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Dividend Smoothing and Debt Ratings

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Abstract

We find that firms that regularly access public debt (bond) markets are more likely to pay a dividend and subsequently follow a dividend smoothing policy than firms that rely exclusively on private (bank) debt. In particular, firms with bond ratings follow a traditional Lintner (1956) style dividend smoothing policy, where the influence of the prior dividend payment is very strong and the current dividend is relatively insensitive to current earnings. In contrast, firms without bond ratings flow through more of their earnings as dividends and display very little dividend smoothing behavior. In effect, they seem to follow a residual dividend policy.

I. Introduction

This paper examines the interaction between the firm's debt decision and its dividend policy. We show that the type of corporate debt a firm has outstanding (bank debt or public debt) plays an important role in determining the firm's dividend policy. In particular, we argue that firms that regularly access public debt (bond) markets are more likely to pay a dividend and subsequently follow a dividend smoothing policy than firms that rely exclusively on private (bank) debt. This occurs because the use of private (bank) debt reduces the value of the signaling and agency reduction roles typically fulfilled by dividend payments. In contrast, firms with public market debt have a greater incentive to adopt dividend policies that are designed to reduce information asymmetries and agency problems in order to induce investors to hold their debt.

We address these questions by considering the dividend decisions of U.S. firms over the period 1981 to 1999. We examine the decision to pay a dividend by analyzing a variety of fundamental firm characteristics. We then extend these characteristics to include factors that cause the firm to seek public arms length rather than private informed debt markets. Conditional on these factors, we then estimate the classic Lintner (1956) dividend adjustment model, where the decision

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to smooth dividends or adopt a residual dividend policy depends on public market access. To the best of our knowledge, no one has previously examined the direct impact of the decision to issue public market debt on a firm's dividend policy.

The paper is organized as follows. Section II discusses some fundamental firm characteristics and the choice between public versus private debt markets. Section III describes the data and summary statistics. Section IV estimates logistic regressions for predicting whether the firm pays a dividend. Section V presents Lintner coefficient estimates conditioned on firm characteristics and debt ratings. Finally, Section VI adds some conclusions and suggestions for further research.

II. The Importance of Dividend Policy for Debt Markets

Miller and Modigliani (1961) introduced the residual theory of dividends based on the firm's sources and uses of funds. Based on this theory, we would expect the following outcomes: firms with higher profits should pay higher dividends; firms with higher investment rates should pay lower (or zero) dividends; firms with higher future growth opportunities should build up cash for future investments and consequently make lower dividend payments; and firms facing higher debt constraints will have less financial flexibility and thus pay lower dividends.

While these four fundamental factors can be expected to influence the dividend decision, they indicate little about how the firm's dividend payments are implemented as a dividend policy. Lintner (1956) was the first to consider this when he observed that firms tended to follow an adaptive process in setting their dividend. He estimated the following equation,

$$d_{i,t} = a_i + b_i e_{i,t} + c_i d_{i,t-1} + \varepsilon_i, \tag{1}$$

where the actual dividend ($d_{i,t}$) was an adjustment of the existing dividend ($d_{i,t-1}$) to the target dividend, which he hypothesized was determined by the firm's target payout rate and normalized earnings ($e_{i,t}$). In the Lintner model, c_i is the adjustment coefficient, a_i is a fixed time-series intercept, and ε_i is a random error term.[1]

Lintner type dividend smoothing is normally viewed as a solution to both agency and signaling problems.[2] However, as La Porta, Lopez de Silanes, Shleifer, and Vishny (2000) note, financial solutions to agency problems depend in part on the legal environment and characteristics of investors. For example, dividend smoothing may be optimal for firms with dispersed share ownership, but not for "internal" shareholders who can observe earnings and management directly. We

[1] Lintner estimated his equation with a coefficient on lagged dividends of 0.70 and current earnings of 0.15, indicating a speed of adjustment of 0.30 and an optimal payout rate of 50%. Fama and Babiak (1968) examined data for two samples for the 1947 to 1964 period. Their results implied a slightly higher speed of adjustment of 0.366.

[2] As Easterbrook (1984) points out, high dividend payments can solve agency problems. This is because a high dividend payment attenuates managerial opportunism in the face of conflicts of interest between managers and external security holders. A pre-commitment to high dividend payments forces the firm to interact with the capital market more frequently and imposes market discipline on managers. Clearly, the resolution of these problems is to the benefit of the public debt markets as well as the equity holders.

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argue the same holds true for debt markets, where the distinction is between "informed" private (bank) debt held by one institution and "uninformed" public market debt (bonds) with multiple investors.

The contrast between bank debt and public debt has been extensively analyzed. Leland and Pyle (1977) and Diamond (1984) both argued that banks have a comparative information advantage over arms length bond markets. According to Diamond, this stems from the reduced monitoring costs faced by banks, which have better access to both senior managers as well as confidential information that helps alleviate signaling and agency problems. The risk to the bank is further reduced by the practice of recovering the principal through monthly mortgage type payments, which in effect serves a pre-commitment function similar to a dividend. Several aspects of the bank relation serve to control agency costs and reduce signaling problems. It is not surprising, therefore, that James (1987) found that the announcement of a credit facility was accompanied by a 1.7% two-day abnormal equity return. In this sense, initiating a bank relation divulges information to the capital market in the same way as the initiation of a dividend.

