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Multiple clientele influence on ex-dividend day price performance

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ABSTRACT

This paper considers a change in U.S. dividend taxation for qualified public utility stocks from 1982 through 1985. The change affects some of the highest dividend-yielding U.S. stocks and allows individuals to defer payment of income tax on dividends, ultimately paying tax at capital gains rates, and reduces individual income tax rates. This paper examines these stocks' ex-dividend day performance before, during, and after this tax-law change. Results provide evidence that multiple clienteles, not a single marginal investor, determine ex-dividend day pricing for these stocks.

1. Introduction

Extensive literature examines the behavior of stock prices around the ex-dividend day (ex-day). Theories suggest ex-day price performance depends on trading by a single marginal investor who is motivated by tax-induced incentives to trade or hold the stock around the ex-day, or realizes arbitrage opportunities due to low transactions costs, or encounters discreteness in bid-ask spreads. Rantapuska (2008), Graham and Kumar (2006), and Graham, Michaely, and Roberts (2003) provide extensive lists of research explicating single marginal investor theories.

Alternatively, ex-day performance may instead aggregate the effects of trading by multiple investor groups holding or trading a stock around the ex-day. This theory holds that investor or market characteristics limit the ability of a single investor to determine marginal pricing. Consequently, ex-day performance reflects the combination of tax-induced preferences of several investor groups.

This paper examines how the Economic Recovery Tax Act of 1981 (ERTA) affects ex-day price performance of public utility stocks. To facilitate public utility capital formation, ERTA allows individual investors to exclude qualified public utility dividends from income taxation for the 4 years, 1982–1985, provided dividends are reinvested pursuant to a dividend reinvestment plan (Finnerty, 1989). Shares received are taxed upon sale at capital gains rates.

Literature considering ex-day price performance has not examined ERTA's reinvested-dividend exclusion. The high dividend yields of public utility stocks, and ERTA's differential effect on tax-induced trading by various investor groups with incentive to hold or trade these stocks, provide a unique opportunity to examine how investors affect ex-day pricing. Also, most papers considering ex-day performance examine a broad sample of stocks over an extended time period (Chetty, Rosenberg, & Saez, 2007; Whitworth & Rao, 2005). The present paper is distinct in focusing on specific and limited, high dividend-yield stocks over a short time period.

This paper analyzes price change to dividend ($\Delta P/D$) ratios and ex-day returns for ERTA-qualified public utility stocks and for a comparison sample of non-utility high dividend-yield stocks in order to determine the role of various investor groups in ex-day pricing before, during, and after ERTA. A significant change in $\Delta P/D$ ratios and ex-day returns occurs when ERTA alters taxation of individual investors, while ratios and returns continue to reflect corporate preference for dividends. Results are inconsistent with theories relying on a single marginal investor to explain ex-day performance. Rather, ex-day pricing for qualified public utility stocks and non-utility high dividend-yield stocks aggregate the tax-induced preferences of both corporations and individual investors. Multiple investor groups determine ex-day price performance in this study.

2. Ex-day price performance, tax-law revision, and ERTA

Table 1 presents the principal theories in which a single marginal investor's trades determine ex-day price performance, and the corresponding $\Delta P/D$ effects and citations to relevant literature. In the tax-clientele theory (Panel A), tax-induced trading by corporations or individuals determines ex-day pricing that depends on the marginal investor's ordinary income and capital gains tax rates. Under the transactions costs theory (Panel B), tax-neutral arbitrageurs with low transactions costs are the marginal investor and determine ex-day pricing; ex-day performance is independent of tax rates and instead reflects transaction cost bounds. A third theory (Panel C) relies

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Table 1
Theories under which a single marginal investor determines ex-dividend day price performance.
Variables in this table are defined as follows: ΔP is difference between the cum-day price and the expected ex-day price and $\bar{P}$ is the average of the two. D is the amount of the dividend, k is the portion of the dividend a corporation may exclude from income, and τ is a tax rate with subscripts c, o, and g indicating corporate, individual ordinary income, and individual capital gains rates. α is the round trip transaction cost stated as a percentage. d is the largest discrete price change permitted by the market that is less than the dividend.

Investor that determines marginal pricing	$\Delta P/D$ formulas	Representative papers
Panel A. Tax-clientele theory - The marginal investor is the investor with the strongest tax-induced preferences. Price adjusts until that investor is indifferent between purchasing before or after the ex-day.		
Corporation	$\frac{\Delta P}{D} \le 1 + \frac{k\tau_c}{1-\tau_c} - \frac{\alpha\bar{P}}{D}$	Elton and Gruber (1970) Eades, Hess, and Kim (1984) Lakonishok and Vermaelen (1986)
Individual investor	$\frac{\Delta P}{D} = \frac{1-\tau_o}{1-\tau_g}$	Bell and Jenkinson (2002) Zhang et al. (2008)
Panel B. Transaction costs theory - The marginal investor is the investor with lowest transaction costs.		
Arbitrageur	$1 - \frac{\alpha\bar{P}}{D} \le \frac{\Delta P}{D} \le 1 + \frac{\alpha\bar{P}}{D}$	Kalay (1982) Karpoff and Walkling (1988) Koski (1996)
Panel C. Discrete pricing theory - The marginal investor is constrained by interaction of dividends with the market's minimum price movement.		
Arbitrageur	$\frac{\Delta P}{D} = \frac{d}{D}$	Bali and Hite (1998) Frank and Jagannathan (1998)

on discreteness in pricing; as in the transactions costs theory, arbitrageurs are the marginal investor, but pricing depends on discrete bid-ask spreads.

For a marginal investor to determine pricing, ex-day performance must reflect the trading incentives of that investor. If the marginal investor pays tax on dividends at a higher rate than on capital gains, the price drop on the ex-day must be less than the amount of the dividend paid (Elton & Gruber, 1970). When any tax-law change affects this investor, either marginal pricing changes to reflect the new tax treatment of the investor (Bell & Jenkinson, 2002), or a new investor becomes marginal and ex-day performance changes to reflect the new marginal investor's tax-induced preferences. The latter occurs when a tax-law revision reduces the original marginal investor's incentives to trade or hold the stock, or increases another investor's incentives enough that this new investor's trades now determine marginal pricing.

