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THE RELATIONSHIP BETWEEN R&D INVESTMENT AND DIVIDEND PAYMENT TAX INCENTIVES AND THEIR ROLE IN THE DIVIDEND TAX PUZZLE

BY

MARY CATHERINE CLEAVELAND

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree
of
Doctor of Philosophy
in the Robinson College of Business
of
Georgia State University

GEORGIA STATE UNIVERSITY
ROBINSON COLLEGE OF BUSINESS
2006

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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor in Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

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Abstract

THE RELATIONSHIP BETWEEN R&D INVESTMENT AND DIVIDEND PAYMENT TAX INCENTIVES AND THEIR ROLE IN THE DIVIDEND TAX PUZZLE

By

Mary Catherine Cleaveland

August 2006

Committee Chair: Dr. Ernest Larkins

Major Department: Accounting

Although much research on corporate dividend policy exists, the evidence is far from conclusive. Understanding how dividend taxes affect firm-level decisions is crucial to evaluating dividend imputation credits which provide shareholder-level tax credits for dividends received or decreased shareholder-level dividend tax rates, which reduce the double taxation of dividends. Using changes in New Zealand and Australia's tax regimes, this dissertation provides new evidence on the relationship between tax incentives for R&D investment and dividend payment. The results show that the theory that the tension between R&D investment and dividend payment decreases when a country previously not offering tax incentives for R&D investment or dividend payout, implements one, does not hold using New Zealand firms. Further, New Zealand dividend-paying firms with higher marginal tax rates behave in the manner predicted for firms moving from a tax regime offering a tax incentive for R&D investment to a tax regime offering tax incentives for both R&D investment and dividend payment. The results using Australian data, demonstrate that that the tension between R&D investment and dividend payment increases when a country previously offering only a tax incentives for R&D investment, offers one for both R&D investment and dividend payment. This result is driven by firms with high marginal tax rates. These findings demonstrate that the relationship between tax incentives for R&D investment and dividend payment varies according to firm marginal tax rates and typical dividend payment policies. It also reiterates the importance of considering firms' abilities to use R&D tax incentives, via their marginal tax rates, when contemplating the effects a shareholder-level dividend tax decrease will have on R&D investment. This dissertation also provides new insight into the corporate dividend policy views. The results support the double taxation and tax irrelevance views in dividend-paying firms operating in a tax regime with dividend imputation and capital gains taxes. By documenting a significant decrease in R&D investment after a change in dividend taxes, this dissertation also highlights a void in the current corporate dividend policy views and shows the need for the inclusion of R&D investment.

Chapter I

Introduction

The role shareholder-level taxes play in corporations' decisions to pay dividends is still debated in academic research. Since Black (1976) posed the questions of why corporations pay dividends given their tax disadvantages and why investors appear to pay attention to them, researchers have tried to explain corporations' dividend policies (McKenzie and Thompson 1997, Miller and Scholes 1978). Poterba and Summers (1985, 1) reiterate Black's ideas and they demonstrate that when governments tax corporate profits at the corporate level and again when they are distributed to shareholders as dividends, corporations should not pay dividends. Shareholders should prefer that corporations retain earnings where they can continue to be invested by the corporation and increase the corporation's value (Poterba and Summers 1985). Since paying dividends is common among U.S. corporations, corporate dividend policy is obviously not this straightforward (Poterba 1987, John and Williams 1985, Poterba and Summers 1985).[1]

Though much research on corporate dividend policy exists, the evidence is far from conclusive (Blouin et al. 2004, Fama and French 1998, Zodrow 1991, Easterbrook 1984). Understanding how dividend taxes affect firm-level decisions is crucial to evaluating dividend imputation credits (McKenzie and Thompson 1997, 465) which provide shareholder-level tax credits for dividends received or decreased shareholder-level dividend tax rates, which reduce the double taxation of dividends. Three perspectives on how shareholder-level taxes affect firms' dividend-paying decisions dominate the literature: the tax irrelevance view, the tax capitalization (or residual) view, and the double taxation view (McKenzie and Thompson 1997, Zodrow 1991, Poterba 1987, Poterba and Summers 1985). These three views differ as to why corporations pay

[1] The number of firms paying dividends has actually decreased by over 50 percent during the last two decades while the number of listed firms has increased (Fama and French 2001, 11).

dividends, how dividend taxes at the shareholder-level affect dividend payment, and what changes in shareholder-level dividend tax policy mean for corporate investment.[2]

The *tax irrelevance view* states that shareholder-level taxes are irrelevant in the corporation's decision to pay dividends because marginal investors do not demand greater pre-tax returns from dividend-paying corporations (Miller and Scholes 1978, Miller and Modigliani 1961). That is, shareholders do not expect the corporation to bear the economic burden of the shareholder-level dividend tax by requiring a greater pre-tax return such that they receive a minimum desired after-tax return. According to this view, a change in shareholder-level dividend taxes would not alter corporate distribution decisions (Poterba and Summers 1985, 13).

The *tax capitalization view*, also known as the residual view, states that the market value of a corporation's assets incorporates the present value of expected dividends net of their taxes (Auerbach 1979, King 1977). Thus, future taxes on expected dividends are capitalized into price, reducing share prices. This view assumes corporations use retained earnings to finance marginal corporate investments.[3] Corporations only pay dividends when they have cash remaining after satisfying all other obligations and making all corporate investment decisions. Further, they pay dividends when an alternative tax-advantaged method of distributing the income (sometimes referred to as "trapped equity") does not exist (Zodrow 1991, Auerbach 1979, King 1977). According to this view, a decrease in shareholder-level dividend taxes increases the stock price but does not alter corporate investment decisions or dividend payments (Poterba and Summers 1985, 17, McKenzie and Thompson 1997, 464).

The third view, the *double taxation perspective*, contends that despite dividends' tax disadvantage, the market rewards corporations for paying dividends by increasing corporate value (stock price). Proponents of this view do not claim to know the reason for the reward, but simply

---

[2] Each dividend tax policy view is reviewed in detail in Chapter 2, Section 2.
[3] Throughout this paper, the term "corporate investment" includes both plant, property, and equipment and R&D investment. "Capital investment" refers only to plant, property, and equipment; it does not include R&D investment.

accept that the market rewards corporations for paying dividends (Poterba and Summers 1985, McClure 1977). According to this view, a decrease in the taxation of dividends reduces a corporation's cost of equity capital because it reduces the corporation's cost of receiving the market's reward for paying dividends—an increase in stock price. This reduction in the corporate cost of equity capital increases the dividend payment.

The tax irrelevance and tax capitalization views hold that dividend taxes do not impact corporate dividend policy and thus, do not directly affect dividend payments. The tax irrelevance view predicts that pre-tax dividend payments will not change after implementing a dividend imputation credit. Thus, a decrease in dividend taxes will not increase the shareholder's pre-tax dividend income. The tax capitalization view predicts that any change in the pre-tax dividend payment will result from a change in the corporation's profitable alternatives to dividend payments, not changes to the shareholder-level dividend tax rate.

Only the double taxation view predicts that dividend payments will increase as a direct result of a decrease in shareholder-level dividend tax rates. Since shareholders will not have to pay as much tax on the dividends they receive, the corporation's marginal cost of paying dividends (and, thus, increasing its stock price) declines further, reducing the cost of equity capital. In summary, decreasing the taxation of dividends lowers the corporation's cost of capital, increasing capital investment and rates of return, which increases dividend payment (Zodrow 1991, 503, Poterba and Summers 1985, 21).

Blouin et al. (2004) find evidence that immediately following The Job and Growth Tax Relief Act of 2003 (henceforth 2003 Act), which reduced the tax shareholders pay on dividend income, the payment of dividends increased.[4] Using the quarters surrounding the enactment of the 2003 Act, Blouin et al. (2004) document a significant increase in dividends. However, they do not

[4] Prior to 2003, dividends that individuals received were taxed at ordinary income tax rates as high as 38.6 percent. Beginning in 2003, dividends that individuals receive from domestic corporations and qualified foreign corporations are taxed at only five percent if the individuals are in the two lowest tax brackets and 15 percent otherwise (Grace 2003).

find support for their hypothesis that the portion of a firm's shareholders consisting of individuals (i.e., shareholders that the 2003 Act directly affected) influenced the dividend payment. Without this support and given overall economic improvements occurring during their study, they are "hesitant to conclude that tax rates cut caused dividends to increase" (Blouin et al. 2004, 4). The report from the Treasury's Office of Economic Policy also shows that 134 previously non-dividend-paying companies paid dividends in 2003 after President Bush signed the new legislation (Treasury Office of Economic Policy 2003).

Blouin et al. (2004) also document a decrease in the number of share repurchases after the 2003 Act. While their model does not control for uses of funds other than dividends and share repurchases, prior research documents that a decrease in shareholder-level dividend taxes increases capital investment. The decrease in shareholder-level dividend taxes lowers firms' average cost of capital by encouraging equity versus debt financing. This reduction in the cost of capital leads to an increase in capital investment (Dhaliwal et al. 2003, Black et al. 2000, Cummins et al. 1994, Auerbach and Hassett 1991, Jorgenson 1963). However, according to Partington's funds-flow identity (1985), sources of funds must equal uses of funds. In other words, managers can only allocate resources that are actually available. Assuming resources are fixed, this implies that following a shareholder-level dividend tax decrease, the increases in the capital investment and dividend payment would have to be funded by either the decrease in the average cost of capital or the decrease in share repurchases. Otherwise current and prior years' earnings and funds previously allocated to R&D investments would be needed to help offset increases in capital investment and dividend payment.

Though inconclusive, two prior studies suggest that shareholder-level dividend tax credits also lead to decreases in R&D investment (Thomas et al. 2003, Black et al. 2000). The idea that investment in R&D may decrease as a result of shareholder-level dividend tax credits is concerning since evidence has shown that domestic R&D spending is linked to both the rate of innovation and the ability to learn from others (Cameron, 1996; Salter and Martin, 2001). Black

et al. (2000) investigate the effect the implementation of dividend imputation credits in Australia and New Zealand had on capital investment, hypothesizing an increase in capital investment after dividend imputation.[5] They initially define their dependent variable, capital investment, as the change in the sum of plant, property, and equipment and annual R&D expenditures and then as the change in each separate component.[6] Their independent variable for dividend payment is the dividend payout ratio which represents the ratio of cash dividends to net earnings, controlling for variations in dividend payments due to corporate earnings.

When Black et al. (2000) use Australian data and run an ordinary least squares regression with the dependent variable defined as just annual R&D expense, their initial significant positive result between the change in the sum of plant, property, and equipment and annual R&D expenditures and the existence of a dividend imputation credit becomes significantly negative. This significant negative relationship suggests that, after Australia implemented the dividend imputation credit in 1988, R&D investment declined despite the fact that Australia also offered an incentive for R&D investment. Interestingly, the relationship between R&D expenditures and the dividend payout ratio before and after the existence of dividend imputation credits is insignificant. Further the entire model becomes insignificant when they run the regression using New Zealand data. Due to insignificant relationships between capital investment (defined as plant, property, and equipment and R&D investment) and the dividend payout ratio throughout the tax change, Black et al. (2000) concluded that dividend imputation credits did not affect dividend payout ratios. This finding conflicts with the Blouin et al. (2004) U.S. study which concluded that reduced shareholder-level dividend tax rates increase dividend payments (Blouin et al. 2004).

[5] Again, dividend imputation credits decrease the double taxation of dividends by providing shareholders dividend tax credits for taxes the corporation pays.
[6] Their use of "capital investment" differs from this paper, which defines corporate investment as both plant, property, and equipment and R&D investment and capital investment as only plant, property, and equipment.

Since Black et al. (2000) focus on changes in capital investment (rather than the relationship between R&D investment and dividend payment), they run an OLS regression with capital investment as the dependent variable and the dividend payout ratio as an independent variable. Prior research suggests that R&D investment and dividend payment are determined in conjunction with each other (Partington 1985). When a dependent variable (corporate investment) is decided in conjunction with an independent variable (dividend payment), simultaneous equations should be used to correct for the correlation between the independent variable and the error term (Wooldridge 2002, Johnston and DiNardo 1997). Thus, the OLS regression Black et al. (2000) used would not correct for the correlation between the dividend payout ratio and the error term, and simultaneous equations should be used to assess the relationship between R&D expense and dividend payment.

Thomas et al. (2003) use simultaneous equations to analyze the relationship between R&D expense and dividend payment. They investigate three different tax regimes which vary in the tax incentives they provide for paying dividends and investment in R&D.[7] The first regime, consisting of the United Kingdom and Germany, provides incentives for paying dividends but not investing in R&D. In the second and third regimes, France and Canada provide incentives for paying dividends and investing in R&D, and the United States and Japan provide incentives for investing in R&D but not paying dividends. Thomas et al. (2003) find that the negative relationship between R&D expense and dividend payment is stronger, indicating greater tension, in tax regimes providing incentives for both R&D investment and dividend payments than in tax regimes permitting only one of the incentives. One way to interpret this result is that firms operating in countries offering incentives for both R&D investments and dividend payment have more difficulty allocating funds to one over the other, creating a stronger negative relationship between the two.

[7] In these tax regimes, Thomas et al. (2003) do not classify countries with only a 100 percent R&D deduction as offering incentives for investment in R&D. This is consistent with the R&D literature.

However, contrary to Berger (1993), Brown (1985) and Eisner and Sullivan (1984), Thomas et al. (2003) do not find their theorized positive relationship between R&D incentives and R&D investment. If R&D incentives motivate R&D investment, the R&D incentive should be positively related to the amount invested in R&D. They argue that their "cross-country research design incorporating dividends as well as investment finds that the relation is more complex than previously understood in countries whose firms are responding to both R&D credits and imputation credits" (p. 49). The lack of support could indicate a problem in the model they tested. Prior research has indicated that different countries' R&D tax incentives vary in the amount of credit they provide to corporations within their regime and that it is important to consider a firm's ability to use R&D tax incentives (Billings et al. 1994, Berger 1993, Eisner and Sullivan 1984).[8] Thomas et al. (2003) do not control for the magnitude of the R&D incentive nor the firm's current tax position.

Using simultaneous equations and controlling for both the amount of R&D tax incentive offered in two similar countries and the ability of corporations to use the R&D tax incentive, this paper performs an event study to investigate the role R&D tax incentives and dividend imputation credits play in the dividend tax puzzle. Analyzing tax changes within two different but similar countries, Australia and New Zealand, this study controls for the benefit the R&D tax incentive provides the firm by including marginal tax rates. The marginal tax rate (henceforth MTR) is the rate that would be used to calculate the additional tax liability resulting from one additional dollar of income. Unlike many event studies in tax research, the tax changes in Australia and New Zealand included few significant tax reforms, allowing for a relatively clean experimental design. In July of 1985 Australia implemented an R&D investment tax incentive, creating a setting in which to investigate the effect of moving from a tax regime offering neither tax incentives for R&D investment nor dividend payment to offering only a tax incentive for R&D investment.

[8] For example, investment tax credits or foreign tax credits may lower the tax liability such that it is too small to fully use the R&D credit (Billings et al. 1994, 21).

During the late 1980s, both Australia and New Zealand began offering dividend imputation credits. Since at the time of dividend imputation, the two countries treat R&D investment differently, comparing their responses to the dividend tax changes provides new evidence on (1) the relationship between R&D investment incentives and dividend payment incentives and (2) dividend tax policy views.

I find that when moving from a tax regime offering tax incentives for neither R&D investment nor dividend payout to one offering a tax incentive for R&D investment, firms do not exhibit the weaker inverse relationship between R&D expense and dividend payment predicted in Thomas et al. (2003).[9] Further, firms do not exhibit their predicted decrease in the negative relationship between R&D expense and dividend payment when moving from a tax regime offering tax incentives for neither R&D investment nor dividend payout to one offering a tax incentive for dividend payment. Contrary to Thomas et al.'s (2003) prediction, I find that dividend-paying firms with higher MTRs actually experience an increase in the negativity of the relationship between R&D investment and dividend payout when they move from a tax regime offering tax incentives for neither R&D investment nor dividend payout, to one offering a tax incentive for dividend payment. This relationship between R&D expenses and dividend payment does not change in firms with lower MTRs, after dividend imputation.

This finding has three implications for the literature. First, it demonstrates the importance of factoring a firm's tax status into models investigating tax changes. Second, it demonstrates the importance of factoring a firm's typical dividend payment policy into these models. Third, it highlights a potential oversight in much of the literature evaluating the effectiveness of R&D tax incentives—the potential for 100 percent deductibility of R&D to act as an incentive for R&D investment. I find that when dividend imputation is implemented, dividend-paying firms with higher MTRs, receiving only 100 percent deductibility for R&D investment, react in a manner

[9] The terminology "weaker inverse relationship" means a decrease in the inverse or negative relationship.

similar to firms operating under a tax regime offering an additional tax incentive for R&D investment.

I also confirm Thomas et al.'s (2003) finding that the relationship between R&D expenses and dividend payout is stronger (more negative) in dividend-paying firms operating in a tax regime offering a tax incentive for both R&D investment and dividend payment than in a tax regime offering a tax incentive for only R&D investment. I demonstrate this by documenting an increase in the negativity of the relationship between R&D investment and dividend payment as firms actually move from a tax regime offering only an R&D incentive to one offering a tax incentive for both R&D investment and dividend payment. Further, I demonstrate that this finding is driven by firms with higher MTRs.

This improved understanding of the relationship between R&D expense, dividend payment, and firm MTRs provides policymakers with more insight as to how different firms operating within a country will react to changes in the tax incentives for R&D investment and dividend payments. Further, the documented decrease in R&D investment following the implementation of dividend imputation in a tax regime not offering an R&D tax incentive reiterates the potential for changes in shareholder-level dividend taxes to alter other uses of corporate funds.