In contrast to bank debt, public bond markets are dominated by dispersed institutional investors. Data on bond holdings for 1990 and 1999 (not reported here) suggest that bonds are important assets for institutions with long-term liabilities. For example, in 1990 approximately 62% of all outstanding bonds were held by insurance companies, savings institutions, retirement funds, and private pension funds. By 1999, this share had dropped to 47%, mainly due to an increase in foreign holdings from 12.7% to 18.0% and of bond funds from 3.5% to 8.1%. The fact that the bond market is an institutional market has important implications for the criteria used to buy bonds since as fiduciaries such institutions are heavily regulated to ensure that they can meet their liabilities.[3] A common feature of these regulations is an attempt to define a set of investments that pass a "reasonableness" test, which reduces the legal liability of a purchaser to charges of being "imprudent." One of the tests of prudence that has historically been applied involves examining whether a debt issuer in question regularly pays a dividend. This suggests that a firm's dividend policy may have important implications for the institutions that dominate the corporate bond market.

The discussion above indicates that there are significant differences between private informed debt markets and public uninformed debt markets, but how do firms choose between them and where does dividend policy fit in? Berlin and Loeys (1988) argue that the choice hinges on the tradeoff between the relative efficiency of liquidation and rescheduling versus information acquisition and monitoring costs. Similarly, Chemmanur and Fulghieri (1994) focus on the longer time horizon of banks and their reputation incentive to avoid incorrect liquidation decisions. However, the choice of bank debt does not come without a cost as Rajan (1992), for example, argues that the bank may exploit this bargaining power in debt renegotiation, and the illiquidity of bank debt increases its cost. Riskier firms with rapid growth prospects facing significant informational asymmetries are more likely to choose bank debt over public market debt. In contrast, lower

[3]For example, a typical prospectus for a bond issue will include a reference as to who can buy the bonds (i.e., the "legal for life" rules).

risk, more profitable firms with fewer growth prospects are more likely to issue public market debt, where they also have access to longer term funds.

This discussion points to a strong interaction between dividend policy and the type of debt issued by a firm. We have already indicated that profitable firms with spare debt capacity and low growth opportunities (which is often proxied by the market-to-book (M/B) ratio) are more likely to pay dividends. The discussion of debt market access above indicates that these firms are likely to issue public market debt provided they are also low risk. We argue that small firms with high M/B ratios and few tangible assets are riskier than larger firms with low M/B ratios and a higher proportion of tangible assets. All three factors point toward public market access for larger firms with low M/B ratios and lots of tangible assets.[4]

We argue that the firms most likely to pay a dividend are also likely to access the public debt markets if they are larger and have more tangible assets. In this case, they are also more likely to follow a Lintner style dividend smoothing policy. In contrast, firms that are unlikely to pay dividends are more likely to seek out the lower rescheduling risks attached to informed bank debt if they are also smaller with few tangible assets. However, if these firms do pay a dividend they are more likely to follow a genuine residual policy since there is little need for them to smooth their dividends. This is because the use of bank debt reduces the need for signaling and mitigates agency costs, two of the main functions typically served by dividends that lead to a smoothed dividend policy.

We identify the firm's choice between public and private debt by referring to whether the firm has a bond rating. Obviously, all firms have some form of a banking relation since at a minimum they need check clearing and short-term borrowing facilities. However, firms without public market access need not pay the fees or provide the information required for a bond rating.

III. Sample Characteristics

We use annual dividend data collected for the 1981 to 1999 period from the Research Insight (U.S. Compustat) database. All available firm-year observations were collected and deletions were made only if the value for either total assets or sales were zero. The result is an unbalanced panel since there was no requirement that data be available for each firm throughout the entire period. We end up with an unusually comprehensive data set with a total number of 127,516 firm-year observations from all SIC industry groups. Approximately 39% (or 49,300) of these observations involved a firm that made a dividend payment.

Bond ratings were also collected, but these data were only available from 1985. Over the period 1985–1999, there were 104,223 observations, of which 18,675 (17.9%) were for firms with bond ratings. Approximately 67% (or 12,452) of these observations involved the payment of a dividend. In contrast, approximately 30% (or 25,429) of the 85,547 observations for firms without a bond rating paid a dividend. Further, there were 8,747 observations with investment grade

[4]Fama and French (1992) have indicated that two key stock market risk factors are the M/B ratio and size.

