Personal Dividend and Capital Gains Taxes:
Further Examination of the Signaling Bang for the Buck

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Abstract

In this study, we examine the impact of dividend and capital gains taxes on dividend-increase announcement returns. Consistent with Bernheim and Wantz (1995), we find dividend announcement returns increase in the dividend tax rate. In contrast to existing signaling models, however, we also find robust evidence that dividend announcement returns increase in the capital gains tax rate. This anomalous new result sheds new light on the bang-for-the-buck findings in Bernheim and Wantz (1995) and it raises new questions regarding the role for personal taxes in dividend announcement returns.

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Paying dividends increases the portion of returns subject to dividend taxes and decreases the portion subject to capital gains taxes. Hence, the net tax cost of dividends increases in the dividend tax rate and decreases in the capital gains tax rate. Following Bhattacharya (1979), many models posit that this net tax cost deters weak firms from mimicking the dividend behavior of strong firms. Hence, the signaling bang-for-the-buck from paying dividends should increase in the net tax rate.

To test this prediction, Bernheim and Wantz (1995) constructs a single, net variable to reflect both tax rates. Consistent with expectations, the authors find that dividend-increase announcement returns increase in the net personal tax rate on dividends, which supports traditional signaling models. Importantly, however, the authors focus entirely on the net tax cost of dividends – they do not provide direct evidence that dividend announcement returns decrease in the capital gains tax rate as traditional signaling models imply.

In this study, therefore, we directly examine the opposing predictions for dividend versus capital gains taxes. In particular, we construct period-specific measures for each tax rate, and we then test the tax effects for a sample of 16,355 dividend-increase announcements from 1971 to 2001. To ensure robustness, we control for a variety of firm-level factors, including size, dividend yield, Tobin's *q*, and share price, and we control for period-specific economic factors such as the growth rate of industrial production, the inflation rate, interest rates, and the time-series trend in dividend announcement returns. In some tests, we fix industry and year effects to control for the mean influence of any other potentially omitted industry- or period-specific variables. In addition, we use two general approaches to control for the magnitude of dividend increases – a linear approach in which we interact tax rates with dividend changes, and a portfolio approach in which we partition the sample according to the magnitude of dividend changes.

In all cases, we find that dividend-increase announcement returns increase in the net tax rate on dividends as well as in the dividend tax rate, which confirms the evidence in Bernheim and Wantz (1995). In contrast to traditional signaling models, however, we also find strong evidence that dividend-increase announcement returns increase in the capital gains tax rate. Empirically, this latter result is quite robust. In fact, we find the capital gains tax rate result is robust to our use of a sample of dividend initiations, whereas the net tax rate result is not. We view this positive relation between dividend announcement returns and the capital gains tax rate as an anomaly that raises new questions regarding the role for personal capital gains taxes in returns. Among other things, it sheds new light on the findings in Bernheim and Wantz (1995), and it suggests that existing signaling models may need to be reconsidered.

The study proceeds as follows. First, we specify predictions from traditional signaling models. Second, we develop the primary research methodology. Third, we describe the data and provide our primary empirical results. Fourth, we present results from robustness tests. Finally, we conclude.

I. Personal Tax Effects

As previously noted, increasing dividends increases the portion of a shareholder's return subject to dividend taxes and decreases the portion subject to capital gains taxes. Therefore, Bernheim and Wantz (1995) and many other researchers measure the tax on dividends net of the capital gains tax benefit as follows:

$$\lambda = \left[\frac{t_{ds} - t_{ga}}{1 - t_{ga}} \right], \tag{1}$$

where λ is the net personal tax on dividends, t_{ds} is the dividend tax rate, and t_{ga} is the accrual-equivalent capital gains tax rate (defined below).

According to standard signaling models, the signaling bang-for-the-buck increases in the net personal tax cost of dividends, λ. More precisely, (1) implies the signaling bang-for-the-buck, as measured by dividend-increase announcement returns, should increase in the dividend tax rate and decrease in the capital gains tax rate.

Measuring the effect of personal taxes using equation (1), Bernheim and Wantz (1995) provides evidence that dividend-increase announcement returns increase in the dividend tax rate. However, Bernheim and Wantz focus exclusively on the net tax rate on dividends, so they do not provide any specific evidence that announcement returns decrease in the capital gains tax as predicted. In this study, we examine this separate prediction.

II. Primary Research Methodology

A. Measuring the Tax Rates

To implement equation (1) empirically, we must first measure t_{ds} and t_{ga}. One option could be to develop firm-specific measures for the tax rates, possibly based on ownership structure. However, Bernheim and Wantz (1995) point out several compelling theoretical and practical pitfalls associated with this approach, so they eschew firm-specific tax-rate measures in favor of period-specific measures. We also adopt the period-specific approach. Specifically, we measure t_{ds} as the top personal statutory tax rate on dividends for the period, which assumes the marginal investor is a taxable individual. If the marginal investor is tax exempt as posited by

Miller and Scholes (1978), among others, then our measure is irrelevant, so empirically we should not find any related tax effects.

To measure the accrual-equivalent capital gains tax we must adjust the statutory long-term capital gains tax rate (t_{gs}) for the benefits of deferring capital gains taxes or even avoiding the taxes altogether by passing appreciated property through an estate. Therefore, we follow Bernheim and Wantz (1995) by measuring t_{ga} as one-fourth of the statutory long-term capital gains tax rate.[1] This measure for t_{ga} is important because it enters both the numerator and denominator of (1).