The three views of corporate dividend policy, the tax irrelevance view, the tax capitalization view and the double taxation view, are not necessarily mutually exclusive. They could each hold true for certain corporations under certain conditions (Poterba and Summers 1985, 2). My research design allows me to (1) separate firms that, before the tax change, typically paid dividends from those which did not and (2) separate firms in a tax position to use an R&D incentive from those not in such a position. I then analyze each group's reaction to the dividend imputation credit to determine which corporate dividend policy view they follow.

I find that for dividend-paying firms operating under a tax regime which offers dividend imputation but taxes capital gains, the double taxation and tax irrelevant views of corporate

dividend policy are most descriptive. I also find significant decreases in R&D investment when a tax regime not offering tax incentives for dividend payment or R&D investment implements a tax incentive for dividend payments. Current dividend policy views do not include R&D investment in their predictions and researchers tend to add it to capital investment to determine a firm's overall investment. This paper documents a negative relationship between the two and demonstrates the importance of looking at R&D investment separate from capital investment.

This paper proceeds by further explaining the settings in New Zealand and Australia which provide the data used to address the research questions. Chapter II also reviews each of the three corporate dividend policy views. Chapter III provides a literature review of the three corporate dividend policy views, demonstrating that the evidence is inconclusive. Since the paper also investigates the relationship between shareholder-level dividend taxes and R&D corporate-level taxes, Chapter III includes a review of reactions to changes in R&D corporate-level taxes and research indicating a relationship among dividends, investment, and their respective taxes. Chapter IV provides the theory behind the model used in the empirical analysis. Chapter V develops the hypotheses, and Chapter VI discusses the data and presents the model. Chapter VII presents the results of the empirical analysis, and Chapter VIII discusses the implications of the paper and its findings.

Chapter II

Country Settings and Corporate Dividend Policy Views

Country Settings

Effective July of 1985, Australia permitted companies to deduct 150 percent of their R&D cost if the total annual R&D expenditure was greater that 20,000 Australian dollars, and they registered with the Industry Research and Development Board. This board strictly monitored R&D eligibility (Parliament of Australia: Senate Committee Report on Business Taxation Reform, chapter 7, paragraph 1). As shown in Table 1, Panel A, prior to July of 1985, firms were permitted to deduct 100 percent of R&D.[10] In July of 1987, Australia implemented a dividend imputation credit in the form of a dividend tax credit.[11] The dividend tax credit enabled shareholders to receive a credit known as a "franking credit" for the portion of dividends paid out of a company's after-tax profit or "franked dividends" (Petty et al. 2000, 30).[12] Thus, shareholders calculated their imputed credit on fully-franked dividends as follows:

$$\text{Imputation Credit} = \frac{\text{Dividends} * \text{Company tax rate}}{1 - \text{Company tax rate}}$$

Shareholders report the amount of the "franked dividend" they receive plus the imputation credit in their gross incomes (where the addition of the imputation credit "grosses up" the dividend received to a before-tax amount). They then claim the imputation credit against their tax liability (Petty et al. 2000, 31). For example, in 1988 when the maximum corporate and individual tax rates were both 48 percent, without dividend imputation, an Australian individual receiving a dividend of $100 from an Australian corporation in the 48 percent tax bracket would have reported $100 in gross income and been liable for $48.00 in taxes. However, with dividend imputation, the individual reported not only the $100 in gross income but also the $92.31

[10] Australia operates on a July-June tax year instead of a calendar year.
[11] Again, dividend imputation credits reduce the double taxation of dividends by providing shareholder-level tax credits for dividends received or decreased shareholder-level dividend tax rates.
[12] Australia refers to its imputation credit as a franking credit. To be consistent with the terminology in the literature, this paper continues to refer to it as an imputation credit.

imputation credit, calculated according to the above equation. The resulting $192.31 total increase in gross income, increased the individual shareholder's tax before credits by $92.31 (i.e. $192.31 times 48 percent individual tax rate). This $92.31 tax liability is fully offset when the $92.31 imputation credit is applied against it. Thus, the individual effectively received the $100 dividend from the corporation free of additional tax.

As summarized in Panel B of Table 1, Australia also added an individual-level capital gains tax in July 1987. Prior to this date, individuals only paid tax on the gain from selling shares if they held the shares less than 12 months. Since July 1987, when individuals hold shares over one year, they pay tax on the difference between the sale price and the shares' cost, indexed for inflation. They then include this gain in gross income where it is taxed at regular rates. However, shareholders no longer pay tax on fully-franked dividends they receive while holding the stock (Thomas and Sellers 1994, 87).

Prior to April of 1988, New Zealand taxed individual residents' worldwide taxable incomes, including dividends, at a three-rate scale of 15, 30, and 48 percent (Cameron 1996). In April of 1988, the three-rate scale on individual residents' worldwide incomes was reduced to a two-rate scale of 24 and 34 percent.[13] As Panel C of Table 1 shows, corporate rates also fell from 48 to 33 percent (Brash, 1996). At this time, New Zealand also implemented a dividend imputation credit (Prevost et al. 2002, 1100).

Similar to Australia's dividend imputation credit, New Zealand residents include dividends received plus the corporate tax on these dividends (i.e. gross-up amount) in gross income. They then offset their individual tax liabilities with the tax the corporation has already paid, i.e. imputation credit (Prevost et al. 2002, 1081). Prior to 1988, New Zealand permitted corporations a 100 percent deduction for R&D expenditures. While the tax changes in 1988 did

[13] New Zealand operates on an April-March tax year instead of a calendar year.

not alter the R&D deduction, the 15 percent reduction in the maximum corporate tax rate reduced the value of deducting R&D expenditures (Brash, 1996).[14]

The settings in Australia and New Zealand provide unique opportunities in which to test the relationship between R&D investment and dividend payment. Australia went from a tax regime without tax incentives for R&D investment or dividend payment to a tax regime with a tax incentive only for R&D investment and then to a tax regime with tax incentives for both R&D investment and dividend payment. New Zealand went from a tax regime without tax incentives for R&D investment or dividend payment to a tax regime offering a tax incentive for dividend payments.[15]

Corporate Dividend Policy Views

The three views explaining why corporations pay dividends, the tax irrelevance view, the tax capitalization view and the double taxation view, differ in the calculation of the corporation's cost of capital and the components included in this calculation. This difference leads to varying predictions in the event of a change in shareholder-level dividend taxes. This section reviews each corporate dividend policy view's calculation of corporate cost of capital and prediction of alterations in behavior following a change in shareholder-level dividend taxes.

Tax Irrelevance View

In the tax irrelevance view investors do not demand that corporations pay greater returns on equity instruments when shareholder-level dividend tax rates or capital gains tax rates decrease. Instead investors with similar tax characteristics form tax clienteles. For example, individuals or institutions with low shareholder-level dividend tax rates (or MTRs) hold stocks with high dividend payments. Likewise investors facing high shareholder-level dividend tax rates

[14] For example consider a firm with an income of $20,000 before their R&D expense of $1,000. Prior to the tax change the firm would save $480 ($1,000 * .48) in taxes via the R&D deduction; after the tax change the same amount of R&D expense, $1,000, would only save the firm $330 ($1,000 * .33) in taxes.

[15] New Zealand did continue its 100 percent deduction of R&D. However, Thomas et al. (2003) did not classify countries with only a 100 percent R&D deduction as ones offering incentives for investment in R&D. For comparability, I use the same classification approach.

will hold stocks with low dividend payments. Due to uncertainty, investors also hold some stock inconsistent with their tax-preferred dividend payment for diversification. Thus, a "marginal investor clientele" forms which is indifferent between receiving dividends or capital gains.[16] Further, as clarified below, the effective shareholder-level dividend tax rate and capital gains tax rate of these marginal investors is zero (Poterba and Summers 1985, Miller and Scholes 1978, Miller and Modigliani 1961).

Miller and Scholes (1978), proponents of this view, argue that all personal taxes can be effectively laundered. For example, a marginal investor who is selling stock at a loss will also sell stock with a gain, bringing his effective capital gains rate to zero. Further, a marginal investor consisting of a pension fund, university, or charity pays no tax and, thus, has a zero tax rate on both shareholder-level dividends and capital gains. Since the effective shareholder-level dividend and capital gains tax rates for the marginal investor are zero, the return to the marginal investor for one dollar initially invested is the return on the investment after corporate-level taxes. Neither the shareholder-level dividend tax rate nor the capital gains tax rate factor into the corporation's cost of equity capital. Since a permanent change in shareholder-level dividend taxes or capital gains taxes will not result in a change in the corporate cost of equity, corporate investments and dividend payment policies will not change.

Tax Capitalization View

The tax capitalization view states that shareholder-level dividend taxes are an additional tax on corporations' profits, and thus shareholders capitalize future dividend taxes into share values (Auerbach 1979, King 1977). Corporations only pay dividends when they have cash remaining after paying all other obligations and it is the only method for them to distribute this trapped equity. Since an alternative tax-advantaged method of distributing the income does not exist, corporations finance dividends with this remaining or residual cash. In other words,

[16] The marginal investor is the investor who determines the market price of the securities under consideration. Under the tax irrelevance view this is the investor whose marginal tax rates on dividends and capital gains are virtually equal (Poterba and Summers 1985, 11).

dividends do not signal the market; they merely return trapped equity to stockholders (McKenzie and Thompson 1997, Zodrow 1991, Poterba and Summers 1985).

These firms continue to use retained earnings for corporate investment until investors are indifferent between reinvesting within the firm and receiving additional dividends. Not paying dividends defers the tax on the corporation's earnings from the original investment and causes stock price appreciation. This tax deferral offsets the later shareholder-level dividend tax (Zodrow 1991, 500, Poterba and Summers 1985, 15). In other words, the after-tax appreciation of the stock equals the after-tax value of foregone dividends. For instance, if a corporation uses one dollar for new investment, instead of paying one dollar in dividends, the shareholder does not have to pay the shareholder-level dividend tax and thus saves an amount equal to the shareholder-level dividend tax rate. However, the reinvested one dollar will increase the stock price causing the shareholder to pay a capital gains tax.[17] In equilibrium, the cost to the shareholder of the corporation investing one dollar instead of paying one dollar in dividends equals the value of the new investment, q^N, which is reflected in the stock price as follows:

$$q^N = (1 - \text{Shareholder - Level Dividend Tax Rate}) + (\text{Capital Gains Tax Rate})(q^N) \tag{1}$$

where (1- Shareholder-Level Dividend Tax Rate) is the after-tax dividend the shareholder would have received if the corporation had paid dividends and (Capital Gains Tax Rate)(q^N) is the capital gains tax the shareholder pays as a result of the increase in stock price the new corporate investment causes. Rewriting equation (1) in terms of the value of the corporate-level investment of one dollar in equilibrium results in the following:

$$q^N = \frac{1 - \text{Shareholder - Level Dividend Tax Rate}}{1 - \text{Capital Gains Tax Rate}} \tag{2}$$

[17] For the sake of simplicity, this discussion assumes that capital gains taxes are paid annually as they accrue. This is similar to Australia's capital gains taxes.

Whether the corporation pays a dollar of dividends or uses it for corporate investment, the value to the shareholder of each initial dollar invested in the company is the same, and thus dividend tax policy plays a role in the value of the corporation but does not influence corporate investment.

To demonstrate this, consider two scenarios, one in which the corporation pays dividends and one in which it foregoes paying dividends for corporate investment. In both cases the individual initially owns 50 shares of stock, each valued at $1.40, giving him a total stock value of $70. The shareholder-level dividend tax rate is 46 percent, and the capital gains tax rate is 10 percent.

Scenario A: The corporation pays a cash dividend of $1 per share.

Since the dividend is paid and not used for corporate reinvestment, the value of the stock does not change. The individual pays $23 in shareholder-level dividend taxes [($1 dividend per share) (50 shares) (0.46 dividend tax rate)], receives $27 after shareholder-level dividend taxes [($1 dividend per share) (50 shares) – $23 shareholder-level dividend tax], and holds a total of $70 worth of stock.

Scenario B: Instead of paying the $100 dividend, the corporation uses it for new investment.

In accordance with equation (2), the corporate investment will cause the stock price to increase by $0.60 per share [($1 foregone dividend) (1 – 0.46 shareholder-level dividend tax rate) / (1 – 0.10 capital gains tax rate)]. The individual will pay a capital gains tax of $3 [($0.60 share price increase) (50 shares) (0.10 capital gains tax rate)]. The individual now owns 50 shares worth $2 each ($1.40 original stock price + $0.60 increase in stock price), for a total stock value of $100. Now, suppose, the individual decides to sell stock equal to his overall stock value increase of $30 [($0.60 increase in stock price)(50 shares)]. Since his shares each have a value of $2, he sells 15 shares. This leaves him with $70 worth of stock [($2 per share) (50 initial shares – 15 sold shares)]. The total value of the stock, $70 is now the same as it was in Scenario A when the corporation paid a $1 dividend instead of investing it. Further, the total amount the shareholder

has received is $27 [($30 from stock sale) – ($3 capital gains tax)], the same amount received in Scenario A.

To summarize the total distribution the individual in Scenario A receives is $27 ($1 dividend * 50 shares - $1 * 50 shares * 0.46 shareholder-level dividend tax rate) which equals the total distribution the individual in Scenario B receives after selling the portion of stock equal to the capital gain:

$$\left[\frac{(1-0.46\ \text{Shareholder-Level Dividend Tax Rate})}{(1-0.1\ \text{Capital Gains Tax Rate})}\right]*50\text{shares}-\$3\text{Capital Gains Tax}=\$27$$

Now suppose that instead of selling the 15 shares in Scenario B, the individual continues to hold all 50 shares and the corporation pays as dividends all after-corporate-level tax returns from the new capital investment. The individual will receive the return on the investment, less corporate tax and shareholder-level dividends taxes. The individual will be content with this after-tax return as long as it is greater than or equal to the initial cost of each dollar of investment, q^N , as defined in equations (1) and (2). Each period the individual's after-tax return will be determined by the rate of return of the new corporate investment, the corporate tax rate and the shareholder-level dividend tax rate. Again, the individual will expect this after-tax return to equal the initial cost of the investment, q^N, leading to the following equation:

$$q^N = \frac{1-\text{Shareholder-Level Dividend Tax Rate}}{1-\text{Capital Gains Tax Rate}} = \tag{3}$$

$$\text{Before-Tax Rate of Return}*(1-\text{Corporate Tax Rate})*(1-\text{Shareholder-Level Dividend Tax Rate})$$

As you can see, the shareholder-level dividend taxes in equation (3) cancel out, demonstrating that the level of corporate investment is influenced only by corporate tax rates and capital gains tax rates. Rewriting equation (3) reveals that the value to the individual of the return per initial dollar invested is as follows:

$$q^N = (\text{Before-Tax Rate of Return})(1 - \text{Corporate Tax Rate})(1 - \text{Captial Gains Tax Rate}) \quad (4)$$

Thus, while a permanent change in shareholder-level dividend tax rates will increase the price of the stock, unless coupled with a change in capital gains tax rates, it will not result in a change in corporate investments or dividend payment policies (Poterba and Summers 1985).

Double Taxation View

Similar to tax capitalization view, the double taxation view contends that shareholder-level dividend taxes are an additional tax on corporate profits. The shareholder's after-tax return is calculated in equation (5):

Shareholder-Level After Tax Return = [(Before Tax Rate of Return) (1 - Corporate Tax Rate)] * [(Dividend Payment Rate) (1 – Shareholder-Level Dividend Tax Rate) + (1 – Dividend Payment Rate)(Capital Gains Rate)] (5)

The twist is that the double taxation view holds that despite their tax disadvantage, shareholders reward corporations when they pay dividends by increasing the stock price. Note that this differs from the tax capitalization view that stock prices rise when corporations reinvest instead of paying dividends. Proponents of the double taxation view do not claim to know the reason for the increase in stock price but simply accept that the market rewards corporations when they pay dividends (Poterba and Summers 1985, McClure 1977). Therefore, as shown below in equation (6), the shareholder's required rate of return (corporations' cost of capital) depends on corporate taxes and the weighted average of shareholder-level dividend and capital gains taxes:

Shareholder-Level After Tax Return = [(Before Tax Rate of Return) (1 - Corporate Tax Rate)] * [(*w*)(Dividend Payment Rate) (1 – Shareholder-Level Dividend Tax (6)

Rate)

$$+ (1 - w)\ (1 - \text{Dividend Payment Rate})(\text{Capital Gains Rate})]$$

Where (w) is the weight shareholders place on dividend taxes, which depends on the dividend payout ratio. When dividend payout ratios are high, shareholders place less weight on shareholder-level dividend taxes (w) and more weight on capital gain taxes (1- w). This reduces the weighted average tax rate of dividends and capital gains and the shareholder's required rate of return. This lower weighted average tax rate of dividends and capital gains entices firms to pay dividends despite their tax disadvantages (Zodrow 1991, Poterba and Summers 1985). A decrease in shareholder-level dividend taxes decreases the amount corporations have to pay for the shareholder's after-tax dividend to remain constant. In other words the decrease in shareholder-level dividend taxes reduces the cost of paying dividends and receiving the increase in stock price. This motivates the corporation to increase the dividend payout ratio, decreasing the weighted average tax rate of dividends and capital gains and increasing investment (Zodrow 1991, Poterba and Summers 1985).

Chapter III

Prior Research

This literature review first discusses prior research on the three corporate dividend policy views. Evidence both supporting and refuting each view exists. I also include research explaining potential changes in shareholder-level dividend taxes and a review of the reactions each corporate dividend policy view predicts. Since this paper also investigates the relationship between shareholder-level dividend taxes and R&D corporate-level taxes, I include a review of potential changes in R&D corporate-level taxes and documented reactions to such changes. Lastly, I review the research suggesting a relationship among dividends, investment, and their respective taxes.

