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THE ECONOMIC EFFECTS OF DIVIDEND TAXATION

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ABSTRACT

This paper tests several competing hypotheses about the economic effects of dividend taxation. It employs British data on security returns, dividend payout rates, and corporate investment, because unlike the United States, Britain has experienced several major dividend tax reforms in the last three decades. These tax changes provide an ideal natural experiment for analyzing the effects of dividend taxes. We compare three different views of how dividend taxes affect decisions by firms and their shareholders. We reject the "tax capitalization" view that dividend taxes are non-distortionary lump sum taxes on the owners of corporate capital. We also reject the hypothesis that firms pay dividends because marginal investors are effectively untaxed. We find that the traditional view that dividend taxes constitute a "double-tax" on corporate capital income is most consistent with our empirical evidence. Our results suggest that dividend taxes reduce corporate investment and exacerbate distortions in the intersectoral and intertemporal allocation of capital.

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The question of how taxes on corporate distributions affect economic behavior is central to evaluating a number of major tax reform options. Shifts towards either consumption taxation or corporate tax integration would result in dramatic reductions in the taxes levied on dividend income. On the other hand, movement towards a comprehensive income tax would raise the effective tax burden on dividends. While many financial economists have studied the question of why firms pay dividends despite the associated tax penalties imposed on many investors, no consensus has emerged as to the effects of dividend taxation on firms' investment and financial decisions.

This paper summarizes our research program examining the empirical validity of several widely held views about the economic effects of dividend taxation. Empirical analysis of dividend taxation using American data is difficult, because there has been relatively little variation over time in the relevant legislation. We therefore focus on empirical analysis of the British experience since 1950, which has been characterized by four major reforms in the taxation of corporate distributions. These reforms have generated substantial variation in the effective marginal tax rate on dividend income, and provide an ideal natural experiment for studying the economic effects of dividend taxes.

At the outset, it is important to clarify why developing a convincing model of the effects of dividend taxation has been so difficult for economists. Straightforward analysis suggests that since some shareholders are tax penalized when firms pay dividends instead of retaining earnings, firms should not pay dividends. Dividend taxes should collect no revenue and impose no allocative distortions. Even the most casual empiricism discredits this analysis. The payment of dividends is a common and enduring practice of

most large corporations, and it appears to result in substantial tax liabilities for many investors. In modelling the effects of dividend taxes, it is therefore necessary to provide some account of why dividends are paid. Given the simple model's clear no-dividend prediction, any model which rationalizes dividend payout will seem at least partly unsatisfactory. However, some choice is clearly necessary if we are to make any headway towards understanding the economic effects of dividend taxes.

We consider three competing views of how dividend taxes affect decisions by firms and shareholders. They are not mutually exclusive, and each could be relevant to the behavior of some firms. The first view, which we label the "tax irrelevance view," argues that contrary to naive expectations, dividend paying firms are not penalized in the marketplace.[1] It holds that in the United States, because of various nuances in the tax code, marginal investors do not require extra pretax returns to induce them to hold dividend-paying securities. Some personal investors are effectively untaxed on dividend income. Other investors, who face high transactions costs or are non-taxable but face limitations on expenditures from capital, find dividends more attractive than capital gains for non-tax reasons. These investors demand dividend-paying securities. If this view is correct and dividend-paying firms are not penalized, then there is no dividend puzzle. Moreover, changes in dividend tax rates or dividend policies should affect neither the total value of any firm nor its investment decisions. Dividend taxes are therefore nondistor-

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[1]Miller and Scholes (1978, 1982) are the principal exponents of this view.

tionary. The tax irrelevance view implies that reducing dividend taxes would have no effect on share values, corporate investment decisions, or the economy's long-run capital stock.

A second view regarding the dividend payout problem, which also holds that dividend taxes do not have distortionary effects, may be called the "tax capitalization hypothesis."[2] The premise of this view is that the only way for mature firms to pass money through the corporate veil is by paying taxable dividends. The market value of corporate assets is therefore equal to the present value of the after-tax dividends which firms are expected to pay. Moreover, because these future taxes are capitalized into share values, shareholders are indifferent between policies of retaining earnings or paying dividends. On this view, raising dividend taxes would result in an immediate decline in the market value of corporate equity. However, dividend taxes have no impact on a firm's marginal incentive to invest. They are essentially lump sum taxes levied on the initial holders of corporate capital, with no distortionary effects on real decisions. The tax capitalization view implies that reducing dividend taxes would confer windfall gains on corporate shareowners, without altering corporate investment incentives.

A third, and more traditional, view of dividend taxes treats them as additional taxes on corporate profits.[3] Despite the heavier tax burden on

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[2]Although this view is linked with the long-standing notion of "trapped" equity in the corporate sector, it has been formalized by Auerbach (1979), Bradford (1981), and King (1977).

[3]This is the implicit view of many proponents of tax integration; see, for example, McClure (1977).

dividends than on capital gains, firms are rewarded for paying dividends. The explanation for this reward is unclear; managerial signalling could provide one rationale. Therefore, in spite of their shareholders' higher tax liability, firms can be indifferent to marginal changes in their dividend payments. This view suggests that the relevant tax burden for firms considering marginal investments is the total tax levied on investment returns at both the corporate and the personal level. Dividend tax reductions both raise share values and provide incentives for capital investment, because they lower the pre-tax return which firms are required to earn. Dividend tax changes would therefore affect the economy's long run capital intensity.

Our empirical work is directed at evaluating each of these three views of dividend taxation. The results suggest that the "traditional" view of dividend taxation is most consistent with British post-war data on security returns, payout ratios, and investment decisions. While the effects of dividend taxes need not be parallel in the United States and the United Kingdom, our results are strongly suggestive for the United States.

The plan of the paper is as follows. Section I lays out the three alternative views of dividend taxation in greater detail, and discusses their implications for the relationship between dividend taxes and corporate investment and dividend decisions. Section II describes the nature and evolution of the British tax system in some detail. The "natural experiments" provided by post-war British tax reforms provide the basis for our subsequent empirical tests. Section III presents evidence on how tax changes affect investors' relative valuation of dividends and capital gains by focusing on "ex-dividend"

share price movements in the United Kingdom. Our results show that tax rates do appear to influence the value of dividend income. Section IV extends this analysis by examining share price changes in months when dividend tax reforms were announced, presenting further evidence that tax rates affect security valuation. Tests of the alternative theories' implications for the effects of dividend tax changes on corporate payout policies are presented in Section V. We find that dividend tax changes do affect the share of profits which firms choose to distribute. Section VI focuses directly on investment decisions, testing which view of dividend taxation best explains the time series pattern of British investment. Finally, in Section VII we discuss the implications of our results for tax policy and suggest several directions for future research.

I. Three Views of Dividend Taxation

The irrelevance of dividend policy in a taxless world has been recognized since Miller and Modigliani's (1961) pathbreaking work. If shareholders face differential tax rates on dividends and capital gains, however, then the irrelevance result may no longer hold. Dividend policy may affect shareholder wealth, and shareholders may not be simultaneously indifferent to investments financed from retained earnings and investments financed from new equity issues.

To illustrate these propositions, we consider the after-tax return which a shareholder with marginal tax rates of m and z on dividends and capital gains, respectively, receives by holding shares in a particular firm.[4] The shareholder's after-tax return R is

$$(1.1) \qquad R_t = (1-m)\frac{D_t}{V_t} + (1-z)\left(\frac{V^0_{t+1} - V_t}{V_t}\right)$$

where D_t is the firm's dividend payment, V_t is the total value of the firm in period t, and V^0_{t+1} is the period t+1 value of the shares outstanding in period t. To focus on tax-related aspects of the firm's problem, we shall ignore uncertainty, treating V^0_{t+1} as known at time t.[5] The total value of the firm at t+1 is

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[4]The tax rate z is the marginal effective tax rate on capital gains, as defined by King (1977). Since gains are taxed on realization, not accrual, z is the expected value of the tax liability which is induced by a capital gain accruing today.

[5]A closely related model which incorporates uncertainty and investment adjustment costs is solved in Poterba and Summers (1983).

$$(1.2) \qquad V_{t+1} = V^{O}_{t+1} + V^{N}_{t}$$

where V^{N}_{t} equals new shares issued in period t. Equation (1.1) can be rewritten, assuming that in equilibrium the shareholder earns his required return so $R_t = \rho$, as

$$(1.3) \qquad \rho V_t = (1-m)D_t - (1-z)V^{N}_{t} + (1-z)(V_{t+1} - V_t).$$

Equation (1.3) implies the difference equation for the value of the firm, V_t;

$$(1.4) \qquad V_{t+1} = (1 + \frac{\rho}{1-z})V_t + V^{N}_{t} - (\frac{1-m}{1-z})D_t.$$

It may be solved forward, subject to the transversality condition

$$(1.5) \qquad \lim_{T\to\infty} (1 + \frac{\rho}{1-z})^{-T} V_T = 0$$

to obtain an expression for the value of the firm:

$$(1.6) \qquad V_t = \sum_{j=0}^{\infty} (1 + \frac{\rho}{1-z})^{-j} [(\frac{1-m}{1-z})D_{t+j} - V^{N}_{t+j}].$$

The total value of the firm is the present discounted value of after-tax dividends, less the present value of new share issues which current shareholders would be required to purchase in order to maintain their claim on a constant fraction of the firm's total dividends and profits.

Before turning to consider the different views of dividend taxation, we shall sketch the firm's optimization problem. The firm's objective is to maximize its market value, subject to several constraints. The first is its cash flow identity:

$$(1.7) \qquad (1-\tau)\Pi_t + V_t^N = D_t + I_t$$

where Π_t is pretax profitability and I_t gross investment expenditures and τ is the corporate tax rate. $\Pi_t = \Pi_t(K_t)$, where K_t is the capital stock at the beginning of period t.[6] Next, there is an equation describing the evolution of the firms' capital stock:

$$(1.8) \qquad K_t = K_{t-1} + I_t.$$

We assume that there is no depreciation, and ignore adjustment costs or the possible irreversibility of investment. Finally, there are restrictions on the firm's financial policies: dividends cannot be negative, and new share issues must be greater than some minimal level $\overline{V}^N$,[7] reflecting restrictions on the firm's ability to repurchase shares or to engage in transactions with equivalent tax consequences. These two constraints can be written

$$(1.9) \qquad D_t \geq 0$$

and

$$(1.10) \qquad V_t^N \geq \overline{V}^N$$

where $\overline{V}^N \leq 0$.

Before formally solving for the firm's investment and financial plan, we observe one important feature of any solution to this problem. The

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[6] We consider the firm's problem in discrete time to avoid the difficulties of infinite investment over short time intervals which would result in a continuous-time model without adjustment costs.

[7] Share repurchases are possible to some extent in the United States. However, regular repurchasing can lead to IRS actions treating the repurchase as a dividend. In Britain, where share repurchase is explicitly

firm would never simultaneously issue new equity and pay dividends. If a firm sets both $D_t > 0$ and $V_t^N > \bar{V}^N$ in any period, then there would exist a feasible perturbation in financial policy which would not affect investment or profits in any period but would raise share values. This perturbation involves a reduction in dividends, compensated for by a reduction in new share issues. To vary dividends and new share issues without affecting Π_t or I_t, we require

$$(1.11) \qquad dV_t^N = dD_t.$$

From equation (1.6), the change in share value caused by a dividend change in period t+j which satisfied (1.11) is

$$(1.12) \qquad dV_t = \{\frac{(1-m)}{(1-z)}dD_{t+j} - dV_{t+j}^N\}(1 + \frac{\rho}{1-z})^{-j} = -\frac{(m-z)}{(1-z)}dD_{t+j}(1 + \frac{\rho}{1-z})^{-j}.$$

If m exceeds z, reducing dividends whenever feasible will raise V_t.

Since this perturbation argument applies at any positive level of dividends, it establishes that firms with sufficient profits to cover investment needs should reduce new share issues and repurchase shares to the extent possible. For some firms, I_t may exceed $(1-\tau)\Pi_t$, and there will be new share issues. Even if $m > z$, therefore, some new equity may be issued. Similarly, some firms may have too few investments to fully utilize their current profits. If feasible, these firms should repurchase their shares. Only after exhausting tax-free distribution channels should these firms pay dividends.

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banned, these questions do not arise. The situation is more complex when transactions equivalent to share repurchase, such as direct portfolio investments, are considered.

No firm, however, should ever operate on both the dividend and share issue margins simultaneously. The "dividend puzzle" consists of the observation that some firms pay dividends while also having unused opportunities to repurchase shares or engage in equivalent transactions which would effectively transmit tax-free income to shareholders. Edwards (1984) reports that in a sample of large British firms, over 25 percent paid dividends and issued new equity in the same year, while 17 percent not only paid but raised their dividends during years when they issued new shares.

The conclusions described above apply when there is only one shareholder and his tax rates satisfy $m > z$. However, the actual economy is characterized by many different shareholders, often with widely different tax rates. While m may exceed z for some shareholders, there are many investors for whom $m = z$ and still others facing higher tax rates on capital gains than on dividends.[8] If there were no short selling constraints, then as Brennan (1970) and Gordon and Bradford (1980) show, there would be a unique market-wide preference for dividends in terms of capital gains. It would equal a weighted average of different investor's tax rates, with higher weights on wealthier, and less risk averse, investors. If there are constraints, however, then different firms may face different investor clienteles, possibly characterized by different tax rates. If some traders face low transactions costs (Miller and Scholes (1982), Kalay (1982)) or are nearly risk neutral, then they may effectively determine the market's relative valuation of dividends and capital gains and become the marginal investors.