Table 2
Change in $\Delta P/D$ ratios implied by single marginal investor theories due to tax-law revision.
This table indicates the expected magnitude of the $\Delta P/D$ ratio when different investor groups determine marginal ex-day price performance before and after a change in tax law. Each panel specifies the marginal investor prior to the tax-law change and identifies the magnitude of the $\Delta P/D$ ratio set by that investor's trading. Lines within each panel indicate how the $\Delta P/D$ ratio will change after a tax-law revision, depending on which investor group determines marginal prices after the change becomes effective.

Marginal investor after the tax-law revision	$\Delta P/D$ ratio after tax-law revision	Change in $\Delta P/D$ ratio when tax-law revisions become effective
Panel A. Corporation is marginal investor before tax-law revision: $\Delta P/D_{pre} > 1$.		
Corporation	$\Delta P/D_{post} > 1$	No change
Individual investor	$\Delta P/D_{post} \le 1$	Decrease to one or less
Arbitrageur	$\Delta P/D_{post} = 1$	Decrease to one
Panel B. Individual investor is marginal before tax-law revision: $\Delta P/D_{pre} \le 1$.		
Corporation	$\Delta P/D_{post} > 1$	Increase to greater than one
Individual investor	$\Delta P/D_{post} \le 1$	Remain less than or equal to one
Arbitrageur	$\Delta P/D_{post} = 1$	No change or increase to one
Panel C. Arbitrageur is marginal investor before tax-law revision: $\Delta P/D_{pre} = 1$.		
Corporation	$\Delta P/D_{post} > 1$	Increase to greater than one
Individual investor	$\Delta P/D_{post} \le 1$	No change or decrease to less than one
Arbitrageur	$\Delta P/D_{post} = 1$	No change

Table 2 details the expected effect on $\Delta P/D$ ratios if a single marginal investor determines ex-day pricing, and tax law changes. In Panel A, corporations are initially the marginal investor and $\Delta P/D$ ratios exceed one. After a tax-law change, if corporations remain the marginal investor, the $\Delta P/D$ ratio will reflect the new corporate tax rates but remain greater than one. When a change in either individual or corporate taxation causes individual investors to replace corporations as the marginal investor, the new $\Delta P/D$ ratio will no longer exceed one: if dividend tax rates exceed capital gains rates, individual investors will prefer capital gains and $\Delta P/D$ ratios will be less than one; if the rates on dividends and capital gains are equal, individual investors will be indifferent and $\Delta P/D$ ratios will equal one. Similarly, if the tax-law change causes an arbitrageur to become the marginal investor, the new $\Delta P/D$ ratio will equal one. Panel B (C) detail $\Delta P/D$ ratios if individuals (arbitrageurs) are initially the marginal investors and tax-law changes.

Theories that rely on multiple investor groups to determine ex-day pricing also consider tax-induced preferences for dividends or capital gains. In addition, each investor group can be affected differently by non-tax factors, such as risk aversion (Michaely & Vila, 1995), ability to shift trades across time (Grundy, 1985), transactions costs differences (Bhardwaj & Brooks, 1999), and ability to recognize good managers or to add value by monitoring (Allen, Bernardo, & Welch, 2000).

When ex-day performance reflects multiple investors' incentives to hold or trade the stock, change in ex-day pricing due to tax-law revision aggregates the altered incentives of each investor group. The result may be indistinguishable from an ex-day pricing change caused instead by a single marginal investor. Multiple investor determination of ex-day pricing is evident only when the change in performance cannot be explained by any theory that relies on a single marginal investor.

The present study examines ERTA's effect on ex-day performance of qualified public utility stocks for evidence consistent with the single marginal investor or multiple investor theories. The public utility sample and ERTA provide a unique opportunity for such an analysis. The sample stocks are very sensitive to changes in tax-induced preferences due to high dividend yields. A change in dividend and capital gains tax rates has relatively greater effect on high dividend-yield stock returns. Also, trading costs for high dividend-yield stocks are lower relative to the expected price adjustment for dividends than for stocks with low dividend yields, making the arbitrageur's transactions costs bound narrowest in the former. The sample stocks are among the highest dividend-yielding stocks and are attractive both to corporations for dividend capture, and to arbitrageurs and low tax-bracket investors that are indifferent between dividends and capital gains. When dividend tax rates exceed capital gains rates, high tax-bracket individual investors have a strong disincentive to hold these stocks on the ex-day, or to acquire them immediately before; and a strong incentive to sell them immediately prior to the ex-day, or acquire them immediately thereafter.

ERTA temporarily changes the tax treatment of dividends paid by qualified public utilities to individual investors, dramatically altering high tax-bracket individuals' incentives to hold or trade these stocks around the ex-day. From January 1982 through December 1985, ERTA allows individual investors to exclude from income $750 ($1500 joint) of dividends received from qualified public utilities, provided the dividends are automatically reinvested in the company's dividend reinvestment plan. When stock purchased with reinvested dividends is ultimately sold, capital gains tax rates apply. This change affects high tax-bracket individuals' preferences most dramatically. The ratio of dividends net of tax to capital gains net of tax, $(1-\tau_o)/(1-\tau_g)$, normally lower for high tax-bracket taxpayers than any other investor group, equals one during the ERTA period. ERTA eliminates high tax-bracket individuals' disincentive to own these stocks on the ex-day, but does not create a preference for dividends.

ERTA also has a general effect on individual investors' incentives relative to all dividend-paying stocks. Beginning in 1981, ERTA permanently reduces individual income tax rates by approximately 23%, phased-in over 3 years. This provision's effect is greatest for high dividend-yield stocks because the relative decrease in taxes is most pronounced. The rate change reduces all individual investors' disincentive to receive dividends by moderating the difference between ordinary income and capital gains rates. High tax-bracket individual investors are the group most affected by this provision because their disincentive to receive dividends is strongest prior to the revision. However, ERTA's temporary (4-year) dividend-received exclusion for qualified public utility stocks should have the greater influence during its effective period, since it entirely eliminates the disincentive.

While ERTA alters individual investor incentives, it does not change pre-existing corporate tax-induced preference or alter arbitrageurs' trading costs. Corporations retain the incentive to purchase before the ex-day in order to realize tax-advantaged dividend income. That incentive is especially strong for high dividend-yield stocks in which dividend capture is most efficient.

