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CAPITAL TAX REFORM AND THE REAL ECONOMY: THE EFFECTS OF THE 2003 DIVIDEND TAX CUT

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Capital Tax Reform and the Real Economy: The Effects of the 2003 Dividend Tax Cut
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ABSTRACT

Policymakers frequently propose to use capital tax reform to stimulate investment and increase labor earnings. This paper tests for such real impacts of the 2003 dividend tax cut—one of the largest reforms ever to a U.S. capital tax rate—using a quasi-experimental design and a large sample of U.S. corporate tax returns from years 1996-2008. I estimate that the tax cut caused zero change in corporate investment, with an upper bound elasticity with respect to one minus the top statutory tax rate of .08 and an upper bound effect size of .03 standard deviations. This null result is robust across specifications, samples, and investment measures. I similarly find no impact on employee compensation. The lack of detectable real effects contrasts with an immediate impact on financial payouts to shareholders. Economically, the findings challenge leading estimates of the cost-of-capital elasticity of investment, or undermine models in which dividend tax reforms affect the cost of capital. Either way, it may be difficult for policymakers to implement an alternative dividend tax cut that has substantially larger near-term effects.

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I Introduction

The Jobs and Growth Tax Relief Reconciliation Act of 2003 reduced the top federal tax rate on individual dividend income in the United States from 38.6% to 15%. President George W. Bush argued that the tax cut would provide "near-term support to investment" and "capital to build factories, to buy equipment, hire more people."[1] The underlying rationale finds support in economics: traditional models imply that dividend tax cuts substantially reduce firms' cost of capital (Harberger 1962, 1966; Feldstein 1970; Poterba and Summers 1985), and investment appears highly responsive to the cost of capital (Hall and Jorgenson 1967; Cummins, Hassett, and Hubbard 1994; Caballero, Engel, and Haltiwanger 1995). Similar arguments motivate ongoing proposals to use capital tax reforms to increase near-term output (Ryan 2011, 2012; Hubbard, Mankiw, Taylor, and Hassett 2012).[2]

However, there is no direct evidence on the real effects of the 2003 dividend tax cut, for the simple reason that real corporate outcomes are too cyclical to distinguish tax effects from business cycle effects. Aggregate investment rose 31% in the five years after the tax cut, but that increase could have been driven by secular emergence from the early 2000s recession. Indeed, aggregate investment rose by 34% in the five years following the early 1990s recession despite no dividend tax cut. As a result, existing work on the real effects of dividend taxes has relied on indirect evidence such as the goodness-of-fit of alternative structural investment equations (Poterba and Summers 1983).

This paper tests for real effects of the 2003 dividend tax cut by using a set of unaffected corporations to control for the business cycle. Upon incorporating at the state level, U.S. corporations adopt either "C" or "S" status for federal tax purposes. C-corporations and S-corporations face similar tax rates except that C-corporations are subject to dividend taxation while S-corporations are not. S-status typically confers tax advantages, but restrictions on the number and type of shareholders prevent corporations with publicly traded stock, with

[1] The first quote is from the February 2003 Economic Report of the President, p.55; the second is from President Bush's speech on January 7, 2003, introducing the tax cut. Both refer specifically to the dividend tax cut.

[2] The influential "Ryan Plans" of the U.S. House Committee on the Budget proposed to keep capital income tax rates low or to lower them further in order to "provide an immediate boost to a lagging economy by increasing wages, lowering costs, and providing greater returns on investment" (Ryan 2011) and to prevent "raising taxes on investing at a time when new business investment is critical for sustaining the weak economic recovery" (Ryan 2012). Hubbard et al. predicted that Governor Mitt Romney's proposed capital and labor income tax reforms "will increase GDP growth by between 0.5 percent and 1 percent per year over the next decade."

any institutional equity financing, and with any divisions between ownership and control from enjoying S-status. This paper uses S-corporations (not directly affected by the dividend tax cut) as a control group for C-corporations (directly affected) over time.[3]

The identifying assumption underlying this research design is *not* random assignment of C- vs. S-status; it is that C- and S-corporation outcomes would have trended similarly in the absence of the tax cut. Three facts support this "common trends" assumption. First, C- and S-corporations of the same ages operate in the same narrow industries and at the same scale throughout the United States and are thus subject to similar cyclical shocks. Second, contemporaneous stimulative tax provisions like accelerated depreciation applied almost identically. Third and perhaps most important, key outcomes empirically trended similarly for C- and S-corporations in the several years before 2003.

This paper uses rich data from U.S. corporate income tax returns from years 1996 to 2008. All publicly traded corporations, and thus the absolute largest corporations, are C-corporations; I therefore focus on a stratified random sample of private C- and S-corporations with assets between one million and one billion dollars (the 90^{th} and 99.9^{th} percentiles of the U.S. firm size distribution) and revenue between 0.5 million and 1.5 billion dollars. Based on Census Bureau data, firms in this size range employ over half of all U.S. private sector workers. In the tax data, C- and S-corporations in this range are densely populated within fine industry-firm-size bins, and all results flexibly control for time-varying industry-firm-size shocks. This paper's main sample is an unbalanced panel comprising 333,029 annual observations from 73,188 corporations, 58% of which are C-corporations; I obtain qualitatively similar results in balanced panel regressions in which the only firm-level variable changing over time is the outcome of interest.

I find that annual C-corporation investment trended similarly to annual S-corporation investment before 2003 and continued to do so after 2003. The difference-in-differences point estimate implies an elasticity of investment with respect to one minus the top statutory dividend tax rate of .00 with a 95% confidence interval of $-.08$ to .08, equivalent to $-.03$ to .03 standard deviations of firm-level investment.

