Taxes and Ex-Dividend Day Returns: Evidence From REITs

Abstract – The distributions of Real Estate Investment Trusts (REITs) are comprised of components that differ in how they are taxed to the recipient shareholders. This variation in tax characteristics enables us to study the effect of shareholder taxes on stock prices around ex-dividend days, while avoiding the problems associated with non-tax confounding factors and intertemporal tests that have hampered the interpretation of previous studies. Using a dataset that includes the component makeup of individual REIT distributions, we provide evidence that abnormal returns and trading volume around ex-dividend days are driven by the component of the distributions that is most tax-penalized. Our results support a tax-based explanation for ex-dividend day pricing and investor trading behavior.

I. INTRODUCTION

The impact of investor-level taxes on firm value has long been a question of central importance in financial economics. It has implications for stock returns (Brennan, 1970; Litzenberger and Ramaswamy, 1979, 1980, 1982; Dhaliwal, Li, and Trezevant, 2003), cost of capital (Dhaliwal et al., 2005), and capital structure (Modigliani and Miller, 1958, 1963; Graham, 1996a, 1996b, 1999; Dhaliwal, Heitzman, and Li, 2006). Much academic attention in this area has centered on the fact that investors have commonly faced higher tax rates on dividend income than capital gains, which raises the question of whether a tax penalty is capitalized into the share prices of dividend-paying stocks such that investors are compensated for investing in these stocks with higher pre-tax returns.

Because dividends are paid at discrete points, rather than continuously through time, ex-dividend days provide a useful setting for investigating the dividend tax penalty. In this setting the tax hypothesis suggests that the dividend tax penalty should cause stock prices to drop by less than the value of the dividends on ex-dividend days (Elton and Gruber, 1970; Barclay, 1987). While much of the literature reports evidence broadly consistent with this argument, there has been no consensus, as the tax interpretation has been challenged by potential non-tax explanations for ex-dividend day price behavior (Dubofsky, 1992; Bali and Hite, 1998; Frank and Jagannathan, 1998). Further, while much of
the ex-dividend day evidence is based on changes in tax regimes over time, Chetty, Rosenberg, and Saez (2006) argue that the time series of ex-dividend day pricing data is too volatile for reliable inferences from intertemporal tests.1

In this study, we examine the ex-dividend day pricing of Real Estate Investment Trusts (REITs). While the trading of REIT shares is similar to other common stocks, an unusual feature of REIT distributions is that they commonly consist of three components that differ in how they are taxed to the recipient shareholders: (1) a component taxed as ordinary income, (2) a component taxed as a long-term capital gain, and (3) a component classified as a tax-free return of capital.2 These different components present two important advantages for studying ex-dividend day pricing. First, if investor-level taxes are capitalized into stock returns, then the ex-dividend day pricing of REIT shares should vary systematically with the component makeup of the distributions. Because the components differ only with respect to their tax status, this institutional setting allows us to largely avoid complications from non-tax considerations that may have affected previous studies using regular common stocks. Second, the three components vary across REIT distributions, which provides variation in the expected tax penalty without having to rely on intertemporal changes in tax regimes. We exploit these advantages of the REIT setting to study the more general question of how taxes affect share prices.

Our dataset is based on information obtained from the National Association of Real Estate Investment Trusts (NAREIT) that details the taxable makeup of REIT distributions. We partition total yield into the component that is most likely to be tax penalized (ordinary income) and the two components that are less likely to be tax penalized (capital gains and return of capital). When we regress ex-dividend day abnormal returns on these different yield components, we find that the tax-penalized component of yield increases abnormal returns while the other components have no discernable effect. Supplemental analyses reveal that abnormal trading volume around REIT ex-dividend days is also driven by the tax-penalized component of yield. Together, these results support the tax hypothesis that investor-level taxes affect both share prices and trading activities.

By exploiting the REIT institutional setting, we make an important contribution to the literature. We provide strong evidence consistent with shareholder-level taxes affecting share prices and trading activities around ex-dividend days without resorting to intertemporal tests, which recent research suggests are not reliable. Further, because the components we study differ only in their tax characteristics, our results do not support non-tax explanations.

The remainder of this paper is organized as follows. The next section discusses prior literature and the institutional details related to REITs. The third section develops our research design. The fourth section describes our data sources and sample selection. The fifth section presents the empirical results. The sixth section summarizes and concludes.

II. EX-DIVIDEND DAY PRICE BEHAVIOR AND REIT DISTRIBUTIONS

A. Related Literature on Ex-Dividend Day Pricing

In Miller and Modigliani’s (1961) frictionless world, stock prices are predicted to drop by exactly the amount of the

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1 Boyd and Jagannathan (1994) make a similar point.
2 Corporations can also distribute a return of capital in certain circumstances, but it is not nearly as common as it is for REITs.
dividend on ex-dividend days. Several empirical studies, however, report that stock prices tend to drop by less than this amount, leading to positive ex-dividend day returns (see Graham (2003) for a survey). In a seminal study, Elton and Gruber (1970) argue that this result is caused by the capital gains tax rate being lower than the tax rate on dividends. Their argument implies that stock prices must drop by an amount lower than the dividend to compensate the investors who receive the tax-disadvantaged dividend payment. They also show that the price-drop-to-dividend ratio increases with dividend yield, consistent with a clientele effect where higher yield stocks are held by investors facing lower tax rates. Kalay (1982) contends that tax-neutral, short-term arbitrageurs should mitigate abnormal returns around ex-dividend days through arbitrage trading, particularly for high yield stocks. Michaely and Vila (1995, 1996) argue that ex-dividend day pricing is not necessarily determined by any specific tax clientele, but rather a weighted average across investor groups with heterogeneous tax preferences.

Recent research also investigates ex-dividend day pricing in alternative settings. For example, Green and Rydqvist (1999) examine Swedish lottery bonds, which are taxed similarly to common stock except that dividends are tax free (i.e., capital gains are taxable, but dividends are not). The tax explanation predicts that in this setting the ex-dividend day price drop should be greater than the amount of the dividend, and Green and Rydqvist provide evidence consistent with this hypothesis. Other studies in alternative settings also report results that are broadly consistent with tax motivated trading around ex-dividend days. Examples include Callaghan and Barry (2003) in the case of American Depository Receipts, Elton, Gruber, and Blake (2005) in the case of taxable and tax free closed-end funds, and Chay, Choi, and Pontiff (2006) in the case of capital gains distributions from a sample consisting primarily of closed-end funds.

