A New Look at the 'Old View': Endogenous Discounting, Taxation, and Corporate Financial Decisions

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A NEW LOOK AT THE 'OLD VIEW':

ENDOGENOUS DISCOUNTING, TAXATION, AND

CORPORATE FINANCIAL DECISIONS

BY

ROBERT D. BUSCHMAN

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
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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 of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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ABSTRACT

A NEW LOOK AT THE 'OLD VIEW': ENDOGENOUS DISCOUNTING, TAXATION, AND CORPORATE FINANCIAL DECISIONS

By

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Committee Chair: Dr. James Alm

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The theoretical debate over the effect of dividend taxation on corporate decisions is long-running and unsettled, and was central to the debate and passage of the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). It is a critical issue again as the expiration of JGTRRA tax rates looms at the end of 2012.

This dissertation proposes an enhanced "old view" theoretical model of dividend taxation, using endogenous discounting methodology of Uzawa (1968) and Obstfeld (1990) to relate dividend policy, taxes, and investment. In addition to the standard *old* view condition for optimal investment, an Euler equation for optimal dividend policy is derived. Optimal dividends and investment are both shown to vary negatively with dividend tax rates, ceteris paribus, whereas competing "new view" and agency theories conclude no such dependence.

Predictions from the theory are tested using a pooled panel of U.S. firms covering a period, 1994-2009, that includes two relevant tax changes: the 1997 cut in federal capital gains tax rates and, in 2003, the JGTRRA cuts in the top dividend tax rate from 39.6 to 15 percent and in the top capital gains rate from 20 to 15 percent. Existing empirical studies of the effect of dividend taxation on firm behavior, including a limited

body of work on the 2003 tax changes, are improved upon by use of a Tobit regression model to properly address the "excess zeroes" problem of more than 45 percent of firms, on average over the period, not paying dividends. In addition, while the existing literature generally omits firm investment as an explanatory variable in dividend models, theory suggests dividend and investment decisions may be linked. Thus firm investment is included, but is treated as an endogenous variable, instrumented by exogenous or predetermined aggregate and firm-specific variables.

Empirical results are consistent with predictions of the *old* view, showing a positive effect of the JGTRRA dividend tax cut on both payouts and investment, and suggesting that the expiration of JGTRRA could be expected to reduce payouts and investment. Point estimates of the effects of JGTRRA on public companies' dividend payouts relative to assets are statistically significant and large compared to average annual payouts since 1994. Estimates also suggest an increase in firm investment of about 5-6 percent from pre-JGTRRA levels, ceteris paribus.

CHAPTER I

INTRODUCTION

"It dramatically reduces the tax on dividends and investment. This will have a profoundly positive effect on job creation, corporate accountability, and the well-being of all Americans." – *U.S. Treasury Secretary John Snow, May 23, 2003*

The Jobs and Growth Tax Relief Reconciliation Act of 2003, signed into law in May 2003, made sharp cuts to the personal income tax rates applicable to dividend income in the United States, greatly reducing the double taxation of corporate source income and the discrimination in the tax system against dividend income and in favor of capital gains. The proponents of the 2003 act argued that the double taxation of corporate income, together with tax discrimination against dividends and equity finance, distorts corporate financial decisions, raises capital costs, and discourages productive investment. The act was proposed and passed with the objectives of encouraging both business investment and the increased payment of dividends – objectives that under some theories of corporate dividend decisions would seem to be in conflict.

The theoretical debate over how firms set dividend policy, especially in the face of changes to the tax treatment of dividends, is long-running and passage of the 2003 tax changes presented an opportunity to test the theories and whether the bill was having the promised effects. The economic literature around the law's effects is varied, some focusing on estimating stock price effects of the tax changes or what those prices changes

imply about the cost of capital, some on whether firms responded by switching from share repurchases to special dividends as a means or distributing cash to shareholders, and some on whether the frequency of dividend initiations or increases changed after passage. Few have looked at the effects on dividend payouts directly, most settling for modeling binary decisions to pay a dividend or not, to increase it or not, etc.; few have looked at the act's effects on business investment; and few have looked at the effects over a long time period, over complete business cycles. This dissertation will model dividend payments directly, rather than binary choices, using a panel of U.S. firms with data spanning 16 years and two business cycles, and will also model corporate investment and the interdependence between dividends and investment.

Testing the theories of dividends and their taxation also affords an opportunity to explore the theory. As noted above, there is much disagreement over the theoretical effects of dividend taxation on firm behavior, with different predictions arising from the so-called *old* and *new* views of dividend taxation, and from more recent agency theories. There is also some inconsistency in the theoretical literature in the modeling of the firm decision, so this dissertation will use a consistent framework to model some of the competing theories, and compare their assumptions and predictions. The application of a dynamic optimization model that incorporates an endogenous discount rate results in a somewhat enhanced version of the *old* view model, including the derivation of an Euler equation for the optimal dividend policy in addition to the usual condition for optimal investment.

Further analysis of the effects of the 2003 act is warranted and timely not only as an academic exercise. The present policy with regard to dividend and capital gains

taxation is set to expire at the end of this year, 2012, along with the expiration of all of the 2001 and 2003 tax cuts that had been extended as recently as December 2010. These expiring tax policies are a large part of what some have recently taken to referring to as an approaching "fiscal cliff." Hopefully, this project will contribute in some way to the analysis and debate over how corporate source income should be taxed in the future.

The dissertation will proceed as follows: Chapter II will provide some historical perspective and an overview of current tax policy with regard to capital income in the U.S., with comparisons to other major economies. Chapter III will offer some preliminary empirical observations on dividend policies of U.S. firms over time, and will review and highlight some recent survey evidence on firms' dividend policies. Chapters IV and V delve into the theory, first with background on the *old* view – *new* view debate and alternate theories, and next with the formal theoretical models. The next three chapters review the empirical literature, describe the data and some key empirical issues, present the main hypotheses and lesser predictions to be tested, and outline the econometric methods and present results. Chapter IX concludes.

CHAPTER II

TAXATION OF CORPORATE SOURCE PERSONAL INCOME IN THE UNITED STATES

Policy History in Brief

Over the history of income taxation in the United States since 1913, dividend income was fully exempt from individual income taxes through 1953, with the exception of four years from 1936 through 1939 during which dividends were fully taxable. From 1954 through 1985, dividend income was taxable as ordinary income, but small amounts were excluded from taxation.[1] The exclusion was repealed as part of the Tax Reform Act of 1986 ("TRA86"), which also reduced the top marginal tax rate on dividend income from 50 percent to 28 percent, and dividends remained fully taxable at ordinary income tax rates until 2003 (Joint Committee on Taxation 1981, 1987; Tax Foundation 2006).

In the first 73 years of individual income taxation in the U.S., some 20 acts of Congress changed some aspect of capital gains taxation, including changes in applicable rates, exclusions, and holding period requirements for "long-term" gains treatment (Esenwein 2007). Prior to passage of TRA86, 60 percent of net long-term capital gains were excluding from taxable income, resulting in an effective top marginal tax rate of 20 percent. TRA86 repealed this exclusion, bringing the top capital gains tax rate to the same 28 percent top rate applicable to ordinary income and dividends. Since 1986,

[1] The first $50 was excluded through 1963, increasing to $100 per filer each year through 1985, with the exception of 1981 when there was a combined $200 ($400 joint) interest and dividend income exclusion.

significant changes with regard to long-term capital gains (i.e. on assets held for more than one year) include two cuts in statutory rates from the TRA86 top rate of 28 percent to 20 percent in May 1997, under the Taxpayer Relief Act of 1997, and 15 percent effective May 6, 2003.[2]

Jobs and Growth Tax Relief Reconciliation Act of 2003

President George W. Bush first proposed changes to dividend and capital gains taxation on January 7, 2003 as part of his "Jobs and Growth" initiative to stimulate the U.S. economy, which was in the midst of a sluggish recovery from the 2001 recession. According to then chairman of the Council of Economic Advisors, Glenn Hubbard, business investment was the "weak spot" of the economic recovery in 2002, falling by 2.0 percent in the first three quarters of recovery, he said, when one would typically see an increase of "roughly 2.7 percent". As proposed, the changes would have represented a full integration of corporate and personal taxes on corporate source income. Dividends would no longer be taxed at the individual level and taxpayers would receive a step-up in basis for retained earnings taxed at the corporate level. The objective, according to Hubbard, was to stimulate business investment and thus boost the economy:

> The most immediate effect of ending the double taxation of corporate income will be to lower the cost of capital faced by firms in equity markets… Corporate income will be taxed once – and only once – which will make corporate equities more attractive to investors and lower the implicit cost that firms pay for equity-financed investment.

[2] The Taxpayer Relief Act of 1997 set the maximum rate on assets held more than 18 months at 20 percent and left the rate on assets held for more than 12 months, but less than 18 months, at 28 percent. However, the 18 month holding period was repealed in 1998 and the holding period for the 20 percent rate was reduced to 12 months. It also established a lower, 18 percent maximum rate for assets purchased after December 31, 2000 and held for more than five years, but this provision was repealed in 2003, before any gains eligible for the rate could have been realized.

With regard to dividends in particular, Hubbard added:

> In addition to the direct stimulative effects of lower costs of equity capital, ending the double taxation of corporate income will rationalize dividend payout policy among American companies. This will also aid investment, even in the short run. Currently, the tax code encourages firms to retain earnings and remit income to shareholders through share repurchases… A main goal of the President's policy is to … [make] tax policy neutral with respect to retaining earnings or paying dividends. (Joint Economic Committee 2003)

The Jobs and Growth Tax Relief Reconciliation Act of 2003 ("JGTRRA") was introduce in the U.S. House of Representatives on February 27, 2003 and passed by the House on May 9. The Senate passed its version of the bill on May 15, sending the bill to a conference committee. The final bill was agreed to by both houses on May 23 and the President signed it on May 28, 2003.

As enacted, the JGTRRA brought about only partial integration of corporate and personal taxes, reducing but not eliminating the double-taxation of corporate source income. Under JGTRRA, qualified dividends[3] received by taxable individuals beginning January 1, 2003, are taxed at a maximum rate of 15 percent, the same as the maximum tax rate on long-term capital gains under JGTRRA. For taxpayers in tax brackets below the 25 percent marginal rate bracket, the rate applicable to qualified dividends and long-term capital gains was 5 percent through 2007 and zero percent beginning January 1, 2008. Immediately prior to passage of JGTRRA, dividends were taxed as ordinary income while long-term capital gains were taxed at a maximum rate of 20 percent.

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[3] "Qualified dividends" are ordinary dividends paid by a U.S. corporation or a qualified foreign corporation on shares held for more than 60 days during the 121-day period that begins 60 days before the ex-dividend date. A more complete explanation of these and other qualifications can be found in IRS Publication 550: Investment Income and Expenses, available online at http://www.irs.gov/pub/irs-pdf/p550.pdf.

In addition to changes in dividend and capital gains taxation, JGTRRA also accelerated the phased reductions in ordinary income tax rates passed as part of the Economic Growth and Tax Relief Reconciliation Act of 2001 ("EGTRRA"). EGTRRA had created a new 10 percent tax bracket, below the 15 percent bracket, for incomes up to $6,150 for single filers, and provided for phased reductions of rates for brackets above the 15 percent bracket. For the 2001-2003 tax years, the higher brackets' tax rates were each reduced by one percentage point to 27, 30, 35, and 38.6 percent from 28, 31, 36, and 39.6 percent, respectively. Further reductions were scheduled to take effect in 2004 and 2006; JGTRRA made the 2006 rates effective beginning January 1, 2003.

As originally passed, all of the tax rate reductions in EGTRRA were set to expire January 1, 2011 and the dividend and capital gains rate reductions in JGTRRA were set to expire January 1, 2009. In 2005, the latter were extended through 2010, and in late 2010, the EGTRRA and JGTRRA income tax cuts were again extended through 2012. On January 1, 2013, absent new legislation, ordinary income, dividend, and capital gains tax rates will return to the levels in effect prior to passage of EGTRRA and JGTRRA. The top rate on ordinary income and on dividends will be 39.6 percent, while the top rate applicable to long-term capital gains will be 20 percent.

Policy in Other OECD Nations

Among the 33 OECD member nations other than the United States, the GDP-weighted average of the top personal income tax rates on dividend income, inclusive of sub-national income taxes and net of any imputation or other credits, was 21.4 percent in 2011. For the U.S., the top federal rate plus the weighted average of state tax rates on dividend income came to 21.2 percent, ranking the U.S. 16th out of 34. In 2000, before

either the EGTRRA or the JGTRRA tax cuts, the comparable U.S. top dividend tax rate was 46.2 percent, well above the 28.9 percent OECD weighted average and ranking it second among OECD nations (Organisation for Economic Co-operation and Development 2011; Carroll and Prante 2012).

However, personal tax rates are only a partial measure of the total statutory tax rate on corporate profit distributions. In the U.S. and all other OECD nations, profits are taxed first at the corporate level, on which tax rate the U.S. currently ranks first – second in 2011, before Japan lowered its corporate tax rate. A more complete measure – one that enables comparison across nations – requires integrating the two levels of taxes. In the U.S., $1 of pretax corporate earnings is first subjected to federal and average local taxes at a combined rate of about 39.2 percent, leaving 60.8 cents in after-tax earnings. If distributed to shareholders as qualified dividends, these earnings are subjected to federal and (average) state personal income taxes at, according to OECD calculations, a 21.2 percent combined top rate. Together, corporate and personal taxes at the top statutory rates would absorb about 52.1 cents of the $1 of pretax profits.

This 52.1 percent integrated top dividend tax rate in the U.S. in 2011 compares to a GDP-weighted average of 44.5 percent for non-U.S. OECD countries (Carroll and Prante 2012) and ranks the U.S. fourth out of 34 nations, lower than only the United Kingdom, Denmark, and France. In 2000, the combined rate in the U.S. was 67.3 percent by OECD calculations, comparing unfavorably to a non-U.S. weighted average integrated dividend tax rate of 54.8 percent and ranking second among OECD nations behind the Netherlands.

The U.S. clearly wasn't alone among OECD nations in cutting personal tax rates on dividend income over the period. In fact, 17 of the 33 other OECD nations cut their top personal dividend tax rate from 2000 to 2011, while eight raised the top rate and eight others left it unchanged. On an integrated basis, 29 of the 33 non-U.S. OECD countries reduced overall taxation of corporate profit distributions. 30 of 33 cut corporate tax rates.

Carroll and Prante (2012) make a similar comparison of top long-term capital gains tax rates in OECD countries based on country-specific analyses conducted by accounting firm Ernst & Young. According to their data, the non-U.S. weighted average tax rate is 17.8 percent, including national and sub-national individual income taxes, and countries were split between raising or lowering capital gains taxes, or leaving them unchanged. Nine raised, 12 lowered (including the U.S.), and 13 left rates unchanged between 2000 and 2011. However, holding periods and other conditions for preferential, long-term gains rates (where preferential treatment exists) vary widely, so comparisons are sometimes difficult. In addition, calculation of the integrated capital gains tax rate, which includes the effect of corporate tax as well, assumes that after tax corporate profits become realized gains for shareholders in the same year, distributed in the form of share repurchases or otherwise. Nevertheless, by the authors' analysis, the U.S. also ranks fourth among OECD nations in terms of integrated capital gains tax rates.

What's Next for U.S. Policy?

As noted above, the personal income tax provisions of the EGTRRA and JGTRRA are now scheduled to expire at the end of 2012, with dividend tax rates returning to ordinary income tax rates, and rates on ordinary income and capital gains returning to levels in effect before passage of EGTRRA in 2001. The top federal tax rate

on dividends and ordinary income, beginning January 1, 2013, will be 39.6 percent, and the top rate on long-term capital gains will be 20 percent.

In addition, investment income of many taxpayers will be subject to a new 3.8 percent Medicare tax under current law. This tax will apply to the net "unearned" income, including dividends and capital gains (short- or long-term), to the extent that a single filer's adjusted gross income exceeds $200,000 or married filers' joint adjusted gross income exceeds $250,000. Filers in the top marginal rate bracket, and many or most in the second highest rate bracket, will be subject to this tax on investment income.

Including the new medicare tax as well as average state taxes, the top personal income tax rate on dividend income in the U.S. will rise to 48.3 percent in 2013, according to Carroll and Prante. The top integrated tax rate on dividends, including corporate income taxes, will be 68.6 percent. Absent changes in other OECD countries from 2011 rates, these dividend tax rates would rank the U.S. first in the OECD, surpassing the next highest personal tax rate (Denmark) by 8.3 percentage points and the next highest integrated rate (France) by 10.8 percentage points. Top personal and integrated tax rates on long-term capital gains would rise to 28.7 percent and 56.7 percent, respectively, ranking the U.S. fourth in personal capital gains tax rates and first on an integrated basis among OECD nations.

CHAPTER III

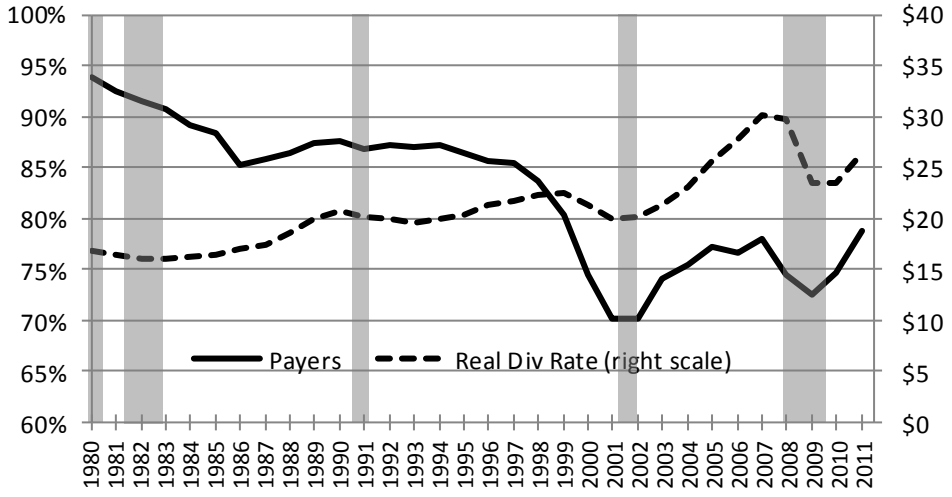
FIRM BEHAVIOR: OBSERVATIONS AND SURVEY EVIDENCE

Before delving into the theory of how the tax changes discussed in the last chapter might affect corporate behavior, it is worth considering what firms and their managers do and say with regard to dividend payments and related decisions. In this chapter, we first observe payout policies of U.S. firms from data on firms in broad stock market indices published by the Standard and Poors Corporation ("S&P"), and how payout policies changed as tax structures changed in recent decades. Observations on how dividend payments relate to firm earnings and capital expenditures are also presented, followed by a review of some recent survey evidence as to how firm managers view and make decisions about payment dividends.

Dividend Payers and Payments

Trends in firms' dividend policies since 1980 can be seen in Figure 1, which shows the percentage of firms in the S&P 500® stock index that pay a regular dividend as well as the annual real dividend rate in 2011 U.S. dollars. From 1980 through 2001, dividend payers declined from about 94 percent of the large capitalization firms in the S&P 500 to 70 percent. The decline was interrupted for a few years after the Tax Reform Act of 1986 reduced the top marginal tax rate on dividend income and increased the top rate on capital gains, but the decline in dividend payers accelerated in the late 1990s through 2001.

Figure 1. S&P 500 Percent of Firms Paying Regular Dividends and Annualized Real Dividend Rate, by calendar year.



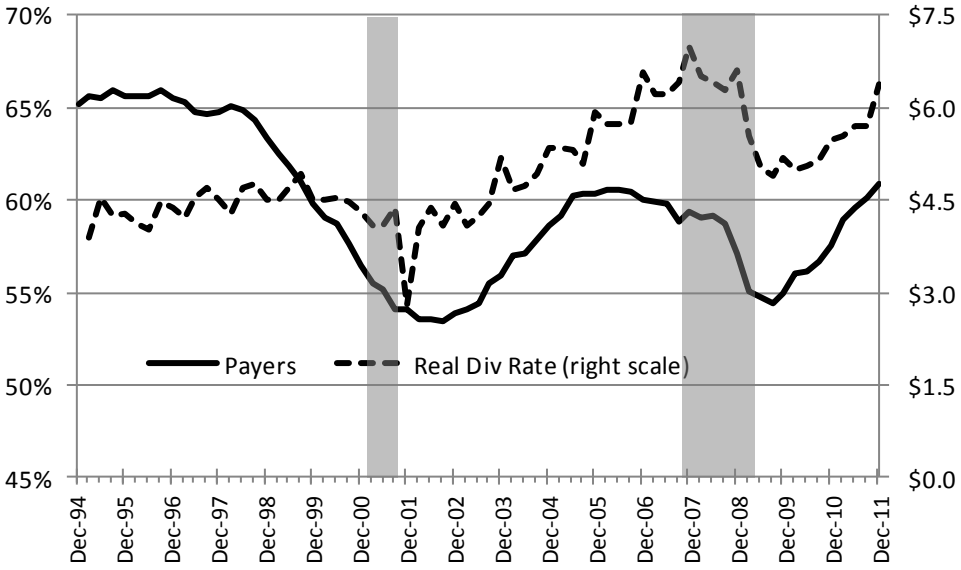
Dividends in 2011 $, deflated using the CPI-U. Recession periods shaded.
Sources: Standard & Poors, NBER, BLS, and author's calculations

Over the same period, the "per share" dividend on the S&P 500 grew slowly on an inflation-adjusted basis. Measuring from the 1982 to the 2001 recession lows, average annual real growth in S&P 500 dividends was only about 1.15 percent. Trough-to-trough real dividend growth from the 2001 recession to the latest, much deeper one was much higher at 2.04 percent. Measuring from recession lows to expansion peaks, 1982-1999 dividend growth averaged 2.01 percent per annum while 2001-2007 growth averaged 7.04 percent.

The S&P 500, however, consists of only large capitalization stocks, but we find a similar pattern in the broader S&P 1500® index over the 1994-2011 period shown in Figure 2. The S&P 1500 is a composite index comprised of the S&P 500, the S&P

Midcap 400®, and the S&P Smallcap 600®, which accounts for more than 90 percent of the total market capitalization of U.S. publicly traded firms.[4]

Figure 2. S&P 1500 Percent of Firms Paying Regular Dividends and Annualized Real Dividend Rate, by quarter.



Dividends in 2011 $, deflated using the CPI-U. Recession periods shaded.
Sources: Standard & Poors, Compustat, NBER, BLS, and author's calculations.