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bond ratings of which 94% or 8,225 paid a dividend. If we think in terms of conditional probabilities, while the overall probability of a firm paying a dividend is about 39%, conditional on the firm having a bond rating the probability increases to 67% and conditional on an investment grade bond rating it increases further to 94%. This evidence strongly suggests the dividend decision is closely related to the bond rating.[5]

Table 1 provides summary statistics on dividend policy and other key financial measures for our two time periods, 1981–1999 and 1985–1999. The first observation in each row is the mean and the second the median, since accounting ratios are often highly skewed. We report ratios for total common share dividends scaled by earnings before interest and taxes (EBIT), which we term the "overall" dividend payout, as well as by net income, which is the normal or "regular" measure of payout. We chose to scale dividends by both EBIT and net income to avoid the influence of extra-ordinary items. For the entire sample, the average overall payout was 10.2% and the regular payout 26.1%, with medians of 0% for both indicating the skewed nature of dividend payments. When the zero dividend observations were removed, the average values increased to 26.3% and 67.4% respectively, with medians of 18.2% and 33.2%.

For the period since 1985 where bond ratings are available, the median payout ratios for rated firms are 11.0% and 19.4% for the overall and regular payouts, which increase to 19.9% and 37.5% for the firms that pay a dividend. In contrast, the median overall and regular payout rates for non-rated firms are both zero, while for the non-rated, dividend paying firms the medians increase to 17.9% and 31.5%. This evidence suggests that while non-rated firms are less likely to pay a dividend, those that do pay a dividend seem to have similar payouts to rated firms. Similarly, if we look at the differences between investment and non-investment grade rated firms, we see that the differences are less pronounced for firms that pay a dividend.[6]

Table 1 also provides summary data on several independent control variables that will be used in our future analysis. As hypothesized in the previous section, the medians indicate that rated firms tend to be much larger in terms of both sales and assets, more profitable, more indebted, and tend to have more tangible assets and lower investment rates with similar M/B ratios. When contrasting investment versus non-investment grade firms, we see that investment grade firms are larger, more profitable, far less indebted, and they invest less. While they also have more tangible assets and higher M/B ratios, the differences are not very pronounced.

We decompose our sample into seven broad industry groups based on SIC codes. As one would expect, this process reveals the importance of industry in-

[5]The fact that the existence of a debt rating influences the dividend decision is consistent with the importance of debt ratings on other related corporate decisions. For example, Kisgen (2004) provides evidence that dividend ratings can exert a significant influence on a firm's capital structure decisions. His findings substantiate the survey findings of Graham and Harvey (2001) who find that debt ratings are the second most important consideration for CFOs when considering debt issuances, with 57% of the CFOs that were surveyed citing this as an important consideration.

[6]Non-investment grade debt normally starts at BB+. To maintain slightly more equal samples we divide the sample based on BBB recognizing that many institutions will not hold lower rated investment grade debt for fear that a rating cut will force them to sell BBB rated debt. This is mainly a concern for non-utility debt.

TABLE 1

Summary Statistics: Overall Sample

First observation is the mean, the second is the median. All observations are 1985–1999, except for the first two rows which are for 1981–1999. Div/EBIT is dividends divided by earnings before interest and taxes; DPS/EPS is the regular dividend payout; profit is net income before extraordinary items divided by total assets; invest is capital expenditures divided by lagged net fixed assets; debt ratio is total debt divided by total assets; and tangibility is net fixed assets divided by total assets.

	Div/ EBIT	DPS/ EPS	Total Sales $mil.	Total Assets $mil.	Profit %	Market-to-Book	Invest	Debt Ratio	Tangibility
Total sample	0.102	0.261	1,008	1,954	−14.2	2.98	1.690	0.555	0.305
$N = 127,516$	0.000	0.000	65	76	2.34	1.60	0.250	0.228	0.239
Total sample (positive DPS)	0.263	0.674	2,251	4,582	5.62	2.76	0.754	0.240	0.336
$N = 49,300$	0.182	0.332	326	461	4.35	1.51	0.203	0.217	0.288
Rated firms	0.179	0.429	3,923	8,458	1.70	2.63	0.995	0.373	0.384
$N = 18,675$	0.110	0.194	1,175	1,778	2.87	1.69	0.195	0.332	0.344
Rated firms (positive DPS)	0.268	0.644	5,158	11,613	3.74	2.40	0.295	0.312	0.399
$N = 12,452$	0.199	0.375	1,763	2,948	3.67	1.73	0.182	0.310	0.366
Non-rated firms	0.086	0.207	450	792	−20.3	3.28	2.010	0.601	0.275
$N = 85,547$	0.000	0.000	39	47	1.70	1.69	0.282	0.189	0.202
Non-rated firms (positive DPS)	0.288	0.697	1,228	2,324	6.32	3.43	1.170	0.208	0.291
$N = 25,429$	0.179	0.315	158	250	4.38	1.57	0.223	0.165	0.237
Investment grade firms	0.254	0.519	6,523	15,365	4.59	2.60	0.276	0.279	0.398
$N = 8,748$	0.214	0.394	2,359	4,127	4.23	1.87	0.186	0.161	0.361
Investment grade firms (positive DPS)	0.271	0.552	6,681	15,760	4.63	2.56	0.261	0.276	0.404
$N = 8,221$	0.224	0.416	2,410	4,165	4.31	1.85	0.181	0.261	0.369
Non-investment grade firms	0.112	0.351	1,632	2,366	−0.09	2.64	1.570	0.457	0.371
$N = 9,924$	0.000	0.000	604	787	1.71	1.51	0.208	0.417	0.331
Non-investment grade firms (positive DPS)	0.263	0.823	2,201	3,558	2.04	2.10	0.358	0.378	0.389
$N = 4,227$	0.135	0.253	897	1,302	2.60	1.51	0.182	0.254	0.357