Arbitrageurs (tax neutral investors with low trading costs) are most likely to find arbitrage opportunities when tax-induced trading by individuals and/or corporations is high and relative transactions costs low, that is, in high dividend-yield stocks. Consequently, ERTA provides an opportunity to observe effects on ex-day price performance of trading by several different investor groups.

Multiple investor groups have incentives to hold or trade qualified public utility stocks around the ex-day. ERTA does not change the incentives of corporations or arbitrageurs, so only individual investors' trading activity should change after ERTA. Changes in public utilities' ex-day performance provide information regarding the investors responsible for marginal pricing.

3. Qualified public utility stock sample

The qualified public utility stock sample for this study consists of U.S. public utilities with dividends that qualify (per CRSP and Standard and Poor's Outlook) for the ERTA exclusion. Initially the sample includes all dividends paid in three tax regimes: pre-ERTA (January 1, 1979 through December 31, 1980), ERTA (January 1, 1982 through December 31, 1985), and post-ERTA (January 1, 1986 through December 31, 1986). The sample omits dividends paid in 1981 when $200 ($400 joint) of individual investors' dividends and interest were exempt from tax, double the exemption for prior and subsequent years. The study period allows comparison of ex-day performance before, during, and after ERTA's reinvested-dividend exclusion, and is short enough that noise from other proximate tax-law changes is limited. (Personal tax rates differ before 1979 and the 1986 Tax Reform Act changes tax rates for subsequent years).

The sample is reduced by excluding non-continuous dividend payments (which due to their nature should not attract a particular clientele), dividends that are not regular cash dividends, dividends with an ex-day on which the stock does not trade, and dividends less than $0.125 (Gottlieb and Kalay (1985) discuss the problem of small dividends). To avoid confusing the announcement effects with ex-day pricing, dividends with ex-days less than 3 trading days after dividend announcement are also excluded; the mean (median) time between the announcement and the ex-day is 12 (9) days. The final qualified public utility sample consists of 2617 dividends from 103 firms.

Information on dividends, ex-days, and returns comes from CRSP's Daily Master File. To control for bias due to use of end-of-day prices, $\Delta P/D$ ratios and returns are adjusted for expected return using each stock's beta (calculated from 1981 returns for each stock) and CRSP's value-weighted market index returns (Barclay, 1987; Kalay, 1982).

Annual dividend yields for the sample are 9.57% (1979), 10.76% (1980), 11.19% (1982), 9.78% (1983), 10.61% (1984), 9.11% (1985), and 7.12% (1986). These are approximately double the average common stock dividend yields: 4.74% (1979); 5.06% (1982); 3.44% (1986).

4. Results

4.1. Effect of ERTA's reinvested dividend exclusion and individual tax-rate reduction

$\Delta P/D$ ratios and ex-day returns reflect ex-day price performance in the three study tax-regimes. Ratios greater than one (negative returns) are consistent with corporate preference for dividends, ratios less than one (positive returns) reflect individual investor preference for capital gains, and ratios that equal one (returns equal to zero) suggest tax neutrality consistent with price determination by arbitrageurs.

Table 3 presents results for the qualified public utility sample. The mean $\Delta P/D$ ratio is in Column 1; the t-statistic (in parentheses) tests the hypothesis that the ratio equals one. Panel A contains pre-ERTA data; Panel B, during ERTA; and Panel C, post-ERTA. Ratios are significantly greater than one in each period. Column 4 shows the mean ex-day return and t-statistic testing whether return equals zero. Average returns are significantly negative in each period. Ratios exceeding one and negative ex-day returns indicate that corporations are a tax-induced clientele in each tax-regime.

Columns 2 (5) present the t-statistics and non-parametric Wilcoxon rank sum z-statistics, testing equality of the $\Delta P/D$ ratios (ex-day returns) pre-ERTA with those during ERTA in Panel B, and equality of pre-ERTA with post-ERTA in Panel C. Columns 3 (6) present the results from testing equality of $\Delta P/D$ ratios (ex-day returns) during ERTA with those post-ERTA. Column 7 shows the number of dividends and independent ex-day observations in each tax-regime.

When ERTA becomes effective, the mean $\Delta P/D$ ratio (ex-day return) declines (increases) significantly. Upon expiration of ERTA's reinvested dividend exclusion, $\Delta P/D$ ratios (ex-day returns) increase (decrease) significantly. Pre-ERTA $\Delta P/D$ ratios and ex-day returns are not significantly different from post-ERTA.

This change in ex-day performance occurring from 1982 through 1985 suggests that ERTA's dividend exclusion is the cause. The direction of the change reflects increased individual investor influence on ex-day pricing during ERTA. Post-ERTA reversion indicates that the permanent individual tax rate reduction is not responsible for the change.

Corporate tax-induced preferences alone cannot explain these results. Marginal corporate tax rates are unchanged under ERTA. If corporations are the marginal investor, ERTA should have no effect on $\Delta P/D$ ratios or ex-day returns.

The results do not indicate that individuals or tax-neutral investors become the marginal investor after ERTA. Individuals prefer capital gains before and after ERTA but are indifferent between dividends and capital gains during the exclusion period. If individuals become the marginal traders, pre-ERTA and post-ERTA $\Delta P/D$ ratios will be less than one (ex-day returns greater than zero), but will equal one (zero) during the ERTA. If tax-neutral investors become the marginal traders, $\Delta P/D$ ratios (ex-day returns) will equal one (zero) in all three study tax-regimes.

The results are inconsistent with the existence of a single marginal investor. A significant decrease in $\Delta P/D$ ratios that nevertheless remain greater than one, with an increase in ex-day returns that remain negative, can only occur if both individual investors and corporations influence ex-day performance. The observed results can only occur when multiple investor groups influence ex-day pricing.