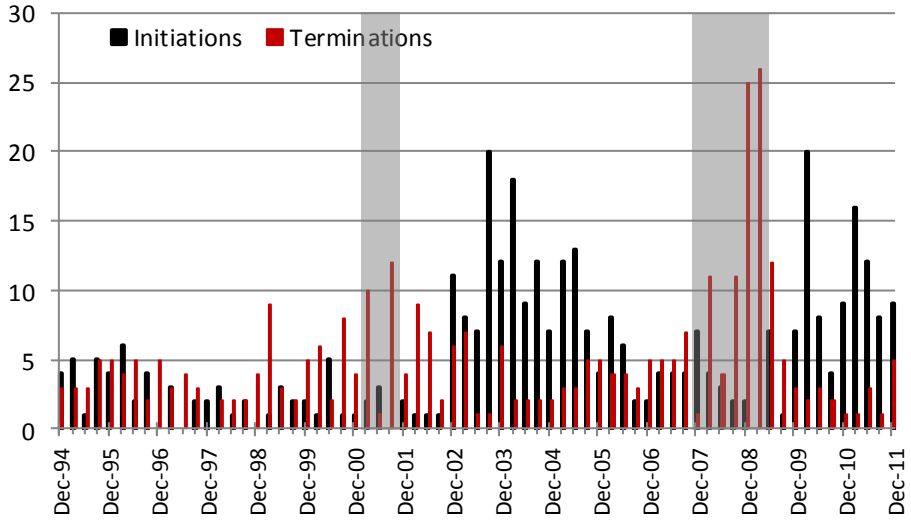
The percent of firms in the S&P 1500 paying a regular dividend was about 65 percent each year until a sharp fall-off began in 1997-1998, after which the percentage fell to below 54 percent for all of 2002. By the second quarter of 2005, dividend payers again accounted for more than 60 percent of S&P 1500 firms. With the recent deep recession, the share of payers fell back again to near 2002 levels, but has since returned to over 60 percent. Real dividends on the S&P 1500 also showed a similar pattern to the

[4] The S&P Midcap 400 and Smallcap 600 are presently comprised, respectively, of firms with market capitalizations of between about $1 billion and $4.4 billion, and between $300 million and $1.4 billion. The float-adjusted total market capitalization of S&P 1500 firms was approximately $14.1 trillion as of April 20, 2012, accounting for about 92 percent of the $15.3 trillion capitalization of the S&P Total Market Index, which includes the common equities of all U.S. firms listed on the NYSE (including NYSE Arca and NYSE Amex) and the NASDAQ stock market. The S&P 1500 has been published since 1994, beginning after the S&P 600 index was created. See http://www.standardandpoors.com/indices/main/en/us for further information.

S&P 500, being essentially flat from 1995 through the 2001 recession (ignoring the 2001 fourth quarter dip) and into 2003 before rising sharply through late 2007, by almost 9 percent per annum.

Firms initiating or increasing regular dividend payments tell a similar story of a change in behavior beginning in 2003. Figure 3 shows the number of firms in the S&P 1500 initiating or terminating regular dividends payments each quarter from the December quarter of 1994 through 2011, and Figure 4 shows the number of firms increasing their regular dividend rate (excluding initiations) over the same period.

Figure 3. Initiations and Terminations of Regular Dividends by S&P 1500 Firms, by quarter.

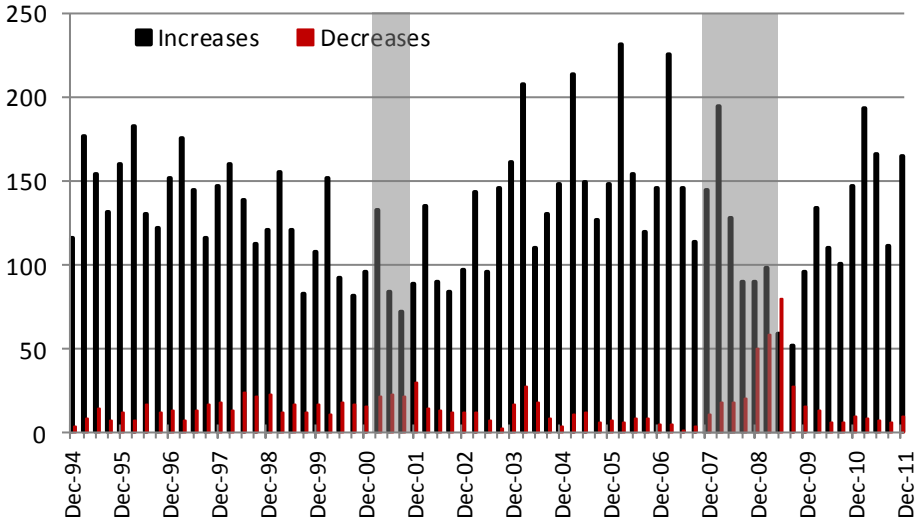


Recession periods shaded.
Sources: Compustat, NBER, and author's calculations.

Through December 2000, S&P 1500 firms averaged about 1.4 net terminations per quarter (2.4 initiations and 3.8 terminations per quarter, on average), while from mid-year 2003 through the end of 2007 the average was about 4.8 net initiations per quarter (8.4 initiations and 3.6 terminations per quarter). The first two years after passage of JGTRRA saw average net initiations of more than 10.2 per quarter. The recent recession

favored terminations, as one might expect, but over the last two years, 2010-2011, initiations again far outpaced terminations by 8.5 net initiations per quarter. The pattern of firms increasing or decreasing dividends is similar, though less visually obvious. Through 2000, 120 more firms, on average, increased than decreased dividends each quarter; from mid-year 2003 through mid-year 2008, there were 148 more dividend increases than decreases each quarter. The recession resulted in a relatively large number of dividend cuts, particularly toward the end of the recession, but the pace of net increases has averaged 149 firms per quarter over the latest five quarters.

Figure 4. Increases and Decreases of Regular Dividends by S&P 1500 Firms, by quarter.



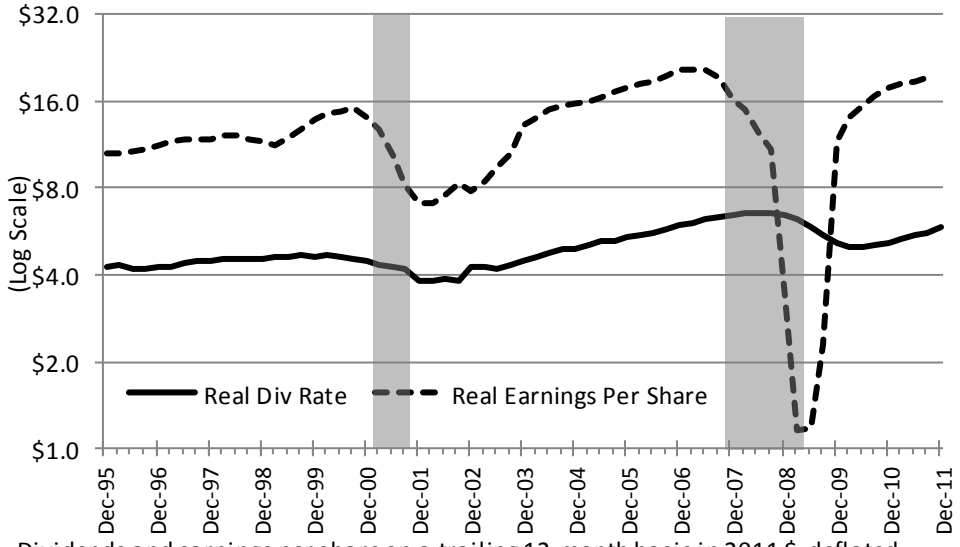
Recession periods shaded.
Sources: Compustat, NBER, and author's calculations.

Dividends, Earnings, and Investment

Representing the distribution of corporate profits to shareholders, dividends reduce the internally generated financial resources available for reinvestment in new productive capital – in accounting terms, capital expenditures. As such, one might expect to find certain relationships among these variables, with dividends positively related to

profits and negatively related to capital expenditures. In addition, there may be reason to expect dividends to be relatively more volatile than earnings if, as some theorists suggest, dividends are paid as a residual, after all profitable investment opportunities have been funded. Figure 5 shows trends in real dividends and earnings per share for the S&P 1500 since 1995; while there is clearly a positive correlation, dividends appear to be considerably more stable in the aggregate than earnings. During expansion periods, dividends rose much more slowly than earnings and during the latest recession, dividends peaked about a year after earnings began to decline and then declined by only 24 percent in real terms compared to a 94 percent decline in real earnings.

Figure 5. S&P 1500 Real Dividends and Earnings, trailing 12-months by quarter.

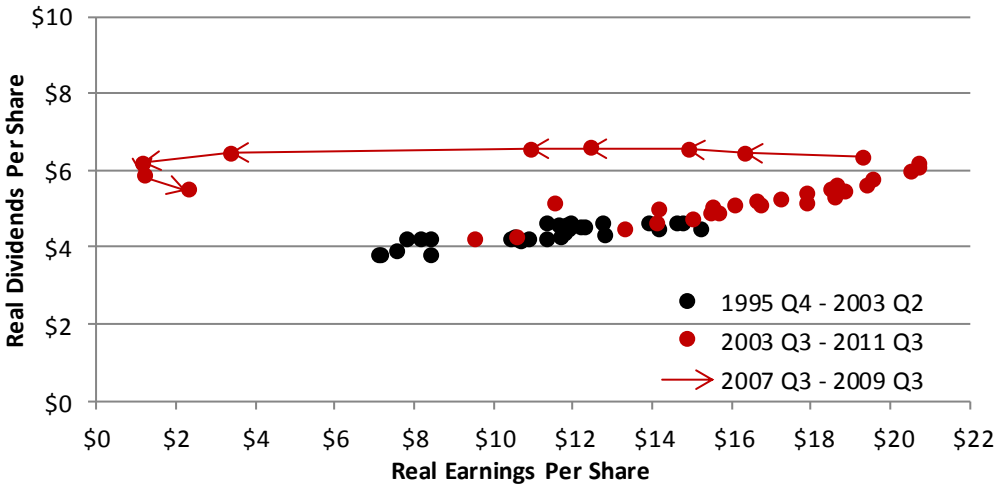


Dividends and earnings per share on a trailing 12-month basis in 2011 $, deflated using the CPI-U. Recession periods shaded.
Sources: Standard & Poors, NBER, BLS, and author's calculations

Figure 6 presents the same dividend and earnings data as a scatter plot, with black and red dots representing, respectively, periods before and after passage of JGTRRA. Red arrows connect the periods from the third quarter of 2007, just before the latest

recession, to the first quarter of the recovery, the third quarter of 2009. Excluding those quarters, the relationship between earnings and dividends seems clear; a simple linear regression suggests that an additional $1 of real earnings would increase real dividends by about 9 cents (significant at the 1 percent level). A much longer monthly series on S&P 500 real dividends and earnings, going back to 1871, yields an estimate of 30 cents of dividends for the marginal dollar of earnings.[5]

Figure 6. S&P 1500 Real Dividends vs. Real Earnings.



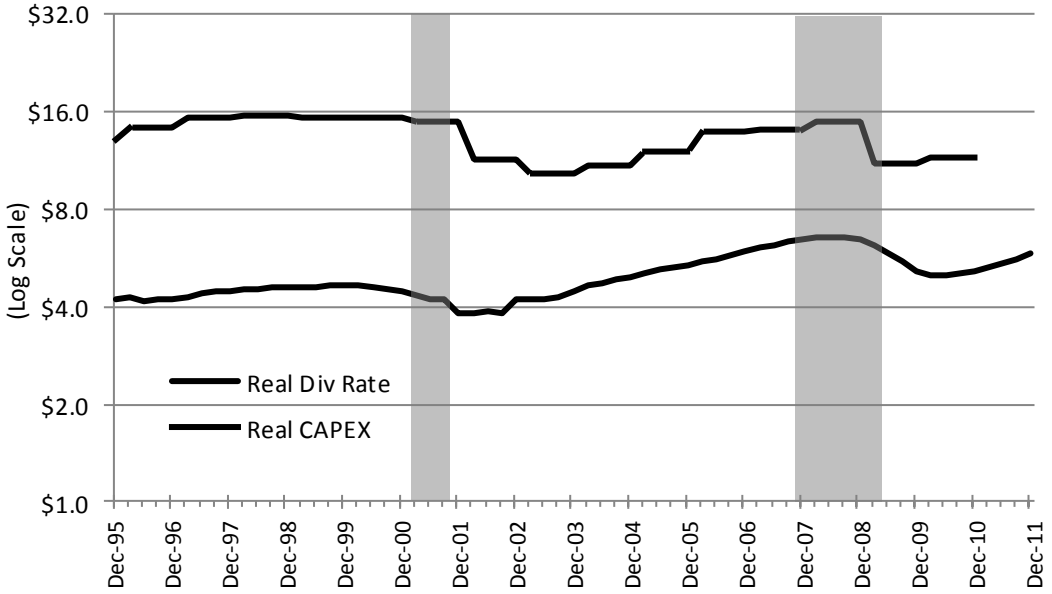
Dividends and earnings on trailing 12-mo. basis in 2011 $, deflated using the CPI-U.
Sources: Standard & Poors, NBER, BLS, and author's calculations

Figure 7 similarly relates capital expenditures ("CAPEX") to dividends, though CAPEX data for the S&P indices are reported only annually and are available only through yearend 2010. CAPEX and dividends appear to grow and contract similarly over the business cycle, but unlike dividends, capital expenditures in the post-2001 expansion never surpassed late-1990s levels on an inflation-adjusted basis. Though they represent

[5] The data for this estimate were compiled by Yale University's Robert Shiller and are available on his website, http://www.econ.yale.edu/~shiller/data.htm.

alternative or competing uses of firms' financial resources, any relationship between the two variables remains unclear.

Figure 7. S&P 1500 Real Dividends and Capital Expenditures.



Dividends reported quarterly on a trailing 4-qtr basis, CAPEX reported annually, both in 2011 $, deflated using the CPI-U. Recession periods shaded.
Sources: Standard & Poors, NBER, BLS, and author's calculations.

Survey Evidence: What Managers Say About Dividend Decisions

Chapter 4 will provide some background on the theoretical debate over dividends – why firms pay them, the relationship with profits and investment, and the effect of taxes. First, though, surveys of firm managers might shed some practical light on the matter. An early survey of dividend policy was conducted by Lintner (1956), who analyzed seven years (1947-1953) of financial results and practices, and interviewed managers of 28 established, publicly-traded industrial firms to learn the factors and priorities affecting their dividend decisions. Lintner found that, without exception, the first consideration in dividend decisions was the existing dividend rate. Managers

believed that stockholders put a premium on stability and gradual growth in the dividend rate, and sought to avoid changes in dividend policy that might soon have to be reversed. The accompanying empirical analysis found that dividend increases depended primarily on growth in earnings, but only over time, through a partial adjustment process. Recent surveys, over much larger samples, find that little has changed since the post-war period.

Brav, Graham, Harvey, and Michaely (2005) surveyed 384 financial executives and conducted in-depth interviews with 23 more to find what drives dividend and share repurchase decisions. A second survey of 328 executives, conducted jointly with CFO magazine, attempted to determine the effects of the dividend tax cut in JGTRRA on firms' payout policies (Brav et al. 2008).

The earlier survey covered 256 public companies along with 128 privately held ones, and was conducted in April and May of 2002, several months before the tax cuts of JGTRRA were first proposed. Privately held firms were included in part as a sort of control group in that they should be less affected than public firms by asymmetric information and agency issues that theory suggests may motivate dividend payout decisions (results tended to support this notion). Some key findings of this survey are as follows:

- Very large majorities (84 to 94 percent) of respondents from dividend-paying public firms said that they try to maintain a consistent dividend policy with a smooth dividend stream from year to year, and that there are negative consequences to cutting dividends and they try to avoid doing so.

- Large majorities of both dividend-payers and share-repurchasers agreed that their dividend or repurchase decisions conveyed information about their companies to investors (80 and 85 percent, respectively).

- A 65 percent majority of dividend-payers said that they would raise new, outside funds to finance investments rather than reducing dividend payouts, but only 16 percent of share-repurchasers would do the same to avoid reducing buybacks.

- Only 33 percent of dividend-payers (79 percent of share-repurchasers) said they make their dividend (repurchase) decisions only after determining their investment plans.

- Among respondents from the 76 firms that have not paid dividends in the last three years, the factors most often cited as important or very important considerations for initiating a dividend are influence of institutional investors, a sustainable earnings increase, fewer profitable investment opportunities, excess cash, and as a response to, or a signal to investors about, market undervaluation of their firm's shares.

The later survey, conducted in August 2005, covered 152 public firms, of which 106 had paid dividends during the latest three years, and 176 private firms, of which 57 had paid dividends. Brav et al. (2008) found a small to moderate effect of the 2003 dividend tax cut on the decisions of firms that had initiated dividends over three years prior to the survey. Higher ranking factors for these firms' decisions to initiate were their cash flow stability, their cash balances, and their investment opportunities. Among firms that had paid dividends for all of the last three years, the tax change was far less important a factor, the most important factor being the historical level of their dividends.

The authors also reviewed 243 news articles and press releases about dividend initiations over the 2002-2005 period, finding 193 that mentioned one or more reasons for initiating dividends. 33 of these specifically mentioned the dividend tax cut as a reason for initiating, with the majority of those mentions coming in the quarter following passage of JGTRRA. Overall, the authors concluded that while executives consider personal taxes in making dividend decisions, they are of secondary importance, with little effect on decisions of firms already paying dividends, but a somewhat greater effect on firms "sitting on the fence" about whether to initiate dividend payments.

Similar results were found in two surveys of NYSE listed firms in 1983 and 1987, and of NASDAQ firms in 1999 (Baker and Powell 2000; Baker, Veit, and Powell 2001).

The pattern of past dividends was the highest ranked factor influencing dividend policy among the NASDAQ firms, followed by stability of earnings, and the levels of current and expected future earnings. Among NYSE firms, the top ranked factor in both survey years was the level of current and expected future earnings, followed by the pattern of past dividends and concern about maintaining or increasing the stock price.

The survey evidence can be summarized by the following stylized facts about dividend decisions of firms:

- Firm managers generally believe there are negative consequences to cutting dividends (but not necessarily to cutting share repurchases) and try to avoid doing so, instead attempting to maintain a smooth dividend stream from year to year.
- Managers believe their dividend (and repurchase) decisions convey signals to investors about their companies.
- Most managers disagree that their dividend decisions are made only after investment decisions.
- Most managers agree they would raise new outside funds to finance investment rather than cutting dividends (but not to avoid cutting repurchases).
- The most often cited reason for initiating or increasing dividends is sustainable earnings growth. Cash balances and investment opportunities are the next most important factors.

As we delve into the theory in the coming chapters, keep in mind that the survey evidence does not support the conclusion of some theoretical models that dividends are a residual payment. However, the availability of profitable investment opportunities is, according to managers, a leading factor in firms' decisions as to initiating or increasing dividends, suggesting simultaneous or interdependent choices. The survey evidence is also consistent with the assumption in some models of the signaling value of dividends. In other words, changes in dividend policy can change investor perceptions of firm prospects and risks, and this investor sentiment is reflected in their return requirements.

CHAPTER IV

THEORETICAL BACKGROUND

While managers' views on the importance of dividend policy are fairly clear and observable behavior seems to have changed along with changes in tax policy, dividend policy and the effect of taxes are subjects of long-running theoretical debate. Miller and Modigliani (1961) showed that, given the firm's capital budget and assuming perfect capital markets, dividend policy is irrelevant with regard to the value of the firm. Distortionary taxes, however, are a market imperfection, presenting a problem for their theorem that can only be partially mitigated by tax "clientele" effects, as they acknowledge. The perfect markets assumption also implies perfect information, and Miller and Modigliani also acknowledged the potential "information content" of dividends. Black (1976) and Miller (1982) discuss how, in a world of informational asymmetries and rational expectations, information conveyed by changes in dividend policy can affect firm value, but the puzzle of why firms pay dividends at all remains, especially given tax discrimination against dividend payouts. A related problem for the dividend irrelevance theorem is the potential principal-agent conflict between shareholders and management, suggesting a possible basis for investors valuing dividends in some circumstances in spite of the tax consequences.

The theory of why firms pay dividends, and how taxation affects the financial and real decisions of firms remains unsettled. This chapter summarizes the competing

theories, and briefly touches on related theory about financial structure and the interdependence between real and financial decisions. The next chapter will formalize three alternate theories of dividend taxation within a consistent mathematical framework and derive hypotheses for empirical testing.

Competing Neoclassical Theories of Dividend Taxation

Two competing views of the effects of dividend taxation, the so-called *old* and *new* views, are based on the neoclassical model of firm investment, following and building upon Jorgensen's optimization theory (Jorgensen 1963; Hall and Jorgensen 1967). The debate has its roots in King(1974), who showed that the firm's cost of capital depends on the source of funds for investment. Auerbach (1979, 1983) and Bradford (1981) further developed the model into the *new* view, or more descriptively the "tax capitalization" or "trapped equity" view of dividend taxation. Under this view, marginal investment is funded out of retained earnings, if they are sufficient, implying that dividends are paid only as a residual, after all marginally profitable investment opportunities are funded. Auerbach (1979) concludes that "the appropriate cost of capital … does not depend directly on either the dividend payout rate or the tax on dividends", and thus dividend taxes would not affect investment. Furthermore, since firms pay dividends only from residual profits after funding all marginal investment opportunities, neither would dividend taxes affect payout policy. Bradford reaches essentially the same conclusion, and argues that any change in the taxation of dividends is merely capitalized into the price of the stock, representing a windfall gain or loss in wealth to shareholders at the time of the change, but having no effect on investment or payout choices of the firm.

Poterba and Summers (1983, 1985) argue that the *new* view is unable to explain the payment of dividends in the presence of a tax penalty for doing so. In particular, if firms are able to repurchase stock, they should never pay dividends in a classical tax system of taxing dividends more heavily than capital gains. Furthermore, firms should never issue new shares while also paying dividends. Yet several authors have observed that firms often pay dividends while also issuing new equity (Poterba and Summers 1983; Easterbrook 1984; Zodrow 1991; Bond and Meghir 1994; Gordon and Dietz 2006). In addition, since the *new* view holds that dividends are a residual payment, it would follow that exogenous changes that make investment more desirable should lead to a fall in dividends and that dividends should be relatively more volatile than profits as a result. Again, however, the literature suggests that dividend payments are both less volatile than firm profits and positively related to subsequent investment spending (Lintner 1956; Feldstein and Green 1983; Poterba and Summers 1983, 1985; Zodrow 1991).

The *old* (or "traditional") view, on the other hand, holds that shareholders derive benefits from the payment of dividends in addition to the payment itself. These may be signaling benefits (Bhattacharya 1979; Poterba and Summers 1983) or a means of shareholders limiting the discretion of management to invest in low-return projects by reducing cash balances under management control (Easterbrook 1984; Jensen 1986). Feldstein and Green, however, offer a simple model of a two-company economy with two investor types (taxable households and non-taxable institutions, both risk averse) in which dividends are paid in equilibrium without assuming signaling or similar benefits, or restrictions on repurchases. Feldstein and Green's result is due, instead, to the model's assumptions of heterogeneous tax rates, risk averse investors, and uncertainty.

Regardless of the mechanism, the notion of some optimal payout policy that minimizes the cost of equity capital is consistent with earlier empirical observation of payout behavior as following a dynamic adjustment process, responding to volatile earnings that cause payouts to differ from some target payout policy based on longer-term trend earnings (Lintner 1956; Feldstein 1970).