For our primary tests, we follow (1) carefully by using measures that incorporate t_{ga} in the denominator. We designate these measures t_d and t_g, where $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so that $\lambda = t_d - t_g$. To ensure the denominator does not drive empirical results, however, we conduct a robustness test in which we simply use t_{ds} and t_{gs} to measure the tax rates. This robustness check also helps ensure that our decision to follow Bernheim and Wantz (1995) by measuring t_{ga} as one-fourth of t_{gs} does not affect results materially.

To further ensure robustness, we use λ, t_d, and t_g in two different sets of tests. In our first set of tests, we follow Bernheim and Wantz (1995) by using interaction terms to control for the magnitude of dividend increases, and in a second more robust set of tests, we partition the sample into portfolios to control for the magnitude of dividend increases.

B. Regression Approach

When using interaction terms, we begin by estimating the following specification for a pooled sample of observations spanning several tax regimes:

[1] There is considerable variation in statutory dividend and capital gains tax rates for our sample period. For the distributions of t_d and t_g, see Table 1. For a year-by-year summary of the statutory rates we use, see Appendix A.

$$AR_0 = (\alpha_1 \lambda + \boldsymbol{\alpha}_2{}' \boldsymbol{y}) \times \frac{\Delta D_0}{P_{-1}} + \boldsymbol{\beta}' \boldsymbol{x} + \varepsilon \,, \tag{2}$$

where AR_0 is the three-day window return, centered on the dividend announcement date, minus the concurrent CRSP value-weighted return. ΔD_0 is the change in dividends per share. P_{-1} is closing price two days prior to the dividend announcement. $\boldsymbol{x}$ is a vector of variables consisting of λ and $\boldsymbol{y}$. Similar to Bernheim and Wantz (1995), we add the $\boldsymbol{\beta}'\boldsymbol{x}$ term to mitigate potential biases resulting from nonlinearity.

In our primary specification, $\boldsymbol{y}$ is a vector of four time-specific control variables – industrial production (*PROD*), inflation (*INF*), interest rates (*R10*), and a monotonic trend (*TREND*). We focus on economy-wide controls because the statutory tax rates that constitute λ are also time-specific. In robustness checks, however, we also include firm-specific controls.

We measure *PROD* as the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. As in many prior studies (e.g., Fama, 1990), this variable serves as a proxy for economic conditions. When business activity is high, firms generate strong cash flows from operations and so they may be expected to increase dividends.[2] If so, then including *PROD* helps control for the expected component of dividend changes, allowing us to better isolate the effects of unexpected changes.

We measure *INF* as the inflation rate during the twelve months that ended in the month prior to the dividend change announcement. In periods of inflation firms may be expected to increase dividends in order to preserve the real dividend.

[2] On the other hand, it also could be argued that when *PROD* is high, capacity utilization is high, which increases the opportunity cost associated with distributing cash to shareholders, which could deter dividends. In any case, we do not use the estimated *PROD* coefficient to make inferences, but simply use it as a control for the expected change in dividends.

We measure *R10* as the yield at the beginning of the dividend change month on constant maturity Treasury bonds with ten years to maturity, which helps control for discount rates. This control is potentially important because the present value of any change in expected future dividends triggered by a dividend change announcement decreases in the discount rate.

The final control variable, *TREND*, is equal to the number of months from December 1970 through the month prior to the dividend change announcement. Trends in the information environment over the sample period (e.g., more accounting disclosures) may have affected the extent of information revealed by dividend changes.

Like the empirical specifications in Bernheim and Wantz (1995), equation (2) nets dividend and capital gains tax rates into a single variable (λ). Given the evidence in Bernheim and Wantz (1995), we expect a positive estimate for α_1. We simply estimate (2) to ensure our results are consistent with Bernheim and Wantz (1995) and to provide our own evidence that dividend announcement returns increase in the net tax rate on dividends.

Nevertheless, we are primarily interested in estimating the separate effects of dividend versus capital gains taxes on announcement returns. After estimating (2), therefore, we examine the tax rates separately as follows:

$$AR_0 = (\alpha_1 t_d + \alpha_2 t_g + \boldsymbol{\alpha}_3{}' \boldsymbol{y}) \times \frac{\Delta D_0}{P_{-1}} + \boldsymbol{\beta}'\boldsymbol{x} + \varepsilon \,, \tag{3}$$

where $\boldsymbol{x}$ now consists of t_d , t_g , and $\boldsymbol{y}$. Standard signaling models imply α_1 should be positive and α_2 should be negative.

C. Portfolio Approach

Equation (2) assumes announcement returns are linearly related to price-deflated dividend changes, conditioned on the variables in $\boldsymbol{x}$. If linearity does not hold, then the resulting bias in estimates could be material because the interaction terms in (2) could compound the bias. Moreover, fitting a conditionally linear model to a nonlinear relationship reduces the statistical power of the tests. To ensure robustness and to potentially improve power, therefore, we use a second approach in which we relax the linearity assumption and simply assume the announcement return is an increasing function of the dividend change, conditioned on the variables in $\boldsymbol{x}$. Specifically, we assume the announcement return is proportional to $f(\frac{\Delta D_0}{P_{-1}})$, where $f(.)$ is an increasing but otherwise unspecified function. Substituting this general function for $\frac{\Delta D_0}{P_{-1}}$ in (2), and dropping the $\boldsymbol{\beta}`\boldsymbol{x}$ term because we now use $f(.)$ to account for nonlinearity, yields:

$$AR_0 = (\alpha_1\lambda + \boldsymbol{\alpha_2}'\boldsymbol{y}) \times f(\frac{\Delta D_0}{P_{-1}}) + \varepsilon \,. \tag{4}$$