fluences on dividend behavior and the likelihood of issuing public debt. For example, while approximately 39% of all firm-year observations in the total sample involve a dividend payment, this percentage varies from a low of 4.8% for Public Administration and Other firms (with SIC codes between 9,000 and 10,000), to a high of 63.6% for Finance, Insurance and Real Estate firms ($6000 < SIC < 7000$). The percentages for the other five groups are as follows: 18.2% for Service firms ($7000 < SIC < 9000$); 26.6% for Resource firms ($SIC < 2000$); 32.2% for Wholesale & Retail firms ($5000 < SIC < 6000$); 36.3% for Manufacturing firms ($2000 < SIC < 4000$); and, 59.1% for Transportation and Public Utility firms ($4000 < SIC < 5000$). Similarly, Transportation and Public Utilities have by far the largest percentage of rated observations at 40.8% while Public Administration has only 2.8%. This discussion indicates that there are pronounced industry effects in both bond ratings and dividend payments, and in our subsequent analysis we control for these influences by including industry indicator (dummy) variables corresponding to our seven groupings (SIC 1–7).

IV. Factors Affecting the Probability of Paying a Dividend

The discussion in Sections II and III suggests that the probability of paying a dividend increases for more profitable firms with low investment requirements, low debt, and low M/B ratios. In addition, if these firms are larger with more tangible assets then there is an increased probability that they will access the public

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debt markets rather than use private bank debt, and will therefore have a bond rating. Hence, we have two testable hypotheses that can be tested empirically using logistic regression models to: i) estimate the probability of a firm paying a dividend; and, ii) estimate the probability of a firm possessing a debt rating. The results from estimating various versions of these logit models are presented in Table 2. In each case, the estimates are based on robust standard errors, estimated assuming independence across firms, but not necessarily for the within-firm observations. This is done to recognize that with panel data many of the firm-year observations are not genuinely independent since there are multiple observations for the same firm. Note that the robust standard errors are frequently much larger than conventional estimates so our significance tests are not inflated by the large number of firm-year observations.

TABLE 2

Predicting Dividend Payments and Debt Type

The dependent variable for Models #1 through #6 equals 1 for a dividend and 0 otherwise. For Models #7 and #8, the dependent variable is a rating indicator for the period 1985–1999 (1 for a rating, 0 otherwise). The first value in each row is the coefficient and the second the *t*-statistic. The last row reports the (pseudo) R^2. The number of observations is below the R^2 value. All estimates include robust standard errors where independence is assumed across firms (groups), but not within firm-year observations. ** (*) indicates significance at the 1% (5%) level.

Independent Variable	Dividend Payment (1 = yes; 0 = no)						Debt Rated (1 = yes; 0 = no)	
Model #/Type	#1 Logit	#2 Logit	#3 Logit	#4 Logit	#5 Logit	#6 Logit	#7 Logit	#8 Logit
Constant	−0.864 −41.55**	−1.261 −16.76**	−1.659 −17.62**	101.306 11.55**	106.7 14.31**	213.9 22.20**	−14.77 −1.33	49.56 3.64**
Rating indicator (= 1 rated)	1.554 35.73**	1.489 32.53**	1.501 32.64**	1.500 32.64**				
Profitability					6.494 23.92**	4.753 12.50**	2.930 13.11**	0.619 1.700
Investment rate					−0.001 −0.32	0.000 0.06	−0.000 −0.31	0.000 0.42
Market-to-book					−0.000 −3.82**	−0.000 −2.75**	−0.000 −0.44	0.003 1.38
Debt ratio					−0.312 −3.77**	−2.139 −18.16**	1.716 10.11**	1.451 5.85**
Log of total assets						0.731 47.91**		1.049 39.23**
Tangibility						1.431 13.01**		0.216 1.450
Time				−0.051 −11.67**	−0.054 −14.37**	−0.109 −22.54**	0.006 1.14	−0.029 −4.19**
Significant SIC dummies		5/6	5/6	5/6	5/6	4/6	2/6	2/6
Significant year dummies			All	All	11/18	16/17	5/13	4/13
(Pseudo) R^2 No. of obs.	6.39% 104,223	13.31% 104,223	13.61% 104,223	13.61% 104,223	16.27% 105,425	37.50% 105,425	8.97% 86,280	45.48% 86,280

Before examining the reported estimates, we note that there is an element of endogeneity in our models since the factors affecting the probability of paying a dividend are a subset of the factors affecting public market access. If we were estimating these equations as least squares regression models, we would use a simultaneous equations framework. However, the simultaneity problem is much reduced when the dependent variables are qualitative rather than continuous since a necessary condition for internal consistency is that the reciprocal effects