However, the tax explanation has not been without challenge, and consensus on its validity has been elusive. For example, Eades, Hess, and Kim (1984) and Shaw (1991) report evidence of ex-dividend day abnormal returns for non-taxable distributions. More recently, other research proposes non-tax microstructure arguments to justify abnormal returns on ex-dividend days. These studies contend that abnormal ex-dividend day returns should exist even in the absence of tax considerations. For example, Dubofsky (1992) argues that the incomplete price movement on the ex-dividend days is due to limit-order adjustments, Frank and Jagannathan (1998) attribute it to bid-ask bounce, and Bali and Hite (1998) suggest it is an artifact of discrete tick sizes. Finally, another challenge to the tax explanation stems from the fact that many previous studies rely on changes in tax regimes to generate variability in the dividend tax penalty (e.g., Lakonishok and Vermaelen, 1983; Poterba and Summers, 1984; Michaely, 1991; Eades, Hess, and Kim, 1994; Graham, Michaely, and Roberts, 2003). Using a sample period spanning 1962–2004, Chetty, Rosenberg, and Saez (2006) show that the size of the ex-dividend day premium exhibits strong year-to-year fluctuations that over a long time series are not always consistent with the tax explanation. They conclude that results from prior studies may be sensitive to the particular event windows employed, suggesting the importance of research designs that do not depend on changes in tax regimes over time.

By examining REITs, we largely avoid the obstacles that have hindered prior studies. Because REIT distributions are comprised of components that differ only with respect to their tax characteristics, any non-tax explanations for the ex-dividend day anomaly would predict that the com-
ponents have identical effects on pricing. Further, because the composition of yield varies across different REIT distributions, we are able to test the tax hypothesis without relying on tax regime changes.\(^3\)

B. Institutional Background on REITs

The REIT organizational form is essentially a creation of the Internal Revenue Code (Sections 856–860). In most ways, the operations of REITs and the trading of REIT shares are similar to those of regular corporations. REITs are traded on all major U.S. exchanges, are required to file periodic financial statements with the Securities and Exchange Commission (SEC), are followed by securities analysts, are included in major stock market indices such as the S&P 500, are owned by both individuals and institutions, and, as with other corporations, REIT shareholders have limited legal liability. REITs, however, are required by the tax code to maintain minimum levels of both assets and income attributable to real estate activities.\(^4\) REITs are also required to distribute at least 90 percent of their taxable income each year.

REITs are effectively taxed as pass-through entities. They receive deductions for the distributions they pay out, which allows them to avoid taxation at the entity level. However, the income they distribute retains its tax character at the shareholder level. Hence, the tax treatment of REIT distributions differs from other corporations in that ordinary income and capital gains distributed by REITs escape entity-level taxation, but are taxed as ordinary income and capital gains, respectively, to the recipient shareholders.

Moreover, while REITs are required to distribute at least 90 percent of their taxable income, in practice it is common for them to actually distribute more than 100 percent (Wang, Erickson, and Gau, 1993). Large tax deductions for depreciation frequently leave REITs with cash flows in excess of taxable income, enabling larger cash distributions. For tax purposes, distributions in excess of earnings and profits are considered return of capital and are not taxed to the recipient shareholders, but rather reduce the shareholders’ cost basis in the stock. While a return of capital is tax-free in that there is no immediate tax consequence, the basis reduction will eventually be taxed as a capital gain if and when the shareholder sells the stock in the future. In this sense, a return of capital can be thought of as an unrealized capital gain.\(^5\)

To summarize, REIT distributions are comprised of three components for tax purposes: ordinary income, capital gains

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\(^3\) Some other recent research has also examined REITs in the context of shareholder taxes and stock prices (Hardin, Liano, and Huang, 2002; Gentry, Kemsley, and Mayer, 2003; Whitworth and Carter, 2005). While related, our study differs from these in important ways. Hardin, Liano, and Huang (2002) and Whitworth and Carter (2005) focus on potential non-tax explanations for the ex-dividend day behavior of REIT shares and report conflicting results. Rather than focusing on ex-dividend days, Gentry, Kemsley, and Mayer (2003) investigate the relationship between market value of equity and an estimate of available remaining tax deductions from depreciation that are presumed to represent lower taxes on future distributions for investors. Our study complements theirs by focusing on ex-dividend days, which allows for a cleaner measure of the market valuation of REIT distributions. Importantly, our data also allow us to exploit the specific tax composition of each distribution, which the other studies do not.

\(^4\) Detailed discussions of the requirements to qualify for REIT status and the taxation of REITs can be found in Johnson (2006) and Brueggeman and Fisher (2005).

\(^5\) As a simple example, consider a REIT with taxable rental income of $100 and tax depreciation of $20. Assume the REIT also sells some land during the year, resulting in a long-term capital gain of $10. Therefore the REIT’s taxable income for the year is $90 ($100 + $10 – $20). If the REIT distributes $105 for the year, it escapes entity-level tax by deducting the distribution, but the income retains its tax character in the hands of the shareholder. Thus the recipient shareholder would face ordinary income rates on $80 ($100 – $20), long-term capital gains rates on $10, and the remaining $15 would be considered a return of capital. The return of capital portion is not taxable upon receipt, but leads the shareholder to adjust his basis in the stock downwards by $15. Thus the $15 will eventually be taxed as capital gain when the shares are sold in the future.
and return of capital. The ordinary income and capital gains portions are taxed at the recipient shareholders’ marginal ordinary income and capital gains rates, respectively, and the return of capital portion avoids any immediate tax but reduces shareholders’ cost basis and is thus eventually taxed as a capital gain. Therefore, because of the higher rates typically applicable to ordinary income, the ordinary income portion is tax penalized relative to the capital gains and return of capital portions of REIT distributions.

III. FRAMEWORK AND RESEARCH DESIGN

In this section we present a simple model of trading around REIT ex-dividend days to provide a framework for the empirical analyses that follow. The model considers three types of traders. Sellers are those investors who currently own the stock and for some exogenous reasons (e.g., portfolio considerations) have decided to sell their share. Their decision is whether to sell the stock cum-dividend or ex-dividend. Likewise, buyers are those investors who have exogenous reasons to buy the stock and are deciding whether to purchase it cum-dividend or ex-dividend. The third type of trader, arbitrageurs, only trade to the extent that their payoff from doing so exceeds their transaction costs.6 For the analysis we assume that the investors are fully taxable individuals.

A. Seller

Consider a REIT that pays a total cash distribution per share of \( D_{\text{tot}} = D_{\text{ord}} + D_{\text{cg}} + D_{\text{roc}} \), where \( D_{\text{ord}} \), \( D_{\text{cg}} \), and \( D_{\text{roc}} \) are the portions representing ordinary income, capital gain, and return of capital, respectively.