We do not specify $f(.)$, so we cannot estimate (4) directly for our full sample of observations. However, we can hold $f(\frac{\Delta D_0}{P_{-1}})$ constant by estimating the equation for portfolios of observations in which the value of $\frac{\Delta D_0}{P_{-1}}$ (and therefore $f(\frac{\Delta D_0}{P_{-1}})$) is essentially the same for all observations within each portfolio. When using portfolios to hold $f(\frac{\Delta D_0}{P_{-1}})$ constant, (4) reduces to:

$$AR_0 = \delta_1\lambda + \boldsymbol{\delta_2}'\boldsymbol{y} + \varepsilon \,, \tag{5}$$

where the δ parameters equal the α parameters multiplied by the (unknown) constant $f(\frac{\Delta D_0}{P_{-1}})$.

Specifically, $\delta_i = \alpha_i \times f(\frac{\Delta D_0}{P_{-1}})$ for i = 1, 2. Separating λ into its two tax-rate components leads to:

$$AR_0 = \delta_1 t_d + \delta_2 t_g + \boldsymbol{\delta_3}' \boldsymbol{y} + \varepsilon. \tag{6}$$

f(.) is an increasing function, so if α_i from (2) or (3) is positive (negative), δ_i in (5) or (6) should be positively (negatively) related to the portfolio's price-deflated dividend change (i.e., $\frac{\Delta D_0}{P_{-1}}$). Therefore we examine the correlation between estimated values for δ_i and price-deflated dividend changes across portfolios to examine the empirical predictions concerning α_i from (2) and (3).[3]

III. Primary Empirical Examination

A. Sample

To create our sample, we searched the CRSP monthly event file for dividend increases using the following criteria: (1) the company paid an ordinary quarterly cash (U.S. dollars) dividend in the current quarter and in the previous quarter, and the current dividend per share is larger than the previous dividend per share; (2) no other distributions were announced during the period beginning with the declaration of the previous dividend and ending four days after the declaration of the current dividend; and (3) there were no ex-distribution dates between the ex-

[3] Focusing on the correlation between the estimated tax coefficients (δ_i) and price-deflated dividend changes in (5) and (6) is analogous to focusing on coefficients for the interactions between tax variables and price-deflated dividend changes (α_i) in (2) and (3).

distribution date of the previous and current dividends. The first criterion allows us to focus on firms that increase dividends from some previous positive level. Following Bernheim and Wantz (1995) we focus on dividend increases because previous studies document that the market reaction to dividend increases and decreases is asymmetric, and because dividend increases are much more common than dividend decreases. We address dividend initiations separately in a later section. Criteria (2) and (3) help ensure that only "clean" dividend changes that avoid confounding effects from other distributions are identified.

When firms announce earnings and dividend changes simultaneously, the announcement return may reflect both effects. To avoid any confounding effects from earnings announcements, therefore, we exclude all observations for which the dividend change announcement occurs within five calendar days before or after a quarterly earnings announcement (Bernheim and Wantz, 1995, imposes a similar screen). We also exclude observations with missing values for any of the firm-specific control variables discussed below. Finally, to mitigate the influence of potential outliers, we delete observations lying in the 1% and 99% tails of the empirical distributions of any of the firm-specific explanatory variables. The resulting sample includes 16,355 dividend increases by 3,376 firms over the 31 years from 1971 through 2001 (Compustat's quarterly earnings report date is available only since 1971).

B. Descriptive Statistics and Correlation Coefficients

Table 1 presents the distribution of the variables, including four observation-specific variables, *SIZE*, *YIELD*, *Q*, and *LOGP*, which we discuss later. The mean of *AR* is 0.74 percent, which is significantly different from zero (*t*-statistic= 27.04). While the average market reaction is small, there is substantial variation in announcement returns (standard deviation of 3.5 percent), which provides power for our tests. The mean price-deflated dividend change is

0.0011, and the mean annual dividend yield is 0.0382. Thus the average percentage change in dividends is approximately 12 percent ($4 \times 0.0011/0.0382$).

Table 2 provides the Pearson (lower triangle) and Spearman (upper triangle) correlation coefficients among the variables. Coefficients above 0.03 in absolute value are significant at the 0.0001 level. As expected, the size of the dividend change is positively and strongly related to the abnormal return. The dividend change also is positively related to λ, t_d, t_g, and *INF*, and it is negatively related to *TREND*. Consistent with the general decline in tax rates during the sample years, *TREND* is negatively and strongly correlated with each of the three tax variables (λ, t_d, and t_g). The tax variables are also correlated with *PROD*, *INF* and *R10*. These correlations demonstrate the importance of controlling for economy-wide conditions.

As expected, the correlation between λ and t_d is positive and high. However, the correlation between λ and t_g also is positive, even though the direct effect of t_g on λ is negative. It appears that the positive correlation between t_d and t_g drives this positive correlation between λ and t_g. Therefore, a positive correlation between dividend announcement returns and λ does not necessarily imply the relation between dividend announcement returns and t_g is negative as hypothesized – it is essential to examine the separate effects of t_d and t_g.

