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STOCKHOLDER TAX RATES AND FIRM ATTRIBUTES

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ABSTRACT

Stockholder Tax Rates and Firm Attributes

This paper develops a rigorous theoretical model to assess when investor clienteles may be empirically identified using ex dividend day data and what firm attributes these clienteles should respond to. It then presents empirical results for the period 1963-1977 suggesting that

(1) tax-based investor clienteles do exist, and are reasonably stable over time

(2) these clienteles are strongly influenced by the dividend-price ratio, but insignificantly by direct measures of risk and other firm characteristics.

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I. Introduction

Since first being hypothesized by Miller and Modigliani (1961), the "dividend clientele" phenomenon of individuals in high tax brackets investing in low dividend stocks has been the subject of several empirical tests utilizing a number of methodological approaches. Though complete agreement is lacking in these studies, the weight of existing evidence does appear to support the presence of such a clientele effect in the United States.

Whether such sorting by tax rates occurs is important, because the behavior of a firm acting in the interests of its shareholders is likely to be influenced by their tax rates. However, while there may be a negative correlation between firm payout rates and shareholder tax rates, it is important to know whether this is a result of the desire of high bracket investors to avoid taxes on dividends, or whether low payout firms offer some other inducement to investors in high tax brackets. For example, it has often been suggested that wealthy individuals, presumably in high tax brackets, would invest in riskier types of equity. As growth stocks are seen typically as riskier, and also typically have smaller dividend distributions, one alternative hypothesis might be that the observed dividend clientele effect actually has nothing to do with taxes and dividends at all, but merely reflects wealthy individuals holding risky stocks. Such a hypothesis may be evaluated if one controls empirically for firm characteristics other than payout rate when testing for the existence of the clientele effect, and this is done below. Our results suggest the presence of a strong dividend clientele phenomenon, even when care is taken to hold constant other differences among firms.

The outline of the paper is as follows. In the next section, we review previous empirical work on the subject. Section III presents an extension of the Capital Asset Pricing Model with personal and corporate taxes developed by Auerbach and King (1982). This model suggests the types of constraints on individual behavior and firm characteristics that would be required for a clientele effect to exist and be measurable using stock price data from ex dividend days. It also predicts how other firm attributes should influence portfolio decisions by individuals. Finally, with it we can explicitly evaluate the effect of firm dividend policy on stockholder utility and discuss when wealth maximizing behavior is in the interest of the firm's owners.

In Section IV, we describe the data used and present estimates based on the theoretical model developed in Section III. Section V offers some concluding comments.

II. Previous Findings About Dividend Clienteles

Probably the most straightforward way of testing for the existence of clienteles is to examine individual portfolios and see how they differ by the owner's tax bracket, and studies of such kind have been done. From survey data, Blume et al. (1974) found that dividend-price ratios of investor portfolios declined with the wealth and, presumably, the tax rate of the investor. There was also some indication that wealthier individuals held riskier stocks, as measured roughly by whether the issues were listed on the New York Stock Exchange, the American Stock Exchange, or traded over the counter. On the other hand, a more recent investigation by Lewellen et al. (1978), using individual investor data supplied by a brokerage firm, suggests that tax rates vary insignificantly over payout rate.

While such survey evidence is certainly useful and informative, there are a number of questions it cannot answer. First of all, it is limited to the behavior of individual investors, while a growing fraction of equity investment is undertaken by institutions, many of which are tax-exempt. Second, when individuals in different tax brackets hold the same stock, it may be those trading actively who influence the marginal decisions of the firm. Such information is not available from cross-section survey data.

A second method of measuring the tax clientele of a firm is through an examination of price movements around the day a stock goes ex dividend -- the first day on which the owner of a share is not entitled to a previously declared dividend.[1] In the absence of taxes, transaction costs and uncertainty, the price of a share of stock on the ex dividend day would have to fall by the value of the dividend. The introduction of a single, uniform tax rate τ on dividends would lead to an equilibrium price change equal to $-(1 - \tau)$ times the dividend per share, since in purchasing the stock after the ex date an investor would forego only the net of tax dividend. With individuals in different tax brackets, no equilibrium could exist without transaction consts, constraints, or unertainty. With progressive taxes, transaction costs and uncertainty, one may argue (as done formally below) that, controlling for market fluctuations, the amount by which a firm's share price drops on its ex date is related to some weighted average of the tax rates of its stockholders.

There are different ways of controlling for market fluctuations to measure these implicit tax rates. Elton and Gruber (1970) did so by taking mean values of the ratio of ex day price change to dividend over a one year period (April 1966 - March 1967) for all firms listed on the New York Stock Exchange, grouped by deciles according to their dividend price ratios. They found a strong and nearly monotonic increase in the implicit tax rate of firm clienteles, as measured by the extent to which this ratio is less than one in absolute value, moving across decile means from high to low payout firms. However, Black and Scholes (1973) found that, for successive periods, these decile means tended to be quite unstable, frequently being greater than one or less than zero, and often appearing to contradict the existence of a clientele effect. Using their own methodology of constructing high and low payout portfolios and adjusting the portfolio returns for risk by subtracting from the daily return on each stock the return on a different portfolio with similar risk characteristics, Black and Scholes found that there were no significant differences in the <u>gross</u> of tax returns on the ex dates between high and low payout portfolios. Though they took this as a contradiction of the clientele effect, such a result could occur with a clientele effect present, even with all investors receiving the same net of tax return. If d_i and g_i are the dividend and capital gain per dollar for firm i, the net return (ignoring capital gains taxes) to shareholders with tax rate τ_i is

$r_i = (1 - \tau_i)d_i + g_i$. Thus, if the gross return $d_i + g_i$ is constant across firms, so will be r_i if $\tau_i d_i$ is constant, not τ_i. This is perfectly consistent with the existence of a clientele effect. However, since r_i may also vary, and since $\tau_i d_i$ can increase or decrease with d_i even if $\frac{d\tau_i}{dd_i} < 0$, the Black-Scholes result is really not informative about whether a clientele effect is present.

