INVESTOR TAX HETEROGENEITY AND EX-DIVIDEND DAY TRADING VOLUME – THE EFFECT OF DIVIDEND YIELD AND INSTITUTIONAL OWNERSHIP

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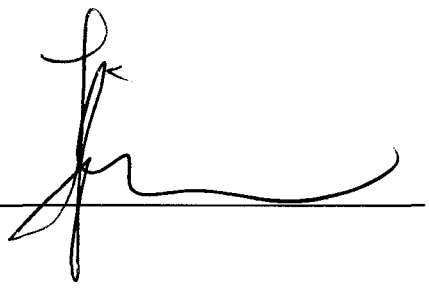
SIGNED: 

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ABSTRACT

I demonstrate how the presence of institutional investors impacts the volume effect of dividend yield around ex-dividend days. Dividend yield proxies for the tax-disadvantaged portion of security return while the level of institutional ownership proxies for the degree of tax-induced investor heterogeneity. Cross-sectional tests support the tax-motivated trading hypotheses: 1) Ex-day excess trading volume increases in dividend yield and this positive relation is a concave quadratic function of the level of institutional ownership. 2) The volume effect of dividend yield peaks when the level of institutional ownership is at 32.18% - lower than 50%, implying that institutional investors may be more risk tolerant than individual investors. 3) Across tax regimes, some support is also found for the ex-day tax-motivated trading hypotheses. These results, combined with studies supporting dividend tax capitalization, suggest that tax matters in valuation and it impacts both stock price and investor trading patterns around ex-dividend days.

1. INTRODUCTION AND LITERATURE BACKGROUND

I examine how stock ownership structure impacts ex-dividend day excess trading volume and provide results consistent with the tax-motivated trading hypotheses. While a lot of studies focus on price behavior around ex-dividend days, controversy remains concerning its causes.[1] Michaely and Vila (1995 and 1996) argue that while ex-day price may not reveal whether the trading population is homogeneous or heterogeneous with respect to taxes, trading volume can help shed light on investor tax status – stock price may hardly move while there exist tax-related trading activities around ex-dividend days. Ex-day trading volume offers a way of examining whether and how investors *respond* to tax rate differences in dividend and capital gains incomes.[2] Michaely and Vila (1995, 1996) demonstrate that investors with differing preference for dividends or capital gains will trade with each other around ex-dividend days. First, trading volume significantly

[1] Traditionally, researchers have pursued a tax explanation for the ex-day price behavior. Elton and Gruber (1970) find that the average ratio of cum- and ex-dividend day price differential to the amount of dividend distributed is less than unity, due to the fact that dividend incomes are taxed at a higher rate than capital gains incomes. Further more, this ratio is increasing in dividend yield – a finding widely viewed as being consistent with the existence of dividend tax clienteles. Kalay (1982) argues that this ratio should be equal to unity since the short-term traders, who are not subject to differential tax treatment of dividends and capital gains, should eliminate this ex-dividend day excess return through arbitrage activities. His empirical evidence, however, is still consistent with a tax effect and a tax-induced clientele effect. On the other hand, Lakonishok and Vermaelen (1983) and Michaely (1991) produce evidence that the activities of short-term and corporate traders dominate the price determination on the ex-day. Recently, a few studies resort to non-tax explanations for the ex-dividend day price behavior – see Frank and Jagannathan (1998) and Bali and Hite (1998). However, Cloyd, Li and Weaver (2002) and Graham, Michaely and Roberts (2002), examining the impact of decimalization of major US stock exchanges on ex-day price formation, suggest that the root cause of price behavior around ex-dividend days is still the differential tax treatment of dividend and capital gains incomes (not discrete prices as suggested in Bali and Hite (1998)), thus again supporting a tax argument. Jakob and Ma (2002) also find evidence against Bali and Hite (1998).

[2] Cready and Hurrt (2002), in a methodology paper, provide evidence that volume-based metrics provide more powerful tests of investors response to public disclosure than do return-based metrics. Kandel and Pearson (1995) report that trading volume around earnings announcements is abnormally high even for earnings announcements that stimulate little price movement. Bamber and Cheon (1995) provide evidence consistent with the notion that trading volume is likely to be high relative to price reaction when an earnings announcement generates differential belief revisions among investors but a small average

increases around ex-dividend days and ex-day excess trading volume increases in tax-disadvantaged dividend yield. Second, excess trading volume is high when the tax differential between dividends and capital gains is high. Third, excess trading volume is increasing in investor tax heterogeneity.

Empirically, however, the role played by stock ownership structure is still not well resolved in the above papers. While dividend yield, as a measure of the tax-disadvantaged portion of security return, is a necessary condition for ex-day excess trading activities, the ownership structure of the underlying security is another necessary condition. For example, even if the level of tax-disadvantaged dividend yield is very high, but most of the investors are of the same tax category, ex-day excess trading volume will be thin and security price around the ex-days will be determined by investors with long holding windows (a certain tax clientele). It is the differential tax treatment of dividend and capital gains incomes in conjunction with investor tax-induced heterogeneity that causes excess trading volume, not just the differential tax treatment alone.[3]

I tackle the issue of stock ownership structure here. Specifically, I examine the impact of the stock-level institutional ownership on the ex-day volume effect of dividend yield. I use dividend yield to proxy for the tax-disadvantaged portion of security return (thus the extent of potential gains from exchanging tax burdens among investors) and the level of

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aggregate market belief revision. Later in the text, I argue that the root causes for excess volume around ex-dividend days and earnings announcement days are fundamentally similar.

[3] Michaely and Vila (1996) use an economy-wide (not a stock-level) measure of investor tax heterogeneity. Specifically, they find a positive relation between the monthly economy-wide mean cumulative abnormal volume calculated as the weighted average (weighted by market capitalization) of the cumulative abnormal

institutional ownership to proxy for the firm-level tax-induced investor heterogeneity. As the level of institutional ownership increases, tax-induced investor heterogeneity first increases and then decreases. Since ex-day excess trading volume is a result of the interaction between a stock's payout policy and ownership structure, I hypothesize that the positive volume effect of dividend yield is a concave quadratic function of the level of institutional ownership.

Cross-sectional tests support my tax-motivated trading hypotheses and the major results can be summarized as follows: 1) Excess trading volume around ex-dividend days is increasing in dividend yield and this positive effect of dividend yield on ex-day excess trading volume is a concave quadratic function of the level of institutional ownership. 2) The peak of the volume effect of dividend yield is reached when the level of institutional ownership is at 32.18% (lower than 50%), implying that institutional investors may be more risk tolerance than individual investors. 3) Partial support is found for the volume effect of tax regime changes. The tax-motivated trading argument in terms of tax regime changes is supported for the period 1989-1996 (TRA86 and RRA93 regimes) – the volume effect of dividend yield in the RRA93 regime is higher than that in the TRA86 regime (RRA93 raised the dividend tax rate for individuals, thus increasing the spread between dividend and capital gains rates); but not for the period 1993-1998 (RRA93 and TRA97 regimes) – the volume effect of dividend yield in the TRA97 regime is not

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volume for all securities with an ex-dividend day in that month and the cross-sectional tax rate dispersion variable computed using IRS and Federal Reserve data.

significantly different from that in the RRA93 regime (TRA97 reduced the capital gains tax rate, thus increasing the relative tax difference between dividends and capital gains).[4]

In conclusion, this paper suggests that the excess trading volume around ex-dividend days is tax related. I contribute to the literature by considering the interaction between dividend payout policy and stock ownership structure in explaining the variation in excess trading volume around ex-dividend days. This paper, in conjunction with price level studies supporting the notion of dividend tax capitalization (see Ayers, Cloyd and Robinson (2002), Dahliwal, Li and Trezevant (2003) and Dhaliwal, Erickson and Li (2002)), offers a fuller picture of how investors *respond* to the differential tax treatment of dividend and capital gains incomes. The results from both lines of research are consistent: Tax matters in valuation and it impacts both price and investor trading patterns around ex-dividend days.

The paper proceeds as follows. In Section 2, I formulate the tax-motivated trading hypotheses. Section 3 describes the data. Section 4 tests the hypotheses and discusses the empirical results. Section 5 summarizes and concludes.

2. UNDERLYING THEORY AND TESTABLE HYPOTHESES

2.1. Relative value of dividends v.s. capital gains and excess trading activities – Intuition

The relative value of dividend (D) v.s. capital gains (G) incomes, that is, their marginal rate of substitution ($MRS_{D,G}$), is determined by their relative taxation. It is computed as:

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[4] TRA86 refers to the Tax Reform Act of 1986; RRA93 refers to the Revenue Reconciliation Act of 1993 and TRA97 refers to Taxpayer Relief Act of 1997.

$$MRS_{D,G} = \frac{1-t_d}{1-t_g} = \frac{G}{D}, \quad (1)$$

where t_d and t_g are tax rates on dividends and capital gains, respectively. $MRS_{D,G}$ measures the value per dollar of dividends in terms of capital gains.

Assume that there are two investors, one with $MRS_{D,G,1} = 1.5$ ($t_{d,1} < t_{g,1}$) and the other with $MRS_{D,G,2} = 0.5$ ($t_{d,2} > t_{g,2}$). To Investor 1, \$1.0 of dividend is worth \$1.5 of capital gain; while to Investor 2, \$1.0 of dividend is worth \$0.5 of capital gain – or equivalently, \$1.0 of capital gain is worth \$2.0 of dividend. This suggests that Investor 1 prefers to receive incomes in the form of dividends while Investor 2 prefers to receive incomes in the form of capital gains. They can achieve their goals by trading with each other. This is how ex-day trading occurs.[5] Note that it is the difference in the *relative taxation* of dividends and capital gains that matters, not their absolute taxation. Even if both prefer dividends/capital gains, as long as they have different values of $MRS_{D,G}$, there is benefit in trading with each other.[6]

2.2. Impact of stock ownership structure on the volume effect of dividend yield

Michaely and Vila (1995) model ex-dividend day trading activities. Ex-day excess trading volume is determined in the following manner:

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[5] Lakonishok and Smidt (1986) make similar argument. They state that in idealized markets with homogeneous investors, market adjustments require price changes but not necessarily transactions. Tax laws serve to partition investors into distinct categories that may result in tax-induced trading not necessarily accompanied by price change (p953). For example, in my case, if both investors have the same level of risk tolerance, price may not change while volume goes up.

[6] For example, if it is the case that $MRS_{D,G,1} = 1.5$ and $MRS_{D,G,2} = 1.2$, since Investor 1 prefers dividend incomes more than Investor 2 (even though they both prefer dividends to capital gains), they will trade with each other.

$$V_e = \frac{1}{2} D \left\{ \sum_{i=1}^{N} | (\alpha_i - \overline{\alpha})(K_i / \sigma_e^2) | \right\}, \tag{2}$$

where D is the amount of dividend per share, K_i is the level of risk tolerance for investor i, α_i is the tax-induced preference for dividend versus capital gains income for investor i (the marginal rate of substitution $MRS_{D,G,i}$) computed as $(1 - t_{id})/(1 - t_{ig})$ [t_{id} and t_{ig} are the tax rates on dividend and capital gains incomes for investor i] and $\overline{\alpha}$ is the economy-wide average preference for dividend income versus capital gains income, weighted by different investors' levels of risk tolerance. σ_e^2 is the total risk of the stock that goes ex-dividend. Trading volume depends positively on the amount of dividend as well as on the degree of tax-induced heterogeneity in the stock ownership structure.[7] If there is no tax-induced investor heterogeneity, that is, if $\alpha_i = \overline{\alpha}$, then there is no extra trading around ex-dividend days, even in the presence of tax disadvantaged dividends (e.g., even if $\overline{\alpha} < 1$). This means that one important determinant of excess trading volume is the degree of tax-induced heterogeneity among investors with differing tax status.[8]

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[7] Frank and Jagannathan (1998) show that excess trading volume is generally negative and mostly insignificant during the 11-day period around the ex-dividend days in Hong Kong, a region where neither dividends nor capital gains are taxed. Since there is no tax differential on dividends and capital gains, and thus all investors have the same tax status concerning dividends and capital gains incomes, there is no excess trading around ex-dividend days. This result is consistent with the argument of tax-motivated trading around ex-dividend days.

[8] Michaely and Vila's (1995) result is structurally similar to that of Kim and Verrecchia (1991), who analyze how the difference in the precision of pre-announcement private information affects trading volume around earnings announcement days. Their volume reaction to a public announcement is

$$V = \frac{1}{2}\left(\int r_i \,|\, s_i - s \,|\, di\right) | \tilde{P}_2 - \tilde{P}_1 | = \frac{1}{2}\left(\int r_i \,|\, s_i - s \,|\, di\right) \frac{n}{K_2} | Surprise + Noise |,$$

where $| \tilde{P}_2 - \tilde{P}_1 |$ is the absolute price change at the time of the announcement, r_i is investor i's risk tolerance, s_i is investor i's precision of private information prior to the announcement and s is the average precision of private information, weighted by r_i. In both cases trade occurs because investors have differing

As discussed earlier and based on prior literature, dividend yield is a measure of the extent to which a stock's return is tax-disadvantaged. In this study, however, I stress the importance of the role played by the tax-induced investor heterogeneity on the ex-day excess trading volume. I use the level of institutional ownership of common stocks to proxy for the degree of tax-induced investor heterogeneity.