The firm chooses I_t, V_t^N, K_t, and D_t to maximize V_t subject to

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[8]The principal class of American investors for whom m is less than z is corporate holders of common stock, who may exclude 85 percent of their dividend income from their taxable income, thereby facing a tax rate of .15 x

(1.7), (1.8), (1.9) and (1.10). The firm's problem may be rewritten as

$$(1.13)\quad \max \sum_{t=0}^{\infty} (1 + \tfrac{\rho}{1-z})^{-t} \{ [(\tfrac{1-m}{1-z})D_t - V_t^N] - \lambda_t [K_t - K_{t-1} - I_t]$$

$$- \mu_t [(1-\tau)\Pi(K_t) + V_t^N - D_t - I_t] - \eta_t (V_t^N - \bar{V}^N) - \xi_t D_t \}$$

where λ_t, μ_t, η_t, and ξ_t are the Lagrange multipliers associated with the constraints. The first order necessary conditions for an optimal program are:

$$(1.14)\quad I_t: \qquad \lambda_t + \mu_t = 0$$

$$(1.15)\quad K_t: \qquad -\lambda_t + (1 + \tfrac{\rho}{1-z})^{-1}\lambda_{t+1} - \mu_t(1-\tau)\Pi'(K_t) = 0$$

$$(1.16)\quad V_t^N: \qquad -1 - \mu_t - \eta_t = 0 \qquad\qquad \eta_t(V_t^N - \bar{V}^N) \leq 0$$

$$(1.17)\quad D_t: \qquad (\tfrac{1-m}{1-z}) + \mu_t - \xi_t = 0 \qquad\qquad \xi_t D_t \leq 0.$$

By interpreting these conditions under the different views of dividend taxation, we can isolate the implications of each for the effects of dividend taxation on the cost of capital, investment, payout policy, and security returns.

I.A. The Tax Irrelevance View

The first view of dividend taxation which we consider assumes that share prices are set by investors for whom m = z. We label this the "tax irrelevance" view; it was advanced by Miller and Scholes (1978, 1982). Miller

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.46 = .069, while being taxed at a 28 percent rate on their realized capital gains.

and Scholes argue that the marginal investor in corporate equities is effectively untaxed on both dividends and capital gains income.[9] Hamada and Scholes (1984), who call this view the "Before Tax Theory," note that it essentially assumes "that all personal income taxes - to bondholders, stockholders, and partners of businesses - can be effectively laundered."

Several scenarios could lead to marginal investors being untaxed on capital income. The marginal investor may be an institutional investor for whom $m = z = 0$. Alternatively, in the United States, the marginal investor may be an individual investor for whom dividend income relaxes the deduction limit for interest expenses, making m effectively zero. This investor might, as a result of tax-minimizing transactions such as holding shares with gains and selling shares with losses, also face a zero tax rate on capital gains.

The interpretation of first order conditions (1.14)-(1.17) in the m=z=0 case is straightforward. The last two constraint conditions simplify substantially. As long as the firm is either paying dividends or issuing shares, one of η_t or ξ_t, the shadow values of the D_t and V_t^N constraints, will equal zero. Using either (1.16) or (1.17), and $m = z = 0$, this implies that $\mu_t = -1$. The value of one dollar of additional profits is just one dollar. The shadow value of capital, λ_t, can be determined from (1.14). Since $-\mu_t = \lambda_t$, we can conclude that $\lambda_t = 1$. The shadow value of one more unit of capital in place, λ_t, corresponds to "marginal q" in the investment literature. Firms invest until the incremental increase in their market value from a one dollar investment is exactly one dollar, regardless of the source of their marginal

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[9]Another case in which the market would exhibit an indifference between dividends and capital gains is when the marginal investor is a broker or dealer in securities, facing equal (but non-zero) tax rates on both divi-

investment funds.

The knowledge that $\lambda_t = \lambda_{t+1} = 1$ enables us to solve equation (1.15) for the equilibrium marginal product of capital:

$$(1.18) \qquad (1-\tau)\Pi'(K_t) = \frac{\rho}{1+\rho}.$$

The Taylor expansion of $\rho/(1+\rho)$ around $\rho = 0$ allows us to approximate the right hand side of this expression by ρ, yielding the standard result that $(1-\tau)\Pi'(K_t) = \rho$. We define the cost of capital as the value of $\Pi'(K)$ which just satisfies (1.18), and using the approximation find

$$(1.19) \qquad c = \frac{\rho}{(1-\tau)}.$$

The firm's cost of capital is independent of its payout policy. Changes in the corporate tax rate will affect investment decisions. However, investment policy will be independent of both the firm's dividend payout choices and the prevailing nominal dividend tax rate, since it is always effectively reduced to zero by tax-wise investors. Assuming that m=z=0 for the marginal investor leads immediately to Miller and Modigliani's (1961) irrelevance result for a taxless world.

The tax irrelevance view also implies that the risk-adjusted required return on all equity securities is equal, regardless of their dividend yield. Assuming that all returns are certain, basic capital market equilibrium condition is[10]

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dends and short term capital gains.

[10]The extension to the CAPM framework which incorporates risk is straightforward and involves replacing ρ with $r_f + \beta_i(r_m - r_f)$ where r_f is the post-tax risk free return, β_i is firm i's beta, and r_m is the expected post-tax return on the market.

$$(1.20) \qquad \rho = d_i + g_i \qquad \text{all } i$$

where d_i is the dividend yield and g_i the expected capital gain on security i. There should be no detectable differences in the returns on different shares as a result of firm dividend policies.

The assumption that m=z=0 for marginal investors is ultimately verifiable only from empirical study. Some evidence, such as the somewhat controversial finding that on ex-dividend days share prices decline by less than the value of their dividends, suggests that the marginal investor may not face identical tax rates on dividends and capital gains. The tax irrelevance view also has difficulty explaining the substantial amount of dividend tax revenue collected by both the Internal Revenue Service and (in the U.K.) the Board of Inland Revenue. If most personal investors were effectively untaxed on dividend receipts, relatively little tax revenue should be raised.

The second and third views of dividend taxation assume that shares are valued as if the marginal investor faced a higher effective tax rate on dividends than on capital gains. They attempt to explain why, in spite of this tax disadvantage, dividends are still observed. We label the next two views the "tax capitalization" and the "traditional" views. Each yields different predictions about how the cost of capital, investment, and dividend policy are affected by dividend taxation.

I.B The Tax Capitalization View

The "tax capitalization view" of dividend taxes was developed by Auerbach (1979), Bradford (1981), and King (1977). It applies to mature firms which have after-tax profits in excess of their desired investment expen-

ditures. Retained earnings are therefore the marginal source of investment funds for these firms. This view assumes that firms cannot find tax-free channels for transferring income to shareholders so that the $V^N = \bar{V}^N$ constraint binds. Therefore, the firm pays a taxable dividend equal to the excess of profits over investment:

$$(1.21) \qquad D_t = (1-\tau)\Pi_t - I_t + \bar{V}^N.$$

Dividends are determined as a residual.

The first order conditions (1.14)-(1.17) can be reinterpreted for a firm in this situation. We showed above that a firm which was paying dividends would repurchase shares to the maximum extent possible, so $V_t^N = \bar{V}^N$. Formally, the knowledge that $D_t > 0$ allows us to set $\xi_t = 0$ in (1.17), implying $\mu_t = -[(1-m)/(1-z)]$. The marginal value of a unit of capital, from equation (1.14), is therefore

$$(1.22) \qquad \lambda_t = \left(\frac{1-m}{1-z}\right) < 1.$$

Marginal q is less than one in equilibrium. Firms invest until investors are indifferent at the margin between receiving additional dividend payments and reinvesting money within the firm. When the firm pays a one dollar dividend, the shareholder receives (1-m) after tax. If the firm retains the dollar and purchases capital, its share value will appreciate by q and the shareholder will receive (1-z)q in after-tax income. If the shareholder is indifferent between these two actions, the equilibrium value of marginal q must equal $[(1-m)/(1-z)]$.

The cost of capital under the tax capitalization view can be derived from equation (1.15). It will depend on both the current marginal source of investment finance, and on the source which is expected to be available in period t+1.[11] This is because λ_{t+1}, which depends upon whether retentions or new share issues are next period's marginal source of funds, affects the cost of capital in period t. The assumption in the tax capitalization view is that mature firms will never again issue new shares and always set $V_t^N = \bar{V}^N$, so that marginal source of funds in this and all future periods is retained earnings. We can therefore set $\lambda_t = \lambda_{t+1} = (1-m)/(1-z)$, and find that

$$(1.23) \qquad (1-\tau)\Pi'(K_t) = \frac{\rho/(1-z)}{1 + \rho/(1-z)}.$$

Again using a Taylor approximation to the right hand side, the cost of capital can be written

$$(1.24) \qquad c = \frac{\rho}{(1-\tau)(1-z)}.$$

The dividend tax rate has no effect on the cost of capital, and permanent changes in dividend taxes, unless accompanied by changes in the capital gains tax, will have no effect on investment activity.

This view implies that the dividend tax is a lump sum levy on wealth in the corporate sector at the time of its imposition. The total value of corporate equity, using (1.6) and defining D'_{t+j} as the dividends paid to period t shareholders in period t+j,

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[11] More complete discussions of the importance of the marginal source of funds over time may be found in King (1974), Auerbach (1983b, pp. 924-5), and Edwards and Keen (1984).

$$(1.25) \qquad V_t = \left(\frac{1-m}{1-z}\right) \sum_{j=0}^{\infty} \left(1+\frac{\rho}{1-z}\right)^{-j} D'_{t+j}.$$

Changes in the dividend tax rate therefore have direct effects on the total value of outstanding equity,[12] even though they do not affect the rate of return earned on these shares. The tax capitalization view treats current equity as "trapped" within the corporate sector, and therefore as bearing the full burden of the dividend tax.

Permanent changes in the dividend tax rate will have no effect on the firm's dividend policy. The cost of capital, hence the firm's investment and capital stock, are unaffected by dividend taxes. Dividend payments, the difference between $(1-\tau)\Pi(K_t)$ and investment expenditures, are therefore unaffected as well. Temporary tax changes, however, do have real effects. For example, consider a temporary dividend tax which is announced in period t-1. It will set the dividend tax rate to m in period t, but zero in all previous and subsequent periods. We set z = 0 in all periods for convenience. Since $\lambda_t = 1-m$ but $\lambda_{t+j} = 1$ for all $j \neq 0$, we can use equation (1.15) to determine the period-by-period cost of capital around the tax change:

Period	t-2	t-1	t	t+1
Cost of Capital	$\frac{\rho}{1-\tau}$	$\frac{\rho+m}{1-\tau}$	$\frac{\rho-m}{1-\tau}$	$\frac{\rho}{1-\tau}$

The general formula for the cost of capital is

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[12] If the desired wealth to income ratio is fixed, then raising dividend tax rates may actually raise equilibrium capital intensity by reducing the portfolio value of each unit of physical capital. The discussion in the text precludes this possibility by assuming that ρ is fixed.

$$(1.26) \qquad c = (1-\tau)^{-1}\left[1 - \left(1+\frac{\rho}{1-z}\right)^{-1}(\lambda_{t+1}/\lambda_t)\right].$$

The cost of capital depends in part on the change in the shadow value of capital which is expected to take place between one period and the next. Since λ_t is low because of the dividend tax, the cost of capital is high in the period immediately prior to the imposition of the tax, and low during the taxed period. Since changes in the cost of capital have real effects, temporary tax changes may alter investment and therefore dividend payout. This result may be seen intuitively. Firms will go to great lengths to avoid paying dividends during a temporary dividend tax period. As a consequence, they will invest even in very low productivity investments.

Finally, since the capitalization view assumes that dividends face higher tax rates than capital gains, it predicts that shares which pay dividends will earn a higher pre-tax return to compensate shareholders for their tax liability. The after-tax capital market line corresponding to (1.20) is

$$(1.27) \qquad \rho = (1-m)d_i + (1-z)g_i$$

which can be rewritten as

$$(1.28) \qquad R_i = \frac{\rho}{1-z} + \frac{m-z}{1-z}d_i$$

where $R_i = d_i + g_i$. There should be detectable differential returns on securities with different dividend yields.

There are two principal difficulties with the capitalization view of dividend taxation. First, if marginal q is less than one and marginal and average q are not very different, then firms should always prefer acquiring

capital by takeovers instead of direct purchases. This is because the purchase price of a new capital good is unity, but the market value of capital goods held by other corporations is only $(1-m)/(1-z)$.

Second, this view's premise is that dividends are the only way to transfer money out of the corporate sector. Firms are constrained in that they cannot further reduce new equity issues or increase share repurchases. In the U.S. at least, there are many methods potentially available to firms which wish to convert earnings into capital gains. These include both share repurchases and takeovers, as well as the purchase of equity holdings or debt in other firms and various other transactions. The proposition that all marginal distributions must flow through the dividend channel may be untenable. The tax capitalization view therefore does not explain dividend payout in any real sense. Rather it assumes that dividends must be paid and that firms are not issuing new shares and then analzses the effect of changes in dividend tax rates.