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of the jointly dependent variables must be equal. Schmidt and Strauss (1975) developed the simultaneous logit model with this constraint, where both dependent variables, similar to ours, are either 1 or 0. However, Koo and Janowitz (1983) in an application of Schmidt and Strauss's model confirm Guilkey and Schmidt's (1979) result that "very little is gained going from a single equation logit to a simultaneous logit estimation when the sample size is large (greater than 500)."[7] In our case, the sample size is never less than 14,000 observations. Consequently, we implement our estimates using the single equation logit model, which has the added benefit of allowing more robust specifications of the error term.[8]

The results presented in Table 2 for the simplest model (#1) examine whether a firm's likelihood of paying a dividend is influenced by whether the firm has a bond rating. The coefficient on the bond rating indicator is 1.554 with a *t*-statistic of 35.73 (without the robust standard errors adjustment the *t*-statistic would have been 90.18). Although the pseudo R^2 value is only 6.4%, there is clearly a relation between the dividend decision and whether the firm has a bond rating.[9] Model #2 adjusts Model #1 to account for industry effects by including indicator (dummy) variables for each of the seven SIC groups discussed in Section III, where the first is automatically dropped. Note that the pseudo R^2 increases to 13.31%, but even with significant SIC indicators, the coefficient on the rating indicator is largely unchanged.

The period 1981 to 1999 includes a variety of economic conditions. Regardless of the fundamental determinants of dividend policy we would expect dividends to be cut in bad rather than good economic conditions. Model #3 in Table 2 accounts for this by including annual indicator variables. Again, even though all of these indicator variables are significant, the coefficient on the rating indicator is largely unchanged. Finally, many of the later year dummies are significantly negative indicating a trend toward decreasing dividend payments, consistent with the work of Fama and French (2001). Model #4 controls for this trend by including time as an independent variable. Once again the coefficient on the rating indicator is largely unchanged, but we confirm the Fama-French result that the probability of a firm in the Compustat database paying a dividend has decreased over time.

We now consider the effects of firm characteristics reflecting the residual theory of dividends: profitability, investment rates, the M/B ratio, and the debt ratio. These estimates are provided in the column for Model #5 in Table 2. The results show that the probability of a firm paying a dividend increases with its profitability and decreases with its M/B ratio and with its debt ratio with the coefficient on the investment rate being insignificant. These results provide broad support for the residual theory of dividends with all coefficients being of the expected sign. The impact of public market access is tested in Model #6, which adds size and the tangibility of assets as additional independent variables. Recall that both these variables induce a firm to access public rather than private debt

[7] See p. 136 of Koo and Janowitz (1983).

[8] Note that there is an interesting temporal question of how dividend policy changes as firms seek public market access. However, this question is beyond the scope of this research.

[9] The pseudo R^2 is estimated as $1 - L_1/L_0$, where L is the log likelihood of the full model (L_1) and a constant only model (L_0). If the model has no explanatory power, the log likelihood ratio is 1.0 and the pseudo R^2 is 0.

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markets. In comparing Models #5 and #6, it is clear that while the coefficients on profits, investment rate, M/B, and debt ratio do not materially change, the signs on both size and the tangibility of the firm's assets are positive and highly significant.[10] Larger firms with tangible assets are much more likely to pay a dividend than smaller firms with more intangible assets.

A more explicit test of whether size and the tangibility of assets affect access to the public debt markets is to examine whether these two variables affect the probability of a firm having a bond rating. Model #7 in Table 2 presents the results from estimating a logit model predicting whether the firm has a bond rating using the four fundamentals: profit, investment rate, M/B, and debt ratio. Model #8 then adds size and tangibility. Since bond ratings are only available for the period 1985–1999, the number of observations is reduced. Model #7 suggests that more profitable firms with high debt ratios have bond ratings. This differs from the results for the dividend decision reported in Models #5 and #6 where a high debt ratio reduced the probability of a firm paying a dividend. Neither the investment rate nor the M/B ratio is significant in either model. When the size and tangibility variables are added (i.e., Model #8), the pseudo R^2 jumps dramatically, and we observe that the size variable is overwhelmingly the most important explanatory factor affecting the rating decision, with the tangibility coefficient being insignificant. The coefficient on debt remains significantly positive, while the size of the profitability coefficient is reduced substantially, and the coefficient on this variable is no longer significant. Overall, it is clear that larger firms with more debt seek out public debt markets, while the importance of profitability, investment rates, M/B, and asset tangibility are less important.

V. Dividend Smoothing

The results above indicate that the debt and dividend decisions are affected by similar underlying firm characteristics and that the type of debt matters. We now examine whether firms with public market debt are more likely to follow a smoothing or a residual dividend policy. We address this issue by estimating the standard Lintner model, which is specified in equation (1).

Table 3 provides estimates for different econometric specifications of the Lintner model. The first model includes all firm-year observations where we obtain the now standard result that, relative to Lintner's results, the coefficient on the lagged dividend has increased to about 0.90, while that on earnings has dropped marginally to about 0.14. We obtain this result whether we include all observations or restrict the sample to positive dividend paying observations only. The second model includes the same time and industry indicator variables that we use in the logit models. However, unlike those models the addition of the SIC and time indicator variables do not change the results. Overall, these results confirm the prior work of Dewenter and Warther (1998), for example. However, the estimates in the first two rows of Table 3, similar to recent estimates such as those of

[10]We conducted tests that indicate there are no significant multi-collinearity problems with our independent variables.

