LMV*, *FR* may serve as an alternative measure even though it is less important than *LMV* in terms of nondiversified risk measure. Having analyzed from *FR* only, our previous conclusion still holds.

The second problem involves causality. In our specification, we are implicitly assuming that causality runs from the insider-holding measures to the debt ratio. In this view, managers set their insider holdings based upon exogenous considerations and then address the capital structure problem. It is possible that other mechanisms may lead to a reversed causality. A higher level of debt, for example, increases (ceteris paribus) the risk of a stock, motivating the reduction of undiversified holdings. The possibility of reversed causality remains an open question although such a mechanism would not be inconsistent with our hypothesized relationship between managerial holdings and capital structure.

III. Conclusion

In this paper, we have examined 984 NYSE firms from 1979 to 1983 to test whether capital structure decisions are at least in part motivated by managerial self interest. It is shown that the level of debt decreases as the level of management investment (shareholding) in the firm increases, reflecting the greater nondiversifiable risk of debt to management than to public investors for maintaining a low debt ratio. This finding is independent of the existence of nonmanagerial principal stockholders who are assumed to have sufficient investment in the firm to warrant the effort required for monitoring and to influence management appropriately. However, as a result, where corporations have large nonmanagerial investors, the average debt ratio is significantly higher than in those with no principal stockholders, which may suggest that the existence of large nonmanagerial stockholders might make the interests of managers and public stockholders coincide.

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