A further difficulty is this view's assumption that dividend payments are a residual in the corporate accounts, and therefore subject to substantial variation. The arrival of "good news," which raises desired investment, should lead dividends to fall sharply. Most empirical evidence[13] suggests both that dividend payments are substantially less volatile than investment expenditures, and that managers raise dividends when favorable information about the firm's future becomes available.

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[13]The survey evidence reported by Lintner (1956) and the regression evidence in Fama and Babiak (1968) suggest that managers adjust dividend payments slowly in response to new information.

I.C The Traditional View

The third view of dividend taxation, which we label the "traditional" view, takes a more direct approach to resolving the dividend puzzle. It argues that for a variety of reasons, shareholders derive benefits from the payment of dividends. Firms derive some advantage from the use of cash dividends as a distribution channel, and this is reflected in their market value. While the force which makes dividends valuable remains unclear, leading explanations include the "signalling" hypothesis, discussed for example by Ross (1977), Bhattacharya (1979), and Miller and Rock (1983), or the need to restrict managerial discretion as outlined in Jensen and Meckling (1976).

To model the effect of the payout ratio on shareholder's valuation of the firm, we must generalize our earlier analysis. A convenient device for allowing for "intrinsic dividend value" is to assume that the discount rate applied to the firm's income stream depends on the payout ratio: $\rho = \rho(\frac{D}{(1-\tau)\Pi})$, $\rho' < 0$. Firms which distribute a higher fraction of their profits are rewarded with a lower required rate of return. This changes the fundamental expression for the value of the firm, equation (1.6), to

$$(1.29) \qquad V_t = \sum_{j=0}^{\infty} \beta(t,j) \left[(\frac{1-m}{1-z})D_{t+j} - V^N_{t+j}\right]$$

where

$$(1.30) \qquad \beta(t,j) = \prod_{k=-1}^{j-1} \left[1 + \rho(\frac{D_{t+k}}{(1-\tau)\Pi_{t+k}})/(1-z)\right]^{-1}.$$

While dividend taxes make dividend payments unattractive, the reduction in discount rates which results from a higher payout ratio may induce firms to

pay dividends.

The first-order conditions characterizing the firm's optimal program are slightly different in this case than under the previous two views, because the choice of dividend policy now affects the discount rate. The new first order conditions are shown below:

(1.14a) I_t: $\quad \lambda_t + \mu_t = 0$

(1.15a) K_t: $\quad -\lambda_t + (1 + \frac{\rho_{t+1}}{1-z})^{-1}\lambda_{t+1} - \mu_t(1-\tau)\Pi'(K_t)$

$$- \frac{\rho'(\frac{D_t}{(1-\tau)\Pi_t})\frac{D_t}{(1-\tau)\Pi_t} \cdot \frac{\Pi_t'}{\Pi_t}}{(1-z)(1 + \rho_{t+1}/(1-z))} \cdot V_t = 0$$

(1.16a) V_t^N: $\quad -1 - \mu_t - \eta_t = 0, \qquad \eta_t(V_t^N - \overline{V}^N) \leq 0$

(1.17a) D_t: $\quad (\frac{1-m}{1-z}) + \mu_t - \xi_t - \frac{\rho'(\frac{D_t}{(1-\tau)\Pi_t}) \cdot \frac{1}{\Pi_t(1-\tau)}}{(1-z)(1 + \rho_{t+1}/(1-z))} \cdot V_t = 0, \qquad \xi_t D_t \leq 0$

For convenience, we define $\rho_{t+1} = \rho(D_t/(1-\tau)\Pi_t)$, so the discount rate in each period depends on the previous period's payout ratio.

To solve these equations for marginal q and the cost of capital, we assume that the returns from paying dividends are sufficient to make $D_t > 0$.[14] If this were not the case, then this view would reduce to the tax capitalization model where dividends are just a residual. Positive

[14] If despite the fact that $\rho' < 0$ firms continued to set $D_t = 0$ at the optimum, the analysis would be similar to the tax capitalization model.

dividends require $\xi_t = 0$, so $\mu_t = -1$ from (1.16a) and $\lambda_t = 1$ from (1.14a). Therefore, the equilibrium value of marginal q is unity. This follows, because at the margin firms are effectively relying on new equity finance. Investors are trading one dollar of after-tax income for one dollar of corporate capital. For values of q less than unity, these transactions would cease.

The cost of capital can also be derived from these conditions. Since $\mu_t = -1$, equation (1.17a) may be rewritten as

$$(1.31) \qquad \frac{z-m}{1-z} = -\frac{\rho'\left(\frac{D_t}{(1-\tau)\Pi_t}\right)}{(1-z)\left(1+\frac{\rho_{t+1}}{1-z}\right)} \cdot \frac{V_t}{\Pi_t(1-\tau)} .$$

This expression may be used to simplify (1.15a):

$$(1.32) \qquad -\lambda_t + \left(1+\frac{\rho_{t+1}}{1-z}\right)^{-1}\lambda_{t+1} + (1-\tau)\Pi'(K_t) + \left(\frac{z-m}{1-z}\right) \cdot \frac{D_t}{(1-\tau)\Pi_t} \cdot (1-\tau)\Pi'(K_t) = 0.$$

Assuming $\lambda_t = \lambda_{t+1} = 1$, and again approximating $[\rho_{t+1}/(1-z)]/[1+\rho_{t+1}/(1-z)] = \frac{\rho_{t+1}}{1-z}$, we find

$$(1.33) \qquad -\frac{\rho_{t+1}}{1-z} + (1-\tau)\Pi'(K_t)\left[1 + \left(\frac{z-m}{1-z}\right)\frac{D_t}{(1-\tau)\Pi_t}\right] = 0$$

which can be written

$$(1.34) \qquad (1-\tau)\Pi'(K_t) = \frac{\rho(\alpha_t)}{(1-m)\alpha_t + (1-z)(1-\alpha_t)}$$

where $\alpha_t = D_t/(1-\tau)\Pi_t$, the dividend payout ratio. The steady state cost of capital is therefore

$$(1.35) \qquad c = \frac{\rho(\alpha)}{(1-\tau)[(1-m)\alpha + (1-z)(1-\alpha)]} .$$

It involves a weighted average of the tax rates on dividends and capital gains, with weights equal to the dividend payout ratio.

The cost of capital will also be affected by a dividend tax change. The precise effect may be found by differentiating (1.34):

$$(1.36) \qquad \frac{dc}{d(1-m)} = \frac{-\alpha c}{[(1-m)\alpha + (1-z)(1-\alpha)]} + \frac{\partial c}{\partial \alpha} \frac{d\alpha}{d(1-m)}.$$

The foregoing conditions for choice of D_t imply $\frac{\partial c}{\partial \alpha} = 0$ at the optimal dividend payout so we can write

$$(1.37) \qquad \frac{dc}{d(1-m)} \cdot \frac{(1-m)}{c} = \frac{-(1-m)\alpha}{(1-m)\alpha + (1-z)(1-\alpha)} < 0.$$

A reduction in the dividend tax will therefore lower the cost of capital, increasing current investment spending.

The traditional view implies that when the dividend tax rate falls, equilibrium capital intensity and the required return ρ may rise. Under the extreme assumption that capital is supplied inelastically, the only effect of a dividend tax cut is an increase in the equilibrium rate of return, ρ. If capital was supplied with some positive elasticity, then a reduction in the dividend tax rate would raise both capital intensity and the rate of return.[15] Dividend tax changes can have substantial allocative effects.

The traditional view suggests that as dividend taxes fall, the dividend payout ratio should rise. The firm equates the marginal benefit from divi-

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[15]In the partial equilibrium model described here, the supply of capital is perfectly elastic at a rate of return $\rho(\alpha)$. Therefore, the whole adjustment to the new equilibrium would involve changes in capital intensity.

dend payments with the marginal tax cost of those payments. Dividend tax reductions, whether temporary or permanent, will lower the marginal cost of obtaining signalling or other benefits, and the optimal payout ratio should therefore rise.

Finally, we should note the implications of this view for the relative pre-tax returns on different securities. The pricing relation is a generalization of (1.28):

$$(1.38) \qquad R_i = \frac{\rho(\alpha_i)}{1-z} + (\frac{m-z}{1-z})d_i.$$

This implies two effects for dividend yield. First, in periods when firm i actually pays dividends ($d_i > 0$), the measured pre-tax return will rise to compensate investors for their resulting tax liability. However, even in periods when no dividend is paid, the required return on higher yield stocks may be lower than on low yield stocks as a result of the signalling or other value which payout provides.

While it may provide an explanation of the dividend puzzle, the traditional view depends critically on a clear reason for investors to value high dividend payout, but as yet provides only weak motivation for the $\rho(\alpha)$ function.[16] It is particularly difficult to understand why firms use cash dividends as opposed to less heavily taxed means of communicating information to their shareholders. An additional difficulty with this view is that firms rarely issue new equity. It is possible that even though firms issue shares infrequently, however, new equity is still the marginal source of funds. For

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[16]Black (1976), Stiglitz (1980), and Edwards (1984) discuss many of the proposed explanations for "intrinsic dividend value" and find them unsatisfactory in some dimension.

example, some firms might use short-term borrowing to finance projects in years when they do not issue equity, and then redeem the debt when they finally issue new shares. Moreover, the wide variety of financial activities described above which are equivalent to share repurchase may allow firms to operate on the equity-issue margin without ever selling shares.

I.D Summary

In this section, we have described three distinct views of the economic effects of dividend taxation. While we have treated them as opposing alternatives, they may each be partially correct. Different firms may be on different financing margins, and the tax rates on marginal investors may also differ across firms. We allow for both these possibilities in interpreting the empirical results reported below.

Table 1 summarizes the cost of capital and equilibrium "q" under each of the alternative views. We also report each view's prediction for the responsiveness of investment, the payout ratio, and the pretax return premium earned by dividend-paying shares to a permanent increase in the dividend tax rate. In subsequent sections, we test each of these different predictions using British data from the post-war period.

Table 1

The Alternative Views of Dividend Taxation

	Traditional View	Tax Capitalization View	Tax Irrelevance View
Cost of Capital	$\frac{\rho(\alpha)}{[(1-m)\alpha + (1-z)(1-\alpha)](1-\tau)}$	$\frac{\rho}{(1-z)(1-\tau)}$	$\frac{\rho}{1-\tau}$
$\frac{dI}{dm}$	< 0	0	0
$\frac{d\alpha}{dm}$	< 0	0	0
Equilibrium Marginal "q"	1	$\frac{1-m}{1-z}$	1
Dividend Premium in Pre-tax Returns	$\frac{m-z}{1-z}$	$\frac{m-z}{1-z}$	0

Note: These results are derived in the text and are recorded here for later reference. The level of investment is I, m is the marginal dividend tax rate, and α is the dividend payout ratio. All of the tax changes are assumed to be permanent.

II. The Taxation of Dividends in Great Britain: 1950-1983

The previous section's stylized discussion of taxes focused on the United States' tax environment. Since our empirical tests rely on the major changes in British tax policy that have occurred over the last three decades, this section describes the evolution of the U.K. tax system with respect to dividends. Subsequent sections present our empirical results.

In the United States, discriminatory taxation of dividends and retained earnings occurs at the shareholder level, where dividends and capital gains are treated differently. In Britain, however, there have been some periods when corporations also faced differential tax rates on their retained and distributed income. During other periods, the personal and corporate tax systems were "integrated" to allow shareholders to receive credit for taxes which had been paid at the corporate level. Between 1965 and 1973, Britain experimented with a tax system structured after that of the post-war United States. Five different systems of dividend taxation have been tried in Britain during the last three decades.

Two summary parameters are needed to describe the effects of the various tax regimes on dividends. The first, which measures the amount of the tax discrimination at the shareholder level, is the investor tax preference ratio (δ). It is defined as the after-tax income which a shareholder receives when a firm distributes a one pound dividend, divided by his after-tax receipts when the firm's share price rises by one pound.[17] In the United States, $\delta = (1-m)/(1-z)$. The investor tax preference ratio is central to ana-

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[17]For consistency, in our section on ex-dividend price changes it will prove helpful to focus on the dividend announced by the firm. Prior to March, 1973, that was the gross dividend in the notation of King (1977). After 1973, it was the net dividend. We define δ relative to the announced dividend.

lyzing share price movements around ex-dividend days, since if m and z are the tax rates reflected in market prices, then a firm paying a dividend of d should experience a price drop of $(1-m)/(1-z)d$ or δd.

The second parameter which may affect investment and payout decisions is the total tax preference ratio (θ). It is defined as the amount of after-tax income which shareholders receive when a firm uses one pound of after-tax profits to increase its dividend payout. This return must be measured relative to the amount of after-tax income which shareholders would receive if the firm retained this pound. In the American tax system, where corporate tax payments are unaffected by payout policy, $\theta = \delta = (1-m)/(1-z)$. In Britain, the relationship is more complex, depending on the change in corporate tax payments which results from a one pound reduction in gross dividends. This variable determines firm payout policy under the traditional view of dividend taxation and equilibrium q under the tax capitalization hypothesis.

II.A. The Different Tax Regimes

To characterize the changes in δ and θ which provide the basis for our empirical tests, we consider each British tax regime in turn. We follow King (1977) and express the total tax burden on corporate income as a function of the prevailing tax code parameters, and then derive δ and θ. More detailed discussions of British dividend taxation may be found in King (1977), House of Commons (1971), the Corporation Tax Green Paper (1982), and Tiley (1978).