Corporate Dividend Policy Views

The first of the three views corporate dividend policy views is the tax irrelevance view. Under this view, a corporation's decision to invest is independent of its decision to pay dividends (Miller and Modigliani 1961). Thus, changing the way a country taxes dividends would not change the firms' dividend payments, capital investments, or stock prices (Poterba and Summers 1985). Miller and Scholes (1978) warn that many studies rely on short-term responses to dividends when testing the relationship between taxes and dividend yield or the relationship between taxes and rate of return. As a result, findings that do not support the tax irrelevance view often are suspect. They demonstrate that dividend announcement effects, which also increase rates of return in the short run, bias these studies by creating short-term price increases.

The tax irrelevance view assumes operation in perfect capital markets; everyone in the market has the same expectations of future earnings and amount of risk involved. In other words, everyone participating in the market has the same information set (Mougoue and Mukherjee 1994). But, researchers have found evidence that managers have superior information regarding their corporations. Since information asymmetry exists, dividends provide a signal to the market (Bhattacharya 1979 and Ross 1977). Ross (1977) uses Spence's signaling model (1974) to

investigate the risk investors assume and corporate debt-equity choices. Bhattacharya (1979) expands Ross' model (1977) by including the tax-based cost of paying dividends. He finds that in an imperfect market, cash dividends provide a signal of expected firm cash flows.

Woolridge and Ghosh (1988, 1991) find that corporations do not like to reduce dividend payments. Thus, they will only pay dividends when they feel confident that they can continue to do so. When they announce a dividend, they signal the market that they are not only in a financial position to pay dividends but will continue to pay dividends of the same magnitude in the future. John and Williams (1985) develop a model where only dividends are taxed. They demonstrate that shareholders' needs to receive cash, drive the payment of dividends. In their opinion, this explains why firms either pay dividends instead of repurchasing shares or pay dividends while simultaneously selling new shares.

The tax irrelevance view also assumes transaction costs and taxes do not exist (Mougoue and Mukherjee 1994). However, Easterbrook (1984) contends that not only do taxation costs exist but agency costs also influence dividend payments. Managers are imperfect agents of investors, and paying dividends helps to restrict their discretion. Easterbrook builds on Jensen and Meckling's theory (1976) that agency costs exist as a result of debt and outside equity. Continuously paying dividends encourages managers to raise new money. Further, even if paying dividends does not force managers to raise new money, dividends increase the debt-equity ratio. Paying dividends versus increasing retained earnings decreases bondholder's wealth by lowering the security the bond provides. This explains why dividends please shareholders (Easterbrook 1984).

The second corporate dividend policy view, the tax capitalization view states that despite the fact that shareholder-level dividend taxes are an additional tax on corporations' profits, shareholders capitalize future dividend taxes into share values. Thus dividend taxes do not impact marginal corporate investment decisions (Auerbach 1979, King 1977, Zodrow 1991). The after-tax appreciation of the stock equals the after-tax value of foregone dividends. Thus, a permanent

change in dividend taxation, unless coupled with a change in capital gains taxation, will not result in a change in corporate investments or dividend policies (Poterba and Summers 1985, 15, Zodrow 1991, 500).

Looking at the financing choices of corporations, Masulis (1980) finds that stock prices increase when corporations exchange debt for equity and decrease when corporations exchange equity for debt. In his opinion, this supports the tax capitalization view: when debt replaces equity, stock prices increase because they now incorporate future dividends into the price. Contrary to Masulis' study (1980), Myers-Majluf's theory (1984) predicts the opposite: corporations tend to issue equity when their shares are over-valued. Consistently, Masulis and Korwar (1986) and Vermaelen (1981) find that new stock issues lower stock prices while repurchases raise stock prices.

Elton and Gruber (1970) argue in favor of the tax capitalization view by showing that stock prices fall on ex-dividend days. The stock price falls because the dividend is no longer included in the stock price. Further, the decrease in the stock price is less than the dividend amount due to the difference in shareholder-level dividend tax rates and capital gains tax rates. According to Elton and Gruber, this result demonstrates that individual-level taxes make dividends less attractive than capital gains. Eades et al. (1984) refute this finding by demonstrating that stock dividends, which are not subject to a shareholder-level tax, produce similar results in the stock prices on ex-dividend dates.

By estimating firms' implied cost of capital, Dhaliwal et al. (2005) find that firms operating under classical tax systems (double taxation of corporate profits), with high institutional ownership pay lower dividend premiums than firms with low institutional ownership. This dividend premium is the additional amount a firm must pay in dividends such that the dividends meet non-institutional shareholders' after-tax required rates of return and supports the tax capitalization view. In their setting, the dividend tax penalty is the difference between the dividend and capital gains tax.

Altering the Ohlson model (1995) to incorporate shareholder-level dividend taxes, Harris and Kemsley (1999) find support for dividend tax capitalization. They separate book value into retained earnings and contributed capital. Retained earnings proxies for earnings and profits, which is the portion of book value subject to dividend tax since non-liquidating distributions are taxed as dividends to the extent of earnings and profits and then as a tax-free return of capital. They find that the weight placed on earnings increases while the weight placed on contributed capital decreases as the ratio of retained earnings to contributed capital increases. Harris and Kemsley claim that this supports dividend tax capitalization: as the ratio of retained earnings to contributed capital increases, the amount of dividend taxes to which shareholders become subject increases. This results in a lower emphasis on total equity since a greater portion of it is taxed. Harris et al. (2001) also use this methodology to demonstrate that investors value accumulated retained earnings less per unit that contributed capital. Using firm-level data from the United States, they show that the discount rate applied to dividends varies depending on the dividend tax rate. They confirm these findings by looking at dividend taxes in five other countries.

However, Dhaliwal et al. (2003) and Hanlon et al. (2003) disagree with the methodology and interpretation of the results in both Harris and Kemsley (1999) and Harris et al. (2001). Dhaliwal et al. (2003) demonstrate that when looking at long-term stock returns, the conclusions of Harris and Kemsley (1999) are not supported. Hanlon et al. (2003) question the validity of incorporating the ratio of retained earnings to contributed capital into the Ohlson model (1995) and conclude that, given its significance, this ratio must be a proxy for a correlated omitted variable.

Fama and French (1997) also look for evidence in support of the tax capitalization view using asset pricing models. If the tax capitalization hypothesis is true, they expect a negative relationship between corporate value and dividend payments. When a corporation pays dividends, the payout should no longer be included in the firm's future value; thus, the stock price should decline. Instead, they find a positive relationship between firm value and dividends and a negative

relationship between leverage and value. They conclude that dividends and debt convey information to the market about profitability that is not captured elsewhere.

This potential for dividend signaling and the restriction of manager discretion is incorporated into the third view, the double taxation view (Poterba and Summers 1985, McClure 1977). Similar to dividend tax capitalization, this view contends that shareholder-level dividend taxes are an additional tax on corporate profits. The primary difference between the two views is the motivation behind paying dividends. The double taxation view holds that despite their tax disadvantage, shareholders still reward corporations when they pay dividends by increasing the corporate value (Poterba and Summers 1985, McClure 1977). The higher the dividend payout ratio, the lower the weighted average tax rate of dividends and capital gains, and the lower the shareholder's required rate of return (Zodrow 1991, Poterba and Summers 1985). Thus, a decrease in the taxation of dividends would lower the cost of capital, increasing investment and the rate of return, which would result in a higher dividend payout ratio (Zodrow 1991, Poterba and Summers 1985).

Using British data before and after changes in the way Great Britain taxes corporate retained and distributed income, Poterba and Summers (1985) find that the double taxation view is the closest match to their results and reject both the tax irrelevance and tax capitalization views. Their results show that changes in dividend taxation significantly impact ex-dividend price movements. Poterba and Summers (1985) also find that the announcement of a reduced dividend tax rate is positively related to dividend yield. They conclude that dividend taxes reduce corporate investment and distort capital allocations.

McKenzie and Thompson (1995) perform an event study investigating the impact an increase in Canadian dividend tax had on stock prices. They compare only companies offering both higher-yield preferred and lower-yield common shares. They find that the decrease in the price of higher-yield preferred shares was significantly greater than the decrease in the price of lower-yield common shares. They conclude that this finding supports the double taxation and tax

capitalization views but not the tax irrelevance view. McKenzie and Thompson (1997) perform a literature review of the research on the three dividend policy theories and conclude that the double taxation view has the most support. Similarly, Zodrow (1991) reviews empirical studies testing the double taxation and the tax capitalization views and determines that the double taxation view has the most support.

Ayers et al. (2002) use the Revenue Recognition Act of 1993's increase in the highest individual tax rate to investigate the relationship between dividend policy and stock prices. Since at that time U.S. individuals paid taxes on dividends, the increase in the highest individual tax rate increased the dividend tax rate for shareholders in the highest bracket. Using a five-day event window, they find that corporations with high dividend yields experienced the largest drop in price and that institutional ownership mitigates this negative relationship. While both the tax capitalization and double taxation views predict a decrease in stock prices following this type of change, the tax capitalization view does not hold that the magnitude of the decrease will vary according to the shareholder clientele. Thus Ayers et al. (2002) conclude that the existence of the mitigating factor, institutional ownership, demonstrates the importance of corporate dividend policy and supports the double taxation view over the tax capitalization view. Dhaliwal et al. (2003) also use the Revenue Reconciliation Act of 1993 to investigate the effects of the increase in the highest individual tax bracket on stock prices. They document a positive relationship between dividend yield and long-term stock returns which is mitigated by institutional ownership which supports the traditional double taxation view.

As this section demonstrates, prior research examines the three corporate dividend policy views in a variety of settings. While evidence supporting each view over the others exists, evidence refuting each view or its assumptions also exists. The literature has not reached a consensus as to the correct view.

Shareholder-Level Dividend Taxes

A change in shareholder-level dividend tax creates the setting for this paper's study. During this study, both New Zealand and Australia begin taxing corporate profits only once through dividend imputation credits. Though countries can implement such credits in a variety of ways, the net effect of a dividend imputation credit is to reduce the double taxation of dividends by reducing the tax shareholders pay on dividend income they receive. Some dividend imputation credits permit shareholders to exclude dividends from gross income. Others require shareholders to include dividends in gross income but offer credits to offset the tax liability attributable to all or a portion of the dividend income.

Both the tax capitalization and the double taxation views contend that shareholder-level dividend taxes are an additional tax on corporate profits. The difference between the two theories is the motivation for paying dividends. The tax capitalization view implies that dividend policy is irrelevant to price in the sense that what is not paid in dividends will be capitalized into price. The traditional double taxation view suggests that dividend policy is extremely relevant to price since the market rewards corporations for paying dividends (Ayers et al. 2002).

The results of the studies supporting the traditional double taxation view predict that a reduction in the taxation of dividends will result in a lower cost of capital, an increase in current capital investment spending, and an increase in the dividend payout ratio (McKenzie and Thompson 1995, Poterba and Summers 1985, McClure 1977). As demonstrated in Poterba and Summers (1985), the increase in the optimal dividend payout ratio stems from the fact that the corporation's cost of equity decreases since, after a dividend tax decrease, it does not pay as much for shareholders to receive the same after-tax dividend. The firm's marginal cost of paying dividends and receiving the benefit of an increase in firm value is less, increasing the optimal dividend payout ratio, which reduces the discount rate applied to future cash flows in determining the firm's value.

R&D Corporate-Level Taxes

This paper investigates a shareholder-level dividend tax change in countries with two different R&D tax treatments. Here I explain R&D investment incentives. I then review the prior R&D investment literature, demonstrating that the success of R&D investment incentives is still debated in the literature.

Since firms often deduct R&D in the year incurred, R&D investment is tax favored in comparison to capital investment. Additional R&D tax incentives come in a multitude of guises. Tax regimes can offer R&D tax credits based on flat rates (Canada), R&D tax credits based on incremental rates above a base (France, Japan, Spain, and the United States), or super-deductibility (more than 100 percent) of R&D expenses (Austria and Australia). Researchers still debate the effectiveness of R&D tax incentives in increasing R&D investment and the organizational factors influencing this investment (Hoskisson and Johnson 1992, Goel 1990, Hill and Snell 1989, Bradley et al. 1984, Link and Long 1981).

Billings and Fried (1999) synthesize the R&D investment literature and test the influence of the U.S. tax regime and four organizational factors' influence on R&D investment. They find that eligibility for the R&D incentive, the capital intensity, and the debt-to-equity ratio significantly impact the amounts U.S. firms invest in R&D.[18] Using time-series data, Brown (1985) finds evidence that the U.S. R&D tax incentive included in the Economic Recovery Tax Act of 1981 had a positive incentive effect. Berger (1993) expands Brown's analysis by separating firms in a position to take advantage of the R&D tax incentive from those not in such a position (based on their tax liability for the current and previous three years and the difference between their qualified R&D expenditures and base R&D levels). He also incorporates non-tax factors into his model. His results show that the U.S. R&D tax incentive of 1981 increased R&D investment for firms in a tax position to use the tax credit.

[18] They do not find that unrelated diversification, defined as activity in industries outside of a company's primary industry, significantly impacts R&D investment.

Several studies using U.S. data find results indicating an R&D tax incentive is not as influential as Brown (1985) and Berger (1993) indicate (Billings and McGill 1992, Mansfield 1986, Eisner and Sullivan 1984). Using firm-level data, Eisner and Sullivan (1984) find that the firm-specific, moving average base R&D incentive, introduced by the United States' Economic Recovery Tax Act of 1981 has limited ability to stimulate research activity. Summarily, Mansfield (1986) uses survey data and finds that this U.S. R&D tax incentive increased R&D activity less than two percent annually, about one-third of the revenue the government lost as a result of the credit. Billings and McGill (1992) find that, prior to the Omnibus Budget Reconciliation Act of 1990, which changed the R&D tax incentive from a moving-average formula to a fixed-base percentage formula, the average rate of credit was 2.5 percent. After 1990, it was 1.9 percent.

Hall and Reenen (2000) survey the international literature on R&D tax incentive effectiveness and conclude that the response in the United States to R&D tax incentives is greater than the responses in Canada and France. Further, tax incentives do not have an effect on the amount of R&D investment. In their survey of the literature, Hall and Reenen reference a 1993 study by the Australian Bureau of Industry Economics as "one of the most comprehensive and carefully done of these [international] studies" (466). The Australian Bureau of Industry Economics' study combines Australian survey and econometric data surrounding the implementation of super-deductibility, a 150 percent R&D tax deduction. The survey data indicates that for 23 percent of the respondents, super-deductibility was critical in at least one R&D project in the last three years, proceeding. Further, super-deductibility critically influenced 10 percent of R&D expenditures and was significant in continuing, widening, or improving around 50 percent of the R&D projects. The Australian Bureau of Industry Economics' study also compares the R&D growth rates, controlling for firms' abilities to use the tax deduction, and it finds a benefit-cost elasticity of between 0.6 and 1.0, similar to that of the United States. Looking at Canada, Mansfield and Switzer (1985) do not find support for an increase in R&D spending

after the implementation of an R&D tax incentive. As the above studies show, the literature has not reached consensus concerning the ability of R&D incentives to influence R&D investment.

Relationship Among Dividends, R&D Investment, and Tax Incentives

This section focuses on the relationship between dividend payment and R&D investment when the tax incentives for each differ. Thomas et al. (2003) suggest that the reason for the mixed results concerning the influence of R&D incentives on R&D investment is due to the different ways countries tax dividends. They suggest that dividends and corporate investments compete for limited funds; thus, a negative relationship between dividends and R&D investment exists. Similarly, Smith (1995) suggests that, after implementing Australia's dividend imputation credit, investors preferred companies paying higher cash dividends instead of those investing in R&D.

Contrary to Smith (1995), Black et al. (2000) find that the dividend payout ratios in Australia did not increase or decrease as a result of the dividend imputation credit. They run an OLS regression examining the relationship between R&D investment and dividend payout ratios before and after Australia implemented its dividend imputation credit.[19] While they do not find a significant relationship between R&D investment and dividend payout ratios before or after dividend imputation, they do find a significant negative relationship between R&D investment and the existence of dividend imputation. Black et al. (2000, 56) conclude "it appears that dividend imputation stimulated capital investment in property, plant, and equipment at the expense of research and development. A plausible explanation is that the more generous tax benefits of R&D, generated in the form of immediate expensing, lost some of their value under dividend imputation."

Thomas et al. (2003) investigate three different tax regimes: one provides incentives for paying dividends but not investing in R&D, one provides incentives for paying dividends and investing in R&D, and one providing incentives for investing in R&D but not paying dividends. Contrary to Black et al. (2000), they find evidence that the inverse relationship between R&D

[19] Black et al. (2000) define dividend payout ratio as cash dividends divided by net earnings.

expense and total dividends paid becomes stronger when the tax regime provides both an R&D tax incentive and a dividend imputation credit as opposed to providing a credit for just one of them. However, in this same analysis, they do not find the positive relationship between R&D investment and R&D tax incentives which is central to the theory that the negative relationship between dividend payment and R&D investment becomes stronger when incentives for both exist.

Thomas et al. (2003) use a dummy variable to classify each country's tax regime. Thus, four of the six countries used in the study were coded "1" to indicate that their tax regime offered an incentive for R&D investment. Such coding assumes that the R&D tax incentives in all four countries do not differ. However, when Billings et al. (1994) examine the R&D investment in four different countries, they find that the rate of tax credit differs in each country. Further, they find that a significant positive relationship between R&D investment and the rate of tax credit on total R&D expenditures exists.

Thomas et al.'s data also do not allow them to control for which firms within a tax regime can use the R&D tax incentive. Berger (1993) demonstrates the importance of incorporating a firm's ability to use an R&D tax incentive. He shows that, once this is considered, the U.S. R&D tax incentive of 1981, which prior research declared unsuccessful as an incentive, did increase R&D investment for firms in a position to use it.