The finding of no significant increase in investment is robust across alternative specifica-

[3] To the extent that an increase in C-corporation investment displaced S-corporation investment, this empirical design *overstates* the magnitude of the aggregate effect. The design tests for the canonical price effect of dividend taxation; indirect effects such as wealth effects among savers that could have increased or decreased worldwide corporate investment are outside the scope of this paper. Switching between corporate types is rare.

tions (with and without controls), sample frames (unbalanced and balanced panels), investment measures (gross investment and net investment), outlier top-coding (at the 95^{th} and 99^{th} percentiles), and subsamples (defined by size, age, growth, profitability, cash, and debt). I further find a negative point estimate and a 95% confidence upper bound elasticity of .04 (.02 standard deviations) for the related and independently relevant outcome of total employee compensation. Results remain unchanged when including the 76% of publicly traded corporations that fall in this paper's size range and become negative when including all publicly traded corporations.

To confirm the tax cut's salience and relevance in spite of the lack of detectable real effects, I test for an effect on total payouts to shareholders (dividends plus share buybacks)—the focus of the existing academic debate over the effects of this tax reform (Chetty and Saez 2005; Brown, Liang, and Weisbenner 2007; Blouin, Raedy, and Shackelford 2011; Edgerton 2013). I find that C-corporation payouts spiked immediately in 2003 by 21% relative to S-corporation payouts, with a t-statistic over 5. The payouts effect was large and persistent in percentage terms but small in dollar terms and is consistent with a small dollar-for-dollar displacement of C-corporation investment, or alternatively with a mere reshuffling of financial claims that had no real effects.

These core results do not necessarily apply to corporations that were smaller or larger than the firm size range analyzed here, so I test for real effects of the tax cut within each firm size decile and ask whether the results suggest that out-of-sample effects were likely different. For each real outcome, I find a zero effect within every firm size decile and no upward or downward trend across deciles. Hence, I do not find evidence suggestive of different out-of-sample results.

Finally, a recent model notes that a dividend tax cut can increase the productivity of investment even if it does not increase its level, by causing poorly-managed C-corporations to reduce wasteful investment and to increase payouts while causing other C-corporations to increase productive investment via increased equity issuance (Chetty and Saez 2010). When dividing the sample by each of six firm characteristics (size, age, growth, profitability, cash, and debt), I find no relationship between the subgroups that increased payouts the most and those that increased equity issuance the least. Thus I do not find evidence in favor of this efficiency-enhancing channel.

This paper complements a large empirical literature that has found substantial real effects of other fiscal policies. Temporary countercyclical policies such as accelerated investment depreciation (House and Shapiro 2008; Zwick and Mahon 2014), individual income tax rebates (Johnson, Parker, and Souleles 2006), and temporary durable goods subsidies (Mian and Sufi 2012) have increased at least some component of aggregate spending. Many studies have shown that labor income taxes reduce labor supply (see Chetty 2012 for a recent review); q-theory-based regressions suggest that corporate income taxes reduce investment (Cummins, Hassett, and Hubbard 1994); and the pooled effect on near-term output of labor income, capital income, and other tax reforms since World War II was substantial (Romer and Romer 2010). This paper contributes to this literature by documenting that in contrast to numerous other fiscal policies, the 2003 dividend tax cut—one of the largest changes ever to a U.S. capital income tax rate—had no detectable near-term impact on the real outcomes it was projected to improve.

The null result relates to theory and to alternative dividend tax reforms. Economically, the null result rejects the joint hypothesis that the tax cut substantially reduced firms' cost of capital as in traditional models and that investment responded to the cost of capital as much as leading estimates predict. In particular, combining the leading traditional model of dividend taxation (Poterba and Summers 1985) with consensus estimates of the cost-of-capital elasticity of investment (Hassett and Hubbard 2002) would predict a dividend tax elasticity of investment range of 0.21 to 0.41—at least 2.5 times the 95% confidence upper bound of this paper's empirical estimate.

The null result accords instead with the leading class of alternative models (the "new view" of dividend taxation) in which marginal investments are funded out of retained earnings and riskless debt rather than out of newly issued equity or risky debt (King 1977; Auerbach 1979; Bradford 1981). The key mechanism is that earnings from pre-existing operations will inevitably be subject to dividend taxes (whether paid out immediately or paid out in the future after being retained for investment), so a dividend tax cut increases the post-tax return on investment by the same magnitude that it increases the opportunity cost of investment, inducing no investment change.[4]

Traditional models of dividend taxation can nevertheless explain the null result as due to particular features of this dividend tax cut and other tax rates, as detailed in Section VI. A bottom line from that discussion is that even in that case, it may be difficult for policymakers

[4]In terms of Tobin's q (1969), q is less than one in the new view by an amount that varies proportionally with one minus the dividend tax rate.

to implement an alternative dividend tax cut that substantially increases near-term investment. For example, the 2003 dividend tax cut carried a default expiration date, and it is possible that a permanent dividend tax cut would have substantially increased investment. However, the United States has never committed to a near-term or long-term path for tax policy so the required longevity may be infeasible to guarantee: the 2003 dividend tax cut has outlasted many tax reforms that had no expiration date, and a majority of G7 countries have revised their dividend tax rates up or down substantially since 2003.

The corporate finance literature on the 2003 dividend tax cut has focused on whether the post-2003 increase in dividend payouts from publicly traded corporations (Chetty and Saez 2005) represented an increase in total corporate payouts or was offset by an equal reduction in share buybacks (Brown, Liang, and Weisbenner 2007; Blouin, Raedy, and Shackelford 2011; Edgerton 2013). This paper shows that the tax cut indeed increased total corporate payouts—a finding again made possible by the S-corporation control group because, like investment, share buybacks are very procyclical.