King (1977) follows a different procedure for the post-1973 regime. Although this leads to some semantic differences, the results with respect to θ are identical.

1950-51: Differential Profits Tax Regime I

Prior to the 1952 Budget, firms faced a two-tier tax system with different tax rates on distributed and undistributed income. The tax code was described by s, the standard rate of income tax, τ_u, the tax rate on undistributed profits, and τ_d, the tax rate on distributed profits. There was no capital gains tax, so z=0. Corporations were subject to both income taxes and profits taxes, although profits taxes could be deducted from a company's income in calculating income tax liability. Income tax was paid at rate s. The corporate tax liability of a corporation with pre-tax profits Π and gross dividend payments D was[18]

$$(2.1) \qquad T^c = [s + (1-s)\tau_u](\Pi - D) + (1-s)\tau_d D$$
$$= [(1-s)\tau_u + s]\Pi + [(1-s)(\tau_d - \tau_u) - s]D \ .$$

In addition, shareholders were liable for

$$(2.2) \qquad T^p = mD.$$

In practice, part of this tax was collected by the corporation when it paid dividends; it withheld sD as prepayment of part of the shareholder's tax. Shareholders therefore received (1-s)D immediately after a gross dividend D was paid. A taxpayer whose marginal rate was greater than s would subsequently be liable for taxes of (m-s)D; one with m<s would receive a refund.

The investor tax preference ratio for this system is easy to derive. The shareholder's after-tax income associated with a one pound dividend equals

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[18]The term gross dividends refers to dividends received by shareholders prior to paying shareholder taxes, but after the payment of all corporate taxes. Note that King (1977) uses G to represent gross dividends, and D for net dividends. We use D for gross dividends.

(1-m), where m is the marginal dividend tax rate. Since there are no taxes on capital gains, the shareholder tax preference ratio is $\delta = (1-m)$.

We can also compute θ for this tax regime. To raise gross dividends by one pound, the firm must forego $[1 + dT^c/dD]$ pounds of after-tax retentions. The second term is the marginal change in tax liability which results from raising D by one pound. The parameter $\hat{\theta}$, which is the change in gross dividends per pound of foregone retentions, is defined as

$$(2.3) \qquad \hat{\theta} = \frac{1}{1 + \frac{dT^c}{dD}} = \frac{1}{(1-s)(1 + \tau_d - \tau_u)}$$

from (2.2). The total tax preference ratio is defined by

$$(2.4) \qquad \theta = \delta\hat{\theta} = \frac{(1-m)}{(1-s)(1-\tau_d-\tau_u)}.$$

For most investors who paid taxes at rates above the standard rate of income tax, the tax system discriminated against dividend payout. In addition, τ_d exceeded τ_u, sometimes by as much as forty percentage points.

1952-58: Differential Profits Tax Regime II

The tax law was changed in 1952 to eliminate the deduction of profit taxes from income subject to income tax. The analysis of this tax regime closely parallels that above. This system required the firm to pay

$$(2.5) \qquad T^c = [s + \tau_u](\Pi-D) + \tau_d D = (s + \tau_u)\Pi + (\tau_d-\tau_u-s)D$$

while for shareholders (2.2) continued to hold. The payment of a one pound gross dividend would again provide the shareholder with (1-m) pounds of after-tax income, so $\delta = (1-m)$. Following the earlier expression for θ we find

$\frac{dT^c}{dD} = \tau_d - \tau_u - s$, so

(2.6) $$\hat{\theta} = \frac{1}{1 - s + \tau_d - \tau_u}$$

and

(2.7) $$\theta = \frac{1-m}{1 - s + \tau_d - \tau_u}.$$

This tax system was less favorable to the payment of dividends than the previous regime had been, since by eliminating deductability of profits tax it increased the burden induced by differential corporate profits tax rates.

1958-1964: Single-rate Profits Tax

In 1958, Chancellor Barber Amory announced a major reform in corporate taxation. The differential profits tax was replaced by a single-rate profits tax: all profits were taxed at the rate τ_p, regardless of a firm's dividend policy. In addition, the firm was liable for income tax at rate s on its undistributed earnings, while it withheld sG for shareholders' income tax liability on the dividends it distributed. Shareholders were still taxed at rate m on gross dividends, but since firms were not subject to income tax on distributed profits, there were offsetting burdens at the two levels. The total tax burden on corporate source income was

(2.8) $$T^c = (s + \tau_p)\Pi - sD$$

while $T^p = mD$. This implies $\delta = (1-m)$, but $\hat{\theta} = \frac{1}{1-s}$, so

(2.9) $$\theta = (1-m)/(1-s).$$

For values of the marginal tax rate near the standard rate of income tax, this tax system is neutral with respect to distribution policy. For higher marginal rates, it discriminates against dividends. However, it was a more favorable tax system for dividends than eith r of the previous regimes.

1965-1973: Classical Corporation Tax

The Labour Victory in 1964 marked the beginning of harsher taxation of corporate income. The 1965 Finance Bill introduced a new system of corporate taxation parallel to that in the United States. Profits were taxed at a corporate tax rate, τ_c, and there was no distinction between retained and distributed earnings. This implies $T^c = \tau_c \Pi$, and since $dT^c/dD = 0$, $\hat{\theta} = 1$. Shareholders continued to pay dividend taxes at rate m. However, the shareholder preference ratio was altered by the introduction in early 1965 of a capital gains tax at a flat rate of 30 percent on all realized gains. Each asset was ascribed as a taxable basis its value on 6 April 1965. We use z to represent the effective marginal capital gains tax rate, taking account of the reductions afforded by deferred realization.[19] The investor tax preference ratio for this tax system is $\delta = (1-m)/(1-z)$. Since $\hat{\theta} = 1$, $\theta = (1-m)/(1-z)$. Unlike the previous tax regime, the classical system made no attempt to avoid the double taxation of dividends. As a result, the dividend tax burden was substantially heavier than that under the previous system.

1973 - Present: The Imputation System

The Conservative return to power in 1970 set in motion a further set of tax reforms, directed at reducing the discriminatory taxation of dividend

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[19]Deferred realization is one of the techniques which enables American investors to lower their capital gains tax liability. Trading so as to generate short-term losses and long-term gains, taking advantage of the dif-

income. The current tax system resembles the system which was used between 1958 and 1964, with several differences. All corporate profits are taxed at the corporation tax rate, τ_c. When firms pay dividends, they are required to pay Advance Corporation Tax (ACT) at a rate of τ_a per pound of gross dividends paid. However, while in the 1958-64 regime this tax on dividends was treated as a withholding of investor income taxes, under the current regime it is a prepayment of corporate tax. At the end of its fiscal year, the firm pays $\tau_c \Pi - \tau_a D$ in corporate taxes, taking full credit for its earlier ACT payments.[20] Since total corporate tax payments equal $\tau_c \Pi$, $\hat{\theta} = 1$ under this tax system.

Shareholders receive a credit for the firm's ACT payment. A shareholder calculates his tax by first inflating his dividend receipts by $1/(1-\tau_a)$ and then applying a tax rate of m. However, he is credited with tax payments of $\tau_a/(1-\tau_a)$, so his effective marginal tax rate is $(m-\tau_a)/(1-\tau_a)$. If his marginal income tax rate is above τ_a, the imputation rate, then he is liable for additional dividend taxes. Shareholders with marginal tax rates below τ_a are eligible for tax refunds.

The shareholder tax preference ratio under the imputation system is is given by

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ferential taxes on the two, is another technique; it is unavailable to British investors, since the tax rate on all gains is equal. Step-up of asset basis at death is another feature of the U.S. tax code which lowers effective capital gains rates still further. Prior to 1971, estates in the U.K. were subject to both estate duty and capital gains tax on assets in the estate. Since 1971, however, capital gains liability has been forgiven at death and heirs become liable for capital gains tax only on the difference between the price which they receive when they dispose of the asset, and it's value at the time of inheritance.

[20] If $[\tau_a G > \tau_c \Pi]$, the firm is unable to fully recover its ACT payments. The "unrelieved ACT" may be carried forward indefinitely and backwards for a period of not more than two years. A substantial fraction of British firms are currently unable to recover their full ACT payments and

$$(2.10) \qquad \delta = \frac{1 - \frac{m-\tau_a}{1-\tau_a}}{1-z} .$$

Since $\hat{\theta} = 1$, we know $\theta = \delta$ and can rewrite this as

$$(2.11) \qquad \theta = \frac{1-m}{(1-\tau_a)(1-z)} .$$

The imputation rate has typically been set equal to the standard rate of income tax, the rate paid by most taxpayers (but not most dividend recipients). For standard rate taxpayers, the imputation system provides an incentive for paying dividends; retentions yield taxable capital gains, but there is essentially no tax on dividends at the shareholder level. For individuals facing marginal dividend tax rates above the standard rate, there may be an incentive for retention, provided $m > z + \tau_a(1-z)$. Pension funds and other untaxed investors have a clear incentive to prefer dividend payments. For these investors, $m = z = 0$ and the tax system provides a sudsidy, since one pound of dividend income is effectively worth $1/(1-\tau_a)$ pounds. Finally, brokers and dealers in securities have a less powerful incentive to encourage firms to pay dividends. They are allowed to reclaim ACT paid by corporations in which they hold shares only up to the amount of ACT paid by the brokerage firm in regard to its dividend distribution. Thus, for many brokers, marginal dividend receipts cannot be inflated by the $1/(1-\tau_a)$ factor.

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therefore face corporate tax discrimination between retentions and distributions. See Mayer (1982) and King (1983) for further details on the workings of ACT.

II.B. Summary Statistics

Table 2 summarizes the tax parameters for each different tax regime. It relates δ and θ to the profits tax rates, investor dividend tax rates, and capital gains tax rates. Estimates of δ and θ based on weighted-average marginal tax rates are reported in Table 3. The values of m and z which we used to compute these statistics are weighted averages of the marginal tax rates faced by different classes of investors, with weights proportional to the value of their shareholdings. These weighted average tax rates were first calculated by King (1977) and have been updated in King, Naldrett, and Poterba (1984).

These tax rates are indicative of the major changes in tax policy which have occurred over time. If one type of investor is in fact "the marginal investor," then the weighted averages are substantially misleading as indicators of the tax rates guiding market prices. Even if this is the case, however, there is still some information in our time series since the tax burden for most types of investors moved in the same direction in each tax reform. We present empirical evidence below suggesting the relevance of weighted average marginal tax rates.

The time series movements in δ and θ deserve some comment. The dividend tax burden was heaviest in the 1950-58 and 1965-73 periods, and lightest in recent years. The most dramatic changes in δ occur in 1965 (capital gains tax) and 1973 (imputation). For θ, there are additional changes in 1958 and 1966. These substantial changes raise the prospect of detecting the effects of dividend taxation on the behavior of individuals and firms. Similar descriptive statistics for the United States tax system would

Table 2

Tax Code Parameters and Dividend Taxation

Tax Regime	Years	Investor Tax Preference Ratio (δ)	Total Tax Preference Ratio (θ)
Differential Profits Tax I	1950-1952	$1-m$	$\frac{1-m}{(1-s)(1-\tau_D-\tau_u)}$
Differential Profits Tax II	1952-1958	$1-m$	$\frac{1-m}{1-s+\tau_D-\tau_u}$
Single Rate Profits Tax	1958-1965	$1-m$	$\frac{1-m}{1-s}$
Classical Corporation Tax	1966-1973	$\frac{1-m}{1-z}$	$\frac{1-m}{1-z}$
Imputation System	1973-	$\frac{1-m}{(1-\tau_a)(1-z)}$	$\frac{1-m}{(1-\tau_a)(1-z)}$

Note: See text for further details and parameter definitions.

Table 3

British Tax Rates, 1950-81

Year	Dividend Tax Rate (m^*)	Capital Gains Tax Rate (z)	Investor Tax Preference Ratio (δ)	Total Tax Preference Ratio (θ)
1950	0.568	0.000	0.432	0.674
1951	0.575	0.000	0.425	0.619
1952	0.560	0.000	0.440	0.598
1953	0.545	0.000	0.455	0.612
1954	0.530	0.000	0.470	0.621
1955	0.518	0.000	0.482	0.624
1956	0.517	0.000	0.483	0.596
1957	0.515	0.000	0.485	0.575
1958	0.502	0.000	0.498	0.673
1959	0.488	0.000	0.512	0.807
1960	0.485	0.000	0.515	0.840
1961	0.485	0.000	0.515	0.841
1962	0.484	0.000	0.516	0.843
1963	0.483	0.000	0.517	0.844
1964	0.509	0.000	0.491	0.801
1965	0.529	0.138	0.550	0.936
1966	0.500	0.174	0.608	0.706
1967	0.488	0.173	0.619	0.619
1968	0.483	0.169	0.622	0.622
1969	0.472	0.157	0.627	0.627
1970	0.456	0.152	0.641	0.641
1971	0.444	0.150	0.654	0.654
1972	0.425	0.148	0.674	0.674
1973	0.214	0.143	0.916	0.916
1974	0.105	0.133	1.032	0.978
1975	0.048	0.130	1.094	0.970
1976	-0.004	0.131	1.156	1.019
1977	-0.031	0.134	1.190	1.055
1978	-0.040	0.135	1.202	1.070
1979	-0.043	0.136	1.207	1.041
1980	-0.101	0.134	1.271	1.047
1981	-0.120	0.133	1.292	1.064

Notes: Column 1 is the weighted average marginal tax rate on all shareholders, reported by King (1977, p.268) and updated by King, Naldrett, and Poterba (1984). This is the time series for $m^* = (m-\tau_a)/(1-\tau_a)$ as reported in the text. Column 2, the effective capital gains tax rate, is also drawn from King (1977). Columns 3 and 4 were computed by the authors as descibed in the text. They may not correspond exactly to calculations based on Columns 1 and 2 since they are averages of quarterly ratios.

display far fewer movements in the postwar period, and no dramatic jumps.