Also using ex dividend day data, for twenty-nine of the thirty large Dow Jones industrial firms over the period 1962-1977, Green (1980) estimated pooled cross-section time series versions of the following basic equation:

$$g_{it} = \lambda_o + \lambda_1 d_{it} + \lambda_2 d_{it}^2 + \lambda_3 M_t + \varepsilon_{it} \tag{1}$$

where d_{it} and g_{it} are the dividend and capital gain per dollar on the ex date t for firm i, and M_t is the weighted gross return on date t of the Dow Jones industrials as a whole. This equation is very similar to that which would come from the Capital Asset Pricing Model (discussed below) except that the coefficient λ_3, which corresponds to the firm's "beta," or correlation with the market as a whole, would vary across firms, and some measure of the return on either a riskless asset or a "zero-beta" portfolio would be subtracted from g_{it} and M_t. Green found that λ_2 was usually significantly negative, suggesting that an increase in dividend yield increases the absolute value of g_{it}/d_{it} and hence decreases the implicit tax rate of the representative stockholder. However, aside from the earnings/price ratio and fraction of the firm's shares held by institutional investors (neither of which had a significant effect in the full sample), Green did not attempt to control for firm characteristics in his regressions.

Using pooled cross-section time series monthly data for all New York Stock Exchange firms, Litzenberger and Ramaswamy (1980) estimated a version of the Capital Asset Pricing Model resembling Green's equation, and found significant evidence of a clientele effect for the period 1936-1978. They did not control for the importance of any other firm characteristics.

In summary, the results thus far indicate that some sorting by tax rates among firms with respect to dividend payout does exist, and that some measure of these tax rates can be obtained using ex dividend day data. However, such estimates do not appear to be very stable and no attempt has been made to estimate tax rates for specific firms. Our objectives in the remaining sections of the paper are to develop a model based on optimal portfolio behavior to determine how we should interpret results like those just discussed, and to extend the previous empirical findings to test whether other factors can explain the existence of clienteles, and whether it is possible to obtain a meaningful measure of the tax clienteles of individual firms.

III. Financial Equilibrium with Taxes

As discussed in Auerbach and King (1982), the nature of financial equilibrium, and even the existence of such an equilibrium in a world where individuals face different tax rates, depends crucially on the nature of constraints placed on the behavior of firms and investors. As many types of constraints may be envisaged, we begin by developing a model which assumes the absence of constraints, and then consider the effects of imposing them.

This model extends that of Auerbach and King (1982) by treating explicitly the dividend payout decision of the firm, and follows closely their analysis. We consider a two-period model in which each investor m has initial wealth w^m consisting of claims on the debt and equity of each firm i. Each firm is assumed to have a fixed production plan, issues a certain amount of risk-free debt,[2] B_i, in period 1, and pays a dividend D_i in period 2. The market valuation in period 1 of the equity of firm i is E_i. Each investor purchases debt, B^m,[3] and equity in each firm i, E_i^m, subject to the budget constraint:

$$w^m = B^m + \sum_i E_i^m \tag{2}$$

in order to maximize the utility of his terminal wealth, which we assume to be defined over its mean and variance:

$$U^m = U^m(\mu^m, (\sigma^m)^2) \tag{3}$$

If we let R denote the second period return to corporate debt, t_c, t_p^m and t_g^m the tax rates on corporate income, personal interest and dividend income, and personal capital gains income, respectively, and q_i the value by which a dollar of retentions increases the value of firm i, then, using (2), μ^m and $(\sigma^m)^2$ are given by:

$$\mu^m = [w^m - \sum_i E_i^m]R(1 - t_p^m) + \sum_i E_i^m \frac{q_i[(\mu_i - RB_i)(1 - t_c) - D_i](1 - t_g^m) + D_i(1 - t_p^m)}{E_i} \tag{4}$$

$$(\sigma^m)^2 = \sum_i \sum_j E_i^m E_j^m (\frac{q_i}{E_i})(\frac{q_j}{E_j}) C_{ij} (1-t_c)^2 (1-t_g^m)^2 \tag{5}$$

where μ_i is the mean total pre-tax return to firm i and C_{ij} is the covariance of the underlying total returns to firms i and j. Equation (4) takes account of the normal provision that interest payments but not dividends are deductible from corporate taxes.

The value of a dollar of retentions q_i, need not equal one. In a world where earnings not paid out to shareholders as dividends were redistributed directly to stockholder in some other way, q_i would have to be unity. However, where such distributions, amounting to share repurchases, are precluded, or at least hindered, and retentions are used to purchase new capital goods, there are two reasons why q_i may diverge from one. First of all, if there are adjustment costs to changing dividend or investment levels, reinvestment of earnings may earn a positive or negative rent. This is the standard "Tobin's q" argument. In addition, even without adjustment costs, there need be no arbitrage condition setting $q_i = 1$. This possibility, explored in multi-period models by Auerbach (1979a, 1979b) and Bradford (1981) rests on the notion that firms may reinvest retentions even if $q_i<1$ because of the preferential tax treatment of capital gains.[4]