Division of the qualified public utility sample into higher and lower dividend-yield subsamples provides results consistent with those of the entire utility sample. Annual dividend yields for the

Table 3
Effect of the Economic Recovery Tax Act of 1981 on $\Delta P/D$ ratios and ex-day returns of qualified public utility stocks.
$\Delta P/D$ ratios and ex-day returns for 103 public utility stocks whose dividends, reinvested in a dividend reinvestment plan, qualify for exclusion from individual income under ERTA. Columns 1(4) present adjusted mean $\Delta P/D$ ratios (adjusted mean ex-day returns). Each observation is an equally-weighted portfolio of all dividends with the same ex-day. Panels A, B, and C indicate results for the three tax-regimes: pre-ERTA, 1979–1980; ERTA, 1982–1985; and post-ERTA, 1986. $\Delta P/D$ ratios are adjusted by adding to the observed ratio the expected return (βr_{market}) divided by the dividend yield (D/P). Returns are adjusted by subtracting the expected return. *t*-Statistics (in parentheses) test the hypotheses that adjusted $\Delta P/D$ ratios equal one (adjusted ex-day returns equal zero). Columns 2 and 3 (5 and 6) present independent sample *t*-statistics and Wilcoxon two-sample rank sum test *z*-statistics for equality of adjusted $\Delta P/D$ ratios (ex-day returns) across regimes. Columns 2 (5), panel B, compare ratios (returns) pre-ERTA to ERTA; panel C, pre-ERTA to post-ERTA. Columns 3 (6), Panel C, compare ratios (returns) during ERTA to post-ERTA. Superscripts "a", "b", and "c" indicate significance at the 1%, 5%, and 10% levels.

(1) Adjusted Mean $\Delta P/D$ (*t*-statistic $H_0: \frac{\Delta P}{D} = 1$)	(2) *t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1979-1980} = \frac{\Delta P}{D}_{1982-1985(\text{PanelB}),\ 1986(\text{PanelC})}$	(3) *t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1982-1985} = \frac{\Delta P}{D}_{1986}$	(4) Adjusted Mean Percent Ex-day Returns: *r* (*t*-statistic $H_0: r = 0$)	(5) *t*-statistic/*z*-statistic $H_0: r_{1979-1980} = r\,pt_{1982-1985(\text{PanelB}),\ 1986(\text{PanelC})}$	(6) *t*-statistic/ *z*-statistic $H_0: r_{1982-1985} = r_{1986}$	(7) No. of dividends/ No. of independent obs.
Panel A: Pre-ERTA						
1.285(10.55)[b]			−0.739(−11.04)[a]			775/337
Panel B: ERTA						
1.133(7.46)[a]	−4.789[a]/−5.040[a]		−0.337(−8.03)[a]	5.079 [a]/5.087[a]		1446/695
Panel C: Post-ERTA						
1.349(6.50)[a]	1.050/0.953	3.815[a]/4.597[a]	−0.604(−6.98)[a]	1.192/1.244	−2.768[b]/−2.801[b]	396/164

higher (lower) dividend-yield subsamples are: for 1979, 10.16% (8.88%); 1980, 11.84% (10.77%); 1982, 12.11% (10.25%); 1983, 10.56% (9.01%); 1984, 12.18% (9.06%); 1985, 10.33% (7.89%); and 1986, 7.81% (6.45%). Average yields for the subsamples are 10.71% (8.90%). Table 4 presents the $\Delta P/D$ ratios of these two subsamples for the three tax-regimes. Results for the higher dividend-yield subsample mirror the full sample and are equally significant. Lower dividend-yield subsample results are similar to the full sample, but with lower statistical significance. Both subsamples' results support multiple investor groups' influence on utility ex-day performance, and suggest that influence increases with dividend yield.

A comparison sample of the highest dividend-yielding U.S. non-utility corporate stocks from 1980 to 1982 is also tested to confirm that results are driven by ERTA and not some other contemporaneous factor. Since the ERTA dividend exclusion does not apply to dividends from non-utility stocks, changes in ex-day performance of this comparison sample should not mirror those for qualified public utilities. Thus, examining the ex-day behavior of high dividend-yielding non-utility stocks serves to establish the robustness of the base results for the qualified public utility sample. Exclusions using criteria described for the qualified public utility sample in Section 3 leave a sample of 58 high dividend-yielding stocks with 1477 dividends. $\Delta P/D$ ratios and ex-day returns for this comparison sample, calculated as for the qualified public utility sample, are tested pre-ERTA, ERTA, and post-ERTA. (For the study period, this sample's dividend yields average 2.61% less than those of the qualified public utility sample.)

Table 5 presents results for this comparison sample. $\Delta P/D$ ratios are not significantly greater than one (ex-day returns, not significantly negative) in any period. Instead, ERTA and post-ERTA ratios are significantly less than one, and returns are significantly positive. This is consistent with arbitrageurs as marginal investors pre-ERTA, while individual investors become marginal during ERTA and post-ERTA. ERTA's permanent tax-rate reduction apparently influences trading in non-utility high dividend-yield stocks. However, these results are not inconsistent with price-setting by a single marginal investor.

4.2. Influence of the Tax Reform Act of 1984 on trading volume and ex-day returns during ERTA

The Tax Reform Act of 1984 (TRA) allows observation of changes in corporate trading volume during ERTA's exclusion period. During 1985 when ERTA provides individual investors a tax advantage for reinvesting qualified public utility dividends, TRA lengthens the holding period required for corporate dividend exclusion from sixteen (twelve

Table 4
Effect of the Economic Recovery Tax Act of 1981 on $\Delta P/D$ ratios of higher and lower dividend-yield subsamples of qualified public utility stocks.
$\Delta P/D$ ratios for the higher dividend-yield half (Part I) and the lower dividend-yield half (Part II) of 103 public utility stocks whose dividends, reinvested in a dividend reinvestment plan, qualify for exclusion from individual income under ERTA. Column 1 presents adjusted mean $\Delta P/D$ ratios. Panels A, B and C indicate results for the three tax-regimes: pre-ERTA, 1979–1980; ERTA, 1982–1985; and post-ERTA, 1986. $\Delta P/D$ ratios are adjusted by adding to the observed ratio the expected return (βr_{market}) divided by the dividend yield (D/P). *t*-Statistics (in parentheses) test the hypotheses that adjusted $\Delta P/D$ ratios equal one. Columns 2 and 3 present independent sample *t*-statistics and Wilcoxon two-sample rank sum test *z*-statistics for equality of adjusted $\Delta P/D$ ratios across regimes. Column 2, Panel B, compares pre-ERTA to ERTA ratios; Panel C, pre-ERTA to post-ERTA. Column 3, Panel C, compares ERTA to post-ERTA ratios. Superscripts "a", "b", and "c" indicate significance at the 1%, 5%, and 10% levels.

