THE SHARE PRICE EFFECTS OF
DIVIDEND TAXES AND TAX IMPUTATION CREDITS

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NBER Working Paper No. 7445
December 1999
JEL No. H3

ABSTRACT

We examine the hypothesis that dividend taxes are capitalized into share prices by focusing on investors' implicit valuations of retained earnings versus paid-in equity. Retained earnings are distributable as taxable dividends, whereas paid-in equity is distributable as a tax-free return of capital. Consistent with dividend tax capitalization, firm-level results for the United States indicate that accumulated retained earnings are valued less per unit than contributed capital. In addition, differences in dividend tax rates across U.S. tax regimes are associated with predictable differences in the magnitude of the implied tax discount for retained earnings, as are differences in dividend tax rates across Australia, Japan, France, Germany, and the United Kingdom.

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1. Introduction

Researchers have long debated the role of taxes in corporate financial policy. Following Modigliani and Miller (1963), numerous studies have considered the relationship between debt and equity financing in the presence of tax-advantaged debt, and other research has focused on the implications of dividend and capital gains taxation for different components of equity financing. Many of the issues addressed in these research programs critically depend on whether shareholder-level taxes on dividends are capitalized in share prices. Prior examinations of the share price effects of dividend taxes, however, have primarily relied on event studies or indirect tests, with inconclusive results about the specific question of dividend tax capitalization. In this study, we examine the influence of dividend taxes on firm value directly for a sample of U.S. firms from 1975 to 1994 and for a sample of non-U.S. firms from 1984-1995, and we find evidence consistent with the hypothesis that a substantial portion of these shareholder-level taxes are capitalized in share prices.

The firm valuation effects of dividend taxation have several fundamental implications. If, for example, dividend taxes do not influence share prices as suggested by Miller and Scholes (1978), then dividends impose a tax penalty on taxable shareholders. However, if share prices absorb the effects of dividend taxation, then corporations could distribute dividends without imposing a penalty on shareholders at the margin. That is, dividend policy would be unaffected by

dividend taxes.[1] In addition, if dividend taxes reduce the market value of retained-earnings equity,

then it would reduce shareholders' required return on this source of financing below the required

return on equity raised from external markets (see King, 1977; Auerbach, 1979a,b; and Bradford,

1981). This tax wedge between the costs of using internal versus external equity financing would

exist whether or not transactions costs and costs of asymmetric information accentuate the result

(see Myers and Majluf, 1984), and it would suggest that a simple dichotomy between "debt" and

"equity" financing is incomplete.[2]

Prior studies have sought to isolate tax share price effects by investigating ex-dividend-day

price reactions, dividend yields, or the financial policy implications of dividend tax capitalization

for dividend payouts, q, or the user cost of capital. In contrast to the prior studies, we use a firm

valuation approach to study the relationship between dividend taxes and share values. In the

United States and many other jurisdictions, retained earnings are subject to dividend taxes upon

distribution, but contributed equity can be returned to shareholders free from such taxation.[3]

Therefore we exploit variation in the relative proportions of retained earnings and contributed

capital to examine the direct prediction that retained earnings are valued less than dollar-for-dollar

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[1] This statement is true for a constant dividend tax; unanticipated temporary changes in the dividend tax would affect payout decisions.

[2] Aside from the corporate financial implications, tax policymakers devote substantial attention to the potential share price effects of dividend taxes (see, *e.g.*, U.S. Department of the Treasury, 1992; American Law Institute, 1993; and the reviews in Zodrow, 1991; and in Gentry and Hubbard, 1998). If dividend taxes reduce share prices, then a portion of the economic efficiency benefits of corporate tax integration or other fundamental income and consumption tax reform would be dissipated in windfall gains to current shareholders.

[3] Firms sometimes distribute retained earnings without triggering dividend taxes, as in share repurchases and certain taxable acquisitions. In section 4.4, we address the influence of these alternative equity distribution methods on our analysis.

in firm value. We also examine the prediction that the relatively low predicted valuation of retained earnings decreases shareholders' required return on this component of equity, thereby increasing the valuation of reported earnings.

Our approach is related to recent work by Harris and Kemsley (1999), who incorporate dividend taxes into a firm valuation model and find empirical support for the hypothesis that U.S. dividend taxes result in a lower value for retained earnings than for total book value. We extend the tax interpretation of these results by developing a market-to-book specification, by controlling for a wide range of potential non-tax explanations suggested by various models in finance and economics, and by repeating our basic valuation test in several different tax regimes. In the United States, we conduct tests for five tax regimes in the 1975-1997 period corresponding to five different levels of dividend taxation. We also conduct tests for the 1984-1995 period for Australia, France, Germany, Japan, and two different tax regimes in the United Kingdom. The non-U.S. settings allow for comparisons of empirical results across different levels of dividend tax relief provided by tax imputation credits.

Our investigation results in three principal findings. First, firm-level results for the United States indicate that accumulated retained earnings are valued less per unit than contributed capital. This finding is consistent with the capitalization of future dividend taxes in retained earnings, and it is robust to inclusion of a variety of control variables and tests for possible alternative explanations. Second, we find that differences in dividend tax rates across U.S. tax regimes are associated with predictable differences in the implied tax discount for retained earnings. Third, cross-country variation in dividend tax rates is associated with predictable variation in the implied tax discount. Furthermore, the difference in dividend tax rates across two

different tax regimes in the United Kingdom is associated with predictable differences in the estimated discount of value.

The remainder of the paper is organized as follows. Section 2 reviews predictions of competing models of dividend decisions and describes existing empirical evidence. Section 3 describes our methodology for estimating the extent to which dividend taxes are capitalized in share values. Section 4 reports empirical results for U.S. firms, and section 5 reports results for non-U.S. firms. Section 6 provides concluding remarks.

2. Investigating the Share Price Effects of Dividend Taxes

When dividend taxes are capitalized, share prices absorb the burden of dividend taxation whether or not a firm pays current dividends. Dividends *per se* do not produce a tax penalty because paying a dollar of dividends reduces firm value by less than a dollar. In particular, firm value only declines by the after-tax value of the dividend to the marginal investor, preserving the dividend displacement property of Miller and Modigliani (1961).

Using event studies, many researchers have examined the hypothesis that there is a less than dollar-for-dollar reduction in share prices on ex-dividend days. Empirical evidence supporting the tax hypothesis is provided by Elton and Gruber (1970), Litzenberger and Ramaswamy (1979), Lamdin and Hiemstra (1993), and Lasfer (1995). Poterba and Summers (1984) strengthen the tax interpretation of these results by finding predictable differences in ex-dividend-day share price reactions across three different tax regimes in the United Kingdom. Barclay (1987) further bolsters the results by finding that share values declined by the full value of dividends before adoption of income taxes in 1913, but not after that date. More mixed evidence

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is offered by Eades, Hess, and Kim (1984), and empirical evidence to the contrary is offered by

Gordon and Bradford (1980) and Miller and Scholes (1982).[4]

Some researchers have questioned the ex-dividend-day studies, providing evidence that

the tax effect has declined over time and may be induced by discreteness of changes in trading

prices (Bali and Hite, 1997), or to nontax factors influencing ex-day share price movements (see,

e.g., Shaw, 1991). Others have questioned the studies because of predictable clientele trading

behavior surrounding ex-dividend days that could eliminate the observable tax effect (see, *e.g.,*

Kalay, 1982). By focusing on the valuation of the pre-arbitrage stock of accumulated retained

earnings instead of focusing on share price reactions on ex-dividend days, however, we avoid the

confounding effects of this tax arbitrage (as addressed in section 3.2).

In addition, the ex-dividend-day findings have generally been interpreted without

considering the implications of dividend tax capitalization. The research program emerged

primarily in response to the argument by Miller and Scholes (1978) that the marginal investor is

tax-exempt, making dividend taxes irrelevant both for payout decisions and for equity valuation.

Ex-dividend-day studies typically assume that, if the marginal investor is taxable, dividend

payments are tax-penalized. However, if firm value only decreases by the after-tax value of a

dividend payment, the MM dividend displacement property is preserved and marginal returns on

equity are unaffected by the dividend tax.