For institutional investors, dividends are on average less tax-disadvantaged relative to capital gains than for individual investors (see Dhaliwal, Erickson and Trezevant (1999), Allen, Bernardo and Welch (2000), Ayers, Cloyd and Robinson (2000), Dhaliwal, Li and Trezevant (2003) and Dhaliwal, Erickson and Li (2002)).[9] This means, on average, dividend income is worth relatively more to an institutional investor than to an individual investor while capital gains income is worth relatively more to an individual investor than to an institutional investor. This being the case, around ex-dividend days, institutional investors may want to acquire the stocks cum-dividend and/or sell the stocks ex-dividend so as to capture the dividend while individual investors may want to sell the stocks cum-dividend and/or acquire the stocks ex-dividend so as to avoid the dividend. This process causes an increase in trading volume around ex-dividend days.

Based on the above argument, I examine the Michaely and Vila (1995) model in an economy of two basic categories of investors with differing tax status concerning dividend and capital gains incomes. The purpose is to determine how stock ownership

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private valuations for the same asset. Volume reflects the sum of differences in traders' reactions while the change in price measures only the average reaction (Kim and Verrecchia (1991)).

[9] Institutional investors include banks, insurance companies, mutual funds, college endowment funds, corporate investors, pension and retirement funds, broker dealers, and other investment advisors.

structure impacts ex-day excess trading volume. Since I assume two basic categories of investors, Equation (2) becomes:

$$V_e = \frac{D}{2\sigma_e^2}\{n_1 \mid \alpha_1 - \overline{\alpha} \mid K_1 + n_2 \mid \alpha_2 - \overline{\alpha} \mid K_2\}, \tag{3}$$

where n_1 and n_2 indicate the numbers of investors that belong to Category 1 and 2, respectively; K_1 and K_2 are the levels of risk tolerance for Category 1 and 2 investors; α_1 and α_2 are the tax-induced preference for dividend versus capital gains income for investor Category 1 and 2; and $\overline{\alpha}$, the economy-wide average preference for dividend income versus capital gains income, weighted by the level of risk tolerance of both categories of investors, is computed as

$$\overline{\alpha} = \frac{K_1 n_1 \alpha_1 + K_2 n_2 \alpha_2}{K_1 n_1 + K_2 n_2}. \tag{4}$$

Substitute Equation (4) into Equation (3), ex-day trading volume becomes

$$V_e = \frac{D}{2\sigma_e^2}(K_1 + K_2) \mid \alpha_1 - \alpha_2 \mid \frac{n_1 n_2}{K_1 n_1 + K_2 n_2}, \text{ or} \tag{5}$$

$$V_e = \frac{D}{2\sigma_e^2}(K_1 + K_2) \mid \alpha_1 - \alpha_2 \mid \frac{n_1 (N - n_1)}{K_1 n_1 + K_2 (N - n_1)}, \tag{5'}$$

where $N = n_1 + n_2$ is the total number of investors in the economy for the underlying stock. Equation (5) or (5′) suggests that ex-day trading volume is determined by the interaction between the relative taxation of dividends and capital gains for Category 1 and 2 investors $|\alpha_1 - \alpha_2|$ and the stock's ownership structure *OS*:

$$OS = \frac{n_1 n_2}{K_1 n_1 + K_2 n_2} = \frac{n_1 (N - n_1)}{K_1 n_1 + K_2 (N - n_1)}. \tag{6}$$

Maximize Equation (5) with respect to n_1 and n_2, subject to $n_1 + n_2 = N$, the volume-maximizing levels of Category 1 and 2 investors are

$$\begin{cases} n_1^* = \pm\dfrac{N\sqrt{K_1K_2}}{|K_1-K_2|} - \dfrac{NK_2}{K_1-K_2} = \dfrac{N\sqrt{K_2}(\sqrt{K_1}-\sqrt{K_2})}{K_1-K_2} = \dfrac{N\sqrt{K_2}}{\sqrt{K_1}+\sqrt{K_2}} \\ n_2^* = \mp\dfrac{N\sqrt{K_1K_2}}{|K_1-K_2|} + \dfrac{NK_1}{K_1-K_2} = \dfrac{N\sqrt{K_1}(\sqrt{K_1}-\sqrt{K_2})}{K_1-K_2} = \dfrac{N\sqrt{K_1}}{\sqrt{K_1}+\sqrt{K_2}} \end{cases}. \tag{7}$$

Without losing generality, let $K_1 > K_2$ (that is, let Category 1 investors be those with a higher level of risk tolerance than Category 2 investors), Equation (7) becomes

$$\begin{cases} n_1^* = \dfrac{N\sqrt{K_2}}{\sqrt{K_1}+\sqrt{K_2}} < \dfrac{N}{2} \\ n_2^* = \dfrac{N\sqrt{K_1}}{\sqrt{K_1}+\sqrt{K_2}} > \dfrac{N}{2} \end{cases}.^{10} \tag{8}$$

If $K_1 = K_2$, then of course $n_1^* = n_2^* = N/2$.

Two implications can be drawn from Equation (5′) and (8). The first implication concerns the shape of excess trading volume as a function of the level of Category 1 (or 2) investors (ownership structure). The first and second derivatives of Equation (5′) with respect to n_1 are:

$$\frac{\partial V_e}{\partial n_1} = \frac{D}{2\sigma_e^2}(K_1+K_2)\,|\alpha_1-\alpha_2|\,\frac{K_2(N-n_1)^2 - K_1n_1^2}{[K_1n_1+K_2(N-n_1)]^2}, \tag{9}$$

$$\frac{\partial^2 V_e}{\partial n_1^2} = -\frac{D}{\sigma_e^2}(K_1+K_2)\,|\alpha_1-\alpha_2|\,\frac{K_1K_2N^2}{[K_1n_1+K_2(N-n_1)]^3} < 0. \tag{9′}$$

[10] Of course, this is not suggesting that investors consciously adjust their relative holding of the stock so that trading volume can be maximized. But rather, when the ownership structure is as specified Equation (8), trading volume reaches its maximum.

This means, ex-day trading volume is a concave function of the level of Category 1 (or 2) investors. It first increases in the level of Category 1 (or 2) investors, reaching its peak at the level stipulated in Equation (7) and then decreases. This is because, the level of tax-induced investor heterogeneity, being a function of the stock ownership structure, first increases and then decreases in the level of Category 1 (or 2) investors.

The second implication concerns the location of the peak of excess trading volume. The volume-maximizing level of Category 1 investors (those with a higher level of risk tolerance) is reached when they own less than 50% of the firm's common equity.

Though Equation (5′) is not a quadratic function (which is symmetric), it resembles a "skewed" quadratic function. When $K_1 > K_2$, it is skewed to the left and when $K_1 < K_2$, it is skewed to the right (see Figure 1). Considering Equation (5′) as a "skewed" quadratic function offers a convenient way of testing the theory empirically. I use the phrase "concave quadratic" to describe the predicted relation between the volume effect of dividend yield and the stock ownership structure.

2.3. Intuition and the tax-motivated trading hypotheses

Assume that the two categories are institutional and individual investors and that within each of these two categories, investors are homogeneous. For individual investors, dividends are tax-disadvantaged relative to capital gains; while institutional investors are either tax neutral or have preferential tax treatment of dividends. Since these two categories of investors are taxed differently on dividend and capital gains incomes, fractional ownership by institutional investors can be used to proxy for firm-level tax-induced investor heterogeneity. The intuition for Equation (5)/(5′) and (8) is: When the

level of institutional ownership is very low, the degree of tax-induced investor heterogeneity is low, because most of the investors are homogeneous individual investors. By the same reason, the degree of tax-induced investor heterogeneity is low when the level of institutional ownership is very high (most of the investors are homogeneous institutional investors). The highest degree of tax-induced investor heterogeneity occurs in between of these two extremes. Its exact location depends on the relative risk tolerance of individual and institutional investors. In testing the relation between excess trading volume around ex-dividend days and investor tax-induced heterogeneity, Michaely and Vila (1996) use an economy-wide measure of investor tax heterogeneity. They find a positive relation between investors' weighted average absolute deviation from the mean tax rate and the excess trading volume around ex-dividend days. I use a stock-specific measure of investor tax-induced heterogeneity in this paper.[11]

Based on the above argument concerning the role played by institutional ownership on the relation between dividend yield and excess trading volume, I propose the following tax-motivated trading hypotheses for the cross-sectional relation between ex-day excess trading volume, dividend yield and institutional ownership.

H1: Tax-Motivated Trading Hypothesis – *Trading volume rises around ex-dividend days and is increasing in dividend yield – a measure of the extend to which return on a stock is tax-disadvantaged. This positive volume effect of dividend yield is a concave quadratic function of the level of institutional ownership – a proxy for the degree of tax-induced investor heterogeneity.*

[11] Michaely and Vila (1996) argue that if clientele groups could be precisely identified, one could construct a firm-specific tax heterogeneity variable. However, there are no reliable data on the cross-sectional variation in tax rates (and in absolute risk aversion) across holders of different stocks. The stock-specific level of institutional ownership used in my study is of course not a precise measure but an approximation of the firm-level tax-induced heterogeneity.

While the exact levels of risk tolerance for institutional investors and individual investors are difficult to ascertain, sophisticated, wealthy and possibly better-informed institutional investors may be more risk tolerant than individual investors (see Naranjo, Nimalendran and Ryngaert (2000)). If this is the case, then they are Category 1 investors.

H2: Volume-Maximizing Level of Institutional Ownership Hypothesis – *If institutional investors are more risk tolerant than individual investors, then the volume-maximizing level of institutional ownership is reached at a level lower than* 50%.

The intuition for the above hypothesis is that investors with higher levels of risk tolerance will trade more aggressively around ex-days. Since demand has to meet supply, these investors will need to have a larger base of counter-parties (those with whom they can trade). This causes the volume-maximizing level of high risk tolerant investors to be lower than 50%.

2.4. Excess trading volume and tax regime changes

Tax regime changes should have an impact on ex-dividend day excess trading volume, because they cause changes in the relative taxation of dividends and capital gains among different investors. When the differential tax treatment of dividends and capital gains increases, the gains to exchanging tax burdens among investors with different tax status also increase, thus increasing trading volume around ex-dividend days. Since it is assumed that for institutional investors, dividend income is less tax-disadvantaged relative to capital gains income, then $\alpha_1 = (1 - t_{1d})/(1 - t_{1g}) > (1 - t_{2d})/(1 - t_{2g}) = \alpha_2$ (dividend being relatively more valuable to institutional investors than to individual investors). Equation (5) can be written as:

$$V_e = \frac{D}{2\sigma_e^2}(K_1 + K_2)(\alpha_1 - \alpha_2)\frac{n_1 n_2}{K_1 n_1 + K_2 n_2}$$

$$= \frac{D}{2\sigma_e^2}(K_1 + K_2)\frac{n_1 n_2}{K_1 n_1 + K_2 n_2}\left[\frac{1-t_{1d}}{1-t_{1g}} - \frac{1-t_{2d}}{1-t_{2g}}\right], \tag{10}$$

where t_{1d} and t_{1g} (t_{2d} and t_{2g}) are tax rates on dividend and capital gains incomes for Category 1 institutional (Category 2 individual) investors. The first-order conditions for Equation (10) with respect to t_{1d}, t_{1g}, t_{2d} and t_{2g} are:

$$\frac{\partial V_e}{\partial t_{1d}} = -\frac{D}{2\sigma_e^2}(K_1 + K_2)\frac{n_1 n_2}{K_1 n_1 + K_2 n_2}\frac{1}{1-t_{1g}} < 0; \tag{11a}$$

$$\frac{\partial V_e}{\partial t_{1g}} = \frac{D}{2\sigma_e^2}(K_1 + K_2)\frac{n_1 n_2}{K_1 n_1 + K_2 n_2}\frac{1-t_{1d}}{(1-t_{1g})^2} > 0; \tag{11b}$$

$$\frac{\partial V_e}{\partial t_{2d}} = \frac{D}{2\sigma_e^2}(K_1 + K_2)\frac{n_1 n_2}{K_1 n_1 + K_2 n_2}\frac{1}{1-t_{2g}} > 0; \tag{11c}$$

$$\frac{\partial V_e}{\partial t_{2g}} = -\frac{D}{2\sigma_e^2}(K_1 + K_2)\frac{n_1 n_2}{K_1 n_1 + K_2 n_2}\frac{1-t_{2d}}{(1-t_{2g})^2} < 0. \tag{11d}$$

This means, *ceteris paribus*, an increase in dividend tax rate for institutional investors will decrease ex-dividend day trading volume [Equation (11a)] while an increase in capital gains tax rate for institutional investors will increase ex-dividend day trading volume [Equation (11b)]; an increase in dividend tax rate for individual investors will increase ex-dividend day trading volume [Equation (11c)] while an increase in capital gains tax rate for individual investors will decrease ex-dividend day trading volume [Equation (11d)]. The intuition for the above first order conditions is, all else equal, an increase in dividend (capital gains) tax rate for institutional investors decreases

(increases) the relative value of dividend for institutional investors, thus decreasing (increasing) ex-day trading volume. On the other hand, an increase in dividend (capital gains) tax rate for individual investors decreases (increases) the relative value of dividend for individual investors, thus increasing (decreasing) ex-day trading volume. Based on the above argument, the hypothesis for ex-day trading volume concerning tax regime changes is:

H3: Tax Regime Change Hypothesis – *A tax regime change that increases the degree of differential tax treatment of dividends and capital gains among investors of differing tax status will increase excess trading volume around ex-dividend days and enhance the positive effect of dividend yield on ex-day trading volume.*

This study covers three tax regimes – TRA86, RRA93 and TRA97.[12] During the TRA86 regime, the preferential tax treatment of long-term capital gains adopted in 1921 was eliminated, so that dividends and capital gains incomes were treated equally – though a disparity in tax treatment of dividends and capital gains may still exists but to a less extent, because the realization of capital gains can be deferred.[13] In RRA93, maximum marginal tax rate on dividend incomes for individual investors was raised from 31% to 39.6% [Equation (11c) applies]. In TRA97, tax rate on capital gains for individual investors was reduced. Specifically, for individual taxpayers with a marginal tax rate on ordinary income of 28% or more, TRA97 reduced the long-term capital gains tax rate from 28% to 20%. Also, for individual taxpayers with a marginal tax rate on ordinary income of 15%, TRA97 reduced the long-term capital gains tax rate from 15% to 10% [Equation (11d) applies]. So, over these three tax regimes, dividends become more and

[12] For convenience, I name each tax regime after its related tax law change.

more tax-disadvantaged relative to capital gains for individual investors.[14] Since an increase in the level of differential tax treatment of dividends and capital gains among different investors will increase tax-motivated trading around ex-dividend days, I expect the effect of dividend yield on excess trading volume to increase over these three tax regimes.