Maximization of utility U^m with respect to holdings of equity in each firm yields using (2), (3), (4) and (5), the first-order conditions:

$$(\mu_i - RB_i - \frac{D_i}{1 - t_c})q_i A^m - (R\,E_i - D_i)G^m = \sum_j (\frac{E_j^m}{E_j})\ C_{ij}^*\ \forall_{i,m} \qquad (6)$$

where

$$A^m = \frac{1}{\gamma^m T^m (1 - t_p^m)}$$

$$G^m = A^m / T^m$$

$$\gamma^m = -2\,\frac{U_2^m}{U_1^m}$$ where U_i is the derivative of U with respect to the i^{th} argument

$$T^m = \frac{(1 - t_c)(1 - t_g^m)}{(1 - t_p^m)}$$

$$C_{ij}^* = C_{ij}\ q_i\ q_j$$

If we sum these first-order conditions over individual investors, we obtain:

$$(\mu_i - RB_i - \frac{D_i}{1 - t_c})q_i A - (RE_i - D_i)G = C_i^* \qquad (7)$$

where

$$A = \sum_m A^m$$

$$G = \sum_m G^m$$

$C_i^* = \sum_j C_{ij}^*$, the covariance of the total return of firm i with the total return in the economy.

To derive the optimal investor portfolios, we combine conditions (6) and (7) to obtain (using the definitions of G^m, A^m and T^m):

$$\sum_j (\frac{E_j^m}{E_j})(\frac{C_{ij}^*}{C_i^*}) = A^m[\frac{1}{A} + (\frac{1}{1-t_c})(\frac{R - D_i/E_i}{C_i^*/E_i})(\frac{G}{A}(1-t_c) - (\frac{1-t_p^m}{1-t_g^m}))]\ \forall_{i,m} \qquad (8)$$

Stacking these conditions for each individual m and solving for (E_j^m/E_j) yields[5]

$$\underset{\sim}{n}^m = A^m \left[\frac{\underset{\sim}{1}}{A} + \left(\frac{1}{1 - t_c}\right)\Gamma^{-1} \underset{\sim}{y} \left(\frac{G}{A}(1-t_c) - \left(\frac{1 - t_p^m}{1 - t_g^m}\right)\right)\right] \tag{9}$$

where

$$\Gamma = \begin{pmatrix} \frac{C^*_{11}}{C^*_1} & \cdots & \frac{C^*_{1N}}{C^*_1} \\ \vdots & & \\ \frac{C^*_{N1}}{C^*_N} & \cdots & \frac{C^*_{NN}}{C^*_N} \end{pmatrix}; \quad \underset{\sim}{n}^m = \begin{pmatrix} n_1^m \\ \vdots \\ n_N^m \end{pmatrix} = \begin{pmatrix} E_1^m/E_1 \\ \vdots \\ E_N^m/E_N \end{pmatrix}; \quad \underset{\sim}{y} = \begin{pmatrix} \frac{R - D_1/E_1}{C^*_1/F_1} \\ \vdots \\ \frac{R - D_N/E_N}{C^*_N/E_N} \end{pmatrix}; \quad \underset{\sim}{1} = \begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix}$$

To interpret this condition, note first that without taxes, with $\frac{G}{A}(1 - t_c) = 1$, it is in accordance with the separation theorem, which dictates that all investors hold the same equity portfolio, with the total portfolio fraction of equity held by each individual, $\frac{A^m}{A}$, depending on the risk aversion parameter γ^m. With taxes, individual m will hold the market portfolio only if all firms have the same value of $(R - D_i/E_i)/(C^*_i/E_i)$ or if his relative tax preference for dividends versus capital gains, $\frac{1 - t_p^m}{1 - t_g^m}$, equals $\frac{G}{A}(1 - t_c)$, which is a weighted average of this tax preference across investors. Otherwise, individual portfolios will differ in a complicated manner. However, for the special case where Γ is diagonal (firm returns are uncorrelated) (9) yields:

$$n_i^m = A^m \left[\frac{1}{A} + \left(\frac{1}{1 - t_c}\right) \frac{R_i - (D_i/E_i)}{C^*_i/E_i} \left(\frac{G}{A}(1 - t_c) - \left(\frac{1 - t_p^m}{1 - t_g^m}\right)\right)\right] \quad \forall i \tag{10}$$

which says that individuals in high tax brackets will concentrate more in stocks with low dividend price ratios and low risk, as measured by return variance (or, here, also covariance with the market).[6] Thus, a clientele would exist not only with respect to payout rate, but also risk. As argued by Auerbach and King (1982), this latter, seemingly counterintuitive result comes about because by holding safer stocks, high bracket investors can hold a greater fraction of their wealth in the form of equity without incurring more risk. This outcome is independent of whether the wealthy are more or less risk averse than the poor, for that would influence the total amount of risk undertaken but not the composition of the equity portfolio.

Still maintaining the assumption of no constraints on investors, we can rearrange (7) to obtain (letting $d_i = D_i/E_i$):

$$Ag_i + G(1 - t_c)(d_i - R) = (1 - t_c)\left(\frac{C_i^*}{E_i}\right) \tag{11}$$

Multiplying (11) by E_i/E, the fraction of firm i's equity in the total amount outstanding, and summing over i, we obtain

$$Ag_M + G(1 - t_c)(d_M - R) = (1 - t_c)\frac{C_M^*}{E} \tag{12}$$

where g_M and d_M are the weighted average values of g_i and d_i and $C_M^* = \sum_i C_i^*$ is the total risk in society. Combination of (11) and (12) yields

$$g_i = -\frac{G}{A}(1 - t_c)d_i + \beta_i(g_M + \frac{G}{A}(1 - t_c)d_M) + (1 - \beta_i)\frac{G}{A}(1 - t_c)R \tag{13}$$

where $\beta_i = \dfrac{C_i^*/E_i}{C_M^*/E_M}$ is the firm's "beta" as usually defined. As observed by Gordon and Bradford (1981), this equation, which holds for all firms regardless of their clientele, predicts the same value for the coefficient of d_i, $-\frac{G}{A}(1 - t_c)$. Thus, the existence of clienteles could not be verified by attempting, as did Green (1980) and Litzberger and Ramaswamy (1980), to detect differences in this coefficient across firms. Gordon and Bradford therefore concentrated on estimating this parameter under the assumption that it was constant across firms at any given moment.