The principle difference between the *old* and *new* views, however, lies in the presumption of each as to the marginal source of investment finance. The *new* view argues that mature firms fund the marginal investment from earnings retentions and then pays dividends with any surplus. Sinn (1991a, 1991b) extends this view, developing a "nucleus" theory that lays out the stages of firm development whereby firms are initially capitalized with new equity, followed by a period of purely internally funded growth and then a mature stage. In the internal growth phase, firms would not pay dividends, repurchase stock, or issue new equity. Once the firm accumulates sufficient retained equity capital so that the return on the marginal investment equals the cost of capital (the market interest rate), the second phase terminates and the firm begins distributing residual earnings to shareholders. Firms may use debt, but the level of debt is taken as given and must be repaid from retentions in any event, so the conclusion that dividend paying firms fund the marginal investment from retained earnings remains. Sinn (1991a) acknowledges that dividend taxes have a distorting effect in the initial capitalization phase, reducing firms' starting stocks of capital and consequently slowing or lengthening the internal growth phase. However, he argues that subsequent changes in personal taxes on dividends have no effect on firm behavior because, again, they are merely capitalized into the price of existing shares.

The *old* view, on the other hand, argues that the marginal source of investment finance is effectively new equity at all stages, whether immediately through new share issuance or from reductions in stock repurchases. The use of debt, according to this view, is a temporary substitute for new equity and must be repaid from future stock issuance or through reductions in stock repurchases, again effectively operating at the new equity margin. Under the *old* view, the cost of new equity is positively related to dividend taxes, with the effect of changes proportional to the payout ratio, dividends over earnings (Poterba and Summers 1985; Zodrow 1991).

Alternate Theories

Tax Irrelevance / Tax Clienteles

According to the tax irrelevance view originally proposed by Miller and Modigliani (1961), and developed by Miller and Scholes(1978), the dividend policy of the firm and the tax rate on dividends do not affect the cost of capital because the marginal investor in dividend-paying equity securities faces an effective tax rate of zero. Explanations include that the marginal investor is:

- a tax exempt entity (e.g. a pension fund, 401k, or IRA);
- able to offset dividend income against investment interest expense, which is not deductible except against investment income; or
- able to arbitrage away dividend tax liability in the market so that dividend income is realized by non-taxable investors or institutional investors who are indifferent between dividends and gains because they are taxed at the same rate.

Put simply, the "clientele" for shares of dividend paying firms is not subject to dividend taxation. Some theoretical support for the notion of tax clienteles comes from the Feldstein and Green (1983) model of heterogenous firms and investors, where firms optimally specialize as dividend payers or non-payers with investors also specializing

according to their tax status. This leads to a corner solution resulting in the collection of no dividend taxes. However, Feldstein and Green caution that such a corner solution may not hold if investors hold heterogeneous expectations of firm prospects and is, in any case, inconsistent with the observed behavior of firms and investors.

In addition, while it is certainly true that the avoidance explanations above hold for some portion of investors, the evidence suggests they do not hold generally. Gale (2002) estimates that, since at least 1982, roughly half of corporate dividends (about $93 billion in 2000) face individual income taxation. More recently, according to IRS Tax Stats data, an estimated 32.0 million personal income tax returns reported a total of $237.1 billion of dividend income for 2007, prior to the recent recession. Of these amounts, 27.7 million taxable returns accounted for $226.6 billion of dividends in 2007 (IRS).

Agency Theory

Chetty and Saez (2007, 2010) offer an alternate theory of firm payout behavior based on the agency theory of the firm, under which management's objective function includes possible private benefit from their authority over firm resources, thus misaligning management and shareholder interests. The Chetty and Saez agency model is built on the same neoclassical foundation as the *old* and *new* views, but takes into account this principal-agent conflict between shareholders and management, and introduces monitoring mechanisms and incentives used to align interests, resulting in an alternate set of predictions as to firm behavior. Shareholders bear monitoring costs to ensure that management is acting in their interests, while small shareholders have an incentive to free-ride on the monitoring efforts of larger ones. Boards of directors'

oversight, incentive features of management contracts, and direct share ownership by management serve to better align management and shareholder interests under the agency model.

The key result of interest here is that only "cash-rich" firms with sufficient monitoring and management incentives to align the interests of management and investors would pay dividends. However, changes in dividend taxation would affect both the threshold for what is sufficiently cash-rich to initiate dividend payments (i.e. in response to a dividend tax cut) and the amount of dividends paid by existing payers. In addition, the model predicts that changes in dividend taxes can affect investment decisions, though offsetting changes in private benefit activities of agents likely obscures the effect in firm data. Finally, Chetty and Saez also show that, according to their model, the effects of a dividend tax change should be positively related to the degree of monitoring/incentive effort. In particular, greater management or board ownership should lead to a greater increase (decrease) in dividends of "cash-rich" firms in response to a dividend tax cut (increase).

Another approach to explaining positive dividends in the face of discriminatory taxation also exploits the potential principal-agent conflict. Bond, Devereux, and Klemm (2007) hypothesize that increased monitoring and scrutiny by financial market participants, resulting from firms' accessing the markets for new financing, leads to "control benefits" in the form of higher returning investment projects than might be made absent the need to access external financing. Their model provides a possible explanation for firms simultaneously paying dividends and issuing new equity, and also predicts an

effect on firm investment from changes in dividend taxes, but is unable to predict the dividend payment response to dividend tax changes.

Other Theoretical Issues

Another relevant aspect of firm theory centers on the relationship or interdependence between firms' real and financial decisions. Hayashi (1985) offers a theoretical model based on Tobin's "q" theory of firm investment that links the investment and financial structure decisions of the firm. Tobin's marginal "q" is the contribution to firm value of a marginal dollar of investment and theoretically determines the optimal level of investment for the firm. Hayashi's model describes three investment financing regimes, differentiated by the relative size of profits and investment, which lead to different funding mixes of debt, retained equity, and new equity. Optimal debt policy is a function of the debt tax shield, which depends on tax rates, profits, bankruptcy costs, and bankruptcy risk. Hayashi assumes profits and bankruptcy costs to be proportional to the capital stock, with bankruptcy risk proportional to the debt-to-capital ratio. Two of the resulting regimes finance investment with debt and either new or retained equity, depending on the regime, in constant (though different) proportions of investment finance. The third results in funding the marginal investment entirely with debt. Only in the case of the debt and retained equity funding mix does the firm pay dividends and the optimal level of investment in that case is partially a function of the dividend tax rate.

Gourio and Miao (2007) also develop a neoclassical model of investment and financial policy, deriving theoretical responses of each to temporary or permanent dividend tax changes. The investment and financial policy effects of both, in their model, are limited to the short run and differ depending on whether the tax change is anticipated.

Dividend policies and source of equity finance break down into three regimes similar to those of Hayashi, but with repurchases substituting for dividends to whatever extent possible whenever capital gains are taxed at a lower rate than dividends. Debt policy in Gourio and Miao is determined by corporate and personal tax rates such that, as long as debt finance is treated more favorably for tax purposes, firms will borrow up to some binding constraint – in this case a collateral constraint where the limit is proportional to the market value of the firm's capital. Gourio and Miao, and Hayashi thus raise two possible approaches to modeling optimal financial policy – the former as a function of tax rates and the market value of the firm (equity plus debt) relative to asset book values, and the latter as a function of tax rates and debt-to-capital.

Finally, another paper addressing optimal financial policy (DeAngelo and Masulis 1980) generalizes Miller's (1977) model, by which he concluded leverage irrelevancy, to incorporate depreciation/depletion tax benefits and investment tax credits in addition to corporate and personal taxes. The model demonstrates a unique interior solution of optimal leverage that is dependent on these tax parameters and leads to testable predictions about tax effects on leverage decisions. In particular, the use of financial leverage is decreasing in investment-related tax shields and bankruptcy costs, and increasing in corporate tax rates, ceteris paribus.

Summary

A shortcoming in the literature on dividend policy and tax effects is that the competing theories, as presented, are often not consistently derived or easily compared. Besides matters of form (two-period versus infinite horizon, discrete or continuous time, etc.), models in the literature differ with regard to at least one critical assumption that

distinguishes the *old* view model from all the others. Sinn (1991a) complained that the Poterba and Summers (1985) *old* view expression for the cost of equity capital, which differs from the *new* view formula in that it is a positive function of the dividend tax rate, "has never been consistently derived from an optimization approach" and raised "doubts that it can ever be derived." This is not entirely true, though.

What Sinn and other *new* view proponents overlook or ignore in their own derivations is the assumption in *old* view models of an effect of dividend policy on shareholders' return requirements. Though its validity is certainly debatable, the reason the dividend tax rate drops out of *new* view cost of capital derivations is that this assumption is left out of their models. The shareholders' required return is treated as exogenously given and fixed.

One objective of this dissertation is to clarify differences between the theoretical models buy putting them in the same mathematical framework and highlighting the differences in key assumptions. The next chapter develops a continuous time model of the firm's optimization problem whereby it chooses levels of investment and dividends, subject to the usual constraints and state equations, to maximize the value of firm shares. The basic model is consistent in its assumptions and conclusions with the standard *new* view model. Simple modifications then produce an infinite horizon analog to the Bond, Devereux, and Klemm (2007) 2-period monitoring benefits model. Finally, a different modification to the basic model produces the *old* view model, following the methods Uzawa (1968) and Obstfeld (1990) applied to consumer behavior to introduce a time-varying, endogenously determined discount rate to the firm's dynamic optimization problem.

CHAPTER V

THEORETICAL FRAMEWORK FOR ANALYSIS

The framework for the empirical analysis to follow begins with a simple model of the firm where the manager's objective is to maximize the value of the firm by choosing levels of investment and dividends, subject to a budget constraint and other conditions. The basic model is similar to the neoclassical models proposed by Jorgenson (1967), King (1974), and others to describe the firm's optimal investment policy.

The model is easily modified to allow for share issuance or repurchase, and can also be modified to allow for debt finance as a choice variable and for other assumptions. Conditions for the payment of dividends, and the issuance or repurchase of stock will be derived, along with predicted responses in the choice variables to changes in the various tax parameters and other exogenous factors.

The Basic Model

If the firm's objective is, as the neoclassical model assumes, to maximize the value of the firm's equity, then we must first have an expression for the value of the firm. As in King(1974), Poterba and Summers(1983), and others, we derive this expression from a capital markets no arbitrage condition, which says that investors will only hold shares in the firm if the expected return from holding them at least equals the return on comparably-risky assets. Equilibrium in the market for shares requires that investors' risk-adjusted, after-tax required return, ρ, multiplied by the current market value of the

firm's equity, V_t, equal the expected future cash returns to equity holders. Cash returns can take the form of dividends, D_t, or capital gains. Suppressing the expectations operator,

$$\rho V_t = D_t + (V_{t+1} - V_t). \tag{5.1.1}$$

If share issuance is allowed, then the value at $t + 1$ includes the value of shares existing at time t, V_t^e, plus the value of new shares issued during the period, V_t^n; that is,

$$V_{t+1} = V_{t+1}^e + V_t^n.$$

Thus, the condition becomes

$$\rho V_t = D_t + V_{t+1} - V_t^n - V_t.$$

In the presence of shareholder-level taxes, the dividends and capital gains returns on the right hand side must be reduced by the applicable taxes, at the rate τ_d on dividend payments and at an accrual-equivalent tax rate, τ_g, on capital gains, resulting in

$$\rho V_t = D_t(1 - \tau_d) + [V_{t+1} - V_t^n - V_t]\left(1 - \tau_g\right)$$

Rearranging, we have

$$\left(\frac{\rho}{1-\tau_g}\right) V_t = D_t \left(\frac{1-\tau_d}{1-\tau_g}\right) + V_{t+1} - V_t^n - V_t. \tag{5.1.2}$$

Defining $\Theta = \left(\frac{1-\tau_d}{1-\tau_g}\right)$, the tax discrimination parameter between dividends and capital gains, and $\Phi = \left(\frac{\rho}{1-\tau_g}\right)$, the after-tax required return grossed up for capital gains taxes, the value of the firm at time $t = 0$, in continuous time and an infinite horizon, is given by

$$V_0 = \int_0^\infty e^{-\Phi t} [D_t \Theta - V_t^n] dt. \tag{5.1.3}$$

The objective function of the firm is to maximize the current value of the firm's equity, V_0, choosing dividends and investment, subject to a budget constraint, equations

of motion for state variables (capital), non-negativity constraints as needed, and transversality conditions.

Allowing for share issuance (but for simplicity, not debt finance), the budget constraint takes the form

$$D_t + I_t = \pi(K_t)(1 - \tau_c) + \delta K_t + V_t^n$$

where $\pi(K_t)$ is the firm's pretax profit function in capital with $\pi_k \geq 0$ and $\pi_{kk} \leq 0$, and δ represents the rate of depreciation of capital. The budget constraint equates uses of funds, dividends and investment, to sources of funds, cash profits after corporate taxes plus new share issuance. Solving for new share issuance, we have

$$V_t^n = -\pi(K_t)(1 - \tau_c) - \delta K_t + D_t + I_t \tag{5.1.4}$$

Substituting the right hand side of (1.3) for V_t^n in (1.2), the objective function becomes

$$\max_{D,I} \int_0^\infty e^{-\Phi t} \left[D_t \Theta - [-\pi(K_t)(1 - \tau_c) - \delta K_t + I_t + D_t]\right] dt \tag{5.1.5}$$

subject to

$$\dot{K}_t = I_t - \delta K_t \tag{5.1.6}$$

$$D_t \geq 0 \tag{5.1.7}$$

$$V_t^n \geq \bar{V}^n \tag{5.1.8}$$

where $\bar{V}^n \leq 0$, representing a lower bound for share issuance; that is, some negative number if share repurchases are allowed up to an arbitrary limit or zero if repurchases are not allowed.

The current value Hamiltonian for the problem is

$$H_t = D_t \Theta + [\pi(K_t)(1 - \tau_c) + \delta K_t - I_t - D_t] + q(I_t - \delta K_t) + \mu(D_t)$$
$$-\gamma[-\bar{V}^n + \pi(K_t)(1 - \tau_c) + \delta K_t - I_t - D_t] \tag{5.1.9}$$

The Lagrangian multiplier q represents the shadow value or marginal benefit of a one dollar increase in capital (units are such that capital prices are indexed to \$1), and is equivalent to Tobin's marginal "q". The multipliers μ on the dividend non-negativity constraint and γ on the new equity constraint represent, respectively, the marginal value of relaxing those constraints to allow a dollar of negative dividends or allow a dollar more of share repurchases.

First order conditions are

$$H_D = \frac{\partial H}{\partial D} = \Theta - 1 + \mu + \gamma = 0$$

$$\therefore \Theta + \mu + \gamma = 1 \tag{5.1.10}$$

$$H_I = \frac{\partial H}{\partial I} = -1 + q + \gamma = 0$$

$$\therefore q = 1 - \gamma \tag{5.1.11}$$

$$H_K = \frac{\partial H}{\partial K} = [\pi_k(1-\tau_c) + \delta] - \delta q - \gamma[\pi_k(1-\tau_c) + \delta] = \Phi q - \dot{q}$$

$$\therefore \dot{q} = (\Phi + \delta)q - (1-\gamma)[\pi_k(1-\tau_c) + \delta] \tag{5.1.12}$$

along with

$$\dot{K}_t = I_t - \delta K_t$$

$$D_t \geq 0, \quad \mu D_t = 0$$

$$V_t^n \geq \bar{V}^n, \quad \gamma(V_t^n - \bar{V}^n) = 0$$

From equation (1.6) we can see that whenever dividend tax rates are higher than capital gains rates, then either μ or γ, or both, must be positive and thus the associated constraint binding. As a result, firms should never pay a dividend while also issuing new shares or leaving opportunities for share repurchase unexhausted. When optimal dividends are positive, then $\mu = 0$ and from equation (1.6), $\gamma = 1 - \Theta$, so γ is strictly

positive for the dividend-paying firm given $\Theta < 1$. The firm will not issue new shares and if repurchases are allowed up to some limit, $\bar{V}^n < 0$, then the constraint (5.1.8) must be binding; the firm will have exhausted opportunities to repurchase stock before paying a dividend.

Additionally, for the dividend-paying firm, optimal marginal $q = \Theta$, which is less than unity if dividend tax rates are higher than that on capital gains. The marginal dollar retained and invested in new capital adds $\Theta < 1$ dollars to the market value of the firm.

An increase in attractive investment opportunities will cause firms to reduce dividends, if any, first. Only when the non-negativity constraint on dividends binds so that dividends are zero and $\mu > 0$ will they reduce repurchases (if $\bar{V}^n < 0$) or issue new shares to fund the marginal investment. In this case, $\gamma = 0$, $\mu = 1 - \Theta > 0$, and $q = 1$ in equilibrium.

This can be seen as well through equation (5.1.12), which can be rewritten to define implicitly the optimal level of capital and thus investment. Substituting q for its equivalent from equation (5.1.11) and rearranging, we have

$$\pi_k = \frac{\rho}{(1-\tau_g)(1-\tau_c)} - \frac{\dot{q}/q}{(1-\tau_c)}. \tag{5.1.13}$$

In steady state, where $\dot{q} = 0$, the marginal return on capital must equal the shareholder required (after-tax) return, grossed up for corporate income and capital gains taxes. The firm's cost of capital relevant to the marginal investment decision is given by the right hand side of the expression

$$\pi_k = \frac{\rho}{(1-\tau_g)(1-\tau_c)}. \tag{5.1.14}$$

As long as the firm faces unexhausted investment opportunities with marginal returns on capital in excess of this amount, then the firm would not be paying dividends and would

be reducing repurchases (and perhaps issuing new shares if the investment opportunities were large enough) to fund investment.

Note that steady state, in this context, simply means that the firm is in one regime or the other; that is, paying dividends and financing the marginal investment from retentions, or issuing shares (or equivalently, not repurchasing the maximum amount of shares) to finance the marginal investment. Equation (5.1.14) gives the cost of capital for the equilibrium marginal investment in either case. Only when conditions (e.g. an increase or decrease in attractive investment opportunities relative to available cash flows) induce a switch from one regime to the other does $\dot{q} \neq 0$, and then only fleetingly. By equation (5.1.10), μ and γ can only take on two values, zero or $1 - \Theta$, unless both constraints just bind; that is, in the unlikely (and thus uninteresting) event that the optimal marginal investment is just fully funded by the last dollar of dividend reductions, reducing them to zero without then reducing repurchases.

Finally, as equation (5.1.14) makes clear, dividend taxation does not enter into the cost of capital on the marginal investment and thus, changes in dividend taxation do not affect optimal investment. As a result, because dividends are paid only as a residual, changes in dividend taxation also do not affect payout policies. The only effect of a change in dividend tax rates is a wealth effect on current owners of shares, hence the descriptive name for this view, the tax capitalization view.

These results and conclusions are consistent with those of the tax capitalization or *new* view from the literature (Auerbach 1983; Sinn 1991a), but as the third model presented below will show, they rest critically on the assumption that the discount rate is exogenously given, that the financial policy of the firm does not affect shareholders'

required returns. In addition, this view presents some problematic predictions, including that dividend payments would be relatively more volatile than firm income and negatively related to investment; and that firms would repeatedly change regimes as their investment outlook changes or as earnings rise and fall as a result of business cycles or industry developments. While firms do sometimes suspend dividends to conserve cash in times of financial stress, empirical literature dating to Feldstein (1970) and Lintner (1956) shows that dividends tend to adjust only slowly over time in response to changes in corporate income. In addition, survey evidence (Brav et al. 2005) of financial executives contradicts the notion that dividends are determined as a residual, suggesting instead that firms resist reducing dividends to fund new projects (preferring to raise new funds instead) and that it is repurchases that are determined as a residual, after investment decisions are made. Finally, I find no evidence in the literature and no legal basis (in the U.S., at least) for assuming that firms face a binding constraint on share repurchases before paying dividends (or at all).

A Monitoring Benefits Model

One variation on the basic model (Bond, Devereux, and Klemm 2007) arrives at an inside solution of positive dividends and positive share issuance by assuming that accessing external finance subjects firm investment to increased scrutiny and monitoring, producing "control benefits" that positively affect future profits. To incorporate these control benefits, Bond, Devereux and Klemm (hereafter "BDK") include new share issuance, V_t^n, as an argument in the pretax profit function, $\pi(K_t, V_t^n)$, with $\pi_v \geq 0$, $\pi_{vv} \leq 0$, and $\pi_{kv} \geq 0$. In addition, it is assumed that there is a cost to share issuance such that net proceeds from new shares equal $V_t^n(1-f)$, where $0 < f < 1$. For

simplicity, $\bar{V}^n$ is assumed to be zero, assuming away share repurchases. The budget constraint, solved for dividends, is

$$D_t = \pi(K_t, V_t^n)(1-\tau_c) + \delta K_t + V_t^n(1-f) - I_t. \tag{5.2.1}$$

Now choosing investment and share issuance, equation (5.2.1) is substituted for dividends in the objective function and the Hamiltonian, after some algebra to simplify, becomes

$$H_t = (\Theta+\mu)[\pi(K_t, V_t^n)(1-\tau_c) + \delta K_t + V_t^n(1-f) - I_t]$$
$$-(1-\gamma)V_t^n + q(I_t - \delta K_t). \tag{5.2.2}$$

First order conditions are:

$$H_{V^n} = \frac{\partial H}{\partial V^n} = [\pi_v(1-\tau_c) + 1 - f](\Theta+\mu) - (1-\gamma) = 0$$

$$\therefore \pi_v(1-\tau_c) = f + \left(\frac{1-\gamma}{\Theta+\mu} - 1\right) \tag{5.2.3}$$

$$H_I = \frac{\partial H}{\partial I} = -(\Theta+\mu) + q = 0$$

$$\therefore q = \Theta + \mu \tag{5.2.4}$$

$$H_K = \frac{\partial H}{\partial K} = (\Theta+\mu)[\pi_k(1-\tau_c) + \delta] - \delta q = \Phi q - \dot{q}$$

$$\therefore \dot{q} = q(\delta+\Phi) - (\Theta+\mu)[\pi_k(1-\tau_c) + \delta]. \tag{5.2.5}$$

Assuming first a steady state, inside solution for dividends and share issuance, then $\mu = \gamma = 0$, $\dot{q} = 0$, and the first order conditions become

$$\pi_v(1-\tau_c) = f + \frac{1-\Theta}{\Theta} \tag{5.2.6}$$

$$q = \Theta \tag{5.2.7}$$

and
$$\pi_k(1-\tau_c) = \Phi. \tag{5.2.8}$$

Equation (5.2.8), solved for π_k, is the same as (5.1.14) in the base model (giving the equilibrium marginal cost of capital) except for the assumption in this case that the marginal return to capital is also a positive function of new share issuance.

Equation (5.2.6) says that the marginal, after corporate tax "control benefit" of new share issuance must equal the marginal cost of issuing shares plus the marginal tax penalty of paying dividends. For equation (5.2.6) to hold, given $\pi_v \geq 0$, requires that $f + \frac{1-\Theta}{\Theta} \geq 0$. This is satisfied if dividends are taxed more heavily than capital gains so that $\Theta < 1$, or if $\Theta = 1$ and $f \geq 0$.

Otherwise, if $\Theta > 1$, then an interior solution requires that *f* be sufficiently large to offset the tax advantage (negative tax penalty) of dividends. Also, provided that the marginal control benefit is strictly positive, the non-negativity constraint on share issuance will never bind and γ will always equal zero.