2.5. Controls for risk and transaction costs of trading

Michaely and Vila (1995) suggest that ex-dividend day trading will cause investors to deviate from an otherwise optimal portfolio, thus increasing the associated risk exposure. This suggests that ex-day excess trading volume should be decreasing in the risk. They argue that both systematic and total risk will dampen trading activities around ex-dividend days.

Transaction costs serve as frictions to trade, since they erode trading profits and dampen trading incentive. When transaction costs increase, investors trade in fewer stocks and fewer investors trade. This means, excess trading volume around ex-dividend days should be decreasing in the level of transaction costs of individual stocks. As in Karpoff and Walkling (1988) and Naranjo, Nimalendran and Ryngaert (2000), I use the inverse of stock price as a measure of transaction costs. Both papers argue that a higher level of the inverse of stock price results in a higher percentage brokerage costs and bid-ask spreads. In fact, Bhardwaj and Brooks (1992) show direct evidence that both the bid-

[13] TRA86 reduced the differential tax treatment of realized long-term capital gains and dividend income in 1987 and eliminated this difference in 1988.

[14] In 1990 (RRA90), the top marginal tax rate on ordinary income for individual investors was raised from 28% to 31%. Since this increase is relatively minor compared with other tax regime changes, I do not consider it here.

ask spreads and round-trip commissions are inversely related to share prices. Thus, excess trading volume around ex-dividend days is expected to be negatively related to the inverse of stock price. Apart from the inverse of stock price, I also consider the size (market capitalization) of stocks. Size can be a measure of liquidity, if this is the case, its effect on trading volume should be similar to that of stock price. On the other hand, trading activity around ex-dividend days may be more pronounced for stocks with lower levels of market capitalization or liquidity, since during non-ex-dividend periods, trading on those stocks may be very thin. If this is the case, size should have a negative effect on excess trading volume.

3. DATA DESCRIPTION AND DERIVATION

This study covers a ten-year period, from 1989 to 1998. I focus on regular taxable cash dividend distributions – specifically, I examine monthly (CRSP distribution code 1222), quarterly (code 1232), semi-annual (code 1242) and annual (code 1252) distributions for common stocks. These distributions represent predictable and committed dividend policies. 78,717 ex-dividend days that fall into the above categories are extracted from the CRSP dividend distribution file. Next, I apply three criteria to the above: 1) each ex-dividend day in the sample must not coincide with other distribution days or announcement days; 2) each stock-ex-dividend-day-specific observation must have 91 days (from day –45 to day 45 relative to the ex-dividend day) of daily trading volume and return data around the ex-dividend day; and 3) each observation must also have data on the amount of dividend distributed, cum-dividend and ex-dividend stock

price. After applying these three criteria, 67,247 stock-ex-dividend-day-specific observations remain.

Next, each stock-ex-dividend-day-specific observation is required to have data on the level of institutional ownership. Beginning-of-the-year aggregate levels of institutional ownership are obtained from Compact Disclosure SEC. All institutional investors with more than $100 million in equity ownership must report their holdings to the SEC in quarterly 13f filings. Institutional investors in this database include banks, insurance companies, mutual funds, college endowment funds, corporate investors, pension and retirement funds, broker dealers, and other investment advisors. Aggregate level of institutional ownership is defined as the total number of shares held by institutional investors over the total number of shares outstanding for each stock.[15] After volume data are matched with institutional ownership data, I have 33,032 stock-ex-dividend-day-specific observations.

Dividend yield (*YIELD*) around ex-dividend days is computed as the amount of dividends per share (*AMT*) over the cum-dividend stock price (P_{CUM}). To avoid the effect of outliers, I eliminate observations within the top 0.5 percentile of dividend yield.[16] This reduces the sample size to 32,867 stock-ex-dividend-day-specific observations.

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[15] This aggregate level of institutional ownership is of course not a perfect measure of tax-related stock ownership structure. For example, this measure includes mutual funds that indirectly hold equity for fully taxable individuals for whom dividends are tax-disadvantaged. However, this may not pose too serious a problem in this paper for two reasons. 1) The proportion of mutual funds is relatively low and it has been declining over time. Gompers and Metrick (2001) find that the proportion of mutual funds among all institutional investors has declined from 9.00% in 1980 to 6.90% in 1996. 2) If mutual funds behave like individual investors, it will make it more difficult to find results supporting the tax-related trading hypotheses.

[16] These outliers are mainly due to small denominators – the cum-dividend prices being too small.

To control for systematic risk, I adopt the Fama-French three-factor approach. For each stock-ex-day combination, I perform the following time-series regression to get the estimates of these risk factors:

$$R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}, \quad (12)$$

where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book-to-market stocks minus the return on a portfolio of low book-to-market stocks in period t.[17] This process further reduces the sample size to 29,252. Michaely and Vila (1995) argue that total risk also affects trading volume. I use the ratio of a stock's daily return standard deviation σ_i over the CRSP value-weighted index daily return standard deviation σ_M during the 80-day non-event period from day –45 to day –6 and day 6 to day 45 as a proxy for total risk. It is computed as,

$$TRISK_i = \frac{\sigma_i}{\sigma_M}. \quad (13)$$

[17] To capture their ex-ante magnitudes, I estimate annual Fama-French risk factors using data from the preceding 48 months. For example, estimates of the risk factors for 1992 are based on 1988 to 1991 monthly data. The data needed to compute the Fama-French risk factors are obtained from the following sources. Monthly returns for stocks are obtained from CRSP. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Annualized returns on three-month treasury bills, which serve as a proxy for R_f after being converted to monthly returns, are obtained from Federal Reserve Bank publications. The CRSP value-weighted monthly return serves as a proxy for R_m. Monthly measures for *SMB* and *HML* are also computed using CRSP data (from French). β_{MKT}, β_{SMB} and β_{HML} are estimated for each stock.

To control for transaction costs, as in Naranjo, Nimalendran and Ryngaert (2000), I use the inverse of the cum-dividend closing price (P_{CUM}).

A measure of size (market capitalization) of stocks is included in the model. Previous studies, such as Bamber (1986, 1987) and Utama and Cready (1997) show that trading response around earnings announcement days is more pronounced for small firms. I use the average daily market capitalization of a stock during the 80-day non-event period as the measure of firm size. It is computed as,

$$ACAP_i = \frac{\sum_{t\in[-45,-6]\cup[6,45]} CAP_{it}}{80}, \tag{14}$$

where CAP_{it} is daily market capitalization (in $millions) for stock i on day t and $ACAP_i$ is the mean daily market capitalization for stock i.

I focus on excess trading volume around ex-dividend days. To conduct cross-sectional tests, an estimate of excess trading volume for each stock around its ex-dividend day is needed. For each stock, I obtain daily trading volume from day –45 to day 45 relative to its ex-dividend day. Similar to Michaely and Vila (1995 and 1996), the event period is defined as the 11-day period from day –5 to day 5 relative to the ex-dividend day and the non-event period is defined as the 80-day period from day –45 to day –6 and day 6 to day 45 relative to the ex-dividend day. I use the mean daily trading volume during the non-event period as a measure of normal daily trading volume. It is computed as

$$NV_i = \frac{\sum_{t\in[-45,-6]\cup[6,45]} VOL_{it}}{80}, \tag{15}$$

where VOL_{it} is daily trading volume (share turnover) for stock i on day t and NV_i is normal daily trading volume for stock i. Excess trading volume each day during the event period ($EXVOL_{it}$) is computed as

$$EXVOL_{it} = \frac{EV_{it}}{NV_i} - 1 \qquad t \in [-5, 5], \tag{16}$$

where EV_{it} is event daily period trading volume for stock i on day t. $EXVOL$ is a normalized measure of event period daily excess trading volume.

I then measure the average event period excess trading volume ($EXVOL_i$) for each stock-ex-dividend-day-specific observation, it is computed as

$$EXVOL_i = \frac{\sum_{t\in[-5,5]} EV_{it}}{11 \times NV_i} - 1. \tag{17}$$

This is the measure of ex-dividend day excess treading volume for each stock-ex-dividend-day-specific observation and it is the dependent variable used in the cross-sectional tests.

Table 1 shows the average daily excess trading volume for the 31-day period around the ex-dividend days. 67,247 observations are used for this computation. For each day during the 11-day event period, daily excess trading volume is significantly greater than 0 – consistent with tax-motivated trading around ex-dividend days. The peak of ex-dividend day trading occurs on the cum-dividend day (22.65% above normal). During the non-event period, only Day 14 has a marginally significant excess trading volume. This phenomenon is also depicted in Figure 2. This result justifies the use of an 11-day period (from day –5 to day 5) around the ex-dividend days as the event period.

4. TEST DESIGN AND EMPIRICAL RESULTS

4.1. Excess trading volume, dividend yield and institutional ownership around ex-dividend days

Michaely and Vila (1996) argue that excess trading volume around ex-dividend days should increase in dividend yield. As dividend yield increases, the potential gains from transferring dividends from investors who are averse to them to investors who are less averse to, or to investors who prefer them, increase. They find evidence consistent with this argument – for high dividend yield stocks, excess trading volume is more pronounced. I first conduct a similar test in my study. Using a sample of 29,252 stocks that have data on dividend yield and institutional ownership, I form quintiles based on the level of dividend yield and institutional ownership. This results in a total of 25 portfolios. Within each portfolio, I compute the mean excess trading volume as well as the dividend yield and the level of institutional ownership. The results are shown in Table 2. In general, within each institutional ownership quintile, excess trading volume increases when dividend yield increases. I compute the χ^2-statisitic for testing equality of mean excess trading volume across dividend yield quintiles within each institutional ownership quintile. In each of the five institutional ownership quintiles, equality of excess trading volume is rejected. This result is consistent with the notion of tax-motivated trading around ex-dividend days. When the potential tax benefit of exchanging dividends and capital gains among investors is high, they are motivated to trade, thus a positive relation between dividend yield and excess trading volume. On the other hand, it is also observed from Table 2 that as the level of institutional ownership increases, excess trading volume

first increases and then declines. This is consistent with the notion that as the level of institutional ownership increases, tax-induced investor heterogeneity first increases and then decreases, causing excess trading volume to peak and then decline (See Figure 3 for an illustration). This implies a concave quadratic relation between the volume effect of dividend yield and the level of institutional ownership.

The regression analyses are designed to examine the interaction between dividend yield and institutional ownership while controlling for risk, transaction costs and size. The tests are based on a sample of 29,252 stock-ex-dividend-day-specific observations that have data on the dependent variable and all the independent variables. Table 3 presents descriptive statistics and Table 4 presents correlations among dependent variable and independent variables. Excess trading volume is positively correlated with dividend yield – consistent with the tax-motivated trading hypothesis. The correlation between excess trading volume and institutional ownership is negative. Since the expected relation between these two variables is predicted to be non-linear, this simple correlation may not be very meaningful. It is interesting to note that the correlation between dividend yield and the level of institutional ownership is negative, suggesting that the theorized dividend tax clientele effect does not exist – at least for dividend paying stocks (see Grinstein and Michaely (2002) for some formal analyses).

To detect the non-linear relation between the level of institutional ownership and the effect of dividend yield on excess trading volume, I first analyze the following regression model in institutional ownership deciles:

$$EXVOL_i = \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2\beta_{SMBi} + \alpha_3\beta_{HMLi} + \alpha_4 TRISK_i + \alpha_5 1/P_{CUMi} + \alpha_6 ACAP_i + \alpha_7 INST_i + \alpha_8 YIELD_i + u_i. \quad (18)$$

I expect the coefficients on β_{MKT}, β_{SMB}, β_{HML} and *TRISK* to be negative, since extra trading around ex-dividend days will cause investors to deviate from their optimal portfolio holding, thus assuming more risk. I also expect the coefficient on $1/P_{CUM}$ to be negative. In this test based on institutional ownership deciles, the focus is on the *YIELD* coefficient. Since *YIELD* is a measure of the potential tax gains to exploit by exchanging tax burdens among different investors, I expect the coefficient on *YIELD* to be positive in each *INST* decile. On the other hand, as the level of institutional ownership increases, the degree of tax-induced heterogeneity first increases and then decreases, the coefficient on *YIELD* should follow the same pattern.