Other researchers have studied whether "implicit taxes" (to use the terminology of Scholes

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[4] Analogous to the distinction we make between retained earnings and contributed capital, Eades, Hess, and Kim (1994) separately examine ex-dividend-day pricing behavior for taxable dividends versus non-taxable returns of capital. They find that share prices decline by less than the full amount of distributions for taxable dividends, and by more than the full amount of distributions for nontaxable returns of capital.

and Wolfson, 1992) vary across firms according to dividend yields. This line of inquiry suggests that dividends are penalized relative to capital gains for tax purposes, so high-dividend-yield stocks should be priced at a discount relative to low-dividend-yield stocks. That is, high-dividend-yield stocks should provide a greater pre-tax return on investment than low-dividend yield stocks. Empirical evidence on this point has been inconclusive, however. Black and Scholes (1974) find no difference in expected returns for high- versus low-dividend-yield stocks. In contrast, using a two-stage generalized least-squares procedure, Rosenberg and Marathe (1979) find a positive and significant relationship between dividend yields and common stock returns. Litzenberger and Ramaswamy (1982) also find a positive relationship between returns and dividends, even after including controls for the information effects of dividends. However, they conclude that it is still an open question as to whether personal taxes or some omitted variable (other than information effects) account for their results.[5]

More recently, Chen, Grundy, and Stambaugh (1990) conclude that the positive relation between returns and dividend yields is not robust to the inclusion of various controls for risk. Using a different approach, Fama and French (1998) examine the hypothesis that after controlling for profitability, the tax penalty on dividends results in a negative price effect. Instead, they find a positive relationship between prices and dividends, concluding that if any tax effects exist, they are outweighed by the signaling effects of dividends.

All of these lines of inquiry abstract from a key implication of dividend tax capitalization: If future dividend taxes are capitalized in equity values, then share prices absorb the burden of this

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[5] Consistent with a non-tax interpretation for the dividend-yield effect, Keim (1982) finds that most of the dividend-yield effect occurs in January.

expected tax. This frees dividends from the marginal tax burden, so consistent with the evidence

provided by Fama and French (1998), dividend yields *per se* should not capture tax effects.

To summarize, a variety of dividend tax predictions have been subjected to significant

empirical scrutiny, providing many important insights but without providing conclusive results

regarding the share price effects of dividend taxes.[6] Because little attention has been paid to the

hypothesis that dividend taxes on accumulated equity are capitalized in share values, we now turn

to this prediction.

3. Testing Tax Capitalization: Methodology

In this section, we develop a firm valuation methodology to exploit variation in firm-level

ratios of retained earnings to total book value to examine the direct prediction that the burden of

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[6] Related research programs have explored predictions for corporate financial policy or for business investment of dividend tax capitalization. Under tax capitalization, permanent changes in the dividend tax rate should not influence dividend payouts. Poterba and Summers (1985) exploit changes in dividend taxation in the United Kingdom from 1950 to 1981 to examine this prediction. They find a significant negative relationship (which is corroborated by evidence in Brittain, 1966, Feldstein, 1970, and Poterba, 1987). Although this evidence is consistent with the presence of a tax penalty for dividends, it is difficult to identify permanent changes in the tax rate on dividends, and temporary changes in the tax rate are expected to affect payouts whether or not tax capitalization occurs. It also is difficult to isolate the effects of changing dividend tax rates from simultaneous changes in other tax parameters, including the tax rate on interest income.

Using an alternative approach, Poterba and Summers (1985) analyze the impact of dividend taxes on the level of business fixed investment in the United Kingdom. Essentially, they estimate a variant of the q model in the presence of adjustment costs (see Hayashi, 1982; and Summers, 1981). They find that specifying q with a tax penalty for dividends explains investment patterns more effectively than specifying q under tax capitalization. However, many researchers have questioned the simple q model on measurement error grounds (see, *e.g.,* the reviews of studies in Hubbard, 1998). In addition, the tax burden on undistributed earnings in the United Kingdom may actually have exceeded the tax on dividends for at least a portion of the time period studied by Poterba and Summers. In this case, predictions are similar whether or not taxes on dividends are capitalized in share values (see, *e.g.,* Sinn, 1985).

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dividend taxation reduces the valuation of retained earnings below the valuation of contributed equity. This variation generally is not considered in economic valuation models, which adjust for future growth in equity but do not emphasize the distinction between contributed capital and retained earnings in current equity (book value). We also clarify how our tests avoid the potential confounding effects that dividend capture arbitrage can have on ex-dividend-day price reaction studies.

3.1 Firm Valuation Methodology

We begin with a basic valuation model in which the price per share (*P*) equals the present after-tax value of dividends (($1 - t_d$)*D*) plus the present value of nontaxable returns of capital (*NC*), where t_d is the tax rate on dividends.[7] That is, letting D equal the firm's discount factor (*i.e.*, one plus the appropriate discount rate) and *i* and *t* denote the firm and time period, respectively:

$$P_{it} = \sum_{s=1}^{\infty} r_i^{-s} \left(1 - t_d\right) D_{i,t+s} + \sum_{s=1}^{\infty} r_i^{-s} NC_{i,t+s}. \tag{1}$$

Equation (1) is the principal valuation model for our study. If the marginal investor is taxable, then $t_d > 0$. If the marginal investor is a tax-exempt entity, then $t_d = 0$. Nevertheless, we cannot directly use dividend and return of capital distributions to examine dividend tax effects. These variables are discretionary functions of dividend and capital distribution policies, and dividend tax capitalization should be independent of current distribution policies. Therefore we use an accounting identity to reexpress equation (1) in terms of observable accounting variables

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[7] Negative values for *NC* represent additional capital contributions. We do not specify the tax rate of the marginal investor for our empirical tests. Instead, we infer from the data whether t_d is statistically different from zero.

that do not rely on current-period distribution policies.

In particular, we express current book value of common equity (BV_{it}) as the sum of contributed capital (C_{it}) and accumulated retained earnings (RE_{it}). Using additional accounting identities, we express C_{it} in terms of $C_{i,t-1}$ and NC_{it}, and we express RE_{it} in terms of $RE_{i,t-1}$, NI_{it}, and D_{it} as follows:

$$C_{it} = C_{i,t-1} - NC_{it}, \tag{2a}$$

$$RE_{it} = RE_{i,t-1} + NI_{it} - D_{it}. \tag{2b}$$

We can use equations (2a) and (2b) to solve for current-period net returns of capital and dividends:

$$NC_{it} = C_{i,t-1} - C_{it}, \tag{3a}$$

$$D_{it} = RE_{i,t-1} + NI_{it} - RE_{it}. \tag{3b}$$

Using equations (3a) and (3b) to substitute for net returns of capital and dividends in equation (1) yields:

$$P_{it} = \sum_{s=1}^{\infty} r_i^{-s}\left(C_{i,t+s-1} - C_{it+s}\right) + \sum_{s=1}^{\infty} r_i^{-s}\left[(1-t_d)RE_{i,t+s-1} - (1-t_d)RE_{it+s}\right]$$
$$+ \sum_{s=1}^{\infty} r_i^{-s}(1-t_d)NI_{i,t+s}. \tag{4}$$

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We now decompose net income into normal and supranormal returns on invested equity. To do so, we assume that normal profits equal the investors' required rate of return times the amount of funds (net of tax) investors have at stake in the firm, after taxes. As discussed later, our empirical tests rely on this central assumption. After taxes, the amount of invested funds shareholders have at stake in the firm, and which they could withdraw for alternative investments, is $(C + (1-t_d)RE)$. Therefore we assume that normal profits (T), or the opportunity cost of funds, is:

$$w_{it} = r_1 \left[C_{i,t-1} + \left(1 - t_d\right) RE_{i,t-1} \right]. \tag{5a}$$

where r equals (D-1). We then define after-tax supranormal or economic profit (B) as after-tax earnings less the opportunity cost of invested funds, or:

$$p_{it} = \left(1 - t_d\right) NI_{it} - r_i \left[C_{i,t-1} + \left(1 - t_d\right) RE_{i,t-1} \right]. \tag{5b}$$

Before proceeding, note that equation (5b) posits that all earnings are subject to dividend taxation, irrespective of whether those earnings are generated from investments out of contributed capital or retained earnings. For any given level of total equity, however, the decomposition of total profits into normal and economic profit components is a function of the mix of C versus RE. More specifically, the after-tax economic profit portion of a fixed amount of total earnings increases in the retained earnings component of equity, or in RE/BV (*i.e.,* $\partial B_{it} / \partial (RE/BV) > 0$).