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Dewenter and Warther, are puzzling since they imply equilibrium payouts of over 100%.[11] Clearly an equilibrium payout of this magnitude is a puzzle.

TABLE 3

Lintner Model Regression Estimates

The dividend per share at time t (DPS_t) is regressed against the lagged dividend and earnings per share with and without an interaction indicator variable constructed as the rating indicator variable times the lagged dividend. For each regression, the first is over all observations including zero dividend observations and the second over positive dividend payments only. In each case, the first row is the coefficient on the independent variable and the second the t-statistic. Time period is 1981–1999 for all observations and 1985–1999 for the subset with bond ratings. The adjusted R^2 is the overall R^2 not that estimated from the fixed effects model; as such it is a simple squared correlation coefficient and does not represent the explained variance. The significance of the interaction terms is given by the t-statistic. ** (*) indicates significance at the 1% (5%) level.

	No. of Obs.	Constant	DPS_{t-1}	EPS_t	DPS Rating Interaction	EPS Rating Interaction	Optimal Payout	Adj. R^2 (%)
Total sample (1981–1999)	127,516	14.55	0.894	0.138				81.4
		1.18	12.29**	3.95**			> 100%	
	46,707	13.86	0.892	0.176				87.9
		20.22**	10.68**	3.05**				
SIC & year indicators	127,516	40.69	0.894	0.138				81.4
		0.35	12.30**	3.95**			> 100%	
	46,706	38.79	0.892	0.176				87.9
		0.01	10.69**	3.05**				
Fixed effects: firm indicators	127,516		0.761	0.120			50.2%	81.4
			306.10**	108.29**				
	46,707		0.839	0.160			99.0%	87.9
			232.30**	88.18**				
Fixed effects & autoregression (FE&A)	110,092	131.07	0.619	0.124			31.0%	82.4
		6.13**	204.08**	104.19**				
	40,234	301.79	0.678	0.161			50.0%	88.3
		6.14**	133.22**	82.29**				
Rated DPS interaction (FE&A)	110,092	153.9	−0.136	0.117	0.850		40.9%	74.0
		7.93**	−20.61**	108.83**	131.77**			
	40,234	349.1	−0.031	0.154	0.784		62.3%	82.9
		7.84**	−3.02**	86.61**	83.11**			
Rated DPS & EPS interaction (FE&A)	110,092	159.2	−0.316	0.248	1.064	−0.168	32.1%	74.8
		8.46**	−43.89**	117.99**	152.68**	−71.58**		
	40,234	384.6	−0.238	0.265	1.010	−0.156	48.0%	82.2
		8.86**	−21.35**	85.14**	95.18**	−42.50**		

The problem with the prior results, like those in the existing literature, is that they are based on panel data estimates with no prior screening or smoothing of the data. Consequently, they have two possible econometric weaknesses: they do not adjust for any possible dependence of firm-year observations within a group, or for any possible autocorrelation across time. The third model corrects for individual firm effects and the estimates are closer to those of Lintner with a smaller coefficient on the lagged dividend.[12] The overall model implies an equilibrium payout of about 50%, and when estimated over nonzero dividend observations

[11] Lintner used his model to estimate the equilibrium payout that occurs when the dividend adjustment is complete so the lagged and current dividends are the same. At a zero intercept, the equilibrium payout is the coefficient on current earnings divided by 1 minus the coefficient on the lagged dividend. While conceptually the intercept has to be 0, regression results with suppressed intercepts are problematic.

[12] While the significance of the independent variables increases dramatically after making this estimation adjustment, the reported adjusted R^2 value does not increase, which may seem puzzling to the reader at first glance. This is because the reported adjusted R^2 value is the overall R^2, and not that estimated from the fixed effects model. In other words, it is a simple squared correlation coefficient and does not represent the explained variance.

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the payout is still almost 100%. The estimates from the fourth model allow constant autocorrelation across the individual firm observations, as well as fixed firm effects.[13] For this model, the coefficient on the lagged dividend is smaller still and the equilibrium payout is no longer unreasonable. For all observations, the equilibrium payout is 31%, which is close to the average reported in Table 1. As expected, the equilibrium payout increases once the sample is restricted to only positive dividend paying observations, with the 50% estimate falling between the average and median payout ratios reported in Table 1. The results of the fourth model seem the most reasonable since they adjust for the possible econometric problems associated with unbalanced panel data with autocorrelated errors.[14]