The actual values of Θ and *f* determine implicitly the optimal level of new share issuance, V_t^{n*}, which given $\pi_{vv} \leq 0$ will vary negatively with the dividend tax rate, τ_d (positively with Θ), assuming we remain at an interior solution. In addition, since $\pi_{kv} \geq 0$, then an increase in τ_d and the resulting decrease in V_t^{n*} imply lower π_k for all levels of *K*. To maintain the equality in the optimality condition given by equation (5.2.8) and $\pi_{kk} \leq 0$, then $\dot{K}_t^*$ and thus I_t^* must decrease. Summarizing, a rise in dividend tax rates implies lower share issuance and lower investment spending for the dividend-paying firm. The effect on dividends depends on whether the effect on share issuance or on investment is larger.

However, when faced with an exogenous increase in attractive investment opportunities, all else the same, then the firm would reduce dividends to fund increased

investment just as under the *new* view. The optimal level of share issuance would be unaffected.

When dividends reach zero and thus cannot be reduced further, then $\mu > 0$ reflects the shadow value of further dividend reductions; that is, of loosening the non-negativity constraint on dividends. In this financially constrained case, μ enters into the first-order condition for new share issuance, equation (5.2.6), such that

$$\pi_v(1-\tau_c) = f + \tfrac{1-\Theta-\mu}{\Theta+\mu}. \qquad (5.2.6')$$

For the financially constrained firm, a positive μ means that the marginal cost on the right hand side of (5.2.6') is smaller, implying, given $\pi_{vv} \leq 0$, that optimal share issuance must rise to restore the equality. Higher share issuance, in turn, implies higher π_k for all levels of *K* and thus an increase in optimal investment to maintain the equality in equation (5.2.8). Note that this optimal investment response by the constrained firm to new investment opportunities differs from the result in BDK's two period model in which the parallel to equation (5.2.8) includes their analogs to both μ and Θ as determinants of optimal investment directly (negatively related in the case of μ) rather than only through the cross partial derivative, π_{kv}. The effect of a change in dividend taxation on share issuance and investment, however, is consistent with BDK. For the financially constrained firm, an increase in dividend taxation increases the right hand side of (5.2.6') and thus decreases V_t^{n*} and I_t^*, just as for dividend-paying firms.

The major shortcoming of this model is that, while it does provide an explanation for the simultaneous issuance of new shares and payment of dividends, and also predicts a negative effect of dividend tax changes on investment, it does not offer clear predictions as to the optimal dividend response to changes in the tax parameters. Share

issuance is optimized to obtain the monitoring benefits and varies with the tax parameters, but dividends are still effectively determined as a residual.

Endogenous Discounting: A New Look at the *Old* View

The *old* (or traditional) view, on the other hand, assumes that shareholders derive benefits from the payment of dividends based on signaling or the restriction of managerial discretion over surplus cash (Poterba and Summers 1985), and thus the firm optimizes dividends rather than share issuance. These benefits are assumed to manifest as an effect of dividend payout ratios (dividends over corporate net income) on the shareholders' required return; that is,

$$\rho = \rho(\alpha)$$

where $\rho_\alpha < 0$, $\rho_{\alpha\alpha} > 0$ and $\alpha = D/[\pi(K)(1-\tau_c)]$. Incorporating this relationship between the payout ratio and the discount rate into the optimization problem requires a modification to the discount factor in equation (5.1.3) and the addition of a constraint defining the evolution of this discount factor. Specifically, in place of the term Φt in equation (5.1.3), we define a new discounting term, Δ, such that

$$\Delta_t = \int_0^t \frac{\rho(\alpha_s)}{(1-\tau_g)} ds. \tag{5.3.1}$$

The evolution of Δ_t is given by the equation

$$\dot{\Delta}_t = \frac{\rho(\alpha_t)}{(1-\tau_g)}. \tag{5.3.2}$$

Adapting the Poterba and Summers model to continuous time and my notation, and adding the state equation (5.3.2), the firm's problem is restated as

$$\max_{D,V,I} \int_0^\infty e^{-\Delta_t} [D_t\Theta - V_t^n] dt \tag{5.3.3}$$

subject to

$$\pi(K_t)(1-\tau_c)+\delta K_t+V_t^n=D_t+I_t$$

$$\dot{K}_t=I_t-\delta K_t$$

$$\dot{\Delta}_t=\frac{\rho(\alpha_t)}{(1-\tau_g)}$$

$$D_t\geq 0$$

$$V_t^n\geq \bar{V}^n$$

Following Obstfeld (1990), the present value Hamiltonian for the problem is

$$H_t=e^{-\Delta_t}[D_t\Theta-V_t^n]+\tilde{q}(I_t-\delta K_t)-\tilde{\lambda}\left(\frac{\rho(\alpha_t)}{(1-\tau_g)}\right)$$

$$+\tilde{\eta}[\pi(K_t)(1-\tau_c)+\delta K_t+V_t^n-I_t-D_t]+\tilde{\mu}(D_t)+\tilde{\gamma}[V_t^n-\bar{V}^n] \qquad (5.3.4)$$

where $\tilde{\lambda}$ is the co-state variable for the new state variable, Δ_t, , and the other multipliers are the present value analogs of the current value multipliers from equation (5.1.6). First-order conditions are

$$H_D=\frac{\partial H}{\partial D}=\Theta e^{-\Delta_t}-\tilde{\lambda}\frac{\rho_\alpha}{(1-\tau_g)\pi(K_t)(1-\tau_c)}-\tilde{\eta}+\tilde{\mu}=0$$

$$H_I=\frac{\partial H}{\partial I}=\tilde{q}-\tilde{\eta}=0$$

$$H_V=\frac{\partial H}{\partial V}=-e^{-\Delta_t}+\tilde{\eta}+\tilde{\gamma}=0$$

$$H_K=\frac{\partial H}{\partial K}=-\delta\tilde{q}+\tilde{\lambda}\frac{\alpha_t\rho_\alpha\pi_k}{(1-\tau_g)\pi(K_t)}+\tilde{\eta}[\pi_k(1-\tau_c)+\delta]=-\dot{\tilde{q}}$$

$$H_\Delta=\frac{\partial H}{\partial \Delta}=e^{-\Delta_t}[D_t\Theta-V_t^n]=-\dot{\tilde{\lambda}}$$

Note that the multipliers in this case are the present value analogs to those of the current-value Hamiltonian solution of the *new* view model above. In particular,

$$\tilde{q}=qe^{-\Delta_t}$$

$$\dot{\tilde{q}}=e^{-\Delta_t}\dot{q}-e^{-\Delta_t}q\dot{\Delta}=e^{-\Delta_t}\dot{q}-e^{-\Delta_t}q\frac{\rho(\alpha_t)}{(1-\tau_g)}$$

$$\tilde{\lambda} = \lambda e^{-\Delta_t}$$

$$\dot{\tilde{\lambda}} = e^{-\Delta_t}\dot{\lambda} - e^{-\Delta_t}\lambda\dot{\Delta} = e^{-\Delta_t}\dot{\lambda} - e^{-\Delta_t}\lambda\frac{\rho(\alpha_t)}{(1-\tau_g)}$$

$$\tilde{\eta} = \eta e^{-\Delta_t},\ \tilde{\mu} = \mu e^{-\Delta_t}, \text{ and } \tilde{\gamma} = \gamma e^{-\Delta_t}.$$

Using this correspondence between the present- and current-value multipliers, we can substitute the current-value form for all of the multipliers and eliminate the discounting terms. Rearranging, we have the following restated conditions in the same current-value terms as in the *new* view case:

$$\Theta + \mu - \frac{\lambda\rho_\alpha}{(1-\tau_g)\pi(K_t)(1-\tau_c)} = \eta \tag{5.3.5}$$

$$q = \eta \tag{5.3.6}$$

$$\eta = 1 - \gamma \tag{5.3.7}$$

$$-\delta q + \alpha_t \pi_k \frac{\lambda\rho_\alpha}{(1-\tau_g)\pi(K_t)} + \eta[\pi_k(1-\tau_c) + \delta] = q\frac{\rho(\alpha_t)}{(1-\tau_g)} - \dot{q} \tag{5.3.8}$$

$$D_t\Theta - V_t^n = \lambda\frac{\rho(\alpha_t)}{(1-\tau_g)} - \dot{\lambda} \tag{5.3.9}$$

Some immediate similarities and differences between this *old* view result and the *new* view result can be seen. First, combining (5.3.6) and (5.3.7), we have $q = 1 - \gamma$, just as before. However, from (5.3.5) and (5.3.6), $q = \Theta + \mu - \lambda\frac{\rho_\alpha}{(1-\tau_g)\pi(K_t)(1-\tau_c)}$, as opposed to simply $q = \Theta + \mu$ in the *new* view case. Since $\rho_\alpha < 0$ by assumption, the equilibrium marginal *q* derived under the *old* view is strictly greater than under the *new* view.

Assuming first an inside solution with positive dividends and the share repurchase constraint non-binding, then $\mu = \gamma = 0$ and $q = 1$. In this case, the necessary conditions (5.3.5) thru (5.3.7) can be reduced to

$$-\frac{\lambda\rho_\alpha}{(1-\tau_g)\pi(K_t)} = (1-\Theta)(1-\tau_c), \tag{5.3.10}$$

which we will use again below to simplify (3.7). First, though, by rearranging equation (5.3.10), we have

$$-\frac{\lambda\rho_\alpha}{(1-\tau_g)} = (1-\Theta)\pi(K_t)(1-\tau_c). \tag{5.3.11}$$

The left hand side of (5.3.11) is, in current value Hamiltonian terms, $\partial H/\partial\rho \cdot \partial\rho/\partial\alpha$ or the marginal benefit of an increase in the payout ratio. For optimality, this must equal the marginal cost in additional shareholder taxes of such an increase, given by the right hand side.[6] This expression, however, includes the unobservable shadow value, λ. We can eliminate it using equation (5.3.9), the necessary condition with respect to the state variable Δ. Equation (5.3.9) equates the period *t* return to the discount rate times the shadow value of an exogenous reduction in the discount rate minus the period t change in the shadow value term. Assuming steady state where $\dot{\lambda} = 0$ and solving for λ, this shadow value, in equilibrium, is equal to the period *t* net cash return to shareholders, discounted in perpetuity at the period t discount rate (gross of capital gains taxes) or

$$\lambda = (D_t\Theta - V_t^n)\left(\frac{\rho(\alpha_t)}{1-\tau_g}\right)^{-1}.$$

Rearranging slightly so that the left hand side equals $\partial H/\partial\rho$, we have

$$\frac{\lambda}{1-\tau_g} = \frac{(D_t\Theta - V_t^n)}{\rho(\alpha_t)},$$

the right hand side of which is substituted into equation (5.3.11) to eliminate the co-state variable. After some algebra, we derive the Euler equation that implicitly determines optimal dividend policy:

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[6] This can be seen more clearly by multiplying both sides by $d\alpha$. A change in the payout ratio from, say, 0.5 to 1.0 would have a tax cost equal to 0.5 times the after corporate tax profit times one minus the tax discrimination parameter.

$$\frac{-\rho_\alpha(D_t\Theta - V_t^n)}{\rho(\alpha_t)} = (1-\Theta)\pi(K_t)(1-\tau_c). \qquad (5.3.12)$$

The left hand side is the marginal benefit of increasing the payout ratio or, again, $\partial H/\partial\rho \cdot \partial\rho/\partial\alpha$. Note, in particular, that marginal benefits are positive whenever the firm is repurchasing shares ($V_t^n < 0$), regardless of whether the share repurchase constraint binds, so such a firm should substitute dividend payments for share repurchases until the marginal benefit equals the marginal cost of increasing the payout ratio – the right hand side, as in (5.3.11). This result differs from the *new* view conclusion that, given $\tau_d > \tau_g$, firms should only pay dividends after the share repurchase constraint binds.

Differentiating the right hand side of (5.3.12) with respect to the tax discrimination parameter, Θ, we find that a rise in Θ (corresponding to a reduction in the dividend tax penalty resulting from a cut in the dividend tax rate or rise in the capital gains rate) would, under reasonable conditions, reduce the marginal cost of increasing dividends.[7] The conditions under which these relationships would be expected to hold are that the firm has positive profits, $\pi(K_t) > 0$, and in the case of τ_c, that the dividend tax rate is greater than the capital gains tax rate. At the same time, given $\rho_\alpha < 0$, the rise in Θ also increases the marginal benefit for the dividend-paying firm of an increase in the payout ratio.[8]

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[7] Partial derivatives of the right hand side of (5.3.12) with respect to the tax parameters and the conditional sign for each are as follows:

$\frac{\partial}{\partial\Theta} = -\pi(K_t)(1-\tau_c) < 0$ if $\pi(K_t) > 0$;

$\frac{\partial}{\partial\tau_c} = -(1-\Theta)\pi(K_t) < 0$ if $\pi(K_t) > 0$, and $\tau_d > \tau_g$.

[8] The partial derivative of the left hand side of (5.3.12) with respect to the tax discrimination parameter is:

$\frac{\partial}{\partial\Theta} = \frac{-\rho_\alpha D_t}{\rho(\alpha_t)} > 0$ if $D_t > 0$.

Given a rise in Θ, the firm would need to increase the payout ratio to restore the equality. Similarly, the optimal payout ratio would also be positively related to the corporate tax rate, τ_c.

Next, using (5.3.6) and rearranging, (5.3.8) can be rewritten as

$$q\pi_k(1-\tau_c) + \alpha_t\pi_k \frac{\lambda\rho_\alpha}{(1-\tau_g)\pi(K_t)} = q\frac{\rho(\alpha_t)}{(1-\tau_g)} - \dot{q}. \tag{5.3.13}$$

Equation (5.3.10) can now be used to simplify (5.3.13), assuming steady state where $\dot{q} = 0$, to give us the *old* view analog to equation (5.1.11), or

$$\pi_k = \frac{\rho(\alpha_t^*)}{[(1-\alpha_t^*)(1-\tau_g)+\alpha_t^*(1-\tau_d)](1-\tau_c)}. \tag{5.3.14}$$

The equilibrium marginal cost of capital for the dividend-paying firm under the *old* view is thus an increasing function of each of the three tax rate parameters, including the dividend tax rate. This is in contrast to the *new* view, where the dividend tax rate does not enter into the cost of capital.

For the financially-constrained firm, which pays no dividend ($\mu > 0$, $\alpha = 0$) and repurchases no shares (thus $\gamma = 0$), marginal q is again equal to one and, because $\alpha = 0$, (5.3.14) becomes

$$\pi_k = \frac{\rho(0)}{(1-\tau_g)(1-\tau_c)}. \tag{5.3.15}$$

This expression, on the surface, appears to be the same as the cost of capital under the *new* view, and appears to be a lower cost of capital than that given by (5.3.14) for the dividend-paying firm whenever $\tau_d > \tau_g$. Recall, however, that the shareholders' required return is endogenously determined; it is assumed to be a negative function of the payout ratio, which in this case is zero. We can see, however, that while the cost of capital is positively related to corporate income and capital gains taxes (and thus optimal

investment would be negatively related), changes in dividend taxes would not affect optimal investment for the financially-constrained firm.

However, because of the endogeneity of the discount rate, (5.3.15) does not suggest that the optimal dividend policy of non-dividend-paying firms generally would be unaffected by a change in dividend taxation, as suggested by the *new* view. From (5.3.12), as noted above, a reduction in the dividend tax rate (an increase in Θ) would reduce the marginal tax cost of increasing the dividend payout, potentially enabling the firm to reduce its cost of equity, ρ, by initiating a dividend. If the firm has not exhausted all profitable investment opportunities at the cost of capital given by (5.3.15), then a reduction in the dividend tax penalty would not induce the firm to initiate a dividend, but if the firm is repurchasing shares or even just accumulating surplus cash, then it may induce an initiation.

Equation (5.3.14) can also be used to evaluate the effects of an exogenous increase in attractive investment opportunities or an exogenous change in time preferences of investors (independently of α, perhaps due to a change in real interest rates). In the former circumstance, the firm faces increased investment opportunities for which π_k exceeds the cost of capital, the right hand side of (5.3.14). The firm would clearly want to increase investment, but the optimal payout ratio being determined by equation (5.3.12), optimal dividends would be unchanged. The firm would thus reduce share repurchases (or draw down surplus cash) to fund the increased investment before it would cut dividends.

An exogenous change in investors' time preference is more complicated as $\rho(\alpha)$ appears in the Euler conditions both for optimal investment, equation (5.3.14), and for

optimal dividends, equation (5.3.12). Higher $\rho(\alpha)$ for all α would directly increase the cost of capital, reducing optimal investment as some projects no longer return the (increased) cost of capital. In equation (5.3.12), meanwhile, higher $\rho(\alpha)$ for all α would reduce the value on the left hand side, the marginal benefit of a dividend increase. A reduction in dividends in favor of share repurchases would increase the value on the left hand side to restore the equality.

Summary

The Euler equations for optimal investment derived from the three models, equating the marginal profit from the last dollar of equilibrium investment to the cost of capital, are summarized in Table 1 below. The equilibrium value of *q*, the increase in firm value from the equilibrium marginal dollar of investment, is also provided.

Table 1. Optimal Investment, Cost of Capital, and *q*.

Model	Cost of Capital	Eq. #	Equilibrium ***q***	
***New* View**	$\pi_k = \frac{\rho}{(1-\tau_g)(1-\tau_c)}$	(5.1.11)	$q = \Theta$ $q = 1$	if D>0 if D=0
Monitoring Benefits	$\pi_k = \frac{\rho}{(1-\tau_g)(1-\tau_c)}$	(5.2.8)	$q = \Theta$ $q = \Theta + \mu$	if D>0 if D=0
***Old* View**	$\pi_k = \frac{\rho(\alpha_t^*)}{\left[(1-\alpha_t^*)(1-\tau_g) + \alpha_t^*(1-\tau_d)\right](1-\tau_c)}$	(5.3.14)	$q = 1$	

For the *new* view model, surplus cash flow after the optimal level of investment, I^*, defined by equation (5.1.11) has been funded would first be used to fund share repurchases and then, once further repurchases are not possible, to pay dividends. For the monitoring benefits and *old* view models, optimality requires satisfaction of an additional condition in each, implicitly defining optimal new share issuance, V^*, in the former and

optimal dividends, D^*, in the latter. In each case, the remaining variable (D and V, respectively) is determined as a residual. These conditions are a repeated here for convenience:

Monitoring benefits V^*: $$\pi_v(1-\tau_c) = f + \tfrac{1-\Theta-\mu}{\Theta+\mu}. \qquad (5.2.6')$$

Old view D^*: $$\tfrac{-\rho_\alpha(D_t\Theta - V_t^n)}{\rho(\alpha_t)} = (1-\Theta)\pi(K_t)(1-\tau_c). \qquad (5.3.12)$$

Predictions derived from these optimality conditions with regard to the responses of investment, dividends, and in the case of the monitoring benefits model, share issuance to changes in tax and other parameters are summarized in Table 2.

Table 2. Summary of Theoretical Predictions.

Predicted responses to exogenous changes in tax parameters, time preferences or investment opportunities, ceteris paribus.

			Parameter				
Model	Regime[1]	Choice Var	τ_d	τ_g	τ_c	ρ[2]	π_k[2]
***New* View**	Unconstrained	*I*	0	–	–	–	+
		D	0	0/+[3]	0/+[3]	0/+[3]	–
	Constrained	*I*	0	–	–	–	+
		D	0	0/+[3]	0/+[3]	0/+[3]	0
Monitoring Benefits	Unconstrained	*I*	–	+/–	–	–	+
		V	–	+	–	0	0
		D	+/–	+	+/–	+	–
	Constrained	*I*	–	+/–	–	–	+
		V	–	+	–	0	0
		D	+/0	+/0	+/0	+/0	0
***Old* View**	Unconstrained	*I*	–	–	–	–	+
		D	–	+	+	–	0/–[4]
	Constrained	*I*	0	–	–	–	+
		D	0	+/0	+/0	0	0

1. A constrained firm is one for which the budget constraint binds with $D_t = 0$ and $V^n_t \geq 0$.
2. The final two columns represent, respectively, responses to exogenous changes in shareholder required returns and available investment opportunities; that is, higher or lower ρ for all levels of α and π_k for all levels of K.
3. Dividend increase only after the share repurchase constraint binds.
4. Dividend reduction only after share repurchases reduced to zero.

CHAPTER VI

REVIEW OF THE EMPIRICAL LITERATURE

The empirical literature on dividend payout behavior of firms extends back at least to Lintner (1956), who hypothesized a dynamic adjustment process whereby firms change dividend payouts to bring them closer over time to some "optimum" payout, determined by net profits and a target payout ratio. The first to estimate the effects of changes in dividend taxation was Feldstein (1970, 1972), who introduced a tax discrimination parameter (along with other modifications) to Lintner's optimum dividend equation. Feldstein estimated the effect on dividend payouts from the British repeal in 1958 of a differential tax on distributed profits. Prior to 1958, British corporations had been taxed on distributed profits at up to eleven times the rate on retained profits, with the objective of discouraging dividends and encouraging investment (Rubner 1964). Feldstein's analysis was criticized by King (1971, 1972), but both authors concluded that dividend payouts do respond to changes in dividend taxation, differing only as to the size of the effect.

More recent literature has looked at changes in dividend taxation in the United States, Australia, Finland, and other countries, investigating effects on dividend payouts, stock repurchases, stock prices, corporate investment, and capital structure decisions of firms. This chapter reviews the most relevant of this empirical literature, particularly

research investigating the effects of the U.S. Jobs and Growth Tax Relief Reconciliation Act of 2003 ("JGTRRA").

JGTRRA and Payout Policies

JGTRRA reduced the tax rate on qualified dividends to a maximum of 15 percent (from ordinary income rates), simultaneously reducing the maximum rate on long-term capital gains from 20 percent to 15 percent, thus sharply reducing the tax discrimination in U.S. personal income taxation against dividend income. Enacted May 28, 2003 and retroactive to January 1, 2003, JGTRRA provided the first reduction in the maximum tax rate on dividend income relative to capital gains tax rates since 1986 and thus offered a unique opportunity to study the effects of dividend tax changes on the payout behavior of firms. Several authors have written on the topic over the nine years since passage.

Chetty and Saez (2004, 2005) study the effects of JGTRRA on dividend policy on the extensive and intensive margins; that is dividend initiations or terminations, and increases or decreases where dividends were positive both before and after the change. The data cover up to six thousand U.S. firms (varying by year and excluding financial and utility stocks) with shares traded on the NYSE, AMEX, and NASDAQ markets over the period 1980 thru the first or second quarter of 2004 (the later paper including the addition quarter) on a quarterly basis. They also used annual data on insider and taxable institutional ownership to test for agency model incentive or monitoring effects on the response to the tax cut.

Chetty and Saez (2004) model regular dividend payment amounts (in real $) in OLS regressions on treatment dummies (pre- and post-reform quarters), a time trend, and lags (8) of dividend amounts, with or without financial and industry code controls.

Coefficients on the treatment dummies (for the quarter of announcement and the first quarter after passage of JGTRRA, 2003-Q1 and Q3, respectively) were positive, but they were not statistically significant and dropped considerably with the removal of the five largest firms as of 2004 from the sample. Results were better for pooled probit models of dividend payment (the dependent variable equals one for periods where the firm pays a dividend and zero otherwise), with significant positive coefficients for both 2003-Q1 and 2003-Q3, and a larger effect after passage than after announcement of JGTRRA. Probit models of initiations, dividend increases (>20%), and special dividends also produced significant positive estimates, except that for increases and special dividends, the effect only appears after passage of JGTRRA (2003-Q3).