This result follows directly from our assumption that normal profits equal the required rate of return times the amount of after-tax funds investors have at stake in the firm, and after taxes, investors have less funds at stake for each dollar of taxable retained earnings than they have for each dollar of nontaxable contributed capital.

Substituting (5a) and (5b) for the $(1\text{-}t_d)NI$ term in equation (4), and simplifying, leads to:[8]

$$P_{it} = \sum_{s=1}^{\infty} r_i^{-s}\left(r_i C_{i,t+s-1} - C_{it+s} \right)$$
$$+ \sum_{s=1}^{\infty} r_i^{-s}\left[r_i(1-t_d)RE_{i,t+s-1} - (1-t_d)RE_{it+s} \right] + \sum_{s=1}^{\infty} r_i^{-s} p_{i,t+s}. \qquad (6)$$

Next, recognizing that:

$$\sum_{s=1}^{\infty} r_i^{-s}\left(rC_{i,t+s-1} - C_{it+s} \right) = C_{it},$$

and

$$\sum_{s=1}^{\infty} r_i^{-s}\left[r_i(1-t_d)RE_{i,t+s-1} - (1-t_d)RE_{it+s} \right] = (1-t_d)RE_{it},$$

we can reexpress (6) as:

$$P_{it} = C_{it} + (1-t_d)RE_{it} + P_{it}, \qquad (7)$$

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[8] As previously defined, normal profits equal $(D_i - 1)C_{i,t+s-1} + (D_i - 1)(1-t_d)RE_{i,t+s-1}$. When adding these normal profits to $C_{i,t+s-1}$ and $(1-t_d)RE_{i,t+s-1}$ in equation (4), $D_i C_{i,t+s-1}$ and $D_i(1-t_d)RE_{i,t+s-1}$ result, as shown in equation (6).

where A_{it} is the expected present value of firm i's economic profit, or

$$P_{it} = E_t \sum r_i^{-s} p_{i,t+s}.$$

Equation (7), which follows directly from the dividend discount model in equation (1), simply states that the value of the firm equals the after-tax present value of normal profits (equal to the current after-tax value of the firm's common equity) plus the present value of economic profits. Note that the time paths of the distributions of contributed capital or retained earnings do not influence the valuations of C and RE in this equation. C and $(1-t_d)RE$ simply measure the after-tax present value of normal returns on invested equity, plus the eventual return of the equity.

At this juncture, it is important to identify the influence of dividend taxation on the cost of capital for marginal investment projects and on the value of the firm. The effect of dividend taxation on the cost of capital depends on the expected source of financing, which could be retained earnings or new equity. As is generally the case with tests of dividend tax capitalization, it is difficult to clearly identify the source of capital for future investments because firms may switch between the different types of financing in response to shifts in investment opportunities. For simplicity, however, we follow the conventional approach of distinguishing between retained-earnings and new-equity financing regimes. In this case, equation (7) posits that the cost of capital for marginal investments in a retained-earnings financing regime is $(1-t_d)r$, and the cost of capital in a new-equity financing regime is r. Therefore the cost of capital depends upon the financing regime, and there is a unique cost of capital for any marginal investment projects pursued under either regime.

Complications arise when considering the effect of dividend taxation on the value of the

firm, for firms consist of collections of investment projects originally financed by both retained

earnings and new equity. In particular, if a firm is in a new-equity (retained-earnings) financing

regime, it is necessary to determine how to value the inframarginal retained earnings equity

(contributed capital).

If new equity is the marginal source of financing, then the marginal cost of capital is r, but

all earnings and any distributions from retained earnings are still subject to dividend taxes. From a

shareholder's perspective, therefore, book value is overstated by the capitalized value of taxes on

future dividends. That is, the after-tax value of the book value of common equity is $C+(1-t_d)RE$,

as posited in equation (7).

If retained earnings is the marginal source of financing, then the marginal cost of capital is

$(1-t_d)r$, and the firm may reinvest its contributed capital for many years, or even indefinitely.[9]

However, equation (7) posits that the value of this inframarginal contributed equity is not

dependent on the timing of expected distributions of the capital, so contributed capital is simply

valued at C. To support this property of equation (7), which directly follows from our previous

assumptions regarding normal versus economic profits, we appeal to a no-arbitrage argument. If

investors valued C by discounting future distributions at rate $(1-t_d)r$, so that the after-tax value of

contributed equity is $(1-t_d)C$, an arbitrageur could liquidate the firm at a profit.

The Compustat data illustrate the scope of this opportunity. The mean value of (C/BV)

for our entire sample is 0.445, and the mean value of the top statutory federal dividend tax rate

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[9] However, firms in the Compustat sample sometimes do appear to return contributed
capital to shareholders. In particular, 3.6 percent of our U.S. observations report a decrease in
contributed capital from the prior year coupled with current-year dividends in excess of current-
year income.

weighted by observations in different tax regimes is 0.448. Consider a firm with total equity of

$1,000, consisting of $445 of contributed capital and $555 of retained earnings. In the

conventional benchmark case (abstracting still from taxes on capital gains) of $q = (1 - t_d)$, the

value of the firm would be $1,000 (1-0.448) = $512. If shareholders liquidated the firm, however,

they would receive a tax-free return of the $445 of contributed capital, plus a taxable dividend of

$555, or an after-tax payment value of $445 + $555 (1-0.488) = $719.16. This after-tax

liquidation payment is 41 percent ($207.16) greater than the value of the firm as a going concern,

so the incentive to liquidate would be significant. The no-arbitrage value for q, which equals the

after-tax payment value of $719.16 in this example, is $(1 - t_d (RE/BV))$, not $(1 - t_d)$. It is, of course,

true that firms generally do not liquidate themselves. However, our model is built on the

assumption that the valuation of retained earnings and contributed capital must ensure that

liquidation does not offer arbitrage profits.[10]

The potential arbitrage incentive in this example is especially large because we have

assumed the firm earns no economic profits. If investors expect economic profits, and if the

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[10] Other assumptions regarding the opportunity cost of capital lead to different
implications. For example, if we assume that arbitrage opportunities do not materially influence
investors' valuations, then investors would disregard the tax difference between C and RE unless
firms plan to distribute C sometime in the near future. Similarly, investors would disregard the
tax difference between C and RE if they apply a single cost of capital to total physical capital,
independent of the tax arbitrage opportunities. In either case, the opportunity cost of capital in a
retained-earnings financing regime would be $r(1 - t_d)(C + RE)$, and dividend taxes would not
influence the relative valuation of C versus RE. Empirically, therefore, if the market prices normal
returns according to these alternative assumptions, or if dividend tax capitalization does not
occur, then we would not expect to find any difference in the valuation of contributed capital
versus accumulated retained earnings. In contrast, if the market prices normal returns according
to our assumption that it equals $r(C + (1 - t_d)RE)$, and if dividend tax capitalization occurs, then we
expect to find a value discount for the accumulated stock of retained earnings (after controlling
for economic profits, as discussed later).

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present value of these economic profits is greater than or equal to the potential arbitrage profit of $207.16, then valuing the inframarginal contributed capital as $(1-t_d)C$ rather than C would not provide an incentive to liquidate the firm. However, the conventional average q benchmark of $(1-t_d)$ (abstracting from capital gains taxes) also assumes that there are no economic profits. In addition, equation (7) exhibits the desirable property that $\mathsf{M}P/\mathsf{M}D = -(1-t_d)$, and $\mathsf{M}P/\mathsf{M}NC = -1$. That is, the Miller-Modigliani dividend displacement property holds on an after-tax basis for both taxable dividends and nontaxable returns of capital. Therefore no tax arbitrage opportunities exist for firms to increase shareholder wealth through distribution policies, even for distributions that fall far short of complete liquidations of the firms.

We now add capital gains taxes on distributions from equity to the analysis by letting t_g equal the accrual-equivalent tax rate on gains.[11] If all retained and future earnings are eventually paid out as dividends, then only contributed capital (C) would potentially be subject to capital gains taxes upon distribution. The net capital gain or loss on the distribution would equal taxable gross proceeds, or C, less each shareholder's tax basis. Because a stock's purchase price establishes tax basis, we assume basis equals the current purchase price of the stock, or P, so the net tax upon distribution of contributed equity is $t_g(C-P)$.[12] Subtracting this tax from equation (6) results in:

$$P_{it} = C_{it} + \left(1-t_d\right)RE_{it} + \boldsymbol{P}_{it} - t_g\left(C_{it} - P_{it}\right),$$

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[11]   By focusing on the taxation of equity distributions to shareholders, we abstract from capital gains recognized on sales of stock on the secondary market. Collins and Kemsley (1998) address the firm valuation effects of these capital gains taxes.