The use of legal changes to identify economic relationships is always problematic since such changes may themselves be endogenous responses to economic conditions. The hist ry of British corporate tax reform provides little reason to think that this is an important problem for our empirical work. Major reforms typically followed elections which brought about changes in the governing party. For example the 1965 reforms closely followed the Labour party's victory in the 1964 election, and the 1973 reform was a consequence of the Conservative victory in the 1970 elections. A reading of the press reports suggests that corporate tax reform was not an issue in either election.

The remainder of the paper is devoted to various tests of how the tax changes described in this section have influenced (i) the market's relative valuation of dividends and capital gains, (ii) the decisions made by firms with respect to their dividend payout, and (iii) the investment decisions of British firms.

III. Dividend Taxes and Dividend Valuation

The changes in investor tax rates on dividend income and capital gains provide opportunities for testing the "tax irrelevance" view by examining share price movements around ex-dividend days. If marginal investors value dividend income as much as they value capital gains, then when shares experience ex-days their price should decline by the full amount of the dividend payment. If the marginal investors are taxed more heavily on dividends than on capital gains, however, then share prices will fall by less than the dividend payment. Moreover, if marginal investors are untaxed, then changes in dividend tax rules should not affect the marginal valuation of dividends and capital gains.

Numerous authors, including Elton and Gruber (1970), Black and Scholes (1973), Green (1980), Kalay (1982), Eades, Hess and Kim (1984), Auerbach (1983a), Hess (1982), and others, have used daily data to analyze relative share price movements in the United States. Although their results are controversial, these studies suggest that share prices decline on ex-days, but by less than the amount of the dividend. These results have been interpreted as confirming the hypothesis that marginal investors are taxed.

British data provide an opportunity for studying the general issue of whether taxes affect dividend valuation, as well as the role of short term trading in determing the ex-dividend day behavior of share prices. As noted in the last section, there have been substantial changes in the investor tax preference ratio during the last twenty-five years. The principal changes occurred in 1965 and 1973.

There have also been important changes in the tax rates affecting securities traders involved in tax arbitrage around ex-dividend days. The most significant changes affecting short term traders were introduced in the 1970 Finance Act.[21] Prior to 1970, "dividend stripping" by trading around ex-days was apparently widespread. Since then, however, the Inland Revenue has been empowered to levy penalties on investors engaging in securities transactions which are principally motivated by tax considerations. For an individual investor, if trading around ex-days (i.e., selling shares before the ex-day and repurchasing them later) reduces his tax liability by more than 10 percent in any year, the tax savings from these transactions may be voided by the Inland Revenue.

After 1970, trading by institutions around ex-days could be declared void if they bought and then sold the same share within one month of its ex-dividend day. If its transactions are disallowed, the institution could be required to pay taxes, in spite of its tax-exempt status. Since 1970, a dealer who trades in a security around its ex-day and holds his shares for less than a month will not be able to deduct his full capital loss from taxable income.[22] A fraction of his capital loss, varying inversely with the holding period, is disallowed for tax purposes. As the holding period declines to only the ex-day, the fraction disallowed rises to nearly 100 percent.

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[21]The anti-dividend stripping provisions in the 1970 Act are described in Tiley (1978), pp. 761-4, and Kaplanis (1983).

[22]Miller and Scholes (1982) suggest brokers and dealers as the ex-day price setters.

The interactions among these tax provisions are difficult to describe, and the extent to which the Board of Inland Revenue exercised its authority remains unclear. However, one cannot doubt that the opportunities for avoiding taxes by trading around ex-days were substantially reduced in 1970. To the extent that trading around ex-days is important in determining ex-dividend price movements, we would expect to observe noticable changes in dividend valuation, if at all, only around 1970. This should be contrasted with the traditional and tax capitalization views, which predict major changes in the relative value of dividends and capital gains when the tax reforms affecting ordinary investors occurred but none when rules affecting dividend stripping took place.

III.A Data and Methods[23]

To estimate the share price response to dividends, we obtained daily data on the share prices and dividends of sixteen large U.K. firms. A listing of the firms in our data set and further background data may be found in Poterba and Summers (1984a). We obtained a listing of ex-dividend dates from the London Business School Share Price Data Base, and then consulted microfilm copies of the London Financial Times. The closing share prices on the trading day before the ex-date and the ex-date itself were recorded for each firm.[24] For each firm in the sample, we included all ex-dates between 1955 and 1981

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[23]The data used in this section are described, and further results are reported, in Poterba and Summers (1984a).

[24]The prices used are the average of closing bid and asked prices.

corresponding to cash dividend payments which were taxable as ordinary income and not accompanied by any dividend rights, stock options, or other special features. Our data set contained 633 ex-days, distributed evenly among the years 1955-81. We also obtained data on the value of the Financial Times Industrial Ordinary Share Index, and used this index to construct a market return series.

We estimated the follow model for R_{it}, the total pretax return on security i:

$$(3.1) \qquad R_{it} = \beta_{0i} + \beta_{1i} \cdot R_{mt} + \sum_{j=1955}^{1981} \zeta_j I_{jit} d_{itj} + \nu_{it}$$

where R_{mt} is the market return, β_{0i} is a firm specific intercept term, β_{1i} is a company-specific coefficient which should resemble the security's beta. The dividend yield on each day is d_{itj}, where j denotes the year in which the dividend falls. We also estimate (3.1) constraining β_{0i} to be constant across firms. Both equations were estimated by a generalized least squares procedure which allowed for heteroscedasticity across different firms. Since there were few instances in which two firms had coincident ex-days, we did not need to correct for residual correlation across firms.

When two tax regimes occur within one year, we allow for two ζ_j's in that year. The ζ_j coefficients reflect the excess pretax return on ex-dividend days, and therefore correspond to $1-\delta$ for each year. If the "tax irrelevance" view is correct, then the parameter ζ_j should not depend upon the relative tax rates on dividends and capital gains.[25] Under the other views we

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[25]The tax changes in 1973 altered the value of dividend income to nonprofit institutions and personal investors engaged in tax-free accumulation, as well as to naive personal investors paying high marginal dividend taxes.

would expect ζ_j to vary over time, especially when the imputation system was introduced in 1973 but also as the composition of shareholders varies over time.[26]

III.B Results

The results of estimating (3.1) are shown in Table 4. The α coefficients are clearly subject to substantial variability over time, even when the tax system does not vary. However, there is a pronounced drop in the estimated coefficients beginning in the second half of 1973. There is even a clear difference in the estimates for the first and second halves of 1973. This suggests the importance of the 1973 imputation reform in altering the relative valuation of dividends and capital gains. The difference in the average value of ζ between the 1965-73 and 1973+ tax regimes is 0.51, which corresponds very closely to the value of 0.54 computed from the weighted average marginal tax rates in Table 3.

The estimated coefficients did not change substantially, however, when the capital gains tax was introduced in 1965. This may indicate that effective marginal capital gains tax rates were actually negligible. Constantinides (1983) and Stiglitz (1983) have shown that optimal portfolio strategies can substantially reduce effective capital gains tax rates, so the

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For securities dealers and brokers, however, who were unable to fully reclaim the Advance Corporation Tax on the dividend they received, the tax change should have had a smaller effect.

[26]Approximately 6 percent of British equity was held by untaxed institutions in 1957; by 1980, the fraction had risen to 26 percent.

Table 4

The Stock Market's Relative Valuation of Dividends and Capital Gains: 1955-81

Year	Model Without Fixed Effects		Model With Fixed Effects		Average Tax Rate Value
1955	.637	(.194)	.694	(.198)	.518
1956	.149	(.177)	.208	(.181)	.517
1957	.439	(.165)	.501	(.171)	.515
1958	.393	(.151)	.451	(.155)	.502
1959	.537	(.182)	.610	(.187)	.488
1960	.361	(.201)	.441	(.207)	.485
1961	-.142	(.207)	-.056	(.213)	.485
1962	.378	(.194)	.457	(.199)	.484
1963	.276	(.205)	.360	(.210)	.483
1964	.050	(.174)	.105	(.180)	.509
1965	.304(.186)/.546(.240)		.351(.188)/.589(.242)		.533/.427
1966	.272	(.150)	.300	(.155)	.392
1967	.259	(.148)	.301	(.152)	.381
1968	.254	(.190)	.308	(.195)	.378
1969	.460	(.180)	.499	(.187)	.373
1970	.459	(.151)	.518	(.155)	.359
1971	.298	(.145)	.339	(.150)	.346
1972	.455	(.180)	.519	(.189)	.326
1973	.365(.305)/-.044(.297)		.368(.290)/-.014(.333)		.302/-.109
1974	-.146	(.160)	-.088	(.166)	-.032
1975	-.600	(.185)	-.551	(.192)	-.094
1976	-.031	(.164)	-.005	(.171)	-.156
1977	-.109	(.174)	-.072	(.180)	-.190
1978	-.115	(.168)	-.036	(.174)	-.202
1979	-.056	(.137)	-.019	(.143)	-.207
1980	-.093	(.139)	-.029	(.143)	-.271
1981	-.064	(.145)	-.023	(.149)	-.292
Average Values:					
Regime I (1955-65)	.308		.376		.499
Regime II (1965-73)	.369		.415		.368
Regime III (1973-81)	-.143		-.095		-.174

Notes: The coefficients in columns 1 and 3 were estimated from the equation:

$$R_{it} = \beta_{0i} + \beta_{1i} \cdot R_{mt} + \sum_{j=1956}^{1981} \zeta_j I_{jit} d_{itj} + \nu_{it} .$$

The results in Column 1 impose the restriction $\beta_{0i} = \beta_0$, all i, while those in column 3 do not impose this restriction. The data in the last column are the dividend return premia, $\left((m-\tau_a)/(1-\tau_a) - z\right)/(1-z) = 1 - \delta$, calculated from the weighted average tax rates reported in Table 2. See Poterba and Summers (1984a), for further description.

naive assumptions of constant turnover probabilities used in constructing z in Table 3 may be substantially incorrect.[27]

There is also little change in the estimated coefficients before and after 1970, when the ex-day trading restrictions were introduced. This is evidence against the importance of short-term trading in determining the behavior of share prices around their ex-days, and when coupled with the changes in valuation around 1973, suggests that views which hold that a weighted average marginal tax rate affects security market equilibrium are more accurate descriptions of reality than those which assume that marginal investors are broker-dealers.

While the annual ex-day coefficients in Table 4 are informative about how taxes may affect security values, they are not "tests" in any usual sense. To test the proposition that the estimates of ζ reflected tax rates, we compare our estimate of ζ for each year with $(1-\delta)$ in Table 3. The hypothesis that $\zeta_t = (1-\delta_t)$, all t, was rejected at standard significance levels. However, tests of the hypothesis $\zeta = (m-\tau_a)/(1-\tau_a)$, imposing $z_t = 0$, did not reject the null. This again suggests that while our measures of capital gains tax rates may be very imprecise indicators of actual tax rates, underlying variation in dividend tax rates as measured by our crude weighted averages is reflected in share price movements.

The results reported here suggest the potentially substantial influence of dividend taxation on the stock market's relative valuation of dividends and capital gains. However, while daily share price movements are likely

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[27]The capital gains tax rate series computed by King (1977), which we report, assumed that shareholders followed a policy of liquidating ten percent of their equity holdings each year, regardless of their trading gains or losses. This assumption clearly overstates the liability which would follow

to yield the most precise evidence on dividend valuation, they may be contaminated by unusual return patterns around ex-days or other subtle factors.[28] If taxes play an important role in the valuation of dividend income, then it should also be possible to detect this phenomenon in a sample of monthly security returns. Miller and Scholes (1982) have argued that previous monthly studies using American data, for example Gordon and Bradford (1980) and Litzenberger and Ramaswamy (1979, 1982), were contaminated by information effects and that their discovery of a tax effect was therefore spurious. Monthly data are of course subject to other biases, and they are noisier than the daily series. However, in Poterba and Summers (1984a), we used monthly British data for the period 1955-81 and again found evidence that tax changes induced movements in dividend valuation.[29]

The results in this section cast doubt on the value of the tax irrelevance hypothesis in explaining why British firms pay dividends. Although it is of course possible that British and American institutions differ in ways that preclude generalizing from the British experience, this seems unlikely. Miller and Scholes (1978), in their analysis of the taxation of dividends in the United States, suggested that the interaction between various tax provisions can cause dramatic reductions in the effective marginal tax rate on capital income. They focussed on several devices in the tax code which might

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from an optimal trading strategy.

[28]Some evidence of unusual return patterns around American ex-days is reported in Black and Scholes (1973) and Eades, Hess and Kim (1984). Mas (1984) presents corroborative evidence for the United Kingdom.