The results are shown in Table 5. The coefficients on *YIELD* are positive in all the *INST* deciles and are significant in the first eight. In Decile 3, the coefficient on *YIELD* peaks and then generally declines as the level of institutional ownership increases. This result is consistent with the tax-induced investor heterogeneity hypothesis. See Figure 4 for an illustration of the results.

Next, I directly test for the concave quadratic relation between the level of institutional ownership and the volume effect of dividend yield by interacting *YIELD* with *INST* and $INST^2$. I utilize the following regression model for the whole sample:

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2\beta_{SMBi} + \alpha_3\beta_{HMLi} + \alpha_4 TRISK_i + \alpha_5 1/P_{CUMi} \\ & + \alpha_6 ACAP_i + \alpha_7 INST_i + \alpha_8 INST^2{}_i + \alpha_9 YIELD_i \\ & + \alpha_{10} YIELD_i \times INST_i + \alpha_{11} YIELD_i \times INST^2{}_i + u_i, \end{aligned} \tag{19}$$

I expect the coefficient on *YIELD* and *YIELD*×*INST* to be positive and that on *YIELD*×$INST^2$ to be negative.

The results are shown in Table 6. The coefficient on β_{MKT} is negative but insignificant. The coefficient on β_{SMB} is negative and significant, consistent with my conjecture. However, the coefficient on β_{HML} is positive and significant, inconsistent with the conjecture on risk. Michaely and Vila (1996) find a negative relation between excess trading volume around ex-dividend days and the β estimated from the CAPM model. I use the Fama-French three-factor model to control for risk of individual stocks. It appears that excess trading volume around ex-dividend days is higher for stocks with higher book-to-market equity ratios. A possible explanation for this result is that for stocks with high levels of book-to-market equity ratio, their non-event period trading volume may be relatively thin, so the normalized excess trading volume around ex-dividend days may be relatively high. The coefficient on *TRISK* is negative and significant, consistent with Michaely and Vila (1995) in that total risk reduces trading volume around ex-dividend days. The coefficient on $1/P_{CUM}$ is insignificant, inconsistent with prior research.[18] The coefficient on *ACAP* is negative and significant, suggesting that trading response is more pronounced for stocks with lower level of market capitalization, consistent with Bamber (1986, 1987) and Utama and Cready (1997). The coefficient on *INST* is negative and significant and the coefficient on $INST^2$ is positive and significant.[19]

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[18] Previous studies usually find a negative relation between excess trading volume and measures of transactions costs. For example, Lakonishok and Vermaelen (1986), Naranjo, Nimalendran and Ryngaert (2000) and Koski and Scruggs (1995).

[19] This suggests that when considered alone (with the tax-induced investor heterogeneity effect controlled for), the level of institutional ownership has some dampening effect on the ex-day excess trading volume and this dampening effect declines when the level of institutional ownership increases. Since ownership structure enters the excess trading volume model in conjunction with dividend yield, I do not have an *ex ante* prediction on the effect of the level of institutional ownership in isolation.

The primary focus concerns the impact of institutional ownership on the volume effect of dividend yield. The coefficient on *YIELD* is significantly positive (α_9 = 18.4838, t = 2.84), consistent with the tax-motivated trading hypothesis – the higher the level of dividend yield, the higher the level of trading activities. This result is consistent with numerous existing studies, such as Michaely and Vila (1995, 1996) and Lakonishok and Vermaelen (1986). On the other hand, the coefficient on *YIELD*×*INST* is significantly positive (α_{10} = 124.6886, t = 4.06) and the coefficient on *YIELD*×*INST*^{2} is significantly negative (α_{11} = -193.7132, t = -5.72), suggesting that the effect of dividend yield on excess trading volume is a concave quadratic function of the level of institutional ownership, consistent with the tax-induced investor heterogeneity hypothesis.[20]

4.2. Volume-maximizing level of institutional ownership

Based on the regression results for Equation (19), the volume-maximizing level of institutional ownership is

$$INST^* = -\frac{124.6886 \times YIELD}{2 \times (-193.7132 YIELD)} = 0.3218 = 32.18\% .^{21} \quad (20)$$

[20] In a different line of research, but with similar theoretical construct, Utama and Cready (1997) find that volume response around earnings announcement dates is a quadratic function of the level of institutional ownership. This is consistent with Kim and Verrecchia's (1991) proposition that trading volume response to public announcements increases with the level of cross-investor variation in precision of private pre-disclosure information, proxied for by the level of institutional ownership. The fundamental issue in both researches is the differential valuation of the same asset by different investors. In Kim and Verrecchia (1991) and Utama and Cready's (1997) case, differential valuation is caused by variation in precision of private pre-disclosure information while in Michaely and Vila's (1995, 1996) and my case, it is caused by differential tax treatment of dividend and capital gains incomes for different investors. In both cases, trading volume reflects changes in expectations of all investors (Beaver's (1968) intuition).

[21] For a concave quadratic function $y = ax^2 + bx + c$, where $a < 0$ and $b > 0$, the value of y is maximized when $x = -b/2a$.

This volume-maximizing level of institutional ownership appears to be consistent with the univariate result in Table 2, which shows that in the highest dividend yield quintile, the highest level of excess trading volume occurs when the level of institutional ownership is 34.09%. The volume-maximizing level of institutional ownership being lower than 50% implies that institutional investors may be more risk tolerant than individual investors.[22] Figure 5 depicts the expected level of excess volume as a function of dividend yield and institutional ownership based on the regression results for Equation (19). It shows that at any dividend yield cross-section, volume is a concave quadratic function of the level of institutional ownership and its maximum is reached at a level of institutional ownership lower than 50%.

4.3. Effect of tax regime changes

According to the tax regime change hypothesis, trading volume around ex-dividend days should be higher when there is an increase in the degree of differential tax treatment of dividends and capital gains. The period 1989-1998 spans three tax regimes, TRA86, RRA93 and TRA97. During the TRA86 regime, tax rate on dividends and capital gains were equalized for individual investors, but a preferential tax treatment on capital gains may still exist. For example, the realization of capital gains can be deferred, so excess trading volume around ex-dividend days may still exist during the TRA86 regime. In 1993, the Clinton administration increased investor ordinary income tax rates from 31% to 39.6%. This change increased the spread in tax rates on dividends and capital gains. In 1997, the individual investor capital gains tax rate was reduced from 28% to 20%. This

[22] An F-test (testing whether $\alpha_{10} + \alpha_{11} = 0$) value of 58.00 strongly rejects that the volume-maximizing

further increased the differential tax treatment of dividends and capital gains. Based on the above, excess trading volume around ex-dividend days and the volume effect of dividend yield should increase over these three tax regimes. This means, over these three regimes, the coefficient on *YIELD* should increase. Presumably, with the increase in the differential tax treatment of dividends and capital gains, the effect of investor heterogeneity should also increase. But since excess trading volume is a quadratic function of the level of institutional ownership, I do not attempt to predict whether the coefficients on *YIELD*×*INST* and *YIELD*×*INST*^{2} should increase or decrease over the three tax regimes.

I begin my analysis with a comparison of excess trading volume around ex-dividend days during the three tax regimes. I expect excess volume to increase over these three regimes. The results, shown in Table 7, are not consistent with this conjecture. Actually, excess volume decreases over these three regimes. A χ^2-test shows that this decrease in excess trading volume is significant over the three tax regimes. But it is also observed that dividend yield decreases over the three regimes. Firms may be adjusting their dividend policy in response to the tax regime changes – they may have decreased their dividend yield when dividend incomes become relatively more tax-disadvantaged.[23] On the other hand, the level of institutional ownership increases monotonically. This pattern in the data illustrates the necessity to control for dividend yield and institutional ownership simultaneously in order to have a clear picture of the effect of tax regime changes.

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level of institutional ownership is equal to 50%.

I partition the 10-year period into two partially overlapping sub-periods: 1989-1996 (TRA86 regime switched to RRA93 regime in 1993) and 1993-1998 (RRA93 regime switched to TRA97 regime in 1997). I perform regression tests separately for these two sub-periods. For the first sub-period that covers TRA86 and RRA93, I create an indicator variable *T*93 that equals 1 if the stock-ex-dividend-day-specific observation falls in the RRA93 regime and 0 otherwise. *T*93 is also interacted with *YIELD*, *YIELD*×*INST* and *YIELD*×*INST*^{2} to create *YIELD*×*T*93, *YIELD*×*INST*×*T*93 and *YIELD*×*INST*^{2}×*T*93. The regression model used is

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1 T93 + \alpha_2 \beta_{MKTi} + \alpha_3 \beta_{SMBi} + \alpha_4 \beta_{HMLi} + \alpha_5 TRISK_i + \alpha_6 1/P_{CUMi} \\ & + \alpha_7 ACAP_i + \alpha_8 INST_i + \alpha_9 INST^2{}_i + \alpha_{10} YIELD_i + \alpha_{11} YIELD_i \times T93_i \\ & + \alpha_{12} YIELD_i \times INST_i + \alpha_{13} YIELD_i \times INST_i \times T93_i + \alpha_{14} YIELD_i \times INST^2{}_i \\ & + \alpha_{15} YIELD_i \times INST^2{}_i \times T93_i + u_i. \end{aligned} \quad (21)$$

The results are shown in Panel A, Table 8. While the coefficient on *YIELD* becomes insignificantly positive (α_{10} = 4.3893, t = 0.63), the coefficient on *YIELD*×*T*93 is significantly positive (α_{11} = 18.4668, t = 2.09), suggesting that an increase in dividend tax rate increases the effect of dividend yield on excess trading volume.[24] This is consistent with Michaely and Vila (1995), who find that excess trading volume around ex-dividend days is higher pre-TRA86 than post-TRA86. It is also consistent with Kato and Loewenstein (1995) who show that excess volume around ex-dividend days declines after the 1988 tax reform in Japan. After the reform, individuals were taxed on capital gains for the first time and trading by corporations in other firms' stocks around those

[23] Or, firms simply have a lower propensity to pay dividends over time, see Fama and French (2001).
[24] The insignificant coefficient on *YIELD* may be due to the fact that during the TRA86 regime, tax rates on dividends and capital gains were equalized.

firms' fiscal year end for dividend capture purpose was restricted and made more costly. Kato and Loewenstein attribute the decline partially to tax reasons.

With control for the tax regime change variable, the quadratic relation between the level of institutional ownership and the effect of dividend yield on ex-dividend day excess trading volume is still present – the coefficient on *YIELD*×*INST* is significantly positive (α_{12} = 182.3588, t = 4.99) and the coefficient on *YIELD*×*INST*^{2} is significantly negative (α_{14} = -252.3961, t = -5.75). On the other hand, the coefficients on *YIELD*×*INST*×*T*93 and *YIELD*×*INST*^{2}×*T*93 are both insignificant (α_{13} = -36.7104, t = -0.84; α_{15} = 9.6277, t = 0.19), suggesting that the tax regime change does not alter the shape of this quadratic relation.

Next, I test for the effect of tax regime change for the period 1993-1998. Similarly, an indicator variable *T*97 is created that equals 1 if the stock-ex-dividend-day-specific observation falls in the TRA97 regime and 0 otherwise. *T*97 is also interacted with *YIELD*, *YIELD*×*INST* and *YIELD*×*INST*^{2} to create *YIELD*×*T*97, *YIELD*×*INST*×*T*97 and *YIELD*×*INST*^{2}×*T*97. Similar to the 1989-1996 period, I utilize the following regression model:

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1 T97 + \alpha_2 \beta_{MKTi} + \alpha_3 \beta_{SMBi} + \alpha_4 \beta_{HMLi} + \alpha_5 TRISK_i + \alpha_6 1/P_{CUMi} \\ & + \alpha_7 ACAP_i + \alpha_8 INST_i + \alpha_9 INST^2{}_i + \alpha_{10} YIELD_i + \alpha_{11} YIELD_i \times T97_i \\ & + \alpha_{12} YIELD_i \times INST_i + \alpha_{13} YIELD_i \times INST_i \times T97_i + \alpha_{14} YIELD_i \times INST^2{}_i \\ & + \alpha_{15} YIELD_i \times INST^2{}_i \times T97_i + u_i. \end{aligned} \quad (22)$$

Since TRA97 decreases the individual investor tax rate on capital gains, it increases the level of differential tax treatment of dividends and capital gains. I expect the coefficient

on *YIELD*×*T*97 to be positive. The results (Panel B, Table 8) show that while the coefficient on *YIELD* is positive and significant (α_{10} = 35.9957, t = 3.95), the coefficient on *YIELD*×*T*97 is negative but insignificant (α_{11} = -8.1335, t = -0.53), suggesting that TRA93 did not increase ex-day trading volume. The quadratic relation between the level of institutional ownership and the effect of dividend yield on excess volume is unaltered after the 1997 tax regime change. Based on the above, I find partial support for the hypothesis concerning tax regime changes.[25]

There maybe two possible reasons for not finding support for the tax-motivated trading hypothesis for the Taxpayer Relief Act of 1997. The first one is that the asset holding period to qualify for the long-term capital gains rates increases from 12 months to 18 months. An increase in holding period increases the risk involved in dividend-related trading and this has a negative effect on excess trading volume (see Code Section 302). The second reason is related to rules on dividend-received deduction for corporations. Before TRA97, no dividend-received deduction is allowed for stock held by a corporation for 45 days or less. After TRA97, no dividend-received deduction is allowed for stock held for 45 days or less during the 90-day period beginning on the date 45 days before the ex-dividend date of the stock. This means, after TRA97, dividend-related trading for corporations is further restricted, and this has a dampening effect on ex-day trading volume (see Code Section 246(c)). While a decrease in individual investor

[25] Two *price level* studies do find price movements consistent with these two tax regime changes. Ayers, Cloyd and Robinson (2002) find evidence of dividend tax capitalization – stock price reaction to the increase in the individual income tax rate enacted in the Revenue Reconciliation Act of 1993 is negatively related to dividend yield and that this negative relation is mitigated by the level of institutional ownership. Lang, and Shackelford (2000) find evidence of capital gains tax capitalization – stock prices moved

capital gains tax rate should increase ex-day trading volume, the changes in rules on holding period and dividend-received deduction should decrease it, and the net change in ex-day excess volume may be insignificant.