In summary two papers examine the relationship between dividends, R&D investment, and their respective taxes. One paper uses an OLS regression to investigate dividend tax changes within two different countries and does not find a significant relationship between the ratio of cash dividends to net earnings, R&D investment, and their respective taxes (Black et al. 2000). The other paper, Thomas et al. (2003), performs a cross-country analysis using simultaneous equations and finds a significantly stronger negative relationship between total dividends paid and R&D investments when tax incentives for both exist. However, they do not find the theorized positive significant relationship between R&D expense and the existence of an R&D tax

incentive nor do they include countries with neither tax incentive in their comparison. Using different tax settings and analyses these papers reach two different conclusions regarding the relationship among dividends, R&D investment and their respective taxes.

Chapter IV

Theoretical Development

As shown in Partington's (1985) funds flow identity, managers can only allocate resources that are actually available for allocation. The sources of these resources, external financing and earnings this period are allocated to the uses of these resources, this period's dividends and investments.

$$D_t + \Delta I_t = \Delta C_t + Y_t \tag{7}$$

where

D_t = Dividends in period t;

ΔI_t = Net change in investment in period t;

ΔC_t = Net change in external financing in period t; and

Y_t = Earnings in period t.

Uses of resources appear on the left-hand side of equation (7).[20] They are expressed as current period dividends and net change in investments.[21] These uses of resources equal the available resources, which are comprised of net change in external financing (ΔC_t) and earnings (Y_t). As is typical with theoretical models, several assumptions are necessary for this identity to hold. First, the firm must operate on a cash-only basis such that all earnings and new external capital are readily available for dividends or investments. Second, the firm must pay dividends or invest all of its earnings and new external capital each period. The first assumption that the firm operates on a cash-only basis can be removed by replacing external financing (ΔC_t) and earnings (Y_t) with net cash flows into the firm.

$$D_t + I_t = FCFBD_t + ICFBNI_t + OCFBRD_t \tag{8}$$

where

[20]Though share repurchases are a potential use of firm funds, they are not included in this discussion because (1) New Zealand did not permit share repurchases during the time period used in this study and (2) Australia permitted regulated repurchases only during the last three years of this study.

[21]The term "net change in investments" incorporates the difference in all firm investments made during the current period.

I_t = New investments made in period t

$FCFBRD_t$ = Cash flow in period t from financing activities before dividends;

$ICFBRD_t$ = Cash flow in period t from investing activities before new investments; and

$OCFBRD_t$ = Cash flow in period t from operating activities before R&D expenses.

Net change in investment (ΔI_t) becomes new investments (I_t) because any cash received this period for an investment previously held will appear in cash flow from investing activities before new investments ($ICFBNI_t$). If the firm then acquires another asset with this cash, the new asset will appear in new investments (I_t).[22] The equation still assumes that the firm chooses to pay dividends or increase investment with all of the cash that it has available.

R&D Investment Incentives

As evidenced in Thomas et al. (2003), tax regimes can provide varying incentives for R&D investment, investment in other assets, and dividend payments to shareholders. In a tax regime providing no incentive to pay dividends but an additional incentive for R&D investment, allocating limited resources to continued funding of old R&D projects or funding new R&D projects lowers taxes the corporations pay and, thus, increases the net cash flow from operations. Separating R&D investment from all other new investments and incorporating the tax savings from R&D investment results in the following:

$$D_t + O_t + R_t = FCFBD_t + ICFBNI_t + OCFBRD_t + \delta R_t \tag{9}$$

where

O_t = All new investments other than R&D;

R_t = R&D investment; and

δ = rate of R&D investment tax incentive.

[22] For example, a firm sells a building for $25,000 cash and then uses $20,000 of it to purchase equipment. The $25,000 cash will appear on the right-hand side of the equation in cash flow from investing activities before new investments ($ICFBRD_t$) and the $20,000 will appear on the left-hand side of the equation in new investments (I_t). The $5,000 difference will also appear on the left-hand side in the form of a different new investment or dividends.

R&D investment now costs less than other investments or dividend payments. Assuming funds are fixed, firms have an increased incentive to invest more heavily in R&D. Depending on the extent to which firms choose to use the tax incentive by investing in R&D, either investment in other assets or dividend payments may decrease.

Dividend Tax Incentives

In a tax regime providing no incentive for R&D investment but granting an incentive for dividend payments and assuming the double taxation view, allocating funds to paying dividends reduces the cost of capital which results in dividends becoming more attractive than other investments, including R&D. This alters equation (9) as follows:

$$D_t + O_t + R_t = FCFBD_t + \lambda D_t + ICFBNI_t + OCFBRD_t \quad (10)$$

where λ represents the reduced cost of equity capital resulting from a dividend imputation credit.

When a country previously not offering R&D investment or dividend payment incentives implements dividend imputation credits, corporations paying dividends should realize a decrease in their cost of equity capital because a dividend imputation credit reduces or eliminates the double taxation of dividends (Dhaliwal et al. 2003). By providing shareholders a tax credit for dividends received or omitting dividends from shareholders' net incomes, shareholders no longer pay tax on the dividends. Corporations operating under these tax regimes actually have to pay less in dividends for shareholders to receive the same after-tax returns; this reduces the corporation's cost of equity capital (Dhaliwal et al. 2003). Further, an imputation credit provides incentives for corporations to switch from debt to equity financing, which also lowers their average cost of capital and could increase corporations' investment in equipment and structures (Black et al. 2000, Schulman et al. 1996, Auerbach and Hassett 1991, Cummins and Hassett 1992).

R&D Investment and Dividend Tax Incentives

What happens when the tax regime implements both incentives to pay dividends and to invest in R&D? Mathematically, the inverse relationship between R&D investment and dividend

payment will increase in firms paying dividends. As evidenced by combining equations (9) and (10), this should help equate R&D investment and dividend payments since both increase the firm's available cash flow.

$$D_t + O_t + R_t = FCFBD_t + \lambda D_t + ICFBNI_t + OCFBRD_t + \delta R_t \quad (11)$$

Firms paying dividends now have an incentive to invest in R&D (δR_t) and pay dividends (λD_t). Dividend-paying firms will have more difficulty allocating funds to R&D investments, dividend payments, or other investments than if only one tax incentive existed. Every dollar they contribute to paying dividends will increase their savings from the reduced cost of capital (λD_t); however, every dollar they use to pay dividends will reduce the funds available for R&D investment and thus the R&D investment tax savings (δR_t). Therefore, tax regimes offering both tax incentives for R&D investment and dividend payments should exhibit the greatest inverse ratio between R&D investments and dividend payouts. While the increase in the inverse ratio could result from simply holding R&D investment constant and placing the savings from the lower cost of capital into dividend payments, it could also result from decreasing R&D investment to further increase dividend payment.

Chapter V

Hypothesis Development

In July of 1985, Australia implemented an R&D investment tax incentive in the form of super-deductibility. Super-deductibility permitted companies to deduct 150 percent of their R&D expenses. While New Zealand did not offer an explicit tax R&D incentive, R&D expenses were 100 percent deductible.[23] Before the respective 1987 and 1988 tax changes, neither Australia nor New Zealand offered dividend imputation credits. Theoretically, I expect to find a negative relationship between dividend payment and R&D expense regardless of tax incentives or dividend tax views.[24]

When a corporation invests in R&D, it will have fewer funds available for capital investments or dividend payments. Thomas et al. (2003) find a negative relationship between R&D investment and dividend payment when looking at the United Kingdom, Canada, France, Germany, Japan and the United States. When looking at New Zealand and Australia, Black et al. (2000), do not find a significant relationship between R&D investment and dividend payment in either country. Given the mixed results, I investigate the relationship between R&D investment and dividend payment and between R&D investment and capital expenditures. The signs of these relationships, themselves, are not crucial to my study. I am interested in what happens to the relationships as the tax regimes change. Therefore, I need to know what the relationships look like in the countries prior to the tax regime changes. To test these relationships, I define two tax regimes. As Table 2 shows, Tax Regime I provides incentives for neither R&D investment nor dividend payments (corresponding to Australia prior to July 1985 and New Zealand prior to

[23] I use the same classification approach as Thomas et al. (2003) and do not classify countries with only a 100 percent R&D deduction as ones offering incentives for investment in R&D.

[24] My first two hypotheses focus on relationships among R&D investment, dividends, and MTRs at a point in time and, thus, are not indicative of a particular dividend policy view.

1988) and Tax Regime II provides only R&D investment incentives (corresponding to Australia from July 1985 to June 1987).[25] The first hypothesis is:[26]

H1a: A negative relationship between a firm's R&D investment and capital investment will exist in both Tax Regimes I and II.

H1b: A negative relationship between a firm's R&D investment and dividend payment will exist in both Tax Regimes I and II.

The monetary benefit an R&D tax incentive provides is not the same for all firms within a country (Billings and Fried 1999, Billings et al. 1994, Berger 1993, Brown 1985). The marginal rate of credit and the average rate of credit typically measure the benefit an R&D incentive provides corporations (Eisner and Sullivan 1984, Altshuler 1989, Billings et al. 1994). The average rate of credit measures the tax credit received on total R&D expenditures while the marginal rate of credit indicates the tax credit a corporation will receive from investing an additional dollar in R&D (Billings et al. 1994). Since the R&D tax incentives in Australia and New Zealand are both in the form of deductions, a firm's MTR indicates the tax benefits it will receive from an additional dollar of R&D investment. Firms with higher MTRs should invest more in R&D since they receive more benefit from R&D expenses than firms with lower MTRs. Thus, prior to each of the tax changes in Australia (July 1985 and July 1987) and the tax change in New Zealand (April 1988), firms positioned to benefit from the R&D deduction should have invested more heavily in R&D.

H2: A positive relationship between a firm's R&D expense and MTR will exist in both Tax Regimes I and II.

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[25] Due to the implementation of dividend imputation in July of 1987, Australia was a country offering only an R&D investment tax incentive for only two years. However, as cited on page 489 of Australia's Industry Commission 1995 Research and Development Report, "The largest year-on-year increases in BERD [Business Enterprise R&D] during the complete decade occurred in 1985-86 and 1986-87." This is despite a 15 percent per year rate of increase in BERD from 1981-82 to 1984-85.

[26] All hypotheses appear in alternative form.

Effect of R&D Investment Incentives in the Absence of Dividend Imputation

In July of 1985, the R&D tax deduction for R&D investment in Australia increased from 100 percent to 150 percent.[27] This allowed Australian companies to receive more tax benefit from R&D investment. As equation (11) shows, when a tax regime moves from offering neither an R&D investment tax incentive nor dividend imputation (defined as Tax Regime I) to offering an R&D investment tax incentive (defined as Tax Regime II), the relationship between R&D investment and dividend payment changes. At this point in time, firms began receiving additional savings from investing in R&D as compared with paying dividends. Therefore, when Australia implemented its R&D investment tax incentive in 1985, the relationship between R&D investment and dividend payment should have become weaker (less negative).

H3: When a country moves from Tax Regime I to Tax Regime II, there will be a weaker relationship between R&D investment and dividend payment.

Effect of Dividend Imputation in the Absence of Explicit R&D Incentives

As stated above, when a country offers tax incentives for only R&D investment (equation (9)) or only dividend payment (equation (10)), the inverse relationship between the two should not be as strong as when the tax regime does not offer a tax incentive for either of them (equation (8)). However, the dividend policy views vary in their predictions of the effects of a dividend imputation credit. As summarized in Table 3, Panel A, the tax irrelevance view predicts that dividend imputation credits will not change the dividend payment or the relationship between R&D investment and dividend payment. Similarly, the tax capitalization view states that any change in the dividend payment is the result of a change in the firm's corporate investment opportunities; thus, a dividend imputation credit will not change the firm's corporate investment policy.

[27] The implementation of super-deductibility, a 150 percent R&D deduction, alters the calculation of corporate taxes. It does not offer a setting in which to analyze the dividend policy views since all three views contend that a change in corporate taxes could alter corporate investments or dividend payments. Hypotheses 4, 6, 7, and 9 use the dividend tax changes in 1987 and 1988 to investigate which dividend policy view is most supportable.

Only the double taxation view of dividend policy suggests that a change in the way dividends are taxed will alter the dividend payment. According to this view, the market rewards dividend-paying firms by increasing stock prices when firms pay dividends. A decrease in the dividend tax decreases the amount of pre-tax dividend necessary for shareholders to receive the same after-tax dividend. This reduction in the cost of equity capital reduces the firm's cost of receiving the market's reward of an increased stock price. Thus, capital investment and the dividend payout ratio will increase (Poterba and Summers 1985, 4). As mentioned earlier, prior corporate dividend policy research does not address R&D investment alone. Instead it either includes it as part of capital investment or excludes it completely. Thus, the double taxation view of corporate dividend policy does not predict a direction for the change in R&D investment (Table 3, Panel A). Following a decrease in dividend taxes, the increases in the capital investment and dividend payment predicted by the double taxation view have to be funded by either the decrease in the average cost of capital, newly raised capital or as suggested by Thomas et al. (2003), a decrease in R&D investments. New Zealand's 1988 tax change provides a setting in which to explore these relationships and dividend views.

In 1988, New Zealand changed its tax regime from one offering tax incentives for neither R&D investment nor dividend payment to one offering tax incentives for paying dividends.[28] According to Thomas et al. (2003), after this change, New Zealand firms that typically paid dividends should have now found paying dividends more attractive than investing in R&D. At this time, New Zealand also decreased its highest corporate tax rate by 15 percentage points (from 48 to 33 percent). This reduced the tax benefit of the implicit incentive for R&D investment, making the incentive for the payment of dividends even stronger. This does not alter the predictions under the double taxation view. However, corporate tax rates affect the cost of capital calculation under both the tax irrelevance and tax capitalization views of corporate dividend

[28]New Zealand did continue to offer immediate deduction of 100 percent of the R&D expenses. To be consistent with prior literature, the 100 percent deduction is not classified as an explicit incentive to invest in R&D.

policy. Reducing the cost of capital results in an increase in capital investments according to both of these views (McKenzie and Thompson 1997, Zodrow 1991, Poterba and Summers 1985, Miller and Scholes 1978). Panels A and B of Table 3 summarize the effects these tax changes should have on dividend-paying firms and their R&D investment, capital investment, and dividend payment according to the three views of how dividend taxes affect corporate dividend policies. Defining Tax Regime III as providing only a tax incentive for dividend payment (Table 2), the forth hypothesis is as follows:

H4a: When a country moves from Tax Regime I to Tax Regime III, dividend-paying firms will alter their R&D investment.[29]

H4b: When a country moves from Tax Regime I to Tax Regime III, dividend-paying firms will increase their capital investment.

H4c: When a country moves from Tax Regime I to Tax Regime III, dividend-paying firms will increase their dividend payment.

As equation (10) demonstrates, the implementation of the dividend imputation credit makes paying dividends more attractive than R&D investment or other assets. Firms will receive more benefit from the decrease in the cost of capital as they pay more in dividends. The decision to pay dividends should be easier than when neither a tax incentive for R&D investment or dividend payment exists or when incentives for both exist (equation 11). Thus, the relationship between R&D investment and dividend payment should become weaker (less negative).

H5a: When a country moves from Tax Regime I to Tax Regime III, there will be a weaker relationship between R&D investment and dividend payment in dividend-paying firms.

Despite the reduction in the highest corporate tax rate, New Zealand dividend-paying firms with higher MTRs should have found R&D investments an attractive option since they

[29] When all of the corporate dividend policy views predict no change or do not provide a prediction, the hypothesis is non-directional.

could claim the 100 percent R&D deduction. Dividend-paying firms with lower MTRs were not in as advantageous a position to use the R&D deduction. Thus, the weakening of the relationship between R&D investing and paying dividends should be smaller for firms with higher MTRs than firms with lower MTRs.

H5b: When a country moves from Tax Regime I to Tax Regime III, the weakening of dividend-paying firms' relationship between R&D expense and dividend payment will be greater among those firms with lower MTRs.

The tax irrelevance and tax capitalization views suggest that the implementation of a dividend imputation credit will not affect the dividend payment in firms not typically paying dividends (Table 4, Panel A). According to the tax irrelevance view, shareholder-level taxes do not affect dividend payments; thus, any change in dividend taxation is irrelevant. The tax capitalization view holds that implementing a dividend tax change will not change the dividend payment (Poterba and Summers 1985). While both views contend that it should not alter dividend payments, decreasing the highest corporate tax rate reduces the cost of capital, increasing capital investment (Table 4, Panel B).

While the double taxation view holds that dividend taxes affect dividend policy, shareholders of non-dividend-paying firms do not expect to receive dividends. Since these firms have not been paying dividends, they will not experience tax savings from lower equity costs (Table 4, Panel A). However, decreasing corporate tax rates also reduces the cost of capital under the double taxation view and increases capital investments (Table 4, Panel B).

H6a: When a country moves from Tax Regime I to Tax Regime III, non-dividend-paying firms will alter R&D investment.

H6b: When a country moves from Tax Regime I to Tax Regime III, non-dividend-paying firms will increase capital investment.

H6c: When a country moves from Tax Regime I to Tax Regime III, non-dividend-paying firms will not alter dividend payment.

Effect of Dividend Imputation in the Presence of Explicit R&D Incentives

Australia's 1987 tax change also provides a setting in which to test the relationships among the uses of firm resources and the views of what affects corporate dividend policy. In July of 1987, Australia altered its tax regime from one offering tax incentives only for R&D investment (defined as Tax Regime II) to one offering tax incentives both for R&D investment and dividend payments (defined as Tax Regime IV). According to the double taxation view, the implementation of a dividend imputation credit will directly impact the payment of dividends in dividend-paying firms (Table 3, Panel C). The dividend imputation credit allows firms to pay less in dividends while shareholders receive the same after-tax dividend payment. The reduced equity costs make paying dividends and capital investments attractive uses of firm resources (Poterba and Summers 1985, 4).