The remainder of this paper is organized as follows. Section II describes the 2003 dividend tax cut and the distinction between C- and S-corporations. Section III introduces the tax data. Section IV estimates real effects of the 2003 dividend tax cut. Section V confirms salience and relevance by analyzing payouts. Section VI details economic and policy implications. Section VII concludes.

II C- vs. S-Corporations and the 2003 Tax Reform

II.A C- vs. S-Status

After filing incorporation documents at the state level, U.S. corporations elect either "C" or "S" status for federal tax purposes. C-corporations pay the corporate income tax on annual taxable income, and U.S. shareholders pay dividend taxes on dividends and pay capital gains taxes on qualified share buybacks. S-corporations—named after their subchapter of the Internal Revenue Code—have the same legal structure as C-corporations but for tax purposes are flow-through entities that do not pay an entity-level income tax. Instead, taxable business income flows through *pro rata* to individual shareholders' tax returns and is taxed as ordinary income in the year it is earned, regardless of whether the income is actually distributed to shareholders that year.[5] When distributed, S-corporation dividends are untaxed.[6]

S-status typically confers tax advantages (detailed in the next subsection), but not all corporations qualify for S-status. The most important restrictions are that the corporation must have no more than 100 shareholders, all shareholders must be U.S. citizens or residents and not business entities, and the corporation must have only one class of stock. Thus all publicly traded corporations, corporations financed with venture capital, corporations partially or wholly owned by private equity or other firms, corporations that widely use stock-based compensation, and corporations that use stock classes to divide ownership from control cannot be S-corporations. Despite these restrictions some very large corporations are publicly-known S-corporations such as Fidelity Investments.[7] Corporations can switch status and I account for this in the analysis below, though consecutively switching back and forth is restricted by law and switching is rare empirically because most factors that bar S-status (e.g. institutional shareholders) are persistent.

Except for the very largest corporations which are all publicly traded and are thus C-corporations, C- and S-corporations of the same ages operate in the same narrow industries and at the same scales across the United States. For example, Online Appendix Figure 1a uses data from the full population of U.S. corporate tax returns to plot the distribution of C- and S-corporations by 1-digit NAICS classification for all 397,008 corporations in 2002 that satisfy the size and industry restrictions in this paper, detailed in Section III.B.[8] The figure shows that C- and S-corporations are relatively evenly distributed across major industries. Zeroing in on the 23,892 corporations in the most-common 3-digit NAICS classification (wholesale durable goods trade), Online Appendix Figure 1b shows the even distribution of C- and S-corporations across narrow 4-digit industries. Online Appendix Figure 1c similarly shows even distributions of firm size. Online Appendix Figure 1d uses public data on two large corporations (Home

[5] Taxable dividend income or capital gains earned by S-corporations (e.g. on passively held securities) retain their character and are taxed as dividend income or capital gains at the shareholder level.

[6] The tax treatment of C- and S-corporations differ in other, smaller ways. For example, C-corporations can deduct charitable deductions up to only 10% of taxable income whereas S-corporations face limits at the individual shareholder level. S-corporations are taxed similarly to partnerships; relative to partnerships which were not analyzed for this paper, S-corporations may be a more appropriate control group for C-corporations because, aside from taxes, C- and S-corporations have identical legal rights and responsibilities.

[7] This information was obtained from a recent press report (http://www.boston.com/business/markets/articles/2007/11/03/fidelity_changes_its_corporate_structure) and not from tax data.

[8] These unedited population data lack investment and other key variables and so are used only for Online Appendix Figures 1a-1c.

Depot and Menard Inc., respectively the country's largest and third-largest home improvement retailers) to illustrate a specific example of publicly known C- and S-corporations operating in the same narrow industry and in the same locale (the Chicago metropolitan area).

C- and S-corporations differ along some notable dimensions. For example, C-corporations tend to be more asset-intensive and less-profitable than S-corporations after controlling for revenue and industry. Nevertheless, the substantial overlap demonstrated in Online Appendix Figure 1—and below in Figure 1 and Table 1 for the main analysis sample—by industry and size suggests that even if the corporation types differ in the *level* of outcomes, they may share *common trends* because they share any time-varying industry and firm-size shocks. Common trends is the condition required for identification below. Later, I demonstrate empirically that C- and S-corporation outcomes indeed trended similarly before 2003.

II.B The 2003 Tax Reform

On May 28, 2003, President George W. Bush signed into law the Jobs and Growth Tax Relief Reconciliation Act of 2003. This tax reform reduced the marginal federal dividend income tax rate from 38.6% to 15% for the recipients of most taxable dividends.[9] President Bush proposed the reform on January 7, 2003; it applied retroactively to January 1, 2003; and the dividend tax proposal appears to have been largely unanticipated (Auerbach and Hassett 2007). As the name of the law ("Jobs and Growth") and the paper's introductory quotes from President Bush indicate, the tax cut's supporters argued that it would affect real economic outcomes beginning in the near-term.

The tax reform changed three other relevant provisions. It reduced the top capital gains tax rate (the rate assessed on income earned from qualified share buybacks) from 20% to 15%. It expanded temporary accelerated depreciation for equipment and light structures investment through 2004, which applied nearly identically to C- and S-corporations.[10] And it accelerated

[9] The tax reform reduced the marginal tax rate on qualified (i.e. from U.S. or tax-treaty-qualifying foreign corporation stock held for at least sixty days) and taxable (i.e. not from S-corporations or accrued to tax-preferred accounts) dividends for individual taxpayers in the top four ordinary income tax brackets from 27%, 30%, 35%, and 38.6% to 15%, and for taxpayers in the bottom two ordinary income tax brackets from 10% or 15% to 5%. Most taxable dividends accrue to taxpayers in the top ordinary income tax bracket and approximately 90% accrue to taxpayers in the top four. The tax reform did not change the tax treatment of dividends recevied by individuals in tax-favored savings accounts or by nonprofit, corporate, or government entities.