In Elton and Gruber’s (1970) framework, for an existing long-term REIT investor to be indifferent between selling a share immediately before and immediately after it goes ex-dividend, the total after-tax payoffs must be equivalent. That is

\[
(1) \quad P_{\text{cum}} - t_{\text{cg}} (P_{\text{cum}} - P_{\text{basis}}) = P_{\text{ex}} - t_{\text{cg}} (P_{\text{ex}} - P_{\text{basis}}) + D_{\text{ord}} (1 - t_{\text{ord}}) + D_{\text{cg}} (1 - t_{\text{cg}}) + D_{\text{roc}} (1 - t_{\text{cg}}),
\]

where \( P_{\text{basis}} \) is the investor’s cost basis in the stock, \( P_{\text{cum}} \) is the cum-dividend stock price, \( P_{\text{ex}} \) is the expected ex-dividend stock price, \( t_{\text{cg}} \) is the long-term capital gains tax rate and \( t_{\text{ord}} \) is the ordinary income tax rate. The left-hand side of (1) represents the payoff from selling cum-dividend and the right-hand side represents the payoff from selling ex-dividend. We assume that the seller has held the share for at least one year and thus her share price appreciation is subject to the long-term capital gains rate. Therefore, while \( D_{\text{roc}} \) is tax-free upon distribution, because it reduces the investor’s cost basis and the investor is selling the share immediately after the ex-dividend day, it is effectively taxed as a capital gain immediately. Thus, for a seller around the ex-dividend day, the distinction between \( D_{\text{cg}} \) and \( D_{\text{roc}} \) is irrelevant. Rearranging terms, (1) translates into

\[
(2) \quad \text{DROP} = \frac{1 - t_{\text{ord}}}{1 - t_{\text{cg}}} D_{\text{ord}}\% + D_{\text{cg}}\% + D_{\text{roc}}\%,
\]

where \( \text{DROP} \) is the ex-dividend day drop in stock price scaled by the total distribution amount \((P_{\text{cum}} - P_{\text{ex}}) / D_{\text{tot}}\), and \( D_{\text{ord}}\%, D_{\text{cg}}\%, \) and \( D_{\text{roc}}\% \) are the proportions of the distribution representing the various individual components \((D_{\text{ord}} / D_{\text{tot}}, D_{\text{cg}} / D_{\text{tot}}, \) and \( D_{\text{roc}} / D_{\text{tot}} \), respectively). From (2) we see that the price-drop-to-dividend ratio is a function

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6 Because one-way sellers (buyers) are assumed to have already decided to sell (buy) the stock for exogenous reasons, their only remaining choice is whether to transact before or after the stock goes ex-dividend. Thus, for one-way traders, transaction costs are sunk and can be ignored. By contrast, arbitrageurs do not have exogenous reasons to trade, which makes transaction costs relevant for them.
of the taxable makeup of the distribution. If a non-zero portion is taxed as ordinary income (i.e., \(D_{ord} > 0\)) and ordinary income rates exceed long-term capital gains rates (i.e., \(t_{ord} > t_{cg} \)) then the stock price should drop by less than the total amount of the distribution. By contrast, there should be a one-for-one relation between the price drop and the capital gain and return of capital components. Therefore, \(DROP\) should vary between \((1 - t_{ord})/(1 - t_{cg})\) and one, depending on how much of the distribution is taxed as ordinary income.

In ex-dividend day return form, (2) is equivalent to

\[
(3) \quad RET = \frac{t_{ord}}{1 - t_{cg}} YIELD_{ord} + \frac{t_{cg} - t_{cg}'}{1 - t_{cg}} YIELD_{cg} + \frac{t_{roc} - t_{cg}'}{1 - t_{cg}} YIELD_{roc}
\]

\[
= \frac{t_{ord} - t_{cg}'}{1 - t_{cg}} YIELD_{ord}
\]

where \(RET\) = \((P_{ex} - P_{cum} + D) / P_{cum}\)' and \(YIELD_{ord} = D_{ord} / P_{cum}\) and \(YIELD_{cg} = D_{cg} / P_{cum}\)' are the three components of the total yield, \(YIELD_{ord}\) such that \(YIELD_{ord} = YIELD_{cum} + YIELD_{cg} + YIELD_{roc}\). Based on (3), for the seller to sell shares cum-dividend, it must be that

\[
(4) \quad RET \leq \frac{t_{ord} - t_{cg}'}{1 - t_{cg}} YIELD_{ord}.
\]

For the seller to instead sell shares ex-dividend, it must be that

\[
(5) \quad RET \geq \frac{t_{ord} - t_{cg}'}{1 - t_{cg}} YIELD_{ord}.
\]

B. Buyer

For an investor to be indifferent between buying a REIT share immediately before or immediately after it goes ex-dividend, it must be that her after-tax payoff from buying cum-dividend equals her after-tax payoff from buying ex-dividend. That is,

\[
(6) \quad D_{ord}(1 - t_{ord}) + D_{cg}(1 - t_{cg}) + D_{roc}(1 - t_{roc}')
+ (P_{future} - P_{cum})(1 - t_{cg}')
= (P_{future} - P_{ex})(1 - t_{cg}'),
\]

where \(P_{future}\) is the investor’s expected eventual selling price, \(t_{cg}'\) is the present value of the capital gains tax rate that eventually applies when the share is sold (i.e., the capital gains rate discounted to reflect the value of deferral), and the other variables are as previously defined. We assume that the buyer will hold the share for at least one year, thus her share price appreciation faces \(t_{cg}''\) rather than \(t_{ord}'\). The presence of \(D_{roc}(1 - t_{cg}"")\) reflects that the return of capital portion is eventually taxable as capital gain when the tax basis of the share is reduced by \(D_{roc}\) upon sale in the future. Rearranging terms, (6) translates into

\[
(7) \quad DROP = \frac{1 - t_{ord}}{1 - t_{cg}} D_{ord} + \frac{1 - t_{cg}}{1 - t_{cg}'} D_{cg} + \frac{1 - t_{roc}'}{1 - t_{cg}'} D_{roc},
\]

With \(t_{ord} > t_{cg}'' > t_{cg}'\), \(D_{ord}\) causes the stock price to drop by a fraction less than one, \(D_{cg}\) also causes the price to drop by a fraction less than one, but a larger fraction than \(D_{ord}\) and \(D_{roc}\) causes a one-for-one price drop.

In ex-dividend day return form, (7) is equivalent to

\[
(8) \quad RET = \frac{t_{ord} - t_{cg}''}{1 - t_{cg}'} YIELD_{ord}
+ \frac{t_{cg}'' - t_{cg}'}{1 - t_{cg}'} YIELD_{cg}
+ \frac{t_{roc} - t_{roc}''}{1 - t_{cg}'} YIELD_{roc}
\]

\[
= \frac{t_{ord} - t_{cg}'}{1 - t_{cg}} YIELD_{ord}
+ \frac{t_{cg} - t_{cg}'}{1 - t_{cg}} YIELD_{cg}
\]
which suggests that for a marginal buyer, the portion of the yield that is subject to ordinary income taxes increases returns. The capital gains portion also increases returns, but to a lesser extent than ordinary income. Based on (8), for the buyer to buy shares cum-dividend, it must be that

\( RET_{ex} \geq \frac{t_{ord} - t_{sg}'}{1 - t_{sg}'} YIELD_{ord} + \frac{t_{sg} - t_{sg}'}{1 - t_{sg}'} YIELD_{sg} \).

For the buyer to instead buy shares ex-dividend, it must be that

\( RET_{ex} \leq \frac{t_{ord} - t_{sg}'}{1 - t_{sg}'} YIELD_{ord} + \frac{t_{sg} - t_{sg}'}{1 - t_{sg}'} YIELD_{sg} \).