At this time, Australia also implemented a capital gains tax. A capital gains tax would not cause a change in the dividend payment or investment policy under the tax irrelevance view. The tax capitalization view contends that implementing a capital gains tax will decrease the after-tax appreciation shareholders receive when they sell their stock (Table 3, Panel D). In turn, this will increase the cost of capital and discourage capital investment (McKenzie and Thompson 1997, 9). Under the double taxation view, the cost of capital depends on a weighted average of shareholder-level dividend taxes and capital gains taxes. An increase in capital gains taxes alone would increase a firm's cost of capital. This increase in the cost of capital would decrease investments and dividend payout ratios. However, when coupled with dividend imputation which as discussed above, has the opposite effect on the cost of capital, it is not possible to predict the movement in R&D investment, capital investment, or dividend payment.

H7a: When a country moves from Tax Regime II to Tax Regime IV, dividend-paying firms will alter R&D investment.

H7b: When a country moves from Tax Regime II to Tax Regime IV, dividend-paying firms will increase capital investment.

H7c: When a country moves from Tax Regime II to Tax Regime IV, dividend-paying firms will increase dividend payment.

As equation (11) demonstrates, when a country offers tax incentives for both R&D investment and dividend payment, the savings a firm receives from the R&D tax incentive depends on the amount invested in R&D, and the savings a firm receives from the decrease in the cost of capital depends on the amount of dividends they pay. After 1987, Australia's tax regime offered tax incentives for both R&D investment and dividend payment. Since both R&D investment and dividend payments pose tax advantages, the decision to participate in one over the other became more difficult than when a tax credit for only one of them existed. This should strengthen the relationship between these two uses of firm funds.

H8a: When a country moves from Tax Regime II to Tax Regime IV, there will be a stronger relationship between R&D investment and dividend payment in dividend-paying firms.

Adding a dividend tax credit to a tax regime offering an R&D tax incentive reduces the difference in the tax benefit provided by R&D investment and dividend payment (equation (11)). Further, firms with lower MTRs versus firms with higher MTRs will not find it as difficult to increase dividend payment since the R&D tax incentive was not extremely beneficial to them. On the other hand, firms with higher MTRs will find it harder to switch from investing in R&D to paying dividends since R&D investment results in a high (150 percent) tax deduction.

H8b: When a country moves from Tax Regime II to Tax Regime IV, the increase in strength of dividend-paying firms' relationships between R&D expense and dividend payment will be greater among those firms with higher MTRs.

All three views of corporate dividend policy contend that non-dividend-paying firms would not be affected by the implementation of dividend imputation (Table 4, Panel C). However, a capital gains tax causes shareholders to pay a tax on any profit they received when selling their shares. According to the tax capitalization view, any change in dividend payment

which occurs after a dividend imputation credit is merely the result of a change in the firm's investment decision, unless coupled with a capital gains tax (Zodrow 1991, Poterba and Summers 1985). Since capital gains taxes hinder corporate investments, it is plausible that under the tax capitalization view, firms would begin paying dividends (Table 4, Panel D).

The double taxation view also contends that non-dividend-paying firms may begin paying dividends because: (1) with the implementation of the capital gains tax, shareholders will have to pay tax on the profit they receive when they sell their stock, and (2) coupled with the capital gains tax and dividend imputation credit, shareholders will prefer that these firms begin paying dividends (Poterba and Summers 1985). This assumes of course that the reduction in dividend tax has a greater impact on the cost of capital calculation than the implementation of a capital gains tax.

H9a: When a country moves from Tax Regime II to Tax Regime IV, non-dividend-paying firms will alter R&D investment.

H9b: When a country moves from Tax Regime II to Tax Regime IV, non-dividend-paying firms will increase capital investment.

H9c: When a country moves from Tax Regime II to Tax Regime IV, non-dividend-paying firms will increase dividend payment.

Further, the double taxation view contends that firms with lower MTRs receive less tax benefit from R&D investment. These firms will find it more tax efficient, vis-à-vis higher MTR firms, to pay dividends instead of subjecting shareholders to greater capital gains taxes by investing the funds in retained earnings, R&D, or other assets.

H10a: When a country moves from Tax Regime II to Tax Regime IV, the change in non-dividend-paying firms' R&D investment will be greater among those firms with lower MTRs.

H10b: When a country moves from Tax Regime II to Tax Regime IV, the change in non-dividend-paying firms' capital investment will be greater among those firms with

lower MTRs.

H10c: When a country moves from Tax Regime II to Tax Regime IV, the increase in non-dividend-paying firms' dividend payment will be greater among those firms with lower MTRs.

Chapter VI

Research Design

As previously discussed, this paper assumes that the decisions of R&D investment and dividend payment occur simultaneously. The theory supports a relationship between these two uses of funds. This paper tests and builds on the only paper explicitly investigating the relationship between R&D investment and dividend payments, Thomas et al. (2003) which assumes that the decision to invest in R&D is not totally independent of the dividend payment decision or other capital expenditures.[30] For comparability, this study uses a similar set of simultaneous equations, which consists of a model for R&D investment and a model for dividend payment. Also this section introduces three new variables to the set of simultaneous equations used to test the hypotheses—the corporate before-R&D MTR, the individual tax rate, and the statutory tax rate for corporations.

R&D Investment Model

In the first of the simultaneous equations models, the R&D investment model, the dependent variable is the R&D expense the firm reported in the current year. It is not deflated by sales; instead, the natural log of total sales is included as a control variable (Thomas et al. 2003, Barth and Kallapur 1996). The independent variables are the before-R&D MTR and the dividend payment. Since R&D is tax deductible, a firm lowers its MTR when it invests in R&D. Similar to the before-financing MTR variable in Graham et al. (1998), the before-R&D MTR (BRDMTR) variable measures the MTR prior to the firm investing in R&D. After adding the R&D expense to the taxable income, I derive Shelvin's (1990) trichotomous variable. The trichotomous variable equals the top statutory rate if the corporation has positive taxable income but not a net operating

[30] Several papers investigate the relationship between financing, investing, and paying dividends. Smirlock and Marshall (1983) use Granger causality to see if dividend decisions influence investment decisions. They conclude that dividends are not causal related to investments. Mougoue and Mukherjee (1994) incorporate financing decisions into this methodology and determine that the three activities are independent. However, investment consisted of plant, property, and equipment in both studies, so they did not consider R&D investment.

loss (NOL) carryforward from prior years, one-half of the statutory rate if the corporation has negative taxable income (i.e., a current year NOL) or an NOL carryforward but not both, and zero if the firm has negative taxable income and an NOL carryforward. The second dependent variable, the dividend payout (DIVPAY) is the total amount paid in dividends for the current year. It is the product of the dividend payment per share and the number of shares outstanding.

As in Thomas et al. (2003), the model includes controls for the funds available, the firm's financial position, and external influences. Research has shown that the ability to invest in R&D depends on available funds. The two-year average of cash from operations (AVGOPCF) and cash from financing (AVGFCF) proxy for these funds. Also included is the amount of capital investment (CAPEX); funds invested in capital are not available for R&D investment.

Firms under financial distress are less likely to invest in R&D because firm-specific assets created through R&D cannot easily be used to pay down debt (Bhagat and Welch 1995). The firm's beginning-of-the-year debt-to-assets ratio (DEBT) measures the firm's financial distress. Research shows that managers incorporate the effect R&D investment will have on current-period earnings when determining the R&D outlay (Baber et al. 1991, Elliot et al. 1984). Thus, the current level of earnings before taxes and research (EBTR) is included as a control variable. The model includes controls for the firm's size (SIZE) and last year's R&D expense (LRDX) since they have both been shown to influence the current year's R&D investment (Berger 1993, Tillinger 1991).

The model controls for external influences through the inclusion of Gross Domestic Product (GDP) and the firm's book-value-to-market-value ratio (B/M). The Gross Domestic Product captures the economic variations and serves as a control variable for time since the data is annual. As in Thomas et al. (2003), the book-value-to-market-value ratio proxies for Tobin's q, a measurement of the marginal benefit to the marginal cost of an additional unit of investment (Tillinger 1991). This variable captures the marginal benefit in terms of the value the market places on the investment. It does not capture the benefit through the tax savings the before-R&D

MTR variable captures. This variable also speaks to the line of research indicating that the market capitalizes R&D and that market value is a determinant of R&D spending (Green et al. 1996, Lev and Sougiannis 1996).

I include two additional control variables that Thomas et al. (2003) did not, the maximum individual tax rate (IRATE) and the maximum statutory corporate tax rate (CRATE). The tax reforms investigated in this study include significant reductions in both the corporate and individual income tax rates. Since both of these rates affect corporate investment, I include them as controls.[31]

Dividend Payment Model

The dividend payment model is similar to the R&D investment model. This equation serves to complete the simultaneous system of equations. The dependent variable, dividend payment (DIVPAY) is the same as that in the R&D investment model. The before-R&D MTR (BRDMTR) is included to distinguish between firms that can and cannot benefit from R&D tax incentives. Firms which cannot benefit from R&D tax incentives would be more likely to pay dividends. The R&D spending (RDX) is included since it is a competing use of the funds. The controls in this equation are similar to those in the R&D investment model. The proxies for funds available are the two-year average of cash from operations (AVGOPCF) and cash from financing (AVGFCF). The amount of capital investment (CAPEX) captures an alternative way of investing the firm's funds. The maximum individual tax rate (IRATE) and maximum corporate tax rate (CRATE) are also included to control for the effect tax rates can have on corporate investment.

Partington (1989) finds the cost of financing also influences dividend payment. The firm's beginning-of-the-year debt-to-assets ratio (DEBT) proxies for this cost. Partington (1989) finds that profitability is the most important determinant of dividend policy. Thus, the current

[31] Again, share repurchases are not included because, at this time, they were not permitted in New Zealand, and Australia did not permit them until 1991. From 1991 to 1995, Australian repurchases (buy-backs) were highly regulated, and only 44 companies (less then four percent of the Australian Stock Exchange) participated in them (Mitchell and Robinson 1996) compared to 50 percent of the companies in the New York Stock Exchange from 1954 to 1963 (Guthart 1965).

level of earnings before taxes and research expenditures (EBTR) is included as a control variable. He also finds that managers consider the effects dividend policy can have on share price. The market penalizes firms typically paying dividends when they omit dividend payments (Akhigbe and Madura 1996). Thus, last year's dividend payment (LDIVPAY) is included in the model.

Size is included as another proxy for one of Partington's dividend determinants, the cost of financing. Two additional control variables, the percent change in earnings growth (EGROW) and the proportion of return received from capital gains (CAPRET) are also included in the dividend model. The percent change in earnings (EGROW) captures company growth. Alli et al. (1993) show that firms with high growth are less likely to pay dividends since the retained funds can help finance future growth. Investors also can receive returns on investment through capital gains. This is captured in the proportion of return received from capital gains (CAPRET), measured as the annual return provided to investors through price appreciation.

The system of equations is as follows:

R&D Investment Model (12)

$$RDX = \alpha_1 + \beta_{11}BRDMTR + \beta_{21}DIVPAY + \beta_{31}AVGOPCF + \beta_{41}AVGFCF + \beta_{51}CAPEX + \beta_{61}DEBT + \beta_{71}EBTR + \beta_{81}LRDX + \beta_{91}SIZE + \beta_{101}GDP + \beta_{111}B/M + \beta_{121}CRATE + \beta_{131}IRATE + \beta_{141}IMPCRED + \beta_{151}IMPCRED*BRDMTR + \beta_{161}IMPCRED*CAPEX + \beta_{171}IMPCRED*DIVPAY + \varepsilon$$

Dividend Payment Model (13)

$$DIVPAY = \alpha_2 + \beta_{12}\ BRDMTR + \beta_{22}RDX + \beta_{32}AVGOPCF + \beta_{42}AVGFCF + \beta_{52}CAPEX + \beta_{62}DEBT + \beta_{72}EBTR + \beta_{82}LDIVPAY + \beta_{92}SIZE + \beta_{102}EGROW + \beta_{112}CAPRET + \beta_{122}CRATE + \beta_{132}IRATE + \beta_{142}IMPCRED + \varepsilon$$

where

RDX = reported R&D expense (Worldscope Database item 0119)

BRDMTR = before-R&D marginal tax rate calculated by adding R&D expense to the taxable income and then determining Shelvin's (1990)

trichotomous variable; Shelvin's (1990) trichotomous variable equals the top statutory rate if the corporation has before-R&D taxable income and no NOL carryforward, one-half of this rate if the corporation has negative before-R&D taxable income or an NOL carryforward but not both, and zero if the firm has negative before-R&D taxable income and an NOL carryforward;

DIVPAY = dividend payment or total cash dividends paid (4551);

AVGOPCF = average cash from operations for the current and prior years, which is the sum of income before extraordinary items and preferred dividends (1551), depreciation, depletion, and amortization (1151) and R&D expense (1201);

AVGFCF = average cash from financing for the current and prior years, which is the sum of change in long-term debt (3251) and change in common equity (3501) minus the difference between net income after preferred dividends (1706) and common dividends (5376);

CAPEX = capital expenditures (4601);

DEBT = beginning-of-the-year debt-to-assets ratio, which is the sum of total assets (2999) less common equity (3501) and preferred stock (3451) divided by total assets (2999);

EBTR = earnings before taxes and research spending, which is the sum of pretax income (1401) and R&D expense (1201);

LRDX = R&D expense for the prior year;

SIZE = natural log of total sales (1001);

GDP = gross domestic product;

B/M = beginning-of-the-year book-to-market ratio, which is market capitalization (8001) divided by common equity (3501);

EGROW = earnings growth, which is the percent change in pretax earnings (1401) from the previous year to the current year;

CAPRET = capital return, which is the annual return to the shareholders through price appreciation measured as market capitalization (8001) divided by common equity (3501);

CRATE = statutory corporate tax rate;

IRATE = statutory individual tax rate; and

IMPCRED = a dummy variable equaling one when a dividend imputation credit is available.

Since R&D spending and dividend payment are determined in conjunction with one another and the variables in the two equations are related, I use three stage least squares (3SLS) to run the system of equations.[32] This method allows for the possibility of contemporaneous correlation between the disturbances in the two structural equations (Johnston and DiNardo 1997, 317). The first two stages of 3SLS are similar to two stage least squares (2SLS). The first stage obtains the predicted values for the endogenous regressors. The second stage uses the predicted values from stage one to estimate the equations' errors and then uses these to estimate the contemporaneous variance-covariance matrix of the structural equations' errors. Finally the third stage obtains the estimates by applying generalized least squares to the large equation, which consists of the system of equations (Mukherjee et al. 1998, 450).

Data Selection

To test the hypotheses, I examine pooled cross-section firm-year Australian and New Zealand data from the fiscal year ending 1982 to the fiscal year ending 1993. Where available, the data comes from the Worldscope Global Researcher Database via Thompson Financial and Datastream Advance 4.0. The remainder of the data is hand-collected from the Australian Graduate School of Management Annual Report File and the Australian Stock Exchange annual reports housed in Perth, Western Australia. I delete firm-years where the data needed to calculate the regressions are unavailable.[33] Further, only domestic firms are kept in the sample since these are the firms which will be most affected by a tax change in their country. Consistent with Thomas et al. (2003), this paper defines domestic firms as those with (1) less than 50 percent of their total sales due to foreign sales, (2) less than 50 percent of their total assets located abroad,

[32] 3SLS differs from 2SLS in that it estimates all of the parameters of the model jointly while 2SLS estimates only the identified structural equation of interest. The 3SLS estimator is consistent and asymptotically more efficient than the 2SLS estimator.

[33] One of the proxies for funds available, average financing cash flows, requires the availability of firm data for at least two years prior to being included in the sample. Thus three years of consecutive data must be available for the firm to be included in the sample.

and (3) less than 50 percent of their total income due to foreign income. The complete sample contains 695 firm-year observations.

Descriptive Statistics

Table 5 displays the means and medians of the variables for each country. Similar to Black et al.'s (2000) paper investigating tax changes in New Zealand and Australia, New Zealand firms compose approximately 10 percent of the sample.[34] The means of the dependent variable of interest, R&D expense (RDX) are not statistically different in the two countries. The mean for the before-R&D MTR (BTRMTR) is 25 percent in New Zealand which is lower than the highest corporate statutory rate in New Zealand, indicating the presence of an NOL or negative taxable income. The average prior year's R&D expense (LRDX) is less than the current year's average in both countries. The means of dividend payment (DIVPAY), average operating cash flow (AGVOPCF), gross domestic product (GDP), prior year dividend payment (LDIVPAY), and growth in earnings (EGROW) are much higher in Australia than in New Zealand. Except for the gross domestic product, the medians of these variables are similar, indicating skewness in the average calculations.

Tables 6 through 8 contain the Pearson correlation matrices for the combined sample, New Zealand sample, and Australian sample, respectively. As in Black et al. (2000), the measures for dividend imputation, corporate tax rate, and individual tax rates are highly correlated. The corporate and individual tax rates are included to control for changes in these statutory rates. The dividend imputation dummy variable is included to determine changes related to dividend imputation.

[34] In Black et al.'s (2000) paper, New Zealand firms compose 13.5 percent of the sample.

Chapter VII

Results

Running the set of simultaneous equations shown in equations (12) and (13) on the New Zealand and Australian samples of firm-years separately, tests the first hypothesis. Table 9 contains the New Zealand results.[35] The model includes a dummy variable indicating the existence of dividend imputation (IMPCRED) and its interaction with dividend payment (IMPCRED*DIVPAY) and capital expenditures (IMPCRED*CAPEX). Therefore the dividend payment variable (DIVPAY) and capital expenditure variable (CAPEX) capture the period where neither an R&D investment tax incentive nor dividend payment tax incentive exist, Tax Regime I.[36] In Tax Regime I, using New Zealand data, the relationships between R&D expenses and capital expenditures (CAPEX) and between R&D expenses and dividend payment (DIVPAY) are in the predicted direction but insignificant.[37] This does not provide support for H1a nor H1b in New Zealand's Tax Regime I.