[10] The exception is that owners of S-corporations with current losses could deduct the depreciation allowances from any current wage or other ordinary income on their 1040's, while C-corporations must carry forward the tax benefit to future years' profit. Thus the 2003 tax reform could in principle have benefited low-profit S-

the already-legislated phase-in of reductions in individual ordinary income tax rates, such as immediately reducing the top rate from 38.6% to 35% rather than waiting for it to fall to 37.6% in 2004 and 35% in 2006. S-corporation income (as well as dividend income until 2003) is taxed as ordinary income, but because the small reduction in ordinary income tax rates was merely an acceleration and based on evidence presented in Section IV.E, I make the simplification of considering S-corporation income tax rates to have been unaffected. The tax reform did not change the corporate income tax schedule.

The 2003 dividend tax cut was originally legislated to expire in 2009 but was extended to 2013 and has now been made "permanent" (i.e. with no default expiration date) in nearly its original form. In late 2005 Congress proposed to extend the tax cut until 2011, and President Bush signed it into law in May 2006.[11] In 2010, Congress and President Barack Obama extended it again until 2013. In the first days of 2013, President Obama signed into law a permanent extension of the tax cut for all individuals with taxable income below $400,000 and married couples with taxable income below $450,000, as well as a permanent marginal dividend tax rate of 20% for taxpayers with taxable income above these thresholds. In Section VI.B, I discuss the possible implications of the original default expiration dates.

The OECD reports that when considering federal and average state tax rates, the 2003 tax reform reduced the top statutory dividend tax rate from 44.7% to 20.8%. In the empirical analysis below, I report elasticities with respect to one minus this top statutory rate.[12] One minus the dividend tax rate is the relevant entity for parameterizing traditional models as I illustrate in Section VI. The vast majority of taxable dividend income accrues to households in the top tax bracket. Shares of private corporations (the focus of this paper) are unlikely to be held by dividend-tax-exempt investors like pension funds or by taxpayers in the lowest dividend tax brackets. And unlike public company share buybacks, private corporation share buybacks are typically taxed as dividends rather than capital gains (and indeed share buybacks are relatively uncommon in my sample).[13] Readers can apply their own assumed tax change

corporations relative to low-profit C-corporations. However, the negative point estimate in Table 3 column 1 row 4 (introduced in Section IV.C) suggests that this was not a relevant confound.

[11] This law also lowered the bottom dividend tax rate from 5% to 0% beginning in 2008 and was set to expire in 2011 but never did before being made permanent in 2013.

[12] See OECD Tax Database Table II.4 (http://www.oecd.org/tax/tax-policy/tax-database.htm). Elasticities with respect to the tax rate are 19% smaller in absolute value; one minus the tax rate is the element relevant for theory.

[13] IRS rules require a share buyback to materially change ownership in order to qualify as a capital gain.

to the raw estimates as they see fit; for example, one could assume that private C-corporation dividends faced the average taxable dividend tax rates for the total U.S. economy, which Poterba (2004) reports fell from 32.1% to 18.5%.

III Data

III.A SOI Sample of U.S. Corporate Income Tax Returns

This paper uses a large stratified random sample of U.S. corporate income tax returns from years 1996-2008. Each year the Internal Revenue Service (IRS) Statistics of Income (SOI) division randomly samples corporate income tax returns, edits many variables for accuracy and consistency, and uses them to publish aggregate statistics. The sampling percentages are a function of assets and a measure of net income; corporations with at least $50 million in assets are sampled with probability one and progressively smaller corporations are sampled at progressively smaller rates. Corporations sampled in one year are typically though not always sampled in subsequent years, so the SOI sample constitutes an unbalanced panel.[14] The fine reweighting I detail in subsection E accounts for any differential changes over time in the sampling percentages.

The SOI sample has three key advantages relative to the commonly-used Compustat database on corporations: it contains data on both C-corporations and S-corporations, it contains data on many young corporations, and it has a much larger sample size even of relatively large corporations. As detailed below, this paper focuses on corporations with between $1 million and $1 billion in assets. Most Compustat corporations fall in this asset range but the SOI sample contains observations on many more such firms, including in the range $500 million to $1 billion.

III.B Analysis Sample

This paper focuses on corporations in the SOI sample with between $1 million and $1 billion in assets (the 89.7^{th} and 99.9^{th} percentiles of the 2002 U.S. pooled-C-and-S-corporation size

This may be easier to do with dispersed shareholders who trade their stock in public markets than it is for concentrated shareholders who do not.

[14] The sampling is done using a deterministic function of the last four digits of the corporation's employer identification number, so corporations sampled in one year are usually sampled the next as well.

distribution) and with revenue between \$0.5 million and \$1.5 billion (i.e. within 50% of either asset threshold) in 2010 dollars, for three reasons. The \$1 million lower bound restricts attention to corporations operating at substantial scale and lies comfortably above a reporting threshold that restricts the balance sheet information available on corporations with less than \$250,000 in assets. Almost all of the very largest corporations are publicly traded and are therefore C-corporations, so the \$1 billion upper bound ensures substantial overlap between C- and S-corporations across size bins. And corporations in this size range are quantitatively important: firms in this size range employ over half of all U.S. private sector workers.[15]

The main analysis sample is an unbalanced panel of corporations constructed from the SOI samples. The unbalanced panel includes a corporation's year t tax return if the corporation: (a) had assets in the range \$1 million to \$1 billion and revenue in the range \$0.5 million to \$1.5 billion on average between years t-2 and t-1 (so that lagged values can be used for scaling); (b) was private at least until year t-2 (since all S-corporations are private); and (c)—as restricted in earlier work on the 2003 dividend tax cut (Chetty and Saez 2005)—is not a financial company (whose main productive assets are typically not tangible capital) or a utility company (to which unique regulations apply). I further discard any tax returns that contain missing variable values or in which the filing months of consecutive tax years indicate that the tax return did not cover a full twelve month period.