4.4. Sensitivity analysis

4.4.1. Alternative risk control

Michaely and Vila (1995 and 1996) argue that both systematic risk and total risk affect ex-day excess trading volume and they use risk measures generated from the CAPM model. I repeat my analyses using their alternative risk measures to determine how my results are sensitive to an alternative risk control. For the cross-sectional tests, I utilize the following two regression equations:

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2 TRISK_i + \alpha_3 1/P_{CUMi} + \alpha_4 ACAP_i \\ & + \alpha_5 INST_i + \alpha_6 INST^2{}_i + \alpha_7 YIELD_i + \alpha_8 YIELD_i \times INST_i \\ & + \alpha_9 YIELD_i \times INST^2{}_i + u_i, \end{aligned} \tag{23}$$

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2 IRISK_i + \alpha_3 1/P_{CUMi} + \alpha_4 ACAP_i \\ & + \alpha_5 INST_i + \alpha_6 INST^2{}_i + \alpha_7 YIELD_i + \alpha_8 YIELD_i \times INST_i \\ & + \alpha_9 YIELD_i \times INST^2{}_i + u_i, \end{aligned} \tag{24}$$

where β_{MKT} is the CAPM beta estimated over the non-event 80-day period (day –45 to day –6 and day 6 to day 45 relative to the ex-dividend day), total risk *TRISK* is as defined earlier and idiosyncratic risk *IRISK* is the standard deviation of the CAPM residual scaled by the standard deviation of the market return during the corresponding period. Qualitatively similar results are obtained concerning the effect of dividend yield and institutional ownership and Equation (24) suggests that the volume maximizing level of institutional ownership is 32.67%, very close to its level when the Fama-French three-

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inversely with dividend yields during the May, 1997 week when the White House and Congress agreed on

factor model is used to control for risk. The coefficients on β_{MKT}, *TRISK* and *IRISK* are all negative and significant, consistent with the notion of risk reducing excess volume in Michaley and Vila (1995 and 1996).[26]

Also, I use the following regression equations to test the effect of tax regime changes in 1993 and 1997,

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1 T93 + \alpha_2 \beta_{MKTi} + \alpha_3 IRISK_i + \alpha_4 1/P_{CUMi} + \alpha_5 ACAP_i \\ & + \alpha_6 INST_i + \alpha_7 INST^2_i + \alpha_8 YIELD_i + \alpha_9 YIELD_i \times T93_i \\ & + \alpha_{10} YIELD_i \times INST_i + \alpha_{11} YIELD_i \times INST_i \times T93_i + \alpha_{12} YIELD_i \times INST^2_i \\ & + \alpha_{13} YIELD_i \times INST^2_i \times T93_i + u_i, \end{aligned} \tag{25}$$

$$\begin{aligned} EXVOL_i = {} & \alpha_0 + \alpha_1 T97 + \alpha_2 \beta_{MKTi} + \alpha_3 IRISK_i + \alpha_4 1/P_{CUMi} + \alpha_5 ACAP_i \\ & + \alpha_6 INST_i + \alpha_7 INST^2_i + \alpha_8 YIELD_i + \alpha_9 YIELD_i \times T97_i \\ & + \alpha_{10} YIELD_i \times INST_i + \alpha_{11} YIELD_i \times INST_i \times T97_i + \alpha_{12} YIELD_i \times INST^2_i \\ & + \alpha_{13} YIELD_i \times INST^2_i \times T97_i + u_i. \end{aligned} \tag{26}$$

Again, similar results are obtained when I use the alternative risk control.

4.4.2. Alternative measure of transaction costs

When I use $1/P_{EX}$ as a proxy for transaction costs, its coefficient is insignificant (like that of $1/P_{CUM}$) while the coefficients on other variables are qualitatively similar.

4.4.3. Impact of outlying and influential observations

I use Belsley, Kuh and Welsch's (1980) procedures to check for the effects of outliers and influential observations and find that the results are not impacted by outlying and influential observations.[27]

4.4.4. Economic significance

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a budget accord that included a reduction in the capital gains tax rate.

[26] The results are not tabulated here.

[27] I use the general cutoff levels suggested in Belsley, Kuh and Welsch (1980) for the two procedures.

Base on the results in Table 6, I estimate the excess trading volume due to the interaction between dividend yield and the level of institutional ownership. For a dividend yield of 1%, excess trading volume is 29.02%, 38.46% and 32.40% when the level of institutional ownership is 10%, 30% and 50%, respectively.[28] These levels of excess volume are all economically significant and they demonstrate that the level of institutional ownership first increases and then decreases excess volume (Also see Figure 5 for an idea of economic significance).

4.5. Relation with dividend capitalization (price level) studies

Three papers investigating the notion of dividend tax capitalization consider the effect of stock ownership structure (institutional ownership) on stock price. Ayers, Cloyd and Robinson (2002) find that stock price reaction to the increase in the individual income tax rate enacted in the Revenue Reconciliation Act of 1993 is negatively related to dividend yield and that this negative relation is mitigated by the level of institutional ownership. Dahliwal, Li and Trezevant (2003) find that a firm's dividend yield has a positive impact on its common stock return that is decreasing in the level of institutional ownership. From a different angle, Dhaliwal, Erickson and Li (2002) find that for high dividend yield stocks, low levels of institutional ownership suppress the earnings response coefficient, because for these stocks, a higher portion of earnings goes to taxes. These three studies use the level of institutional ownership as an indicator of the identity of the marginal

[28] (*YIELD* = 0.01, *INST* = 0.1): $18.4838\times0.01 + 124.6886\times0.01\times0.1 - 193.7132\times0.01\times0.1^2 = 0.2902$; (*YIELD* = 0.01, *INST* = 0.3): $18.4838\times0.01 + 124.6886\times0.01\times0.3 - 193.7132\times0.01\times0.3^2 = 0.3846$; (*YIELD* = 0.01, *INST* = 0.5): $18.4838\times0.01 + 124.6886\times0.01\times0.5 - 193.7132\times0.01\times0.5^2 = 0.3240$.

investor and argue that to understand dividend tax capitalization, one has to consider payout policy in conjunction with stock ownership structure.

I stress the importance of payout policy and ownership structure in understanding ex-dividend day excess trading volume. Since price and trading volume are the two most important statistics in financial market (Michaely and Vila (1996)), my study combined with results from the above three papers offers a fuller picture of how investors *respond* to the differential tax treatment of dividend and capital gains incomes. Ownership structure can assume two roles. In price level tests (dividend tax capitalization), it is used as an indicator of whether the marginal investor in a firm's common stock is more likely to be a low-tax or a high-tax investor. In trading volume tests, it proxies for the degree of tax-induced investor heterogeneity. The results from both lines of research are consistent with each other: Tax matters in valuation and it impacts both price and investor trading patterns around ex-dividend days.

5. SUMMARY AND CONCLUSION

In this study, I examine the interaction between dividend yield and institutional ownership on excess trading volume around ex-dividend days. Dividend yield proxies for the tax disadvantaged portion of stock return while the level of institutional ownership proxies for the degree of tax-induced investors heterogeneity. I hypothesize that while dividend yield is positively related to excess trading volume around ex-dividend days, this positive relation is a concave quadratic function of the level of institutional ownership.

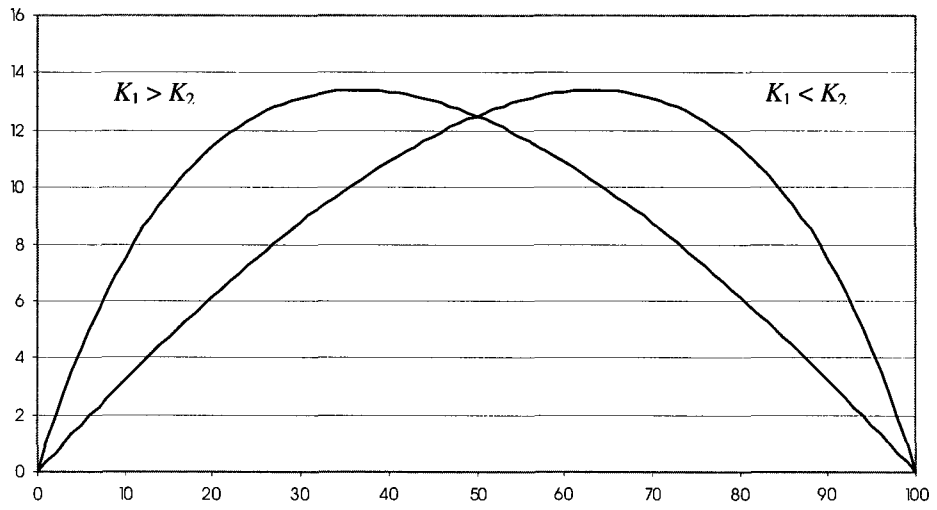
Cross-sectional test results support these hypotheses. First, excess trading volume is increasing in dividend yield, consistent with the notion of tax-motivated trading around the ex-dividend days. Second, this positive relation between dividend yield and ex-day excess trading volume is a concave quadratic function of the level of institutional ownership, consistent with a tax-induced investor heterogeneity argument. Third, the volume-maximizing level of institutional ownership is reach at 32.18%, lower than 50%, implying that institutional investors may have a higher level of risk tolerance than individual investors.

I also test for systematic changes in ex-dividend day excess trading volume when tax regime changes. Excess trading volume and the volume effect of dividend yield should increase for a regime change that increases the degree of differential tax treatment of dividends and capital gains. I find results consistent with this hypothesis for the period 1989-1996 that covers TRA86 and RRA93, but not for the period 1993-1998 that covers RRA93 and TRA97.

In conclusion, this paper demonstrates that tax-motivated trading is a cause of excess trading volume around ex-dividend days. An important contribution of the paper is the consideration of stock ownership structure in explaining the variation in excess trading volume around ex-dividend days. Ownership structure affects excess trading volume by influencing the degree of tax-induced investor heterogeneity. The above results, combined with studies supporting the notion of dividend tax capitalization, reinforce the notion that tax matters in valuation and its effect can be detected from both stock price and investor trading patterns around ex-dividend days.

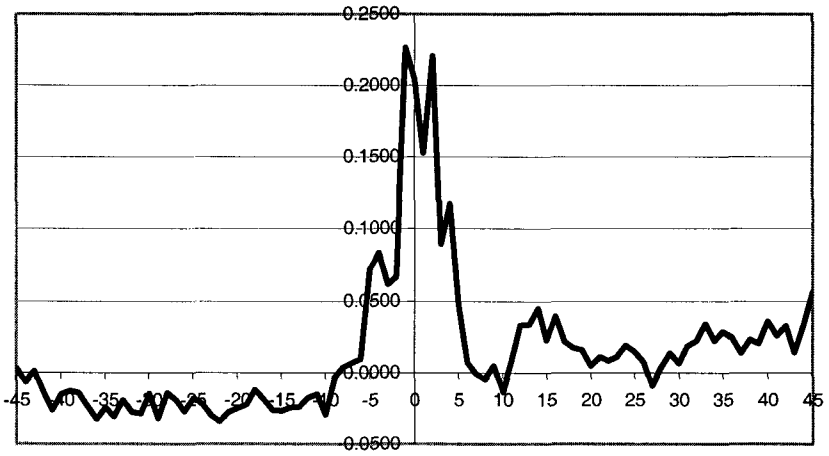
APPENDIX A: FIGURES

Figure 1
Level of Risk Tolerance and Ex-Day Excess Trading Volume as a Function of n_1 – the Number of Category 1 Investors



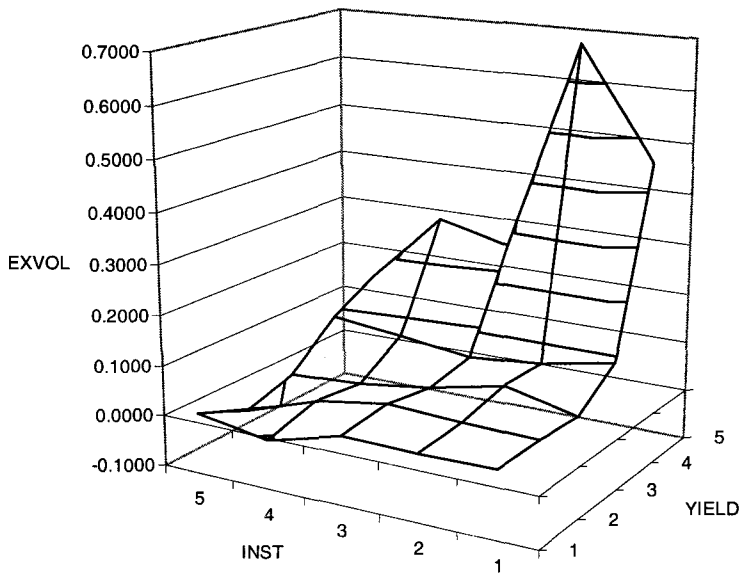
The horizontal axle is n_1 and the vertical axle is $n_1(N - n_1)/[K_1 n_1 + K_2(N - n_1)]$. Assume that $n_1 + n_2 = N = 100$. When $K_1 > K_2$, $K_1 = 3$ and $K_1 = 1$; when $K_1 < K_2$, $K_1 = 1$ and $K_2 = 3$.

