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Dividend Tax Capitalization and Liquidity

Abstract

We provide a new explanation for cross-sectional variation in dividend tax capitalization. Our analysis is twofold. First, we conduct a theoretical analysis that shows that liquidity (illiquidity) mitigates (magnifies) the positive effect of dividend taxes on expected rates of return documented in prior literature. Second, we conduct an empirical analysis centered around the Jobs and Growth Tax Relief and Reconciliation Act of 2003, which reduced the difference between the maximum statutory dividend and capital gains tax rates, and find results consistent with our theory. We also provide results suggesting that institutional ownership's mitigating effect on dividend tax capitalization documented in prior studies is attributable to stocks with greater institutional ownership being more liquid and not to the "marginal investor" being insensitive to dividend taxes.

Keywords

dividend taxes, liquidity, tax capitalization, expected rate of return

Disciplines

Accounting

Dividend Tax Capitalization and Liquidity

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Abstract

We provide a new explanation for cross-sectional variation in dividend tax capitalization. Using historical dividend tax rates from 1988-2006, we find that lower liquidity amplifies the positive relation between expected rates of return and the dividend tax rate documented in prior literature. Our results suggest that prior studies that conclude that institutional ownership mitigates dividend tax capitalization due to institutional investors being tax-exempt or insensitive to dividend tax rate changes suffer from an omitted correlated variable: liquidity.

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1 Introduction

For decades researchers in economics, finance, and accounting have debated and sought evidence that dividend taxes are impounded into the value of equity shares (e.g., Black and Scholes 1974; Litzenberger and Ramaswamy 1979, 1980, 1982; Miller and Scholes 1978, 1982; Ayers, Cloyd, and Robinson 2002; Dhaliwal, Li and Trezevant 2003; and Dhaliwal, Krull, Li, and Moser 2005). In order to identify the effect, several papers predict and find that the positive relation between expected pretax rates of return and dividend taxes is higher the lower the institutional ownership in a firm. Such studies argue that the tax status of the marginal investor determines the extent to which dividend taxes are impounded into stock price (Miller and Scholes 1982). These studies presume that institutional investors are tax-insensitive, either because they are exempt from taxes (e.g., pensions) or because they are corporations and thus are not tax-disadvantaged with respect to dividends. Moreover, they presume that the remainder of a firm's shareholders are tax-sensitive. These studies hold that as the percent of a firm's shares that are owned by institutional investors increases, the likelihood that the marginal investor setting price is tax-sensitive decreases, and as a result, the extent to which dividend taxes are impounded into price decreases (e.g., Ayers, Cloyd, and Robinson 2002; Dhaliwal, Li and Trezevant 2003; Dhaliwal, Krull, Li, and Moser 2005; Dhaliwal, Krull, and Li 2007; Campbell, Chyz, Dhaliwal, and Schwartz 2011).

The marginal investor approach described above is inconsistent with the after-tax Capital Asset Pricing Model (CAPM) developed by Brennan (1970) and Gordon and Bradford (1980) where investors form portfolios to maximize their after-tax return. In such a general equilibrium analysis, the weighted-average tax rate of all investors in the economy (where the weight depends on investors' risk tolerances), rather than the tax rate of the marginal investor, determines the extent of dividend tax capitalization (e.g., Brennan 1970; Gordon and Bradford 1980; Michaely and Vila 1995; Guenther and Sansing 2006, 2010; Bond, Devereux, and Klemm 2007). Despite this, researchers continue to rely upon the marginal investor approach in their empirical designs. In this paper, we offer an explanation for why prior studies find that institutional ownership mitigates dividend tax capitalization that has nothing to do with the tax status of institutional investors. Our results suggest that lower liquidity amplifies, and higher liquidity attenuates, the general positive relation between the dividend tax rate and firms' expected pretax rates of return (hereinafter referred to as "expected rates of return"). Moreover, we show that once one controls for liquidity, institutional ownership no longer mitigates the effect of dividend taxes on expected rates of return.

Although the prediction that lower liquidity amplifies, and higher liquidity mitigates, dividend tax capitalization may seem intuitive, to our knowledge no one has posited or tested this prediction. We suspect that this is the result of prior studies of tax capitalization having relied on the after-tax CAPM for their motivation. The CAPM assumes that markets are perfectly competitive; as such, it harbors no notion of liquidity (see, e.g., Lambert, Leuz, and Verrecchia 2012). In contrast, our analysis is motivated by the assumption that all markets are imperfectly competitive to some degree, and under this assumption liquidity plays a central role.

The intuition for our analysis is very simple. As the market for a firm's shares becomes less liquid, share price becomes more sensitive to changes in features of the economy. Share price is more sensitive in a less liquid market because less liquidity implies that there is less "cushion" to absorb shocks to, or changes in, the economy. Features of an economy whose change might result in price shocks include investor-level tax rates, investors' aversion to risk, the quality of information about the firm, etc. As these features change, and as the market becomes less liquid, heightened price sensitivity implies that the absolute value of the percentage change in price increases. For example, as the market for a firm's shares becomes increasingly less liquid, a reduction in the dividend tax rate leads to an increasingly larger percentage increase in price. Similarly, as the market becomes increasingly less liquid, an increase in the dividend tax rate leads to an increasingly larger percentage decline in price. Because the absolute value of the percentage change in price is associated negatively with liquidity, lower liquidity will *amplify* the effect of a tax rate change on a firm's expected rate of return, whereas higher liquidity will *attenuate* the effect. This implies that when one assesses the behavior of a firm's expected rate of return, the effect of the dividend tax rate cannot be divorced from the level of liquidity in the market for the firm's shares.

We empirically test the effect of liquidity on the relation between dividend tax rates and expected rates of return over the period 1988-2006; during this time the maximum statutory dividend tax rate varies from 15 percent to 39.6 percent. Our proxy for expected rates of return are annual estimates of the implied cost of equity capital. We use four different models to estimate the implied cost of capital. These models are those suggested in Claus and Thomas (2001); Gebhardt, Lee, and Swaminathan (2001); Ohlson and Juettner-Nauroth

(2005), as implemented in Gode and Mohanram (2003); and Easton (2004). We also use a measure that equals the average of the estimates from the four above models. We use Amihud's (2002) measure of price impact as our measure of illiquidity. Amihud's ratio gives the absolute percentage price change per dollar of daily trading volume, or the daily price impact of the order flow. In this sense, the measure is consistent with Kyle's (1985) concept of illiquidity (λ), or the response of price to order flow. Consistent with dividend tax capitalization, we find that expected rates of return are positively related to the dividend tax rate. Moreover, consistent with our prediction, we find that the positive relation is stronger among less liquid stocks.

Next, we replicate the results in prior studies that dividend tax capitalization is weaker among stocks with higher institutional ownership. However, once we control for liquidity, we no longer find that institutional ownership plays a mitigating role. These results suggest that prior studies that use institutional ownership to proxy for the tax status of the marginal investor suffer from an omitted correlated variable: liquidity.

The paper proceeds as follows. In Section 2, we discuss prior literature. In Section 3, we present the empirical analyses. Section 4 concludes.

2 Prior Literature

Over the past several decades, research on the economics of dividend taxation has centered on three basic theories: the "tax irrelevance view," the "traditional view," and the "new view." Under the tax irrelevance view, taxable individuals are infra-marginal. In other words, a non-taxable entity (e.g., a pension fund) or symmetrically taxed investor (e.g., a securities dealer) is the relevant price-setter (Black and Scholes 1974; Miller and Scholes 1978, 1982). As a result, changes in the dividend tax rate do not affect expected rates of return, and thereby do not affect investment, payout, and financing decisions. Under the traditional view, there are non-tax benefits from paying dividends and the manager sets dividend policy at the point where the marginal benefit of an extra dollar of dividends equals the marginal tax cost. Reductions in the dividend tax rate can lower the required pretax rate of return. Moreover, because the traditional view assumes that the marginal source of funds for investment is new equity issues (assuming no debt), reductions in the dividend tax rate can also lead to greater investment and higher dividend payouts. The new view assumes that retained earnings are the marginal source of investment funds and all retentions will eventually be distributed as taxable dividends. The market value of equity capitalizes all expected taxes on current and future dividends, even for non-dividend paying firms. The new view predicts that an increase in the dividend tax rate leads to lower equity prices, but dividend yields per se do not explain firm value (because all taxes are already impounded into price, even for non-dividend paying firms) and thus investment and payout decisions are unaffected (Auerbach 1979; Bradford 1981; King 1977). The new view is consistent with what one might expect to occur when a dividend tax rate change is permanent. In reality, the process via which dividend taxes affect prices is likely a combination of the traditional view and the new view.[1]

[1] Hanlon and Heitzman (2010) provide a discussion of the three different views. This paragraph relies heavily on Section 5.1.1 of their paper.