I use the unbalanced panel for all main results due to its simplicity and inclusiveness. However, it has the potential disadvantage of a changing composition over time. I therefore repeat all analyses using a balanced panel constructed similarly to the unbalanced panel except that it includes the same corporations in every year. The balanced panel comprises annual observations on corporations that: (a) filed tax returns in all years 1996-2008; (b) had assets in the range \$1 million to \$1 billion and revenue in the range \$0.5 million to \$1.5 billion average over years 1996-1997; (c) were private through 1997; and (d) are outside the financial and utilities industries. As I describe in Section IV.B, the balanced panel allows me to conduct the regression analysis such that the outcome of interest is the only firm-level variable changing from year

[15] Corporate income tax returns do not include employment. In the most recent Census Bureau release with employment statistics by firm revenue, 45.2% of private sector employees were employed by firms with between \$500,000 and \$100 million in revenue (http://www.census.gov/econ/susb/data/susb2007.html). Employment at firms with revenue between \$100 million and \$1.5 billion is not reported separately; I estimate that an additional 5.3% to 18.5% of private sector employees are employed at firms with between \$100 million and \$1.5 billion in revenue.

to year. However, the balanced panel carries the obvious drawbacks of omitting corporations that are young in the post-2003 era and of requiring survival through 2008.

III.C Variable Definitions

The SOI data contain the variables necessary for this paper's analysis: assets, revenue, investment, tangible capital assets, net investment, employee compensation, dividends, total payouts to shareholders, equity issued, profit margin, cash, debt, NAICS industry classification, and age. All variables are constructed from annual corporate income tax returns filed by the corporation. This section defines variables in economic terms; Online Appendix A defines them in terms of line items on tax forms.

C-corporations file the corporate income tax Form 1120 and S-corporations file the similar Form 1120S. Year t refers to the corporation's tax filing that covered July of calendar year t. Each observation's C- vs. S-status is defined as of its filing in year t-2; this means, for example, that a spike in C-corporation payouts in 2003 refers to corporations that filed a Form 1120 in 2001. Results are insensitive to this choice.

Investment equals the purchase price of all newly installed capital assets logged on Form 4562, filed alongside the corporate income tax return in order to claim depreciation deductions.[16] The U.S. tax code permits a corporation to deduct the purchase price of newly acquired capital assets (i.e. both new and used capital assets as long as they are new to the corporation) from its taxable income. The corporation typically cannot deduct the entire amount immediately and instead must make a sequence of depreciation deductions over several years, computed each year using Form 4562. To a close approximation, investment eligible for depreciation comprises the same capital goods included in NIPA private fixed non-residential investment statistics; see House and Shapiro (2008), Kitchen and Knittel (2011), and IRS Publication 946 for more details.[17]

[16] Throughout this paper, "capital assets" refers to property depreciable under the U.S. tax code (equipment and structures used in the trade or business). Thus "capital assets" is used here in its traditional economic sense rather than in the tax accounting sense of securities that generate passive income or similar assets.

[17] Kitchen and Knittel (2011) demonstrate that SOI Form 4562 aggregates approximate NIPA investment statistics. Software, equipment, and structures are included; land and depletable assets (e.g. oil deposits) are not. New purchases of patents and certain other intangible assets can be logged as new investment. If the investment purchase is only partially used by the firm, only a portion is logged as new investment. U.S.-based corporations with foreign operations typically establish wholly-owned foreign entities that are regarded as separate entities; property placed into service in separate entities do not appear on Form 4562.

Tangible capital assets (shortened to "capital" in table headings) equals the book value of all tangible (e.g. excluding goodwill) capital assets owned by corporation at the end of the tax year, net of accumulated book depreciation. I compute net investment as the annual dollar change in tangible capital assets, which equals new tangible investment less tangible capital asset retirements and accumulated book depreciation. Employee compensation equals the sum of wages and salaries paid to non-officer employees, payments for employee benefit programs (e.g. health insurance), and contributions to pension or employee-profit-sharing plan contributions.

Dividends equals the sum of cash and property distributions to shareholders. Total payouts to shareholders (sometimes shortened to "payouts") equals dividends plus share buybacks—where share buybacks are defined as non-negative annual dollar changes in treasury stock, the primary method used in Blouin, Raedy, and Shackelford (2007), Skinner (2008), and Edgerton (2013). Equity issued equals non-negative annual changes in total paid-in capital.

Assets equals total book assets. Revenue equals operating revenue. I use tax fields to define operating profit margin (sometimes shortened to "profit margin") homogeneously for C-corporations and S-corporations. Operating profit margin equals operating revenue less cost of goods sold and all components of total deductions except interest, depreciation, domestic production activities, and officer compensation deductions.[18] Cash equals the sum of all liquid current assets. Debt equals the sum of all non-equity liabilities. For each corporation, 2-digit NAICS classification equals the first two digits of the 6-digit NAICS classification code reported on the corporate income tax return observed for each corporation that was filed nearest to 2003. There are nineteen valid 2-digit NAICS classifications. Age is defined similarly, using the date incorporation field reported on the return filed nearest to 2003.