C. Regression Results

In the top pair of rows in Table 3, we report results from estimation of equation (2) when we exclude the four control variables comprising $\boldsymbol{y}$. As reported, the estimated λ coefficient (i.e., α_1) is positive and statistically different from zero (9.886, t-statistic = 4.293), suggesting that dividend announcement returns increase in the net tax rate on dividends. In the bottom pair of rows in Table 3, we report that adding controls for industrial production, inflation, interest rates, and a trend does not materially change the λ coefficient (10.01), although the related t-statistic declines to 1.855 (in all cases, we report White (1980) heteroskedasticity-consistent *t*-statistics). Hence the results in Table 3 confirm that the findings in Bernheim and Wantz (1995) are robust to our choice of control variables and to our more recent sample. In particular, dividend announcement returns are positively related to the net tax rate on dividends.

Next, to examine the capital gains tax prediction separately, we estimate (3) both with and without the vector of control variables. As reported in Table 4, the estimated t_d and t_g coefficients (i.e., α_1 and α_2) both are positive and at least marginally significant whether we exclude the control variables (α_1 = 4.530, *t*-statistic = 1.593, and α_2 = 56.90, *t*-statistic = 2.399) or not (α_1 = 10.57, *t*-statistic = 1.923, and α_2 = 72.16, *t*-statistic = 2.001).[4] The positive estimates for the t_d coefficients are consistent with extant signaling models. However, the positive estimates for the t_g coefficients provide evidence against the models.

As a preliminary robustness check, we insert year-specific dummy variables (in additive form) to the list of control variables we use to estimate equations (2) and (3). Fixing year effects controls for the mean influence of any period-specific economic factors that may be omitted from our regressions, which is important because these factors may be correlated with our period-specific tax rate measures. In both cases, the coefficients on the tax variables remain similar in magnitude and significance.[5]

[4] The estimated t_g coefficients are substantially higher than the estimated t_d coefficients, possibly because we follow prior studies by using one-fourth of the statutory capital gains tax rate to measure t_g, which could underestimate the true value of the tax. Nevertheless, the high coefficients emphasize the importance of the capital gains tax rate.

[5] Specifically, the estimated λ coefficient is 8.535 (*t*-statistic = 1.516), the estimated t_d coefficient is 10.455 (*t*-statistic = 1.846), and the estimated t_g coefficient is 80.589 (*t*-statistic = 2.112).

D. Portfolio Results

Given our concerns with the linearity assumption underlying (2) and (3), which may bias coefficients and reduce statistical power, we now use our portfolio approach to estimate tax effects. Specifically, we partition the total sample into 100 portfolios based on the price-deflated dividend change (qualitatively, results are similar when using 25 portfolios and when using 250 portfolios). The average standard deviation of the price-deflated dividend change within each portfolio is negligible (equal to 0.000025, 2 percent of the unconditional standard deviation), indicating that the portfolios help hold the price-deflated dividend change constant.

We begin by estimating (5). As we report in Table 5 Panel A, the estimated portfolio λ coefficients are positively and significantly correlated with the portfolio price-deflated dividend changes, whether we report the Pearson (0.255, p = 0.010) or Spearman (0.226, p = 0.024) correlations. Hence the results in Table 3 are robust to our control for nonlinearity, providing confirming evidence that the signaling bang-for-the-buck is linked to the net tax rate on dividends.

Next we examine the separate predictions for each tax rate by using the portfolio approach to estimate (6). As we report in Table 5 Panel B, the t_d coefficient is positively and significantly correlated with the portfolio price-deflated dividend changes, whether we report the Pearson (0.274, p = 0.006) or Spearman (0.243, p = 0.015) correlations. More interestingly, however, we also find the t_g coefficient is positively and significantly correlated with the portfolio price-deflated dividend change, whether we report the Pearson (0.332, p = 0.001) or Spearman (0.183, p = 0.068) correlations. This latter finding provides additional capital gains evidence against existing signaling models.

IV. Robustness Tests

We now conduct three sets of supplementary tests to ensure robustness. First, we use statutory tax rates in lieu of t_d and t_g. Second, we control for firm-specific characteristics. Third, we estimate parameters for a sample of dividend initiations.

A. Using Statutory Tax Rates

As discussed earlier, we use t_d to measure the dividend tax rate and t_g to measure the capital gains tax rate, where t_d equals t_{ds} /(1-t_{ga}), t_g equals t_{ga} /(1-t_{ga}), and t_{ga} equals one-fourth of t_{gs}. These measures follow directly from equation (1) but they require assumptions regarding the measurement of the accrual-equivalent capital gains tax rate, and they require the use of the capital gains tax rate to help measure t_d. To address any concerns this may raise, we now estimate equation (6) simply using the statutory tax rates, t_{ds} and t_{gs}.

As reported in Table 6, using t_{ds} and t_{gs} has little impact on the significance of estimated correlations between the tax coefficients and the portfolio price-deflated dividend change. Specifically, for t_d the correlations are: Pearson 0.281, $p = 0.005$, Spearman 0.248, $p = 0.013$; and for t_g: Pearson 0.345, $p < 0.001$, Spearman 0.198, $p = 0.048$.

B. Controlling for Firm Characteristics

Using the portfolio approach, we further check for robustness by adding controls for four firm-specific variables used to explain announcement returns in prior research: *SIZE*, *YIELD*, *Q*, and *LOGP*. To the extent these characteristics help explain announcement returns, adding them to the regressions increases the power of our tests. In addition, the four variables could help control for expected dividend changes, allowing the price-deflated dividend change to isolate the unexpected component of dividend changes more effectively. Furthermore, if these four firm characteristics vary systematically over the sample period, omitting them would not only reduce the power of our tests, but also could bias the estimated tax coefficients, which reflect time-series variation in statutory tax rates.