Other issues raised by Chetty and Saez (2004) include possible attrition or survival bias, and spurious treatment effects. Possible biases arise from firms dropping out of the sample due to reasons that are correlated with dividend payments, such as bankruptcy or merger, or the likelihood that firms remaining in the sample longer may be systematically more likely to pay or increase dividends in the later, post-reform periods. To address the possibility of spurious treatment or placebo effects, they ran models framed around different hypothetical treatment periods and found no effect except around the actual treatment periods; that is, after announcement and passage of JGTRRA.

Chetty and Saez (2005) focused next on the effects of ownership on the response to the tax cut. Using a simple difference-in-difference analysis, they find that non-taxable institutional ownership[9] (the case for firms in the control group) is associated

[9] The largest institutional owner of firm shares in the quarter is one classified by the authors as "nonaffected" by the tax change. The authors got similar results with alternative definitions of the control group.

with no response to the tax cut in terms of dividend initiation rates, while the "treated" group showed a substantial positive response. However, as the authors note, the possibility of some other cause for the observed increase in initiation rates (e.g. U.S. corporate financial scandals around the same period) cannot be ruled out. Finally, the authors also observed that the frequency of dividend initiations also appears to increase the most in the post-reform period for firms with higher taxable institutional ownership.

Blouin, Raedy, and Shackleford (2004, 2007) also analyze dividend declarations in the quarters surrounding passage of JGTRRA for evidence of increases in dividend payments attributable to the act. Their identification strategy is to test whether the effect appears to be increasing in ownership by taxable individual shareholders, the only shareholders affected by the tax cut. They also hypothesized that, to the extent regular dividend payments are motivated by signaling benefits, tax-motivated changes in dividend policy could distort the intended signal and that this may lead to firms paying special dividends rather than increasing regular dividends in response to JGTRRA. In addition, firms may substitute special dividends for share repurchases as the latter lost its substantial tax advantage.

The dependent variable in the earlier paper's regular dividend payment models is the change in dividends declared per share from the pre-enactment period to the post-enactment period. Models are OLS with a lag of the dependent variable, lagged change in earnings per share, the dividend yield prior to enactment, and ownership variables as regressors. The sample is 1,463 U.S. public firms that paid regular dividends in the six months before or after passage. Similar regressions were run on 82 special dividend payers over the four quarters surrounding enactment, except with additional financial

controls (free cash flow per share and the market-to-book value ratio) and a dummy variable for post-enactment quarters, and without a lag of the dependent variable. They found evidence that both regular and special dividends increased post-enactment, but no significant results on the effects of greater individual ownership.

In the 2007 paper, Blouin, Raedy, and Shackleford extend the period covered to eight quarters before and after enactment, but focus on the payout mix rather than amounts; that is, dividends divided by the sum of dividends and share repurchases. This later paper finds that firms did substitute dividends for repurchases and that substitution was increasing in ownership by individual investors, as expected.

A 2011 paper by these authors again investigates the payout mix question, but now also controlling for the degree of three types of taxable ownership (Blouin, Raedy, and Shackleford 2011). The authors hypothesize that both taxable investors and firms might be expected to respond to JGTRRA, with the former increasing their holdings of higher dividend-paying stocks and the latter increasing dividend payouts relative to share repurchases. Investor and firm responses are simultaneously determined in a system of equations –one each for the percentage of firm shares held by insiders, by non-insider individual investors, and by mutual funds as well as one where the dependent variable is the dividend share of total payouts. The results for the dividend share equation are consistent with what Chetty and Saez (2005) observed with regard to dividend initiations; that is, the dividend share of total payouts increased after JGTRRA in accordance with ownership of firm shares by individuals (insiders and non-insiders) and mutual funds. Thus the greater is the firm's ownership by insiders, non-insider individual investors, or mutual funds, the greater is the increase in the dividend share of payouts post-JGTRRA.

Other studies of the effects of JGTRRA on dividend policies of firms include two that use logistic regressions to investigate firm characteristics that might be associated with a larger payout post-JGTRRA (Howton and Howton 2006) or whether changes in the dividend tax penalty lead firms to substitute dividends for share repurchases (Moser 2007). No published studies can be found more recent than the 2004 Chetty and Saez, and Blouin, Ready, and Shackelford papers discussed above that have modeled the response to JGTRRA in terms of amounts of dividends paid or payout ratios rather than as binary decisions to pay, increase, or decrease dividends. Possible improvements on this literature include extending the time period of the data post-enactment; including additional control variables suggested by neoclassical or other theory; using annual rather than quarterly data to allow for inclusion of financial variables only reported in firms' annual financial statements (e.g. capital expenditures); and applying appropriate econometric methods for addressing potential survivorship (or attrition) bias and other issues to be discussed in the next chapter.

Other Payout Policy Studies

In addition to studies of the JGTRRA dividend tax cut, others have looked at the determinants of dividend policy on either a single- or multi-nation basis. Pattenden and Twite (2008) present a single country study of the dividend policy effects of tax changes around the introduction of a full imputation system of dividend taxation in Australia in 1987. This study uses firm level data covering the period 1982-1997 in pooled regressions of gross and regular dividends (log of the payout ratio), as well as a logit regression of dividend initiations, controlling for firm financial characteristics, industry, and GDP growth. Their results show a significant positive increase in all payout

measures and in initiations in the post-reform period. Another single-country study is that of Kari, Karikallio, and Pirttilä (2008), who look at the Finnish dividend tax increase of 2005 and find a decline in dividend payments among closely held corporations, but no effect on investment.

Recent multi-nation dividend policy studies include Denis and Osobov (2008), who study payout policies in six of the G8 nations over the period 1989-2002, and Eije and Megginson (2008), who look at dividends and repurchases over the period 1991-2005 in the15 nations that were European Union members prior to May 2004. The former uses logit regressions (separately by country and year) with the dependent variable equal to one if a dividend is paid in the period and using controls for firm size, market-to-book ratio, percent change in assets, and profitability. The primary variable of interest was the ratio of accumulated retained earnings to total equity, which they used as a proxy for the maturity of the company. The authors found that firms with proportionally greater retained equity balances were significantly more likely to pay dividends. However, they estimate the regressions separately for each year, as several country cross-sections, rather than as a panel and do not consider changes in tax policy.

Eije and Megginson use random effects logit regressions to estimate propensity to pay a dividend or, alternately, to repurchase shares. Controls are similar to those of Denis and Osobov, plus measures for balance sheet leverage, volatility of earnings, firm age, and several dummy variables, including one for having a common law-based legal system. Their estimated coefficient on the retained-to-total equity variable was statistically insignificant for both dividends and repurchases, contradicting the findings of

Denis and Osobov. Age of firm, however, showed a positive effect on dividends, but not on repurchases.

Similar panel regressions for the real amount of dividend payments or repurchases (in log form) found results similar to the logit regressions. The retained-to-total equity variable was statistically insignificant for both dividends and repurchases, while age was positive for both. However, like Denis and Osobov, this study also neglected to control for changes in tax policies. Nevertheless, these studies highlight a number of potential control variables.

Cost of Capital and Tax Capitalization

Dhaliwal, Krull, and Li (2007) point out that, holding earnings expectations constant, changes in the implied or *ex-ante* cost of equity capital "perfectly map" onto changes in stock prices; that is, they are "equivalent methods of detecting a possible tax effect." Thus a decrease in the ex-ante cost of equity capital attributable to a dividend tax cut would be equivalent to (at least partial) capitalization of the tax savings into the stock price, as predicted by the *new* view. Full capitalization of a dividend tax cut would require that the stock price rise, reducing the implied pre-tax cost of equity capital, such that the implied after-tax cost is the same after as before the tax change, all else held constant.

Dhaliwal, Krull, and Li (2007) as well as Guenther, Jung, and Williams (2005) offer two recent studies that estimate the effects of the JGTRRA on the cost of equity capital, finding that firms realized a cost of capital reduction from the tax rate reduction, ceteris paribus. Guenther, Jung, and Williams estimate ex-ante, risk-based cost of equity capital as the average of three estimation methods from the accounting and finance

literature. The basic idea of each is based on the dividend discount model of stock valuation; that is, to estimate the discount rate that equates the present value of the expected stream of future pre-tax cash returns to the current stock price, deducting the risk free rate of interest. Inputs to the cost of capital calculations are forward dividend, earnings, and long-term earnings growth estimates from the Institutional Brokers Estimate System (I/B/E/S). The risk-free rate is the ten-year Treasury Constant Maturity Rate. The authors then regress the change in ex-ante cost of capital from November-December 2002 to June-July 2003 on leverage and market value measures; the estimated market "beta" on the stock; industry dummy variables; and indicators for post-enactment new equity issues (under the hypothesis that firms planning new equity offerings should realize a greater cost of capital benefit from the tax cut) and for payment of a dividend in 2002. Regression results indicate i) a significant reduction in cost of capital for all firms; ii) no significant difference in the effect on dividend-paying and non-paying firms; iii) a significantly larger effect (greater reduction) for firms planning new equity issues; and iv) a still larger effect for firms planning new equity issues that were also dividend payers in 2002. In regressions of only dividend paying firms, they also found that firms distributing a larger portion of their earnings (as either dividends or repurchases) realized a larger reduction in their cost of equity capital after the tax cut.

Dhaliwal, Krull, and Li use similar methods to estimate the cost of equity capital over 12 calendar quarters ending December 2001 to September 2004. The treatment variable in the regressions is an indicator for periods ending after May 2003, when the JGTRRA was passed. Controls include measures of institutional ownership, the growth rate and dispersion of analyst estimates of forward earnings, industry average cost of

capital, three risk measures from the finance literature, and firm financial and valuation characteristics. This study's estimate of the average treatment effect is about a 1 percentage point decrease in cost of capital, similar to that of Guenther, Jung, and Williams, and is significant at the one percent level. The estimated effect is decreasing in institutional ownership, consistent with the authors' presumption that the tax change would not generally affect institutional investors. Unlike Guenther, Jung, and Williams and contrary to the authors' expectations, however, this study finds a larger decrease in cost of equity capital for non-dividend paying firms.[10]

However, the ex-ante cost of equity capital is measured as a negative partial function of the stock price, and stock prices may rise or fall in the short run for many reasons, or for no obvious reason. Given the vagaries of the stock market, one cannot rule out the possibility that the rise in stock prices and corresponding declines in the ex-ante cost of equity after enactment of JGTRRA are due to unobserved factors. Possibilities include geo-political and macroeconomic developments that affect investor expectations (or risk tolerance), but are not reflected in analysts' earnings forecasts or other control variables in the models.

Rather than measuring the ex-ante cost of equity capital, Auerbach and Hassett (2007) attempt to measure the effect of JGTRRA on firms' valuations, testing how market value gains (specifically, *abnormal returns*) differ by firm characteristics, including dividend payment status and yield before passage, and propensity to issue new shares or repurchase shares after passage. Abnormal returns are estimated over 5-day event windows around eight "key event dates" in the process toward passage of

[10] Auerbach and Hassett (2007) anticipate this result for non-dividend paying firms.

JGTRRA, from December 2002 through May 2003, using regression equations based on the capital asset pricing model (CAPM).

The authors find that abnormal returns in response to key events that increased the likelihood of a dividend tax cut were positively related to dividend yields prior to the first news of a possible dividend tax cut. This finding would be consistent, without qualification, with the old view of dividend taxation and would be consistent with the new view only if the tax cut is viewed as being temporary. Similarly, they expect a positive response to these key events for "immature" or non-dividend-paying firms if the dividend tax cut is perceived as being permanent on the grounds that forward-looking investors would place a higher value on expected future dividends, even if there are none now, if they will be taxed at a lower rate. Furthermore, they suggest that non-dividend-payers that are expected to issue new shares in the future to raise capital should show a larger positive response, consistent with what Dhaliwal, Krull, and Li found, but didn't expect, with regard to the ex-ante cost of capital. Auerbach and Hassett reason that future share issues dilute the claims of current shareholders on future dividends, thus expected share issues would reduce the current value of the firm. However, a tax cut that increases the after-tax value of future dividends will also increase the price at which new shares can be sold, reducing the amount of expected dilution and further increasing the current equity value.

Investment

There has been little empirical research into the effects of JGTRRA on firm investment, in particular, even though encouraging business investment was the primary justification for its dividend and capital gains tax cuts. Desai and Goolsbee (2004)

conduct one such study, using a neoclassical framework to investigate whether firms responded as proponents of the *old* view and JGTRRA predicted, and whether what some argued was a non-response was actually due to an "investment overhang" from the late 1990s investment boom. In other words, did this overhang reduce investment in the recovery years after the boom ended and mask a real response to the tax cuts, or was there no real response at all, as the *new* view predicts?

Desai and Goolsbee conclude that the data appears more consistent with the *new* view prediction, that there was no impact on investment from the dividend tax cut. They also find no effect from earlier, smaller changes in depreciation allowances, including partial expensing provisions that took effect in 2002. However, the firm-level data they use cover only through 2003, so given the likely dynamic nature of firm investment decisions (as suggested by the overhang question), this study may have been hasty in its conclusions.

Financial Structure

Recent empirical literature on financial structure effects of tax changes is also limited and, to my knowledge, no firm-level study has looked at the effects of JGTRRA in this regard. A pre-JGTRRA study into these effects is that of Gordon and Lee (2001), who use SOI corporate tax return data in a model that incorporates firm and shareholder level taxes, and non-tax factors likely to influence debt policies of firms. Data are aggregated in the SOI files for confidentiality reasons, but key data are reported by asset size interval categories, allowing the authors to calculate marginal corporate tax rates by firm size category and estimate tax effects on the use of debt finance as a function of firm size. The dependent variable in Gordon and Lee's model is the debt-to-assets ratio of

firms (as an average for each size class) and the tax variable of interest is the marginal corporate tax rate calculated for each size class less the marginal tax rate applicable to interest income for the average investor in debt (including non-taxable investors). However, only in one specification does the tax variable account for dividend and capital gains taxes, and they are combined with corporate taxes and interest income taxes into one variable. Results suggest a significant positive relationship between corporate tax rates and debt levels in general, but the contribution of personal taxes to this effect is not clear.

CHAPTER VII

DATA, EMPIRICAL METHODS, AND HYPOTHESES

The empirical analysis utilizes a panel of U.S. firms over a sixteen year period, 1994-2009, on a fiscal year basis. The objective of the analysis is to test predictions from theory about the effects on dividend policy and investment from changes in dividend taxation. Before proceeding, however, there are several econometric issues that complicate the analysis. This chapter describes the firm sample and data to be used, and the issues that affect the choice of econometric methods, and then outlines the chosen methods.

U.S. Firm Sample and Data

Selection of Sample Time Period and Firms

Considerations in sample selection included having a sample that is representative of firms in all major industry sectors (with exceptions as described below) and of all sizes, and having reliable and consistently reported financial data spanning several periods before and after passage of JGTRRA. Previous empirical literature using U.S. firm-level data addresses a variety of related topics, as discussed in Chapter VI, including dividend policy, cost of capital, investment, and financial structure. Firm samples, periods covered, and data frequency varied considerably in these studies.

Studies of stock price and cost of equity capital effects tend to use higher frequency data – e.g. quarterly financial statement data or daily stock market data. Of the payout policy studies reviewed in Chapter VI that investigate effects of JGTRRA, Chetty and Saez (2004, 2005), and Blouin, Raedy, and Shackleford (2004, 2007) use quarterly firm financial data, but doing so precluded the inclusion of any measure of firm investment since most firms report capital expenditures only on an annual basis. Annual data were used by Howton and Howton (2006), and Moser (2007), and are also used here to allow inclusion of capital expenditures in the analysis.

The period covered, again, is firm fiscal years 1994 through 2009, several years longer than other studies of the effects of JGTRRA. The beginning period, consisting of firm fiscal years ending between June 1994 and May 1995, is the earliest full period during which the personal income tax increases passed in 1993 were in effect.[11] The periods covered include two relevant tax changes, the Taxpayer Relief Act of 1997 (TRA97), which cut the top capital gains tax rate from 28 percent to 20 percent, and JGTRRA in 2003. It also includes two extended periods of economic expansion and two recessions.

As for the selection of firms to include in the analysis, the literature varies here as well, from only S&P 500 firms as of January 2003 to all U.S. public companies covered by I/B/E/S or other data sources. The S&P 500, of course, is only representative of established, large capitalization firms and selection into the S&P 500 is likely correlated with firms' propensities to pay and increase dividends. The universe of public companies

[11] The Omnibus Budget Reconciliation Act of 1993 was proposed in February 1993 and passed Congress in June. Though it did not change capital gains tax rates or the treatment of dividends, it did raise the top marginal tax rate on ordinary income, and thus dividends, from 31 percent to 39.6 percent, substantially increasing the tax advantage of capital gains.

in the U.S., meanwhile, is unnecessarily broad, and introduces issues of data availability and reliability.

The S&P 1500, on the other hand, includes a broad range of firm sizes while also accounting for more than 90 percent of the market capitalization of U.S. publicly-traded firms. The index is designed to represent and replicate the performance of the universe of tradable U.S. stocks, with industry sector representation mirroring the broader market. The sample used herein is drawn from this index – more specifically, the components of the S&P 1500 as of December 31, 2002, immediately prior to the proposal of the JGTRRA tax cuts.

Depending on the research objective and the types of data used, it is common in firm-level studies to exclude certain industry sectors. Utility companies are sometimes excluded because they may be subject to regulation that can impact financial and investment decisions (Chetty and Saez 2004, 2005). More often, financial firms such as banks, securities brokers, and insurance carriers are excluded (Chetty and Saez 2004, 2005; Blouin, Raedy, and Shackleford 2007; Moser 2007). Such firms are also regulated, especially with regard to capital requirements and capital structures, but because of the nature of their businesses, their financial statements are in many important respects not comparable to non-financial firms.

Financial firms, those with GICS sector code 40 or 2-digit NAICS code 52, are excluded here. In addition, real estate investment trusts (REITs), generally falling under 4-digit NAICS code 5311, are also excluded. REITs are investment companies that are taxed only at the personal level, as pass-through entities, provided at least 90 percent of their earnings are distributed to shareholders. In total, 219 firms were dropped for these

reasons. One additional stock in the index was a "tracking stock"—a special class of stock designed to track the performance of a specific subsidiary or division within a larger company, and was also dropped. Another was dropped because of inconsistencies in the data from year-to-year and with SEC reports, leaving 1,279 firms. The distribution of firms by 2-digits NAICS code is provided in Table 3.[12]

Table 3. Sample Firms by NAICS Sector Code.

Code	Description	# Firms
11	Agriculture, Forestry, Fishing and Hunting	4
21	Mining, Quarrying, and Oil and Gas Extraction	56
22	Utilities	82
23	Construction	18
31-33	Manufacturing	626
42	Wholesale Trade	50
44-45	Retail Trade	95
48-49	Transportation and Warehousing	43
51	Information	116
52	Finance and Insurance	6
53	Real Estate and Rental and Leasing	5
54	Professional, Scientific, and Technical Services	57
55	Management of Companies and Enterprises	0
56	Administrative and Support and Waste Management and Remediation Services	33
61	Educational Services	8
62	Health Care and Social Assistance	26
71	Arts, Entertainment, and Recreation	6
72	Accommodation and Food Services	37
81	Other Services (except Public Administration)	5
92	Public Administration	0
99	Unclassified	6
	Total Firms	**1,279**

Lastly, for firms in existence prior to fiscal 1994, 1993 data was collected as well in order to allow for lags of certain financial variables. For firms entering after 1994, the

[12] Remaining firms in the finance and insurance classification have been identified and confirmed to be non-financial firms, in most cases firms offering transaction or information processing services to financial firms.

data includes the year the firm became publicly traded and generally one prior year, if available, again to allow for lags. The average firm appears in the dataset for about 14.5 years, not including 1993 data.

Firm-Level Data

Firm-level data for the U.S. panel are from the Compustat North America database and are derived from public filings to the U.S. Securities and Exchange Commission ("SEC").[13] The data are annual and include financial measures from firms' published financial statements as well as variables identifying each firm's industry, fiscal year end, and other firm-specific information. A small amount of data missing from the Compustat database was filled in from firms' SEC filings. Key financial variables included are listed, with their Compustat variable name, in Table 4. "Type" indicates whether the variable is a balance sheet (bs), income statement (is), or statement of cash flows (cf) item. In regressions, balance sheet variables associated with any period, *t*, are beginning balances; that is, measured as of the prior year end. Flow variables, from the income and cash flow statements, are for the given period, *t*. In addition to these financial measures, the percent ownership of the firms' shares by institutional investors is included where available.[14]

[13] Wharton Research Data Services (WRDS) was used in preparing this dissertation. This service and the data available thereon constitute valuable intellectual property and trade secrets of WRDS and/or its third-party suppliers.

[14] This variable, from the Thomson Reuters Institutional Holdings database (accessed through Wharton Research Data Services), is available for about 81 percent of firm-year observations.

Table 4. Firm-Level Financial Data.

Label	Description	Type
che	Cash and Equivalents	bs
at	Total Assets	bs
dlc	Debt in Current Liabilities	bs
dltt	Total Long-term Debt	bs
ceq	Common Equity – Total	bs
dp	Depreciation	is
ni	Net Income	is
ebitda	Earnings Before Interest, Taxes, Depreciation, and Amortization	is
dvc	Dividends on Common Stock	is
capx	Capital Expenditures	cf

Other Data

Additional variables used in the analysis include four forward-looking aggregate economic measures as proxies for the attractiveness of business investment. While new view theory suggests dividends, as residual payments, depend directly on the level of capital expenditures, the *old* view and some agency theories suggest that capital expenditures and dividends are simultaneously determined. Thus capital expenditures would be endogenous if included as an explanatory variable for dividends. The four aggregate economic variables are thus candidates for instruments for the possibly endogenous firm investment. These variables are the University of Michigan Consumer Sentiment Index; the Federal Reserve Bank of Philadelphia's 50-state leading index; and the capacity utilization rate reported by the Federal Reserve Board. Interest rates enter into the cost of capital directly, affecting the value of the firm and its investment decisions, so nominal and real interest rate measures are also included. Summary statistics for these data as well as the firm-level variables are provided in Appendix A.

Some Empirical Issues

The firm-level nature of the data gives rise to a few issues that should be addressed, including issues of attrition or survivorship, firms changing fiscal year-ends, potential influential observations problems, and an excess zeroes problem.

Attrition/Survivorship

The firm sample, again, is comprised of non-financial firms in the S&P 1500 index as of December 31, 2002, just prior to proposal of the JGTRRA dividend tax cut. The number of years firms appear in the sample, however, varies as many firms did not exist or, at least, were not publicly traded until sometime after 1994. Similarly, some firms drop out of the sample after December 2002 due to mergers, buyouts, or bankruptcies. If firms entering the sample after 1994 or exiting before their 2009 fiscal year are systematically different from firms that are included for the full period, then this could bias the empirical results. For example, firms entering may be younger and in need of external funding for investment, and thus unlikely to pay a dividend. Firms exiting, on the other hand, might be in financial distress in their final periods in the sample.