The fifth model in Table 3 extends the Lintner estimates to include an interaction term for whether the firm is rated. The interaction term is equal to the lagged dividend times an indicator variable, which is 1 if the firm is rated and 0 otherwise. This is equivalent to estimating two separate regression models, while pooling the observations to maximize the power of the tests and forcing a common intercept. The simple null hypothesis is that the indicator variable for a bond rating is insignificant and that all firms smooth their dividends to the same degree. In this case, the interaction term should be insignificantly different from 0. However, this is not the case. For all observations, the interaction term is highly significant at 0.85 and the coefficient on the lagged dividend drops to -0.136. This means that non-rated observations have a negative coefficient of -0.136, while rated firms have a positive coefficient of 0.714 (i.e., $0.850 - 0.136$). This indicates that rated firms smooth their dividends, while non-rated ones do not. For the rated firms, the equilibrium payout is 40.9%, which is an increase from the 31% of the fourth model. For the positive dividend observations, the results are very much the same. The coefficient on the interaction term is highly significant (0.784) while that on the lagged dividend is marginally negative (-0.031). Again this indicates the absence of dividend smoothing by non-rated firms and very significant smoothing by rated firms with an equilibrium dividend payout of 62.3%.

If only rated firms smooth their dividends, what happens to their payout from current operations? To answer this, we include an interaction term for earnings equal to the earnings per share times the rating indicator. This allows both the coefficient on the lagged dividend and the earnings to vary depending on whether the firm is rated, and this is the sixth model in Table 3.

First, notice that the impact on dividend smoothing is even more dramatic than for the fifth model. For all observations, the coefficient on the lagged dividend is -0.316, while the interaction indicator for the dividend increases to 1.064, indicating an *even larger* impact on dividend smoothing between rated and non-rated firms. For earnings, the results are also dramatic. The coefficient on earnings almost doubles from 0.117 to 0.248 indicating a much greater adjustment of

[13]The level of autocorrelation is not high since the Lintner model already includes the lagged dependent variable as an independent variable. For all observations, the autocorrelation coefficient is 0.2 and for dividend paying observations it is 0.3.

[14]We tested a generalized least squares random components model, but there is significant correlation between the independent variables and the random error terms that biases the model's coefficient estimates. The fixed effects model is robust to this specification.

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the dividend to current earnings. However, the interaction term is significantly negative at −0.168, indicating that rated firms adjust their dividend much more slowly in response to increased earnings. When the model is run only on positive dividend payments, the results are the same: highly significant interaction terms indicating that rated firms smooth their dividends more and adjust their dividends more slowly to increased earnings.

The results for the sixth model are impressive; they are also entirely consistent with Lintner's classic results, and differ from more recent results.[15] In particular, the statistics in Table 1 demonstrate that firms with bond ratings tend to be larger, more profitable, have more tangible assets, more debt, and lower M/B ratios than the typical firm-year observation in our sample. By all objective yardsticks, these firms are closer to the limited sample analyzed by Lintner. For these rated, dividend paying firms, the coefficient on lagged dividends is 0.763 and that on earnings is 0.109, implying an equilibrium payout of 48%. For these firms, the Lintner model works as well as it did for Lintner. In contrast, for non-rated firms the coefficient on lagged dividends is −0.238 and that on earnings is 0.265. These non-rated firms seem to be following a residual dividend policy, flowing through a greater share of current earnings in dividends, as well as ignoring the prior period's dividend payment. Clearly these non-rated firms are not using dividends extensively to reduce signaling and agency problems and seem to have no equilibrium dividend payout.

How robust are these results? The second model in Table 3 includes SIC and year dummies so that the results are robust to industry effects. Further, when the fundamental firm characteristics are included as independent variables in the logit models in Table 2, the most consistently significant variable is size. Table 4 presents estimates for the Lintner model with the preferred econometric specification: fixed effects with autocorrelated errors estimated over nonzero dividend payments. In this case, the Lintner model is estimated over five size quintiles based on total assets. Since the number of firm-year observations within each grouping varies, the actual number of observations in each quintile differs. The models are estimated both with and without interaction effects for dividends and earnings.

The estimates in Table 4 offer several insights. First, since we know that size is important in both the public market access decision and the dividend decision, it is not surprising that the proportion of firms with a bond rating increases with size. In fact, the percentage of firms with a bond rating increases dramatically from just 0.3% of firms in the smallest size quintile to 60.4% in the largest quintile. Consequently, we can expect the interaction terms to be more significant for larger firms, which they are. Second, the Lintner model only has "normal" coefficients for the largest size group (TA5). For the smaller groups, the coefficient on the lagged dividend is smaller than normal or negative, while that on earnings is also much more variable. However, this does not mean that the bond rating effect is not at work. The interaction term for four of the five quintiles is positive for the dividend, while it is negative for earnings for all five. This indicates that dividend smoothing is apparent across all size quintiles, except for the second

[15]Note again Lintner did not estimate his model over thousands of firms, he estimated it for 28 carefully screened firms. These firms would more closely match our sample of rated firms.

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TABLE 4

Size and Lintner Model Regression Estimates

The dividend per share at time t (DPS_t) is regressed against the lagged dividend and earnings per share with and without the interaction variable. All models are estimated as fixed effects with first order autoregression correction (FE & AR). The models are estimated over positive dividend observations only for five quintiles based on total assets, with TA1 the smallest to TA5 the largest quintile. For each regression, the first row is the coefficient on the independent variable and the second the t-statistic. Note in the autoregression correction one observation for each firm is dropped since larger firms tend to have more time-series observations. The effective sample size of the total asset quintiles increases with size. ** (*) indicates significance at the 1% (5%) level.