Table 10 contains the results of running the set of simultaneous equations on the Australian sample of firm-years prior to dividend imputation (from July 1981 to June 1985). The model includes a dummy variable indicating the existence of an R&D tax incentive (R&DINCENT) and its interaction with dividend payment (R&DINCENT*DIVPAY) and capital expenditures (R&DINCENT*CAPEX). Therefore the dividend payment variable (DIVPAY) and capital expenditure variable (CAPEX) capture the period where neither an R&D investment tax incentive nor dividend payment tax incentive exist, Tax Regime I. Due to the high correlation between the individual tax rate (IRATE), corporate tax rate (CRATE), and the before-MTR

[35] The dividend payment model controls for the interdependence in the system of equations. Thus, throughout the paper, I use the results from the R&D model to answer my research questions.
[36] Due to the multicollinearity between the individual tax rate (IRATE), the corporate tax rate (CRATE) and the before-MTR variable (BRDMTR), I also run the system of simultaneous equations without the corporate tax rate, without the individual tax rate, and without either tax rates. The results do not change.
[37] Not finding a significant relationship between R&D investment and dividend payment in New Zealand is consistent with Black et al.'s (2000) finding when running their OLS regression on New Zealand data using R&D investment as the dependent variable.

variable (BRDMTR), the system of simultaneous equations will not run on the Australian data prior to dividend imputation.[38] Since the individual tax rate is included in the model primarily because of its influence on dividend payment following dividend imputation, and this sample represents Australia prior to dividend imputation, I drop the individual tax rate variable (IRATE) from the system of equations.[39] In Tax Regime I, using Australian data, I find a significant negative relationship between R&D expenses and capital expenditures (CAPEX); the relationship between R&D expenses and dividend payment (DIVPAY) is in the predicted negative direction but insignificant. Thus, the Australian Tax Regime I evidence supports H1a but not H1b.[40]

Australian firms operating after the implementation of R&D super-deductibility, but prior to dividend imputation's implementation, compose Tax Regime II. The results in Table 10 also contain the relationships between R&D expenses and capital expenditures and between R&D expenses and dividend payment during this period. To evaluate them, one must examine the coefficients of the variables in Table 10 and their interactions with the dummy for the R&D tax incentive of super-deductibility (R&DINCENT). Combining the coefficient of capital expenditures (CAPEX = -.0104) with the coefficient for the interaction between the availability of R&D super-deductibility and capital expenditures (R&DINCENT*CAPEX = .0103), results in a negative coefficient (-.0001) for the relationship between R&D expense and capital expenditures. This finding supports H1a in Tax Regime II. In this same setting, a negative, significant relationship between R&D expense and dividend payment is not found and thus, H1b is not supported.

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[38] When running a three stage least squares regression on simultaneous equations, Stata automatically drops any variables causing multicollinearity issues.

[39] The results of the system of simultaneous equations do not change when instead of dropping the individual tax rate (IRATE) from the model, I drop the corporate tax rate (CRATE), nor when I drop both the individual tax rate (IRATE) and corporate tax rate (CRATE).

[40] Not finding a significant relationship between R&D investment and dividend payment in Australia is consistent with Black et al.'s (2000) finding when running their OLS regression on Australia data using R&D investment as the dependent variable.

The second hypothesis predicts a positive relationship between R&D expense and the before-R&D MTR in both Tax Regimes I and II. As Tables 9 and 10 show, this variable is only significant in Tax Regime I for New Zealand firms. Here, firms with higher MTRs tend to invest more heavily in R&D despite the absence of a tax incentive for R&D investment. This supports H2 in Tax Regime I for New Zealand but not Tax Regime I or II for Australia.

In conclusion, when investigating the initial relationships between R&D investment and dividend payment and between R&D investment and capital investment, the only significant relationships are between R&D investment and capital investment in Australian Tax Regimes I and II. Further they are negative, suggesting that as Australian firms invest less in capital as they invest more in R&D. Again, not finding support for H1a, a negative relationship between R&D investment and dividend payout does not threaten the validity of this study or its data. The purpose of the first two hypotheses is simply to understand the setting prior to the tax regime changes.

The third hypothesis investigates firms moving from Tax Regime I to Tax Regime II—Australia before and after the R&D tax incentive. Here the prediction is a weaker or less negative relationship between R&D investment and dividend payment after the R&D tax incentive's implementation. Before and after the implementation of super-deductibility, this relationship is negative (Table 10). However, since it is insignificant in both cases, the results cannot support H3.[41] As shown in Table 13, the sample size of Australian firms in Tax Regimes I and II is 192. The post-hoc observed power is 0.99, indicating that low power is likely not the reason for a lack of significance.

The fourth and fifth hypotheses investigate actions of dividend-paying firms moving from Tax Regime I to Tax Regime III—New Zealand before and after dividend imputation.[42] H4

[41] The change from Tax Regime I to Tax Regime II involves a change in corporate taxes (via a 150 percent R&D deduction), and thus, cannot be used to investigate the dividend policy views.
[42] Hypotheses four and five correspond to hypotheses seven and eight which investigate dividend-paying firms moving from Tax Regime II to Tax Regime IV (Australia from July 1988 to June 1993).

compares the amounts of dividend payment, capital investment, and R&D investment in Tax Regime II with Tax Regime IV, to determine the dominant dividend policy view. H5 investigates the change in the relationship between R&D investment and dividend payment when moving from Tax Regime II to Tax Regime IV. Using the nonparametric Wilcoxon-Mann-Whitney test to investigate H4a shows that R&D expense deflated by size changed (decreased) significantly ($z = 1.80$, $p = 0.0714$) after dividend imputation.[43,44] Running it on capital expenditures, deflated by size and dividend payment, deflated by earnings tests H4b and H4c.[45] The results do not show a significant change in the median of capital expenditures so H4b is not supported. However, they do indicate a marginally significant increase in dividend payment ($z = -1.25$, $p = 0.10$) after dividend imputation, supporting H4c. When New Zealand moved from Tax Regime I to Tax Regime III, it also lowered its corporate tax rate. As Table 4, Panel B shows, all of the corporate dividend policy views predict that R&D investment could change and that capital expenditures should increase after moving from Tax Regime I to Tax Regime III. Further while the double taxation view suggests that dividend payment should increase, the other two views also hold that it may. Since capital investment did not increase, the results cannot support one corporate dividend policy view over another.

Generating the system of simultaneous equations (12) and (13), using only dividend-paying, New Zealand firms, investigates the changes in the relationship between R&D investment and dividend payment when moving between these two tax regimes.[46] The relationship between R&D expense and dividend payment in both tax regimes is insignificant. This insignificance does not support Thomas et al.'s (2003) idea that dividend imputation increases dividend payment at

[43] The R&D expense variable is not deflated when running the system of simultaneous equations since a firm size variable is included in the equations as a control variable.
[44] I run the Wilcoxon-Mann-Whitney test because Bartlett's test for equal variances rejects the null hypothesis of equal variances in the deflated R&D expense variable, and thus the parametric t-test would not be appropriate. I use a two-tailed test since the hypothesis is non-directional.
[45] Again, the Wilcoxon-Mann-Whitney test is used because Bartlett's test for equal variances rejects the null hypothesis of equal variances in the deflated capital expense and dividend payment variables, and thus the parametric t-test would not be appropriate. I use a one-tailed test since the direction is predicted.
[46] I cannot use the system of equations generated in Table 9 since it includes both dividend-paying firms and non-dividend-paying firms.

the expense of R&D investment when an incentive for only dividend payment exists (H5a). This insignificance also prevents testing H5b directly by comparing the magnitude of change in the coefficients. The system of simultaneous equations does yield three significant variables, the prior year's R&D expense ($z = 2.91$, $p = 0.004$), before-R&D MTR ($z = 1.64$, $p = 0.100$), and the interaction between the imputation credit and the before-R&D MTR ($z = -1.89$, $p = 0.058$). When New Zealand operates under Tax Regime I, the coefficient for the before-R&D MTR is 23321; in Tax Regime III, it is 5900. This implies that for dividend-paying firms in Tax Regime I, where no R&D investment or dividend payment incentives exists, the greater the MTR, the greater the investment in R&D. However, when in Tax Regime III, firms with high MTRs do not invest as much in R&D as they did when in Tax Regime I.

Since the before-R&D MTR variable and its interactions with dividend imputation are significant, running the system of simultaneous equations by MTR could provide additional information. Thus the system of simultaneous equations (12) and (13) is run on the New Zealand dividend-paying firms after replacing the before-R&D MTR variable with a dummy variable. If a firm has a before-R&D MTR value of the highest corporate statutory tax rate, it receives a dummy MTR value of one. If the firm's before-R&D MTR equals either one-half of the corporate statutory rate or zero, it receives a dummy MTR value of zero.[47] The results of running a three stage least squares regression on the system of equations appear in Table 11.

When the sample is divided by MTR, only the prior year's R&D expense and interactions involving the high-MTR group are significant.[48] Dividend imputation does not affect the relationships between R&D expense and capital investment or between R&D expense and dividend payment in low/mid-MTR, dividend-paying New Zealand firms. This demonstrates that the effects of dividend imputation in dividend-paying firms differ according to firm MTRs. In

[47]Due to the size of the sample, Stata cannot run the set of simultaneous equations if the sample is divided into three groups (high, medium, and low-MTRs) instead of two groups (high and medium/low-MTRs) because the low-MTR group is too small.

[48] These results do not change when the system of simultaneous equations is run using the mid-MTR group instead of the low/mid-MTR group. Again, the low-MTR group alone is too small for Stata to run.

Tax Regime I, dividend-paying firms with higher MTRs, as compared to firms with lower MTRs, invest significantly more in R&D as they pay more dividends (MTR*DIVPAY). However, once in Tax Regime III, dividend-paying firms with high MTRs, as compared to firms with lower MTRs, invest significantly less in R&D as they pay more in dividends (MTR*IMPCRED*DIVPAY).

This is contrary to Thomas et al.'s prediction that firms operating under Tax Regime I (no tax incentives) experience a decrease in the inverse relationship between R&D expense and dividend payment when they move to Tax Regime III (tax incentive for dividend payment). Further it supports the prediction in hypothesis 5b that dividend-paying firms in Tax Regime III display a significantly greater negative relationship between R&D expense and dividend payment when they have higher versus lower MTRs. Dividend imputation does not seem to affect firms with lower MTRs. This finding reiterates the importance of considering firm MTRs when evaluating tax changes and demonstrates that a policy permitting 100 percent deductibility of R&D expenses may serve as an R&D incentive for firms with high MTRs.

The sixth hypothesis investigates corporate dividend policy views by focusing on non-dividend-paying New Zealand firms operating in Tax Regime I versus Tax Regime III.[49] As in the forth hypothesis, running the Wilcoxon-Mann-Whitney test on R&D deflated by size and dividend payment deflated by earnings and capital investment deflated by size investigates hypothesis 6.[50] The results on all three of these runs do not indicate significant changes in any of the variables and thus cannot support H6. Table 4, Panel B displays the predictions of the dividend policy views. All three views predict that capital investment will increase and thus my findings in non-dividend-paying, New Zealand firms do not support one view over another.

[49] Hypothesis six corresponds to hypothesis nine which investigates non-dividend-paying firms moving from Tax Regime II to Tax Regime IV (Australia from July 1988 to June 1993).
[50] I run the Wilcoxon-Mann-Whitney since Bartlett's test for equal variances rejects the null hypothesis of equal variances. I use a two-tailed test when the hypothesis is non-directional and a one-tailed test when the direction is predicted.

The seventh and eighth hypotheses compare dividend-paying firms operating under Tax Regime II with those operating under Tax Regime IV—Australia before and after the implementation of dividend imputation. H7 focuses on changes in investments and dividend payments to investigate the corporate dividend policy views; H8 investigates the relationship between R&D expense and dividend payment.[51] Running the Wilcoxon-Mann-Whitney test on R&D and capital investment deflated by size and dividend payment deflated by earnings investigates the changes in these variables between the two tax regimes.[52] None of these tests detect significant changes in the medians of these variables when operating under Tax Regime II versus Tax Regime IV. Table 3, Panel D, contains the predictions of the corporate dividend policy views.

The tax irrelevance view predicts no changes in R&D investment, capital investment, or dividend payment. According to the tax capitalization view, R&D investment and dividend payment may increase. However, it also contends that the capital gains tax which was added under Tax Regime IV will decrease the after-tax appreciation shareholders receive when they sell their stock—increasing the cost of capital and decreasing capital investment. The double taxation view does not provide a prediction for the change since dividend imputation and capital gains affect the cost of capital in opposite directions. Thus when comparing the behavior of dividend-paying firms in Tax Regime II to those in Tax Regime IV, I find support for only the tax irrelevance and double taxation views.

Running the system of simultaneous equations (12) and (13) using only Australian dividend-paying firms in operation between July 1985 and June 1993 investigates the relationship

[51] Hypotheses seven and eight correspond to hypotheses four and five which investigate dividend-paying firms moving from Tax Regime I to Tax Regime III (New Zealand before and after dividend imputation).
[52] I run the Wilcoxon-Mann-Whitney test since Bartlett's test for equal variances rejects the null hypothesis of equal variances, indicating the parametric t-test would not be appropriate. I use a two-tailed test when the hypothesis is non-directional and a one-tailed test when it is directional.

between R&D investment and dividend payment.[53] Table 12 displays the results. Investigating the interaction between the availability of dividend imputation and dividend payment (IMPCRED*DIVPAY), reveals that dividend-paying firms exhibit a stronger (more negative) relationship between R&D expense and dividend payment when operating under Tax Regime IV (Australia, after super-deductibility and dividend imputation) than under Tax Regime II (Australia, after super-deductibility and before dividend imputation). This supports H8a and suggests that after dividend imputation, when firms pay dividends, they decrease their R&D investment by a larger amount than they did prior to dividend imputation.

Running the system of simultaneous equations (12) and (13) on the Australian dividend-paying firms investigates the differences Australian dividend-paying firms may exhibit due to their MTRs. A dummy variable for before-R&D MTR is included. If a firm has a before-R&D expense value of the highest corporate statutory tax rate, it receives a dummy value of one. If the firm's before-R&D MTR equals either one-half of the corporate statutory rate or zero, it receives a dummy value of zero.[54] Unfortunately Stata cannot run this system of equations due to the high collinearity between the interaction of the dummy variable indicating a high MTR and dividend payment (MTR*DIVPAY) and the interaction of the existence of dividend imputation and dividend payment (IMPCRED*DIVPAY).[55] However, the multicollinearity between these variables implies that it is the firms with the high-MTRs driving the negative relationship between the interaction of the existence of dividend imputation and dividend payment (IMPCRED*DIVPAY) in Table 12. Further, this implies that firms with higher marginal tax rates experience a stronger (more negative) relationship when both tax incentives are available, supporting H8b.

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[53] I cannot use the system of equations generated in Table 10 since it includes both Australian dividend-paying and non-dividend-paying firms in operation between July 1981 and June 1987.

[54] Due to the size of the sample, Stata cannot run the set of simultaneous equations if the sample is divided into three groups (high, medium, low) instead of two groups (high and medium/low).

[55] When running a three stage least squares regression on simultaneous equations, Stata automatically drops any variables causing multicollinearity issues.

The ninth hypothesis compares non-dividend-paying firms operating under Tax Regime II with non-dividend-paying firms operating under Tax Regime IV—Australia before and after the implementation of dividend imputation.[56] Running the Wilcoxon-Mann-Whitney test on R&D and capital investment, deflated by size and on dividend payment deflated by earnings provides dividend policy view evidence in this setting.[57] The medians of these variables when operating under Tax Regime II versus Tax Regime IV do not change significantly and thus do not support hypothesis 9. Table 4, Panel D, contains the predictions of the corporate dividend policy views.

The tax capitalization and double taxation views both contend that it is plausible for these non-dividend-paying firms to begin paying dividends. None of my non-dividend-paying firms began paying dividends following dividend imputation's implementation. The lack of companies beginning to pay dividend after dividend imputation may initially seem surprising given the recent studies of U.S. companies after an individual dividend tax rate decrease (Blouin et al. 2004, Treasury Office of Economic Policy 2003). However, these studies also find that share repurchases, which were not common in New Zealand or Australia during my sample period, decreased.[58]

H10 investigates the changes in R&D expenses, capital expenditures, and dividend payment to see if they vary depending on the firms' MTRs. This is tested by using the sample of non-dividend-paying Australian tax firms with a dummy variable created for the MTR to divide the sample into two MTR groups as in the test for H8. Neither group, low/mid-MTR or high-MTR show significant changes. This finding does not support H10a, H10b or H10c.

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[56] Hypothesis nine corresponds to hypothesis six which investigates non-dividend-paying firms moving from Tax Regime I to Tax Regime III (New Zealand before and after dividend imputation).

[57] I run the Wilcoxon-Mann-Whitney test since Bartlett's test for equal variances rejects the null hypothesis of equal variances, indicating the parametric t-test is not appropriate. When the hypothesis is non-directional, I use a two-tailed test and when it is directional, I use a one-tailed test.

[58] In the United States, share repurchases could serve as an alternative use of corporate funds. A decrease in share repurchases could increase the funds available for dividend payments, leading to the increased dividend payments observed in these studies.

Tables 13 through 15 contain summaries of the hypotheses and findings. Table 13 contains the predictions and results of the first two hypotheses which investigate the relationships among R&D investment and capital expenditures and among R&D investment and dividend payment prior to each of the tax regime changes. The results of investigating the relationship between R&D investment and dividend payment when the tax regime changes (hypotheses 3, 5, and 8) are in Table 14. Table 15 shows the results of hypotheses 4, 6, 7, and 9 which investigate the changes in tax regimes for evidence on the corporate dividend policy views.