Figure 2
Daily Excess Trading Volume Around Ex-Dividend Days



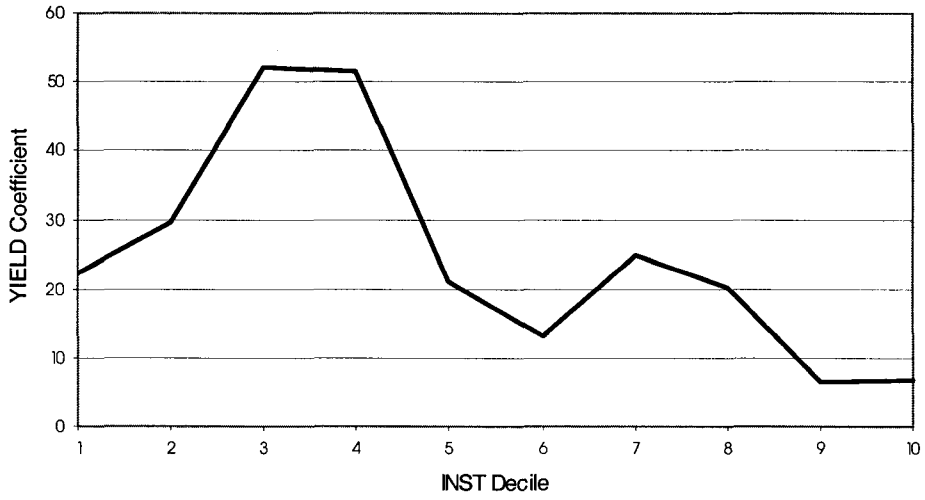
Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where *EV* is event period daily trading volume for each stock-ex-dividend-day specific observation. 67,247 stock-ex-dividend-day-specific observations are used.

Figure 3
Excess Trading Volume Around Ex-Dividend Day Based on Level of Dividend Yield and Institutional Ownership



Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where *EV* is event period daily trading volume for each stock-ex-dividend-day specific observation. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC.

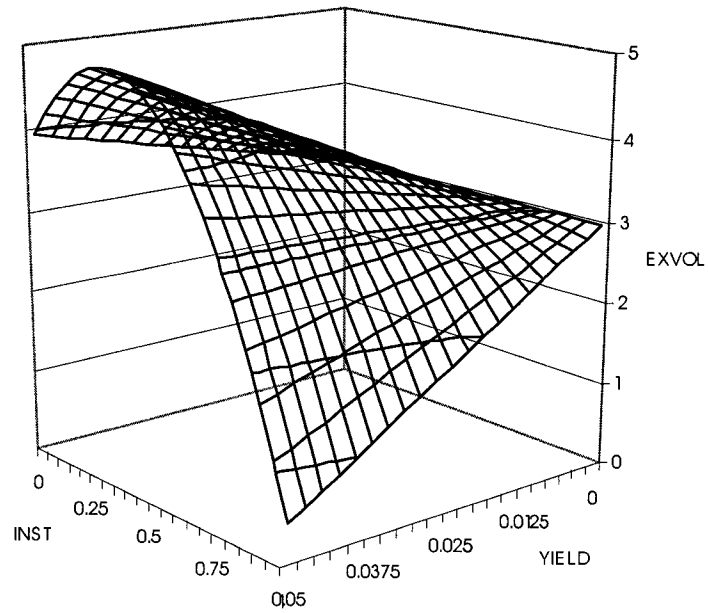
Figure 4
Coefficient on *YIELD* in *INST* Deciles



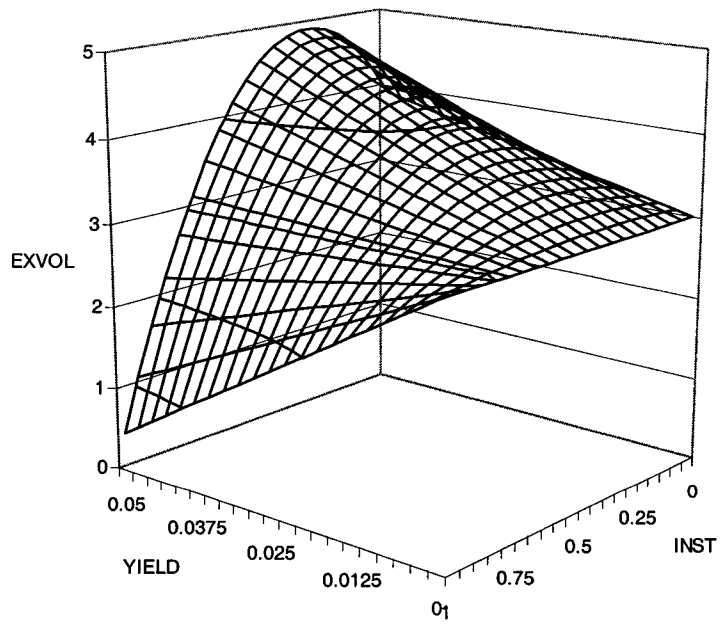
Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where EV is event period daily trading volume for each stock-ex-dividend-day specific observation. To control for systematic risk related to the Fama-French three factors, β_{MKT}, β_{SMB} and β_{HML} are estimated using the regression: $R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}$, where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book to market stocks minus the return on a portfolio of low book to market stocks in period t. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Total risk *TRISK* is defined as standard deviation of an individual stock's daily return scaled by the standard deviation of the CRSP value-weighted index daily return. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC. $1/P_{CUM}$ and $1/P_{EX}$ proxy for transactions costs. Average market capitalization *ACAP* is defined as the average of daily market capitalization during the non-event 80-day period.

[a] Model: $EXVOL_i = \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2\beta_{SMBi} + \alpha_3\beta_{HMLi} + \alpha_4 TRISK_i + \alpha_5 1/P_{CUMi} + \alpha_6 ACAP_i + \alpha_7 INST_i + \alpha_8 YIELD_i + u_i$.

Figure 5
Effect of Dividend Yield and Institutional Ownership on Excess Trading Volume Around Ex-Dividend Days



a. Frontal View[a]



b. A 90-Degree Clockwise Rotation

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where *EV* is event period daily trading volume for each stock-ex-dividend-day-specific observation. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{cum}. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC.

[a] The parameter values used for depicting the above relations among *EXVOL*, *INST* and *YIELD* are obtained from the regression: $EXVOL_i = \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2\beta_{SMBi} + \alpha_3\beta_{HMLi} + \alpha_4 TRISK_i + \alpha_5 1/P_{CUMi} + \alpha_6 ACAP_i + \alpha_7 INST_i + \alpha_8 INST^2_i + \alpha_9 YIELD_i + \alpha_{10} YIELD_i \times INST_i + \alpha_{11} YIELD_i \times INST^2_i + u_i$. I use $EXVOL = 18.4838 \times YIELD + 124.6886 \times YIELD \times INST - 193.7132 \times YIELD \times INST^2$ to compute the expected excess trading volume around ex-dividend day. Since I ignore the effects of risk and transactions costs, the expected trading volumes shown above are only proportional. The curves across the mesh are the iso-*EXVOL* curves.

APPENDIX B: TABLES

Table 1
Daily Excess Trading Volume Around Ex-Dividend Days

Date	*EXVOL*	T-Value
-15	-0.0266	-1.1805
-14	-0.0244	-1.0819
-13	-0.0240	-1.0658
-12	-0.0174	-0.7722
-11	-0.0149	-0.6613
-10	-0.0293	-1.3012
-9	-0.0038	-0.1698
-8	0.0041	0.1826
-7	0.0071	0.3148
-6	0.0098	0.4345
-5	**0.0725**	**3.2199**
-4	**0.0833**	**3.6981**
-3	**0.0615**	**2.7305**
-2	**0.0668**	**2.9684**
-1	**0.2265**	**10.0602**
0	**0.2046**	**9.0875**
1	**0.1530**	**6.7969**
2	**0.2209**	**9.8106**
3	**0.0896**	**3.9805**
4	**0.1172**	**5.2048**
5	**0.0474**	**2.1054**
6	0.0072	0.3202
7	-0.0007	-0.0319
8	-0.0047	-0.2101
9	0.0050	0.2203
10	-0.0135	-0.6010
11	0.0074	0.3306
12	0.0331	1.4681
13	0.0339	1.5036
14	0.0450	1.9977
15	0.0226	1.0059

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where *EV* is event period daily trading volume for each stock-ex-dividend-day specific observation. 67,247 stock-ex-dividend-day-specific observations are used.

Table 2
Sub-Sample Statistics for Excess Trading Volume Around Ex-Dividend Day Based on Level of Dividend Yield and Institutional Ownership

		INST Quintile 1			*INST* Quintile 2			*INST* Quintile 3		
	Variable	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**
YIELD	***YIELD***	1210	0.0014	0.0009	881	0.0014	0.0010	1077	0.0014	0.0009
Quintile 1	***INST***	1210	0.1295	0.0864	881	0.3515	0.0474	1077	0.4823	0.0314
	EXVOL	1210	0.0339	0.7352	881	0.0310	0.5701	1077	0.0340	0.5148
YIELD	***YIELD***	984	0.0038	0.0006	1111	0.0038	0.0006	1183	0.0038	0.0006
Quintile 2	***INST***	984	0.1460	0.0870	1111	0.3531	0.0451	1183	0.4840	0.0318
	EXVOL	984	0.0339	0.7446	1111	0.0389	0.7001	1183	0.0448	0.5402
YIELD	***YIELD***	925	0.0058	0.0006	1086	0.0058	0.0006	1212	0.0059	0.0006
Quintile 3	***INST***	925	0.1410	0.0866	1086	0.3516	0.0463	1212	0.4841	0.0335
	EXVOL	925	0.0289	0.7546	1086	0.0627	0.7635	1212	0.0305	0.5432
YIELD	***YIELD***	872	0.0083	0.0009	1051	0.0084	0.0009	1405	0.0084	0.0009
Quintile 4	***INST***	872	0.1418	0.0848	1051	0.3554	0.0438	1405	0.4829	0.0342
	EXVOL	872	0.0879	0.9853	1051	0.0603	0.7065	1405	0.0482	0.6691
YIELD	***YIELD***	1858	0.0157	0.0043	1726	0.0152	0.0038	978	0.0141	0.0044
Quintile 5	***INST***	1858	0.1675	0.0705	1726	0.3409	0.0471	978	0.4780	0.0344
	EXVOL	1858	0.4551	1.7416	1726	0.6731	1.7923	978	0.2454	0.8321
	χ^2 **Test**		169.3611			416.7468			61.4223	

(To be continued)

Table 2 (continued)
Sub-Sample Statistics for Excess Trading Volume Around Ex-Dividend Day Based on Level of Dividend Yield and Institutional Ownership

		INST Quintile 4			*INST* Quintile 5			
	Variable	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**	χ^2 **Test**
YIELD	***YIELD***	1100	0.0014	0.0009	1581	0.0014	0.0009	
Quintile 1	***INST***	1100	0.5987	0.0333	1581	0.7560	0.0821	
	EXVOL	1100	-0.0034	0.4982	1581	0.0196	1.1423	4.00
YIELD	***YIELD***	1164	0.0038	0.0006	1410	0.0038	0.0006	
Quintile 2	***INST***	1164	0.5939	0.0328	1410	0.7410	0.0716	
	EXVOL	1164	0.0241	0.4916	1410	-0.0238	0.4500	17.39
YIELD	***YIELD***	1390	0.0059	0.0006	1226	0.0058	0.0006	
Quintile 3	***INST***	1390	0.5979	0.0313	1226	0.7301	0.0654	
	EXVOL	1390	0.0113	0.4413	1226	0.0043	0.4716	6.78
YIELD	***YIELD***	1478	0.0083	0.0009	1054	0.0083	0.0009	
Quintile 4	***INST***	1478	0.5963	0.0310	1054	0.7204	0.0593	
	EXVOL	1478	0.0668	0.7295	1054	0.0855	0.9383	2.06
YIELD	***YIELD***	706	0.0135	0.0041	584	0.0128	0.0027	
Quintile 5	***INST***	706	0.5937	0.0317	584	0.7205	0.0543	
	EXVOL	706	0.2809	0.9533	584	0.1356	0.8417	170.38
	χ^2 **Test**		76.2907			36.3322		

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where *EV* is event period daily trading volume for each stock-ex-dividend-day specific observation. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC.