Of the 1279 firms, 187 went public in an initial public offering ("IPO") in 1994 or later, excluding those whose IPO was part of a spin-off from another firm. Spin-offs account for 77 entries in fiscal 1994 or later. An additional 63 held an IPO and 9 were spin-offs in 1993. Four firms entered in 1994 or later as a result of mergers of already public firms or emergence from bankruptcy reorganization, or began trading publicly on the so-called OTC Bulletin Board (a.k.a. the "pink sheets") prior to a public offering of stock and listing on an exchange. An entry flag dummy variable is set equal to one for these 340 firms in the year of the IPO, spin-off, or other entry.

Firms exiting prior to their 2009 fiscal year total 327 and these are similarly flagged with an exit dummy variable equal to one in the last observation period if before fiscal 2009. 27 of these firms exited prior to reporting any fiscal year results for fiscal 2003 and for another 37, fiscal 2003 was the last reported period; these firms are excluded from the regressions. The most common reason, by far, for firms to exit is because of being acquired or merged into another firm. As firms may be targets for acquisition or merger for a variety of reasons and at any stage of firm development, there is no obvious reason to presume that they are systematically better capitalized or more in need of capital, or more or less likely to pay or increase dividends. Table 5 shows the numbers of firm exits by reason, as coded in Compustat, and by fiscal year.

Table 5. Firm Exits by Last Reported Fiscal Year and Reason for Exit.

	Fiscal Year						
Reason	**pre-2004**	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
Acquisition/Merger	54	48	52	70	35	22	281
Bankruptcy	2		2	1	5	7	17
Liquidation	3	2	1	1		2	9
Leveraged Buyout	2					1	3
Now Private	2	1	1		2		6
Other	1	1		3	3	3	11
Total	64	52	56	75	45	35	327

Another perspective on firm exits considers the potential for bias based on surviving firms being systematically different than those dropping out – in this context, the concern being whether the remaining firms, by virtue of surviving longer, are more mature or financially stronger, and thus more likely to pay dividends. However, given the very small numbers of firms exiting for reasons of bankruptcy or liquidation, there is again little reason to expect the survivors to be systematically different from exiting firms. Nevertheless, the exit flag dummy variable enables testing for attrition or

survivorship bias. In addition, while firm age is not necessarily a good measure of firm maturity (and no consistent measure of firm age is available, anyway), the passage of time might be correlated with firms reaching the mature stage where cash flows exceed investment funding needs, leaving funds for distribution to shareholders. To account for this aging or maturing of firms, a time index can be included in regressions in levels.

Fiscal Year-end Changers

Though relatively rare, on average about 1 percent of firms covered by Compustat change their fiscal year-end in any given year (Porter et al. 2000; Kamp 2002), often reporting a stub period of less than 12 months or leaving a gap in reporting, and generally making periods before and after the change difficult or impossible to compare. Of the 1,279 firms in the dataset, 100 firms changed fiscal year-end between 1994 and 2009, leaving a gap or a stub period. As a result, these firms cannot be included in regressions or other analyses of annual data, at least over the periods affected, because missing months or stub periods make the data not comparable across time. Similar to the attrition problem, this raises the issue of potential bias if, for example, fiscal year-end changes are related to financial distress or other characteristics that one might expect to be correlated with dividends or investment.

Porter et al. (2000), in fact, found that among fiscal year-end changers in 1995 that reported transition period earnings, 62 percent reported a net loss for the period, compared to only 34 percent of the Compustat universe reporting a net loss for the year. The authors suggest that firms use such transition periods to mask losses by booking them in periods many investors overlook. Their sample, however, was very small – only 79 fiscal year-end changers, of which only 63 reported transition period results. Du and

Zhang (2011) delve more deeply into the "missing months" problem and find that firms tend to report lower income in the transition periods than they report in adjacent quarters, consistent with the notion of managing earnings. However, they do not find significant evidence of such earnings management by firms that shift their year-end by whole quarters – that is, by three, six, or nine months – as is the case with 64 of the 100 year-end changers in the present sample. They also suggest that lower reported earnings in the transition months are not necessarily indicative of a negative outlook for the firm.

The most common practice in the accounting literature is to simply drop all firms that changed their fiscal year-end at any time during the period of study and that was the approach taken by Blouin, Raedy, and Shacklford (2007) as well. The approach taken here is to drop only those firms that changed their fiscal year-end during the period 2000-2005 to ensure at least two full-year observations (plus one year for lagged variables) before passage of JGTRRA and two years after passage. For year-end changes before or after that window, respectively, only those observations up to or after the year-end change are dropped. As a result, 704 total firm-year observations are lost, but only 22 firms are dropped outright.

Influential Observations

Chetty and Saez (2004) noted that, in their regressions of amounts of dividends paid, results are dominated by a small number of very large firms, leading them to model binary indicators of dividend payments, increases, initiations, etc. instead. Other studies have used scaled measures of dividends such as dividends per share (Blouin, Raedy, and Shackleford 2004), the payout ratio (Pattenden and Twite 2008), or the dividend yield

(Howton and Howton 2006), narrowing the range of values and eliminating the extreme values of large firm dividends.

To model dividend payments directly without this problem of extreme values, scaling by some other variable may solve one problem while introducing new ones. The payout ratio, for example, is simply dividends divided by net income, but this ratio is likely to be much more volatile than dividends themselves, rising (falling) because of a fall (rise) in earnings rather than any change in dividend policy. Similarly, dividend yields are subject to changes in the market value of the firm's stock. Scaling dividends and other variables – e.g. earnings or cash – by outstanding shares avoids this problem of variation independent of dividend policy, but outstanding shares can change dramatically because of stock splits, requiring additional calculations to adjust for the splits, and are not consistently reported in the Compustat data in any case. A simpler approach would be to scale by a suitable financial variable, such as by total assets as in Auerbach and Hassett (2003), by total revenues as in Bond, Devereux, and Klemm (2007)[15], or by total financial capital (debt plus equity).

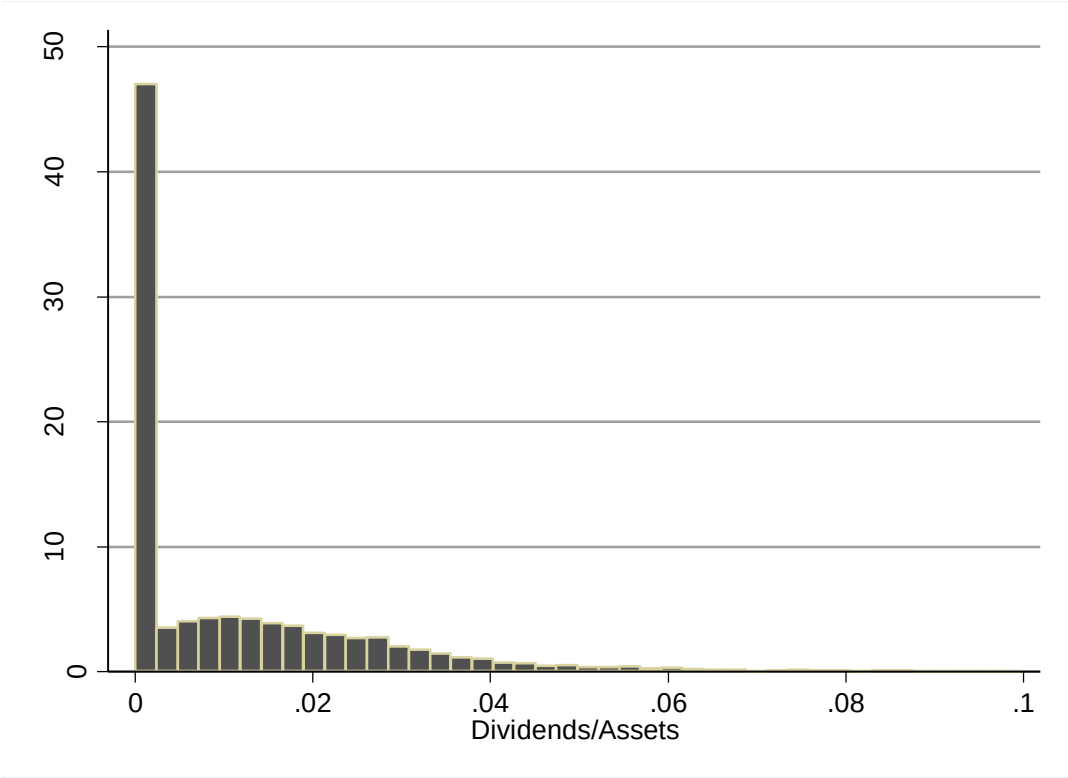
Alternatively, one might rescale all financial variables by taking their natural logs, but doing so for dividends would have the effect of censoring out non-dividend-paying firms and possibly introducing selection bias. In addition, to the extent any other financial variables used in the regressions can take on zero or negative values, a log transformation would result in lost observations for the remaining, dividend-paying firms.

[15] Bond, Devereux, and Klemm actually estimate a weighted least squares model, weighting by the square of sales, but note that the estimates can be interpreted as equivalent to OLS estimates of a scaled model.

Excess Zeroes

Another important empirical issue arises because dividend payments are restricted to be non-negative, so the dependent variable in dividend payment models is censored, and because for a large portion of observations – about 40 percent of S&P 1500 firms on average each year – the value is zero. Figure 8 below shows, for the final sample of December 2002 S&P 1500 non-financial firms, the distribution of dividend payments over the entire 1994-2009 period, with over 45 percent of observations equal to zero.

Figure 8. Sample Distribution of Dividends / Assets



The theoretical models assume non-negativity of dividends for practical reasons – public firms cannot call upon shareholders to inject funds into the firm through negative dividends – so for many firms, the non-negativity constraint binds and results in a corner solution outcome of zero dividends. In such a corner solution model, OLS is a generally

inconsistent estimator, whether the entire sample is used or only those observations with non-zero dividends (Wooldridge 2002). Provided that the dependent variable is continuous, particularly in the vicinity of the limit (in this case zero), and is observed at the limit, a Tobit model is the appropriate choice for estimating such a corner solution model.

Dynamic Processes and Other Issues

As previously noted, surveys of dividend policy from Lintner (1956) to Brav et al. (2008) suggest that, for whatever reason, firm managers place a high priority on maintaining historical dividend policies. This suggests a dynamic process in the data as current payouts depend on past payouts, in addition to earnings, investment opportunities, and other factors. In addition, shocks to firm earnings, investment outlook, or other factors may persist and affect multiple periods. Finally, because firms are often affected by common aggregate or industry shocks to investment opportunities that may not be captured by the explanatory variables, and because firms' payout policies may be interdependent as they compete for analyst and investor favor, cross-sectional dependence is likely as well. The empirical model should ideally account for possible cross-sectional and temporal dependence.

Regression Model and Methods

The primary equation of interest relates dividend payments to the explanatory variables, including the likely endogenous level of investment. Specifically, the hypothesized relationship is given by

$$y_{it} = \mathbf{x}_{1it}\beta_1 + z_{it}\varphi + \varepsilon_{it} \qquad (7.3.1)$$

$$z_{it} = \mathbf{x}_{1it}\beta_{21} + \mathbf{x}_{2it}\beta_{22} + \upsilon_{it} \tag{7.3.2}$$

where y_{it} is the dividend payout (scaled by total assets), $\mathbf{x}_{1it}$ represents the vector of exogenous variables (including financial variables, tax change and other dummy variables, and the intercept term), z_{it} represents endogenous capital expenditures, $\mathbf{x}_{2it}$ represents a vector of instruments, the βs and φ are a coefficient vectors and a scalar coefficient, respectively, and ε_{it} and υ_{it} are error terms (including firm and year effects).

As a preliminary step, some simple probit models are run, with binary indicators of dividend payments ("Payer") as the dependent variable. The probit model in this context treats the continuous variable dividends as a latent variable, observable only as a discrete choice – to pay or not to pay – even though dividends are, in fact, observed. It has been used in the literature in the context of JGTRRA, so is included here in part for comparison, but also to model dividend initiations. Next, the model is estimated by ordinary least squares ("OLS"), ignoring the likely endogeneity of CAPEX. To address the endogeneity issue, instrumental variable probit ("IV Probit") and two-stage least squares ("2SLS") regressions are run, instrumenting for CAPEX with several aggregate and firm-specific variables described in the next chapter.

Again, the issue of non-negative dividends, resulting in around 45% of firms paying zero dividends on average each year, is inherent in the decision problem of the firm and presents a problem for the linear models of dividend payment above. The corner solution model takes the form

$$y_{it} = \max(0, \mathbf{x}_{1it}\beta_1 + z_{it}\varphi + \varepsilon_{it}) \tag{7.3.3}$$

$$z_{it} = \mathbf{x}_{1it}\beta_{21} + \mathbf{x}_{2it}\beta_{22} + \upsilon_{it}. \tag{7.3.4}$$

This is the standard censored or type I pooled Tobit model, except that in this case, y_{it} does not represent a latent variable, but rather one that is observed even at the zero corner solution.

Finally, the likelihood of serial dependence in the data, survey evidence on preferences for consistency in dividend policy, and empirical evidence suggesting a partial adjustment (to earnings) process in dividend payments, all suggest modeling these dynamic processes directly by including lagged variables in the dividend equation. A lagged dependent variable ("LDV") model would be particularly appropriate if firms, in fact, consciously set dividends in part to be consistent with past dividends and, since we are estimating a pooled rather than a fixed effects model, does not violate any methodological assumptions. Thus each of the models described above – probit, IV probit, OLS, 2SLS, and IV Tobit – are estimated including one lag of the dependent variable, Payer or Dividend Payment / Assets as appropriate.

Main Hypotheses and Theoretical Predictions

Whether the changes in observed dividend behavior can be attributed to JGTRRA, or whether firms raised dividends simply out of surplus cash flows and limited investment opportunities, is the empirical question at hand. Answering it, and determining whether the results are more supportive of the *old* or the *new* view, or some other view of dividend taxation, requires testing hypotheses based on the predictions of these models.

The tax changes in TRA97 and JGTRRA, as detailed in Chapter II, included reductions in capital gains tax rates in both cases and a relatively larger reduction in dividend taxes in the latter, increasing the tax discrimination parameter, Θ. Predicted

responses in terms of whether firms pay dividends (Payer), the dividend amount, and capital expenditures under each of the theoretical models presented in Chapter V are summarized by Table 6 below.

Table 6. Predicted Dividend and Investment Responses to TRA97 and JGTRRA.

		Dependent Variable		
Model		Payer (binary)	Dividends	CAPEX
***New* View**	JGTRRA	–	–	+
	TRA97	–	–	+
Monitoring Benefits	JGTRRA	+/–	+/–	+
	TRA97	–	–	+/–
***Old* View**	JGTRRA	+	+	+
	TRA97	–	–	+

Unfortunately, the models are not distinguishable with regard to investment responses to these tax changes except that, because of its ambiguous predictions, a negative or zero investment response to TRA97 would be consistent only with the monitoring benefits model. An increase in investment would be consistent with all three, though in the case of JGTRRA and the *new* view, only because of the capital gains tax cut component. In addition, for constrained firms that neither pay dividends nor repurchase stock, the dividend response is nil under all three models and both tax changes because increases in investment would leave the firms still financially constrained and issuing new shares to fund the increased investment. However, since dividend-paying firms may find themselves newly financially constrained as a result of increased investment, termination of dividends after TRA97 would also be consistent with any of the models. If not terminated, dividends would be expected to decline after TRA97 under all three models. Where the predictions more clearly differ is in the dividend response to JGTRRA.

The *new* view predicts that dividend-paying firms would reduce dividends after JGTRRA, ceteris paribus, while those repurchasing stock, but not paying dividends, would reduce repurchases and leave dividends at zero. Firms not making distributions by either means would also leave dividends at zero.

The monitoring benefits model produces an ambiguous prediction with regard to dividends after JGTRRA. Because the dividend tax cut would be expected to increase both new share issuance and investment through equation (2.6), the dividend response to that parameter depends on whether the effect on share issuance or investment is larger. The capital gains tax cut in JGTRRA would affect investment through both the cost of capital and equation (2.6) with at least partially offsetting effects. Meanwhile, lower capital gains taxes would tend to reduce share issuance, leaving fewer funds available for dividend payments. Overall, a positive dividend response to JGTRRA seems the least likely outcome based on the monitoring benefits models, but it cannot be ruled out. As for constrained firms not making distributions prior to the tax changes, the monitoring benefits model also would not predict initiations.

In contrast, under the *old* view, firms currently paying dividends, repurchasing stock, or both would be expected to increase or initiate dividends. In addition, firms not already making distributions, but accumulating surplus cash after funding I^*, would also be more likely to initiate a dividend as the marginal tax cost of increasing dividends in equation (3.11) is reduced and the marginal benefit is increased. Truly constrained firms, funding the marginal investment with new, outside capital would not be expected to initiate a dividend, even under the *old* view. Overall, only under the *old* view would one

expect to find both increased payments by firms already paying a dividend and increased initiations.

Finally, one non-tax parameter where the predicted dividend response to changes differs across the models is ρ, the rate of time preference. Exogenous changes in ρ (i.e. a higher or lower ρ for all levels of dividend payouts) would be expected to reduce dividends under the *old* view due to reduced marginal benefits of dividend payments, but because dividends are a residual payment under the other models and higher ρ would tend to reduce investment, the monitoring benefits model predicts an increase in dividends while the *new* view predicts an increase once the repurchase constraint binds. An exogenous change in time preferences could result, for example, from changes in the risk free interest rate or from changes in the risk premium required of equity investments in general.

Tax Policy Variables Definitions

Tests of the predictions reflected in Table 6 require an indicator variable for the "treated" periods after passage of JGTRRA. In addition, though primary interest is in the effects of JGTRRA, with a large relative reduction in dividend tax rates, it is also necessary to control for the smaller relative change from the reduction of top capital gains rates under TRA97. These dummy variables, including one alternate specification of the JGTRRA treatment, are defined as follows:

- JGTRRA. Equals one for all fiscal years ending after October 27, 2003, thus including all fiscal years at least half of which occurred after passage, and over nine months of which occurred after proposal, of the JGTRRA dividend tax cuts.
- JGTRRA Alt. Equals one for all fiscal years ending after July 7, 2003, thus including all fiscal years at least half of which occurred after proposal of the JGTRRA dividend tax cuts.

- TRA97. Equals one for all fiscal years ending after December 31, 1997, thus including all fiscal years at least six months of which occurred after TRA97's introduction in Congress and almost eight months after the retroactive effective date.

Predicted Effects of Additional Variables

In addition to the main hypotheses above, theory, survey evidence, and past empirical work suggest effects one should expect to find from the various control variables and instruments on dividend and investment decisions. These variables are defined, and predictions with regard to their effects are discussed below, beginning with the internal source of funds for investment and distributions to shareholders.

Earnings

Surveys, theory, and intuition all suggest that dividends are increasing in profits, all else the same, though surveys predict and empirical studies since Lintner (1956) find that firms increase dividends only slowly over time in response to higher earnings and are reluctant to reduce them in response to lower earnings. The notion in some theoretical models of dividends as residual payments would suggest a coefficient closer to one, controlling for investment and other factors, than one might expect from a partial adjustment process. Accounting earnings, of course, do not measure economic profits or even cash flows, so net income and an alternative measure of earnings, both scaled by total assets, are used as follows:

- Net Income. The accounting profits of the firm after interest, taxes, and all extraordinary or non-recurring charges and gains.
- Earnings Before Interest, Taxes, Depreciation, and Amortization ("EBITDA"). The cash operating profit of the firm, before financing and other non-operating costs; income from operations plus non-cash operating expenses.

Investment

Investment is often omitted as an explanatory variable in the empirical literature (Blouin, Raedy, and Shackleford 2004; Chetty and Saez 2005) or included only as a lagged variable (Moser 2007), but as a competing use of firm cash flows, current period investment should not be omitted. The relationship between firm investment and dividend policies is a key difference between the *old* and *new* views of dividend taxation, or more generally between theories where dividends and investment are simultaneously determined, and those where dividends are a residual. Under the view of dividends as a residual payment, one would expect investment to be negatively related to dividends, after controlling for other sources of cash, with a coefficient approaching one if dividends are purely a residual payment. On the other hand, simultaneous determination of dividends and investment would suggest no direct dependence, though possibly mutual correlation with other factors. However, while surveys suggest dividend-paying firms will raise new external funds to finance investment rather than cutting dividends, they also suggest that dividend initiations and increases do depend on whether the firm has unmet profitable investment opportunities.

Even under the *old* view, constrained firms with unmet profitable investment opportunities would not be expected to pay dividends. On the other hand, while the payout decisions of unconstrained firms do not depend on investment, investment would be positively affected by dividend payouts as the cost of capital is theorized to be a partial function of dividend policy. Optimal investment would thus depend in part on the payout and would be endogenous. For this reason, three aggregate economic indicators, interest rate measures, lagged investment, and depreciation charges serve as instruments. Interest

rates included are trailing 12-month averages as of the firm's fiscal year-end so as to reflect average interest rate conditions over the year; real 1-year and nominal 10-year rates, are tested. The firm-level measure of investment and the candidates for instruments are as follows:

- Capital Expenditures ("CAPEX"). Expenditures for the purchase or improvement of plant and equipment, reported on firms' statements of cash flows. This variable is scaled by dividing by total assets.
- Lagged CAPEX.
- Depreciation. GAAP accounting depreciation of fixed assets, also scaled by total assets.
- University of Michigan Consumer Sentiment Index ("UMCSI")
- Federal Reserve Bank of Philadelphia 50-state leading index ("Philly Fed Index")
- Federal Reserve Board capacity utilization rate ("CU Rate")
- Federal Reserve Bank of Cleveland 1-year real interest rate estimates, 12-month moving average ("Real Rate")[16]
- 10-year Constant Maturity Treasury rate, 12-month moving average ("CMT 10-year")[17]

Cash

Though not explicitly included in the theoretical models, cash reserves accumulated from past earnings retentions or past securities issuance can be used to fund investment or to smooth dividends in periods when current earnings will not fully fund both. Agency theory, addressing the principle-agent conflict between shareholder and managers, suggests that dividends and share repurchases are a means of removing surplus

[16] Estimates of real interest rates are published monthly by the Federal Reserve Bank of Cleveland and can be downloaded from http://www.clevelandfed.org/research/data/inflation_expectations/.

[17] Treasury rates are published by the Federal Reserve Board in Release H.15 and can be downloaded from http://www.federalreserve.gov/releases/h15/data.htm.

cash from the discretion of managers, thus providing benefits to shareholders that are, under the *old* view, another possible justification for modeling the discount rate as a partial function of dividends. Chetty and Saez (2007, 2010) explicitly model beginning cash balances in their agency model, predicting "cash rich" firms will increase dividends in response to a dividend tax cut, and that such a tax cut will cause some firms to shift to the very high cash regime and initiate dividends. Thus a larger cash position, *ceteris paribus*, is expected to be associated with dividend increases and initiations, and to reduce the likelihood or size of dividend reductions in the event of declining earnings. The cash balances variable, measured as of the prior year-end, is defined as follows:

- Cash and Equivalents ("Cash"). Cash and highly liquid, short-term securities readily convertible into known amounts of cash. Scaled by dividing by total assets.