[12]   A shareholder's tax basis typically is greater than or equal to C, so in most cases, no positive capital gains tax would be due upon distribution of contributed equity.

which can be reexpressed as:

$$P_{it} = C_{it} + \left(\frac{1-t_d}{1-t_g} \right) RE_{it} + \left(\frac{1}{1-t_g} \right) \boldsymbol{P}_{it}. \tag{8}$$

Putting aside contributed capital for the moment and assuming that all distributions are paid out of current and expected future retained earnings, equation (8) simplifies to:

$$P_{it} = \left(\frac{1-t_d}{1-t_g} \right) \sum_{s=1}^{\infty} r_i^{-s} D_{i.t+s}, \tag{8'}$$

which is a common expression used by public finance economists. That is, paying a dividend leads to an immediate dividend tax liability, but the reduced value of the firm reduces future capital gains tax liabilities; the net tax effect of a dividend payment is the dividend tax offset by the reduction in future capital gains taxes. Assuming that $t_d > t_g$, a dollar of dividends paid out of retained earnings is valued at less than one dollar because $(1-t_d)/(1-t_g) < 1.$[13]

Returning to equation (8) and noting that book value equals the sum of contributed capital and retained earnings, we can express the value of the firm as a function of book value, expected economic profit, and the dividend tax discount; recalling that $BV = C + RE$:

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[13]In contrast to studies following Miller (1977) that assume the tax burden on equity is relatively light, equations (8) and (8') suggest that shareholders cannot use tax-favored capital transactions to avoid the dividend tax. Instead, selling stock passes the accumulated dividend tax on to a buyer. If tax capitalization occurs, the buyer "charges" the seller for this tax burden by offering a lower price for the stock. In this case, shareholders face the burden of dividend taxation whether or not they receive current dividends.

$$\frac{P_{it}}{BV_{it}} = 1 - \left(\frac{t_d - t_g}{1 - t_g}\right)\frac{RE_{it}}{BV_{it}} + \left(\frac{1}{1 - t_g}\right)\frac{\boldsymbol{P}_{it}}{BV_{it}}. \tag{9}$$

The left-hand side of equation (9) is the familiar market-to-book ratio. Leaving aside the

economic profits term on the right-hand side of (9), the equation implies that if $t_d > t_g$, there

should be a negative relation between the market to book ratio and the ratio of retained earnings

to total book value. That is, one could regress (P/BV) on an intercept and (RE/BV), and

interpret the coefficient on (RE/BV) as an estimate of the tax discount term (t_d - t_g)/(1- t_g).

When introducing economic profits, however, (RE/BV) plays two roles in firm valuation.

Equation (5b), which defines economic profits, implies that the value-relevant economic profit

portion of the income increases in (RE/BV); *i.e.*, $\partial \boldsymbol{A} / \partial (RE/BV) > 0$. Intuitively, while dividend

taxes reduce the value of retained earnings, this lower valuation decreases the required return on

this component of equity, which increases firm value, all else being equal. Hence (RE/BV) both

reduces (P/BV) from dividend tax capitalization and increases (P/BV) through its magnification of

economic profits. The difference between these two effects equals the present value of the future

tax benefits provided by contributed capital relative to retained earnings, which may be small.

This implies that the estimated coefficient on (RE/BV) in a regression of (P/BV) on (RE/BV) and

current net income (NI/BV) will not capture much of the dividend tax discount.

To address this issue, we first use net income (NI/BV) as a proxy for $\boldsymbol{A}$.[14] Net income is

an imperfect proxy for economic profits because it does not adjust for shareholders' required

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[14] This proxy is not exact in part because the link between current earnings and expected future earnings may vary across firms; we investigate the influence of this variation on our tests by including future net income realizations as controls (in section 4.3).

return on invested capital. In particular, for tax reasons, the required return decreases in

(*RE/BV*). We isolate the economic profits effect of (*RE/BV*) by including an interaction term in

the valuation model, (*RE/BV*) x (*NI/BV*). Because the economic profit portion of net income

increases in (*RE/BV*), we expect the estimated coefficient on (*RE/BV*) x (*NI/BV*) to be positive.

This results in the following estimation equation:

$$\frac{P_{it}}{BV_{it}} = a_0 + g_t + b_1\left(\frac{RE_{it}}{BV_{it}}\right) + b_2\left(\frac{NI_{it}}{BV_{it}}\right) + b_3\left(\frac{RE_{it}}{BV_{it}}\right)\left(\frac{NI_{it}}{BV_{it}}\right) + \in_{it},$$ (10)

where g_t represent year dummies.

Controlling for the economic profits effect allows us to capture the full value of the tax

discount in the (*RE/BV*) coefficient without any reference to the timing of the equity payouts or to

the present value of the tax difference between contributed capital and retained earnings –

essentially because we separate the normal and economic profit effects of (*RE/BV*) that would

largely offset each other in the absence of the interaction term.

Because realistic measurement issues complicate interpretation of the magnitude of the

estimated (*RE/BV*) coefficient as a conclusive measure of tax capitalization, we focus on two sets

of applications for equation (10). First, we use U.S. data to analyze the valuation effects of

differences in dividend tax rates across different tax regimes. Second, we analyze the valuation

effects of cross-country differences in dividend tax rates, especially focusing on the effects of the

dividend tax relief provided by tax imputation credits. By examining patterns in the estimated

(*RE/BV*) and (*RE/BV*) x (*NI/BV*) coefficients across tax regimes, we essentially control for any

omitted variables that may be correlated with (*RE/BV*) but do not vary systematically across tax

regimes and rate structures.[15] In addition, we examine alternative explanations for our findings.

3.2 Dividend Capture Arbitrage

Before proceeding to our empirical results, we evaluate the potential influence of dividend capture arbitrage on our tests versus the ex-dividend-day price reaction tests. If dividend taxes are capitalized into share prices, equation (9) suggests that a firm's accumulated retained earnings would be valued on a less-than-dollar-for-dollar basis. Consistent with the primary hypothesis in the ex-dividend-day literature, therefore, firm value would be expected to decrease by less than a dollar for each dollar of dividends paid out of retained earnings.

This expected share price effect creates an arbitrage incentive for tax-exempt investors to purchase shares immediately before an ex-dividend day, capture the dividend, and then immediately sell the shares to taxable investors.[16] As Kalay (1982) points out, these arbitrageurs are expected to bid up share prices before ex-dividend days, so that in the absence of transaction costs, share prices would be expected to decline on a full dollar-for-dollar basis in dividends, thereby confounding inferences from event studies examining ex-dividend-day price reactions.

To illustrate, consider the case in which arbitrage opportunities are large – a 3 percent quarterly dividend yield. Suppose a stock with a share price of $100 has an upcoming dividend of $3 per share, the dividend tax rate capitalized into share prices is 33.3 percent, and for simplicity, the tax rate on capital gains is zero. Given dividend tax capitalization with no arbitrage and these

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[15] For example, these cross-regime tests address the concern that (*RE/BV*) is in part a choice variable for managers. While (*RE/BV*) is influenced by managers' decisions, it is difficult to argue that this managerial control varies systematically across tax regimes and rate structures.

[16] Other investors who face the same tax rate on dividends and capital gains, including dealers, also have an arbitrage incentive to capture dividends.

assumptions, share prices would decline by $2 on the ex-dividend day (*i.e.*, by (1 - 0.333) x $3), or to $98. This less-than-dollar-for-dollar decline in share prices creates an arbitrage opportunity for tax-exempt investors, who would reap profits as long as they could purchase the shares at a price of less than $101. Hence they are expected to conduct arbitrage until their actions raise share price to this level, so that at the limit, share price would decline from $101 to $98, or on a full dollar-for-dollar basis upon payment of the $3 dividend.

Despite this bias against finding observable tax effects in price reactions, many existing studies document less-than-dollar-for-dollar declines in share prices on ex-dividend days, although this effect has decreased over time (see section 2). Our analysis allows for this finding as long as transaction costs are material. For instance, if we added a $1 arbitrage transaction cost to our example, there would be no arbitrage incentive, and share prices would only decrease by $2 upon payment of the $3 dividend to shareholders (*i.e.*, from $100 to $98). In practice, if transaction costs have declined over time, then the observable tax effect in ex-dividend day price reactions also should have declined, which is consistent with the general trend reported in the literature.