C. Arbitrageur

A short-term arbitrageur trades to exploit abnormal returns around ex-dividend days. Due to the short-term nature of her trades, the arbitrageur’s gains from trade are all effectively taxed as ordinary income, leaving her indifferent with respect to the different components of REIT distributions.\(^7\) However, because the arbitrageur does not have exogenous reasons to trade, transaction costs become relevant and potentially constrain her activities. Thus, for the arbitrageur, the trading conditions around ex-dividend days for REITs mirror those for other common stocks. Similar to the conditions derived by Kalay (1982), for the arbitrageur to buy the share cum-dividend and sell it ex-dividend, it must be that

\( DROP < 1 - \frac{C}{D_{tot}}, \)

where \( C \) represents transaction costs per share. In ex-dividend day return form, (11) becomes

\( RET_{ex} > c, \)

where \( c = C / P_{cum} \).

For the arbitrageur to instead short the share cum-dividend, buy it back ex-dividend, and pay the distribution \( D_{tot} \) to the lender of the share, it must be that

\( DROP > 1 + \frac{C}{D_{tot}}, \)

or, equivalently,

\( RET_{ex} < -c. \)

D. Ex-Dividend Day Returns

For a transaction to occur between any two types of traders, both sets of relevant trading conditions must be simultaneously satisfied. In Table 1, we consider each of the three possible combinations of investor types, for both cum-dividend days and ex-dividend days.

The above analysis has the following implications. First, in the absence of the arbitrageur, the ex-dividend day return should be within the following range (Condition D)

\[
\frac{t_{ord} - t_{sg}'}{1 - t_{sg}'} YIELD_{ord} \leq RET_{ex} \leq \frac{t_{ord} - t_{sg}'}{1 - t_{sg}'} YIELD_{ord} + \frac{t_{sg} - t_{sg}'}{1 - t_{sg}'} YIELD_{sg}.
\]

\(^7\) The arbitrageur’s short-term holding period leaves the basis reduction stemming from any return of capital distribution facing the ordinary income rate. Also, the Internal Revenue Code (Section 857(b)(8)) precludes arbitrageurs from capturing a long-term capital gain distribution at the same time they are receiving short-term capital loss treatment for the price drop on the ex-dividend day. Instead, the price drop from the ex-dividend day is treated as a long-term capital loss to the extent of any long-term capital gain distribution received, thus eliminating the tax rate differential.
If the seller dominates, then the return should be increasing in $YIELD_{ord}$, but not affected by $YIELD_{cg}$ or $YIELD_{roc}$. If the buyer dominates, then the return should be increasing in $YIELD_{ord}$ and, to a lesser extent, $YIELD_{cg}$. The return should not be affected by $YIELD_{roc}$.

Once the arbitrageur is introduced, the outcome depends on the level of transaction costs relative to the amount of tax-penalized yield. The arbitrageur will only be active to the extent it is profitable (i.e., gains from trade exceed transaction costs). While the arbitrageur has incentives to trade until any excess returns are reduced to the level of transaction costs, we are unlikely to observe returns exactly equal to $c$ in equilibrium. A return exactly equaling $c$ relies on the strong assumption that the arbitrageur completely dominates the one-way buyer and seller. With multiple investors, prior research suggests that the ex-dividend day return is determined by a weighted average across investors with heterogeneous tax preferences (Michaely and Vila, 1995, 1996). Therefore, the presence of an active arbitrageur is likely to weaken, but not eliminate, the relation between ex-dividend day return and yield. As the taxable yield increases, it becomes more likely that the arbitrageur can overcome the relevant transaction costs, and therefore, we expect the empirical relation between the return and the yield to weaken as the yield becomes larger. Based on the above argument, our model leads to the prediction that ex-dividend day returns should be a concave function of $YIELD_{ord}$ (and possibly, to a lesser extent, $YIELD_{cg}$).

### Table 1: Ex-Dividend Day Return Conditions

<table>
<thead>
<tr>
<th>Trading Parties</th>
<th>Ex-Dividend Day Return Condition</th>
<th>Trading Possibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seller and Buyer</td>
<td>$\frac{t_{ord} - t_{cg}'}{1-t_{cg}'} YIELD_{ord} + \frac{t_{cg} - t_{cg}'}{1-t_{cg}'} YIELD_{cg} \leq RET \leq \frac{t_{ord}}{1-t_{cg}} YIELD_{ord}$, not possible</td>
<td>No Trade</td>
</tr>
<tr>
<td>Seller and Arbitrageur</td>
<td>$c \leq RET \leq \frac{t_{ord} - t_{cg}}{1-t_{cg}} YIELD_{ord}$</td>
<td>Trade</td>
</tr>
<tr>
<td>Buyer and Arbitrageur</td>
<td>$\frac{t_{ord} - t_{cg}'}{1-t_{cg}'} YIELD_{ord} + \frac{t_{cg} - t_{cg}'}{1-t_{cg}'} YIELD_{cg} \leq RET \leq c$, not possible</td>
<td>No Trade</td>
</tr>
</tbody>
</table>

### Notes:
- Variables are as defined in the text.
- If the seller dominates, then the return should be increasing in $YIELD_{ord}$, but not affected by $YIELD_{cg}$ or $YIELD_{roc}$. If the buyer dominates, then the return should be increasing in $YIELD_{ord}$ and, to a lesser extent, $YIELD_{cg}$. The return should not be affected by $YIELD_{roc}$.

- Once the arbitrageur is introduced, the outcome depends on the level of transaction costs relative to the amount of tax-penalized yield. The arbitrageur will only be active to the extent it is profitable (i.e., gains from trade exceed transaction costs). While the arbitrageur has incentives to trade until any excess returns are reduced to the level of transaction costs, we are unlikely to observe returns exactly equal to $c$ in equilibrium.

- A return exactly equaling $c$ relies on the strong assumption that the arbitrageur completely dominates the one-way buyer and seller. With multiple investors, prior research suggests that the ex-dividend day return is determined by a weighted average across investors with heterogeneous tax preferences (Michaely and Vila, 1995, 1996). Therefore, the presence of an active arbitrageur is likely to weaken, but not eliminate, the relation between ex-dividend day return and yield. As the taxable yield increases, it becomes more likely that the arbitrageur can overcome the relevant transaction costs, and therefore, we expect the empirical relation between the return and the yield to weaken as the yield becomes larger. Based on the above argument, our model leads to the prediction that ex-dividend day returns should be a concave function of $YIELD_{ord}$ (and possibly, to a lesser extent, $YIELD_{cg}$).