In their recent review of the tax literature, Hanlon and Heitzman (2010) discuss that one of the unresolved issues in the literature on the effect of dividend taxes on asset prices is the relevancy of the marginal investor in determining the pricing of dividend taxes. The marginal investor approach to dividend taxation holds that the tax status of the marginal investor in a firm determines the pricing of dividend taxes (Miller and Scholes 1982; Harris and Kemsley 1999; Ayers et al. 2002; Dhaliwal et al. 2003). While the marginal investor perspective could prevail in an economy comprised of two securities whose returns are correlated perfectly and that only differ in terms of their tax treatment, this (exact) scenario seems a poor descriptor of markets in general. Moreover, the marginal investor approach suggests that clienteles should form according to tax status. But if only the tax rate of the marginal investor matters, then tax-based arbitrage opportunities should arise for investors who are not in the marginal investor group, and vice versa. Thus, the equilibrium generated from the marginal investor approach appears to be unstable.

Because diversification is important to investors, an approach that incorporates risk-sharing seems more plausible. One such approach is the after-tax CAPM developed by Brennan (1970) and Gordon and Bradford (1980). As Hanlon and Heitzman (2010, 165) remark:

> In the after-tax CAPM, heterogeneously taxed investors form portfolios to maximize after-tax returns. Taxable investors hold dividend-paying stocks because they cannot replicate their risk exposure with non-dividend-paying stocks; they just hold slightly less because of the tax penalty (see also Long 1977). Thus, equi-

librium asset prices reflect the aggregate preferences of investors and investors with the greatest wealth and risk aversion have the greatest influence on price. All investors are marginal in the sense that a change in the taxation of any group potentially affects asset demand and prices.

Despite the theoretical appeal of the after-tax CAPM approach, disagreement over whether the marginal investor approach or the after-tax CAPM better characterizes the pricing of dividend taxes remains. For instance, Poterba (2007) states that it is not clear which approach better describes market equilibrium.

Our prediction that greater liquidity moderates and lower liquidity magnifies the positive relation between dividend tax rates and expected rates of return is based on the assumption that markets are imperfectly competitive to some degree (e.g., Lambert, Leuz, and Verrecchia 2012). In an imperfectly competitive market, liquidity plays a central role. While the after-tax CAPM model assumes perfect competition and here liquidity plays no role, we concur with the prediction derived from the after-tax CAPM model that the pricing of dividend taxes is a function of the weighted-average tax rates of all investors - not just the tax rate of a hypothetical marginal investor. A theoretical model of an imperfectly competitive market where dividends are taxed and investors face heterogeneous tax treatment generates the same prediction.[2] Our contribution is to show empirically that the mitigating role of institutional ownership on dividend tax capitalization that prior empirical studies attribute to the marginal investor being tax-insensitive to dividends is actually attributable to greater

[2] The proof is available upon request.

liquidity mitigating dividend tax capitalization. In the absence of allowing an imperfectly competitive market to price dividend taxes, such a prediction would be impossible. Our clarification of what prior studies are actually capturing when they use institutional ownership to proxy for the tax status of the marginal investor is important because as long as researchers continue to use institutional ownership as a means to identify dividend tax capitalization, they risk making incorrect inferences.

We are not the first to disagree with prior studies' use of the percentage of a firm's outstanding shares owned by institutional investors to proxy for the marginal investor being tax-insensitive to dividends. According to Guenther and Sansing (2010), one reason that prior empirical studies find that institutional holdings mitigate dividend tax capitalization is that institutional holdings are correlated negatively with individual (i.e., taxable) investors' tolerances for risk. Despite Guenther and Sansing's (2010) suggestion that researchers cease to base their predictions about dividend tax capitalization on the tax status of the marginal investor, researchers continue to do so (e.g., Campbell, Chyz, Dhaliwal, and Schwartz 2012).

3 Empirical Tests

In this section, we empirically test our prediction that lower liquidity amplifies and higher liquidity attenuates the positive relation between expected rates of return and the dividend tax rate. We begin our sample period in 1988, which is the year the reduction in the dividend tax rate enacted by the Tax Reform Act of 1986 became fully effective. Table 1 presents the maximum statutory dividend tax rate in each of the years of our sample period (1988-2006).[3]

The rate varies from as low as 15 percent to as high as 39.6 percent.

[INSERT TABLE 1 HERE]

We first estimate the following Ordinary Least Squares (OLS) regression to document the positive relation between expected rates of return and the dividend tax rate predicted by both the traditional and new views of dividend tax capitalization:

$$
\begin{aligned}
&EXPECTED\ RETURN_{i,y} = \beta_1 + \beta_2 DIVTAXRATE_y + \beta_3 AMIHUD_{i,y-1} + \\
&\beta_4 INST_{i,y-1} + \beta_5 YIELD_{i,y-1} + \beta_6 SIZE_{i,y-1} + \beta_7 BM_{i,y-1} + \\
&\beta_8 ROE_{i,y-1} + \beta_9 LEV_{i,y-1} + \beta_{10} BETA\_MKTRF_{i,y-1} + \\
&\beta_{11} BETA\_SMB_{i,y-1} + \beta_{12} BETA\_HML_{i,y-1} + \beta_{13} BETA\_UMD_{i,y-1} + \\
&\beta_{14} FBIAS_{i,y-1} + \beta_{15-44} INDUSTRY_{i,y-1} + \varepsilon. \qquad (1)
\end{aligned}
$$

Our proxy for expected rates of return are annual estimates of implied cost of capital. We use four different models to estimate the implied cost of capital measures. These models are those suggested in Claus and Thomas (2001); Gebhardt, Lee, and Swaminathan (2001); Ohlson and Juettner-Nauroth (2005), as implemented in Gode and Mohanram (2003); and Easton (2004).[4] The basic idea of all four models is to substitute price and analyst forecasts into a valuation equation and to back out the cost of capital as the internal rate of return

[3] Our sample consists of fiscal years 1988-2005. The implied cost of capital is estimated ten months after fiscal year-end. We use the tax rate that is effective when the implied cost of capital is estimated. Thus, our tests include dividend tax rates from the years 1988-2006.

[4] We use annual as opposed to quarterly estimates to avoid the error in quarterly forecasts (which tends to average out if aggregated over a year) and because of the seasonality in quarterly data. We thank Luzi Hail and Christian Leuz for sharing these annual measures of cost of capital with us and refer readers to the appendices of Hail and Leuz (2006, 2009) for a detailed explanation of the calculation of each measure.

that equates current stock price with the expected future sequence of residual incomes or abnormal earnings. The individual models differ with respect to the use of analyst forecast data, the assumptions regarding short-term and long-term growth, the explicit forecasting horizon, and whether and how inflation is incorporated into the steady-state terminal value. We also use a measure that equals the average of the estimates generated by the four models.[5] We use implied cost of capital measures because these are the most commonly used measures of expected rates of return in dividend tax capitalization studies (e.g., Dhaliwal, Krull, Li and Moser 2005; Dhaliwal, Krull and Li 2007; Chen, Dai, Shackelford and Zhang 2011; Dhaliwal, Krull and Li 2011).

Our sample includes all firm-year observations associated with fiscal years ending in 1988 through 2005, with the exception that we exclude firm-year observations with fiscal year-ends within the windows of July 1992 through September 1992 and June 2002 through August 2002. We exclude these firm-year observations because cost of capital is estimated ten months after fiscal year-end; thus, the implied cost of capital for these observations is estimated in the third quarter of 1993, which is the enactment quarter of the Revenue Reconciliation Act of 1993, and in the second calendar quarter of 2003, which is the enactment quarter of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA03).

Our proxy for lower levels of liquidity is Amihud's (2002) measure of price impact. It equals the ratio of the daily absolute return to the dollar trading volume on that day,

[5] The subscript y on the dependent variable and the subscript y-1 on all of the independent variables other than *DIVTAXRATE* denote that the implied cost of capital measures are estimated ten months after the fiscal year-end. The year y coincides with the year in which implied cost of capital is estimated.

averaged over the trading days in year *y-1* for which there is return and volume data, or

$$AMIHUD_{i,y-1} = \frac{1}{D_{i,y-1}} \sum_{d=1}^{D_{i,y-1}} \left(1,000 * \sqrt{\frac{|R_{i,y-1,d}|}{VOLD_{i,y-1,d}}} \right)$$

where $|R_{i,y-1,d}|$ is firm i's absolute return on day d of year *y-1*, $VOLD_{i,y-1,d}$ is the respective daily volume in dollars, and $D_{i,y-1}$ is the number of days for which data are available for firm i in year *y-1*. Amihud's ratio gives the absolute percentage price change per dollar of daily trading volume, or the daily price impact of the order flow. The measure is consistent with Kyle's (1985) concept of illiquidity (λ), or the response of price to order flow. Similar to Chen, Goldstein, and Jiang (2010), we use the square root version of the Amihud (2002) measure. Consistent with Amihud (2002), we apply several restrictions when calculating the ratio. First, we require for there to be stock return and volume data for more than 200 days of year *y-1* for firm i in order to calculate its ratio. Second, we require for the stock price to be greater than \$5 at the end of year y-1. Third, data to calculate firm i's market capitalization must be available at the end of year y-1. Fourth, after applying the restrictions above, we winsorize observations for the measure at the 1st and 99th percentiles for each year. A positive coefficient on *AMIHUD* will be consistent with prior studies' finding that expected rates of return are positively related to illiquidity (see, e.g., Amihud and Mendelson 1986; Brennan and Subrahmanyam 1996; Brennan, Chordia, and Subrahmanyam 1998; Datar, Naik, and Radcliffe 1998; Haugen and Baker 1996, and Hu 1997 with respect to firm-level liquidity, and Pastor and Stambaugh 2003 with respect to market-wide liquidity).