III.D Summary Statistics

Table 1 displays unweighted summary statistics for the main analysis sample (the unbalanced panel) by C- and S-status. All values are annual and all monetary amounts are in 2010 dollars. The sample comprises 195,033 annual observations on 43,988 C-corporations and 137,996 annual observations on 32,113 S-corporations. The average C-corporation observation has lagged revenue of $69 million, investment of $2.2 million, and employee compensation of $12

[18] I exclude interest, depreciation, and domestic production activities deductions because they are not operating costs. I exclude officer compensation because private corporations may have leeway in the timing and form of compensating owner-managers.

million; S-corporation averages are similar. When weighted by lagged revenue as is done for all subsequent analyses (see next subsection), the average lagged revenue in the sample is $281 million, so the average firm in this paper's analysis operates at considerable scale. Figure 1 shows that there is substantial overlap across C- and S-corporations by industry and size; in the next subsection, I explain how I flexibly account for any differences along these dimensions. The size distribution of corporations is right-skewed, reflecting the right-skewness of the population firm size distribution. Fewer than 4% of firms ever switched between C and S status.[19]

III.E Weighting and Winsorizing

I specify the final weight used for each observation in Online Appendix B; the formula can be understood as the result of two steps. I initially weight each observation according to its revenue, averaged over the previous two lags. Thus each observation contributes to all graphs and regression estimates according to its economic scale, making the parameter estimates "dollar-weighted" in this sense. I then reweight the S-corporation sample to match the C-corporation sample along 190 size-industry bins in order to flexibly control for time-varying size- or industry-based shocks using the reweighting method of DiNardo, Fortin, and Lemieux (1996) that is commonly used in labor economics when data sets are large enough to support it. Specifically, after initially weighting observations by their lagged revenue, I bin each corporation into one of 190 (= 19 two-digit industries $\times$ 10 within-industry size deciles) bins according to the within-industry size-decile distribution of C-corporations in 2002. Then within each corporation type and year, I inflate or deflate each bin's weight so that each bin carries the same relative weight as the 2002 distribution of C-corporations. This ensures, for example, that time-varying shocks to large construction firms will not influence the results because large construction firms will contribute to the results equally for each corporation type and in every year. Empirically, this reweighting turns out to be a careful precaution that makes almost no quantitative difference (compare estimates reported in Table 2 column 2 and Online Appendix Table 4 column 10, introduced below) because C- and S-corporation industry distributions are very similar (Figure 1a) and effect sizes are constant across firm sizes (Figure 3, introduced below).

Finally and unless otherwise specified, I winsorize (top-code) scaled outcomes (e.g. invest-

[19] The total number of corporations reported in the introduction is slightly smaller than the sum of the total number of C-corporations and the total number of S-corporations reported in Table 1 because of this small number of switching corporations.

ment divided by lagged tangible capital assets) at the 95^{th} percentile.[20] I intentionally winsorize observations differently for the time series graphs of Figure 2 than I do for the regressions. The graphs are intended to illustrate how investment and other outcomes change year-by-year and especially around the passage of the 2003 dividend tax cut. Thus for the graphs, I hold the winsorization percentiles fixed across years and in particular use the pre-2003 distribution of the outcome to compute winsorization levels in all years. However, as will be relevant for the payouts outcome only, the tax cut can shift the outcome distribution (e.g. increasing the 95^{th} percentile), and estimates of the impact of tax cut would ideally censor an equal share of observations over time. Thus for the regressions, I winsorize pre-2003 observations using the pre-2003 distribution of the outcome and I winsorize 2003-and-beyond observations using the 2003-and-beyond distribution of the outcome.[21]

IV Effect on Investment and Employee Compensation

I first test whether the 2003 dividend tax cut caused C-corporations to increase investment—a key real behavioral response suggested by policymakers and by economic theory. I begin by presenting visual evidence and regression estimates of the effect of the tax cut on investment. I then present extensive robustness checks, tests for effects on employee compensation, heterogeneity analyses, tests for internal and external validity, and a test for an efficiency-enhancing reallocation of investment.

IV.A Investment

Figure 2a plots the time series of mean investment for C-corporations and S-corporations in the unbalanced panel, net of a rich set of controls as done in Chetty, Friedman, Hilger, Saez, Schanzenbach, and Yagan (2011). As is standard in corporate finance, I first scale each corpo-

[20] By "winsorize", I mean that any observations with values above the 95^{th} percentile are assigned the 95^{th} percentile value. Winsorizing removes the influence of data coding errors, which are occasionally present even in the edited SOI samples. Even without data errors, winsorizing can be optimal when estimating means in finite samples from skewed distributions as one trades off bias with minimizing mean squared error (Rivest 1994). I winsorize controls at the 99^{th} percentile since they're used as quartics; winsoring at the 95^{th} percentile yields nearly identical results.

[21] In each case, I compute percentiles separately for C-corporations and S-corporations to account for level differences in the outcome. When I use only the pre-2003 distribution to winsorize, main regression results remain nearly unchanged but the payouts effect size is approximately two-thirds as large and still very statistically significant.

ration's annual investment by its lagged tangible capital assets and top-code observations at the 95^{th} percentile as described in Section III.E. Then within each year, I regress scaled investment on a C-corporation indicator and this paper's standard set of controls: indicators for two-digit NAICS industry classification and quartics in age, lagged revenue, lagged profit margin, and revenue growth from the second to the first lag.[22] I then construct the two series shown in the figure by setting each year's difference between the two lines equal to that year's regression coefficient on the C-corporation indicator and setting the weighted average of that year's data points equal to the year's sample average. To be concrete, the 2002 C-corporation data point indicates that the average C-corporation in 2002 invested \$0.21 per dollar of its lagged capital assets, net of controls.