That is, returns should first increase in $YIELD_{ord}$ (and possibly $YIELD_{cg}$) but this positive relation should weaken when $YIELD_{ord}$ (or $YIELD_{cg}$) becomes large. Ex-dividend day returns should not be related to $YIELD_{roc}$.
E. Empirical Relation between Ex-Dividend Day Returns and Yield Components

We estimate the parameters of the following basic model to test the effect of the yield components on ex-dividend day abnormal returns (time and firm subscripts are suppressed),

\[
RE Tex = \beta_0 + \beta_1 YIELD_{ord} + \beta_2 YIELD_{cg} + \beta_3 YIELD_{roc} + \beta_4 YIELD_{ord}^2 + \beta_5 YIELD_{cg}^2 + \beta_6 YIELD_{roc}^2 + \beta_7 SPREAD + \epsilon.
\]

We measure \(RE Tex\) as the raw return on the ex-dividend day less an expected return estimated using a market model over the 80 trading days spanning days \((-45, -6)\) and \((+6, +45)\) relative to the ex-dividend day.\(^8\) \(YIELD_{ord}\), \(YIELD_{cg}\) and \(YIELD_{roc}\) are as defined earlier, and \(\epsilon\) is the regression residual. We include \(YIELD_{ord}^2\), \(YIELD_{cg}^2\) and \(YIELD_{roc}^2\) to capture the concavity suggested by our model and documented in the literature (Elton and Gruber, 1970; Naranjo, Nimalendran and Ryngaert, 2000; Cloyd, Li and Weaver, 2006). We also include a control for transaction costs, proxied by bid-ask spread (\(SPREAD\)). We measure \(SPREAD\) as the median value of \(2(ASK - BID)/(ASK + BID)\) during the 11-day period centered on the ex-dividend day, where \(ASK\) is the closing ask price and \(BID\) is the closing bid price. As detailed later, we also estimate variations of this model that include additional controls for various firm- and time-specific factors.

If investor-level taxes affect ex-dividend day stock returns, then we expect the coefficient on \(YIELD_{ord}\) to be positive (\(\beta_1 > 0\)) and the coefficient on \(YIELD_{roc}\) to be zero (\(\beta_3 = 0\)). The prediction for the coefficient on \(YIELD_{cg}\) differs slightly depending on whether the seller or the buyer dominates the price movement on the ex-dividend day, as in (15). If the seller dominates, the coefficient on \(YIELD_{cg}\) should be zero (\(\beta_2 = 0\)). If the buyer dominates, the coefficient on \(YIELD_{cg}\) should be positive but less so than that on \(YIELD_{ord}\) (\(\beta_1 > \beta_2 > 0\)). As yield increases, the short-term arbitrageur becomes more active, causing the relation between return and yield to weaken, and therefore the coefficient on \(YIELD_{ord}^2\) (and possibly \(YIELD_{cg}^2\)) should be negative. The arbitrageur’s incentives to trade are dampened by transaction costs, and thus we expect \(SPREAD\) to have a positive effect on return.

We note that our predictions are based on the implicit assumption that investors have full knowledge of the composition of distributions at the time of the ex-dividend days. To the extent that this assumption is not descriptive and investors are unable to distinguish the various components, it should lead to ex-dividend day pricing that is similar across all components (i.e., pricing inconsistent with our prediction that only the tax-penalized portion drives ex-dividend day returns). While the precise tax composition of REIT distributions is not known with certainty until the end of the year, there are several reasons to believe that market participants can form reasonable expectations of the components prior to the stock going ex-dividend. First, REITs have straightforward business models, with their revenues being generated primarily from stable rent contracts and interest from financing arrangements, which makes their incomes relatively predictable. Second, REITs file

\(^8\) Formally, abnormal returns are computed as \(RETex = RET_i - E(RET)\), where \(RET_i\) is the raw daily return for firm \(i\), \(E(RET) = \hat{\alpha} + \hat{\beta} RET_{mkt}\) is the CRSP daily value-weighted index return, and \(\hat{\alpha}\) and \(\hat{\beta}\) are the estimated coefficients from firm-specific regressions of the form: \(RET_i = \alpha + \beta RET_{mkt} + \epsilon\) (Campbell, Lo, and Mackinley, 1997).
quarterly financial reports with the SEC that are available to the public and include detailed income statements. Third, to the extent that REITs are involved in sizable property sales (the usual source of capital gain income), information regarding the sales is typically disclosed publicly in press releases and/or quarterly SEC filings. Fourth, the distribution policies of REITs tend to be stable. For example, in our sample the year-to-year correlations of the amounts and proportions of the ordinary income and return of capital components are all about 80 percent. Fifth, our review of transcripts from the quarterly earnings conference calls of multiple REITs suggests that distributions are a common topic of discussion and analysts often ask management questions regarding their taxability. For these reasons, it is likely that investors form expectations of the taxable components of distributions by the time of the ex-dividend days.

We focus our primary analyses on ex-dividend day returns because they provide some important empirical advantages relative to price-drop-to-dividend ratios. In particular, several previous studies show that price-drop-to-dividend ratios suffer from small denominator problems, high variance, fat tails and heteroskedastic error terms (Eades, Hess, and Kim, 1984; Boyd and Jagannathan, 1994; Michaely and Vila, 1995; Graham, Michaely, and Roberts, 2003; Chetty, Rosenberg, and Saez, 2006). Further, the effect on the ratio of any price change caused by something other than the dividend itself (error variance in the numerator) is inversely related to the dividend amount (Cloyd, Li, and Weaver, 2006). Overall, these econometric issues render the price-drop-to-dividend ratio an extremely noisy measure, and these problems persist even after trimming extreme observations. Nevertheless, we discuss supplementary results based on price-drop-to-dividend ratios in Section V.C below.

IV. DATA AND SAMPLE SELECTION

We obtain our tax data from NAREIT. Among other services, NAREIT collects information on the tax allocation of distributions from publicly-traded REITs. The NAREIT data include the date and amount of each distribution, as well as the component makeup (i.e., the split between ordinary income, capital gain and return of capital). All other data are from the Center for Research in Security Prices (CRSP), except where otherwise noted.

Our sample is comprised of quarterly distributions from the years 2001–2005. This period straddles the Jobs and Growth Tax Reform Reconciliation Act of 2003 (the 2003 Tax Act) which reduced the tax rate on dividends for individual investors. However, REIT distributions generally do not qualify for the lower dividend tax rates afforded most normal corporate dividends after the 2003 Tax Act because REITs do not pay tax on that income at the corporate level.10 As such, REIT distributions are unaffected by the 2003 Tax Act.

To avoid potential confounding factors stemming from larger, discrete tick sizes (Bali and Hite, 1998), we begin the sample period after the stock exchanges phased in tick size decimalization. Following Graham, Michaely, and Roberts (2003) and Cloyd, Li, and Weaver (2006), we mark this period as beginning on January 29, 2001.

We begin our sample selection by collecting all quarterly distributions with available information from both NAREIT and

---

9 While there can be differences between accounting rules for financial reporting and tax purposes, Gentry, Kemsley, and Mayer (2003) point out that such discrepancies are minimal for REITs (e.g., unlike other firms, REITs typically use straight-line depreciation for both purposes).