Chapter VIII

Conclusions and Implications

Conclusions

As shown in Table 13, in both dividend and non-dividend-paying firms, the relationship between R&D expense and dividend payment is negative but insignificant in Tax Regime I and Tax Regime II. The relationship between R&D expenses and capital investment is negative for both Australian Tax Regime I and II. This implies that as Australian firms invest more in capital, they invest less in R&D. Also summarized in Table 13, a positive relationship between R&D expense and the before-R&D MTR exists in New Zealand's Tax Regime I. This implies that in this setting, firms invest more in R&D when they have higher MTRs. Again firms with higher MTRs, receive greater benefit from any R&D expense deduction than firms with lower MTRs.

As shown in Table 14, Panel A, when Australia moves from Tax Regime I to Tax Regime II (before and after R&D super-deductibility), the change in the relationship between R&D expenses and dividend payment is not significant. When New Zealand moves from Tax Regime I to Tax Regime III, the relationship between R&D expenses and dividend payment is not significant for dividend-paying firms before or after dividend imputation (Table 14, Panel B). Since one would most likely find the effect of dividend imputation on the relationship between R&D investment and dividend payment in firms that pay dividends, this finding suggests that dividend imputation does not have an effect on it.

However, as summarized in Table 14, Panel C, when these New Zealand firms are separated by MTR, after dividend imputation's implementation, dividend-paying firms with higher MTRs exhibit a significantly stronger (more negative) relationship between R&D expense and dividend payment than dividend-paying firms with lower MTRs. Thus the evidence suggests that as dividend-paying firms with higher MTRs move from Tax Regime I to Tax Regime III, the amount they invest in R&D as they pay dividends will decrease. The move between these two tax regimes does not appear to impact dividend-paying firms with lower MTRs. This finding also

stresses the importance of considering firms' abilities to use tax credits and that 100 percent deductibility for R&D expenses may serve as an R&D tax incentive for firms with high MTRs.

In dividend-paying firms operating under Tax Regime II versus Tax Regime IV, a stronger (more negative) relationship between R&D expense and dividend payment exists when operating under Tax Regime IV. This supports the theory that as a firm moves from Tax Regime II, where only an R&D tax incentive exists, to Tax Regime IV, where tax incentives for both R&D and dividend payment exist, the inverse relationship between a firm's R&D investment and dividend payment increases. I cannot directly test to see if this group of firms exhibits differences in the relationship between R&D expense and dividend payment according to their MTRs, because of multicollinearity between the high-MTR firms and dividend payment and between the existence of dividend imputation and dividend payment. However, this multicollinearity implies that the results in Table 12 and Panel D of Table 14 are driven by firms with high MTRs. If so, then high-MTR firms in Tax Regime IV do display a greater increase in the negativity of the relationship between R&D expense and dividend payment. This again demonstrates the importance of considering firms' tax status when predicting outcomes of changes in tax regimes.

This paper also provides insight into the dividend tax puzzle; the results of the dividend policy view hypotheses are summarized in Table 15. When investigating the results of a tax regime simultaneously ceasing to tax dividends at the shareholder-level and lowering corporate tax rates, I do not find support for any of the current corporate dividend policy views (Table 15, Panel A). I find that in dividend-paying firms, R&D investment and dividend payment change significantly. As shown in Table 3, Panel B, all three of the corporate dividend policy views predict an increase in capital investment. Since I do not find this, I cannot support one view over another in this setting. When I investigate non-dividend-paying firms operation under these same changes (Table 15, Panel B), I do not find a change in R&D investment, capital investment, nor dividend payment and again cannot support one view over another.

However, when investigating the results of a tax regime simultaneously ceasing to tax dividends and implementing a capital gains tax (Table 15, Panel C), I find support for the tax irrelevance and double taxation views in dividend-paying firms. I do not find the significant decrease in capital investment predicted by the tax capitalization view. In non-dividend-paying firms moving from Tax Regime II to Tax Regime IV, I do not find significant changes in R&D investment, capital investment, or dividend payment. All of the dividend policy views predict that this is a plausible outcome.

Like many studies using Australian and New Zealand data, this paper is limited by the sample size and thus lower power. The number of companies operating in these countries is small in comparison with the United States. Further, in an effort to be able to conclude that the tax changes of the respective country was a driving force, companies needed to be considered domestic to be included in the sample.[59] In addition, only companies in existence for a minimum of three consecutive years were included in the sample. This was because data from the prior two years were needed to calculate the average cash from financing variable (AVGFCF). As a result data from as early as 1980 was needed and many of the financial databases do not carry information that far back for Australia and New Zealand. Many efforts to increase the number of companies were made, including hand-collecting data from financial statements housed in Western Australia. Ideally, only companies in existence throughout the entire sample period would have been included. However, such a requirement would have further reduced the sample size.

Implications

This paper contributes to two areas of the literature—(1) the relationship between tax incentives for R&D investment and dividend payment and (2) the dividend tax views. It provides new evidence on the relationship between tax incentives for R&D investment and dividend

[59] This paper defines domestic firms as those with (1) less than 50 percent of their total sales due to foreign sales, (2) less than 50 percent of their total assets located abroad, and (3) less than 50 percent of their total income due to foreign income.

payment. I demonstrate that Thomas et al.'s (2003) prediction that the tension between R&D investment and dividend payment decreases when a country previously not offering tax incentives for R&D investment or dividend payout, implements one, does not hold in Australia or New Zealand.[60] Further I find just the opposite for New Zealand dividend-paying firms with higher MTRs. They behave in the manner predicted for firms moving from a tax regime offering a tax incentive for R&D investment to a tax regime offering tax incentives for both R&D investment and dividend payment. This finding demonstrates that the relationship between tax incentives for R&D investment and dividend payment varies according to firm MTRs and typical dividend payment policies. It also reiterates the importance of considering firms' abilities to use R&D tax incentives. The results of this paper provide evidence that 100 percent deductibility for R&D expenses serves as an R&D tax incentive for firms with higher MTRs. This implies that researchers evaluating the success of an explicit R&D tax incentive should consider the benefit firms were previously receiving from the 100 percent deductibility of R&D.

I also demonstrate that Thomas et al.'s (2003) prediction that the tension between R&D investment and dividend payment increases when a country previously offering only a tax incentives for R&D investment, offers one for both R&D investment and dividend payment, holds in Australian, dividend-paying firms. Further, this result appears to be driven by firms with high MTRs. This, coupled with the finding in New Zealand, demonstrates the importance of considering the MTRs of firms when contemplating the effects a shareholder-level dividend tax decrease will have on R&D investment.

This paper also provides new insight into the corporate dividend policy views. It finds support for the double taxation and tax irrelevance views in dividend-paying firms operating in a tax regime with dividend imputation and capital gains taxes. This paper also documents significant decreases in R&D investment when a tax regime provides dividend implementation

[60] The effects of moving from no incentives to one incentive were seen by investigating Australia moving from Tax Regime I to Tax Regime II and New Zealand moving from Tax Regime I to Tax Regime III.

but do not provide explicit incentives for R&D. This highlights a void in the current corporate dividend policy views and shows the need for the inclusion of R&D investment. Traditionally these views have only considered capital investment, not R&D investment. The negative relationships between R&D expenses and capital expenditures documented in this paper demonstrate that R&D and capital investments often move in opposite directions and that tax changes in shareholder-level dividend taxes affect the investment in R&D.

Both managers and policymakers should also find this paper of interest. It documents that decreases in shareholder-level dividend taxes (through dividend imputation) result in changes in the negative relationship between dividend payment and R&D investment. Contingent on the R&D tax incentive in place, changes in shareholder-level dividend taxes may place pressure on firms to increase the amount of dividends paid while decreasing the amount of R&D investment. This study found that in both New Zealand and Australia, investment in R&D decreased after the implementation of dividend imputation.[61] Further, it found that the effects of shareholder-level dividend tax decreases vary according to the R&D tax incentive in place, the dividend policy of the firm, and the MTR of the firm.

Decreases in investment in R&D could have a negative effect on economic growth since research shows that domestic R&D spending is linked to the rate of innovation and the ability to learn from others (Cameron 1996, Salter and Martin 2001). While on the surface, the payment of dividends and R&D investment may seem unrelated, the results of this paper demonstrate this is not true. Therefore when a decrease in shareholder-level dividend taxes designed to stimulate economic growth is implemented, economic growth may be negated by a decrease in R&D investment. Simply put, a decrease in shareholder-level dividend taxes serves as an incentive for corporations to pay dividends. Hence President Bush's statement regarding the Job and Growth Tax Relief Act of 2003, "The bill allows for dividend income to be taxed at a lower rate. This will encourage more companies to pay dividends." However, as explained in this paper, company cash

[61] In New Zealand this decrease was statistically significant (hypothesis 4a).

flow is often limited and the funds to pay increased dividends must come from somewhere. In New Zealand and Australia, much of the increased dividend funding appears to have come from R&D investment. Thus, if a country decides to decrease shareholder-level dividend taxes and the country values investment in R&D, it may need to consider simultaneously increasing the R&D investment incentive.

More research is needed before the conclusions from this paper can be generalized to countries such as the United States. This is due primarily to the fact that unlike New Zealand and Australia during this paper's sample period, the United States permits share repurchases. When a country allowing share repurchases, implements a dividend payment incentive, funding for increased dividend payments may be drawn from funds previously used for share repurchases instead of from R&D investment funds. Therefore, future study in countries permitting share repurchases is needed before we can generalize the results of this paper to the United States.

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Table 1
Summary of Australian and New Zealand Tax Changes

Panel A: Tax Changes in Australia (effective July 1985)

	Prior to the Tax Change	After the Tax Change
R&D Investment	Immediate deduction for 100 percent of investment	Immediate deduction for 150 percent of investment above $20,000 AUS
Dividends Received	Taxed fully at shareholder level	Same
Capital Gains Realized	Taxed at individual rates only if held for less than 12 months; otherwise, no tax applied	Same

Panel B: Tax Changes in Australia (effective July 1987)

	Prior to the Tax Change	After the Tax Change
R&D Investment	Immediate deduction for 150 percent of investment above $20,000 AUS	Same
Dividends Received	Taxed fully at shareholder level	Credit for the portion of the dividend on which the corporation had already paid tax ("franked dividend")
Capital Gains Realized	Taxed at individual rates only if held for less than 12 months; otherwise, no tax applied	Taxed at the individual tax rate on the difference between the consideration received and the indexed cost base

Panel C: Tax Changes in New Zealand (effective April 1988)

	Prior to the Tax Change	After the Tax Change
R&D Investment	Immediate deduction for 100 percent of investment	Same
Dividends Received	Taxed fully at shareholder level	Credit for the portion of the dividend on which the corporation had already paid tax
Top Corporate Tax Rate	48 percent	33 percent

Table 2
Tax Regimes

	Time Period	R&D Investment Incentive	Dividend Payment Incentive
Tax Regime I	Australia prior to July 1985 New Zealand prior to April 1988	No	No
Tax Regime II	Australia from July 1985 to June 1987	Yes	No
Tax Regime III	New Zealand after March 1988	No	Yes
Tax Regime IV	Australia after June 1987	Yes	Yes

Table 3
Tax Change Implications for Firms Typically Paying Dividends

Panel A: Given No Explicit Incentive for R&D Investment, the Effect of a Dividend Imputation Credit *

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	No Change	No Change	No Change
Double Taxation	---------	Increase	Increase

Panel B: Given No Explicit Incentive for R&D Investment, the Effect of a Decrease in Corporate Tax Rates*

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	---------	Increase	---------
Tax Capitalization	---------	Increase	---------
Double Taxation	---------	Increase	Increase

Panel C: Given an Explicit Incentive for R&D Investment, the Effect of a Dividend Imputation Credit**

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	No Change	No Change	No Change
Double Taxation	---------	Increase	Increase

Panel D: Given a Dividend Imputation Credit and an Explicit Incentive for Investment in R&D, the Effect of Capital Gains Tax on Firms**

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	---------	Decrease	---------
Double Taxation	---------	---------	---------

--------- Indicates no prediction. According to the dividend policy view, the variable could increase, decrease, or remain the same.
* Panel B portrays the effect of moving from Tax Regime I to Tax Regime III and is tested in hypothesis 4.
**Panel D portrays the effect of moving from Tax Regime II to Tax Regime IV and is tested in hypothesis 7.

Table 4
Tax Change Implications for Firms Not Typically Paying Dividends

Panel A: Given No Explicit Incentive for R&D Investment, the Effect of a Dividend Imputation Credit*

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	No Change	No Change	No Change
Double Taxation	No Change	No Change	No Change

Panel B: Given a Dividend Imputation Credit and No Explicit Incentive for R&D Investment, the Effect of a Decrease in Corporate Tax Rates*

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	---------	Increase	No Change
Tax Capitalization	---------	Increase	No Change
Double Taxation	---------	Increase	No Change

Panel C: Given an Explicit Incentive for R&D Investment, the Effect of a Dividend Imputation Credit **

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	No Change	No Change	No Change
Double Taxation	No Change	No Change	No Change

Panel D: Given a Dividend Imputation Credit and an Explicit Incentive for Investment in R&D, the Effect of Lower Capital Gains Tax on Firms**

	R&D Investment	Capital Investment	Dividend Payment
Tax Irrelevance	No Change	No Change	No Change
Tax Capitalization	---------	---------	---------
Double Taxation	---------	---------	---------

--------- Indicates no prediction. According to the dividend policy view, the variable could increase, decrease, or remain the same.
** Panel B portrays the effect of moving from Tax Regime I to Tax Regime III and is tested in hypothesis 6.
**Panel D portrays the effect of moving from Tax Regime II to Tax Regime IV and is tested in hypothesis 9.

Table 5
Descriptive Statistics of Regression Variables—Means (Medians)
(in thousands of dollars)

Variable	New Zealand n = 72	Australia n = 623
RDX	1006	3432
R&D expense	(.7)	(0)
BRDMTR**	.25*	.33*
Trichotomous variable on before-R&D MTR	(.33)	(.39)
DIVPAY	9435*	34240*
Dividend payment	(4376)	(6944)
AVGOPCF	29571*	94857*
Average operating cash flows	(14491)	(26257)
AVGFCF	51122	1134
Average financing cash flows	(-454)	(-697.5)
CAPEX	27796*	85813*
Capital Expenditures	(4777)	(16201)
DEBT	.48	.50
Beginning-of-the-year debt-to-assets ratio	(.48)	(.52)
EBTR	21291	89541
Earnings before taxes and R&D expense	(12191)	(23741)
LRDX	823	3061
Lagged R&D expense	(1.15)	(0)
SIZE	11.97*	12.56*
Log of total sales	(12)	(12.55)
GPD	69212*	358470*
Gross Domestic Product	(73152)	(382497)
B/M	1.34	1.49
Book-to-Market ratio	(1.01)	(1.26)
CRATE	.36*	.42*
Statutory corporate tax rate	(.33)	(.39)
IRATE	.40*	.51*
Statutory individual tax rate	(.33)	(.49)
LDIVPAY	7677*	29892*
Lagged dividend payment	(3550)	(6552)
EGROW	.95	493.87
Growth in earnings	(.09)	(.14)
CAPRET	1.34	1.49
Return provided through price appreciation	(1.01)	(1.26)

*Variables with significant differences in the mean.
** Before-R&D marginal tax rate calculated by adding R&D expense to the taxable income and then determining Shelvin's (1990) trichotomous variable; Shelvin's (1990) trichotomous variable equals the top statutory rate if the corporation has before-R&D taxable income and no NOL carryforward, one-half of this rate if the corporation has negative before-R&D taxable income or an NOL carryforward but not both, and zero if the firm has negative before-R&D taxable income and an NOL carryforward;

Table 6
Combined New Zealand and Australia—Pearson Correlation Coefficients

	RDX	BRD MTR	DIV PAY	AVG OPCF	AVG FCF	CAP EX	DEBT	EBTR	LRDX	SIZE	GDP	B/M	C RATE	I RATE	IMP CRED	LDIV PAY	E GROW
BRDMTR	***.08***																
DIVPAY	***.35***	.03															
AVGOPCF	***.57***	***.13***	***.82***														
AVGFCF	***-.09***	.02	.01	***.16***													
CAPEX	***.44***	***.09***	***.58***	***.70***	***.08***												
DEBT	.03	-.03	***.21***	***.17***	.009	***.20***											
EBTR	***.45***	***.19***	***.66***	***.85***	.03	***.57***	***.13***										
LRDX	***.93***	***.08***	***.35***	***.55***	***-.09***	***.43***	.03	***.42***									
SIZE	***.33***	***.23***	***.54***	***.58***	-.001	***.53***	***.56***	***.46***	***.33***								
GDP	***.10***	-.03	***.17***	***.15***	-.05	***.11***	-.05	***.10***	***.11***	.003							
B/M	.01	.07	.01	.05	-.005	.05	-.06	.06	.008	-.005	***.12***						
CRATE	-.03	***.35***	-.06	-.02	.06	.07	***.10***	.02	-.03	***.11***	***-.24***	***-.08***					
IRATE	-.002	***.25***	-.05	-.02	.03	.02	***.12***	.006	.001	***.15***	***-.09***	***-.08***	***.73***				
IMPCRED	.05	***-.22***	***.13***	***.10***	-.05	.04	***-.10***	.06	.05	***-.11***	***.51***	***.10***	***-.65***	***-.83***			
LDIVPAY	***.34***	.002	***.87***	***.70***	***-.10***	***.52***	***.19***	***.46***	***.35***	***.52***	***.18***	-.01	***-.08***	-.06	***.13***		
EGROW	-.002	.04	***.08***	***.13***	.05	.07	***.08***	***.15***	-.002	***.10***	.02	.02	.08	.01	.02	***.10***	
CAPRET	.01	.07	.01	.05	-.005	.05	-.06	.06	.008	-.005	***.12***	.99	***-.08***	***-.08***	***.10***	-.009	.02

Bold and italicized if Pearson Correlation is significant at the 5 percent level.