Part I. Higher dividend-yield subsample of qualified public utility stocks				Part II. Lower dividend-yield subsample of qualified public utility stocks			
(1) Adjusted Mean $\Delta P/D$ (*t*-statistic $H_0: \frac{\Delta P}{D} = 1$)	(2) *t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1979-1980} = \frac{\Delta P}{D}_{1982-1985(\text{PanelB})\ 1986(\text{PanelC})}$	(3) *t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1982-1985} = \frac{\Delta P}{D}_{1986}$	(4) No. of independent obs.	(1) Adjusted Mean $\Delta P/D$ (*t*-statistic $H_0: \frac{\Delta P}{D} = 1$)	(2) *t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1979-1980} = \frac{\Delta P}{D}_{1982-1985(\text{PanelB})\ 1986(\text{PanelC})}$	(3) *t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1982-1985} = \frac{\Delta P}{D}_{1986}$	(4) No. of independent obs.
Panel A: Pre-ERTA							
1.436(13.68)[a]			241	1.150(3.65)[a]			238
Panel B: ERTA							
1.219(10.71)[a]	−5.937[a]/-5.914[a]		467	1.058(2.31)[b]	−1.993[c]/-2.367[b]		520
Panel C: Post-ERTA							
1.397(6.10)[a]	−0.538/-0.443	2.6223[b]/3.173[b]	110	1.324(4.27)[a]	2.011[c]/1.982[c]	3.330[a]/3.908[a]	124

Table 5
Effect of the Economic Recovery Tax Act of 1981 on $\Delta P/D$ ratios and ex-day returns on the comparison sample of non-utility high dividend-yield stocks.
$\Delta P/D$ ratios and ex-day returns for a sample of 58 non-utility high dividend-yield stocks. Columns 1(4) present adjusted mean $\Delta P/D$ ratios (adjusted mean ex-day returns). Each observation is an equally-weighted portfolio of all dividends with the same ex-day. Panels A, B, and C indicate results for the three tax-regimes: pre-ERTA, 1979–1980; ERTA, 1982–1985; and post-ERTA, 1986. $\Delta P/D$ ratios are adjusted by adding to the observed ratio the expected return (βr_{market}) divided by the dividend yield (D/P). Returns are adjusted by subtracting the expected return. *t*-Statistics (in parentheses) test the hypotheses that adjusted $\Delta P/D$ ratios equal one (adjusted ex-day returns equal zero). Columns 2 and 3 (5 and 6) present independent sample *t*-statistics and Wilcoxon two-sample rank sum test *z*-statistics for equality of adjusted $\Delta P/D$ ratios (ex-day returns) across regimes. Columns 2 (5), panel B, compare ratios (returns) pre-ERTA to ERTA; panel C, pre-ERTA to post-ERTA. Columns 3 (6), Panel C, compare ratios (returns) during ERTA to post-ERTA. Superscripts "a", "b", and "c" indicate significance at the 1%, 5%, and 10% levels.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Adjusted Mean $\Delta P/D$ (t-statistic $H_0: \frac{\Delta P}{D} = 1$)	*t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1979-1980} = \frac{\Delta P}{D}_{1982-1985(\text{PanelB}),\ 1986(\text{PanelC})}$	*t*-statistic/ *z*-statistic $H_0: \frac{\Delta P}{D}_{1982-1985} = \frac{\Delta P}{D}_{1986}$	Adjusted Mean Percent Ex-day Returns: *r* (*t*-statistic H_0: $r=0$)	*t*-statistic/*z*-statistic H_0: $r_{1979-1980} = r_{1982-1985(\text{PanelB}),\ 1986(\text{PanelC})}$	*t*-statistic/ *z*-statistic H_0: $r_{1982-1985} = r_{1986}$	No. of dividends/No. of independent obs.
Panel A: Pre-ERTA						
1.071(1.53)			−0.146(−1.65)			415/244
Panel B: ERTA						
0.932(2.22)[c]	−2.555[c]/−2.638[c]		0.147(2.79)[c]	2.844[b]/2.738[c]		848/502
Panel C: Post-ERTA						
0.677(2.27)[c]	−2.637[c]/−2.320	−1.755/−0.944	0.192(1.57)	2.242[c]/2.182[c]	0.334/0.348	214/130

trading) days to 46 (33 trading) days, making corporate dividend-trading less advantageous. Figs. 1 and 2 show how the public utility stock sample's daily trading volume (mean excess return) change before and after TRA's effective date. These figures present the daily percent of normal trading volume (mean excess return) beginning 33 trading days before and ending 33 days after the ex-day, to determine how TRA-induced changes in corporate dividend-capture activity affect trading. (Normal volume is calculated from days −96 to −34; normal returns from days −283 to −34.)

Before TRA, trading volume exceeds the average on each of the 12 trading days before the ex-day and is significant on 11 days; excess returns are positive each day except −11, −2, and −1, and statistically significant on 3 days. Volume peaks on the ex-day and drops to average or below average thereafter. Returns are significantly negative on the ex-day and for ten of the next 12 days.

After TRA, greater than normal trading volume before the ex-day disappears, as do positive excess returns. Volume on the ex-day is much greater (684% of normal compared to 295% before TRA).