However, this negative result depends crucially on the assumption that individuals are subject to no constraints on their portfolio behavior. Suppose we now impose a short sale constraint on the equity of individual firms. (An alternative approach would be to introduce transaction costs.) Equation (9) then would describe individual m's notional equity demands only. Going back to equations (6) and (7), we would have to obtain a new version of (7) by adding up condition (6) for unconstrained individuals for whom $E_i^m > 0$, arriving at an equation in which A and G would be replaced by A_i and G_i, the latter values being weighted averages of A^m and G^m for all m with unconstrained equity demands for equity of firm i. Indeed the pattern of constraints, while complicated, does not depend on an individual's attitude toward risk, since the term in brackets on the right-hand side of (9) varies among individuals only because of differences in tax rates. In the simple case of independent returns, (10) applies and here the pattern of constraints is very simple: the higher the value of $\frac{1 - t_p^m}{1 - t_g^m}$, the lower the value of $\frac{R_i - (D_i/E_i)}{C_i^*/E_i}$ at which the investor would wish to sell short.

In the presence of short sale constraints, with A_i and G_i varying across firms, (11) becomes

$$A_i g_i + G_i(1 - t_c)(d_i - R) = (1 - t_c)\left(\frac{\sum_j \lambda_j^i C_{ij}^*}{E_i}\right) \tag{11'}$$

(12) becomes

$$\bar{A} g_M + c(A,g) + (1 - t_c)\,[\bar{G}(d_M - R) + c(G,d)] = (1 - t_c)\left(\frac{\sum_{ij}\sum \lambda_j^i C_{ij}^*}{E}\right) \tag{12'}$$

where $\bar{A}$ and $\bar{G}$ are sample means and $c(A,g)$ and $c(G,d)$ are sample covariances and λ_j^i is the fraction of the equity of firm j held by individuals also holding positive amounts of firm i. Equation (13) becomes

$$g_i = -\frac{G_i}{A_i}(1 - t_c)d_i + \beta_i^*(\frac{\bar{A}}{A_i})[g_M + \frac{\bar{G}}{\bar{A}}(1 - t_c)d_M + x] + \left[\frac{G_i}{A_i} - \beta_i^*(\frac{\bar{A}}{A_i})(\frac{\bar{G}}{\bar{A}})\right](1 - t_c)R \qquad (13')$$

where $x = \frac{c(A,g) + (1 - t_c)\, c(G,d)}{A}$

and $\beta_i^* = \frac{\sum_j \lambda_j^i C_{ij}^* / E_i}{\sum_{ij}\sum \lambda_j^i C_{ij}^* / E}$. Note that this new version of beta takes account of the pattern of stock ownership in the presence of constraints.

Thus, if we had data on g_i, d_i, g_M, d_M, R and x, we could estimate $\frac{G_i}{A_i}(1 - t_c)$ and $\beta_i^*(\frac{\bar{A}}{A_i})$ for each firm, the former being a measure of the tax preference of firm i's clientele. Even if x is unknown, but constant, we can obtain unbiased estimates. However, there will be a problem identifying β_i^*, since $\frac{\bar{A}}{A_i}$ is unknown; it depends on the relationship between investor tax rates and investor risk aversion. Assuming decreasing absolute risk-aversion, γ^m decreases with wealth[7] and, presumably, tax rates (at least for non-institutional investors). Thus, $A^m = \frac{1}{\gamma^m(1 - t_c)(1 - t_g^m)}$ would be expected to increase with tax rates, for non-institutional investors. However, tax-exempt institutions may behave more like high-bracket than low-bracket individuals with respect to risk. Thus, the value of A_i for a given firm might rise or fall with an increase in the tax bracket of the firm's representative shareholder. Because of this, the coefficient of g_M will probably be a biased estimate of β_i^*, but the direction of this bias is uncertain. We shall return to this problem when discussing our empirical findings in the next section.

An interesting characteristic of equation (13') is that it holds regardless of what we hypothesize to be true about the values of q_i for different firms. This is helpful, because it allows us to test for the existence of clienteles without knowledge of the value of q_i. However, equation (13'), and the other equations derived thus far, simply describe the characteristics of individual portfolios and firm valuation, given firm financial policy. The value of a firm's q would certainly be expected to influence the financial policy it actually chooses, and this, in turn, will affect the range of portfolio investments available to individuals. While a complete discussion of firm objectives is beyond the scope of this paper, it should be emphasized that if a firm has stock holders in different tax brackets, they will normally disagree about what financial policy the firm should follow.[8] Moreover, in such a case, the concept of a unique wealth maximizing policy is not even well defined. If we rewrite (7), we obtain a valuation equation for firm i in the absence of constraints:

$$E_i = \left(\frac{A}{G}\right) \frac{q_i \mu_i}{R} - q_i \left(\frac{A}{G}\right) B_i - \left(\frac{q_i}{1 - t_c} \cdot \frac{A}{G} - 1\right) \frac{D_i}{R} \tag{14}$$

so that firm value is

$$V_i = B_i + E_i = \left(\frac{A}{G}\right) \frac{q_i \mu_i}{R} + \left(1 - q_i \frac{A}{G}\right) B_i - \left(\frac{q_i}{1 - t_c} \frac{A}{G} - 1\right) \frac{D_i}{R} \tag{15}$$

Thus, value maximization is well defined and characterized by corner solutions for either B_i or D_i or both (for q_i constant). However, even if each stockholder wished the firm to pursue a personal wealth maximizing policy, this would not be one which maximizes V_i, but rather one which maximizes

$E_i + \dfrac{1 - t_p^m}{1 - t_g^m} B_i$, since any initial distribution of debt would be taxed as a dividend, while changes in equity value would be taxed at capital gains rates.[9] This would make the wealth maximizing strategy different for different stockholders, and demonstrates the importance of knowing the ownership patterns of firms.