[a] χ^2-statistic testing the equality of the value of *EXVOL* among the 5 sub-samples (within the same *YIELD* or *INST* quintile) is computed as follows:

$$\chi^2(5) = \sum_{s=1}^{5}\left[\frac{\overline{EXVOL_s} - \overline{EXVOL}}{S_s}\right]^2,$$

where $\overline{EXVOL_s}$ is the mean excess trading volume for Quintile s and S_s is its standard deviation, $\overline{EXVOL}$ is the mean excess trading volume for the whole sample.

Table 3
Descriptive Statistics

Variable	N	Mean	Std Dev	Maximum	Minimum
EXVOL	29252	0.1139	0.9280	41.8029	-1.0000
β_{MKT}	29252	0.9603	0.4866	4.2584	-1.2343
β_{SMB}	29252	0.3576	0.7259	6.6322	-2.0959
β_{HML}	29252	0.1715	0.7509	6.3926	-4.6958
TRISK	29252	2.7484	1.5449	38.2018	0.0000
YIELD	29252	0.0068	0.0050	0.0390	0.0000
INST	29252	0.4626	0.2105	0.9999	0.0000
$1/P_{CUM}$	29252	0.0467	0.0541	3.2000	0.0017
$1/P_{EX}$	29252	0.0475	0.0546	3.2000	0.0017
ACAP	29252	3.9561	11.2236	311.1058	0.0026

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where EV is event period daily trading volume for each stock-ex-dividend-day specific observation. To control for systematic risk related to the Fama-French three factors, β_{MKT}, β_{SMB} and β_{HML} are estimated using the regression: $R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}$, where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book to market stocks minus the return on a portfolio of low book to market stocks in period t. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Total risk *TRISK* is defined as standard deviation of an individual stock's daily return scaled by the standard deviation of the CRSP value-weighted index daily return. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC. $1/P_{CUM}$ and $1/P_{EX}$ proxy for transactions costs. Average market capitalization *ACAP* is defined as the average of daily market capitalization during the non-event 80-day period.

Table 4
Linear Relations Between Variables

	EXVOL	β_{MKT}	β_{SMB}	β_{HML}	*TRISK*
EXVOL	1.0000				
β_{MKT}	-0.0534	1.0000			
	<.0001				
β_{SMB}	-0.0645	0.1752	1.0000		
	<.0001	<.0001			
β_{HML}	0.0261	0.2841	0.2542	1.0000	
	<.0001	<.0001	<.0001		
TRISK	-0.0562	0.1088	0.2789	0.0261	1.0000
	<.0001	<.0001	<.0001	<.0001	
YIELD	0.1811	-0.2291	-0.2141	0.1006	-0.0957
	<.0001	<.0001	<.0001	<.0001	<.0001
INST	-0.0639	0.1502	-0.0660	-0.1425	-0.0800
	<.0001	<.0001	<.0001	<.0001	<.0001
$1/P_{CUM}$	0.0156	-0.0122	0.2545	0.1070	0.4514
	0.0076	0.0370	<.0001	<.0001	<.0001
$1/P_{EX}$	0.0172	-0.0162	0.2520	0.1033	0.4486
	0.0033	0.0055	<.0001	<.0001	<.0001
ACAP	-0.0189	0.0230	-0.2743	-0.1035	-0.1132
	0.0012	<.0001	<.0001	<.0001	<.0001

(To be continued)

Table 4 (continued)
Linear Relations Between Variables

	YIELD	*INST*	$1/P_{CUM}$	$1/P_{EX}$	*ACAP*
EXVOL					
β_{MKT}					
β_{SMB}					
β_{HML}					
TRISK					
YIELD	1.0000				
INST	-0.2007	1.0000			
	<.0001				
$1/P_{CUM}$	0.1724	-0.2523	1.0000		
	<.0001	<.0001			
$1/P_{EX}$	0.1659	-0.2533	0.9842	1.0000	
	<.0001	<.0001	<.0001		
ACAP	-0.0663	0.0764	-0.1657	-0.1647	1.0000
	<.0001	<.0001	<.0001	<.0001	

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where EV is event period daily trading volume for each stock-ex-dividend-day specific observation. To control for systematic risk related to the Fama-French three factors, β_{MKT}, β_{SMB} and β_{HML} are estimated using the regression: $R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}$, where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book to market stocks minus the return on a portfolio of low book to market stocks in period t. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Total risk *TRISK* is defined as standard deviation of an individual stock's daily return scaled by the standard deviation of the CRSP value-weighted index daily return. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC. $1/P_{CUM}$ and $1/P_{EX}$ proxy for transactions costs. Average market capitalization *ACAP* is defined as the average of daily market capitalization during the non-event 80-day period.

Table 5
The Effect of Dividend Yield on Excess Trading Volume Based on Institutional Deciles

Variable	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5
Intercept	-0.1072	0.0770	-0.0718	0.8655	0.3091
	(-1.81)***	(0.44)	(-0.31)	(2.03)**	(0.87)
β_{MKT}	0.0210	-0.0405	0.0309	-0.0234	-0.0092
	(0.66)	(-1.02)	(0.78)	(-0.57)	(-0.24)
β_{SMB}	-0.0206	-0.1056	-0.0517	0.0042	-0.0145
	(-0.68)	(-4.04)*	(-1.89)***	(0.13)	(-0.66)
β_{HML}	0.0136	0.0149	-0.0034	-0.0158	0.0048
	(0.62)	(0.50)	(-0.13)	(-0.52)	(0.25)
TRISK	0.0050	-0.0396	-0.0178	-0.0332	-0.0420
	(0.38)	(-3.26)*	(-1.07)	(-1.96)**	(-3.47)*
$1/P_{CUM}$	-0.0328	0.4265	-1.4980	-0.0006	0.3292
	(-0.17)	(1.05)	(-2.32)**	(0.00)	(0.70)
ACAP	-0.0006	-0.0014	-0.0001	-0.0030	-0.0014
	(-0.88)	(-2.64)*	(-0.03)	(-3.31)*	(-2.12)**
INS	0.5684	0.1904	-0.0006	-2.3495	-0.5412
	(1.85)***	(0.27)	(0.00)	(-2.16)**	(-0.71)
YIELD	**22.2788**	**29.6244**	**52.1336**	**51.5707**	**21.1615**
	(3.38)*	**(7.80)***	**(8.53)***	**(7.50)***	**(4.86)***
Adj. R^2	0.0110	0.0446	0.1015	0.0525	0.0277

(To be continued)

Table 5 (continued)
The Effect of Dividend Yield on Excess Trading Volume Based on Institutional Deciles

Variable	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
Intercept	0.4041	0.7755	-0.5971	0.1260	0.0883
	(1.28)	(1.91)***	(-1.05)	(0.32)	(0.40)
β_{MKT}	0.0373	-0.0524	-0.0389	0.0333	0.0017
	(1.47)	(-1.79)***	(-1.12)	(1.16)	(0.04)
β_{SMB}	-0.0085	-0.0511	-0.0046	-0.0253	0.0203
	(-0.50)	(-2.37)**	(-0.14)	(-1.30)	(1.06)
β_{HML}	0.0265	0.0355	0.0057	0.0079	0.0166
	(1.54)	(1.96)**	(0.22)	(0.57)	(0.57)
TRISK	-0.0018	-0.0109	-0.0275	-0.0532	-0.0197
	(-0.13)	(-0.82)	(-0.94)	(-2.20)**	(-1.07)
$1/P_{CUM}$	0.0682	0.1033	0.8855	2.1813	1.0262
	(0.44)	(0.20)	(1.14)	(1.04)	(1.38)
ACAP	-0.0005	-0.0006	-0.0011	-0.0016	-0.0010
	(-1.44)	(-1.00)	(-1.34)	(-0.96)	(-0.97)
INS	-0.9129	-1.3626	0.9984	-0.1097	-0.1161
	(-1.55)	(-1.90)***	(1.04)	(-0.20)	(-0.48)
YIELD	**13.0672**	**24.7984**	**20.1165**	**6.3291**	**6.7693**
	(4.19)*	**(4.15)***	**(5.32)***	**(1.54)**	**(1.12)**
Adj. R^2	0.0111	0.0409	0.0180	0.0098	0.0000

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where EV is event period daily trading volume for each stock-ex-dividend-day specific observation. To control for systematic risk related to the Fama-French three factors, β_{MKT}, β_{SMB} and β_{HML} are estimated using the regression: $R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}$, where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book to market stocks minus the return on a portfolio of low book to market stocks in period t. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Total risk *TRISK* is defined as standard deviation of an individual stock's daily return scaled by the standard deviation of the CRSP value-weighted index daily return. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC. $1/P_{CUM}$ and $1/P_{EX}$ proxy for transactions costs. Average market capitalization *ACAP* is defined as the average of daily market capitalization during the non-event 80-day period.

[a] Model: $EXVOL_i = \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2\beta_{SMBi} + \alpha_3\beta_{HMLi} + \alpha_4 TRISK_i + \alpha_5 1/P_{CUMi} + \alpha_6 ACAP_i + \alpha_7 INST_i + \alpha_8 YIELD_i + u_i$.

[b] * represents significance level at better than 1%, ** represents significance level at better than 5% and *** represents significance level at better than 10%.

[c] The variance-covariance matrix is White's heteroscedasticity consistent.

Table 6
Effect of Dividend Yield and Institutional Ownership on Excess Trading Volume Around Ex-Dividend Days

Variable	Predicted Sign	Estimate
Intercept	+/-	0.0625
		(1.56)
β_{MKT}	-	-0.0073
		(-0.65)
β_{SMB}	-	-0.0306
		(-3.70)*
β_{HML}	-	0.0154
		(2.10)**
TRISK	-	-0.0210
		(-4.15)*
$1/P_{CUM}$	-	0.0354
		(0.30)
ACAP	-	-0.0013
		(-5.28)*
INST	+/-	-0.5637
		(-3.62)*
$INST^2$	+/-	0.7599
		(4.57)*
YIELD	+	**18.4838**
		(2.84)*
YIELD×INST	+	**124.6886**
		(4.06)*
$YIELD \times INST^2$	-	**-193.7132**
		(-5.72)*
Adj. R^2		0.0394

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where EV is event period daily trading volume for each stock-ex-dividend-day specific observation. To control for systematic risk related to the Fama-French three factors, β_{MKT}, β_{SMB} and β_{HML} are estimated using the regression: $R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}$, where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book to market stocks minus the return on a portfolio of low book to market stocks in period t. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Total risk *TRISK* is defined as standard deviation of an individual stock's daily return scaled by the standard deviation of the CRSP value-weighted index daily return. *YIELD* is

defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC. $1/P_{CUM}$ and $1/P_{EX}$ proxy for transactions costs. Average market capitalization *ACAP* is defined as the average of daily market capitalization during the non-event 80-day period.

[a] Model: $EXVOL_i = \alpha_0 + \alpha_1\beta_{MKTi} + \alpha_2\beta_{SMBi} + \alpha_3\beta_{HMLi} + \alpha_4 TRISK_i + \alpha_5 1/P_{CUMi} + \alpha_6 ACAP_i + \alpha_7 INST_i + \alpha_8 INST^2_i + \alpha_9 YIELD_i + \alpha_{10} YIELD_i \times INST_i + \alpha_{11} YIELD_i \times INST^2_i + u_i$.

[b] * represents significance level at better than 1%.

[c] The variance-covariance matrix is White's heteroscedasticity consistent.

Table 7
Excess Trading Volume Around Ex-Dividend Day During Different Tax Regimes

Tax Regime	Period	Variable	Obs.	Mean	Std Dev	Minimum	Maximum
TRA86	**1989-1992**	***YIELD***	10436	0.0081	0.0054	0.0000	0.0390
		INST	10436	0.4412	0.1897	0.0000	0.9300
		EXVOL	10436	0.1483	0.9585	-1.0000	26.2949
RRA93	**1993-1996**	***YIELD***	11618	0.0067	0.0047	0.0000	0.0380
		INST	11618	0.4670	0.2055	0.0000	0.9999
		EXVOL	11618	0.1205	1.0149	-1.0000	41.8029
TRA97	**1997-1998**	***YIELD***	7198	0.0052	0.0042	0.0000	0.0386
		INST	7198	0.4867	0.2419	0.0000	0.9999
		EXVOL	7198	0.0531	0.7072	-0.9916	29.3321
All	**1989-1998**	***YIELD***	29252	0.0068	0.0050	0.0000	0.0390
		INST	29252	0.4626	0.2105	0.0000	0.9999
		EXVOL	29252	0.1139	0.9280	-1.0000	41.8029
$\chi^2(3)$				67.1512			

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where *EV* is event period daily trading volume for each stock-ex-dividend-day-specific observation. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC.

[a] χ^2-statistics testing the equality of the value of *EXVOL* among the 3 tax regimes is computed as follows:

$$\chi^2(3) = \sum_{t=1}^{3}\left[\frac{\overline{EXVOL_t} - \overline{EXVOL}}{S_t}\right]^2,$$

where $\overline{EXVOL_t}$ is the mean excess trading volume for tax regime t and $\overline{EXVOL}$ is the mean excess trading volume for the whole sample.