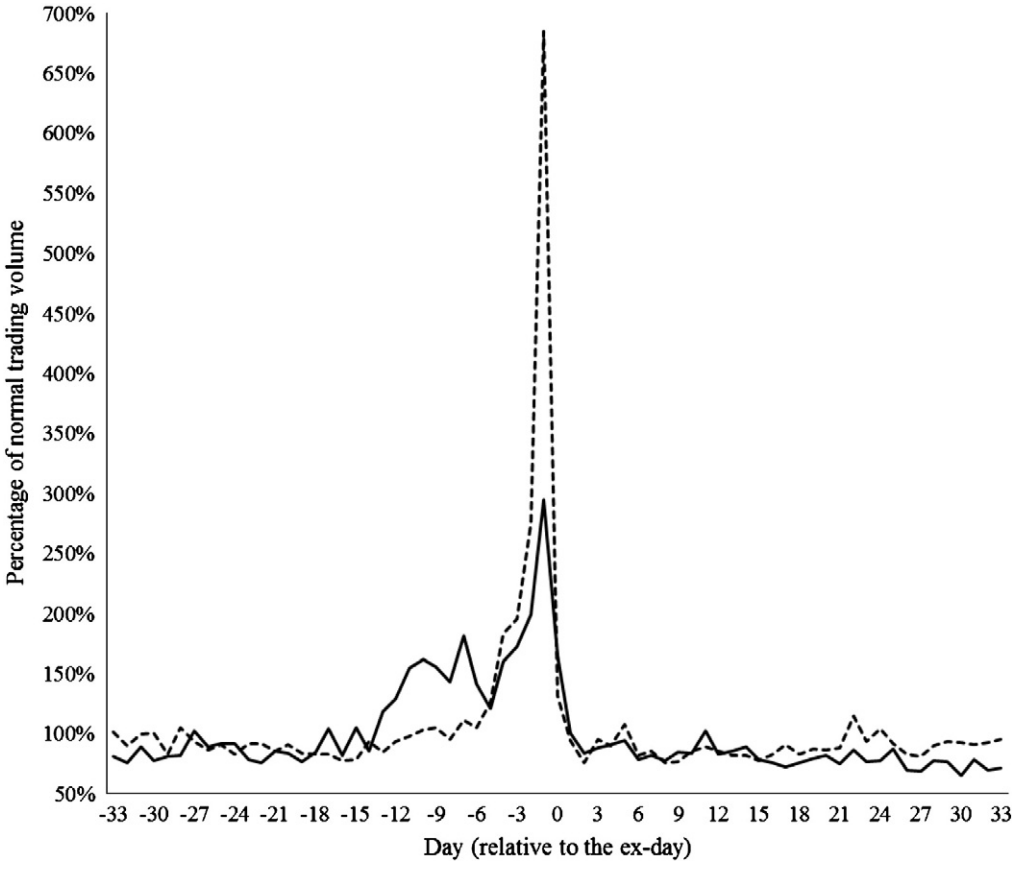

Fig. 1. Trading volume around the ex-day before and after Tax Reform Act of 1984. Solid (dashed) lines depict percent of normal trading volume for qualified public utility stocks before (after) TRA. Normal trading volume is based on days −96 to −34. Day zero is the ex-day.

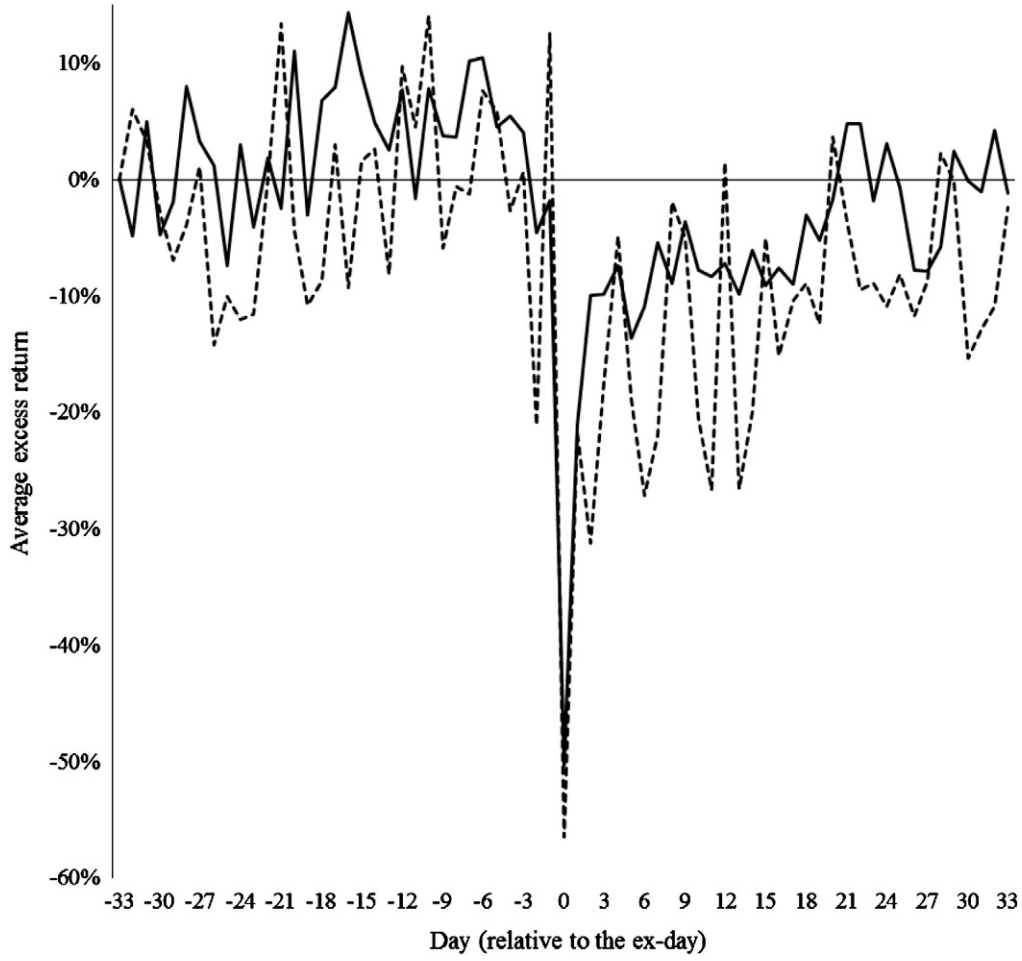

Fig. 2. Excess returns around the ex-day before and after Tax Reform Act of 1984. Solid (dashed) lines depict average excess returns for qualified public utility stocks around the ex-day before (after) TRA. Normal return is average return for days −283 to −34. Day zero is the ex-day.

Returns are negative on the ex-day and remain negative for two weeks, but do not differ significantly from those before TRA except on days +2 and +11 (Fig. 2).

Since TRA's provisions only affect timing of corporate trading, results demonstrate that corporations are active in dividend-capture trading during ERTA, both before and after TRA. These results reinforce the evidence presented in Section 4.1 that ERTA does not cause individuals to replace corporations as the marginal investor in the qualified public utility stock sample; corporate dividend-capture continues during ERTA. TRA results provide additional evidence that changes observed in $\Delta P/D$ ratios and ex-day returns arise from trading by multiple investor groups rather than a single marginal investor.