Debt

Debt finance is also not explicitly modeled, but the ability to borrow may work similarly to cash in enabling firms to smooth dividends over time. On the other hand, the terms of corporate debt sometimes include covenants restricting the borrower's ability to pay dividends under certain conditions. In addition, very high levels of debt, especially debt that must soon be repaid, may constrain firms' ability to fund new investment, or drive up firms' cost of both debt and equity capital due to bankruptcy risk, reducing the amounts of new investment projects that would be profitable. The debt measures, for which no prediction is made with regard to the sign of the coefficient, are also measured as of the prior year-end and include:

- Debt in Current Liabilities ("Current Debt"). Borrowings due within one year, reported in current liabilities. Scaled by total assets.

- Total Long-Term Debt ("LT Debt"). All debt due in more than one year. Also scaled by total assets.

Firm Maturity

Firm maturity, in the sense the term is used in the theory, describes the stage of development of the firm from infancy to the mature stage where it might be expected to initiate dividend payments. However, firm age (a reliable measure of which is not available, anyway) is not necessarily a good measure of firm maturity as the time it takes for firms to reach the mature stage varies widely from industry to industry and firm to firm. In addition, mature, dividend-paying firms may, because of setbacks or because of new investment opportunities, exit the mature stage for a time, terminating dividends.

Under Sinn's (1991a, 1991b) nucleus theory, firms advance to the mature stage after some period of funding all investment through earnings retentions, eventually reaching the point where the marginal investment project just returns the cost of capital and surplus earnings become available for distribution. This suggests that accumulated earnings retentions relative to total assets or total capital might proxy for firm maturity as an explanatory variable for the initiation or payment of dividends. The accumulation of cash reserves, as already discussed, might be an alternative measure. The proxy for firm maturity used here, measured as of the prior year-end, is the following:

- Retained Earnings to Total Common Equity ("RE/CEQ"). The accumulated, undistributed profits divided by the total common equity (proceeds of past common stock issuance plus retained earnings, less past repurchases) of the firm. A higher value indicates greater maturity.

Individual Ownership

Though imperfect, one less the institutional ownership percentage is a rough measure of ownership by individuals who are more likely to be affected by shareholder

taxes. This measure has been widely used in the literature as a control or as a means to try to identify a tax effect, including by Auerbach and Hassett (2007), Blouin, Raedy, and Shackleford (2004, 2007), and Dhaliwal, Krull, and Li (2007). In addition, Short, Zhang, and Keasey (2002) investigated the link between institutional ownership and dividend payouts for a sample of U.K. firms, finding a positive relationship. Individual or non-institutional ownership is included in some regressions as a control variable and in others is also interacted with the post-TRA97 and post-JGTRRA dummy variables. If payouts respond to the tax changes as predicted by the *old* view, the interaction term would be expected to be positive, reflecting a larger (in absolute value) dividend response to the tax changes by firms with higher individual ownership. The individual ownership variable, measured as of the latest report at the prior year-end, is defined as follows:

- Individual Ownership Pct. One minus the institutional holdings percent of outstanding shares as reported by the Thomson-Reuters Institutional Holdings (13F) Database.

Other Controls

To account for the possibility of industry-specific effects – dividend practices that are consistent over time within an industry, but which may differ across industries – some regressions include industry dummies based on 2-digit NAICS codes.

Finally, as discussed above, several indicator variables are also included to test for possible bias resulting from attrition – either an entry into the data set as a result of an initial public offering ("IPO") or spin-off transaction after 1993, or an exit prior to 2009 for any of the reasons described in Table 5. The entry flag may also serve as an indicator of firm immaturity, but firms entering as a result of a spin-off, and even some entering as a result of an IPO, may be relatively mature firms. An additional dummy variable

indicates periods during which a firm was in bankruptcy proceedings. If pre-bankruptcy common shares are cancelled as a result of a reorganization plan or liquidation, the firm is dropped as of the last report before reorganization or liquidation, with the exit flagged like any other exit. If, on the other hand, the firm successfully reorganizes with pre-bankruptcy shareholders receiving a partial or full recovery (that is, existing shares are not cancelled), the firm is retained. In either case, the periods the firm was operating in bankruptcy, from filing to exit from bankruptcy proceedings, are flagged separately. These variables are defined as follows:

- Entry Flag. Equals one in fiscal year the firm is first publicly traded, if not publicly traded before FY 1993.
- Exit Flag. Equals one in fiscal year of final report as a public company if before FY 2009.
- Bankruptcy Flag. Equals one in periods during which the firm was operating subject to a bankruptcy proceeding.

Summary

For convenience, Table 7 summarizes the predictions with regard to the various control variables as positive (+), negative (-), no effect (0), or unclear. See Table 6 for the tax policy dummy variables, TRA97 and JGTRRA.

Table 7. Summary of Control Variable Coefficient Predictions.

Variable (category)		Dependent Variable: Payer (binary)	Dividends	CAPEX
Earnings	*old* view	+	+ (< 1)	+
	new view / monitoring ben.	+	1	
Cash		+	+	uncl.
Debt		uncl.	uncl.	–
Firm Maturity		+	+	–
Individual Ownership Percent		uncl.	uncl.	
IO pct *JGTRRA[1]	*old* view	+	+	
IO pct *TRA97[1]	*old* view	–	–	
Entry Flag		0/–	0/–	+
Exit Flag		0	0	0
Bankruptcy Flag		–	–	–
Investment	*old* view	–/0	– (> –1)	
	new view / monitoring ben.	–	–1	
Interest Rates	*old* view	–	–	–
	new view / monitoring ben.	+	+	
Depreciation				+
Economic Indicators[2]				+

1. JGTRRA payout predictions relative to TRA97 and TRA97 relative to the base period, pre-1997.
2. Includes UMCSI, Philly Fed Index, and CU Rate.

CHAPTER VIII

EMPIRICAL RESULTS

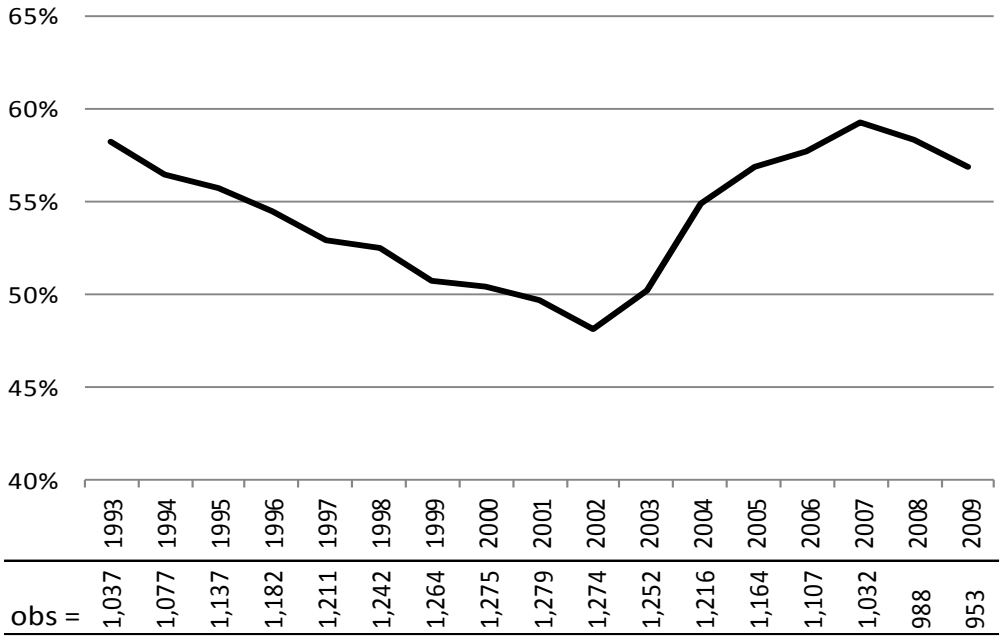
Preliminary Observations

Before presenting the regression results, it is worth reviewing what can be readily observed from the preliminary data in Chapter III about the dividend policy choices of U.S. firms over recent decades, before and after passage of JGTRRA.

- The percentage of publicly-traded companies that pay regular dividends had been generally in decline since at least 1980, but this trend reversed in 2003.
- Real per share dividend payments by S&P 1500 firms, which had been flat from 1994 to mid-2003, rose by 4.4 percent annually from then through 2011, even after dropping sharply during the recent recession.
- The average number of dividend initiations by S&P 1500 firms after passage of JGTRRA through 2011 was nearly triple the average of the prior 35 quarters. Average quarterly terminations rose by only 18 percent, including the spike during the 2007-2009 recession.
- The average net number of S&P 1500 firms increasing dividends each quarter rose over the same time from 110 to 126, again in spite of a spike in reductions late in the recent recession.

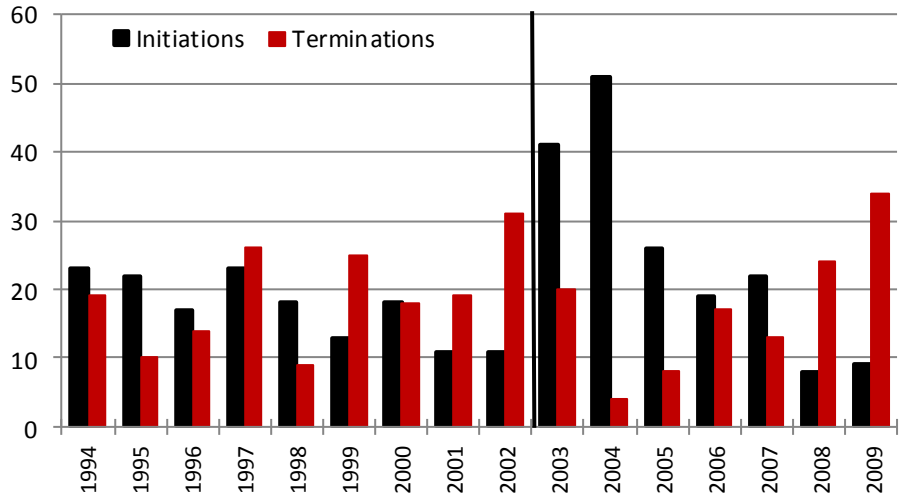
The sample data, including only S&P 1500 non-financial firms as of December 31, 2002 as described in Chapter VII, exhibits similar patterns with regard to dividend payers and payments. Figures 9-10 show, by firm fiscal year, the percent of sample firms paying dividends, and the number of firms initiating or terminating dividends, respectively.

Figure 9. Percentage of Sample Firms Paying Common Dividends, by firm fiscal year.



S&P 1500 non-financial firms as of Dec. 31, 2002
Sources: Compustat, SEC filings, and author's calculations.

Figure 10. Common Dividend Initiations and Terminations by Sample Firms, by firm fiscal year.



Ininitaion if firm paid dividend in year , but not in prior year; termination if firm did not pay a dividend, but did in prior year.
Sources: Compustat and author's calculations.

Regression Results

With these things in mind, we move on to testing whether the data supports one or another theory's predictions, and whether the observed changes in firm behavior since 2003 can be attributed to enactment of JGTRRA.

Probit Models

Table 9 presents the probit and IV probit regressions results, first without CAPEX or the LDV (model 1). Model 2 adds the LDV, CAPEX (treated as exogenous), and the Real Rate. Models 3-5 instrument for CAPEX with lagged CAPEX, depreciation, the three economic indicators – the Philly Fed Index, UMCSI, and CU Rate – and in model 5, the Real Rate. Models 3 and 4 differ only in how the coefficient standard errors are estimated – using jackknife standard errors, clustering first on industry (2-digit NAICS codes) and then year to allow for residual correlations across firms in broad industry groups or common shocks across the cross-section of firms each year. Model 5 adds the individual ownership percent, interactions of individual ownership with the tax policy dummy variables, and the maturity proxy, RE / CEQ.

For each model, the hypothesis that the coefficients on the JGTRRA and TRA97 dummy variables (pre-1997 is the base) are equal is tested. Except for model 4, where the p-value is 0.105, and model 5, where the interaction terms are included, the test shows differences (JGTRRA > TRA97) that are significant at the 1 percent level. In models 1-4, coefficient estimates for JGTRRA range from 0.046 to 0.083, compared to -0.14 to -0.18 for the period when TRA97 governed (or zero in the pre-1997 base period). Though not identical models, these results are consistent with the probit results over a much shorter period from Chetty and Saez (2004). The coefficient estimate on the

JGTRRA*Individual Ownership interaction term, positive and significant at the 1 percent level, indicates that the effect of the JGTRRA tax changes is increasing in individual ownership, as predicted.

Including the LDV and CAPEX greatly increased the explanatory power of the model, reducing the classification errors from almost 1/3 in model 1 to fewer than 4 percent in model 2. In models 1-4, higher profitability or return on assets (Net Income / Assets) has a significant positive effect on the likelihood of paying a dividend while higher CAPEX / Assets has a significant negative effect, suggesting that firms growing their assets more quickly (investment relative to existing assets) are less likely to initiate a dividend. Neither result is surprising, of course. Estimates for the two debt variables (current and long-term) are also not surprising as, except for model 1, all are negative and generally statistically significant. The only surprise is that greater liquidity – higher cash balances relative to total assets – is associated with a lower probability of paying a dividend. It may be that larger relative cash balances are often held by less mature firms because financial capital-raising is lumpy and balances are held for future investment needs. Regressions including the lagged change in cash balances or a lagged cash flow measure (EBITDA) showed a significant positive effect on payment of dividends, but results for other variables were not materially different, so those results are omitted. Finally, while the coefficient estimates on the Real Rate in models 2-4 are large and negative, the standard errors are even larger. Dropping Real Rate from the second stage equation, but retaining it as an instrument, had little impact on estimates for the other variables.

Regarding the suspected endogeneity of CAPEX, a Wald test of the null hypothesis that CAPEX can be treated as exogenous is reported with models 3-5, the results significant at the 1 percent level, rejecting the null.

OLS and 2SLS Models

Turning next to the linear models of dividend payments, OLS and 2SLS results are presented in Table 10. Models 1 and 2 are OLS, the latter adding lagged dividends and calculating standard errors clustered on year rather than industry. Models 3 instruments for CAPEX and substitutes Driscol-Kraay standard error estimates, which are robust to heteroskedasticity and arbitrary common autocorrelation, but is otherwise comparable to model 2 and produces essentially the same results. Models 4 adds the entry and bankruptcy flags, and the Real Rate while model 5 adds the individual ownership and maturity variables, both estimated with heteroskedasticity and autocorrelation robust Newey-West errors.

Results for the tax regime dummies are essentially the same between comparable OLS and 2SLS models, but estimated coefficients are smaller in magnitude in LDV models where the coefficient on JGTRRA is not statistically different from zero. As in the probit models, tests for equality between coefficients on JGTRRA and TRA97 consistently reject the null. The estimates from the LDV models suggest that, controlling for other observable financial characteristics of firms as well as past dividend policies, dividends as a percent of assets post-JGTRRA have returned to levels before passage of TRA97 and were about 21-23 basis points lower in the interim, TRA97 period. This may seem small, but it is actually quite large compared to the historical unconditional mean of Dividends / Assets, which is 1.31 percent over the entire 1994-2009 period.

The coefficients on Net Income and CAPEX tell a similar story with regard to dividend payments as payers, with higher levels of each having significant, offsetting effects on payments. With coefficient estimates ranging from about 0.022 to 0.024 in 2SLS regressions, a one percentage point increase in the return on assets – net income to assets – implies a 2.2 to 2.4 basis point increase in the dividend return on assets. Substituting EBITDA for net income in model 3, the coefficient estimate on EBITDA is 0.039 (also significant at the 1 percent level) with other coefficient estimates essentially unchanged. Higher CAPEX, meanwhile, has a somewhat smaller negative effect on dividend payouts with a one percentage point increase in CAPEX / Assets implying a 1.5 to 1.6 basis point decrease in dividend returns.

Cash and long-term debt exhibit no significant effects on dividend payouts in the linear models, unlike the probit models, while higher levels of current debt appear to be associated with higher payouts. It may simply be that public companies with greater access to short-term borrowing – e.g. commercial paper – tend to be more mature firms and thus more likely to pay dividends.

In model 4, the Real Rate coefficient estimate is positive and significant, consistent with predictions under the *new* view and monitoring benefits models. The entry and bankruptcy flags both showed significant negative effects on dividend payouts, consistent with expectations. Regressions were also run with the exit flag; estimates were very small and not statistically different from zero, and results for other variables were essentially the same as without the exit flag. In model 5, individual ownership, is positively associated with dividend payouts while the firm maturity proxy is statistically significant, but exceedingly small.

Finally, a regression otherwise the same as model 3 was run including industry sector dummy variables, grouping by 2-digit NAICS codes, but coefficient estimates for the other variables were not materially different than model 3 results and the dummies added little explanatory power to the model, so these results are omitted.

Tobit Corner Solution Models

As noted in the empirical issues discussion in Chapter VII, more than 45 percent of firm-year observations show zero dividends, suggesting that a linear model may be inconsistent and that a corner solution model is more appropriate. Table 11 presents the results of instrumental variable Tobit regressions, beginning with LDV models that differ first in the estimation of standard errors – jackknife standard errors, clustering on industry in the case of model 1 and year for model 2, with little difference in the standard error estimates. Model 3 is the same as model 2 except for the inclusion of the Real Rate and industry sector dummies (the dummy variable coefficient estimates are not reported). Model 4 again adds the entry and bankruptcy flags and model 5 adds the individual ownership percent and interaction terms.

In all models except the final one, which includes the individual ownership interaction terms, the difference between the JGTRRA and TRA97 coefficient estimates is statistically significant at the one percent level. Estimates for JGTRRA are statistically zero, as in the linear models, but for TRA97, the magnitude of the coefficient estimates is considerably larger, ranging from -0.0041 to -0.0053 in models 1-4, and significant at least at the 10 percent level and generally better than the 5 percent level. In the final model, the Individual Ownership interaction terms both show a significant positive relationship between individual ownership and payouts during the TRA97 and JGTRRA

periods, but the coefficients on the tax policy dummy variables are no longer significantly different from one another. Adding only the individual ownership percent to model 4, without interaction terms, produces results similar to those of model 4, with a roughly 66 basis point difference between the JGTRRA and TRA97 dummy variables coefficients that is again significant at the 1 percent level. The coefficient estimate on individual ownership is 0.014, also significant at the 1 percent level (these results are not reported in the table). However, a problem with including individual ownership (and the interaction terms) is that this variable is not available for all firms or periods, resulting in substantially fewer observations. In addition, there may be data or measurement problems as some firms show reported institutional ownership in excess of 100 percent, perhaps resulting from large short positions due to arbitrage activities, so these results should be interpreted with caution.

On average, the coefficient estimates of around a 50 basis points suggest a significant increase, ceteris paribus, in dividends / assets in the JGTRRA period versus the TRA97 period compared to the mean payout since 1994 of about 1.3 percent of assets annually.[18]

Net Income, CAPEX, and cash coefficient estimates in the Tobit models are also considerably larger in magnitude than in the 2SLS models and are generally significant at the 1 percent level. Unlike in the 2SLS models, net income and CAPEX have roughly offsetting effects, with 1 percentage point higher return on assets adding about 7.5 to 8.8 basis points to the dividend return and 1 percentage point higher CAPEX/Assets reducing

[18] Note that the Tobit coefficient estimates should not be interpreted as marginal effects on the observed dividend variable, but rather on the latent variable that is not observed unless greater than zero. Unfortunately, marginal effects on the observed (censored and uncensored) payout (or only for uncensored observations) could not be calculated using Stata and thus are not reported.

dividend returns by 7.3 to 9.7 basis points. Note that, though significantly non-zero, these estimates are far from the values implied by the notion of dividends as a residual payment, 1 and -1, respectively.

Adding the Real Rate and the sector dummies in model 3 has little impact on the estimates for other variables and while the estimate for the Real Rate is again positive, it is not statistically significant. In model 4, the entry and bankruptcy flags, both negative and statistically significant, suggest 4-5 percentage point lower dividend returns for newly public firms and firms operating in bankruptcy, all else the same. Neither result is surprising, of course. Lastly, Wald tests of the exogeneity of CAPEX once again consistently reject the null at the one percent level of significance.

Robustness Checks and Other Variables Not Reported

Additional probit, 2SLS, and Tobit regressions were run including other variables described in Chapter VII to test predictions or to check the robustness of the reported estimates. Additional regressions included alternate market interest rate measures such as the 10-year Treasury rate; unfortunately, no market interest rate measure showed a consistent and statistically significant effect in dividend regressions, whether in a Payer or Dividend Payment model. A consistent and significant negative effect would have tended to support the *old* view while a positive effect would have been consistent with either the *new* view or the monitoring benefits model.

Exit flags, included to test for potential attrition bias, and a time index were never significant, and while the entry and bankruptcy flags were usually significant, including them had no material effect on the results for the variables of interest or the conclusions

drawn. Inclusion of industry effects with the NAICS-based dummy variables also had no material impact on results for other variables.

Finally, regressions were run with the alternate specification of the JGTRRA dummy variable, shifting the "treated" period roughly five months earlier. This, too, had no material effect on the results.

CAPEX Regressions

The endogeneity of CAPEX in dividend models is generally supported by the test results noted above, so instrumental variable methods are called for, but the first stage regressions are of interest in their own right because of theoretical and policy questions about the effects of personal taxation on business capital investment. Table 12 presents some OLS results from regressions of CAPEX / Assets first on only the instruments excluded from the second stage dividend equations and then adding the primary set of second stage regressors, including the financial and tax policy variables. The excluded instruments, again, are lagged CAPEX / Assets, Depreciation / Assets, the three economic indicators, and the real rate of interest. In the actual first stage regressions for the IV estimates, other instruments were tested, including substituting nominal interest rate measures, but with little effect on the results. Models 1 and 3 use clustered standard errors, clustering on industry, while models 2 and 4 use Driscoll-Kraay standard errors, accounting for arbitrary heteroskedasticity and arbitrary common autocorrelation. Model 5 is the same as model 4 except for the substitution of EBITDA for net income.

The lagged CAPEX and depreciation variables, unsurprisingly, have large, positive, and statistically significant effects. The capacity utilization rate is also consistently positive and significant while the Philly Fed Index is also positive, but only

significant in models 1 and 2. The Real Rate is not statistically significant in any of the regressions, but at least the sign is negative as expected. Other interest rate measures produced no better results. In models 3 and4, lagged dividends are negative and significant while net income is positive and significant, with the estimate for the two variables having similar magnitudes. Substituting EBITDA in model 5 produces similar results.