Consistent with prior literature, we control for the impact of information asymmetry on a firm's expected rate of return. We include several controls that prior studies find are potentially associated with information asymmetry. These include the percent of outstanding shares owned by institutional investors ($INST$), firm size measured as the natural logarithm of market capitalization ($SIZE$), book-to-market ratio (BM), and leverage measured as the sum of current and long-term liabilities scaled by total assets (LEV). One might expect for information asymmetry to be lower among larger firms and firms with greater institutional investor ownership and higher among firms with higher book-to-market ratios and higher leverage (Sadka and Scherbina 2007). We control for profitability with the ratio of net income before extraordinary items divided by book value of equity (ROE).

We control for dividend yield, *YIELD*, which equals the amount of dividends that firm i paid to common shareholders in year y-1 scaled by firm i's market capitalization, both collected from Compustat (Ayers, Cloyd, and Robinson 2002). We set the variable equal to zero for non-dividend-paying firms. We do not make a directional prediction for the main effect of *YIELD*. Although dividend yield is associated with the amount of dividend taxes that investors currently have to pay and thus may be expected to be positively associated with expected rates of return, studies show that it also reduces agency costs and information asymmetry, which in turn reduces expected rates of return (Bhattacharya 1979; Miller and Rock 1985; John and Williams 1985; and Jensen 1986).

We control for risk by including the coefficient estimates from estimating a four-factor Fama-French-Carhart model (Fama and French 1993; Carhart 1997) using return data from the 48 months prior to year *y-1* (*BETA_ MKTRF*, *BETA_ SMB*, *BETA_ HML*, and *BETA_ UMD*). We also control for forecast bias, which could affect implied cost of capital estimates. If forecasts are overly optimistic and market participants understand this bias and adjust prices accordingly, estimates generated from implied cost of capital models will be upwardly biased. We control for forecast bias by including a control variable that equals one-year-ahead forecast error (forecasts minus actual values), scaled by lagged total assets per share (*FBIAS*). We control for industry effects by including an indicator variable for each of Fama and French's 30 industry portfolios (Fama and French 1997). Consistent with Hail and Leuz (2006), we truncate the five cost of capital measures (*r_ave*, *r_ct*, *r_oj*, *r_mpeg*, *r_gls*) at the bottom and top one percent.[6] We winsorize all continuous independent variables, other than *DIVTAXRATE*, used in our analysis at the 1st and 99th percentiles. Table 2 includes variable definitions.

[INSERT TABLE 2 HERE]

Our sample includes firms that are listed on either the New York Stock Exchange (NYSE), American Stocks Exchange (AMEX), or NASDAQ; are in the Center for Research in Security Prices (CRSP)/Compustat Merged Database; have data on quarterly institutional holdings reported on Form 13F available in the Thomson-Reuters database; and have analyst forecast data on the Institutional Brokers' Estimate System (I/B/E/S).

Table 3 reports the descriptive statistics for the variables used in the analysis. All values are reported in decimal format. The mean (median) implied cost of equity capital over the sample period estimated using the models in Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005) as implemented in Gode and Mohanram (2003), Easton (2004), and

[6] The average of the four measures (*r_ave*) is calculated prior to the truncation.

Gebhardt, Lee, and Swaminathan (2001) equal 10.2 (9.7) percent, 12.5 (11.8) percent, 12.8 (11.6) percent, and 6.7 (6.7) percent, respectively. The mean implied cost of equity capital using the average of the four estimates equals 10.5 (10.0) percent. The mean (median) dividend tax rate is 32.2 (39.1) percent. The mean (median) *AMIHUD* is 13.5 (8.0). The mean (median) percent ownership by institutional investors equals 55 (56) percent.

[INSERT TABLE 3 HERE]

Table 4 presents the results of estimating equation (1). Consistent with investors impounding dividend taxes into stock price, the coefficient on *DIVTAXRATE* is positive and significant at the one percent level in each of the columns. When the dependent variable is the average of the four measures of implied cost of capital, the results suggest that an increase in the dividend tax rate from 15 percent to 39.6 percent results in an increase of 140 basis points in the expected rate of return, which is a 13 percent change for the mean firm. Consistent with prior studies that find a positive relation between expected rates of return and illiquidity, the coefficient on *AMIHUD* is positive and significant in columns (2) and (3). It is also positive but not quite significant in column (4) (p-value=0.101). The coefficients on the control variables are consistent with prior studies (i.e., expected rates of return are lower for larger firms and firms with greater institutional ownership, and are higher for firms with greater book-to-market ratios, greater leverage and greater risk). The positive coefficient on *YIELD* could suggest that the effect of dividend taxes on expected rates of return overwhelms any effect of reduced information asymmetry and agency costs. It is also consistent with Dhaliwal, Krull and Li (2007). The positive and significant coefficient on *FBIAS* is consistent with Hail and Leuz (2009).

[INSERT TABLE 4 HERE]

We next test our prediction that the positive relation between expected rates of return and dividend tax rates is stronger among less liquid stocks by estimating the following OLS regression:

$$EXPECTED\ RETURN_{i,y} = \beta_1 + \beta_2 DIVTAXRATE_y + \beta_3 AMIHUD_{i,y-1} +$$
$$\beta_4 DIVTAXRATE_y * AMIHUD_{i,y-1} + \beta_5 INST_{i,y-1} + \beta_6 YIELD_{i,y-1} +$$
$$\beta_7 DIVTAXRATE_y * YIELD_{i,y-1} + \beta_8 SIZE_{i,y-1} + \beta_9 BM_{i,y-1} +$$
$$\beta_{10} ROE_{i,y-1} + \beta_{11} LEV_{i,y-1} + \beta_{12} BETA\_MKTRF_{i,y-1} +$$
$$\beta_{13} BETA\_SMB_{i,y-1} + \beta_{14} BETA\_HML_{i,y-1} + \beta_{15} BETA\_UMD_{i,y-1} +$$
$$\beta_{16} FBIAS_{i,y-1} + \beta_{17-45} INDUSTRY_{i,y-1} + \varepsilon. \quad (2)$$

A positive coefficient on *DIVTAXRATE*AMIHUD* will be consistent with our prediction that illiquidity magnifies the positive relation between dividend tax rates and expected rates of return. In addition to interacting *DIVTAXRATE* with *AMIHUD*, we interact it with *YIELD*.[7] However, we do not predict a sign for the interaction because as explained in Section 2, although the traditional view of dividend taxation predicts for the positive relation between dividend tax rates and expected rates of return to increase with dividend yield, the new view holds that dividend yield is irrelevant in the pricing of dividend taxes.

[7] We demean the values of *DIVTAXRATE*, *AMIHUD*, and *YIELD* used in the interaction terms by subtracting their sample means. Demeaning, or centering, continuous variables used in interactions reduces the amount of multicollinearity that is induced by multiplying together two independent variables. See Aiken and West (1991) for a discussion of the benefits of demeaning variables.

Table 5 presents the results. Consistent with our prediction, we find that the positive relation between expected rates of return and dividend tax rates is significantly greater for less liquid firms. The coefficient on the interaction *DIVTAXRATE*AMIHUD* is positive and significant at the one percent level in columns (1)-(3) and at the five percent level in columns (4)-(5). In terms of the economic magnitude, when the analysis is conducted using the average of the four estimates as the dependent variable, the results suggest that when the dividend tax rate is 15 percent, a one standard deviation increase in Amihud's (2002) measure of price impact results in a 0.17 percentage point (i.e., 17 basis point) increase in the expected rate of return, which is a 1.6 percent change for the mean firm. Moreover, when the dividend tax rate is 39.6 percent, a one standard deviation increase in Amihud's (2002) measure of price impact results in a 0.44 percentage point (i.e., 44 basis point) increase in the expected rate of return, which is a 4.2 percent change for the mean firm.[8] Consistent with the traditional view of dividend taxation, the coefficient on the interaction *DIVTAXRATE*YIELD* is positive and significant at the one percent level in columns (1), (2), (4), and (5) and at the five percent level in the column (3).