We measure *SIZE* as the log of the market value of common equity two days prior to the dividend change announcement. Eddy and Seifert (1988), among others, document that dividend announcement returns decrease in size, possibly because information asymmetry between managers and investors decreases in size.

Following Bajaj and Vijh (1990), we include *YIELD*, measured as four times the dividend per share in the previous quarter divided by the closing price two days prior to the current dividend announcement. *YIELD* helps control for any variation in the tax rates for the marginal investor across firms according to clientele formation, as well as controlling for other factors that are correlated with the dividend yield.

Q represents Tobin's *q*, or the ratio of the market value of assets to the replacement cost of assets. We measure the market value of assets as the market value of common equity plus the book value of liabilities and preferred stock. We measure the replacement cost of assets as the book value of assets. *Q* proxies for the benefit a firm would derive from reinvesting earnings rather than paying the earnings out as a dividend. In particular, if *Q* is high it could be costly to forgo positive NPV projects in order to pay out dividends, whereas if *Q* is low it could be costly to forgo dividends in order to invest in questionable, low-return projects (see, e.g., Jensen, 1986). Therefore, controlling for *Q* helps hold under- and over-investment constant.

We measure *LOGP* as the log of share price. Bajaj and Vijh (1990, 1995) document that price reactions to dividend changes are greatest for low-priced stocks. They suggest that this relationship may reflect the fact that analysts and investors produce less information for low-priced stocks, which increases the magnitude of the incremental information provided by dividend change announcements.

In addition to adding these four firm-level control variables, we also add 48 industry dummies corresponding to the industry classifications in Fama and French (1997). Fixing industry effects helps control for the possibility that the information conveyed by dividend changes varies across industries.

In Table 7 Panel A (Panel B) we report results from fixing industry effects and adding the four firm-level control variables to the $\boldsymbol{y}$ vector in (5) ((6)). Again we focus on the correlations between the estimated coefficients from the portfolios and the portfolio price-deflated dividend changes. We find the correlations for the four new control variables all are consistent with prior research. In particular, *LOGP* is negatively related to price-deflated dividend changes and *YIELD* is positively related to price-deflated dividend changes. The correlations for *SIZE* and *Q* are not statistically different from zero, which is consistent with the evidence in Denis, Denis, and Sarin (1994) and in Yoon and Starks (1995).

Most importantly, adding the control variables does not affect primary inferences in regard to taxes – the estimated λ coefficient (in Panel A) and t_d and t_g coefficients (in Panel B) all remain positively and significantly correlated with the portfolios' price-deflated dividend changes.

C. Dividend Initiations

In previous sections, we follow Bernheim and Wantz (1995) by estimating tax effects for dividend-increase announcements for firms with a history of dividend payments, and we find that the capital gains tax results do not support traditional signaling models. To help confirm this result, we now estimate tax effects for a sample of dividend-initiation announcements where signaling effects may be especially strong.

We define a dividend initiation as the first cash dividend payment reported on the CRSP file. For an observation to be included in the sample, the observation date must follow the CRSP starting date of coverage by at least two years. This ensures the first dividend payment in CRSP actually represents a dividend initiation, and not just new coverage of dividends. Similar to the criterion used for the primary sample, we exclude all observations for which the dividend initiation announcement occurs within five calendar days before or after a quarterly earnings announcement. The resulting sample includes 1,354 dividend initiations over the 31 years from 1971 through 2001. As may be expected, the average market reaction to dividend initiations is substantially stronger than the reaction to dividend increases (2.2% mean abnormal announcement returns for dividend initiations compared to 0.74% for dividend increases).

In Table 8, Panel A, we report the correlations between the estimated λ coefficient and the portfolio price-deflated dividend change. As shown, the correlation is essentially zero for the dividend-initiations sample. Hence, our results for the net tax rate on dividends are not robust to the use of dividend initiations, which raises concerns regarding use of the net rate in our study as well as in Bernheim and Wantz (1995). In contrast, as we report in Table 8, Panel B, the Pearson correlations between the price-deflated dividend change and the estimated t_d and t_g coefficients are both positive and significant, especially the capital gains tax coefficient. The Spearman correlation (which doesn't use all the information in the data) is not statistically significant for t_d but is marginally significant for t_g. Hence, the positive relationship between dividend-increase announcement returns and the capital gains tax rate is robust to dividend initiations, suggesting we document a pervasive result.

V. Conclusion

In this study, we find robust evidence that dividend-increase announcement returns increase in both the dividend tax rate and especially in the capital gains tax rate. The capital gains tax result is inconsistent with existing signaling models and therefore raises questions regarding the role for capital gains taxes in announcement returns. Future research could investigate the source of this apparent anomaly, thereby enhancing our knowledge of the true relations among personal taxes, dividends, and returns.

Appendix A
Period-Specific Statutory Tax Rates

Years	Top Dividend Tax Rate	Maximum Capital Gains Tax Rate
1971	0.700	0.343
1972-1975	0.700	0.365
1976-1977	0.700	0.399
1978	0.700	0.390
1979-1980	0.700	0.280
1981	0.700	0.237
1982-1986	0.500	0.200
1987	0.385	0.280
1988-1990	0.280	0.280
1991-1992	0.310	0.280
1993-1996	0.396	0.280
1997-2001	0.396	0.200

The capital gains tax rates we use account for all effects of transitions, add-on minimum taxes, and maximum rates on long-term capital gains.