[29]Countries besides the United Kingdom in which dividend tax changes have taken place provide a valuable source of information on the dividend question. Lakonishok and Vermaelen (1983) provide some evidence that the Canadian tax reform of 1971 affected ex-day price behavior in a manner con-

reduce the effective dividend tax rate: (i) the potential for dividend income to raise the limitation on interest income deductability; (ii) the availability of life insurance policies and single premium annuities as essentially tax-free accumulation vehicles; and (iii) the use of pension funds to allow assets to earn the before-tax interest rate.[30]

While some of the relevant tax features appear in the British tax code, others do not. Interest payments are not deductible from taxable income in the United Kingdom, except in special circumstances involving home mortgages and several other minor cases. Moreover, there are strict (and quite low) limits on the amount deductible. The first Miller-Scholes device is therefore inaccessible to British investors. The life insurance mechanism, however, may be more powerful as a tax avoidance device in Britain than in the United States. Tax subsidies are provided for the payment of insurance premia, and the proceeds of the policies are generally exempt from capital gains.[31] Tiley (1978) observes that

> "in recent years, these [insurance tax subsidies] have been used to promote tax avoidance schemes ... taxpayers took advantage of the rules concerning relief from premiums to buy shares or unit trusts with, in effect, the aid of an exchequer subsidy, or higher rate taxpayers put their assets

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sistent with the short-term trading hypothesis. Amoaku-Adu (1983) and Khoury and Smith (1977) provide opposing evidence, however, showing that share values and dividend policies responded as predicted by the "weighted average of investors" model. Further work remains to be done on this question.

[30]Although in principle all of these devices could generate substantial tax savings for personal investors, the extent to which they are actually used in the United States remains controversial. Feenberg (1981), for example, showed that investors for whom the interest deductability limitation was binding received only 2.5 percent of total dividend payments in 1977.

[31]A much more complete account of life insurance taxation is provided in Tiley (1978), Chapter 34. A related discussion of pension accumulation is found in Chapter 36.

> into funds where income could accumulate virtually free of tax thanks to [tax] concessions for insurance companies.[p.717]"

Finally, with regard to pension funds, the British and American systems are similar. Corporate contributions are deductible for corporate tax purposes, and individual pension contributions are not treated as taxable income. Pension funds are untaxed, and the earnings of pension funds are tax exempt. When pension income is received during retirement it is subject to ordinary income taxation. As in the United States, the issue of whether marginal investors are accumulating through these channels is unclear. There may be other devices for sheltering income, available in the United Kingdom but not in the United States, which we have failed to mention. These would only strengthen our case showing that the potential for tax free accumulation is clearly present in Britain.

Before presenting additional evidence to distinguish between the tax capitalization hypothesis and traditional view of dividend taxes, we turn in the next section to an alternative methodology for studying the impact of tax changes on the market valuation of dividends. This will provide further information on whether the stock market exhibits a preference for dividends or capital gains.

IV. Asset Price Changes and Tax Announcements

Ex-day evidence is only one way of trying to measure the effect of tax changes. Another involves the "event study" methodology which is often used to investigate the effects of regulatory reforms, mergers, or other financial news on corporate valuation. By looking for changes in share prices when major tax reforms were announced or when expectations were otherwise altered, we can derive further tests for the influence of taxes on asset valuation.

Using results in Section I, note that the value of a share, V_0', can be written as the present value of the after-tax dividends its shareholders expect to receive:

$$(4.1) \qquad V_0' = \sum_{j=0}^{\infty} \left[\prod_{k=0}^{j} \left(1 + \frac{\rho_k}{1-z_k}\right)^{-1} \right] [\delta_j D_j'].$$

where ρ_k is the after tax return required by the marginal investor in period k and D_j' is the dividend in period j paid to the owners of all currently outstanding shares. It follows immediately from (4.1) that ignoring future equity issues, a permanent change in the dividend tax rate, through its effect on δ_j, will cause an equal proportional reduction in the value of all firms. This holds regardless of the time path of their expected future dividends. However equation (4.1) makes it clear that a <u>temporary</u> change in dividend taxes will impact differently on different firms. Temporary changes in dividend taxes will have their greatest impact on firms which are expected to distribute a large amount of dividend income in the immediate future. In the extreme case of a firm that was not expected to pay any dividends for the duration of a tax change, the change would have no effect on market value.

In practice, the fluidity of tax policy leaves some ambiguity as to whether a particular policy is (i) temporary and likely to be reversed, or (ii) the first step in a program of escalating reform. These two possibilities have distinctly different implications for the impact of a tax increase on the share values of different firms. If higher dividend taxes are expected to be short-lived, then low yielding firms which are valuable primarily because of dividends projected to be paid in the distant future will experience smaller share price declines than high yielding firms which derive most of their value from a high level of current dividends. Alternatively, if the increase in dividend taxes is viewed as the harbinger of still higher tax rates in the future, then low yielding firms will decline by more than those with high yields, as the market expects heavy taxes now, but even heavier taxes during the time period when these firms finally distribute their profits.

Most of the tax changes during our sample period were clearly temporary. In 1958, when the split-rate corporate profits tax was abolished and replaced by a single rate tax which was much more favorable towards dividend payout, support for the measure came from the Conservative Party. Labour was opposed, and the possibility that the tax change would be reversed when the opposition gained control of Parliament was recognized clearly. Indeed, that was what happened. In 1964, Labour won a narrow victory and promptly announced a new plan to raise taxes on capital income by adopting a corporation income tax system which would effectively "double-tax" dividend payments. Support for this policy again was split clearly along party lines. When the Conservatives regained power in 1970, it was not long before plans were

announced (in the 1971 Budget) for a return to an integrated tax system which would substantially reduce the tax burden on dividends.

If dividend tax reforms are perceived as temporary and the stock market equates the value of each share with the present value of its after-tax dividend stream, then increases in the dividend tax rate should reduce the value of high payout shares by a larger amount than low-payout shares. This may be tested by relating the excess return on different firms during budget announcement months to each firm's typical dividend yield. Evidence that dividend tax increases reduce the value of high-yield shares by more than they reduce low-yield share prices would constitute strong evidence against the "tax irrelevance" hypothesis.

IV.A Data and Methods

Our study focuses on three events which substantially affected the outlook for British dividend taxation. They are described below:

April, 1958 Budget Speech: Chancellor Heathcoat Amory announced reforms in the profits tax, abolishing the differential 30% tax on distributed profits and the 3% tax on undistributed earnings. Effective 1 April 1958 (retroactively), he introduced a single-rate profits tax of 10 percent. This reform was not fully anticipated; The Economist (19 April 1958) indicated that Mr. Amory had shown "political courage" in adopting it. During April 1958, the excess return on the market, calculated as the total return on the Financial Times - Actuaries Share Index, minus the Treasury Bill rate, was 1.7 percent. Over the longer February to April period when expectations may have been changing the excess market return was 7.3 percent.

November, 1964 Mini-Budget: After Labour's electoral victory in October, 1964, Chancellor James Callaghan announced sweeping plans for fiscal reform. These included the switch to a classical system of corporate income taxation beginning in 1966 and the imposition of a capital gains tax beginning in April, 1965. The two proposals should have had opposite effects on dividend-paying firms. Introducing a capital gains tax should have raised the value of dividend income, helping high payout firms. The switch to a corporation tax system however, and the repeal of the integrated tax system which had prevailed between 1958 and 1964, imposed a heavier tax burden on high dividend firms than on high retentions companies. This was reflected in the large change in $\hat{\theta}$ calculated in Section II. The general move toward heavier taxation was recognized as one cause of the stock market's -4.7 percent excess return during the month of November 1964.

March, 1971 Budget Speech: This was the first Budget speech after the Conservative victory of 1970. Chancellor Barber announced plans to end "the substantial discrimination in favour of retained as opposed to distributed profits" by adopting a new system of corporation tax which would impute corporate tax payments to shareholders. The budget also promised substantial reductions in the marginal tax rates applicable to investment income received by personal investors, and should therefore have proved highly attractive for firms with currently high dividend payout. The excess return on the overall market during March 1971 was 6.5 percent.

To test for the effects of tax changes on different firms, we generalized the monthly after-tax CAPM used by Gordon and Bradford (1980) and Poterba and Summers (1984a) to include terms which would capture the

effects of budget announcements. The equation estimated was:

$$(4.2)\quad R_{it}-\beta_i R_{mt} - (1-\beta_i)R_{ft} = \alpha_0 + \zeta_k I_{kit} d_{it} + (\eta_{1s} + \eta_{2s} d^*_{it}) I^*_{sit} + \varepsilon_{it}$$

where d* is the average dividend yield on a security during the previous twenty-four months, and I_{kit} is an indicator variable which is set equal to one if the it-th observation corresponds to a month in the first, second, or third "tax regime." Tax Regime I is defined to include observations prior to the introduction of a capital gains tax in 1965. Tax Regime 2 extends from 1965 to 1973, when the imputation system took effect, and Tax Regime 3 is the period after April, 1973. This equation is a modified CAPM which takes account of possibly differential valuation of dividends and capital gains, allowing for changes when major tax reforms occur. Poterba and Summers (1984a) estimate several models of this type and provide a fuller justification for the specification.

The critical variables for our present study are the last terms in equation (4.2). I^*_{sit} is an indicator variable for the months involving major tax reform announcements, where s = 4/58, 11/64, or 3/71. The coefficients η_{1s} and η_{2s} capture the effects of tax announcements on security returns, with η_{2s} reflecting differences which can be attributed to average dividend yield. If a tax reform, say that in 1958, raised the value of high-yield shares, then we would predict that $\eta_{2,1958}$ would be positive. The corresponding coefficient for 1971 should also be positive, and it is difficult to predict the sign of the 1964 announcements because they involved changes in both dividend and capital gains taxes.

The data set we used for our study is a sample of over 40,000 company-months of security returns, drawn from the London Business School

Share Price Data Base. A more complete description of this data set may be found in Poterba and Summers (1984a).

IV.B Results

The results of estimating equation (4.2) on this monthly data set are reported in Table 5. We show both the η_1 and η_2 coefficients in the table, and show results from several different definitions of the "event period" during which information was revealed. For example, the first row of the table corresponds to a one-month event period. That is, I^*_{kit} is equal to 1 only during the month of the tax policy announcement. Since expectations were probably evolving throughout the period immediately prior to the actual policy announcement, in particular in election months as in 1964, we also consider somewhat longer event periods. Two- and four-month event period specifications are also reported in Table 5. In all cases, we define the event period as ending in the announcement month. Many previous studies of "events" and their effects on share prices have suggested that the market quickly adjusts to new information, so allowing for adjustment in the months after the budget speeches seemed unnecessary.[32]

The results in Table 5 provide some support for the view that anticipated taxes are reflected in security prices. In 1958, firms with high dividend yields experienced substantially greater returns during the period around the budget speech than their low-yield counterparts. A one percentage point increase in a firm's dividend yield would have induced a four percent higher

[32]The long tradition of evidence for rapid market adjustment dates to Fama, Fisher, Jensen, and Roll (1969).

Table 5

Tax Reforms and Share Price Changes

Duration of Event Period	Variable	1958 Change in Profits Tax	1964 Announcement of Capital Gains/ Corporation Tax	1971 Announcement of Imputation System
1 Month	Constant	-.024 (.028)	.001 (.010)	-.017 (.007)
	Dividend Yield	4.304 (5.352)	.030 (3.384)	1.466 (2.002)
2 Months	Constant	-0.019 (.016)	-0.006 (.007)	-.0170 (.0074)
	Dividend Yield	4.981 (3.815)	1.860 (1.841)	1.464 (2.003)
4 Months	Constant	-.019 (.016)	-.002 (.005)	-.008 (.005)
	Dividend Yield	4.982 (3.816)	.188 (1.193)	1.042 (1.384)
Predicted Dividend Yield Effect		+	?	+

Notes: Coefficients are estimated from the equation:

$$R_{it}-R_{ft}-\beta_i(R_{mt}-R_{ft}) = \alpha_0 + \zeta_k I_{kit} d_{it} + (\eta_{1s} + \eta_{2s} d^*_{it}) I^*_{sit} + \varepsilon_{it}$$

using a data set of monthly share returns compiled from the London Business School Share Price Data Base. See Poterba and Summers (1984a) for a more detailed description of this data set and the text for further details on the variable definitions. Standard errors are reported in parentheses.

return during the month of April, 1958. Similarly, in 1971, the estimated dividend yield coefficients are positive in all estimated equations. They suggest that when comparing two firms, one with a dividend yield one point higher than the other, the high yield firm would have earned a return about one and one-half percentage points greater than that of the low-yield firm. Unfortunately, none of the estimated coefficients is significantly different from zero at the 95 percent confidence level. This may in part reflect the difficulties of identifying the times when new information was revealed, as well as the inherent imprecision associated with the use of monthly data.

The 1964 budget speech had much weaker effects on the differential returns between high and low payout firms. The one- and four-month event variables have tiny coefficients, and the somewhat larger 2-month variable, which includes both the event month for the budget speech and the previous month, when the election took place, has a larger coefficient but a t-statistic only slightly greater than one. This event, as we noted above, had effects on both the tax treatment of high and low-payout shares. Under the assumption that capital gains taxes were paid at very low effective rates, however, the reform should have reduced the value of high-yield firms. It remains somewhat surprising that this effect does not leave a stronger trace in the data.