4.3. Controlling for dividend yield's effect on ex-day returns

Dividend yields affect investors' relative demand for a stock (Boyd & Jagannathan, 1994; Whitworth & Rao, 2005). When yield changes coincide with a tax-law revision, changes in ex-day pricing actually due to dividend yield-related demand can be erroneously attributed to taxes. Two components, dividend yield and tax-induced preference, affect ex-day return as follows:

$$r_i \equiv Y_i\left(1-\frac{P_{i,t-1}-P_{i,t}}{D_{i,t}}\right). \quad (1)$$

Ex-day return r_i depends on the dividend yield Y_i and the $\Delta P/D$ ratio, $(P_{i,t-1}-P_{i,t})/D_{i,t}$. ($Y_i = D_{i,t}/P_{i,t-1}$, where $P_{i,t-1}$ is the price of stock i on the cum-dividend day and $D_{i,t}$ is the amount of the dividend).

For the single marginal investor theory, the fraction within the parenthetical expression $(1-\Delta P/D)$ is either uniquely determined by the marginal investor's ordinary income and capital gains tax rates, or is bounded by the arbitrageurs' transactions costs. When a change in tax law alters the marginal investor's relative tax rates, the change in the parenthetical expression leads to a change in ex-day performance. When dividend yield is constant, the change in ex-day return depends only on the change in taxes.

Dividend yield influences investors' portfolio selections. Consequently, a change in dividend yield may alter an investor's demand for the stock even in the absence of a tax-law change. If a change in dividend yield causes a new investor to become the marginal shareholder, the parenthetical expression will change to reflect the new marginal investor's preference for dividends and capital gains. This change in both components of the ex-day return alters ex-day price performance even if tax treatment of the initial marginal investor remains the same.

Regression analysis controls for changes in price performance due to changes in dividend yield. Ex-day returns are the dependent variable and the dividend yield together with binary variables to isolate the three study tax-regimes are the independent variables. (Bell and Jenkinson (2002) use a similar approach to study changing U.K. taxation

and ex-day performance of British stocks.) The regression equation is:

$$r_i = \alpha + \beta_1 Y_i + \beta_2 I_{ERTA} Y_i + \beta_3 I_{post-ERTA} Y_i + \varepsilon_i. \quad (2)$$

(r_i is the ex-day return associated with dividend i, Y_i is the dividend yield, and I_{ERTA} and $I_{post\text{-}ERTA}$ are dummy variables. I_{ERTA} is zero for 1979, 1980 and 1986, and one for 1982–1985. $I_{post\text{-}ERTA}$ is zero in 1979, 1980, and 1982–1985, and one in 1986.)

The intercept is expected to equal zero. The slope β_1 is the pre-ERTA coefficient for the dividend yield; it provides an estimate of 1-$\Delta P/D$ before ERTA. If β_1 differs from zero, the pre-ERTA $\Delta P/D$ ratio differs from one. When it is significant, investors' tax-induced preferences for dividends and capital gains significantly affect ex-day returns after controlling for dividend yield. A negative (positive) value for β_1 indicates that the average $\Delta P/D$ ratio is greater (less) than one, consistent with pre-ERTA price-setting by corporations (individual investors). A β_1 not significantly different from zero suggests that tax-neutral investors or arbitrageurs determine pre-ERTA ex-day pricing. A similar intuition applies to $\beta_1+\beta_2$ ($\beta_1+\beta_3$) for ex-day returns during ERTA (post-ERTA).

The coefficient β_2 captures the change in the $\Delta P/D$ ratio from pre-ERTA to during ERTA after controlling for dividend yield, and the coefficient for β_3, from pre- to post-ERTA. When β_2 is significantly different from zero, investors' relative preferences for dividends and capital gains pre-ERTA differ from their preference during ERTA. A non-significant β_2 indicates that any difference in pre-ERTA ex-day returns from returns during ERTA is entirely due to differences in dividend yields. Similarly, a significant value for β_3 indicates a difference in pre- and post-ERTA investor tax-induced preferences, while non-significance indicates that differences in pre- and post-ERTA ex-day returns are due to differences in dividend yields. Ex-day return differences due to changes in investor preferences (changes in dividend yields) from the ERTA period to post-ERTA are indicated by significance (non-significance) of the difference between β_2 and β_3.

The results of the regression for the qualified public utility sample are:

$$r_i = \underset{(0.812)}{0.0017} - \underset{(-4.320^a)}{0.3162} Y_i + \underset{(5.579^a)}{0.1638} I_{ERTA} Y_i + \underset{(-1.062)}{0.0692} I_{post-ERTA} Y_i + \varepsilon_i.$$

(The adjusted R^2 for the regression is 0.032 and the F-statistic is 14.04. *t*-Statistics appear in parentheses; [a] indicates significance at the 1% level.)

Controlling for changes in dividend yield reinforce the results of the two sample t-tests for qualified public utility stocks presented in Section 4.1. The intercept does not differ from zero. In each period, the relationship between the dividend yield and the ex-day return is negative; $\beta_1<0$, $\beta_1+\beta_2<0$, and $\beta_1+\beta_3<0$ (i.e., $\Delta P/D>1$). Ex-day performance reflects a preference for dividends, that is, corporate trading, in each period.

The ERTA period dummy β_2 is significantly greater than zero and greater than β_3. (The F-statistic testing $\beta_2=\beta_3$ is 13.56). $\Delta P/D$ ratios are greater during ERTA than they are pre- or post- ERTA, and the difference cannot be explained by changes in dividend yields. Yet $\Delta P/D$ ratios continue to reflect a corporate preference for dividends. As in Section 4.1, a tax-law change affecting only individuals causes a significant change in ex-day returns without individuals becoming a new marginal investor. Trading by multiple investor groups influences returns in these ERTA-qualified public utility stocks.

Pre- and post-ERTA $\Delta P/D$ ratios do not differ (β_3 is not significantly different from 0), so relative preferences for dividends and capital gains are the same in these tax-regimes; any difference in returns is due to differences in dividend yield. After controlling for dividend yield, pre- and post-ERTA ex-day returns are not significantly different from one another. The change observed during ERTA disappears when the dividend exclusion expires.