			FE & AR		FE & AR with Interaction			
	No. of Obs.	% Rated	DPS_{t-1}	EPS_t	DPS_{t-1}	EPS_t	DPS Rating Interaction	EPS Rating Interaction
Overall sample	40,223	25.0	0.677 133.2**	0.161 82.29**	−0.238 −21.35**	0.265 85.14**	1.016 95.18**	−0.156 42.56**
TA1	6,795	0.3	0.134 27.4**	0.817 109.6**	0.133 27.5**	0.817 109.6**	0.479 0.30	−0.370 −0.27
TA2	7,064	4.7	−0.073 −10.37**	−0.000 −0.05	−0.072 −12.29**	0.697 52.61**	0.092 6.75**	−0.699 −52.80**
TA3	7,248	19.8	−0.306 −26.98**	0.493 30.69**	−0.330 −27.65**	0.604 25.94**	0.627 7.49**	−0.197 −6.67**
TA4	7,708	41.0	0.145 16.47**	0.525 47.20**	0.223 17.52**	0.632 34.24**	−0.296 −17.59**	−0.138 −6.87**
TA5	8,498	60.4	0.741 69.20**	0.161 40.68**	−0.419 −16.19**	0.279 44.74**	1.178 49.08**	−0.182 −24.43**

largest where it is problematic given the negative sign on the lagged dividend. As one would expect, dividend smoothing is most apparent for the largest firms with bond ratings and with the greatest access to public debt markets.

The results based on panel data after adjusting for both autoregressive residuals and dependence across firm observations are consistent with Lintner's results, and are also consistent with the reported summary statistics in Table 1. In contrast with other recent work, the equilibrium payout estimates also make sense. Further, these results are also broader than Lintner's since the estimates are drawn from a broader array of firms. What is quite clear is that the extent of dividend smoothing depends on whether a firm has a bond rating. We find very little evidence that firms without a bond rating smooth their dividends. In fact, quite the opposite, larger dividends tend to be followed by smaller dividends and vice versa, as firms flow through a much larger share of their current earnings (about 25%) into dividends. In contrast, there is very strong evidence that firms with bond ratings smooth their dividends since their dividends are adjusted much more slowly in response to current earnings. This is consistent with our prediction that firms with bond ratings smooth their dividends as part of a strategy to maintain access to public bond markets. The fact that this result is strongest for the largest firms confirms that accessing public debt markets is associated with a different dividend policy from that adopted by smaller firms relying on private debt markets.

VI. Conclusions

We document the existence of a strong interaction between debt and dividend policy. The same fundamental factors that affect the dividend decision also affect the debt decision. However, we show that the critical factor is not the amount of

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debt, but the *type* of debt. Firms that access public debt markets are larger firms with more tangible assets and lower M/B ratios, and tend to pay dividends. The bond rating aggregates this information into a single variable, which empirically serves to differentiate dividend policy. Lintner style dividend smoothing seems primarily a solution to agency and signaling problems only for larger firms with bond ratings. It is these types of firms that have to deal with dispersed public bond market investors. In contrast, firms without bond ratings borrow from the private bank market, and have little reason to use dividend policy to solve agency and information problems. Hence, these firms follow a residual dividend policy.

Empirically, we find support for the above propositions by running Lintner style regressions that include interaction terms related to whether a firm is rated. The regression results provide very strong evidence that firms with bond ratings smooth their dividends and pay out less from current earnings than firms that are not rated. In particular, the signs on the interaction terms are very large and overwhelmingly significant, demonstrating that rated firms smooth their dividends whereas non-rated firms do not and, instead, follow a residual dividend policy. Moreover, the equilibrium payout from these augmented Lintner models is consistent with traditional estimates (and our summary statistics), suggesting an overall equilibrium dividend payout of about 50%.

Our preliminary tests also confirm that the probability of a firm paying a dividend increases with the firm's profitability and decreases with the firm's debt level and the existence of high future growth opportunities. These tests also confirm that the probability of a firm paying a dividend has declined over time, consistent with the recent work of Fama and French (2001). In order to examine our hypotheses, we then include two proxies for public debt market access in our logit regressions and find that size is overwhelmingly significant in determining whether a firm pays a dividend while asset tangibility is also important.

We also estimate directly the factors that influence the probability of a firm having a bond rating, and find that this probability is strongly associated with the same set of fundamental factors that influence the likelihood of paying a dividend, and that public market access proxies (size and asset tangibility) are the most important. In particular, we find that large, profitable firms with tangible assets and low M/B ratios tend to obtain bond ratings. The only obvious difference, as compared to the dividend models, is that firms with high debt tend to also have bond ratings whereas high debt firms have a lower probability of paying a dividend. Clearly if firms do not have much debt outstanding it makes little sense to access public markets and obtain a bond rating. All of our results are robust to the inclusion of industry controls that account, for example, for the special circumstances of regulated industries.

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