[INSERT TABLE 5 HERE]

As explained above, prior studies predict that the pricing of dividend taxes depends on the tax status of the marginal investor (e.g., Dhaliwal, Li and Trezevant 2003; Ayers, Cloyd, and Robinson 2002; Dhaliwal, Krull, Li and Moser 2005; Dhaliwal, Krull, and Li 2007;

[8] We calculate the 0.17 percentage point as (15 percent*the coefficient estimate on *DIVTAXRATE*AMIHUD* in column (1) (0.0659)*standard deviation of *AMIHUD* (0.1691)). The 1.6 percent equals the 0.17 percentage point divided by the mean value of *r_ ave* (0.1050).

Campbell, Chyz, Dhaliwal, and Schwartz 2011). These studies predict that institutional investor ownership mitigates dividend tax capitalization (i.e., dividend tax capitalization is weaker the more likely it is that a tax-exempt or corporate investor is the marginal investor setting price). Such a prediction is inconsistent with prior theoretical studies that rely upon the after-tax CAPM. The after-tax CAPM predicts that the weighted-average tax rate of all investors in the economy (where the weight depends on investors' risk tolerances) rather than the tax rate of the marginal investor in the firm is the relevant tax rate in determining the extent of tax capitalization. We expect that the prior studies that use institutional investor ownership to proxy for the tax status of the marginal investor suffer from an omitted correlated variable: liquidity. Stocks with greater institutional investor ownership are generally more liquid. Over our sample period, we find that the correlation between *INST* and *AMIHUD* is negative and statistically significant (untabulated Pearson correlation $= -0.45$, $p < 0.001$). To investigate the issue further, we next estimate the OLS regression below where instead of interacting *DIVTAXRATE* with *AMIHUD*, we interact it with *INST*. We do so to replicate the result in prior studies that institutional ownership mitigates dividend tax capitalization.

$$EXPECTED\ RETURN_{i,y} = \beta_1 + \beta_2 DIVTAXRATE_y + \beta_3 AMIHUD_{i,y-1} +$$
$$\beta_4 INST_{i,y-1} + \beta_5 DIVTAXRATE_y * INST_{i,y-1} + \beta_6 YIELD_{i,y-1} +$$
$$\beta_7 DIVTAXRATE_y * YIELD_{i,y-1} + \beta_8 SIZE_{i,y-1} + \beta_9 BM_{i,y-1} +$$
$$\beta_{10} ROE_{i,y-1} + \beta_{11} LEV_{i,y-1} + \beta_{12} BETA\_MKTRF_{i,y-1} +$$
$$\beta_{13} BETA\_SMB_{i,y-1} + \beta_{14} BETA\_HML_{i,y-1} + \beta_{15} BETA\_UMD_{i,y-1} +$$
$$\beta_{16} FBIAS_{i,y-1} + \beta_{17-45} INDUSTRY_{i,y-1} + \varepsilon. \quad (3)$$

Table 6 reports the results. Consistent with the findings in prior studies, we find that institutional ownership mitigates the positive relation between expected rates of return and the dividend tax rate. The coefficient on the interaction *DIVTAXRATE*INST* is negative and significant at the one percent level in columns (1), (2), (3), and (5) and at the five percent level in column (4).

[INSERT TABLE 6 HERE]

Next, we examine whether the finding in prior studies that institutional ownership mitigates dividend tax capitalization is due to an omitted correlated variable (i.e., liquidity). We estimate the OLS regression below in which we interact *DIVTAXRATE* with *INST* as well as with *AMIHUD*.

$$EXPECTED\ RETURN_{i,y} = \beta_1 + \beta_2 DIVTAXRATE_y +$$
$$\beta_3 AMIHUD_{i,y-1} + \beta_4 DIVTAXRATE_y * AMIHUD_{i,y-1} +$$
$$\beta_5 INST_{i,y-1} + \beta_6 DIVTAXRATE_y * INST_{i,y-1} + \beta_7 YIELD_{i,y-1} +$$
$$\beta_8 DIVTAXRATE_y * YIELD_{i,y-1} + \beta_9 SIZE_{i,y-1} + \beta_{10} BM_{i,y-1} +$$
$$\beta_{11} ROE_{i,y-1} + \beta_{12} LEV_{i,y-1} + \beta_{13} BETA\_MKTRF_{i,y-1} +$$
$$\beta_{14} BETA\_SMB_{i,y-1} + \beta_{15} BETA\_HML_{i,y-1} + \beta_{16} BETA\_UMD_{i,y-1} +$$
$$\beta_{17} FBIAS_{i,y-1} + \beta_{18-46} INDUSTRY_{i,y-1} + \varepsilon. \quad (4)$$

If institutional ownership proxies for greater liquidity rather than the marginal investor being tax-insensitive to dividends, then once we control for liquidity, we should no longer find that institutional ownership mitigates dividend tax capitalization. Table 7 reports the results. Consistent with our prediction, the coefficient on *DIVTAXRATE*AMIHUD* is positive and significant at the one percent level in columns (1)-(3) and at the ten percent level in column (4). The interaction *DIVTAXRATE*INST* only remains negative and significant in column (5) (p-value < 0.05). Moreover, once we control for liquidity, the sign on the interaction *DIVTAXRATE*INST* actually flips and becomes positive in column (2) (p-value < 0.10). In summary, the results in Tables 6 and 7 suggest that prior studies that attribute the mitigating role of institutional ownership on the pricing of dividend taxes to the marginal investor being tax-insensitive suffer from an omitted correlated variable problem. Once we control for the effect of liquidity on the relation between dividend tax rates and expected rates of return, we only find very weak evidence that institutional ownership mitigates dividend tax capitalization.

[INSERT TABLE 7 HERE]

We are not the first to disagree with the marginal investor interpretation. Prior theoretical studies posit that dividend tax capitalization is a function of the weighted-average tax rate across *all* investors, where the weight depends on investors' tolerances for risk (e.g., Brennan 1970; Gordon and Bradford 1980; Michaely and Vila 1995; Guenther and Sansing 2006, 2010; Bond, Devereux, and Klemm 2007). These studies are based on the after-tax CAPM, which relies on markets being perfectly competitive. In contrast, our prediction is based on the assumption that markets are imperfectly competitive to some degree. Regardless of whether the market is perfectly or imperfectly competitive, dividend tax capitalization is a function of the weighted-average tax rate of all investors, not the tax rate of the marginal investor. However, liquidity can only play a role in markets that are imperfectly competitive. Although our prediction that higher liquidity mitigates and lower liquidity amplifies dividend tax capitalization may seem intuitive, prior studies have failed to considered this cross-sectional prediction - this failure may be the result of prior studies on dividend tax capitalization having relied on the after-tax CAPM for their motivation. In addition to offering a new explanation for cross-sectional variation in dividend tax capitalization, we encourage researchers to cease basing their empirical tests of dividend tax capitalization on cross-sectional variation in institutional holdings. Although institutional ownership is correlated highly with liquidity, it is not the best available proxy for liquidity.

3.1 Alternate Proxy for Liquidity

In this section, we ensure that our results and conclusions are robust to using a different proxy for liquidity. We replace Amihud's (2002) measure of price impact with an estimate of a firm's effective percentage bid-ask spread (Chordia, Roll, and Subrahmanyam 2000; Korajczyk and Sadka 2008). We measure the effective percentage bid–ask spread on each trading day as the absolute value of the difference between the daily closing price and the bid-ask midpoint, divided by the bid-ask midpoint. Then we calculate the average of the ratio over the trading days in year *y-1*.

$$ESPREAD_{i,y-1} = \frac{1}{n_{i,y-1}} \sum_{d=1}^{n_{i,y-1}} \frac{|p_{i,d} - m_{i,d}|}{m_{i,d}}$$

where $p_{i,d}$ is the closing price of firm i on day d of year $y-1$, $m_{i,d} = (Ask_{i,d} + Bid_{i,d})/2$, $Ask_{i,d}$ and $Bid_{i,d}$ are the closing ask and closing bid prices for day d, and $n_{i,y-1}$ is the number of trading days of firm i in year $y-1$. In calculating a firm's average *Espread* for the year, we require for the firm to have at least 200 daily observations. We re-estimate equations (1)-(4), replacing *AMIHUD* with *ESPREAD*.