Table 7
New Zealand—Pearson Correlation Coefficients

	RDX	BRD MTR	DIV PAY	AVG OPCF	AVG FCF	CAP EX	DEBT	EBTR	LRDX	SIZE	GDP	B/M	C RATE	I RATE	IMP CRED	LDIV PAY	E GROW
BRDMTR	***.32***																
DIVPAY	-.04	.11															
AVGOPCF	-.3	.19	***.82***														
AVGFCF	-.01	.14	***.75***	***.69***													
CAPEX	.03	.07	***.83***	***.68***	***.82***												
DEBT	.12	-.23	***.24***	.19	.16	.23											
EBTR	-.07	.09	***.59***	***.73***	***.45***	***.41***	.18										
LRDX	***.62***	***.19***	.02	.02	-.02	.06	.12	-.05									
SIZE	.15	.15	***.48***	***.56***	***.35***	***.37***	***.47***	***.48***	***.25***								
GDP	***-.28***	-.06	.09	.07	.04	.04	-.22	-.02	***-.45***	-.18							
B/M	-.07	***.38***	-.09	-.06	-.13	-.16	-.19	.03	***-.36***	-.01	.20						
CRATE	***.33***	***.32***	-.07	-.06	-.07	-.04	.19	-.03	***.46***	.21	***-72***	-.19					
IRATE	***.34***	.14	-.08	-.07	-.09	-.04	.23	.04	***.55***	.22	***-.90***	-.20	***.86***				
IMPCRED	***-.31***	-.11	.04	.007	.06	.06	***-.24***	-.14	***-.51***	-.22	***.89***	.19	***-.75***	***-.93***			
LDIVPAY	.01	.13	***.62***	***.81***	***.61***	***.47***	.20	***.44***	.08	***.48***	.08	-.10	-.06	-.07	.04		
EGROW	-.04	-.09	.11	.03	-.03	-.02	.14	.13	-.05	-.01	***-.24***	-.02	.08	.11	-.17	-.05	
CAPRET	-.07	***.38***	-09	-.06	-.13	-.16	-.19	.03	***-.36***	-.01	.20	.99	-.19	-.20	.19	-.10	-.02

Bold and italicized if Pearson Correlation is significant at the 5 percent level.

Table 8
Australia—Pearson Correlation Coefficients

	RDX	BRD MTR	DIV PAY	AVG OPCF	AVG FCF	CAP EX	DEBT	EBTR	LRDX	SIZE	GDP	B/M	C RATE	I RATE	IMP CRED	LDIV PAY	E GROW
BRDMTR	.06																
DIVPAY	***.35***	.01															
AVGOPCF	***.57***	***.11***	***.82***														
AVGFCF	***-.09***	.02	.009	***.16***													
CAPEX	***.44***	.07	***.57***	***.70***	.07												
DEBT	.03	-.01	***.21***	***.17***	.01	***.20***											
EBTR	.44	**.18**	***.66***	***.85***	.03	***.57***	***.13***										
LRDX	***.93***	.06	***.34***	***.55***	***-.09***	***.43***	.03	***.41***									
SIZE	***.34***	***.23***	***.55***	***.58***	-.007	***.54***	***.57***	***.46***	***.33***								
GDP	***.08***	***-.26***	***.13***	***.10***	-.06	.04	***-.11***	.05	.08	***-.11***							
B/M	.01	.05	.01	.05	-.003	.05	-.05	.06	.01	-.01	***.14***						
CRATE	-.06	***.32***	***-.11***	-.06	.07	.04	***.08***	-.009	-.06	.07	***-.79***	***-.09***					
IRATE	-.07	***.23***	***-.14***	***-.11***	.06	-.05	***.10***	-.06	-.07	***.11***	***-.95***	***-.11***	***.69***				
IMPCRED	.06	***-.22***	***.14***	***.11***	-.05	.05	***-.08***	.07	.06	***-.10***	***.89***	***.09***	***-.66***	***-.98***			
LDIVPAY	***.34***	-.02	***.87***	***.70***	***-.11***	***.53***	***.19***	***.45***	***.34***	***.53***	***.15***	-.01	***-.13***	***-.15***	***.15***		
EGROW	-.005	.03	.08	***.12***	.05	.07	***.08***	***.15***	-.01	***.11***	-.02	.01	.07	-.01	.02	***.10***	
CAPRET	.01	.05	.01	.05	-.00.	.05	-.05	.06	.01	-.008	***.14***	.99	-.09	***-.11***	***.09***	-.01	.01

Bold and italicized if Pearson Correlation is significant at the 5 percent level.

Table 9
Results for Simultaneous Regression Estimation in New Zealand Firms
Moving from Tax Regime I to Tax Regime III

Variable	RDX R&D Expense	DIVPAY Dividend payment
BRDMTR	12284	5000
Before R&D marginal tax rate	(2.50)**	(0.47)
DIVPAY	-.0525	
Dividend payment	(-0.01)	
AVGOPCF	-.0021	.0847
Average operating cash flows	(-0.07)	(1.99)
AVGFCF	-.0004	-.0022
Average financing cash flows	(-0.18)	(-0.32)
CAPEX	-.0327	.1399
Capital Expenditures	(-0.03)	(5.07)***
DEBT	920	1505
Beginning-of-the-year debt-to-assets ratio	(0.18)	(0.32)
EBTR	.0096	.0163
Earnings before taxes and R&D expense	(0.10)	(0.55)
LRDX	.9878	
Lagged R&D expense	(3.28)***	
SIZE	-32.16	458
Log of total sales	(-0.18)	(0.63)
GDP	-.0222	
Gross Domestic Product	(-0.04)	
B/M	100	
Book-to-Market ratio	(0.08)	
CRATE	4065	-175
Statutory corporate tax rate	(0.47)	(-0.01)
IRATE	-4852	-18283
Statutory individual tax rate	(-0.11)	(-0.68)
IMPCRED	2541	-3958
Dummy measure equal to 1 if dividend imputation exists	(0.22)	(-0.63)
IMPCRED*BRDMTR	-10183	
Interaction between dividend imputation and before-R&D MTR	(-1.86)*	
IMPCRED*DIVPAY	.0119	
Interaction between dividend imputation and dividend payment	(0.00)	
IMPCRED*CAPEX	.0404	
Interaction between dividend imputation and capital expenditures	(0.04)	
RDX		-.5224
R&D Expense		(-0.66)
LDIVPAY		.0566
Lagged dividend payment		(0.46)
EGROW		385
Growth in earnings		(2.05)***
CAPRET		100
Return provided through price appreciation		(0.10)

z-statistics are in parentheses.
*,**,*** Denote 10 percent, 5 percent, and 1 percent significance levels, respectively.

Table 10
Results for Simultaneous Regression Estimation in Australian Firms Moving from Tax Regime I to Tax Regime II

Variable	R&D Expense	Dividend payment
BRDMTR	-848	1976
Before R&D marginal tax rate	(-0.79)	(0.29)
DIVPAY	-.0059	
Dividend payment	(-0.13)	
AVGOPCF	.0152	.1030
Average operating cash flows	(3.70)***	(2.56)**
AVGFCF	-.0006	-.0079
Average financing cash flows	(-1.34)	(-1.96)
CAPEX	-.0104	.2036
Capital Expenditures	(-2.54)**	(3.03)***
DEBT	-895	-12066
Beginning-of-the-year debt-to-assets ratio	(-1.17)	(-1.88)*
EBTR	-.0048	.0879
Earnings before taxes and R&D expense	(-1.00)	(2.95)***
LRDX	1.14	
Lagged R&D expense	(50.53)***	
SIZE	43.77	801
Log of total sales	(0.43)	(0.89)
GDP	-.0008	
Gross Domestic Product	(-0.14)	
B/M	10.40	
Book-to-Market ratio	(0.15)	
CRATE	5214	-9501
Statutory corporate tax rate	(0.46)	(-0.10)
R&DINCENT	-863	549
Dummy measure equal to 1 if super-deductibility exists	(-1.37)	(0.22)
R&DINCENT*BRDMTR	1222	
Interaction between super-deductibility and before-R&D MTR	(0.81)	
R&DINCENT*DIVPAY	-.0095	
Interaction between super-deductibility and dividend payment	(-0.28)	
R&DINCENT*CAPEX	.0103	
Interaction between super-deductibility and capital expenditures	(2.42)**	
RDX		-.5794
R&D Expense		(-4.10)***
LDIVPAY		.2517
Lagged dividend payment		(5.26)***
EGROW		-1.21
Growth in earnings		(-1.61)*
CAPRET		520
Return provided through price appreciation		(0.75)

z-statistics are in parentheses.
*,**,*** Denote 10 percent, 5 percent, and 1 percent significance levels, respectively.

Table 11
Results for Simultaneous Regression Estimation in New Zealand Dividend-Paying Firms Moving from Tax Regime I to Tax Regime III, Separated by MTR

Variable	R&D Expense	Dividend payment
DIVPAY	.4648	
Dividend payment	(0.61)	
AVGOPCF	-.0144	.0196
Average operating cash flows	(-1.40)	(0.40)
AVGFCF	-.0011	-.0123
Average financing cash flows	(-0.69)	(-1.75)*
CAPEX	-0922	.2031
Capital Expenditures	(-0.70)	(6.48)***
DEBT	-2002	7442
Beginning-of-the-year debt-to-assets ratio	(-0.92)	(1.47)
EBTR	.0027	.0617
Earnings before taxes and R&D expense	(0.09)	(1.79)*
LRDX	.9184	
Lagged R&D expense	(3.16)***	
SIZE	-127	-1430
Log of total sales	(-0.32)	(-1.04)
GDP	-.1909	
Gross Domestic Product	(-0.89)	
B/M	164	
Book-to-Market ratio	(0.41)	
CRATE	658	15903
Statutory corporate tax rate	(0.07)	(0.49)
IRATE	-10910	-38366
Statutory individual tax rate	(-1.00)	(-1.22)
IMPCRED	5657	-2836
Dummy measure equal to 1 if dividend imputation exists	(0.66)	(-0.38)
MTR	-866	-2279
Dummy measure equal to 1 if before-R&D MTR is highest corporate tax rate	(-0.41)	(-0.78)
IMPCRED*MTR	651	
Interaction between dividend imputation and MTR	(0.28)	
IMPCRED*DIVPAY	-.4001	
Interaction between dividend imputation and dividend payment	(-0.55)	
IMPCRED*CAPEX	.0880	
Interaction between dividend imputation and capital expenditures	(0.64)	
MTR*DIVPAY	2.85	
Interaction between MTR and dividend payment	(2.65)***	
MTR*CAPEX	-.7672	
Interaction between MTR and capital expenditures	(-2.17)**	
MTR*IMPCRED*DIVPAY	-2.72	
Interaction among MTR, dividend imputation, and dividend payment	(-2.71)***	
MTR*IMPCRED*CAPEX	.7447	
Interaction among MTR, dividend imputation, and capital expenditures	(2.14)**	
RDX		.9694
R&D Expense		(1.27)
LDIVPAY		.2451
Lagged dividend payment		(1.81)*
EGROW		608
Growth in earnings		(3.14)***
CAPRET		492
Return provided through price appreciation		(0.44)

z-statistics are in parentheses; *,**,*** Denote 10 percent, 5 percent, and 1 percent significance levels, respectively.

Table 12
Results for Simultaneous Regression Estimation in Australian Dividend-Paying Firms Moving from Tax Regime II to Tax Regime IV

Variable	R&D Expense	Dividend payment
BRDMTR	-3738	-30405
Before R&D marginal tax rate	(-0.71)	(-2.07)**
DIVPAY	.1303	
Dividend payment	(1.59)	
AVGOPCF	.0104	.1140
Average operating cash flows	(2.04)**	(4.31)***
AVGFCF	-.0004	.0011
Average financing cash flows	(-2.08)**	(0.82)
CAPEX	-.0089	-.0133
Capital Expenditures	(-1.59)	(-1.20)
DEBT	-203	10432
Beginning-of-the-year debt-to-assets ratio	(-0.14)	(1.17)
EBTR	-.0002	.0635
Earnings before taxes and R&D expense	(-0.10)	(4.76)***
LRDX	.9291	
Lagged R&D expense	(30.94)***	
SIZE	-216	48.27
Log of total sales	(-0.87)	(0.03)
GDP	.1205	
Gross Domestic Product	(2.58)***	
B/M	-198	
Book-to-Market ratio	(-0.83)	
CRATE	51980	-11882
Statutory corporate tax rate	(2.31)**	(-0.30)
IRATE	218567	332387
Statutory individual tax rate	(2.71)***	(2.14)**
IMPCRED	14196	34223
Dummy measure equal to 1 if dividend imputation exists	(2.55)**	(2.18)**
IMPCRED*BRDMTR	2841	
Interaction between dividend imputation and before-R&D MTR	(0.48)	
IMPCRED*DIVPAY	-.1487	
Interaction between dividend imputation and dividend payment	(-1.93)**	
IMPCRED*CAPEX	.0140	
Interaction between dividend imputation and capital expenditures	(1.91)*	
RDX		-.8821
R&D Expense		(-4.89)***
LDIVPAY		.7249
Lagged dividend payment		(19.77)***
EGROW		-1.04
Growth in earnings		(-3.16)***
CAPRET		426
Return provided through price appreciation		(0.28)

z-statistics are in parentheses.
*,**,*** Denote 10 percent, 5 percent, and 1 percent significance levels, respectively.

Table 13
Initial Relationships in Tax Regimes I and II

Tax Regime I
New Zealand Firms Prior to April 1988

	Relationship Between	Sample Size	Statistical Test	Predicted Sign	Finding
H1a	R&D Investment and Capital Investment	16	Simultaneous Regression	-	Insignificant
H1b	R&D Investment and Dividend Payment	16	Simultaneous Regression	-	Insignificant
H2	R&D Investment and Before-R&D MTR	16	Simultaneous Regression	+	+

Tax Regime I
Australian Firms Prior to June 1985

	Relationship Between	Sample Size	Statistical Test	Predicted Sign	Finding
H1a	R&D Investment and Capital Investment	106	Simultaneous Regression	-	-
H1b	R&D Investment and Dividend Payment	106	Simultaneous Regression	-	Insignificant
H2	R&D Investment and Before-R&D MTR	106	Simultaneous Regression	+	Insignificant

Tax Regime II
Australian Firms from July 1985 to June 1987

	Relationship Between	Sample Size	Statistical Test	Predicted Sign	Finding
H1a	R&D Investment and Capital Investment	86	Simultaneous Regression	-	-
H1b	R&D Investment and Dividend Payment	86	Simultaneous Regression	-	Insignificant
H2	R&D Investment and Before-R&D MTR	86	Simultaneous Regression	+	Insignificant

Table 14
Changes in the Relationship between R&D Investment and Dividend Payment when Moving Tax Regimes

Panel A: Dividend-Paying Firms Moving from Tax Regime I to Tax Regime II

	Relationship between	Prediction	Finding
H3	R&D Investment and Dividend Payment	Weaker Relationship	Insignificant

Panel B: Dividend-Paying Firms Moving from Tax Regime I to Tax Regime III

	Relationship between	Prediction	Finding
H5a	R&D Investment and Dividend Payment	Weaker Relationship	Insignificant

Panel C: Dividend-Paying Firms Moving from Tax Regime I to Tax Regime III, Separated by MTR

	Relationship between	Prediction	Finding	
			High MTRs	**Low/Mid MTRs**
H5b	R&D Investment and Dividend Payment	Weakening of Relationship Is Greater in Low/Mid-MTRs	Negativity Increases	Insignificant

Panel D: Dividend-Paying Firms Moving from Tax Regime II to Tax Regime IV

	Relationship between	Prediction	Finding
H8a	R&D Investment and Dividend Payment	Stronger Relationship	Stronger Relationship

Panel E: Dividend-Paying Firms Moving from Tax Regime II to Tax Regime IV, Separated by MTR

	Relationship between	Prediction	Finding**
H8b	R&D Investment and Dividend Payment	Increase in the Strength of the Relationship is Greater in High-MTRs	Cannot Test Directly Due to Multi-Collinearity

** The high collinearity between the interaction of dividend imputation and dividend payment and the interaction of the high-MTR group and dividend payment implies that the high-MTR group drives the result in H8a. H8a finds a stronger relationship between R&D expense and dividend payment after dividend imputation. If this finding is driven by the high-MTR group, it supports H8b.

Table 15
Changes in R&D Investment, Capital Investment, and Dividend Payment
When Moving Tax Regimes

Panel A: Dividend-Paying Firms Moving from Tax Regime I to Tax Regime III

	Change in	Prediction	Finding
H4a	R&D Investment	Change	Decrease
H4b	Capital Investment	Increase	Insignificant
H4c	Dividend Payment	Increase	Increase

Panel B: Non-Dividend-Paying Firms Moving from Tax Regime I to Tax Regime III

	Change in	Prediction	Finding
H6a	R&D Investment	Change	Insignificant
H6b	Capital Investment	Increase	Insignificant
H6c	Dividend Payment	Change	Insignificant

Panel C: Dividend-Paying Firms Moving from Tax Regime II to Tax Regime IV

	Change in	Prediction	Finding
H7a	R&D Investment	Change	Insignificant
H7b	Capital Investment	Increase	Insignificant
H7c	Dividend Payment	Increase	Insignificant

Panel D: Non-Dividend-Paying Firms Moving from Tax Regime II to Tax Regime IV

	Change in	Prediction	Finding
H9a	R&D Investment	Change	Insignificant
H9b	Capital Investment	Increase	Insignificant
H9c	Dividend Payment	Increase	Insignificant