In contrast to the ex-dividend-day studies, our approach focuses on the valuation of the pre-arbitrage stock of retained earnings. At any particular time, a firm's single upcoming dividend is the only portion of accumulated retained earnings that is potentially subject to arbitrage valuation effects, and the small amount of shares likely to be involved in the arbitrage should not materially influence prices between arbitrage dates.[17] In this regard, Bagwell (1991) provides

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[17] The opportunity costs of arbitrage rise substantially when holding the stock long enough to capture more than a single dividend. Indeed, concern over ex-dividend-day arbitrage strategies relating to foreign stocks prompted the Clinton administration to propose a 15-day holding period for stock before investors could benefit from the arbitrage. Commentators note that the costs associated with the 15-day holding period would "stop the activity dead" (Martin, 1997).

evidence that the slope of the supply curve for any particular firm's shares is positive and substantial. Indeed, her figures suggest that if even a very small percentage of a typical firm's shares were arbitraged around an ex-dividend day, the share price in our example would increase above the $101 threshold at which dividend capture arbitrage becomes unprofitable.[18] Of course, still fewer shares would be tendered in arbitrage activity for firms with much smaller dividend yields, as generally seen in practice. Hence dividend capture arbitrage is not expected to influence the relationship between year-end share prices and accumulated retained earnings balances materially, so unlike the approach in price reaction studies, our approach does not depend on the presence of transaction costs.

4. Dividend Taxes and Share Price Effects in the United States

In this section, we investigate whether accumulated retained earnings are valued less than dollar-for-dollar by the U.S. equity market, and whether this effect increases the valuation of net income. We also exploit time-series variation in dividend tax rates.

4.1 The Sample

The original U.S. sample for the empirical tests consists of all U.S. firms reported on the 1995 or 1998 Compustat files, which cover the 1975-1997 time period. We eliminate observations: (1) if at least one of the variables in equation (10) is missing; (2) with negative net

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[18] Specifically, in a different context, Bagwell (1991) estimates a supply elasticity of 1.67, so that the share price in our example would rise from $100 to $101 if less than one percent of the shares were purchased by arbitrageurs.

income, book value, or accumulated retained earnings;[19] (3) in the top one percent of the

distributions of price, earnings, retained earnings, or book value (all scaled by shares outstanding)

to control for outliers, and observations for which the market-to-book ratio exceeds ten. The

remaining sample consists of 72,620 firm-years.

We divide the sample into five basic tax-regime periods: (1) the pre-ERTA period from

1975 to 1981 when the top personal tax rate was 70 percent, (2) the ERTA period from 1981 to

1986 when the top personal tax rate was 50 percent, (3) 1987, when the top rate was 38.5

percent, (4) the TRA 86 period from 1987 to 1992 when the top personal tax rate ranged from 28

percent to 33 percent, and (5) the OBRA 93 period from 1993 to 1994 when the top rate on

dividends increased to 39.6 percent. The expected magnitude of the tax discount increases in the

tax rate on dividends.

4.2 Estimation Results

We begin by estimating equation (10). Table 1 provides descriptive statistics for

regression variables for each of the five periods, and Table 2 provides ordinary-least-squares

(OLS) estimates of the equation for the United States.

Consistent with a tax discount for retained earnings, the estimated (*RE/BV*) coefficient is

negative in all five time periods.[20,21] Also consistent with expectations, the magnitude of the

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[19] We exclude observations with negative net income because we use current earnings to
proxy for expected future earnings, and in the long-run, this assumption is not plausible for
observations with negative earnings.

[20] As reflected in the (*RE/BV*) coefficients, the magnitude of the estimated tax discounts
are generally greater than $(t_d - t_g)/(1 - t_g)$. As previously discussed, the relationship between
(*RE/BV*) and economic profits complicates interpretation of the absolute magnitude of this
coefficient, so we focus on differences in estimated tax discounts across tax regimes. In addition,
the estimated coefficients are materially lower when controlling for fixed effects, as reported in

estimated tax discount decreases from the pre-ERTA period (-1.69, $t = -13.2$) to the ERTA

period (-1.61, $t = -11.7$), although the difference is small. The estimated tax discount then

continues to decrease along with declining tax rates from the ERTA period to the transition year,

1987 (-1.05, $t = -5.3$), and then to the TRA 86 period (-0.90, $t = -6.6$). The estimated discount

then rises along with the dividend tax rate for OBRA 93 period (-1.24, $t = -10.8$). The patterns in

the estimated values of $\$_3$ across the tax regimes also are consistent with the assumptions

underlying the model. A Chow test indicates the differences among the separate periods are

statistically significant ($F = 127$, $p = 0.001$).[22]

The increasing discount for the OBRA 93 period is especially instructive, suggesting that

the general decline in the retained earnings discount documented in Table 2 does not merely

reflect some unidentified, steadily declining non-tax trends. For example, share repurchases are

much more common during the latter part of our sample period than they were in the earlier years.

Therefore it seems plausible that dividend tax capitalization could decline over time as more

equity is distributed from the corporate sector without hitting the dividend tax barrier (as

addressed in more detail in section 4.4). In addition, Poterba (1998, Table A-1) documents a

Table 3.

[21] While we believe it is important to include the interaction term (RE/BV) x (NI/BV) to account for the influence of retained earnings versus contributed capital on the valuation of net income, the cross-tax-regime pattern of estimated (RE/BV) coefficients is qualitatively similar when omitting the interaction term. In particular, the estimated (RE/BV) coefficients are – pre-ERTA: -0.68, $t = -22.4$; ERTA: -0.60, $t = -15.5$; 1987: -0.25, $t = -3.1$; TRA 86: -0.30, $t = -7.5$; OBRA93: -0.66, $t = -17.7$.

[22] The cross-tax-regime pattern in the estimated (RE/BV) coefficient is roughly similar when focusing on NYSE firms only. Specifically, the estimated tax discount is high for the pre-ERTA (-1.37, $t = -7.9$) and ERTA (-1.74, $t = -10.1$) periods, before declining for 1987 (-0.78, $t = -2.6$) and for TRA 86 (-0.77, $t = -5.1$), and then increasing for OBRA 93 (-1.36, $t = -9.6$).

declining weighted-average marginal tax rate on dividends over our sample period, which not only reflects changes in statutory tax rates, but also reflects the rising importance of tax-exempt institutional investors. Despite these potentially important trends, however, the relatively large estimated tax discount for the OBRA 93 period is consistent with individual taxes on dividends continuing to result in a substantial amount of dividend tax capitalization.

Although we have used the consistent estimators recommended by White (1980) to adjust the *t*-statistics reported in Table 2 for the effects of heteroscedasticity, serial correlation in the residuals may still improperly inflate these *t*-statistics. Therefore we also estimate equation (10) separately for each year and find that the estimated (*RE/BV*) coefficient is negative and statistically different from zero for all years, and the estimated (*RE/BV*) x (*NI/BV*) coefficient is positive each year.

In Table 3, we present firm-fixed-effects results. This approach controls for the mean effects of omitted cross-firm variables, including cross-firm variation in risk and discount rates. In addition, including fixed effects removes cross-firm variation in mean agency costs from our estimates. This control for agency costs is important, for the market discount for retained earnings could at least partially result from the possibility that high-(*RE/BV*) firms are over-investing internal funds (see, *e.g.*, Easterbrook, 1984; and Jensen, 1986). In effect, if we assume fixed investor clienteles for each firm within each of the tax regimes, then using fixed effects allows us to focus on the influence of changes in financial structure over time.

Here we divide the sample into four periods instead of five (it is, of course, not possible to estimate fixed effects for the year 1987 alone). The estimated (*RE/BV*) coefficient is negative in each of the four tax regimes. Furthermore, the magnitude of the estimated tax discount declines

along with the decreasing tax rate on dividends from the pre-ERTA period (-0.48, t = -5.8) to the ERTA period (-0.40, t = -3.7), and then to the TRA 86 period (- 0.25, t = -2.6). The estimated discount then rises in the OBRA 93 period (-0.56, t = -5.1). Thus both Table 2 and Table 3 provide evidence that is generally consistent with dividend tax capitalization.