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Table 1
Descriptive Statistics

	Mean	Std. Dev.	5%	25%	50%	75%	95%
AR	0.0074	0.0350	-0.0416	-0.0116	0.0045	0.0233	0.0641
λ	0.4792	0.1695	0.2258	0.3505	0.4737	0.6676	0.6774
t_d	0.5568	0.1806	0.3011	0.4168	0.5263	0.7703	0.7776
t_g	0.0776	0.0194	0.0526	0.0630	0.0753	0.1004	0.1108
PROD	0.0333	0.0431	-0.0528	0.0088	0.0392	0.0636	0.0884
INF	0.0550	0.0331	0.0176	0.0290	0.0433	0.0695	0.1235
R10	0.0823	0.0225	0.0554	0.0664	0.0774	0.0909	0.1319
TREND	183.37	100.73	36.000	93.000	178.00	278.00	338.00
ΔD/P	0.0011	0.0010	0.0002	0.0005	0.0009	0.0015	0.0029
SIZE	12.330	1.7409	9.5556	11.046	12.237	13.572	15.312
YIELD	0.0382	0.0234	0.0093	0.0204	0.0326	0.0516	0.0846
Q	1.3074	0.5811	0.8369	0.9915	1.0864	1.3952	2.5053
LOGP	3.1369	0.5474	2.1762	2.7726	3.1676	3.5190	4.0231

All the statistics are based on 16,355 observations. *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1-t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so $\lambda = t_d - t_g$. *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement. *ΔD/P* is the change in quarterly dividend per share divided by the stock price two days prior to the declaration of the new dividend. *SIZE* is the log of market value of equity measured two days prior to the dividend announcement. *YIELD* is the dividend yield, measured as four times the previous quarter's dividend divided by price two days prior to the dividend announcement. *Q* is a measure of Tobin's *q*. *LOGP* is the log of price per share two days prior to the dividend announcement.

Table 2
Pearson (Lower Triangle) and Spearman (Upper Triangle) Correlation Coefficients

	AR	λ	t_d	t_g	*PROD*	*INF*	*R10*	*TREND*	*ΔD/P*	*SIZE*	*YIELD*	*Q*	*LOGP*
AR		0.07	0.09	0.09	-0.01	0.10	0.03	-0.09	0.17	-0.09	0.13	-0.08	-0.09
λ	0.09		0.84	0.24	-0.01	0.66	0.33	-0.71	0.33	-0.30	0.19	-0.27	-0.17
t_d	0.09	1.00		0.59	0.21	0.58	0.20	-0.81	0.37	-0.35	0.17	-0.29	-0.20
t_g	0.09	0.54	0.61		0.23	0.46	-0.07	-0.65	0.26	-0.24	0.10	-0.22	-0.18
PROD	-0.03	-0.01	0.01	0.17		-0.23	-0.25	-0.04	-0.01	-0.03	-0.05	0.00	-0.03
INF	0.08	0.71	0.71	0.36	-0.36		0.63	-0.75	0.42	-0.29	0.25	-0.30	-0.20
R10	0.02	0.31	0.27	-0.21	-0.25	0.53		-0.44	0.29	-0.13	0.18	-0.13	-0.05
TREND	-0.09	-0.84	-0.86	-0.65	0.06	-0.67	-0.40		-0.36	0.32	-0.19	0.28	0.17
ΔD/P	0.19	0.29	0.30	0.23	-0.03	0.29	0.13	-0.27		-0.32	0.32	-0.40	-0.31
SIZE	-0.10	-0.35	-0.35	-0.26	0.02	-0.27	-0.12	0.33	-0.29		-0.15	0.43	0.70
YIELD	0.12	0.17	0.16	0.06	-0.08	0.22	0.15	-0.15	0.23	-0.15		-0.43	-0.20
Q	-0.04	-0.16	-0.16	-0.12	0.00	-0.17	-0.06	0.13	-0.20	0.32	-0.32		0.38
LOGP	-0.12	-0.20	-0.21	-0.20	0.01	-0.19	-0.02	0.17	-0.30	0.71	-0.21	0.30	

All the correlations are based on 16,355 observations. *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1- t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so $\lambda = t_d - t_g$. *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement. *ΔD/P* is the change in quarterly dividend per share divided by the stock price two days prior to the declaration of the new dividend. *SIZE* is the log of market value of equity measured two days prior to the dividend announcement. *YIELD* is the dividend yield, measured as four times the previous quarter's dividend divided by price two days prior to the dividend announcement. *Q* is a measure of Tobin's *q*. *LOGP* is the log of price per share two days prior to the dividend announcement.

Table 3
Regressions of Announcement Returns on λ and Control Variables Conditioned on the Dividend Change

$$AR = (\alpha_0 + \alpha_1\lambda + \alpha_2 PROD + \alpha_3 INF + \alpha_4 R10 + \alpha_5 TREND) \times \frac{\Delta D}{P} + \beta_0 + \beta_1\lambda + \beta_2 PROD + \beta_3 INF + \beta_4 R10 + \beta_5 TREND + \varepsilon$$

α_0	$\boldsymbol{\alpha_1}$	α_2	α_3	α_4	α_5	β_0	β_1	β_2	β_3	β_4	β_5	R^2
1.445	**9.886**					0.002	-0.004					0.041
1.160	**4.293**					1.387	-1.474					
4.940	**10.01**	9.520	-15.16	-26.92	-0.005	0.006	-0.008	-0.038	0.009	-0.001	0.000	0.043
1.223	**1.855**	0.966	-0.711	-1.304	-0.715	1.305	-1.414	-2.841	0.311	-0.040	-0.872	

The number of observations is 16,355. For each regression, the first row reports the coefficient and the second row reports the White's (1980) *t*-statistic. *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1- t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement. $\Delta D/P$ is the change in quarterly dividend per share divided by the stock price two days prior to the declaration of the new dividend.