10 For the same reason, REIT distributions also do not qualify for the corporate dividends received deduction.
CRSP (2,115 observations). We then apply the following screens. To ensure confidence in the allocation of the total distribution to the three components, we remove observations where the sum of the three components from NAREIT differs from the total quarterly cash distribution reported by CRSP (35 observations). We remove thinly traded observations with zero volume on either the cum-dividend day or the ex-dividend day, because our tests depend on prices set on these two days (23 observations). We also remove observations without the necessary information in CRSP to calculate the ex-dividend day abnormal return (88 observations) or bid-ask spread (48 observations). Finally, to mitigate the effect of outliers, we simultaneously trim any observations with abnormal returns in the highest or lowest percentile of the sample distribution or total yields in the highest percentile (55 observations). The resulting sample contains 1,866 observations from 169 unique REITs (about 11 quarterly observations per REIT, on average).

V. EMPIRICAL RESULTS

A. Descriptive Statistics

Table 2 presents descriptive statistics for our sample. Consistent with most prior research using regular common stocks, the average abnormal return, $RET_{ex}$, is significantly greater than zero (0.0006, $p = 0.0389$) and the average price-drop-to-dividend ratio, $DROP$, is significantly lower than one (0.8970, $p = 0.0001$). These results are consistent with the overall distributions being tax penalized on average relative to capital gains.

REITs tend to have relatively high yields. The average quarterly yield, $YIELD_{tot}$, is about 1.72 percent. In dollar terms, the mean total distribution per share, $D_{tot}$, is roughly 43 cents. On the average, $D_{ord}\%$, $D_{cg}\%$ and $D_{roc}\%$ indicate that about 65.57 percent of the total distribution is taxed as ordinary income, 11.60 percent as capital gains, and 22.83 percent is treated as a return of capital. Thus each component of REIT distributions can be economically significant.

If the market for REIT shares is dominated by institutions that are either tax exempt (e.g., pension funds) or face similar tax rates on ordinary income and capital gains (e.g., banks), then any tax effects on ex-dividend day returns may be attenuated. In untabulated analysis we use data from Thomson Financial to examine the institutional ownership structures of our sample of REITs, as well as all other

<table>
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<th>Mean</th>
<th>Std Dev</th>
<th>Quartile 1</th>
<th>Median</th>
<th>Quartile 3</th>
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</thead>
<tbody>
<tr>
<td>$RET_{ex}$</td>
<td>0.0006</td>
<td>0.0118</td>
<td>-0.0068</td>
<td>0.0012</td>
<td>0.0078</td>
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<td>$DROP$</td>
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</tr>
<tr>
<td>$D_{ord}%$</td>
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<td>0.3000</td>
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<td>0.5500</td>
</tr>
<tr>
<td>$D_{cg}%$</td>
<td>0.6557</td>
<td>0.3053</td>
<td>0.4603</td>
<td>0.7160</td>
<td>0.9224</td>
</tr>
<tr>
<td>$D_{roc}%$</td>
<td>0.1160</td>
<td>0.2039</td>
<td>0.0000</td>
<td>0.0157</td>
<td>0.1433</td>
</tr>
<tr>
<td>$D_{tot}$</td>
<td>0.2283</td>
<td>0.2803</td>
<td>0.0000</td>
<td>0.1248</td>
<td>0.3558</td>
</tr>
<tr>
<td>$YIELD_{ord}$</td>
<td>0.0172</td>
<td>0.0051</td>
<td>0.0140</td>
<td>0.0168</td>
<td>0.0202</td>
</tr>
<tr>
<td>$YIELD_{cg}$</td>
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<td>0.0064</td>
<td>0.0069</td>
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<td>0.0149</td>
</tr>
<tr>
<td>$YIELD_{roc}$</td>
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<td>0.0032</td>
<td>0.0000</td>
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<td>0.0025</td>
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<tr>
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<td>0.0057</td>
<td>0.0000</td>
<td>0.0020</td>
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<td>0.0010</td>
<td>0.0024</td>
<td>0.0073</td>
</tr>
</tbody>
</table>

Notes: Variables are as defined in the text.

We note that we do not find any cases of CRSP using multiple codes for the different components of a given distribution. Thus, CRSP at least partially misclassifies the tax status of most REIT distributions by ignoring their taxable composition and, as such, the NAREIT data provide information that is superior to that available solely from CRSP for our setting.
CRSP firms paying quarterly dividends during the years 2001–2005. We find that the average total institutional ownership of the REITs (54.6 percent) is comparable to, but slightly higher than that of the other dividend-paying firms (44.3 percent). However, many institutional holdings are effectively pass-through entities (e.g., mutual funds and investment advisors) and have underlying shareholders who are still taxed as individuals. Thus, we also separately examine only those institutions that are likely to be tax indifferent with respect to ordinary income and capital gains. We find that REITs also have higher levels of tax indifferent ownership on average (14.8 percent for REITs versus 12.6 percent for dividend-paying corporations), but the magnitude of the difference is small and the levels are both low in absolute terms. Overall, the ownership structures of REITs appear to be reasonably similar to those of the more general population of dividend-paying firms, and taxable individuals likely play a significant role in the pricing of REIT distributions.

In Table 3 we provide information on additional financial, market, ownership, and sector characteristics for the REITs in our sample. To assess whether these characteristics vary with the taxable nature of yield, we present them for subsamples based on the level of non-ordinary yield as well as the full sample. While Table 3 does reveal a few differences across groups, the two subsamples appear quite similar on most dimensions, and where statistical differences do exist, they tend to be of small economic magnitudes. The high non-ordinary yield group tends to be less profitable (as measured by return on equity, ROE) and have higher leverage (LEVERAGE). Given that distribution policies tend to be sticky, this is not surprising. Institutional ownership levels (both total ownership, INSTtot and tax indifferent ownership, INSTindif) are similar across groups. In terms of investment and property sectors, the high non-ordinary yield group is more (less) likely to make equity (mortgage) investments, and is more (less) likely to invest in residential (retail) property. We control for these additional characteristics in the regression analysis presented in the next section.

B. Ex-Dividend Day Abnormal Return Regressions

Table 4 presents the results of regression analyses of ex-dividend day abnormal returns. Model (1) provides an initial baseline, with abnormal returns regressed on total yield and its squared term. The coefficient on total yield (YIELD tot) is positive and significant (0.5287, t = 2.26) and the coefficient on total yield squared (YIELD tot^2) is negative and significant (–18.2241, t = –2.62). This result is consistent with many studies that demonstrate non-linearity in this relation for common stocks (e.g., Cloyd, Li, and Weaver, 2006).

In model (2) the total yield is decomposed into the yield subject to ordinary income taxes (YIELD ord) and the yield subject to either immediate or eventual long-term capital gains taxes (YIELDcg + YIELDroc). Because these components dif-

---

12 As in Moser (2007) and Moser and Puckett (2009), our measure of tax indifferent institutional ownership includes only those institutions that are either tax exempt or face similar rates on ordinary income and capital gains, such as pension funds, charitable endowments, universities, and banks.

13 We also consider changes in the institutional ownership of REITs over time. Similar to Chan, Leung, and Wang (2005) and Hartzzell, Sun, and Titman (2006), we find that institutional ownership tends to increase over time for our sample of REITs. In the regression analyses presented later, we control for changing levels of institutional ownership.