IV. Estimation Results

We have derived equation (13'), which will form the basis of estimates of clientele tax rates for different firms. However, if we are actually to use time series observations for a single firm to estimate its clientele, we need to make some further assumption in order to identify the equation's parameters. Otherwise, the clientele would change daily, with low-bracket investors holding the stock on ex dividend days and high-bracket investors holding the stock on other days. Following Green (1980), we argue that transaction costs preclude such daily tax arbitrage, imagining that investors choose their portfolios according to the long run characteristics of the firm. Nevertheless, within a clientele, trading around an ex date which would occur for non-tax reasons may be delayed or speeded up, so that an equation like (13') would still hold and could be identified, though the coefficient of d_i might yield a biased estimate of the implicit tax rate of this stable clientele.[10]

As stated above, equations similar to (13') were estimated for pooled cross-section time series samples by Green (1980) and Litzenberger and Ramaswamy (1980) (hereafter referred to as L-R). Green used daily data from ex dividend days, omitted the interest rate from the set of explanatory variables, and assumed the market coefficient to be the same across firms. L-R used monthly observations including those in which no dividend was paid, and instead of estimating a market coefficient separately, inserted previously (and inconsistently[11]) estimated values of β_i. Green tested for the clientele effect by including a quadratic term in the dividend-price ratio, while L-R did so by grouping observations into five groups by payout rate.

We follow Green in using daily data. Since dividends occur within one day periods, this should minimize extraneous price movements in share price which must be explained by other factors. It also allows us a larger number of observations over a given time interval. Unlike Green, we also include observations from days on which stocks do not go ex dividend, in order to improve the efficiency of our estimates. Unlike any previous study, we will attempt to measure the clientele effect by estimating implicit tax rates for individual firms, and then attempt to explain differences in the estimated tax rates using firm characteristics.

Because we are unaware of any index of daily dividend yield of the market, we simply use for a value of market return the Standard and Poor's index of daily stock returns, which includes capital gains plus dividends. For the risk-free interest rate, the shortest available series is a weekly return on outstanding U.S. Treasury Bills, which has a correlation coefficient over our sample of .996 with the monthly return on T-Bills. Our full sample estimates use the latter while our subperiod estimates use the former. In neither case is the interest rate a significant explanatory variable.

Our sample consists of 436 firms, this being the number for which observations were available for our entire fifteen year sample period (1963-1977) on both daily stock prices and dividends and annual balance sheet and income statement data.[12] The daily data was obtained from the CRSP (Center for Research in Securities Prices) data file, and the annual data comes from Standard and Poor's Compustat file. The sample of firms comes primarily from the New York Stock Exchange, but does include twenty-five from the American Stock Exchange.

The first step in our empirical work was to estimate for each firm a simplified, stochastic version of equation (13')[13]

$$g_i = \alpha_0 + \alpha_1 d_i + \alpha_2 r_M + \alpha_3 R \qquad (16)$$

where the market return r_M is the Standard and Poor's Index and the risk-free rate R is the short-term (weekly or monthly) return on Treasury Bills. Aside from all ex dates for ordinary dividends, data were also included for every tenth trading day, except where such days coincided with a distribution event (ex date, declaration date, etc.). This gives a sample size of about 450 observations over the entire fifteen year period, and 150 for each of the three successive five-year subperiods for which estimates were also obtained to test the stability of our results.

The intercept term α_0 is predicted to be zero, but is included because of the possibility of misspecification of the equation. The terms of interest are α_1 and α_2. According to (13'), α_1 should give the firm's value of $-\frac{G_i}{A_i}(1 - t_c)$, which should be a weighted average of the values of $\frac{1 - t_p^m}{1 - t_g^m}$ of the firm's stockholders. We will typically refer to this term as $(1 - \theta_i)$, where θ_i represents the differential tax rate between dividends and capital gains.[14]

Estimates of equation (16) were obtained for each of the 436 firms for the full sample period and three subperiods. Summary statistics of the regression results are listed in Table 1. As can be seen, α_2 typically is estimated with more precision than α_1, though the average value of each estimate fluctuates over the three subperiods. The mean value of .787 for α_1, and the implicit tax parameter θ of .213, is very close to those obtained by Green (1980) and by Gordon and Bradford (1980) using pooled data. Though the estimated values of α_1 across firms are quite dispersed, only eight (of 436) fall at least two standard errors outside of the interval between .3and 1, the technical bounds imposed by the tax structure. The mean value of .779 for α_2 probably is less than one because of the way in which firms were chosen for our sample, although the fact that α_2 is not an unbiased estimate of β for any firm might also play a role.

Table 1

Estimation of (16): $g_i = \alpha_0 + \alpha_1 d_i + \alpha_2 r_M + \alpha_3 R + \varepsilon_i$

Summary of Results

Parameter	Sample Period 1963-1977	1963-1967	1968-1972	1973-1977
α_0				
mean value	.0008	-.0004	-.0001	.0013
mean standard error	.0031	.0075	.0066	.0080
standard deviation of values	.0035	.0076	.0072	.0082
α_1				
mean value	.787	.747	.559	.862
mean standard error	.251	.478	.538	.425
standard deviation of values	.400	.950	.743	.601
α_2				
mean value	.779	.748	.915	.739
mean standard error	.112	.224	.241	.164
standard deviation of values	.355	.466	.421	.421
α_3				
mean value	-.0001	.0003	.0000	-.0001
mean standard error	.0006	.0019	.0012	.0013
standard deviation of values	.0007	.0019	.0013	.0013

mean value - average of parameter estimate over 436 firm regressions

mean standard error - average estimated standard error of parameter estimate over 436 firm regressions.

standard deviation of values - standard deviation of estimated values over 436 regressions.