Differences in regression analysis results for the non-utility high dividend-yield comparison sample are consistent with ERTA's different tax treatment of dividends from public utility and comparison sample firms. Results for the comparison sample are:

$$r_i = \underset{(0.752)}{0.0014} - \underset{(-1.460)}{0.1479} Y_i + \underset{(3.288^a)}{0.1666} I_{ERTA} Y_i - \underset{(0.861)}{0.0924} I_{post-ERTA} Y_i + \varepsilon_i.$$

(The adjusted-R^2 for the regression is 0.009 and the *F* statistic is 3.67. *t*-Statistics appear in parentheses; [a] indicates significance at the 1% level.)

The intercept is not significantly different from zero. β_1 is negative but not significant. After controlling for dividend yield, ex-day returns do not differ significantly from zero, that is, the results do not allow rejection of $\Delta P/D=1$. The negative sign provides weak evidence of pre-ERTA corporate tax preferences; non-significance indicates that arbitrageurs are the marginal investor.

The ERTA dummy β_2 is significantly greater than zero, and β_3 is positive but not significant. Both ERTA and post-ERTA ex-day returns suggest increased individual investor influence. Unlike results for the public utility sample, post-ERTA returns for the non-utility high dividend-yield comparison sample do not revert to pre-ERTA levels. In the comparison sample, the difference between β_2 and β_3 is not significant (*F*-statistic: 0.527), indicating that any difference between ex-day returns during ERTA and post-ERTA returns is attributable to dividend yields rather than tax-induced preferences. This suggests that ERTA's permanent individual tax rate reduction, rather than the reinvested dividend exclusion (which does not apply to these non-utility high dividend-yield stocks), is responsible for the change.

Low levels of significance in the comparison sample limit the conclusions from this sample's regression results. There is weak evidence of both corporate and arbitrageur influence on pre-ERTA ex-day returns, weak evidence of both individual investor and arbitrageur influence on ex-day returns during and post-ERTA, and stronger evidence that individuals' effect on returns increases with ERTA's permanent tax-rate reduction.

5. Relationship to multiple investor theories

This paper provides evidence that multiple investor groups influence ex-day pricing, but provides no specific support for existing theories that rely on multiple investors to explain ex-day performance. Ex-day pricing during ERTA is not affected by investors' risk aversion because the dividend-received exclusion is optional and subject to a statutory dollar limit. Also, ERTA neither requires investors to change the timing of their trades nor alters trading costs.

The higher dividend yield of the qualified public utility stocks should predict greater arbitrageur influence on the ex-day pricing of these stocks. Instead, the utility sample results show strong evidence that corporations and individual investors affect returns, but no evidence of increased arbitrageur influence. Some evidence of arbitrageur determination of ex-day performance does exist in the non-utility high dividend-yield comparison sample results.

Some studies that test specific theories of trading by multiple investor groups rely in part on trading volume (Michaely & Vila, 1995; Zhang, Farrell, & Brown, 2008). The pre-ERTA, ERTA, and post-ERTA tax-regimes are relatively short, and TRA's increase in the corporate holding period may confound results otherwise arising from changes in tax heterogeneity. These two factors preclude thorough analysis of changes in trading volume, so in the present study volume is considered only to confirm continued corporate trading in qualified public utility stocks before and after TRA.

Results of the present study regarding the influence of multiple investor groups are similar to those anticipated by Rice (1994), in

which the aggregate reaction of all stockholders determines stock price response to management decisions. However, that paper does not address how multiple investor groups may affect pricing when new information is absent.

6. Summary and conclusions

This paper examines ex-dividend day price performance of qualified public utility stocks and non-utility high dividend-yield stocks before, during, and after the Economic Recovery Tax Act of 1981, for evidence of trading by tax-induced clienteles. No previous study considers the effect of ERTA's reinvested dividend exclusion and tax-rate reduction on the ex-day performance of these limited samples.

Results confirm the existence of tax-induced dividend clienteles in ERTA-qualified public utility stocks. Before ERTA, $\Delta P/D$ ratios in these stocks are greater than one and ex-day returns are negative, consistent with trading by corporations to capture the dividend. When ERTA's reinvested dividend exclusion becomes effective for individuals, $\Delta P/D$ ratios decrease significantly and ex-day returns increase significantly, reflecting individual investor reaction to ERTA. However, individuals do not become the single marginal investor, as ratios remain significantly greater than one and returns significantly negative during ERTA; ex-day performance continues to reflect corporate trading. When the reinvested dividend exclusion expires, $\Delta P/D$ ratios and ex-day returns revert to pre-ERTA levels. These results show that multiple investor groups rather than a single marginal investor determine ex-day pricing in these utility stocks.

Results for the qualified public utility stocks are robust to division into higher and lower dividend-yield subsamples, and to regression analysis controlling for dividend yields. Changes in trading patterns due to lengthening the required corporate holding period for dividend capture (imposed by the Tax Reform Act of 1984) confirm that both individual investors and corporations influence ex-day pricing during ERTA's reinvested-dividend exclusion period.

A comparison sample of non-utility high dividend-yield stocks provides statistically weaker evidence of the influence of multiple investor groups. Before ERTA, corporate dividend-capture trading occurs. When ERTA becomes effective, $\Delta P/D$ ratios decrease and ex-day returns increase, suggesting greater influence of individual investor trading on ex-day pricing. Unlike the public utility sample, comparison sample ratios and returns do not revert to pre-ERTA levels when the ERTA reinvested-dividend exclusion expires. Instead, the effect of ERTA's permanent reduction in individual tax-rates is observed for this non-utility high dividend-yield sample. Evidence of multiple investor influence (individuals and arbitrageurs) on ex-day price performance in the comparison sample is strongest in regression results, which isolate the effect of tax laws from that of dividend yields.

Results in this paper are inconsistent with theories that ex-day performance depends on trading incentives of a single marginal investor. Significant changes occur in $\Delta P/D$ ratios and ex-day returns that cannot be explained in the single marginal investor theories. Observed ex-day price performance in the qualified public utility and non-utility high dividend-yield samples aggregates the effect of tax-induced incentives of multiple investors.

In addition to the evidence that multiple investor groups determine marginal pricing on ex-days for qualified public utilities, these results may provide guidance for firms concerned about dividend policy. Like the stocks studied, other stocks are likely to be held by multiple investor groups and hence multiple tax clienteles. Attempting to identify and cater to a single investor group whose tax treatment or investment goals are consistent with a firm's dividend policy may lead to a sub-optimal strategy.

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