4.3 Robustness Tests

To examine the robustness of our findings for the United States, we examine the extent to which the estimated value of $\$_1$ may be biased by the omission of other variables possibly correlated with (*RE/BV*), including size, discount rates, inflation rates, a firm's stage in its life cycle, or expected growth in earnings. To do so, we begin by including dividends over book value and its interaction with (*RE/BV*) as control variables to capture the possibility that dividend payments are a signal of future economic profits or are correlated in other ways with risk or expected future growth in profitability. We also add firm sales and its interaction with (*RE/BV*) as controls for size. Finally, the relation between current earnings (our empirical variable) and expected future earnings likely varies across firms. Under rational expectations, however, we can use the actual values of future earnings realizations to reflect expectations, so we include lead values of net income (NI_{it+1} and NI_{it+2}) as control variables. After including these additional variables, we continue to find that the estimated (*RE/BV*) coefficient remains negative in all five time periods reported in Table 2. As before, the estimated magnitude of the tax discount declines from the pre-ERTA period to the TRA 86 period, and then rises for OBRA 93. The specific estimates are: pre-ERTA: -1.51, t = -9.0; ERTA: -1.35, t = -7.9; 1987: -0.81, t = -2.2;

TRA 86: -0.69, $t = -4.2$; OBRA 93: -0.89, $t = -4.0$.[23]

In a second sensitivity test, we address the possibility that firms which have recently issued substantial amounts of new equity may have especially low values for (RE/BV), and these equity-issuing firms also may tend to have the greatest potential for future growth in earnings. If so, then the negative estimated coefficients for (RE/BV) in Table 2 could merely reflect a negative relation between (RE/BV) and future earnings prospects. Although our previous test helps control for this possibility by including NI_{it+1} and NI_{it+2} as explanatory variables, we address this concern more directly by reestimating equation (10) for the subsample of observations that do not report any new equity issues during the prior two years. Among this subsample of firms (a total of 38,746 observations), we find the estimated (RE/BV) coefficients are: pre-ERTA: -1.89, $t = -12.5$; ERTA: -1.51, $t = -9.0$; 1987: -1.06, $t = -3.9$; TRA 86: -0.99, $t = -4.6$; OBRA 93: -1.21, $t = -6.2$. This pattern in coefficients is similar to the pattern reported in Table 2, and suggests that the negative (RE/BV) coefficients do not appear to reflect recent equity issues.[24]

In addition to these two sensitivity tests, the firm-fixed-effects results presented in Table 3 help address concerns relating to potential omitted-variable bias. First, younger, fast-growing firms likely have lower levels of accumulated retained earnings than mature firms. By focusing on the "within" effect of retained earnings on valuation, it is evident that the firm-fixed-effects estimates of $\$_1$ and $\$_3$ in Table 3 are not simply driven by unobserved cross-firm heterogeneity in

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[23] Including sales and future earnings realizations as explanatory variables decreases the total sample size for this test to 31,808.

[24] Furthermore, the Pearson and Spearman rank correlations between (RE/BV) and an indicator variable for firms issuing new equity within the last two years are not statistically different from zero.

growth opportunities. Second, inflation induces a departure of the accounting book value of assets from their replacement cost. High-(RE/BV) firms may be older firms with a greater inflation bias in (P/BV). Again, including firm fixed effects reduces the problem. Third, returning to equation (9), variation in firm risk (and hence in D) is obscured in the basic estimation equation; high-risk firms could also be low-(RE/BV) firms. Such a concern is less significant for the within estimates reported in Table 3.

4.4 Share Repurchases

Dividend tax capitalization relies on the assumption that taxable earnings and profits will eventually be distributed as dividends. In practice, however, corporations often distribute accumulated earnings through complete liquidations qualifying for capital gains treatment under Section 331(a) of the Internal Revenue Code, or certain taxable mergers and acquisitions avoiding dividend taxes. In addition, share repurchases have been especially popular in recent years. Accordingly, if investors believe that a substantial portion of earnings will eventually be distributed in one of these non-dividend forms, then these expectations could reduce or even eliminate the expected dividend tax discount for retained earnings.

In regard to our findings, the results presented in Tables 2 and 3 suggest that investors appear to assume firms will eventually distribute at least a large portion of their retained earnings as dividends. Nevertheless, it still is possible that firms' observable equity distribution practices influence the amount of future dividend taxes investors capitalize into share prices. For example, it is possible that no tax discount for retained earnings exists for firms engaging in a substantial amount of share repurchases. Because the accumulated balance of share repurchases are reported in treasury stock on firms' balance sheets, the ratio of treasury stock to total book value (TS/BV)

provides a proxy for cumulative share repurchase practices.[25]

If substantial share repurchases limit the scope of dividend tax capitalization, then the

(RE/BV) and (RE/BV) x (NI/BV) coefficients could be zero for high-(TS/BV) observations. To

explore this possibility, we reestimate equation (10) for observations in the top quartile of

(TS/BV) for each of the tax regimes.   In fact, the estimated (RE/BV) coefficient is negative and

statistically different from zero for all five subperiods, and the estimated (RE/BV) x (NI/BV)

coefficient is positive and statistically different from zero for all tax regimes.[26]

This finding suggests that for the period under investigation, our proxy for share

repurchases is not materially associated with the scope of dividend tax capitalization. This finding

could merely reflect noise in our proxy for share repurchase practices, or it could reflect the fact

that dividends and share repurchases may not be perfect substitutes for nontax reasons (see, *e.g.,*

the discussions in Bernheim, 1991; Sinn, 1991; and Auerbach and Hassett, 1997). The finding

also could reflect the fact that firms often must treat the bulk of the funds they use to repurchase

shares as coming from contributed equity rather than retained earnings (see Internal Revenue

Code Section 312(n)(7)), in which case it is not always clear that a share repurchase eliminates a

material amount of future dividend taxes.[27] Nevertheless, if firms continue to repurchase their

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[25] Measurement error can influence this proxy because repurchased shares are sometimes reissued, as for the exercise of employee stock options.

[26] Qualitatively, results are the same when estimating equation (10) for observations in the top quartile of (SR/BV), where SR equals the amount of cash (from the Statement of Cash Flows) a firm uses to purchase its own stock during the year, except the estimated (RE/BV) coefficient is not statistically different from zero for 1987 (-0.18, t = -0.7).

[27] Under §312(n)(7), any amount paid above the amount of a firm's book value of common equity per share to repurchase the shares (which would occur whenever the market-to-book ratio exceeds unity) is deemed paid from contributed capital, not from retained earnings. In

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own stock, we believe it is possible that the cumulative effect of these repurchases could have a more detectable mitigating influence on dividend tax share price effects in the future.

5. Evidence from Countries Outside the United States

The cross-firm and cross-period evidence in section 4 is generally consistent with tax capitalization. In this section, we further examine share price effects of the dividend tax by focusing on cross-country variation in the taxation of dividends. Outside the United States, several countries provide varying degrees of dividend tax relief in integrated tax systems through the provision of tax imputation credits. We exploit this variation by estimating equation (10) for four countries with different dividend tax regimes: Australia, Japan, France, and Germany. We also estimate equation (10) for two different tax regimes within the United Kingdom.

Australia provides a generous tax imputation credit system that can lead to a negative tax rate on dividends for the marginal investor. If so, then we would expect a positive coefficient for (*RE/BV*). The possibility of a negative tax rate on dividends during this period has been noted by Australian firms. For example, Wesfarmers, Inc. is a major Australian company that has been quite clear that it is exploiting this tax benefit in setting its dividend policy. Following the introduction of integration, Wesfarmers surveyed its shareholders and estimated that the weighted-average shareholder tax rate was less than half of the imputation rate, which created an incentive to increase dividends in conjunction with a dividend reinvestment plan (see Moreton, 1993).

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addition, a ratable portion of any other amounts paid to repurchase shares is deemed paid from contributed capital.

At the other extreme, Japan does not offer tax imputation credits, and dividends often are subject to a special 35 percent tax rate. As in the United States, therefore, we expect a tax discount for retained earnings. France and Germany are intermediate cases, offering generous tax imputations credits to shareholders, but the credits are more limited than the Australian credits and are unlikely to result in negative dividend tax rates for most investors. Specifically, the top individual tax rate in France for our sample period is 56.8 percent, and the credit rate is 33.3 percent. The top rate in Germany ranged from 45 to 56 percent during our sample period, and the German imputation credit rate is 36 percent (30 percent after 1992).