Our theory suggests that firms have distinct clienteles that do not change drastically over short periods of time. A test of this conjecture is whether subperiod estimates of α_1 are significantly correlated for the sample of firms. The higher the correlation, the slower the shift in clienteles. Table 2 presents simple correlation coefficients for the estimated values of α_1. Also presented for comparison are the correlations for estimates of α_2. While significantly positive, the correlation coefficient of about .3 across successive five-year sample periods for estimates of α_1 is not overly impressive. However, it should be remembered that these are correlations between estimates, not true parameters. A rough estimate of the correlation between the latter can be calculated by assuming estimation errors to have equal variance across firms at a given time and to be independent over time. We can then adjust the correlation coefficients in Table 2 by estimating the standard deviation of the true values of α_1 in each sample from the standard deviation of estimated α_1's and the average standard error of such estimates given in Table 1.[15] The resulting adjusted correlation coefficients give a much different picture, especially between the second and third subperiods, for which the estimated correlation of the underlying values of α_1 is greater than .7. These results certainly seem to support the hypothesis that there are persistent differences in the value of α_1 and, presumably, the composition of the tax clientele, across firms.

What influences the formation of these clienteles? The theory in section III suggests, at least for the simple case of independent firms, that the implicit stockholder tax rate θ (= $1 - \alpha_1$) should decrease both with the dividend payout and the value of beta. However, portfolio behavior might depend on other firm characteristics as well, given that our model is not a perfect description of the way the world actually works.

Table 2

Correlations Across Subperiods

Estimated Parameter	I/II	II/III	I/III
α_1			
unadjusted	.272	.347	.267
(adjusted)	(.456)	(.712)	(.437)
α_2			
unadjusted	.388	.444	.477
(adjusted)	(.540)	(.588)	(.591)

Subperiods:

I -- 1963-1967

II -- 1968-1972

III -- 1973-1977

Using annual data from the Compustat file, we constructed for each firm the variables listed in Table 3. No attempt is made to correct earnings and assets for inflation and accelerated depreciation. These are difficult adjustments to make, and require assumptions about firm investment patterns and capital asset characteristics. As our aim is to identify differences among firms rather than levels, it is hoped that the variables as constructed will suffice. We use long-run averages for such variables because our theory suggests that clienteles form according to such long run characteristics, as opposed to particular daily or quarterly values. Other variables tried included the debt-equity ratio, which performed much like the debt-asset ratio, the earnings growth rate, which performed much like the dividend growth rate, and industry dummies which were always insignificant.

Using these explanatory variables, $\underset{\sim}{Z}$, we estimate the cross-section equation

$$\hat{\theta}_i = \underset{\sim}{Z}_i \underset{\sim}{\gamma} + \omega_i \tag{17}$$

where $\hat{\theta}_i$ is the estimate of firm i's parameter obtained in the individual firm regressions reported above. If our underlying model hypothesizes that the true θ_i equals $\underset{\sim}{Z}_i \cdot \underset{\sim}{\gamma}$ plus a homoskedastic error term, then ω_i will be heteroskedastic, with larger variance for those firms for which θ_i is estimated imprecisely. We should therefore weight our sample by the inverse of the standard deviation of ω_i, but this is unknown. The inverse of the standard error of estimate of θ_i provides a bound on the degree of weighting necessary, since if the second stage error is large, very little heteroskedasticity will be present. Since we do have estimates of these standard errors, we present regressions weighted in this fashion along with unweighted regressions, as a check of the sensitivity of our results to the

Table 3

Firm Characteristics for Cross-Section Regressions

S	-	Average value of annual sales (in millions of dollars)
D/P	-	Average quarterly dividend price ratio
P	-	Average end-of-year price per share
B/A	-	Average end-of-year ratio of long term debt (book value) to assets (book value)
E/P	-	Average annual earnings price ratio
$\dot{D}/D$	-	Dividend growth rate; obtained by regressing annual dividends on a constant, time and time squared, and dividing the slope by the fitted value at the midpoint of the sample period
σ_Y^2	-	Variance of earnings around a fitted trend
$\hat{\alpha}_2$	-	Estimated value of beta; first-stage regression coefficient of the market return.

use of the correct weighting scheme. Representative results for the full sample estimates of $\hat{\theta}$ and the explanatory variables $\underset{\sim}{Z}$ are presented in Table 4. The low $\bar{R}^2$ values must be seen in light of the fact that we are explaining $\hat{\theta}$, which includes an error presumably orthogonal to the right-hand side variables.

The sales, earnings and price variables are all insignificant in both weighted and unweighted regressions, even though one might construct hypotheses about portfolio behavior which would involve them. Aside from the intercept, only the dividend-price ratio and debt-assets ratio are consistently significant in explanatory power in the weighted regressions; only the former is significant in the unweighted regressions. While their coefficients are fairly stable, neither dividend growth nor earnings variance are significant, though at times they are nearly so. The positive sign of the dividend growth term may simply be helping to explain the dividend clientele effect, since it presumably is negatively correlated with payout ratio and D/P may not perfectly measure the relevant value of the payout. The earnings variance term should be negative, according to our hypothesis. It thus has the wrong sign; the same is true if we replace it with a measure of the firm's β, the coefficient α_2 of the market from the first stage regressions (using two-stage least squares here in the second stage with α_2 endogenous, to purge it of correlation with the estimation error included in $\hat{\theta}$, the dependent variable).