Table 8
The Effect of Tax Regime Changes

Panel A: TRA86 and RRA93 (1989 - 1996)		
Variable	**Predicted Sign**	**Estimate**
Intercept	+/-	0.1556
		(2.96)*
T93	+/-	-0.0015
		(-0.06)
β_{MKT}	-	-0.0035
		(-0.24)
β_{SMB}	-	-0.0333
		(-3.31)*
β_{HML}	-	0.0125
		(1.40)
TRISK	-	-0.0297
		(-5.10)*
$1/P_{CUM}$	-	0.1582
		(1.15)
ACAP	-	-0.0027
		(-4.98)*
INST	+/-	-0.9964
		(-4.31)*
$INST^2$	+/-	1.3143
		(4.65)*
YIELD	+	**4.3893**
		(0.63)
YIELD*×*T93	+	**18.4668**
		(2.09)**
YIELD*×*INST	+	**182.3588**
		(4.99)*
YIELD*×*INST*×*T93	+/-	**-36.7104**
		(-0.84)
$YIELD \times INST^2$	-	**-252.3961**
		(-5.75)*
$YIELD \times INST^2 \times T93$	+/-	**9.6277**
		(0.19)
Adj. R^2		0.0410

(To be continued)

Table 8 (continued)
The Effect of Tax Regime Changes

Panel B: RRA93 and TRA97 (1993 - 1998)		
Variable	**Predicted Sign**	**Estimate**
Intercept	+/-	-0.0228
		(-0.35)
T97	+/-	-0.0140
		(-0.54)
β_{MKT}	-	0.0064
		(0.50)
β_{SMB}	-	-0.0128
		(-1.31)
β_{HML}	-	0.0115
		(1.10)
TRISK	-	-0.0207
		(-2.93)*
$1/P_{CUM}$	-	0.0326
		(0.16)
ACAP	-	-0.0007
		(-2.85)*
INST	+/-	-0.3177
		(-1.44)
$INST^2$	+/-	0.5548
		(2.49)**
YIELD	+	**35.9957**
		(3.95)*
YIELD×T97	+	**-8.1335**
		(-0.53)
YIELD×INST	+	**78.3140**
		(1.84)***
YIELD×INST×T97	+/-	**-9.7138**
		(-0.16)
$YIELD \times INST^2$	-	**-165.7532**
		(-3.57)*
$YIELD \times INST^2 \times T97$	+/-	**28.0508**
		(0.45)
Adj. R^2		0.0387

Ex-dividend dates and volume data are obtained from CRSP. For each stock-ex-dividend-day specific observation, 91 days (from day –45 to day 45) of daily trading volumes are extracted. The 11-day period from day –5 to day 5 is defined as the event period and the 80-day period from day –45 to day –6 and day 6 to day 45 is defined as the non-event period. Average normal daily trading volume *ANV* for each stock is computed as the average of daily trading volume for the non-event 80-day period and normalized excess

volume for each stock-ex-dividend-day-specific observation during the event period is $EXVOL = EV/ANV - 1$, where EV is event period daily trading volume for each stock-ex-dividend-day specific observation. To control for systematic risk related to the Fama-French three factors, β_{MKT}, β_{SMB} and β_{HML} are estimated using the regression: $R_{it} - R_{ft} = \beta_{0i} + \beta_{MKTi}MKT_t + \beta_{SMBi}SMB_t + \beta_{HMLi}HML_t + \varepsilon_{it}$, where $R_{it} - R_{ft}$ is the return on stock i in excess of the risk-free rate of return R_f in period t, MKT_t is the risk premium (i.e., $R_{mt} - R_{ft}$) on a broad market portfolio of stocks in period t, SMB_t is the return on a portfolio of small capitalization stocks minus the return on a portfolio of large capitalization stocks in period t, and HML_t is the return on a portfolio of high book to market stocks minus the return on a portfolio of low book to market stocks in period t. To remain in the sample in year t, a stock must have monthly returns for each of the 48 months preceding the beginning of year t. Total risk *TRISK* is defined as standard deviation of an individual stock's daily return scaled by the standard deviation of the CRSP value-weighted index daily return. *YIELD* is defined as the amount of dividends *AMT* paid on the ex-dividend day over the cum-dividend stock price P_{CUM}. P_{EX} is the ex-dividend day closing price. *INST* is level of institutional ownership defined as the number of shares owned by institutional investors deflated by the total number of shares outstanding. Data on institutional ownership is from SEC 13f filing obtained from Compact Disclosure SEC. $1/P_{CUM}$ and $1/P_{EX}$ proxy for transactions costs. Average market capitalization *ACAP* is defined as the average of daily market capitalization during the non-event 80-day period.

To test the effect of tax regime change for the period 1989 – 1996, an indicator variable *T93* that equals 1 if the stock-ex-dividend-day-specific observation falls in the RRA93 regime and 0 otherwise. *T93* is interacted with *YIELD*, *YIELD*×*INST* and *YIELD*×*INST*^{2} to create *YIELD*×*T93*, *YIELD*×*INST*×*T93* and *YIELD*×*INST*^{2}×*T93*. To test the effect of tax regime change for the period 1993-1998, an indicator variable *T97* is created that equals 1 if the stock-ex-dividend-day-specific observation falls in the TRA97 regime and 0 otherwise. *T97* is interacted with *YIELD*, *YIELD*×*INST* and *YIELD*×*INST*^{2} to create *YIELD*×*T97*, *YIELD*×*INST*×*T97* and *YIELD*×*INST*^{2}×*T97*.

[a] Model A: $EXVOL_i = \alpha_0 + \alpha_1 T93 + \alpha_2\beta_{MKTi} + \alpha_3\beta_{SMBi} + \alpha_4\beta_{HMLi} + \alpha_5 TRISK_i + \alpha_6 1/P_{CUMi} + \alpha_7 ACAP_i + \alpha_8 INST_i + \alpha_9 INST^2_i + \alpha_{10} YIELD_i + \alpha_{11} YIELD_i \times T93_i + \alpha_{12} YIELD_i \times INST_i + \alpha_{13} YIELD_i \times INST_i \times T93_i + \alpha_{14} YIELD_i \times INST^2_i + \alpha_{15} YIELD_i \times INST^2_i \times T93_i + u_i$.

[b] Model B: $EXVOL_i = \alpha_0 + \alpha_1 T97 + \alpha_2\beta_{MKTi} + \alpha_3\beta_{SMBi} + \alpha_4\beta_{HMLi} + \alpha_5 TRISK_i + \alpha_6 1/P_{CUMi} + \alpha_7 ACAP_i + \alpha_8 INST_i + \alpha_9 INST^2_i + \alpha_{10} YIELD_i + \alpha_{11} YIELD_i \times T97_i + \alpha_{12} YIELD_i \times INST_i + \alpha_{13} YIELD_i \times INST_i \times T97_i + \alpha_{14} YIELD_i \times INST^2_i + \alpha_{15} YIELD_i \times INST^2_i \times T97_i + u_i$.

[c] * represents significance level at better than 1%, ** represents significance level at better than 5% and *** represents significance level at better than 10%.

[d] The variance-covariance matrix is White's heteroscedasticity consistent.

REFERENCES

Allen, Franklin, Antonio E. Bernardo, and Ivo Welch, 2000. A theory of dividends based on tax-clienteles, Journal of Finance 55, 2499-2536.

Ayers, Benjamin C., C. Bryan Cloyd, John R. Robinson, 2002, The effect of shareholder-level dividend taxes on stock prices: Evidence from the Revenue Reconciliation Act of 1993. The Accounting Review 77, 933-947.

Bali, Rakesh, and Gailen L. Hite, 1998, Ex dividend day stock price behavior: discreteness or tax-induced clienteles?, Journal of Financial Economics 47, 127-159.

Bamber, Linda S., 1986, The information content of annual earnings releases: Trading volume approach, Journal of Accounting Research 24, 40-56.

Bamber, Linda S., 1987, Unexpected earnings, firm size and trading volume around quarterly earnings announcements, The Accounting Review 62, 510-532.

Bamber, Linda S., and Youngsoon Susan Cheon, 1995, Differential price and volume reactions to accounting earnings announcements, The Accounting Review 70, 417-441.

Beaver, William H., 1968, The information content of annual earnings announcements, Journal of Accounting Research 6, 67-92.

Belsley, D. A., E. Kuh and R. E. Welsch, 1980. Regression diagnostics: Identifying influential data and sources of collinearity. New York, John Wiley & Sons.

Bhardwaj, Ravinder K., and Leroy D. Brooks, 1992, The January anomaly: Effects of low share price, transaction costs, and bid-ask bias, Journal of Finance 47, 553-575.

Cloyd, C. Bryan, and Oliver Zhen Li and Connie D. Weaver, 2002, Ticks and tax: The joint effects of discrete (vs. decimal) pricing and taxation on ex dividend day returns and trading volume, Working paper, University of Illinois at Urbana-Champaign, University of Arizona and University of Texas at Austin.

Cready, William M., and David N. Hurrt, 2002, Assessing investor response to information events using return and volume metrics, The Accounting Review 77, 891-909.

Dhaliwal Dan S., Merle Erickson and Oliver Zhen Li, 2002, The Effect of Payout Policy, Institutional Ownership and Shareholder Income Taxes on the Relation Between Earnings and Returns, Working paper, University of Arizona and University of Chicago.

Dhaliwal, Dan S., Merle Erickson, Robert Trezevant, 1999, A test of the theory of tax clienteles for dividend policies, National Tax Journal 52, 179-194.

Dahliwal, Dan S., Oliver Zhen Li, and Robert Trezevant, 2003, Is a dividend tax penalty incorporated into common stock return?, Journal of Accounting and Economics, Forthcoming.

Elton, Edwin J., and Martin Gruber, 1970, Marginal stockholder tax rates and the clientele effect, Review of Economics and Statistics 52, 68-74.

Fama, E. F., and K. R. French, 2001, Disappearing dividends: Changing firm characteristics or lower propensity to pay?, Journal of Financial Economics 60, 3-43.

Frank, Murray, and Ravi Jagannathan, 1998, Why do stock prices drop by less than the value of the dividend? Evidence from a country without taxes, Journal of Financial Economics 47, 161-188.

Gompers, Paul A., and Andrew Metrick, 2001, Institutional investors and equity prices, Quarterly Journal of Economics 112, 229-259.

Graham, John R., Roni Michaely, and Michael R. Roberts, 2002, Do price discreteness and transactions costs affect stock returns: Comparing ex-dividend pricing before and after decimalization, Working paper, Duke University and Cornell University.

Grinstein, Yaniv, and Roni Michaely, 2002, Institutional holdings and payout policy, Working paper, Cornell University.

Jakob, Keith, and Tongshu Ma, 2002, Tick size and ex dividend day stock price behavior, Working paper, University of Montana and University of Utah.

Kalay, Avner, 1982, The ex-dividend day behavior of stock prices: A re-examination of the clientele effect, Journal of Finance 37, 1059-1070.

Kandel, Eugene, and Neil D. Pearson, 1995, Differential interpretation of public signals and trade in speculative markets, Journal of Political Economy 103, 831-872.

Karpoff, Jonathan M., and Ralph A. Walkling, 1988, Short-term trading around ex-dividend days: Additional evidence, Journal of Financial Economics 21, 291-298.

Kato, Kiyoshi, Uri Loewenstein, 1995, The ex-dividend-day behavior of stock prices: The case of Japan, Review of Financial Studies 8, 817-847.

Kim, Oliver, and Robert E. Verrecchia, 1991, Trading volume and price reactions to public announcements, Journal of Accounting Research 29, 302-321.

Koski, Jennifer Lynch, and John T. Scruggs, Who trades around the ex-dividend day? Evidence from NYSE audit file data, Financial Management 27, 58-72.

Lakonishok, Josef, and Seymour Smidt, 1986, Volume for winners and losers: Taxation and other motives for stock trading, Journal of Finance 41, 951-974.

Lakonishok, Josef, and Theo Vermaelen, 1983, Tax reform and ex-dividend day behavior, Journal of Finance 38, 1157-1179.

Lakonishok, Josef, and Theo Vermaelen, 1986, Tax-induced trading around ex-dividend days, Journal of Financial Economics 16, 287-319.

Lang, Mark H., and Douglas A. Shackelford, 2000, Capitalization of capital gains taxes: Evidence from stock price reactions to the 1997 rate reduction, Journal of Public Economics 76, 69-85.

Michaely, Roni, 1991, Ex-dividend day stock price behavior: The case of the 1986 Tax Reform Act, Journal of Finance 46, 845-859.

Michaely, Roni, 1995, The Effect of tax heterogeneity on prices and volume around the ex-dividend day: Evidence from the Milan stock exchange, Review of Financial Studies 8, 36-399.

Michaely, Roni, and Jean-Luc Vila, 1995, Investors' heterogeneity, prices, and volume around the ex-dividend day, Journal of Financial ad Quantitative Analysis 30, 171-198.

Michaely, Roni, and Jean-Luc Vila, 1996, Trading volume with private valuation: Evidence from the ex-dividend day, Review of Financial Studies 9, 471-509.

Naranjo, Andy, M. Nimalendran, and Mike Ryngaert, 2000, Time variation of ex-dividend day stock returns and corporate dividend capture: A reexamination, Journal of Finance 55, 2357-2372.

Utama, Siddharta, and William M. Cready, 1997, Institutional ownership, differential predisclosure precision and trading volume at announcement dates, Journal of Accounting and Economics 24, 129-150.

White, Halbert, 1980, A heteroscedasticity consistent covariance matrix estimator and a direct test for heteroscedasticity, Econometrica 48, 817-838.