In addition to our focus on these four countries, we also focus on two very different tax regimes existing for the United Kingdom during the sample period. The imputation credit rate remained relatively stable during the sample period, equaling 27 percent through 1988, and then declining to 25 percent through 1993 (the rate dropped to 20 percent for 1994). In contrast, the top personal tax rate in the United Kingdom dropped from 60 percent to 40 percent in 1988. Thus the net tax rate on dividends is substantially lower in the post-1988 period than it is in the pre-1989 period. Hence, we expect the tax discount for retained earnings to be greater in the pre-1989 period than it is in the post-1988 period.

The firm-level sample we use for these tests consists of all Australian, French, German, Japanese, and U.K. companies reported on the 1995 Compustat Global Vantage industrial file, which covers the period from 1984 through 1994. We apply the same sample selection procedures to the non-U.S. samples as we applied to the U.S. sample, leaving 1,034 observations for Australia, 759 for France, 845 for Germany, 6,024 for Japan, 1,787 for the United Kingdom (pre-1989), and 4,076 for the United Kingdom (post-1988).

In Table 4A, we present estimates of the basic model for Japan, France, Germany and Australia. Similar to the U.S. results, the estimated (RE/BV) coefficient is negative and statistically significant for Japan (-1.86, t = -11.1), where tax imputation credits equal zero. In contrast, the estimated (RE/BV) coefficient is positive and statistically significant for Australia (1.13, t = 4.8), where generous imputation credits exist and t_d is expected to be less than zero.[28] The estimated (RE/BV) coefficients for the two partial-integration countries, France and Germany, fall in the middle and are statistically insignificant. Results are qualitatively similar when using firm fixed effects. In particular, the estimated (RE/BV) coefficient is negative for Japan (-1.36, t = -5.5), positive for Australia (1.06, t = 3.0), and statistically insignificant for France and Germany.

Although the results in Table 4A are consistent with cross-country variation in dividend taxation, many nontax factors also vary across countries. Therefore a tax interpretation must be viewed with caution.[29] In contrast, the potentially confounding effects of cross-country variation in nontax factors are not a concern for interpretation of Table 4B, which presents results for the two U.K. tax regimes. As expected, the estimated (RE/BV) coefficient is negative and statistically

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[28] In principle, we would like to compare results for Australia before and after integration, but the Australian data on the Compustat Global Vantage database are not available before 1987. Nevertheless, the finding that Australian tax imputation credits are capitalized into share prices is consistent with the evidence in Bellamy (1994), who finds the ex-dividend price fall is greater for "franked" dividends (*i.e.*, dividends with attached tax imputation credits) than for "unfranked" dividends during the post-1986 period.

[29] Anecdotal evidence consistent with the tax interpretation is found in: "Apples to Apples: Global Telecoms: Number, Please," *Morgan Stanley Dean Witter*, June 12, 1998, page 3. A residual income valuation of Telecom New Zealand yields a value of NZ$5.60 per share when the stock price is NZ$8.40. The difference is attributed to the 33 percent tax imputation credit in New Zealand.

significant in the pre-1989 period (-0.78, t = -4.9), when the top personal tax rate was 60 percent.

In addition, the estimated tax discount decreases when moving to the post-1988 period (-0.10,

t = -1.2), during which the top tax rate dropped to 40 percent. This difference in coefficients

across periods is statistically significant (t = 3.3).[30] The change in the estimated value of β_3 also is

consistent with the predictions from equation (10). When using firm fixed effects, the estimated

(RE/BV) coefficient is -0.84 (t = -2.4) in the pre-1989 period, and 0.76 (t = 4.2) in the post-1988

period. Again, the difference is statistically significant (t = 4.1).

Analogous to the specification check reported in section IV for the U.S. sample, we

reestimate equation (10) for each non-U.S. country after including dividends, sales, and future net

income, all scaled by book values, as control variables.[31] None of these control variables

materially affects the results.

6. Conclusions and Implications

Understanding the role of taxes in capital structure, investment, and tax policy contexts

requires an understanding of how investor tax rates on dividends influence asset values and rates

of return. In particular, financial economists have focused considerable attention on the questions

of whether permanent changes in the dividend tax are capitalized in equity values, and how

dividend taxes affect marginal required rates of return on equity. Answers to these questions

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[30]This result is qualitatively consistent with the findings of Lasfer (1995), who uses an ex-dividend-day price reaction approach and finds a larger tax price effect in the pre-1989 period than in the post-1988 period.

[31] Given the limited number of years included in the non-U.S. samples, we only include the one-period lead value for net income in the test.

influence the evaluation of dividend policy and optimal capital structure.[32]

Despite the significance of the firm valuation effects of dividend taxes, much empirical research has examined the corporate financial policy predictions of alternative models of dividend decisions, without conclusive results regarding tax capitalization. Taking a different approach, we begin by assuming that normal profits equal the required rate of return times the total amount of after-tax funds investors have at stake in the firm. We then use this assumption to design tests that exploit firm-level variation in the ratio of retained earnings to total book value to examine the hypothesis that retained earnings are valued less than dollar-for-dollar, consistent with capitalization of future dividend taxes. Our evidence for U.S. firms is consistent with the expected tax discount for retained earnings, and this result is robust to a variety of controls for alternative explanations. In addition, evidence from countries outside the United States, including countries with integrated tax systems, generally corroborates our findings for the United States.

These results support the hypothesis that at least a substantial portion of the dividend tax is capitalized in equity values. This evidence need not, however, contradict the roles often stressed for signaling and agency factors in firm decisions. With respect to signaling, for example, tax capitalization suggests that all else being equal, the higher the expected future earnings, the greater the amount of expected internal funds available to finance investment, and the more likely

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[32] Dividend tax capitalization also influences the optimal investment strategies of multinational corporations, at least by analogy. Cummins and Hubbard (1995) assume that future U.S. corporate "dividend taxes" on repatriated earnings from overseas subsidiaries in low-tax countries are capitalized in share prices. Collins, Hand, and Shackelford (1997) offer empirical evidence in support of this proposition, even for subsidiary income classified as "permanently reinvested earnings" by the parent corporation. This suggests that multinationals bear the burden of corporate repatriation taxes, whether or not current repatriation occurs, thus limiting the tax benefits of investing in low-tax countries.

a firm can pay dividends without requiring the issuance of costly new equity (or without incurring new debt when the shadow cost of borrowing is high). Hence it is less costly for good firms to pay dividends than for weak firms to pay dividends, illustrating that dividend tax capitalization could support the use of dividends as a signal.

Similarly, dividend tax capitalization does not preclude an important role for agency costs in firm financial policy. Easterbrook (1984) and Poterba and Summers (1985) argue, for example, that shareholders weigh the tax costs of dividends against the benefits of using dividends to reduce managers' discretion over internal funds. Given any non-tax positive costs for adjusting dividends (*e.g.*, signaling costs), however, it is plausible that it is less costly to adjust financial slack, managerial compensation, or other margins to reduce agency costs than it is to adjust dividends (see, *e.g.*, Himmelberg, Hubbard, and Palia, 1999).

At least two fronts are suggested for future work. First, institutional ownership of shares has increased substantially in the 1990s, raising the question of whether dividend tax capitalization may vary between high-institutional-ownership and low-institutional-ownership firms. Second, additional work is needed to integrate debt with retained earnings and contributed capital in more comprehensive studies of capital structure that consider dividend tax capitalization and the costs of adjusting alternative financing and control mechanisms.