A disturbing aspect of the results in Table 4 is the instability of the coefficient of the dividend-price ratio between weighted and unweighted versions of each model. Such variation should not occur with a large sample if both sets of estimates are consistent, as they would be is the estimated model were correct. This suggests that the model as estimated may be misspecified. Indeed, a test carried out following the method proposed by Hausman (1978) strongly rejects the null hypothesis that the model in (17.5) and (17.10)

Table 4

Cross Section Results (Weighted)

Dependent Variable: $\hat{\theta}_i$ (from Full Sample Period)

Independent Variable	(17.1)	(17.2)	(17.3)	(17.4)	(17.5)
Intercept	.473 (5.72)	.405 (8.10)	.437 (9.55)	.456 (5.93)	.453 (10.19)
$S(x10^{-6})$	-1.41 (.40)				
$P(x10^{-4})$	-3.27 (.50)				
E/P	-.783 (1.08)				
D/P	-19.7 (4.71)	-21.8 (6.16)	-22.5 (6.42)	-22.7 (6.46)	-27.8 (3.51)
B/A	-0.272 (3.04)	-.231 (2.78)	-.309 (2.55)	-.231 (2.74)	-.230 (2.84)
$\dot{D}/D$	.442 (1.57)	.441 (1.57)			
σ_Y^2	.072 (1.39)	.060 (1.19)	.070 (1.41)		
$\hat{\alpha}_2$				-.0032 (0.04)	
$\bar{R}^2$	.1377	.1346	.1246	.1256	.1256

t-statistics in parentheses

Table 4 (continued)

Cross Section Results (unweighted)

Dependent Variable: $\hat{\theta}_i$ (from Full Sample Period)

Independent Variable	(17.6)	(17.7)	(17.8)	(17.9)	(17.10)
Intercept	.731 (6.72)	.636 (8.25)	.696 (11.91)	.610 (3.36)	.706 (12.38)
$S(x10^{-6})$	-.874 (.10)				
$P(x10^{-4})$	-4.23 (.49)				
E/P	-1.55 (1.60)				
D/P	-35.4 (4.85)	-41.1 (6.95)	-43.8 (8.00)	-42.3 (6.73)	-43.9 (8.04)
B/A	-.269 (1.79)	-.248 (1.66)	-.240 (1.60)	-.245 (1.63)	-.246 (1.65)
$\dot{D}/D$	.431 (1.13)	.447 (1.19)			
σ_Y^2	.050 (.97)	.033 (.67)	.038 (.76)		
$\hat{\alpha}_2$				.100 (.55)	
$\bar{R}^2$	.1691	.1641	.1606	.1591	.1602

t-statistics in parentheses

is appropriately specified. However, this information is not very helpful, since there are a number of alternative specifications one could propose. One possibility is that the relationship between the implicit tax rate, θ, and the dividend-price ratio is non-linear. For example, the change in the tax rate might depend on the proportional change in D/P rather than the simple change in level. To test this hypothesis, we add the term $(D/P)^2$ to the model of (17.5) and (17.10) and reestimate. The results for weighted and unweighted regressions are shown in the first and third columns of Table 5, respectively, and labelled (17.11) and (17.14). As hypothesized, the squared dividend-price ratio is significantly negative; a unit increase in D/P has a larger effect on θ for small values of D/P than for large ones. A second result of the addition of the new term to the model is that the debt-assets ratio is no longer significant, or even important, in either weighted or unweighted specification. Omission of this last term yields the estimates labelled (17.12) and (17.15) in Table 5.

While a Hausman test still rejects the hypothesis that the model in (17.12) and (17.15) is specified properly, the test statistic is smaller than the previous one by a factor of seven. Indeed, the relative closeness of fit between weighted and unweighted estimates can be seen readily from Table 6, which presents the values of θ predicted by equations(17.12) and (17.15) for values of the dividend-price ratio varying from two standard deviations below the mean to two standard deviations above. Also presented are the comparable values of θ predicted by equations (17.13) and (17.16), which omit the squared dividend-price term. The results from the non-linear model suggest that a one-standard deviation increase above the mean in the dividend-price ratio is associated with a decrease in the predicted implicit tax rate of between .128 and .140; a decrease of one standard deviation in D/P leads to an increase in the predicted value of θ of between .182 and .220.

Table 5

Cross-Section Results

Non-linear Specification
Dependent Variable: $\hat{\theta}_i$ (from Full Sample Period)

Independent Variable	Weighted (17.11)	Weighted (17.12)	Weighted (17.13)	Unweighted (17.14)	Unweighted (17.15)	Unweighted (17.16)
Intercept	.868 (9.78)	.885 (10.18)	.426 (9.74)	1.071 (11.13)	1.074 (11.17)	.688 (12.27)
D/P	-88.2 (6.94)	-92.9 (7.92)	-25.1 (7.30)	-120.1 (6.98)	-123.9 (7.44)	-46.6 (8.92)
$(D/P)^2$	2182.0 (5.35)	2314.9 (6.02)		3376.5 (4.66)	3483.9 (4.88)	
B/A	-0.081 (.97)			-0.129 (.87)		
$\overline{R}^2$	.1799	.1781	.1093	.2004	.1990	.1549

t-statistics in parenthesis

Table 6

Predicted Tax Rates

D/P	Linear Model Weighted	Linear Model Unweighted	Non-linear Model Weighted	Non-linear Model Unweighted
.0034	.340	.528	.596	.693
.0068	.256	.370	.360	.393
.0102	.171	.213	.178	.173
.0136	.086	.055	.050	.033
.0170	-.001	-.103	-.025	-.025

Mean of D/P = .0102 (quarterly)
Standard deviation of D/P = .0034

Results for equations (17.12) and (17.15) for the three-year sub-periods are shown in Table 7. They are more erratic, but the nonlinear specification seems appropriate in all three cases. Experiments with additional explanatory variables confirmed the finding from the full sample period that only the dividend-price ratio is helpful in explaining differences in the implicit tax rates of firms.