The figure shows that the time series of C-corporation investment tracked the time series of S-corporation investment closely in the several years before 2003, suggesting that the two time series would have continued to track each other in the absence of the 2003 dividend tax cut. The two series in fact continued to track each other after 2003, suggesting that the tax cut had little or no effect on C-corporation investment.

Table 2 formalizes this visual evidence by reporting estimates of the following difference-in-differences (DD) regression that uses the same definitions, scaling, and controls underlying the figure:

$$(1) \quad INVESTMENT_{it} = \alpha_1 CCORP_{i,t-2} + \alpha_2 CCORP_{i,t-2} \times POST_t + \mathbf{X}_{i,t-2}\boldsymbol{\beta} + \mathbf{YEAR}_t$$

where $INVESTMENT_{it}$ denotes scaled investment for firm i in a year t between 1998 and 2008 and $CCORP_{i,t-2}$ denotes an indicator for whether firm i was a C-corporation in t-2, $POST_t$ denotes an indicator for year t being 2003 or later, $\mathbf{X}_{i,t-2}$ denotes a possibly empty vector of lagged firm controls, and $\mathbf{YEAR}_t$ denotes a vector of year fixed effects.[23] The coefficient α_2 represents the mean effect of the tax cut on annual C-corporation investment and is my statistic of interest. Standard errors clustered by firm are reported below each estimate.

Column 2 of Table 2 reports that when controlling for the full set of controls used in the graph, the 2003 dividend tax cut is estimated to have had an insignificantly negative effect on

[22] "Lagged" denotes "averaged over the previous two lags".

[23] See Appendix C.ii and Online Appendix Table 5 for similar results when scaling investment by (time-invariant) pre-2003 tangible capital rather than (time-varying) lagged tangible capital.

C-corporation investment: a change of −\$0.0002 per dollar of lagged tangible capital assets with a standard error of \$0.0042, relative to a pre-2003 mean of \$0.2428 and standard deviation of \$0.2514. The 2003 dividend tax cut reduced the top statutory dividend tax rate from 44.7% to 20.8% (see Section II.B), so these estimates imply an elasticity of investment with respect to one minus the top statutory dividend tax rate of 0.00 with a 95% confidence interval of −0.08 to 0.08.[24] The confidence interval in terms of standard deviations of firm-level investment is −0.03 to 0.03. Column 1 reports similar estimates when omitting the firm-level controls.

IV.B Robustness

I conduct several robustness checks. First, columns 4-5 of Table 2 replicate columns 1-2 when top-coding at the 99^{th} percentile. Second, Online Appendix Table 1 replicates Table 2 while allowing for differential pre-2003 trends.[25] Third, Online Appendix Table 2 replicates Table 2 when scaling investment by lagged revenue. Online Appendix Table 3 replicates Table 2, restricted to years 1998-2004 in order to omit years in which the controls, scaling variable, and C-corporation indicator use potentially endogenous post-2003 values. All report more negative point estimates than Table 2 with similar or smaller 95% confidence upper bounds. Online Appendix Tables 4 and 5 report results under fourteen additional variations to the sample frame, variable definition, or reweighting with continued null or marginally significantly negative results; see Online Appendix C for details.

Additionally, I replicate the analysis in the balanced panel of corporations; this sample comes at the obvious cost of omitting corporations that are young in the post-2003 era and requiring survival through 2008, but it permits regressions in which the only firm-level characteristic changing from year to year is investment. Column 3 of Table 2 reports results from estimating equation (1) in the balanced panel, with three changes relative to column 2: each corporation's C- vs. S-status is defined as of 1996, each corporation's annual investment value is scaled by its mean tangible capital assets over years 1996-1997, and I replace the lagged firm-level controls

[24] The elasticity is computed as the percent change in C-corporation investment divided by the percent change in one-minus-the-tax-rate: $(\hat{\alpha}_2/\overline{investment})/(.239/.553)$, where $\overline{investment}$ equals mean pre-2003 C-corporation investment and is reported in Table 2. The elasticity bounds are computed similarly, replacing $\hat{\alpha}_2$ in the above formula with $\hat{\alpha}_2$ plus or minus 1.96 times the standard error.

[25] For this table, I estimate: $INVESTMENT_{it} = \alpha_1 CCORP_{i,t-2} + \alpha_2 CCORP_{i,t-2} \times POST_t + \alpha_3 CCORP_{i,t-2} \times t + \alpha_4 CCORP_{i,t} \times POST_t \times t + \mathbf{X}_{i,t-2}\boldsymbol{\beta} + \mathbf{YEAR}_t$. I report the effect of the tax cut on investment averaged across the post-period, equal in this regression to $\alpha_2 + 2005.5\alpha_4$ since 2005.5 is the mid-point of the post-period.

with firm fixed effects. The resulting estimate has a wider confidence interval but is also essentially zero.

Finally, Figure 2b replicates Figure 2a for the related outcome of net investment, equal to the real annual dollar change in the corporation's stock of tangible capital assets as reported on the balance sheet. Arithmetically, net investment equals investment less tangible capital asset retirements and book depreciation. The figure shows no relative change in C-corporation net investment after the 2003 tax cut. Columns 7-9 of Table 2 repeat the specifications underlying columns 1-3 for the net investment outcome. The unbalanced panel point estimates are positive while the balanced panel point estimate is negative, and none is statistically significantly different from zero.[26] Online Appendix Tables 1-3 repeat these analyses using the same alternative specifications described above for investment, with similar results.