Table 4
Regressions of Announcement Returns on Tax Rates and Control Variables Conditioned on the Dividend Change

$$AR = (\alpha_0 + \alpha_1 t_d + \alpha_2 t_g + \alpha_3 PROD + \alpha_4 INF + \alpha_5 R10 + \alpha_6 TREND) \times \frac{\Delta D}{P} + \beta_0 + \beta_1 t_d + \beta_2 t_g + \beta_3 PROD + \beta_4 INF + \beta_5 R10 + \beta_6 TREND + \varepsilon$$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	β_0	β_1	β_2	β_3	β_4	β_5	β_6	R^2
-0.918	**4.530**	**56.90**					0.002	-0.001	-0.021					0.042
-0.588	**1.593**	**2.399**					1.148	-0.380	-0.674					
-7.659	**10.57**	**72.16**	5.248	-15.72	11.16	0.010	0.013	-0.008	-0.037	-0.036	0.008	-0.018	0.000	0.044
-1.133	**1.923**	**2.001**	0.511	-0.701	0.395	1.094	1.460	-1.377	-0.817	-2.558	0.266	-0.477	-1.365	

The number of observations is 16,355. For each regression, the first row reports the coefficient and the second row reports the White's (1980) *t*-statistic. *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1- t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so $\lambda = t_d - t_g$. *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement. *ΔD/P* is the change in quarterly dividend per share divided by the stock price two days prior to the declaration of the new dividend.

Table 5
Correlations Between Coefficients from Portfolio Regressions and the Portfolios' Price-Deflated Dividend Change (the Partitioning Variable)

Panel A: Using λ to Measure the Tax Effect

$$AR = \delta_0 + \delta_1\lambda + \delta_2 PROD + \delta_3 INF + \delta_4 R10 + \delta_5 TREND + \varepsilon$$

	δ_0	$\boldsymbol{\delta_1}$	δ_2	δ_3	δ_4	δ_5
Pearson correlation	0.147	**0.255**	0.082	-0.121	-0.151	-0.054
p-value	0.144	**0.010**	0.416	0.230	0.134	0.592
Spearman correlation	0.141	**0.226**	0.012	-0.158	-0.096	-0.011
p-value	0.161	**0.024**	0.903	0.116	0.343	0.913

Panel B: Using Separate Measures for Dividend and Capital Gains Tax Rates

$$AR = \delta_0 + \delta_1 t_d + \delta_2 t_g + \delta_3 PROD + \delta_4 INF + \delta_5 R10 + \delta_6 TREND + \varepsilon$$

	δ_0	$\boldsymbol{\delta_1}$	$\boldsymbol{\delta_2}$	δ_3	δ_4	δ_5	δ_6
Pearson correlation	-0.192	**0.274**	**0.332**	0.013	-0.114	0.105	0.184
p-value	0.055	**0.006**	**0.001**	0.897	0.259	0.299	0.068
Spearman correlation	-0.090	**0.243**	**0.183**	-0.065	-0.154	0.081	0.113
p-value	0.371	**0.015**	**0.068**	0.523	0.126	0.425	0.263

The total number of observations is 16,355. The number of regressions is 100, so the average number of observations per regression is 164. The correlations are between the coefficients and the median portfolio price-deflated dividend change. *P*-value is the *p*-value associated with each correlation (two-tails test). *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1- t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so $\lambda = t_d - t_g$. *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement.

Table 6
Correlations Between Coefficients from Portfolio Regressions and the Portfolios' Price-Deflated Dividend Change (the Partitioning Variable) Statutory Tax Rates

$$AR = \delta_0 + \delta_1 t_d + \delta_2 t_g + \delta_3 PROD + \delta_4 INF + \delta_5 R10 + \delta_6 TREND + \varepsilon$$

	δ_0	$\boldsymbol{\delta_1}$	$\boldsymbol{\delta_2}$	δ_3	δ_4	δ_5	δ_6
Pearson correlation	-0.203	**0.281**	**0.345**	0.012	-0.122	0.105	0.184
p-value	0.043	**0.005**	**0.000**	0.908	0.226	0.298	0.066
Spearman correlation	-0.104	**0.248**	**0.198**	-0.062	-0.157	0.082	0.113
p-value	0.303	**0.013**	**0.048**	0.541	0.118	0.418	0.265

The total number of observations is 16,355. The number of regressions is 100, so the average number of observations per regression is 164. The correlations are between the coefficients and the median portfolio price-deflated dividend change. *P*-value is the *p*-value associated with each correlation (two-tails test). *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement.