One of the major difficulties in any event study is identifying the times when information was actually revealed to market participants. To the extent that conditional upon electoral outcomes, budget proposals were easy to anticipate, the elections of 1964 and 1970 may have been the important "events" for the revaluation of different securities. We experimented with these events, as well as the actual budget speeches, in our empirical work and again found

small revaluation effects, generally in the predicted directions, around election periods.

The weak evidence in this section confirms the conclusion of the preceding section that changes in the tax rules facing typical investors have important effects on the market valuation of dividends. As discussed at the end of the last section, this conclusion is probably applicable to the U.S. as well as Britain. We therefore are led to reject the tax irrelevance view as a model for analyzing the role of dividend taxes. In the next two sections, we examine the two remaining views of the effects of dividend taxation.

V. Dividend Taxes and Corporate Dividend Policy

The evidence presented in the last two sections suggests that dividend tax changes alter the stock market's relative valuation of dividends and capital gains. It constitutes a partial refutation of the "tax irrelevance" view, which argues that tax avoidance by individuals, coupled with ex-day trading by brokers and institutions, should eliminate any tax-induced valuation effects. However, the finding that taxes influence security returns does not enable us to distinguish between the "tax capitalization" and the "traditional" views of dividend taxation. Both assume that dividend taxes are capitalized into share prices and reflected in market returns. These two views differ in their predictions about how dividend tax changes will affect corporate financial and investment decisions. The tax capitalization view suggests that neither financial nor real choices will be influenced by a reduction in dividend taxes, while the traditional view predicts that both the payout ratio and the level of corporate investment will respond to a tax reform. In the next two sections, we examine the direct effects of postwar British dividend tax changes, first on corporate dividend payout and then on real investment decisions.

The tax capitalization view derived corporate dividend payments as a residual, the difference between current profits and the firm's investment demands. Assuming that all investment could be financed from retained earnings, we showed in Section I that a permanent dividend tax reduction would not affect the firm's investment decisions. Funds for investment are already inside the firm and therefore subject to eventual dividend taxation. While a

permanent reduction in dividend taxes raises the value of these claims on resources within the corporate sector, it does not alter the rules for investing these resources so as to maximize the firm's value. Since dividend taxation affects neither investment, the capital stock, nor current profitability, it cannot have any effect on $D = (1-\tau)\Pi - I$. The tax irrelevance view suggests that changes in the investor tax preference ratio should have no effect on corporate payout decisions. Discriminatory corporate taxes, however, could alter the level of dividend payments, since they cannot be laundered by tax-conscious investors.

The traditional view, by comparison, predicts that any permanent change in the effective marginal dividend tax rate will affect corporate payout decisions. Dividend policy is chosen by balancing the marginal reduction in the firm's value due to higher investor tax liabilities against the marginal increase in value due to changes in the return, $\rho(D/(1-\tau)\Pi)$, required by investors. A dividend tax reduction will lower the cost of obtaining further reductions in the required return and therefore should increase the firm's payout ratio.

The effects of a temporary reduction in the dividend tax are somewhat different. In the tax capitalization view, the cost of capital depends on the expected change in the equilibrium value of marginal q. Just before an increase in the dividend tax, firms will anticipate capital losses from holding corporate capital, and will reduce their investment activity. By reducing I_t but leaving $\Pi(K_t)$ unchanged, such a change in investment activity would raise the observed dividend payout ratio of the corporate sector.

Similarly, immediately prior to a dividend tax reduction, firms would expect to gain substantially from the upward revaluation of marginal q, and would therefore invest. This would lead to a reduction in dividend payments prior to a dividend tax cut.

The traditional view also predicts changes in payout ratios as a result of temporary dividend tax reductions. However, temporary and permanent changes would cause the same proportionate reduction in dividend payout, since the first order condition for optimal dividend choice, equation (1.17a), depends only on current values of the tax parameters. This conclusion depends critically upon the assumption that capital market participants use only the current period's dividend yield in choosing the appropriate discount rate for the firm's earnings.

If instead investors chose ρ on the basis of the average dividend yield for a few adjacent periods, then the firm would be able to raise its value by altering the timing of its dividend payments. For example, if the discount rate is determined by the value of $(\Sigma D)/(\Sigma(1-\tau)\Pi)$ during a several-quarter period, then the firm could raise its dividend payments during the less heavily taxed period, compensating for this with a reduction in dividend payout during high-tax periods, and could raise its total value. This would induce swings in dividend policy around the introduction of temporary dividend tax changes, as well as when permanent but anticipated dividend taxes were introduced. The tax irrelevance view predicts dividend re-timing when the corporate tax rules change, but predicts no effect of personal tax reforms.

V.A Data and Methods

To test the payout predictions of the different views, we examined

the aggregate payout behavior of Britain's Industrial and Commercial Companies. The tests reported in this section employ seasonally unadjusted data on gross dividend payments and corporate profits. We draw heavily on Poterba (1984a), where the data are described in greater detail. In the United States, the dividend payout ratio is defined as the ratio of dividend payments, before personal tax, to corporate profits after corporate tax. In Britain, this definition is misleading because corporate taxes, hence after-tax profits, depend upon the firm's payout policy when a non-classical corporate tax system is in effect. The dividend payout concept which we employ is the ratio of gross dividends paid to the maximum feasible gross dividends of the firm.[33] This definition ensures that movements in the payout ratio measure changes in the fraction of their dividend paying capacity which firms are using, and not changes in the corporate tax treatment of dividends. Under a tax system like that in the U.S., it is equivalent to the standard measure of the payout ratio.

Explicit dividend controls were in force for much of the 1970s, and they substantially reduced the gross dividends paid by the Industrial and Commercial Companies.[34] The presence of dividend controls can contaminate any investigation of the relationship between dividends, profits, and the tax code. To avoid these difficulties, we report regression results for two

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[33]This is one of the dividend payout concepts suggested by Feldstein (1970).

[34]Evidence in Poterba (1984a) suggests as much as a fifty percent reduction in desired dividends.

separate time periods. The first, 1955-1972, is prior to the introduction of dividend controls. The second sample period includes the pre-control period as well as data for 1980-1983, the period after the dividend controls had been lifted. In using data for 1980-83 we allow for the possibility of structural change in the payout relation by adding a dummy for the post 1980 period.

The equation that we estimate is:

$$(5.1) \quad \log D_t = \beta_0 + \beta_1 \log D_{t-1} + \beta_2 \log D_{t-4} + \beta_3 \log Y_t + \beta_4 \log(Y_{t-1}/Y_t)$$
$$\beta_5 \log(Y_{t-4}/Y_t) + \beta_5 \log\theta_t + \beta_6 \Delta\log\theta_{t+1} + \beta_7 \Delta\log\theta_t + u_t$$

where D denotes gross dividends, Y equals maximum feasible dividends, and θ is the total tax preference ratio. Lagged dividend and profit terms are included to allow for flexible adjustment dynamics toward the new steady state. The estimated equations also include seasonal dummy variables. The equation was estimated both by OLS and with a maximum likelihood correction for second-order serial correlation; the results were not particularly sensitive to the specification of the disturbance term.

V.B Results

Estimates of equation (5.1) are reported in Table 6. They clearly demonstrate the importance of dividend taxes in determining the extent to which firms utilize their dividend-paying capacity. Equations estimated without any allowance for short-run adjustments in dividend policy around tax changes suggest long run dividend payment elasticities with respect to the total tax preference ratio of between 2.6 and 1.8, depending on the specification and time period chosen. There is also evidence that tax policy changes

Table 6

Dividend Payments and Tax Reforms, British Evidence

Eqn.	Time Period	Constant	$\log(D_{-1})$	$\log(D_{-4})$	$\log(\theta)$	$\Delta\log(\theta_{+1})$	$\Delta\log(\theta)$	$\log(Y)$	Post-1980 Dummy	ρ_1	ρ_2	R^2	SSR
1.	1955-1972	.398 (.687)	.414 (.107)	.396 (.080)	.196 (.104)	-.833 (.420)	.689 (.352)	.122 (.070)	----	--	--	.91	9065
2.	1955-1972	.170 (.612)	.608 (.113)	.289 (.098)	.120 (.096)	-.792 (.405)	.956 (.205)	.083 (.071)	----	-.39 (.15)	-.37 (.15)	.92	7832
3.	1955-1972	.811 (.734)	.309 (.149)	.482 (.104)	.390 (.146)	----	----	.092 (.069)	----	--	--	.88	11883
4.	1955-1972	.561 (.547)	.484 (.113)	.390 (.109)	.265 (.118)	----	----	.055 (.073)	----	-.31 (.16)	-.36 (.15)	.89	10581
5.	1955-1983*	1.877 (.729)	.349 (.988)	.449 (.084)	.407 (.148)	-.847 (.281)	.459 (.313)	-.040 (.082)	-.150 (.066)	--	--	.86	15380
6.	1955-1983*	.645 (.558)	.609 (.095)	.280 (.083)	.177 (.098)	-.730 (.243)	.844 (.270)	.036 (.066)	-.084 (.038)	-.26 (.10)	-.54 (.11)	.91	----
7.	1955-1983*	1.963 (.750)	.302 (.096)	.489 (.087)	.540 (.148)	----	----	-.042 (.087)	-.195 (.068)	--	--	.84	17852
8.	1955-1983*	1.056 (.589)	.501 (.095)	.372 (.086)	.321 (.102)	----	----	.001 (.072)	-.125 (.041)	-.24 (.11)	-.47 (.11)	.89	----

Notes: All equations are estimated using quarterly, seasonally unadjusted data on the dividend payments and maximum possible gross dividends of the Industrial and Commercial Companies. Equations 1-4 were estimated for the period 1956:1-1972:3, while those in rows 5-8 also include the post-dividend control period, 1980:1 to 1983:2. The Y variable is maximum feasible gross dividends, described in the text. Equations also include lagged Y terms.

induce short-run adjustments in dividend payout. An anticipated ten percent increase in the tax preference ratio, corresponding to roughly a four percent reduction in the shareholder tax rate on dividends, causes dividends to fall by eight percent of their planned value in the quarter immediately prior to the tax reform. Moreover, there is a somewhat smaller transitory increase in the level of dividend payments immediately after a tax change is instituted. Controlling for short-term adjustments in payout policy alters the estimated steady-state effects of a dividend tax change. The long-run elasticity of dividend payout with respect to the tax preference ratio declines to between 1.03 and 2.05 in the dividend equations which incorporate changes in the tax rates.

The dividend equations estimated for the early sample period, 1955-72, yield plausible models of the elasticity of dividends with respect to profits. They indicate a long-run elasticity of gross dividends with respect to maximum feasible dividends of between .5 and .8, and the hypothesis that this elasticity is unity can never be rejected. Less plausible results emerge from the regression models which include post-1980 data. Estimates of the long-run maximum dividend elasticity are substantially lower than those for the earlier sample, and negative estimates are obtained in two of the four reported equations. The hypothesis that this elasticity is unity still cannot be rejected, however, in either of the equations which were estimated with an AR2 error structure. Poterba (1984a) suggests that the low maximum dividend elasticities are probably due to divergences between accounting profits and real profits at the end of the sample period. Accounting profits are used in

the construction of maximum feasible dividends.

The evidence on dividend payout and tax policy reported above did not distinguish between changes in the investor tax preference ratio and the effect of varying corporate tax rates on retained and distributed earnings. The tax capitalization and traditional view predict that changes in either of these tax parameters should affect dividend payout, while the "tax irrelevance" view suggests that only corporate tax changes should affect dividends. Poterba (1984a) tests the hypothesis that investor tax preference changes affect dividend payout. Although the effect of corporate tax changes can be estimated more precisely than investor tax effects, both types of tax reforms influence corporate dividend decisions. This provides further evidence against the tax irrelevance hypothesis, as well as the capitalization view, and buttresses the traditional view of dividend taxation.

The British time-series data is not the only source of variation in dividend tax rates.[35] American dividend taxes were substantially lower before World War II, and particularly before 1936, than in subsequent years. Brittain (1966) and Poterba and Summers (1984b) document that changes in weighted average marginal tax rates on dividends in the U.S. have a significant impact on corporate dividend policies. Brittain (1966) concluded that "rising individual tax rates [between 1920 and 1960] were found to depress dividends. Most estimates showed [they] were sufficient to account for the pronounced downward trend in payout, that which occurred between the late 1920s and the early postwar period.[p.196]" This finding provides further evidence in

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[35]A number of studies have demonstrated that British tax reforms have influenced payout policy. These include Feldstein (1970), King (1971, 1977), and Fane (1975).

favor of the traditional view of dividend taxes. In Poterba and Summers (1984b), we argue that the failure of dividend payout ratios to rise over the past 15 years is strong evidence against Miller and Scholes' (1978, 1982) claim that the U.S. income tax has evolved towards a consumption tax.

VI. Investment Behavior and Dividend Taxes

The evidence in the last section focused on the direct linkages between tax rates and dividend payout. One of the principal motivations for our interest in dividend taxes, however, was their possible impact on corporate investment decisions. In this section we summarize the results of Poterba and Summers (1983) on the relationship between "Tobin's q" and the investment behavior of British firms. This allows us to obtain further evidence on the difference between the traditional and the tax capitalization views.

These two views predict different steady state values of the ratio of the market value of corporate equity divided by its replacement cost. Because the level of investment activity can be shown to depend upon the difference between the current value of q and its steady state level, the two views yield different specifications for the investment function.