To summarize our empirical findings, there do appear to be significant and persistent differences in firm shareholder tax clienteles, as measured by the coefficient of the dividend-price ratio in equation (16). Only the long-term dividend-price ratio appears to help in explaining these differences. The significance of this variable strongly supports previous findings about the dividend-clientele phenomenum, although the improved fit obtained by adding the $(D/P)^2$ term is a new result. One explanation for this may be that our measures of risk, the variance of earnings and the measured value of β (the estimate of α_2 from equation (16)) are not very good. σ_Y^2 is measured very crudely, and earnings themselves are measured with error. As shown above, α_2 provides an estimate of β with a bias of unknown sign or magnitude. Moreover, our measure of the "market" is certainly not correct in accounting for all risks borne by investors. Since, holding firm characteristics constant, an increase in the firm's debt-equity ratio increases its true earnings variance and true beta, it may be that the negative and sometimes significant, coefficient of the debt-assets ratio means that firms which are riskier attract lower tax bracket investors. Indeed, this would be perfectly consistent with the model developed in the previous section.

Table 7

Cross-Section Results

Dependent Variable: $\hat{\theta}_i$ (from relevant subperiod)

	Independent Variable	Weighted	Unweighted
1963-1967	Intercept	.925 (7.26)	1.763 (8.21)
	D/P	-105.9 (5.66)	-239.0 (6.54)
	$(D/P)^2$	2534.3 (4.03)	7030.2 (4.69)
	$\bar{R}^2$	.1050	.1115
1968-1972	Intercept	1.245 (8.18)	1.746 (9.98)
	D/P	-126.1 (5.03)	-226.0 (5.96)
	$(D/P)^2$	3415.3 (3.32)	7899.5 (4.06)
	$\bar{R}^2$	.1471	.1637
1973-1977	Intercept	.606 (6.26)	.776 (6.45)
	D/P	-53.5 (5.32)	-77.4 (4.35)
	$(D/P)^2$	1008.5 (3.96)	1781.3 (2.79)
	$\bar{R}^2$	.0877	.0804

t-statistics in parenthesis

V. Conclusions

In this paper, we have developed a model of individual portfolio behavior that demonstrates when and how one might empirically test for the existence of investor clienteles sorted by tax rate. The model predicts that sorting should occur with respect not only to the firm's dividend payout rate, but also the riskiness of the firm's earnings, and its validity does not depend on any assumption about how the market values a dollar of reinvested earnings.

Our empirical results established first that it is possible to estimate individual firm clienteles using daily data. This is important, because the behavior of the firms themselves, which we have not explored empirically here, should depend on the composition of their stockholders. Using our calculated tax rates as dependent variables in a large cross section of firms, we corroborated previous findings in support of the dividend clientele effect, but found a non-linear relationship between the dividend-price ratio and the implicit tax rate was superior to the usual linear specification. However, little support for a sorting by risk was found. Further research seems required on this point.

Footnotes

1. The ex ante date is distinct from, and comes after, the declaration date, so that new information imparted by the dividend declaration would already have been reflected in a stock's price before the ex date.

2. This implicitly ignores such things as limited liability and inflation risk. For an attempt to model portfolio behavior in the presence of bankruptcy, see Auerbach and King (1981).

3. Since all debt is riskless and hence identical, it is unnecessary to distinguish holdings of the debt of specific firms.

4. It is important to emphasize that this differential valuation of capital gains and dividends has nothing to do with fallacious arguments such as those attacked by Miller and Modigliani (1961) that capital gains are "riskier" than dividends.

5. Similar results for the special case where $q_i \equiv 1$ may be found in Elton and Gruber (1978) and Litzenberger and Ramaswamy (1980).

6. This follows from the usual assumption that $(1 - t_p^m)/(1 - t_g^m)$ decreases with t_p^m.

7. This may be seen by noting from (9) that the amount of equity held is proportional to $1/\gamma^m$, holding tax rates fixed.

8. See the discussion of this point in Auerbach and King (1982).

9. This argument is developed in greater detail in Auerbach (1979b).

10. See Green (1980) for further discussion.

11. This point is made by Hess (1980).

12. Firms were also omitted that did not satisfy the following criteria

    (1) Ordinary dividends were paid at least once in each of the years between 1963 and 1977.

    (2) The fifteen-year (1963-1977) average of annual earnings divided by the fifteen-year average of end-of-year book assets was at least .01.

    (3) The fifteen-year average of annual dividends divided by the fifteen-year average end-of-year book assets was at least .005.

    The last two restrictions were applied to insure meaningful calculation of growth rates for earnings and dividends.

13. While (13') was derived in terms of expected returns, it is also a standard CAPM result that it applies as well to stochastic returns, with the addition of an error independent of explanatory variables.

14. As Green (1980) pointed out, even if a clientele's composition and tax rates remain constant over time, θ_i will actually vary because of the provision for taxation of capital gains upon realization. Green found that allowing θ_i to vary to account for this had a negligible impact on his results.

15. The formula used is $\rho_{ij} = r_{ij} \dfrac{\sigma_i}{(\sigma_i^2 - S_i^2)^{1/2}} \dfrac{\sigma_j}{(\sigma_j^2 - S_j^2)^{1/2}}$

where σ_i is the sample i standard deviation of estimates of α_1, S_i is the sample i average standard error of estimate of α_1, and r_{ij} is the unadjusted correlation coefficient between periods i and j.

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