14 For example, if a given REIT experiences lower than normal profitability but holds its total payout stable, more of its yield will qualify as return of capital rather than ordinary income.
under the tax explanation, we expect an association with abnormal returns only for the component of yield that is tax disadvantaged (i.e., the ordinary income component). As argued earlier, if the seller dominates, the distinction between the capital gains and return of capital portions is irrelevant. The estimated coefficient on \( YIELD_{ord} \) is positive and significant (0.4335, \( t = 3.12 \)) and the coefficient on \( YIELD_{ord} \) is negative and significant (–21.9155, \( t = -4.43 \)). The coefficients on \( \text{YIELD}_{cg} + \text{YIELD}_{roc} \) and \( \text{YIELD}_{cg} \) are both insignificantly different from zero. These results are consistent with the argument that only the portion of the distributions that is tax penalized increases ex-dividend day returns.

Total yield is further decomposed into its three components in model (3): ordinary income yield (\( YIELD_{ord} \)), capital gains yield (\( YIELD_{cg} \)), and yield that represents

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Characteristics of REITs by Level of Non-Ordinary Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Sample</td>
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<tr>
<td></td>
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<td>Property Sector (%)</td>
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<td>RETAIL</td>
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<tr>
<td></td>
<td>RESIDENTIAL</td>
</tr>
<tr>
<td></td>
<td>OTHER</td>
</tr>
</tbody>
</table>

Notes: The subsamples are based on the median level of yield not subject to ordinary income rates (capital gains plus return of capital). The number of observations per characteristic varies based on data availability. Continuous variables are winsorized at the extreme percentiles of their respective distributions. Italic font in the high non-ordinary yield columns indicates a significant difference from the corresponding amount for the low-ordinary yield group at \( p < .05 \), based on \( t \)-tests for means and median tests for medians. SIZE is the natural logarithm of market capitalization on the cum-dividend day. BETA is the firm-specific market model coefficient estimated over the days –45 to –6 and +6 to +45 relative to the ex-dividend day. RISK is the standard deviation of firm-specific returns over the market model estimation period, scaled by the standard deviation of market returns over the same period. LEVERAGE is the ratio of total liabilities to total stockholders’ equity. BTM is the book value to market value ratio of common equity. ROE is the ratio of income before extraordinary items to total stockholders’ equity. LEVERAGE, BTM, and ROE are based on information from Compustat and are all measured as of the most recently preceding fiscal year end. INST includes only those institutions that are tax indifferent (pension funds, charitable endowments, universities, and banks). The Investment and Property Sectors classifications are from NAREIT. EQUITY REITs own and operate income-producing real estate. MORTGAGE REITs either lend money to real estate owners or invest in mortgage-backed securities. HYBRID REITs have both equity and mortgage investments. INDUSTRIAL REITs invest in industrial and office space property. RETAIL REITs invest in retail space property. RESIDENTIAL REITs invest in residential property. OTHER REITs invest in other types of property.
| Table 4 | Ex-Dividend Day Abnormal Returns Regressions |
|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| YIELD<sub>tot</sub> | 0.5287 | 0.4335 | 0.3979 | 0.3073 | 0.4648 |
| | (2.26)** | (3.12)*** | (2.96)*** | (2.05)** | (2.03)** |
| (YIELD<sub>cg</sub>+YIELD<sub>roc</sub>)<sup>2</sup> | -0.0382 | 0.0800 | 0.0740 | -0.0961 | (–0.26) |
| | | (0.41) | (0.31) | (–0.32) | |
| YIELD<sub>cg</sub> | | 0.0534 | -0.0061 | -0.1880 | |
| | | (0.36) | (-0.04) | (-0.84) | |
| YIELD<sub>roc</sub> | | | | | |
| YIELD<sub>ord</sub> | | | | | |
| | | | | |
| YIELD<sub>ord</sub> | | | | | |
| | | | | |
| SPREAD | 0.1400 | 0.1188 | 0.1206 | 0.0560 | 0.0762 |
| | (3.99)*** | (3.70)*** | (3.75)*** | (1.20) | (1.58) |
| SIZE | | | | | |
| | | | | |
| RISK | | | | | |
| | | | | |
| LEVERAGE | | | | | |
| | | | | |
| BTM | | | | | |
| | | | | |
| ROE | | | | | |
| | | | | |
| INST<sub>ne</sub> | | | | | |
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| MORTGAGE | | | | | |
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| HYBRID | | | | | |
| | | | | |
| INDUSTRIAL | | | | | |
| | | | | |
| RETAIL | | | | | |
| | | | | |
| RESIDENTIAL | | | | | |
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Fixed Effects:

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Notes: The dependent variable in each model is ex-dividend day abnormal return (RE<sub>T</sub>). Intercepts are included in each model but are not tabulated. Variables are as previously defined. Rogers (1993) heteroskedasticity- and cluster-robust t-statistics (clustered by firm) are presented in parentheses. Asterisks denote significance at the 1% (**), 5% (*) and 10% (*) levels.
return of capital ($YIELD_{nc}$). This specification allows for the possibility that the marginal trader is a buyer who values realized and unrealized capital gains differently (Chay, Choi, and Pontiff, 2006). The estimated coefficient on $YIELD_{ord}$ is again positive and significant (0.3979, $t = 2.96$) and the coefficient on $YIELD_{ord}^{2}$ is negative and significant ($-20.5479$, $t = -4.19$). The coefficients on $YIELD_{cg}$, $YIELD_{cg}^{2}$, $YIELD_{ord}$, and $YIELD_{ord}^{2}$ are all insignificant. The fact that the coefficient on $YIELD_{cg}$ is insignificant implies that the difference between $t_{cg}$ and $t_{ord}$ is relatively small.

The coefficient on $SPREAD$ is positive and significant in models (1)–(3) (0.1400, $t = 3.99$ for model (1); 0.1188, $t = 3.70$ for model (2); and 0.1206, $t = 3.75$ for model (3)), suggesting that arbitrageurs also play a significant role in the ex-dividend day pricing of REITs, consistent with Kalay’s (1982) transaction cost argument.15

We expand models (4) and (5) to control for other potentially relevant firm-level and time period-specific factors. In model (4) we include controls for various firm characteristics as well as time period (year-quarter) fixed effects to control for any differences in ex-dividend day returns across time. The coefficient on $SPREAD$ is insignificant in this specification, but otherwise our inferences are unchanged. The coefficient on $YIELD_{ord}$ remains positive and significant, the coefficient on $YIELD_{ord}^{2}$ remains negative and significant, and the coefficients on $YIELD_{cg}$, $YIELD_{cg}^{2}$, $YIELD_{ord}$, and $YIELD_{ord}^{2}$ all remain insignificant.16

In model (5), we employ an alternative approach to controlling for firm-specific effects by replacing the individual controls with firm-specific fixed effects. Our primary inferences survive in this specification as well. Thus, our results are not merely attributable to other firm-level or time period-specific factors.18