Table 8 presents the results. The number of observations is lower using *ESPREAD* because not as many firms have data on the bid and ask for at least 200 days out of the year as have data on return and volume for at least 200 days, which are the inputs for Amihud's (2002) measure. Panel A presents the results of estimating equation (1), replacing *AMIHUD* with *ESPREAD*. Consistent with dividend tax capitalization and an illiquidity premium, respectively, the coefficients on *DIVTAXRATE* and *ESPREAD* are positive and significant at the one percent level in all five columns. Panel B presents the results of estimating equation (2), replacing *AMIHUD* with *ESPREAD*. Consistent with our prediction that lower liquidity magnifies and higher liquidity mitigates dividend tax capitalization, the coefficient on the interaction *DIVTAXRATE*ESPREAD* is positive and significant at the one percent level in the first four columns. Panel C presents the results of estimating equation (3), replacing *AMIHUD* with *ESPREAD*. Consistent with the results in Table 6 and the finding in prior studies that institutional ownership mitigates dividend tax capitalization, the coefficient on the interaction *DIVTAXRATE*INST* is negative and significant at the one percent level in columns (1), (3), and (5), and at the five percent level in columns (2) and (4). Panel D presents the results of estimating equation (4), replacing *AMIHUD* with *ESPREAD*. Consistent with our expectation and the results in Table 7 using *AMIHUD*, the coefficient on the interaction *DIVTAXRATE*ESPREAD* is positive and significant at the one percent level in columns (1), (2), and (4) and at the ten percent level in column (3). Moreover, consistent with our prediction that prior studies that attribute the mitigating force of institutional ownership on dividend tax capitalization to the marginal investor being tax-insensitive suffer from an omitted correlated variable problem, the coefficient on the interaction *DIVTAXRATE*INST* only remains significant in columns (3) and (5).

In summary, the results using *ESPREAD* as our measure of illiquidity further support our prediction that lower liquidity magnifies, and higher liquidity mitigates, the general positive relation between expected rates of return and dividend tax rates. This is important because it suggests that prior studies that conclude that institutional ownership mitigates dividend tax capitalization due to the marginal investor being tax-insensitive to dividends suffer from an omitted correlated variable problem. To be clear, we are not suggesting that these studies are incorrect in concluding that investors discount prices for the dividend taxes that they expect to owe. Rather, we suggest that these studies are incorrect in concluding that the tax rate of the marginal investor determines the extent to which price incorporates dividend taxes.

3.2 Interaction of Dividend Yield and Illiquidity

Banerjee, Gatchev, and Spindt (2007) find that after dividend initiations, firm value becomes less sensitive to liquidity. If firms are more likely to pay a dividend the lower the dividend tax rate, then one potential concern is that the positive coefficients on the interactions *DIVTAXRATE*AMIHUD* and *DIVTAXRATE*ESPREAD* that we document are not actually capturing that illiquidity magnifies dividend tax capitalization but rather that paying a dividend alleviates the illiquidity premium. To address this potential concern, in untabulated tests, we re-estimate equations (2)-(4) and add the interaction *YIELD*AMIHUD*. We also re-estimate these equations using *ESPREAD* and add the interaction *YIELD*ESPREAD*. Consistent with dividends mitigating the illiquidity premium, the coefficient on the interactions *YIELD*AMIHUD* and *YIELD*ESPREAD* are negative and significant. However, all of our results discussed above continue to hold.[9] Thus, the positive coefficients on *DIVTAXRATE*AMIHUD* and *DIVTAXRATE*ESPREAD* are indeed capturing that higher liquidity mitigates and lower liquidity magnifies dividend tax capitalization.

[9] We do not tabulate these results for the sake of brevity. However, the results are available upon request.

4 Conclusion

This paper provides a new explanation for cross-sectional variation in dividend tax capitalization. Unlike prior empirical studies that are motivated by the after-tax CAPM, our analysis assumes that markets are imperfectly competitive to some degree; under this assumption, liquidity plays a role in determining the effect of dividend tax rates on firms' expected rates of return. We predict that lower liquidity amplifies the positive effect of the dividend tax rate on expected rates of return, whereas higher liquidity attenuates the effect. We empirically test our prediction using historical, maximum statutory, investor-level tax rates on dividend income from 1988-2006. The results are consistent with our expectation.

In addition to providing a new explanation for cross-sectional variation in dividend tax capitalization, this paper provides an important implication for prior studies: prior studies that attribute the attenuating force of institutional ownership on dividend tax capitalization to the marginal investor being tax-exempt (or tax-insensitive with respect to dividends) may suffer from an omitted correlated variable problem. Once we control for the effect of liquidity on the relation between dividend tax rates and expected rates of return, we no longer find that institutional ownership mitigates dividend tax capitalization.

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Table 1
Maximum Statutory Tax Rates on Dividend Income

Year	Maximum Statutory Tax Rate on Dividend Income
1988	33%
1989	33%
1990	33%
1991	31%
1992	31%
1993	39.6%[a]
1994	39.6%
1995	39.6%
1996	39.6%
1997	39.6%
1998	39.6%
1999	39.6%
2000	39.6%
2001	39.1%
2002	39.1%
2003	15%[b]
2004	15%
2005	15%
2006	15%

[a]: The Revenue Reconciliation Act of 1993 was enacted in August 1993.

[b]: The Jobs and Growth Tax Relief Reconciliation Act of 2003 was enacted in May 2003.

Table 2
Variable Definitions

Variable	**Definition**
r_ave	Average of *r_ct*, *r_o*j, *r_mpeg*, and *r_gls*
r_ct	Implied cost of capital estimate based on the model suggested in Claus and Thomas (2001)
r_oj	Implied cost of capital estimate based on the model suggested in Ohlson and Juettner-Nauroth (2005), as implemented in Gode and Mohanram (2003)
r_mpeg	Implied cost of capital estimate based on the model suggested in Easton (2004)
r_gls	Implied cost of capital estimate based on the model suggested in Gebhardt, Lee, and Swaminathan (2001)
DIVTAXRATE	Maximum statutory tax rate on dividend income
AMIHUD	Square root of the ratio of the daily absolute return to the dollar trading volume on that day, averaged over the trading days in year y-1 for which there is return and volume data
YIELD	Firm *i*'s dividends paid to common shareholders divided by firm *i*'s market capitalization; equal to zero for non-dividend paying firms
INST	% of firm *i*'s outstanding shares owned by institutional investors
SIZE	Natural log of firm *i*'s market capitalization
BM	Firm *i*'s book equity divided by market capitalization
ROE	Firm *i*'s net income before extraordinary items divided by book value of equity
LEV	Sum of firm *i*'s current and long-term liabilities scaled by total assets
BETA_MKTRF	Firm *i*'s loading on MKTRF from estimating Fama-French-Carhart 4-factor model using return data for the prior 48 months
BETA_SMB	Firm *i*'s loading on SMB from estimating Fama-French-Carhart 4-factor model using return data for the prior 48 months
BETA_HML	Firm *i*'s loading on HML from estimating Fama-French-Carhart 4-factor model using return data for the prior 48 months
BETA_UMD	Firm *i*'s loading on UMD from estimating Fama-French-Carhart 4-factor model using return data for the prior 48 months
FBIAS	One-year-ahead forecast error (forecasts minus actual values), scaled by lagged total assets per share
ESPREAD	Absolute value of the difference between the daily closing price and the bid-ask midpoint, divided by the bid-ask midpoint, averaged over the trading days in year y-1

Table 3
Descriptive Statistics

Variable	Mean	Std. Dev.	5th Pctile	25th Pctile	Median	75th Pctile	95th Pctile
r_ave	0.1050	0.0310	0.0646	0.0844	0.0999	0.1197	0.1621
r_ct	0.1018	0.0309	0.0613	0.0824	0.0969	0.1158	0.1581
r_oj	0.1248	0.0343	0.0833	0.1022	0.1179	0.1394	0.1897
r_mpeg	0.1277	0.0482	0.0733	0.0965	0.1157	0.1459	0.2245
r_gls	0.0665	0.0332	0.0112	0.0432	0.0674	0.0883	0.1198
DIVTAXRATE	0.3216	0.1053	0.1500	0.1500	0.3910	0.3960	0.3960
AMIHUD	0.1353	0.1691	0.0138	0.0375	0.0796	0.1693	0.4389
INST	0.5464	0.2227	0.1511	0.3872	0.5647	0.7140	0.8892
YIELD	0.0131	0.0188	0.0000	0.0000	0.0042	0.0213	0.0500
SIZE	20.6503	1.5391	18.3041	19.5522	20.5380	21.6494	23.4032
BM	0.4987	0.3446	0.1191	0.2767	0.4349	0.6321	1.0797
ROE	0.1211	0.2797	-0.0848	0.0736	0.1265	0.1777	0.3134
LEV	0.2125	0.1795	0.0000	0.0508	0.1916	0.3306	0.5334
BETA_MKTRF	1.0617	0.7286	0.0360	0.6240	1.0101	1.4342	2.3008
BETA_SMB	0.5873	0.9215	-0.6296	0.0121	0.4517	1.0302	2.2703
BETA_HML	0.1597	1.1689	-1.9607	-0.3880	0.3108	0.8479	1.7549
BETA_UMD	-0.1135	0.7426	-1.3098	-0.4532	-0.0737	0.2461	0.9757
FBIAS	0.0021	0.0183	-0.0140	-0.0026	0.0000	0.0032	0.0242
ESPREAD	0.0039	0.0036	0.0007	0.0014	0.0026	0.0052	0.0113

See Table 2 for variable definitions.