Table 7
Correlations After Controlling for Firm-Specific Characteristics

Panel A: Using λ to Measure the Tax Effect

$$AR = \sum_{i=1}^{48} \delta_{0i} DIND_i + \delta_1 \lambda + \delta_2 PROD + \delta_3 INF + \delta_4 R10 + \delta_5 TREND + \delta_6 SIZE + \delta_7 YIELD + \delta_8 Q + \delta_9 LOGP + \varepsilon$$

	$\boldsymbol{\delta_1}$	δ_2	δ_3	δ_4	δ_5	δ_6	δ_7	δ_8	δ_9
Pearson correlation	**0.294**	-0.068	-0.281	-0.160	-0.031	0.112	0.474	0.139	-0.243
p-value	**0.003**	0.504	0.005	0.112	0.758	0.265	<.0001	0.168	0.015
Spearman correlation	**0.303**	-0.172	-0.252	-0.113	0.064	0.143	0.428	0.089	-0.146
p-value	**0.002**	0.087	0.012	0.262	0.524	0.155	<.0001	0.381	0.147

Panel B: Using Separate Measures for Dividend and Capital Gains Tax Rates

$$AR = \sum_{i=1}^{48} \delta_{0i} DIND_i + \delta_1 t_d + \delta_2 t_g + \delta_3 PROD + \delta_4 INF + \delta_5 R10 + \delta_6 TREND + \delta_7 SIZE + \delta_8 YIELD + \delta_9 Q + \delta_{10} LOGP + \varepsilon$$

	$\boldsymbol{\delta_1}$	$\boldsymbol{\delta_2}$	δ_3	δ_4	δ_5	δ_6	δ_7	δ_8	δ_9	δ_{10}
Pearson correlation	**0.318**	**0.265**	-0.128	-0.300	0.073	0.171	0.111	0.466	0.116	-0.223
p-value	**0.001**	**0.008**	0.205	0.003	0.469	0.089	0.273	<.0001	0.250	0.026
Spearman correlation	**0.329**	**0.265**	-0.236	-0.285	0.113	0.244	0.133	0.421	0.062	-0.137
p-value	**0.001**	**0.008**	0.018	0.004	0.263	0.015	0.188	<.0001	0.539	0.175

The total number of observations is 16,355. The number of regressions is 100, so the average number of observations per regression is 164. The correlations are between the coefficients and the median portfolio price-deflated dividend change. *P*-value is the *p*-value associated with each correlation (two-tails test). *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1- t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so $\lambda = t_d - t_g$. *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement. *ΔD/P* is the change in quarterly dividend per share divided by the stock price two days prior to the declaration of the new dividend. *SIZE* is the log of market value of equity measured two days prior to the dividend announcement. *YIELD* is the dividend yield, measured as four times the previous quarter's dividend divided by price two days prior to the dividend announcement. *Q* is a measure of Tobin's *q*. *LOGP* is the log of price per share two days prior to the dividend announcement. $DIND_1$ through $DIND_{48}$ are industry dummies that correspond to the industry classification in Fama and French (1997).

Table 8
Correlations Between Coefficients from Portfolio Regressions and the Portfolios' Price-Deflated Dividend (the Partitioning Variable)
Sample of Dividend Initiations

Panel A: Using λ to Measure the Tax Effect

$$AR = \delta_0 + \delta_1\lambda + \delta_2 PROD + \delta_3 INF + \delta_4 R10 + \delta_5 TREND + \varepsilon$$

	δ_0	$\boldsymbol{\delta_1}$	δ_2	δ_3	δ_4	δ_5
Pearson correlation	0.110	**0.170**	0.587	0.335	-0.574	-0.001
p-value	0.601	**0.418**	0.002	0.102	0.003	0.995
Spearman correlation	0.262	**0.057**	0.149	0.245	-0.184	-0.155
p-value	0.205	**0.787**	0.477	0.237	0.379	0.458

Panel B: Using Separate Measures for Dividend and Capital Gains Tax Rates

$$AR = \delta_0 + \delta_1 t_d + \delta_2 t_g + \delta_3 PROD + \delta_4 INF + \delta_5 R10 + \delta_6 TREND + \varepsilon$$

	δ_0	$\boldsymbol{\delta_1}$	$\boldsymbol{\delta_2}$	δ_3	δ_4	δ_5	δ_6
Pearson correlation	-0.342	**0.393**	**0.440**	-0.037	-0.136	0.012	0.272
p-value	0.094	**0.052**	**0.028**	0.861	0.518	0.954	0.188
Spearman correlation	-0.172	**0.125**	**0.322**	0.053	0.063	0.189	0.202
p-value	0.410	**0.550**	**0.116**	0.801	0.765	0.365	0.332

The total number of observations is 1,354. The number of regressions is 25, so the average number of observations per regression is 54. The correlations are between the coefficients and the median portfolio price-deflated dividend. *P*-value is the *p*-value associated with each correlation (two-tails test). *AR* is cumulative stock return during days –1, 0, and 1 relative to the dividend declaration minus the contemporaneous return on the CRSP value-weighted index. $\lambda = 1 - (1-t_{ds}) / (1- t_{ga})$, where $t_{ga} = (0.25 \times t_{gs})$, and where t_{ds} (t_{gs}) is the top statutory federal tax rate on dividends (long-term capital gains). $t_d = t_{ds} /(1-t_{ga})$ and $t_g = t_{ga} /(1-t_{ga})$, so $\lambda = t_d - t_g$. *PROD* is the rate of change in the industrial production index over the twelve months that ended in the month prior to the dividend change announcement. *INF* is inflation during the twelve months that ended in the month prior to the dividend change announcement. *R10* measures the yield on constant maturity Treasury bonds with ten years to maturity at the beginning of the dividend change month. *TREND* is the number of months from December 1970 through the month prior to the dividend change announcement.