Of particular interest, estimates on the tax policy variables show significantly lower CAPEX during the TRA97 tax regime by about 0.6 percent of assets, compared to the base period and by over 0.3 percent of assets compared to the post-JGTRRA period. For all firm-year observations, the mean value of CAPEX / Assets is about 7.2 percent, so the point estimate of 0.6 percent is relatively large, about 8 percent of the mean value. The point estimate of -0.16 to -0.25 percent for JGTRRA suggests lower relative levels of investment since 2003 compared to pre-1997, but the estimate is not statistically significant in any model, while the TRA97 estimate is significant at the 5 percent or 1 percent level in all three. Considering that the post-JGTRRA data run through fiscal 2009 (fiscal years ending between June 1, 2009 and May 31, 2010) and thus severe recession for most or all of the last two years of firm data, a slightly negative point estimate on the JGTRRA dummy variable is not surprising. The included variables can't fully account for the effects of the financial crisis on access to new financial capital or the negative outlook likely suppressing firms' appetites for new investment. The large negative coefficient on TRA97, compared to JGTRRA, is consistent with the predictions of all three modeled theories and with the predictions of proponents of the JGTRRA in 2003. The difference of 0.33 to 0.44 percentage points between the JGTRRA and

TRA97 estimates is significant in models 4 and 5 at the 5 percent and 1 percent levels, respectively, and represents about a 5 to 6 percent positive swing in mean CAPEX / Assets between the TRA97 and JGTRRA periods, ceteris paribus.

Summary of Findings

The findings of the regression models with regard to the policy change variables, and the firm-specific financial and other variables are summarized below in Table 8 for convenience in comparing results to predictions in Tables 6 and 7. For detailed results, see Tables 9-12 on the following pages. The primary findings of interest are summarized by the following points:

- The endogeneity of capital expenditures in dividend payer or payment amount regressions is supported by consistent test results. Instrumenting for CAPEX, results indicate that investment is indeed a significant factor in dividend decisions of firms, but coefficient estimates are far from the -1 value implied by theories that treat dividends as a residual payment and are more consistent with the *old* view predictions.

- Income measures also clearly influence dividend payouts, but again not to the extent expected if dividends are merely residual payments.

- Large, positive coefficient estimates on lagged dividends are consistent with the survey evidence and past empirical evidence of dividend smoothing, and the notion of signaling benefits as assumed by the *old* view and the vast majority of surveyed managers.

- Coefficient estimates and tests consistently find a significant increase in both dividend payers and payments after passage of JGTRRA compared to the period governed by TRA97, ceteris paribus, returning dividend payments as a percent of assets to pre-TRA97 levels.

- Regression results also provide evidence of a statistically and economically significant increase in firm investment during the period since passage of JGTRRA, controlling for firm financial characteristics and other investment-related factors.

Identification of the policy effect, however, is subject to the possibility that some other, unobserved factor explains the increases in dividend payers and payments after

passage of JGTRRA and thus the correlations with the policy dummy variables may be spurious. The use of individual ownership data, interacted with the policy dummy variables, provided some support for the policy change driving dividend initiations (i.e. in the IV Probit model) and dividend payment amounts appear to be increasing in ownership by individual investors. However, the ownership data do not truly measure taxable versus non-taxable ownership as both individuals and institutions may fall in either category. In addition, ownership data are unavailable for many firms and, in other cases, reported institutional ownership is in excess of 100 percent (thus measured individual ownership is negative), raising concerns about errors in the data. In any case, including the interaction terms in the Tobit dividend payment model muddled the results, so identification remains an issue.

Nevertheless, the empirical analysis presented here spans 16 years of business activity, two recessions, and two relevant tax policy changes where previous studies of the effects of JGTRRA have focused on a much shorter period around passage. In addition, this analysis models payment amounts as well as binary payment decision, and accounts for the interdependence between dividend and investment decisions where others have generally analyzed them separately. Finally, this analysis addresses empirical issues inherent to the dividend decisions of firms – particularly the censored or corner-solution nature of the firm's optimization problem – with appropriate methods. While it does not find neat answers to some questions and opportunities to refine the analysis surely abound, overall, the results are consistent with the effects advertised by JGTRRA proponents and with the *old* view theoretical model as far as its prediction that

a dividend tax cut would tend to increase both dividend distributions to shareholders and firm capital investment, all else the same.

Table 8. Summary of Regression Results.

	Dependent Variable		
Variable (category)	Payer (binary)	Dividends	CAPEX
JGTRRA[1]	+	+	+
TRA97[1]	–	–	–
Lagged Dependent Variables	+	+	+
Earnings	+	+ (<1)	+
CAPEX	–	– (> -1)	
Cash	–	+	–
Debt	–	uncl.	–
Firm Maturity (RE/CEQ)	0	0	
Individual Ownership Percent	0	+/uncl.	
Individual Ownership*JGTRRA	+	+/uncl.	
Individual Ownership*TRA97	0	+/uncl.	
Entry Flag	weak –	–	
Exit Flag	0	0	
Bankruptcy Flag	–	–	
Interest Rates	uncl.	uncl.	uncl./weak –
Depreciation			+
Economic Indicators[2]			+

1. JGTRRA payout predictions relative to TRA97 and TRA97 relative to the base period, pre-1997.
2. Includes UMCSI, Philly Fed Index, and CU Rate.

Table 9. Preliminary Probit Regressions.

Dependent Variable: Dividend Payer					
Method:	Probit[1]	Probit[1]	IV Probit[2,3]	IV Probit[2,4]	IV Probit[2,4]
	(1)	(2)	(3)	(4)	(5)
Lagged Dep Var		3.6371 ***	3.6716 ***	3.6716 ***	3.7036 ***
		(0.071)	(0.090)	(0.077)	(0.086)
JGTRRA	0.0833 *	0.0484	0.0459	0.0459	-0.0700
	(0.043)	(0.050)	(0.065)	(0.119)	(0.142)
TRA97	-0.1426 ***	-0.1647 ***	-0.1791 ***	-0.1791 *	-0.2816
	(0.038)	(0.039)	(0.058)	(0.102)	(0.161)
Net Income / Assets	1.2445 ***	1.7199 ***	2.0253 ***	2.0253 **	1.9967
	(0.216)	(0.362)	(0.656)	(0.877)	(1.233)
CAPEX / Assets		-0.7327 *	-1.2116 *	-1.2116 **	-1.0866 *
		(0.422)	(0.622)	(0.515)	(0.569)
Cash / Assets	-3.1948 ***	-1.2224 ***	-1.1304 ***	-1.1304 ***	-1.0063 ***
	(0.285)	(0.205)	(0.267)	(0.223)	(0.261)
Current Debt / Assets	1.1111 **	-1.1684 **	-1.0891 **	-1.0891 *	-0.9146 *
	(0.480)	(0.470)	(0.489)	(0.578)	(0.511)
LT Debt / Assets	-0.3119 *	-0.3633 ***	-0.3411 *	-0.3411 **	-0.2808 **
	(0.184)	(0.131)	(0.190)	(0.119)	(0.134)
Real Rate		-2.0705	-2.1429	-2.1429	
		(2.147)	(2.534)	(7.220)	
Individual Ownership Pct.					-0.1992
					(0.248)
JGTRRA*Indiv. Ownership					0.8012 ***
					(0.265)
TRA97*Indiv. Ownership					0.3479
					(0.343)
RE / CEQ					0.0003
					(0.004)
Constant	0.5096 ***	-1.4567 ***	-1.4815 ***	-1.4815 ***	-1.5344 ***
	(0.116)	(0.077)	(0.112)	(0.183)	(0.154)
Obs	17,255	17,255	16,118	16,118	13,157
Pseudo R-squared	0.1107	0.7963			
F-test: JGTRRA=TRA97	52.25 ***	31.29 ***	33.02 ***	3.01	1.42
Wald Chi-sq test of exogeneity			9.32 ***	9.32 ***	6.72 ***
Pct. Correctly Classified	68%	97%			

Standard errors in parentheses. *** indicates significance at the 1% level, ** at 5%, and * at 10%.
1. Robust SEs, clustered on industry (2-digit NAICS). 2. Newey's two-step estimator, CAPEX/Assets treated as endogenous. Instruments include lagged CAPEX/Assets, Depr/Assets, Philly Fed Index, UMCSI, CU Rate, and Real Rate. 3. Jackknife SEs, clustering on industry. 4. Jackknife SEs, clustering on year.

Table 10. OLS ans 2SLS Regressions.

Dependent Variable: Dividend Payments / Assets

Method:	OLS[1]	OLS[2]	2SLS[3,4]	2SLS[3,5]	2SLS[3,5]
	(1)	(2)	(3)	(4)	(5)
Lagged Dep Var		0.4869 ***	0.4865 ***	0.4866 ***	0.6061 ***
		(0.107)	(0.080)	(0.089)	(0.107)
JGTRRA	-0.0027 ***	-0.0004	-0.0005	0.0001	0.0011
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TRA97	-0.0052 ***	-0.0022 **	-0.0023 ***	-0.0021 ***	-0.0014 **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Net Income / Assets	0.0191	0.0237 **	0.0239 **	0.0236 ***	0.0213 **
	(0.012)	(0.001)	(0.011)	(0.009)	(0.009)
CAPEX / Assets	-0.0123	-0.0136 **	-0.0163 ***	-0.0146 ***	-0.0151 ***
	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)
Cash / Assets	-0.0077	0.0003	0.0002	0.0011	0.0040
	(0.006)	(0.008)	(0.008)	(0.007)	(0.008)
Current Debt / Assets	0.0242 *	0.0117 **	0.0114 ***	0.0119 ***	0.0087 **
	(0.014)	(0.005)	(0.004)	(0.004)	(0.004)
LT Debt / Assets	0.0011	0.0058	0.0057	0.0059	0.0082
	(0.010)	(0.011)	(0.011)	(0.011)	(0.013)
Real Rate				0.0571 **	
				(0.025)	
Entry Flag				-0.0116 ***	
				(0.002)	
Bankruptcy Flag				-0.0058 **	
				(0.002)	
Individual Ownership Pct.					0.0045 **
					(0.002)
RE / CEQ					0.0000 **
					(0.000)
Constant	0.0162 ***	0.0058	0.0060	0.0048	0.0012
	(0.002)	(0.005)	(0.004)	(0.004)	(0.005)
Obs	17,255	16,118	16,118	16,118	13,157
R-squared (centered)	0.0232	0.2448	0.2448	0.2471	0.3428
F-test: JGTRRA=TRA97	18.95 ***	10.32 ***	12.29 ***	24.14 ***	30.53 ***
Sargan-Hansen test H_0: CAPEX exogenous			0.00	0.39	5.57 **
First stage R-squared			0.6019	0.6031	0.6426
Kleibergen-Paap F test H_0: weak id			189.77 ***	153.08 ***	344.84 ***

Standard errors in parentheses. *** indicates significance at the 1% level, ** at 5%, and * at 10%.
1. Robust SEs clustered on industry (2-digit NAICS). 2. SEs clustered on fiscal year. 3. 2SLS estimated using ivreg2 command (Baum, Schaffer, and Stillman 2010), CAPEX/Assets treated as endogenous. Instruments include lagged CAPEX/Assets, Depr/Assets, Philly Fed Index, UMCSI, CU Rate, and Real Rate. 4. Driscol-Kraay SEs, robust to heteroskedasticity and arbitrary common autocorrelation. 5. HAC robust Newey-West SEs.

Table 11. Tobit Regressions.[1]

Dependent Variable: Dividend Payments / Assets					
Method:	IV Tobit[2]	IV Tobit[3]	IV Tobit[3,4]	IV Tobit[3]	IV Tobit[3]
	(1)	(2)	(3)	(4)	(5)
Lagged Dep Var	0.6751 ***	0.6751 ***	0.6356 ***	0.6802 ***	0.7987 ***
	(0.147)	(0.161)	(0.159)	(0.158)	(0.202)
JGTRRA	0.0002	0.0002	0.0015	-0.0006	-0.0133 ***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
TRA97	-0.0049 ***	-0.0049 **	-0.0041 *	-0.0053 **	-0.0169 ***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)
Net Income / Assets	0.0858 ***	0.0858 ***	0.0881 ***	0.0852 ***	0.0739 **
	(0.023)	(0.021)	(0.022)	(0.021)	(0.029)
CAPEX / Assets	0.0854 ***	-0.0854 ***	-0.0970 ***	-0.0804 ***	-0.0723 ***
	(0.026)	(0.013)	(0.016)	(0.012)	(0.015)
Cash / Assets	-0.0633 ***	-0.0633 ***	-0.0562 ***	-0.0611 ***	-0.0471 ***
	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
Current Debt / Assets	0.0216	0.0216 **	0.0094	0.0236 **	0.0149
	(0.014)	(0.009)	(0.008)	(0.008)	(0.009)
LT Debt / Assets	0.0050	0.0050	-0.0020	0.0053	0.0098
	(0.017)	(0.017)	(0.019)	(0.017)	(0.020)
Real Rate			0.1006		
			(0.071)		
Entry Flag				-0.0489 ***	
				(0.014)	
Bankruptcy Flag				-0.0457 **	
				(0.017)	
Individual Ownership Pct.					-0.0172 ***
					(0.006)
JGTRRA*Indiv. Ownership					0.0404 ***
					(0.010)
TRA97*Indiv. Ownership					0.0282 **
					(0.010)
Constant	-0.0035	-0.0035	0.0070	-0.0033	0.0017
	(0.007)	(0.008)	(0.015)	(0.008)	(0.008)
Obs	16,118	16,118	16,118	16,118	13,173
F-test: JGTRRA=TRA97	19.41 ***	15.20 ***	13.55 ***	11.64 ***	1.01
Wald test of exogeneity	41.08 ***	41.08 ***	32.32 ***	33.04 ***	16.98 ***

Standard errors in parentheses. *** indicates significance at the 1% level, ** at 5%, and * at 10%.
1. Newey's two-step estimator with CAPEX/Assets treated as endogenous. Instruments include lagged CAPEX/Assets, Depr/Assets, Philly Fed Index, UMCSI, CU Rate, and Real Rate. 2. Jackknife SEs, clustering on industry (2-digit NAICS). 3. Jackknife SEs, clustering on year. 4. Includes industry dummy variables (not reported).

Table 12. CAPEX Regressions.[1]

Dependent Variable: CAPEX / Assets					
Method:	OLS[2]	OLS[3]	OLS[2]	OLS[3]	OLS[3]
	(1)	(2)	(3)	(4)	(5)
Lagged Dep Var	0.5202 ***	0.5202 ***	0.4964 ***	0.4964 ***	0.5042 ***
	(0.062)	(0.058)	(0.061)	(0.055)	(0.055)
Depreciation / Assets	0.5234 ***	0.5234 ***	0.6010 ***	0.6010 ***	0.4470 ***
	(0.127)	(0.125)	(0.124)	(0.114)	(0.109)
Philly Fed Index	0.0026 ***	0.0026 ***	0.0007	0.0007	0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
UMCSI	-0.0001	-0.0001	0.0001	0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CU Rate	0.0015 ***	0.0015 ***	0.0013 ***	0.0013 ***	0.0011 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Real Rate	-0.0019	-0.0019	-0.0533	-0.0533	-0.0038
	(0.077)	(0.091)	(0.044)	(0.067)	(0.069)
Lagged Dividends / Assets			-0.0623 ***	-0.0623 ***	-0.0791 ***
			(0.018)	(0.022)	(0.027)
JGTRRA			-0.0025	-0.0025	-0.0016
			(0.003)	(0.002)	(0.002)
TRA97			-0.0058 **	-0.0058 ***	-0.0060 ***
			(0.002)	(0.001)	(0.001)
Net Income / Assets			0.0791 ***	0.0791 ***	
			(0.015)	(0.013)	
EBITDA / Assets					0.0871 ***
					(0.014)
Cash / Assets			-0.0109	-0.0109 ***	-0.0108 ***
			(0.007)	(0.003)	(0.003)
Current Debt / Assets			-0.0310 **	-0.0310 ***	-0.0312 ***
			(0.013)	(0.007)	(0.007)
LT Debt / Assets			-0.0035	-0.0035	-0.0038
			(0.005)	(0.004)	(0.004)
Constant	-0.1063 ***	-0.1063 ***	-0.1046 ***	-0.1046 ***	-0.0975 ***
	(0.023)	(0.029)	(0.033)	(0.021)	(0.021)
Obs	16,118	16,118	16,118	16,118	16,118
R-squared (centered)	0.5808	0.5808	0.6019	0.6019	0.6008
F-test: JGTRRA=TRA97			1.02	5.25 **	15.00 ***

Standard errors in parentheses. *** indicates significance at the 1% level, ** at 5%, and * at 10%.

1. Instruments for IV regressions in italics. All equations estimated using ivreg2 command in Stata (Baum, Schaffer, and Stillman 2010). 2. SEs clustered on industry (2-digit NAICS). 3. Driscol-Kraay SEs, robust to heteroskedasticity and arbitrary common autocorrelation.

CHAPTER IX

CONCLUSIONS, CONTRIBUTIONS, POLICY IMPLICATIONS, AND AVENUES FOR FURTHER RESEARCH

The theoretical portions of this project contribute to the literature and debate in two ways. First, though the debate over the *old* view, the *new* view, and various agency or other theories is long-running and unsettled, I believe it is useful to replicate existing competing models in a consistent, robust framework to more easily compare their assumptions and conclusions, and to more readily enhance them. The models presented here replicate the standard *new* view model, a monitoring benefits model originally presented as a two-period optimization problem, and also a variation on the *old* view model. The framework is a continuous time dynamic optimization model that begins with the *new* view model as a base, and then enhances it to replicate the monitoring benefits and *old* view models. The framework eases the way toward the second contribution, which is the application of the Uzawa (1968) and Obstfeld (1990) endogenous discounting methodology to enhance the *old* view model and derive an Euler condition for the optimum dividend policy of the firm.

The model might be further enhanced by incorporating other aspects of the real-world optimization problem corporations face, including, for example, cash reserves and debt, bankruptcy risk, financial transaction costs, and some of the issues and ideas from agency theory.

The empirical analysis presented here also contributes to the literature on personal taxation of corporate source income primarily from two perspectives. First, it addresses several empirical issues that have gotten limited attention in previous studies of JGTRRA and dividend taxation generally. In particular, with over 45 percent of firm-year observations of dividend payments equal to zero, it is clear that standard linear methods are not appropriate for estimating dividend payment models. Both the data and the theory suggest a corner solution approach such as a Tobit model, yet such an approach has been applied to this topic in the existing literature. Likewise the inclusion of firm investment in dividend models: survey evidence and theory suggest that capital expenditures are at least an important factor in dividend decisions, if not the direct determinant of dividends as a residual payment as some theory holds. Other theory also holds that dividend policy can impact the cost of capital and thus investment. Yet capital expenditures are rarely included in empirical models of dividend behavior and when they are, their apparent endogeneity is not addressed. This study addresses both of those issues, along with several others that have been addressed in previous studies.

Second, though the results are not clear with regard to some questions, such as how exogenous changes in shareholder return requirements might affect dividend policy, or how cash reserves and debt might factor into dividend policy, they do provide evidence of an effect of JGTRRA on dividend policy – both the number of firms paying dividends and the amounts paid out – and also evidence that JGTRRA positively affected business investment. These findings bear directly on the theoretical debate over how dividend decisions are made and affected by taxes.

Ideas to improve the analysis include, for example, using a rotating sample of firms rather than a static sample that is subject to attrition, potential survivorship bias, and other problems associated with using firm-level financial data. Additional useful variables might also be identified, including other instruments for capital expenditures or more reliable data on new share issuance, repurchases, and ownership. Ownership data that more reliably measures taxable versus non-taxable ownership might help with identification of a policy effect. Another identification strategy might be to expend the analysis to include non-U.S. firms whose shareholders are not affected by U.S. tax changes, but may have been affected by tax changes in their home countries.

Finally, the effects identified above of JGTRRA on dividend policy and business investment are what proponents of JGTRRA predicted prior to its passage in 2003. With current dividend and capital gains tax rates scheduled to expire at the end of this year, and the former set to rise particularly sharply, worries over the consequences of the expiration seem warranted. U.S. corporate tax rates are currently the highest among OECD nations and a greatly expanded layer of personal taxes will soon be piled on top. The answer is not necessarily to simply extend the JGTRRA tax treatment of dividends and capital gains. The original proposal that became JGTRRA was for full integration of corporate and personal taxes, with the objectives of encouraging business investment by reducing the cost of equity capital and of making the tax system neutral with regard to business financial decisions by removing disincentives to equity finance and the payment of dividends. Amidst today's slow economic growth and uncertainty about future tax policy, consideration once again of income tax reforms with those same objectives seems

in order. Economists and policy-makers need to focus more attention and effort on capital income taxation and addressing this piece of the approaching fiscal cliff.

APPENDIX A

DATA SUMMARY

Variable			Mean	Std. Dev.	Min	Max	Obs	Firms	Years
Dividends/Assets		overall	0.0134	0.032	0.000	1.671	17,258	1,194	14.45
		between		0.019	0.000	0.269			
		within		0.025	-0.135	1.553			
Dividend Payer		overall	0.5469	0.498	0.000	1.000	17,469	1,194	14.63
		between		0.446	0.000	1.000			
		within		0.224	-0.391	1.484			
Net Income/Assets		overall	0.0579	0.187	-16.459	3.348	17,258	1,194	14.45
		between		0.076	-1.123	0.458			
		within		0.171	-15.278	3.122			
EBITDA/Assets		overall	0.1711	0.184	-16.202	2.776	17,257	1,194	14.45
		between		0.094	-1.052	0.843			
		within		0.158	-14.978	2.683			
CAPEX/Assets		overall	0.0732	0.084	0.000	3.315	17,258	1,194	14.45
		between		0.056	0.002	0.446			
		within		0.063	-0.307	2.993			
Depreciation/Assets		overall	0.0504	0.036	0.000	1.530	17,257	1,194	14.45
		between		0.027	0.002	0.436			
		within		0.024	-0.134	1.368			
Cash/Assets	*	overall	0.1373	0.172	-0.002	0.950	17,476	1,194	14.64
		between		0.150	0.002	0.805			
		within		0.086	-0.350	0.832			
Current Debt/Assets	*	overall	0.0344	0.059	-0.040	1.295	17,473	1,194	14.63
		between		0.037	0.000	0.401			
		within		0.046	-0.217	1.223			
LT Debt/Assets	*	overall	0.1878	0.168	0.000	2.616	17,476	1,194	14.64
		between		0.132	0.000	0.816			
		within		0.106	-0.462	2.469			
RE/CEQ	*	overall	0.4832	19.074	-2098.04	1102.48	17,383	1,194	14.56
		between		4.461	-130.941	58.687			
		within		18.499	-1966.62	1044.28			
Indiv. Ownership Pct.	*	overall	0.3392	0.218	-1.020	1.000	14,002	1,092	12.82
		between		0.159	-0.160	1.000			
		within		0.159	-0.829	1.116			
UNCSI	*	overall	91.7748	10.818	55.300	112.000	17,476	1,194	14.64
		between		1.974	81.363	98.514			
		within		10.676	55.116	116.005			
Philly Fed Index	*	overall	1.0106	1.134	-2.865	2.483	17,476	1,194	14.64
		between		0.183	0.327	1.403			
		within		1.122	-2.869	2.745			
CU Rate	*	overall	79.9515	3.690	67.052	85.041	17,476	1,194	14.64
		between		0.681	76.216	80.669			
		within		3.647	67.351	85.781			
Real Rate		overall	0.0151	0.011	-0.008	0.029	17,469	1,194	14.63
		between		0.001	0.004	0.018			
		within		0.011	-0.007	0.034			
CMT 10-year		overall	5.1244	1.062	3.159	7.442	17,469	1,194	14.63
		between		0.227	4.178	5.635			
		within		1.044	3.150	7.498			

* indicates lagged values

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