In Section I, we derived the value of marginal q predicted by the tax capitalization view. Under a classical corporate tax regime similar to that prevailing in the United States, $q = (1-m)/(1-z)$. Managers ask "will this project raise share values by as much as it reduces the after-tax dividend income of shareholders" and they undertake some investment projects which do not raise the firm's value by the project's full cost. In equilibrium, therefore, the market value of the firm will equal $(1-m)/(1-z)$ times the replacement value of the firm's assets. In contrast, under the traditional view, the equilibrium value of marginal q is always unity. If marginal and average q are equal,[36] the total value of the firm will therefore equal the full replacement cost of its capital in place.

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[36]Hayashi (1982) presents the formal conditions for equality between the average and marginal values of q.

VI.A Data and Methods

As argued by Keynes (1936) and Tobin (1969), and justified formally in the context of an adjustment cost model by Hayashi (1982) and Summers (1981), the level of investment will depend on the deviation of Tobin's q from its equilibrium value, q^e. Thus, it is natural to postulate that:

$$(6.1) \qquad I = I\left(\frac{V}{pK} - q^e\right)$$

where V/pK is the ratio of the market value of a firm to its replacement cost, or "Tobin's q." Since alternative views about dividend taxes have differing implications for the level of q^e, by comparing alternative specifications of q^e in (6.1) we can in principle distinguish these views.

Before turning to the empirical estimates, one additional complication remains. Our discussion so far has ignored debt finance and corporate taxes. In Poterba and Summers (1983) we show how these considerations influence q^e under the alternative investment models. In particular, we show that the appropriate investment functions under the two views are:

$$(6.2) \qquad \frac{I}{K} = f(Q_{TRAD}) = f\left\{\left(\frac{V-B}{pK} + u + b - 1\right)/(1-\tau)\right\}$$

and

$$(6.3) \qquad \frac{I}{K} = f(Q_{TC}) = f\left\{\left(\frac{1}{\theta}\,\frac{(V-B)}{pK} + u + b - 1\right)/(1-\tau)\right\}$$

where u is the present value of all depreciation allowances and investment incentives on a one pound investment, τ is the corporate tax rate on retained earnings, b is the fraction of investment financed with debt, and B is the present value of remaining depreciation allowances on existing capital. The only

difference between the two equations is that the tax capitalization hypothesis implies the presence of a term $1/\theta$ multiplying the market value of equity, correcting for the effects of tax capitalization in affecting the firm's investment decisions.

The investment models which we estimate take the simple form

$$(6.4) \qquad \frac{I}{K_t} = \beta_0 + \beta_1 Q_{TC,t} + \beta_2 Q_{TC,t-1} + \varepsilon_t$$

and

$$(6.5) \qquad \frac{I}{K_t} = \beta_0 + \beta_1 Q_{TRAD,t} + \beta_2 Q_{TRAD,t-1} + \varepsilon_t \quad .$$

These specifications are derived and explained in greater detail in Poterba and Summers (1983), where the ε_t is interpreted as a random shock to the cost-of-adjustment function. The appeal of the "q" investment approach is that while other approaches to estimating the investment impact of personal taxes require us to specify the firm's cost of capital, the "q" formulation does not. Since the investor's discount rate ρ enters the cost of capital and is unobservable, efforts to define the cost of capital are prone to error.

Our first tests of the two views are based on comparisons of the fit of (6.4) and (6.5). Because all firms may not be on the same margin, the aggregate investment function might be a weighted average of the capitalization and the traditional investment functions. In order to allow for this possibility we also specified an investment equation with a weight of σ on (6.5) and $(1-\sigma)$ on (6.4). This weighted average investment equation takes the form

$$(6.6) \qquad \frac{I}{K} = \beta_0 + (\beta_1 + \beta_2 L)\left(\frac{\left\{\sigma + (1-\sigma)\frac{1}{\theta}\right\}\frac{V-B}{pK} + b + u - 1}{(1-\tau)}\right) + \varepsilon$$

where L is the lag operator. The traditional view of the dividend tax is supported by estimates of θ near unity. If, however θ is close to zero, then tax capitalization would appear to be the more appropriate model for investment decisions.

To estimate these models, we used annual data on the Industrial and Commercial Companies in Great Britain for the period 1950-1980. Our investment variable, I/K, is the gross investment rate for these companies. The values of Q_{TRAD} and Q_{TC} were constructed using financial market data provided by the Bank of England. Tax rates were measured using the weighted average marginal tax rates which were described in Section II.

VI.B Results

The results of estimating investment models with both sets of Q variables are shown in Table 7. They are based on revised data and therefore differ (trivially) from earlier findings in Poterba and Summers (1983). The findings demonstrate the superiority of the Q specification based on the "traditional view" of dividend taxation. In each regression pair, the Q_{TRAD} equation fits better than the Q_{TC} specification. In addition, the Q_{TRAD} models suggest a larger effect of Q on investment activity. These results favoring the traditional model are buttressed by other specifications reported in Poterba and Summers (1983).

The most direct test of the two models comes from estimating the weighting parameter in (6.6). The point estimates for this equation are shown

Table 7

Investment Equations Under the Competing Dividend Tax Views

Eq.	Estimation Method	Dividend Tax View	β_0	$\beta_1(\times 10^{-2})$	$\beta_2(\times 10^{-2})$	ρ_1	ρ_2	SSR_4 $(\times 10^{-4})$	D.W.	R^2
(1a)	OLS	Capitalization	6.51 (0.23)	1.04 (0.38)	0.66 (0.38)	-	-	2167	0.37	0.49
(1b)	OLS	Traditional	6.61 (0.17)	1.28 (0.38)	0.96 (0.37)	-	-	1470	0.46	0.65
(2a)	AR2	Capitalization	6.89 (0.41)	0.61 (0.18)	0.37 (0.18)	1.25 (0.18)	-0.45 (0.18)	477	1.69	0.88
(2b)	AR2	Traditional	6.90 (0.31)	0.90 (0.19)	0.51 (0.19)	1.28 (0.17)	-0.50 (0.17)	361	1.70	0.91
(3a)	IV	Capitalization	6.20 (0.24)	1.63 (0.74)	0.62 (0.64)	-	-	2476	0.54	-
(3b)	IV	Traditional	6.46 (0.20)	1.41 (0.68)	1.20 (0.63)	-	-	1558	0.63	-
(4a)	AR2-IV	Capitalization	6.58 (0.42)	0.97 (0.25)	0.98 (0.29)	1.15 (0.20)	-0.43 (0.20)	575	2.00	-
(4b)	AR2-IV	Traditional	6.80 (0.30)	1.16 (0.24)	1.04 (0.27)	1.06 (0.20)	-0.37 (0.20)	398	1.83	-

Notes: The estimated equations correspond to the model

$$(I/K)_t = \beta_0 + \beta_1 Q_{j,t} + \beta_2 Q_{j,t-1} + u_t \qquad j = TRAD, TC$$

where u_t is allowed to follow a second order AR process. All equations are estimated for the period 1950-1980, and standard errors are shown in parentheses. See Poterba and Summers (1983) for further details.

below:

$$(6.7)\qquad \frac{I}{K} = \underset{(.21)}{6.74} + (\underset{(.42)}{11.28} + \underset{(.42)}{1.16}L)\left[\frac{\{\underset{(.27)}{1.10} - .10\,\frac{1}{\theta}\} \cdot \frac{V-B}{pK} + u + b - 1}{(1-\tau)}\right] + \varepsilon_t$$

$$SSR = 440 \qquad R^2 = .68$$

The hypothesis that $\sigma = 1$ cannot be rejected at standard significance levels, suggesting that we cannot reject the traditional view's investment equation. The point hypothesis that $\sigma = 0$, corresponding to tax capitalization view, is however decisively rejected by the investment data. It appears that the bulk of investment decisions are made by corporations who act <u>as if</u> marginal investment is financed through new share issues.

This finding confirms the analysis in the preceding section suggesting that the traditional view of dividend taxes is most consistent with the British experience. It does not appear that firms lower their investment thresholds when they can finance investment out of retained earnings as suggested by the tax capitalization hypothesis.

VII. Conclusions

Our empirical tests using data on security returns, payout behavior, and investment decisions all point to a common conclusion. The traditional view of dividend taxes, which regards them as an additional corporate tax burden, provides the best approximation to their effects. We are led to reject models of the economic effects of dividend taxes which suggest that dividend payments have no adverse tax consequences, as well as those which argue that firms pay dividends because money is "trapped" within the corporate sector. While these conclusions are based on British data, our comparison of the tax laws in Britain and the United States suggests that they are likely to be applicable in the American context as well.[37]

Our results have important implications for tax policy as well as dividend policy and valuation. They imply that the total tax burden on corporate income includes both corporate taxes and dividend and capital gains taxes levied on corporate shareholders. In an economically meaningful sense, dividends are double-taxed. A reduction in dividend tax rates would increase dividend payout and corporate investment, and lower firms' cost of capital.[38]

A further implication of these results is that estimates of the total

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[37]Our analysis is corroborated by the work of Long (1978) and Poterba (1984b) on the valuation of securities issued by the Citizens Utilities Company. Due to a quirk in the tax law this company was allowed to issue both shares with taxable and nontaxable dividends. Long (1978) shows that the taxable securities sell for more than the nontaxable securities. Poterba (1984b) shows using ex-day evidence that marginal investors in taxable shares appear to be taxed. These facts can only be reconciled in terms of a dividend preference model, implicitly the traditional view.

[38]This suggests an important difficulty with many previous studies of investment behavior. Most of the econometric studies proceeding within the flexible accelerator framework pioneered by Jorgenson (1963) and Hall and Jorgenson (1967) has ignored the role of personal tax variables. While this omission may not be too important for the United States, where tax rates on

tax burden on corporate capital income which assume that dividend taxes do not have a marginal impact on retentions-financed investment, such as the calculations in Auerbach (1983c) and King and Fullerton (1984), significantly understate the tax burden on corporate income. Estimates such as those reported by Jorgenson and Sullivan (1983) and Hulten and Wykoff (1983), which ignore dividend taxation entirely, are similarly flawed. The empirical question of which dividend tax rate to use in calculating effective corporate tax rates is difficult to answer with any precision. However, our findings in Section III suggest that the weighted average approach used by King(1977), Feldstein and Summers (1979), and Feldstein, Dicks-Mireaux, and Poterba (1983) may be satisfactory. Taking this approach renders invalid the frequently-quoted conclusion that the United States no longer taxes corporate investment income.

Our results also suggest that measures directed at providing dividend tax relief would reduce the inefficiencies associated with the double taxation of corporate capital income. These inefficiencies include distortions in the allocation of capital between corporate and noncorporate uses, distortions in the choice between present and future consumption, distortions in corporate financial policy,[39] and distortions in the allocation of risk bearing. In considering the merits of dividend tax relief, however, it is necessary to weigh these efficiency gains against the equity effects and the efficiency costs of

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shareholders have evolved slowly over time, it is potentially critical for modelling investment in Britain or other nations in which radical tax changes have taken place.

[39]Estimates of the intersectoral distortions due to capital income taxation are found in Harberger (1962) and Fullerton, etal. (1981). For evidence on distortions in intertemporal choices, see Feldstein (1978) and Summers (1981).

alternative revenue sources.

Miller and Scholes (1978) argue that the failure of the business community to strongly support Carter administration proposals calling for dividend tax relief constitutes evidence that dividend taxes are not burdensome. We would suggest the alternative hypothesis that this failure is attributable to the same agency problems which lead shareholders to require dividend payments in the first instance. Dividend payments are the shareholders' way of monitoring managers. When dividend taxes are reduced, shareholders find monitoring cheaper and do more of it. The failure of corporate managers to lobby for dividend relief reflects their decision to lobby for their own rather than their shareholder's interest. An alternative possibility is that managers saw dividend relief as an alternative to even more attractive forms of corporate tax reduction.

Our analysis has abstracted from two important aspects of reality, clientele effects and firms' use of debt finance. Neither of these abstractions accounts for our qualitative conclusions. Evidence presented by Blume, Crockett, and Friend (1974) and Lewellen, et. al. (1978) suggests that clientele effects are not large. Clienteles might attenuate the burden of dividend taxes, but would not eliminate it unless taxpaying investors held only zero dividend stocks. The data clearly reject this possibility. With respect to debt finance, it would be straightforward to append to our formulation of the firm's decision problem either a "Miller model," as in Miller (1977), or a debt-capacity model (as in Gordon and Malkiel (1981)) in which bankrupty risk limited debt-equity ratios. Neither approach would alter our conclusions.

Nonetheless, it would be valuable to analyze the effects of dividend taxation in a richer model than the one we have presented here.

Our findings suggest the importance of providing both a theoretical motivation for, and empirical measures of, the investors' "dividend preference function." Theoretical explanations might be further developed along the lines of the incentive signalling approach to corporate finance. While models explaining why dividends are paid have been suggested, this work has not yet reached the point of generating empirically falsifiable predictions about the effects of varying dividend yields, either across time or across firms, on required returns.

The most promising direction for empirical research appears to involve examining the effects of dividend yield on the required return of dividend paying firms, during periods when dividends are not paid.[40] The extent to which it is appropriate to control for risk in such a calculation is unclear, since higher yields may reduce required returns precisely because they reduce risk. We are currently pursuing research along these lines.

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[40]Elton, Gruber, and Rentzler (1983) report some investigations along these lines.

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