Table 4
Effect of Dividend Tax Rates on Expected Rates of Return

	(1) r_ave	(2) r_ct	(3) r_oj	(4) r_gls	(5) r_mpeg
DIVTAXRATE	0.0556***	0.0549***	0.0454***	0.0712***	0.0455***
	(33.259)	(31.050)	(22.803)	(43.705)	(16.452)
AMIHUD	0.0028	0.0102***	0.0083***	-0.0156***	0.0060
	(1.285)	(4.519)	(3.242)	(-8.416)	(1.641)
INST	-0.0009	0.0007	0.0017	-0.0056***	0.0009
	(-0.654)	(0.518)	(1.143)	(-4.156)	(0.455)
YIELD	0.1009***	0.0896***	0.1057***	0.1338***	0.0884***
	(5.266)	(4.270)	(4.848)	(7.138)	(3.113)
SIZE	-0.0035***	-0.0023***	-0.0038***	-0.0029***	-0.0051***
	(-14.524)	(-9.050)	(-14.008)	(-12.288)	(-13.221)
BM	0.0186***	0.0053***	0.0165***	0.0238***	0.0268***
	(18.668)	(5.412)	(14.501)	(22.949)	(16.487)
ROE	-0.0011	0.0061***	-0.0043***	0.0056***	-0.0129***
	(-1.231)	(5.678)	(-4.112)	(5.756)	(-7.497)
LEV	0.0220***	0.0253***	0.0230***	0.0100***	0.0310***
	(14.125)	(14.390)	(13.196)	(6.561)	(12.836)
BETA_MKTRF	0.0041***	0.0028***	0.0045***	0.0033***	0.0060***
	(12.745)	(8.410)	(12.225)	(9.837)	(11.847)
BETA_SMB	0.0029***	0.0018***	0.0033***	0.0016***	0.0043***
	(10.248)	(6.280)	(10.470)	(6.023)	(9.900)
BETA_HML	-0.0023***	-0.0006**	-0.0023***	-0.0033***	-0.0024***
	(-9.726)	(-2.372)	(-8.604)	(-13.451)	(-6.916)
BETA_UMD	-0.0013***	-0.0007**	-0.0019***	0.0012***	-0.0035***
	(-4.296)	(-2.181)	(-5.481)	(3.993)	(-7.380)
FBIAS	0.3312***	0.2557***	0.3713***	0.1562***	0.5131***
	(21.339)	(16.074)	(21.394)	(12.693)	(21.462)
Constant	0.1405***	0.1187***	0.1682***	0.0878***	0.1921***
	(25.852)	(21.230)	(27.325)	(16.517)	(21.777)
Observations	24,803	25,863	24,839	25,717	24,722
R-squared	0.306	0.189	0.260	0.399	0.258

This table presents results of estimating equation (1). The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 5
Effect of Liquidity on the Relation between Dividend Tax Rates and Expected Rates of Return

	(1) r_ave	(2) r_ct	(3) r_oj	(4) r_gls	(5) r_mpeg
DIVTAXRATE	0.0571***	0.0572***	0.0469***	0.0722***	0.0475***
	(34.005)	(32.619)	(22.961)	(44.083)	(16.945)
AMIHUD	0.0049**	0.0130***	0.0107***	-0.0150***	0.0076**
	(2.311)	(5.405)	(4.300)	(-7.729)	(2.115)
*DIVTAXRATE*AMIHUD*	0.0659***	0.0894***	0.0709***	0.0246**	0.0492**
	(5.895)	(7.355)	(5.318)	(2.512)	(2.482)
INST	-0.0012	0.0002	0.0014	-0.0058***	0.0006
	(-0.898)	(0.126)	(0.914)	(-4.291)	(0.274)
YIELD	0.1056***	0.0989***	0.1100***	0.1385***	0.0942***
	(5.461)	(4.676)	(5.005)	(7.224)	(3.286)
*DIVTAXRATE*YIELD*	0.2951***	0.5521***	0.2962**	0.2884***	0.4698***
	(2.905)	(5.177)	(2.272)	(3.036)	(2.941)
SIZE	-0.0034***	-0.0022***	-0.0037***	-0.0029***	-0.0050***
	(-14.357)	(-8.678)	(-13.970)	(-12.163)	(-13.245)
BM	0.0183***	0.0048***	0.0161***	0.0237***	0.0265***
	(18.224)	(4.903)	(14.145)	(22.717)	(16.228)
ROE	-0.0012	0.0060***	-0.0044***	0.0055***	-0.0129***
	(-1.372)	(5.554)	(-4.232)	(5.717)	(-7.540)
LEV	0.0220***	0.0255***	0.0230***	0.0102***	0.0311***
	(14.105)	(14.573)	(13.172)	(6.640)	(12.882)
BETA_MKTRF	0.0041***	0.0028***	0.0045***	0.0032***	0.0060***
	(12.721)	(8.327)	(12.212)	(9.741)	(11.803)
BETA_SMB	0.0028***	0.0018***	0.0032***	0.0017***	0.0043***
	(10.171)	(6.258)	(10.395)	(6.035)	(9.886)
BETA_HML	-0.0023***	-0.0006***	-0.0023***	-0.0033***	-0.0025***
	(-9.824)	(-2.605)	(-8.695)	(-13.522)	(-7.012)
BETA_UMD	-0.0013***	-0.0007**	-0.0019***	0.0012***	-0.0035***
	(-4.395)	(-2.283)	(-5.576)	(3.991)	(-7.378)
FBIAS	0.3297***	0.2533***	0.3696***	0.1558***	0.5122***
	(21.171)	(15.873)	(21.240)	(12.630)	(21.402)
Constant	0.1384***	0.1161***	0.1659***	0.0873***	0.1904***
	(25.783)	(20.672)	(27.570)	(16.297)	(21.862)
Observations	24,803	25,863	24,839	25,717	24,722
R-squared	0.308	0.192	0.262	0.400	0.258

This table presents results of estimating equation (2). The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 6
Effect of Institutional Ownership on the Relation between Dividend Tax Rates and Expected Rates of Return

	(1) r_ave	(2) r_ct	(3) r_oj	(4) r_gls	(5) r_mpeg
DIVTAXRATE	0.0578***	0.0573***	0.0477***	0.0726***	0.0488***
	(33.898)	(32.023)	(23.100)	(44.167)	(17.347)
AMIHUD	0.0031	0.0103***	0.0087***	-0.0156***	0.0064*
	(1.451)	(4.528)	(3.417)	(-8.382)	(1.764)
INST	-0.0017	-0.0000	0.0009	-0.0061***	-0.0002
	(-1.213)	(-0.009)	(0.562)	(-4.374)	(-0.088)
*DIVTAXRATE*INST*	-0.0344***	-0.0239***	-0.0383***	-0.0156**	-0.0464***
	(-4.555)	(-2.997)	(-4.290)	(-2.296)	(-3.726)
YIELD	0.1032***	0.0956***	0.1076***	0.1375***	0.0924***
	(5.341)	(4.532)	(4.891)	(7.174)	(3.224)
*DIVTAXRATE*YIELD*	0.1069	0.3764***	0.0894	0.2129**	0.2586
	(0.981)	(3.279)	(0.647)	(2.156)	(1.513)
SIZE	-0.0035***	-0.0023***	-0.0038***	-0.0029***	-0.0050***
	(-14.503)	(-9.108)	(-13.986)	(-12.298)	(-13.212)
BM	0.0185***	0.0051***	0.0163***	0.0237***	0.0266***
	(18.533)	(5.253)	(14.394)	(22.820)	(16.368)
ROE	-0.0011	0.0061***	-0.0043***	0.0055***	-0.0129***
	(-1.295)	(5.630)	(-4.171)	(5.730)	(-7.548)
LEV	0.0222***	0.0257***	0.0232***	0.0103***	0.0312***
	(14.196)	(14.650)	(13.260)	(6.664)	(12.930)
BETA_MKTRF	0.0040***	0.0027***	0.0045***	0.0032***	0.0059***
	(12.545)	(8.211)	(12.047)	(9.678)	(11.660)
BETA_SMB	0.0028***	0.0018***	0.0032***	0.0016***	0.0043***
	(10.065)	(6.226)	(10.275)	(5.973)	(9.759)
BETA_HML	-0.0023***	-0.0006**	-0.0023***	-0.0033***	-0.0024***
	(-9.736)	(-2.490)	(-8.606)	(-13.483)	(-6.954)
BETA_UMD	-0.0013***	-0.0007**	-0.0019***	0.0012***	-0.0036***
	(-4.342)	(-2.143)	(-5.535)	(3.999)	(-7.408)
FBIAS	0.3300***	0.2552***	0.3699***	0.1559***	0.5116***
	(21.225)	(16.031)	(21.274)	(12.652)	(21.371)
Constant	0.1399***	0.1184***	0.1675***	0.0877***	0.1913***
	(25.837)	(21.264)	(27.335)	(16.482)	(21.749)
Observations	24,803	25,863	24,839	25,717	24,722
R-squared	0.307	0.190	0.261	0.399	0.259