The magnitudes of our estimated coefficients can be assessed at multiple values of $YIELD_{ord}$ to capture the nonlinear nature of the relation between ex-dividend day abnormal returns and ordinary income yield. For example, using the model (5) results and evaluating them at the mean of $YIELD_{ord}$ ($YIELD_{ord} = 0.0112$) and one standard deviation below and above the mean ($YIELD_{ord} = 0.0048$ and $YIELD_{ord} = 0.0176$, respectively) implies marginal effects for...
of 0.0354, 0.2808, and –0.2100, respectively, which are comparable to other recent research on non-REIT common stocks. To give the results more economic content, consider that moving from the minimum value of \(YIELD_{ord}\) (\(YIELD_{ord} = 0.0000\)) to the twenty-fifth percentile (\(YIELD_{ord} = 0.0069\)), the median (\(YIELD_{ord} = 0.0112\)), or the seventy-fifth percentile (\(YIELD_{ord} = 0.0149\)) implies increases in total abnormal returns on ex-dividend days of 23 basis points, 28 basis points, and 27 basis points, respectively.

Overall, the results presented in Table 4 provide strong support for the tax hypothesis. Our models allow us to estimate the associations between ex-dividend day abnormal returns and the individual components of yield while simultaneously controlling for the other components and additional firm- and time-specific factors. Importantly, the results suggest that the returns are driven by the tax-penalized portion of yield, but not the other components. Further, because the yield components differ only in their tax character, these results should not be attributable to non-tax explanations.

C. Additional Analysis

1. Trading Volume around Ex-Dividend Days

To supplement our understanding of the effects of taxes on investor trading activities, we also examine abnormal trading volume around ex-dividend days, which Michaely and Vila (1995, 1996) argue is caused by tax-induced investor heterogeneity. Among the three components of REIT distributions, the ordinary income portion is likely to lead to more tax-induced investor heterogeneity than the other two components and therefore we expect that it is more likely to be associated with abnormal trading volume.

When we regress abnormal volume on total yield for our sample of REITs, the coefficient is positive and significant (results not tabulated), consistent with prior literature examining regular common stocks (Michaely and Vila, 1995, 1996; Dhaliwal and Li, 2006). When we then decompose the total yield into its components, however, we find that this association only holds for the ordinary income component. The estimated coefficient on \(YIELD_{ord}\) is 9.4054, which implies that a one standard deviation increase in ordinary income yield (0.0064) is associated with an increase in abnormal trading volume around the ex-dividend day of about 6 percent (9.4054 x 0.0064 = 0.0602). By contrast, the coefficients on the capital gains and return of capital components are small and statistically indistinguishable from zero. These results suggest that the tax-penalized portion of the distributions drives the abnormal trading volume, consistent with tax-motivated trading around ex-dividend days.

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19 For example, our estimate at one standard deviation below the mean (0.2808) is comparable to estimates from Cloyd, Li, and Weaver (2006) of 0.2788 and 0.5424 for low yield stocks for 2001–2004. Likewise, our estimate at one standard deviation above the mean (–0.2100) appears reasonable compared to their estimates for high yield stocks of –0.3126 and –0.5603.

20 Ignoring non-linearity in the empirical specification, (15) implies theoretical lower and upper bounds for the coefficient on \(YIELD_{ord}\) of \((t_{ord} - t_{cg})/(1 - t_{cg})\) and \((t_{ord} - t_{rc})/(1 - t_{rc})\), respectively. Setting \(t_{ord}\) and \(t_{cg}\) to the top statutory rates (which ranged from 39.1–35 percent for ordinary income and 20–15 percent for capital gains during our sample period) and \(t_{rc}\) to zero, leads to average values of 0.2354 for \((t_{ord} - t_{cg})/(1 - t_{cg})\) and 0.3654 for \((t_{ord} - t_{rc})/(1 - t_{rc})\). Our estimated coefficients for \(YIELD_{ord}\) range from 0.3073 to 0.4648. Thus, despite several simplifying assumptions in the theoretical model, our empirical results also appear reasonably in line with the theoretical values.

21 Our measure of abnormal volume is the average of normalized daily share turnover for the 11-day period centered on the ex-dividend day (Michaely and Vila, 1995, 1996). Normalized daily share turnover is the ratio of a stock’s turnover on that day to the stock’s normal turnover, minus one, and normal turnover is estimated as the daily average over the 80 trading days spanning days (–45, –6) and (+6, +45) relative to the ex-dividend day.
2. Price-Drop-to-Dividend Ratios

While our primary analyses focus on abnormal returns rather than price-drop-to-dividend ratios due to the econometric advantages of using abnormal returns described earlier, as a supplemental analysis we also estimate a regression using \( DROP \) as the dependent variable. As implied by (2) and (7), when \( DROP \) is the dependent variable, the independent variables are the proportions of the total distribution in each of the tax categories (as opposed to the component yields). To avoid perfect collinearity, we include \( Dcg\% \) and \( Droc\% \) but omit \( Dord\% \). Thus, we expect positive coefficients on \( Dcg\% \) and \( Droc\% \) because the capital gain and return of capital components should lead to larger (closer to one) price-drop-to-dividend ratios relative to the ordinary income component. We include \( SPREAD \) to proxy for transaction costs and estimate the model including both firm and time period fixed effects. To capture the nonlinearity associated with high yields, we also include an indicator variable for observations in the largest total yield quartile, along with its interactions with \( Dcg\% \) and \( Droc\% \). We expect the interaction terms to have negative coefficients as arbitrageurs become more active for high yield distributions.22

As expected, the estimated coefficients on \( Dcg\% \) and \( Droc\% \) are both positive, but are only marginally significant (both with \( p < .10 \)), and the high yield interaction terms are both negative, but insignificant (results not tabulated). Overall, these results are consistent with the abnormal return results, albeit less precisely estimated.

VI. SUMMARY AND CONCLUSION

The taxation of REIT distributions provides an unusually clean setting to test the effect of taxes on share prices. REIT distributions are commonly comprised of three components that differ in their tax characteristics for the recipient shareholders: ordinary income, capital gains, and return of capital. These differing tax characteristics suggest that only the ordinary income component of REIT distributions is likely to be tax penalized to any significant degree. This feature of the REIT setting enables us to analyze ex-dividend day pricing while avoiding non-tax confounding factors and without relying on intertemporal tests around tax regime changes, which recent research suggests can be problematic.

Using a dataset containing detailed information on the three different components of REIT distributions, we examine whether ex-dividend day pricing differs across these components. Consistent with the tax hypothesis, we find that the component subject to ordinary income taxes is associated with ex-dividend day abnormal returns while the other two components are not. Supplemental tests of trading volume suggest that the tax-penalized component also drives abnormal trading activity around ex-dividend days. Given that the components of REIT distributions differ only with respect to their tax status in the hands of the recipient shareholders, and thus any non-tax explanations for abnormal returns and volume should apply uniformly to each component, our results provide strong evidence in favor of the tax explanation for ex-dividend day pricing and investor trading behavior.

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