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TABLE 1A

Descriptive Statistics Among All Variables for the U.S. Sample of Firms
Panel A: Pre-ERTA Period, 1975-1981, n = 20,693

Variable	Mean	Minimum	1st Quartile	Median	3rd Quartile	Maximum
P_{it}	18.09	0.03	8.00	15.13	24.75	97.25
BV_{it}	17.15	0.01	7.70	14.09	23.38	73.12
RE_{it}	11.56	0.00	4.22	8.81	16.15	61.08
NI_{it}	2.38	0.00	0.99	1.99	3.32	10.95
P_{it}/BV_{it}	1.34	0.05	0.68	0.96	1.56	9.99
RE_{it}/BV_{it}	0.63	0.00	0.48	0.70	0.82	1.00
NI_{it}/BV_{it}	0.15	0.00	0.10	0.14	0.18	1.89

Panel B: ERTA Period, 1982-1986, n = 16,204

Variable	Mean	Minimum	1st Quartile	Median	3rd Quartile	Maximum
P_{it}	20.45	0.03	9.13	17.13	28.00	98.00
BV_{it}	14.53	0.01	5.13	10.51	20.50	74.63
RE_{it}	9.36	0.00	2.08	5.85	13.31	61.31
NI_{it}	1.84	0.00	0.55	1.28	2.65	11.01
P_{it}/BV_{it}	1.87	0.04	1.00	1.44	2.28	9.97
RE_{it}/BV_{it}	0.57	0.00	0.36	0.60	0.79	1.00
NI_{it}/BV_{it}	0.14	0.00	0.08	0.13	0.17	1.67

Panel C: 1987, n = 3,055

Variable	Mean	Minimum	1st Quartile	Median	3rd Quartile	Maximum
P_{it}	17.18	0.03	6.75	13.75	23.63	98.00
BV_{it}	11.97	0.01	4.47	8.70	16.71	65.78
RE_{it}	7.12	0.00	1.55	4.18	9.84	60.27
NI_{it}	1.51	0.00	0.50	1.06	2.08	9.35
P_{it}/BV_{it}	1.80	0.05	1.00	1.41	2.13	9.88
RE_{it}/BV_{it}	0.53	0.00	0.32	0.54	0.76	1.00
NI_{it}/BV_{it}	0.14	0.00	0.08	0.13	0.17	0.87

Panel D: TRA 86 Period, 1988-1992, n = 13,712

Variable	Mean	Minimum	1st Quartile	Median	3rd Quartile	Maximum
P_{it}	19.29	0.03	7.75	15.75	26.75	98.00
BV_{it}	12.06	0.01	4.76	9.04	16.55	73.53
RE_{it}	7.28	0.00	1.59	4.50	10.13	60.74
NI_{it}	1.49	0.00	0.47	1.06	2.09	10.80
P_{it}/BV_{it}	1.98	0.03	1.07	1.54	2.40	9.92
RE_{it}/BV_{it}	0.53	0.00	0.32	0.54	0.76	1.00
NI_{it}/BV_{it}	0.13	0.00	0.08	0.13	0.17	1.57

Panel E: OBRA 93 Period, 1993-1997, n = 18,956

Variable	Mean	Minimum	1st Quartile	Median	3rd Quartile	Maximum
P_{it}	21.61	0.01	10.25	18.38	29.00	98.00
BV_{it}	11.43	0.04	5.27	9.33	15.58	73.41
RE_{it}	6.15	0.00	1.42	3.99	8.53	59.83
NI_{it}	1.39	0.00	0.53	1.08	1.88	10.88
P_{it}/BV_{it}	2.28	0.02	1.26	1.82	2.81	9.99
RE_{it}/BV_{it}	0.49	0.00	0.25	0.47	0.70	1.00
NI_{it}/BV_{it}	0.13	0.00	0.08	0.12	0.16	0.93

Notes:

P_{it} is fiscal year end price per share for firm i at period t.
BV_{it} is book value of shareholders' equity per share for firm i at period t.
RE_{it} is book value of retained earnings per share for firm i at period t.
NI_{it} is net income per share for firm i at period t.

TABLE 2

OLS Results by Tax Regime for the United States

$$\frac{P_{it}}{BV_{it}} = \alpha_0 + \gamma_t + \beta_1 \frac{RE_{it}}{BV_{it}} + \beta_2 \frac{NI_{it}}{BV_{it}} + \beta_3 \frac{RE_{it}}{BV_{it}} * \frac{NI_{it}}{BV_{it}} + \epsilon_{it}$$

	Tax Regime	α_0	β_1	β_2	β_3	n	*Adj.R²*
United States	Pre-ERTA Top Rate: 70%	1.38 (16.3)	-1.69 (-13.2)	2.59 (4.3)	6.72 (7.5)	20693	0.23
United States	ERTA Top Rate: 50%	1.85 (21.0)	-1.61 (-11.7)	3.01 (5.2)	6.56 (6.1)	16204	0.19
United States	1987 Top Rate: 38.5%	1.42 (12.6)	-1.05 (-5.3)	3.48 (3.9)	6.01 (3.9)	3055	0.21
United States	TRA 86 Top Rate: 28%-33%	1.47 (20.0)	-0.90 (-6.6)	5.14 (8.2)	4.08 (3.7)	13712	0.23
United States	OBRA 93 Top Rate: 39.6%	1.68 (30.8)	-1.24 (-10.8)	6.96 (14.3)	4.45 (4.7)	18956	0.23

Notes: *t*-statistics are in parentheses and are based on the consistent standard errors recommended by White (1980). P_{it} is the fiscal year end price per share for firm *i* at period *t*. BV_{it} is book value of shareholders' equity per share for firm *i* at period *t*. RE_{it} is the book value of retained earnings per share for firm *i* at period *t*. NI_{it} is net income per share for firm *i* at period *t*. Year effects (γ_t) are included.

TABLE 3
TABLE 3
Fixed-Effects Results for the United States

$$\frac{P_{it}}{BV_{it}} = \alpha_i + \gamma_t + \beta_1 \frac{RE_{it}}{BV_{it}} + \beta_2 \frac{NI_{it}}{BV_{it}} + \beta_3 \frac{RE_{it}}{BV_{it}} * \frac{NI_{it}}{BV_{it}} + \epsilon_{it}$$

	Tax Regime	$\$_1$	$\$_2$	$\$_3$	n	$\bar{R}^2$
United States	Pre-ERTA Top Rate: 70%	-0.48 (-5.8)	1.63 (8.9)	2.74 (9.5)	20693	0.81
United States	ERTA Top Rate: 50%	-0.40 (-3.7)	5.02 (19.0)	-1.45 (-3.6)	16204	0.82
United States	TRA 86 Top Rate: 28%-33%	-0.25 (-2.6)	4.33 (19.9)	0.25 (0.7)	16767	0.82
United States	OBRA 93 Top Rate: 39.6%	-0.56 (-5.1)	6.54 (25.5)	-1.75 (-3.9)	18956	0.82

Notes: *t*-statistics are in parentheses. P_{it} is the fiscal year end price per share for firm *i* at period *t*. BV_{it} is the book value of shareholders' equity per share for firm *i* at period *t*. RE_{it} is the book value of retained earnings per share for firm *i* at period *t*. NI_{it} is net income per share for firm *i* at period *t*. Firm and year effects are included.

OLS Results for Japan, France, Germany, and Australia from 1984-1994
(All Australian Observations Occur After 1987)

$$\frac{P_{it}}{BV_{it}} = \alpha_0 + \gamma_t + \beta_1 \frac{RE_{it}}{BV_{it}} + \beta_2 \frac{NI_{it}}{BV_{it}} + \beta_3 \frac{RE_{it}}{BV_{it}} * \frac{NI_{it}}{BV_{it}} + \epsilon_{it}$$

	Tax Regime	α_0	β_1	β_2	β_3	n	$\bar{R}^2$
Japan	Special Div. Rate:35%	2.79 (42.4)	-1.86 (-11.1)	6.90 (8.6)	2.10 (1.0)	6024	0.29
France	Partial Integration: Benefit for Some Tax-Exempts	1.19 (10.4)	0.34 (0.9)	5.0 (5.9)	1.43 (0.6)	759	0.19
Germany	Full Integration: No Benefit for Tax-Exempts	1.33 (10.4)	0.44 (1.3)	8.65 (7.7)	-5.51 (-1.9)	845	0.14
Australia	Full Integration: Benefit for Key Tax-Exempts	0.60 (8.9)	1.13 (4.8)	7.14 (14.0)	-3.51 (-2.6)	1033	0.34

TABLE 4B

	Tax Regime	α_0	β_1	β_2	β_3	n	$\bar{R}^2$
UK	Pre-1989 Partial Integration Top Rate: 60%	0.67 (10.1)	-0.78 (-4.9)	6.82 (14.4)	5.45 (6.1)	1787	0.53
UK	Post-1988 Partial Integration Top Rate: 40%	0.67 (17.7)	-0.10 (-1.2)	7.97 (24.8)	2.41 (4.3)	4075	0.51

Notes: t-statistics are in parentheses and are based on the consistent standard errors recommended by White (1980). P_{it} is the fiscal year end price per share for firm *i* at period *t*. BV_{it} is book value of shareholders' equity per share for firm *i* at period *t*. RE_{it} is the book value of retained earnings per share for firm *i* at period *t*. NI_{it} is net income per share for firm *i* at period *t*. Year effects (γ_t) are included.