This table presents results of estimating equation (3). The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 7
Analysis of Omitted Correlated Variable in Prior Studies

	(1) r_ave	(2) r_ct	(3) r_oj	(4) r_gls	(5) r_mpeg
DIVTAXRATE	0.0574***	0.0567***	0.0473***	0.0725***	0.0487***
	(34.103)	(32.264)	(23.174)	(44.207)	(17.454)
AMIHUD	0.0048**	0.0131***	0.0105***	-0.0151***	0.0072**
	(2.259)	(5.414)	(4.230)	(-7.773)	(1.995)
*DIVTAXRATE*AMIHUD*	0.0591***	0.1001***	0.0625***	0.0194*	0.0255
	(4.615)	(7.058)	(4.053)	(1.700)	(1.082)
INST	-0.0014	0.0005	0.0012	-0.0060***	-0.0001
	(-1.007)	(0.332)	(0.751)	(-4.298)	(-0.028)
*DIVTAXRATE*INST*	-0.0103	0.0164*	-0.0129	-0.0079	-0.0361**
	(-1.214)	(1.805)	(-1.272)	(-0.983)	(-2.483)
YIELD	0.1054***	0.0994***	0.1098***	0.1382***	0.0934***
	(5.442)	(4.698)	(4.986)	(7.201)	(3.252)
*DIVTAXRATE*YIELD*	0.2527**	0.6169***	0.2432*	0.2579**	0.3210*
	(2.261)	(5.251)	(1.713)	(2.516)	(1.812)
SIZE	-0.0034***	-0.0022***	-0.0037***	-0.0029***	-0.0050***
	(-14.365)	(-8.651)	(-13.967)	(-12.178)	(-13.239)
BM	0.0183***	0.0047***	0.0161***	0.0237***	0.0265***
	(18.237)	(4.881)	(14.159)	(22.722)	(16.253)
ROE	-0.0012	0.0060***	-0.0044***	0.0055***	-0.0130***
	(-1.377)	(5.564)	(-4.238)	(5.715)	(-7.557)
LEV	0.0221***	0.0255***	0.0230***	0.0102***	0.0312***
	(14.110)	(14.568)	(13.182)	(6.640)	(12.907)
BETA_MKTRF	0.0041***	0.0028***	0.0045***	0.0032***	0.0060***
	(12.665)	(8.372)	(12.153)	(9.703)	(11.706)
BETA_SMB	0.0028***	0.0019***	0.0032***	0.0016***	0.0043***
	(10.103)	(6.314)	(10.314)	(5.990)	(9.769)
BETA_HML	-0.0023***	-0.0006***	-0.0023***	-0.0033***	-0.0025***
	(-9.805)	(-2.628)	(-8.674)	(-13.502)	(-6.975)
BETA_UMD	-0.0013***	-0.0007**	-0.0019***	0.0012***	-0.0036***
	(-4.409)	(-2.261)	(-5.593)	(3.978)	(-7.420)
FBIAS	0.3294***	0.2537***	0.3693***	0.1556***	0.5113***
	(21.148)	(15.904)	(21.213)	(12.615)	(21.353)
Constant	0.1384***	0.1160***	0.1659***	0.0873***	0.1906***
	(25.786)	(20.609)	(27.548)	(16.313)	(21.814)
Observations	24,803	25,863	24,839	25,717	24,722
R-squared	0.308	0.192	0.262	0.400	0.259

This table presents results of estimating equation (4). The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 8
Analysis Using Alternate Proxy for Liquidity

Panel A: Estimation of equation (1) replacing *AMIHUD* with *ESPREAD*

	(1)	(2)	(3)	(4)	(5)
	r_ave	r_ct	r_oj	r_gls	r_mpeg
DIVTAXRATE	0.0537***	0.0517***	0.0410***	0.0771***	0.0393***
	(29.951)	(27.079)	(19.196)	(42.373)	(13.072)
ESPREAD	0.8526***	0.7284***	0.9187***	0.6664***	1.0965***
	(8.954)	(6.883)	(8.247)	(7.245)	(6.920)
INST	0.0028**	0.0024*	0.0040***	0.0030**	0.0040**
	(2.126)	(1.729)	(2.660)	(2.326)	(1.964)
YIELD	0.0141	-0.0050	0.0339	0.0415**	0.0235
	(0.691)	(-0.219)	(1.365)	(2.310)	(0.734)
SIZE	-0.0030***	-0.0026***	-0.0036***	-0.0014***	-0.0046***
	(-13.301)	(-10.741)	(-14.036)	(-6.074)	(-12.566)
BM	0.0156***	0.0034***	0.0137***	0.0197***	0.0227***
	(15.049)	(3.295)	(11.318)	(19.150)	(13.276)
ROE	-0.0015	0.0057***	-0.0047***	0.0050***	-0.0137***
	(-1.557)	(4.667)	(-4.222)	(4.635)	(-7.461)
LEV	0.0223***	0.0256***	0.0230***	0.0118***	0.0303***
	(14.006)	(13.875)	(12.664)	(7.671)	(12.021)
BETA_MKTRF	0.0030***	0.0017***	0.0035***	0.0020***	0.0051***
	(9.636)	(5.272)	(9.526)	(6.405)	(9.987)
BETA_SMB	0.0025***	0.0015***	0.0028***	0.0016***	0.0037***
	(8.799)	(5.039)	(8.659)	(5.806)	(8.138)
BETA_HML	-0.0013***	0.0003	-0.0014***	-0.0018***	-0.0016***
	(-5.250)	(1.400)	(-4.972)	(-7.450)	(-4.188)
BETA_UMD	-0.0014***	-0.0008**	-0.0018***	0.0005*	-0.0033***
	(-4.382)	(-2.555)	(-5.062)	(1.802)	(-6.644)
FBIAS	0.3176***	0.2472***	0.3580***	0.1319***	0.4970***
	(20.053)	(14.900)	(20.200)	(10.548)	(20.589)
Constant	0.1314***	0.1263***	0.1678***	0.0492***	0.1856***
	(25.883)	(24.540)	(28.873)	(9.593)	(22.210)
Observations	20,724	21,585	20,751	21,426	20,653
R-squared	0.323	0.208	0.272	0.434	0.263

This table presents results of estimating a modified version of equation (1) where we replace *AMIHUD* with *ESPREAD*. The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 8 (continued)
Analysis Using Alternate Proxy for Liquidity

Panel B: Estimation of equation (2) replacing *AMIHUD* with *ESPREAD*

	(1)	(2)	(3)	(4)	(5)
	r_ave	**r_ct**	**r_oj**	**r_gls**	**r_mpeg**
DIVTAXRATE	0.0604***	0.0600***	0.0466***	0.0848***	0.0427***
	(26.926)	(25.833)	(17.001)	(41.801)	(10.751)
ESPREAD	0.7168***	0.5678***	0.8157***	0.4993***	1.0867***
	(7.092)	(5.129)	(6.900)	(5.181)	(6.276)
*DIVTAXRATE*ESPREAD*	3.7786***	4.6735***	2.9652***	4.4788***	1.0088
	(4.672)	(5.594)	(3.085)	(6.726)	(0.702)
INST	0.0018	0.0013	0.0032**	0.0020	0.0037*
	(1.354)	(0.888)	(2.105)	(1.498)	(1.758)
YIELD	0.0219	0.0084	0.0404	0.0526***	0.0339
	(1.058)	(0.364)	(1.598)	(2.765)	(1.047)
*DIVTAXRATE*YIELD*	0.4599***	0.6077***	0.4353***	0.4873***	0.5851***
	(4.494)	(5.560)	(3.235)	(4.993)	(3.511)
SIZE	-0.0032***	-0.0027***	-0.0037***	-0.0016***	-0.0047***
	(-13.572)	(-11.158)	(-14.141)	(-6.604)	(-12.416)
BM	0.0155***	0.0033***	0.0136***	0.0196***	0.0225***
	(14.953)	(3.164)	(11.234)	(19.013)	(13.160)
ROE	-0.0017*	0.0055***	-0.0049***	0.0048***	-0.0138***
	(-1.745)	(4.497)	(-4.341)	(4.481)	(-7.483)
LEV	0.0227***	0.0262***	0.0233***	0.0122***	0.0308***
	(14.205)	(14.259)	(12.821)	(7.924)	(12.176)
BETA_MKTRF	0.0030***	0.0017***	0.0035***	0.0020***	0.0051***
	(9.512)	(5.127)	(9.436)	(6.290)	(9.904)
BETA_SMB	0.0025***	0.0015***	0.0028***	0.0015***	0.0037***
	(8.685)	(4.972)	(8.576)	(5.742)	(8.173)
BETA_HML	-0.0013***	0.0003	-0.0014***	-0.0018***	-0.0016***
	(-5.352)	(1.210)	(-5.049)	(-7.603)	(-4.289)
BETA_UMD	-0.0014***	-0.0009***	-0.0018***	0.0005*	-0.0033***
	(-4.473)	(-2.667)	(-5.103)	(1.671)	(-6.595)
FBIAS	0.3166***	0.2460***	0.3573***	0.1307***	0.4971***
	(19.926)	(14.780)	(20.117)	(10.422)	(20.595)
Constant	0.1322***	0.1270***	0.1682***	0.0500***	0.1848***
	(25.794)	(24.530)	(28.727)	(9.714)	(21.996)
Observations	20,724	21,585	20,751	21,426	20,653
R-squared	0.325	0.210	0.273	0.436	0.263

This table presents results of estimating a modified version of equation (2) where we replace *AMIHUD* with *ESPREAD*. The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 8 (continued)
Analysis Using Alternate Proxy for Liquidity

Panel C: Estimation of equation (3) replacing *AMIHUD* with *ESPREAD*

	(1) r_ave	(2) r_ct	(3) r_oj	(4) r_gls	(5) r_mpeg
DIVTAXRATE	0.0562***	0.0541***	0.0436***	0.0788***	0.0428***
	(30.806)	(27.926)	(19.675)	(43.293)	(13.952)
ESPREAD	0.8358***	0.7355***	0.8982***	0.6724***	1.0774***
	(8.627)	(6.847)	(7.939)	(7.162)	(6.701)
INST	0.0017	0.0017	0.0028*	0.0025*	0.0026
	(1.227)	(1.125)	(1.806)	(1.808)	(1.207)
*DIVTAXRATE*INST*	-0.0297***	-0.0192**	-0.0317***	-0.0146**	-0.0391***
	(-3.849)	(-2.384)	(-3.489)	(-2.025)	(-3.046)
YIELD	0.0195	0.0066	0.0381	0.0510***	0.0312
	(0.943)	(0.284)	(1.505)	(2.683)	(0.956)
*DIVTAXRATE*YIELD*	0.2780**	0.4474***	0.2620*	0.3529***	0.4274**
	(2.552)	(3.840)	(1.847)	(3.490)	(2.394)
SIZE	-0.0031***	-0.0026***	-0.0037***	-0.0014***	-0.0047***
	(-13.385)	(-10.753)	(-14.102)	(-6.114)	(-12.631)
BM	0.0154***	0.0032***	0.0135***	0.0195***	0.0224***
	(14.889)	(3.090)	(11.184)	(18.972)	(13.142)
ROE	-0.0015	0.0057***	-0.0048***	0.0049***	-0.0138***
	(-1.639)	(4.619)	(-4.302)	(4.593)	(-7.532)
LEV	0.0226***	0.0261***	0.0233***	0.0121***	0.0307***
	(14.171)	(14.190)	(12.800)	(7.869)	(12.164)
BETA_MKTRF	0.0030***	0.0017***	0.0035***	0.0020***	0.0050***
	(9.381)	(5.059)	(9.313)	(6.200)	(9.779)
BETA_SMB	0.0025***	0.0015***	0.0028***	0.0016***	0.0037***
	(8.724)	(5.075)	(8.567)	(5.830)	(8.085)
BETA_HML	-0.0013***	0.0003	-0.0014***	-0.0018***	-0.0016***
	(-5.364)	(1.214)	(-5.060)	(-7.580)	(-4.294)
BETA_UMD	-0.0014***	-0.0008**	-0.0018***	0.0005*	-0.0033***
	(-4.380)	(-2.499)	(-5.066)	(1.845)	(-6.641)
FBIAS	0.3168***	0.2471***	0.3571***	0.1318***	0.4959***
	(19.978)	(14.883)	(20.121)	(10.535)	(20.530)
Constant	0.1318***	0.1260***	0.1683***	0.0489***	0.1860***
	(25.747)	(24.316)	(28.706)	(9.491)	(22.103)
Observations	20,724	21,585	20,751	21,426	20,653
R-squared	0.324	0.209	0.273	0.435	0.264

This table presents results of estimating a modified version of equation (3) where we replace *AMIHUD* with *ESPREAD*. The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.

Table 8 (continued)
Analysis Using Alternate Proxy for Liquidity

Panel D: Estimation of equation (4) replacing *AMIHUD* with *ESPREAD*

	(1) r_ave	(2) r_ct	(3) r_oj	(4) r_gls	(5) r_mpeg
DIVTAXRATE	0.0601***	0.0602***	0.0461***	0.0851***	0.0414***
	(26.404)	(25.599)	(16.515)	(41.431)	(10.161)
ESPREAD	0.7246***	0.5630***	0.8296***	0.4913***	1.1163***
	(7.165)	(5.088)	(6.994)	(5.114)	(6.372)
*DIVTAXRATE*ESPREAD*	3.2170***	5.0623***	1.9849*	5.0534***	-1.1337
	(3.510)	(5.286)	(1.807)	(6.662)	(-0.677)
INST	0.0015	0.0015	0.0027*	0.0023*	0.0026
	(1.110)	(0.991)	(1.741)	(1.646)	(1.232)
*DIVTAXRATE*INST*	-0.0119	0.0083	-0.0207**	0.0121	-0.0453***
	(-1.397)	(0.913)	(-2.045)	(1.501)	(-3.120)
YIELD	0.0210	0.0092	0.0389	0.0537***	0.0307
	(1.011)	(0.396)	(1.534)	(2.813)	(0.941)
*DIVTAXRATE*YIELD*	0.4070***	0.6432***	0.3425**	0.5380***	0.3818**
	(3.584)	(5.288)	(2.322)	(5.120)	(2.055)
SIZE	-0.0032***	-0.0027***	-0.0037***	-0.0016***	-0.0047***
	(-13.567)	(-11.159)	(-14.133)	(-6.608)	(-12.402)
BM	0.0154***	0.0033***	0.0135***	0.0196***	0.0224***
	(14.940)	(3.172)	(11.213)	(19.021)	(13.133)
ROE	-0.0017*	0.0056***	-0.0049***	0.0048***	-0.0138***
	(-1.751)	(4.501)	(-4.355)	(4.489)	(-7.518)
LEV	0.0227***	0.0262***	0.0233***	0.0122***	0.0307***
	(14.196)	(14.277)	(12.809)	(7.939)	(12.161)
BETA_MKTRF	0.0030***	0.0017***	0.0035***	0.0020***	0.0050***
	(9.442)	(5.149)	(9.341)	(6.341)	(9.768)
BETA_SMB	0.0025***	0.0015***	0.0028***	0.0016***	0.0037***
	(8.650)	(4.989)	(8.521)	(5.775)	(8.101)
BETA_HML	-0.0013***	0.0003	-0.0014***	-0.0018***	-0.0016***
	(-5.354)	(1.211)	(-5.053)	(-7.603)	(-4.298)
BETA_UMD	-0.0014***	-0.0009***	-0.0018***	0.0005*	-0.0033***
	(-4.479)	(-2.664)	(-5.115)	(1.677)	(-6.617)
FBIAS	0.3163***	0.2462***	0.3569***	0.1310***	0.4960***
	(19.907)	(14.798)	(20.084)	(10.446)	(20.548)
Constant	0.1324***	0.1268***	0.1686***	0.0498***	0.1858***
	(25.782)	(24.424)	(28.716)	(9.651)	(22.056)
Observations	20,724	21,585	20,751	21,426	20,653
R-squared	0.325	0.211	0.274	0.436	0.264

This table presents results of estimating a modified version of equation (4) where we replace *AMIHUD* with *ESPREAD*. The dependent variable is *r_ave*, *r_ct*, *r_oj*, *r_gls*, and *r_mpeg* in columns (1)-(5), respectively. See Table 2 for variable definitions. Industry indicator variables are included in the estimation but suppressed in the table. T-statistics are calculated using standard errors clustered by firm and appear in parentheses below coefficient estimates. ***,**, * denote statistically significant at $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively, using a two-tailed test.