IV.C Employee Compensation

Figure 2c replicates Figure 2a for the outcome of employee compensation. Each firm's level of employee compensation is scaled by lagged revenue. The figure shows no relative change in C-corporation employee compensation after 2003.[27] Columns 10-12 of Table 2 repeat the specifications underlying columns 1-3 for the employee compensation outcome. Column 11 lists the results from equation (1) using the set of lagged controls. The point estimate is a change of □$0.0014 per dollar of lagged revenue with a standard error of $0.0020, relative to a pre-2003 mean of $0.1647 and standard deviation of $0.1415. This corresponds to an elasticity of □0.02 with 95% confidence interval of □0.07 to 0.04. The confidence interval in terms of firm-level standard deviations is □0.04 to 0.02. The balanced panel point estimate is positive but is similarly not statistically significantly different from zero. Online Appendix Tables 1-3 repeat these analyses using the same alternative specifications described above for investment and with similar results.

[26] Elasticity confidence intervals for net investment are larger than those for investment because the base level of net investment is close to zero, but standard-deviation confidence intervals are similar.

[27] Note that the downward trend in scaled employee compensation after 2005 is due in part to rising lagged revenue (the scaling variable). Trends are less stable when scaling by tangible capital assets; Online Appendix Table 2 shows that the results are robust to the choice of scaling variable.

IV.D Heterogeneity Analysis

Although the above results indicate no statistically significant impact of the divided tax cut on C-corporation investment, it is possible that this overall result obscures a particular spike in investment at, for example, large C-corporations relative to small C-corporations. To investigate this in a compact way, I estimate six triple-difference regressions, one for each of six prominent firm-level traits: firm size (lagged revenue), age, lagged revenue growth, lagged profitability, lagged cash (liquid assets as a fraction of total assets), and lagged leverage (debt as a fraction of total assets).

In order to avoid strong parametric assumptions such as whether these traits should enter the regressions linearly or in logs, I divide corporations along these traits by their ranks. To explain the general procedure, consider the example of firm size. I compute the 20^{th} and 80^{th} percentiles of firm size in the pooled C-corporation distribution, drop all corporations in the middle quintiles (between the 20^{th} and 80^{th} percentiles), and define an indicator for each observation equal to one if and only if the corporation's size lies in the top quintile (above the 80^{th} percentile). I then estimate the triple-difference analogue of equation (1):

$$
\begin{aligned}
(2) INVESTMENT_{it} = {} & \alpha_1 CCORP_{i,t-2} + \alpha_2 CCORP_{i,t-2} \times POST_t + \alpha_3 TRAIT_{i,t-2} \\
& + \alpha_4 CCORP_{i,t-2} \times TRAIT_{i,t-2} + \alpha_5 TRAIT_{i,t-2} \times POST_t \\
& + \alpha_6 CCORP_{i,t-2} \times TRAIT_{i,t-2} \times POST_t + \mathbf{X}_{i,t-2}\boldsymbol{\beta} + \mathbf{YEAR}_t
\end{aligned}
$$

where $TRAIT_{i,t-2}$ is the top-quintile indicator defined above, $\mathbf{X}_{i,t-2}$ denotes the vector of lagged firm characteristics used in column 2 of Table 2, and all other variables retain the definitions used above. The triple-difference coefficient α_6 represents the quantity of interest: the effect of the 2003 dividend tax cut on large C-corporations relative to small C-corporations and relative to S-corporations.

Columns 1-3 of Table 3 report the results for investment, net investment, and employee compensation. Each cell reports the point estimate of the triple-difference coefficient and its standard error from a separate regression in which the trait indicator is defined using the trait listed in the row heading. For example, the upper left cell indicates that large C-corporations increased investment by a statistically insignificant \$0.0105 per dollar of lagged tangible capital assets more than small C-corporations. All coefficients are small relative to the standard deviation of the outcome (displayed in Table 2 columns 2, 8, and 11, respectively) and are statistically insignificant even when not accounting for the large number of hypotheses being tested simultaneously, though with wider standard errors than in the main analysis.

IV.E Internal Validity

As mentioned in Section II.B, a threat to the internal validity of the empirical design is that temporary or small contemporaneous changes to other tax policies could in principle have increased S-corporation investment relative to C-corporation investment after 2003, masking positive effects of the dividend tax cut on C-corporation investment. Specifically, the 2003 tax reform accelerated the already-legislated reduction in the individual ordinary income tax rates from 38.6% to 35% (which benefited S-corporations relative to C-corporations) and it expanded temporary accelerated depreciation of investment expenditures (which would have benefited S-corporations relative to C-corporations if S-corporations used capital with moderately longer asset lives).[28]

I conduct three tests for quantitatively important bias; see Online Appendix D for full detail. First and most simply, I conduct placebo tests for an increase in S-corporation investment in 2001 and 2002, taking advantage of the fact that the reduction in individual ordinary income tax rates began in 2001 and accelerated depreciation began in 2002.[29] Online Appendix Table 6 columns 2-3 in fact show statistically insignificant reductions in S-corporation investment in those years, providing the simplest evidence suggesting little or no bias.[30] Second, column 4 shows that controlling flexibly for asset life differences across firms has almost no effect on the estimated effect of the dividend tax cut on C-corporation investment, explained by C- and S-corporations having nearly identical asset life mixes in this sample. Third and most completely, I follow Auerbach and Hassett (1992) and Cohen, Hansen, and Hassett (2002) in computing a structural firm-year-specific measure of the cost of capital that encompasses the effects of these contemporaneous non-dividend-tax changes. Columns 5-10 show that controlling for this all-in cost-of-capital measure again has almost no effect on the results, explained by S-corporations'

[28]It also reduced the top capital gains tax rate from 20% to 15%. The Auerbach-Hassett parameterization below addresses this minor potential confound.

[29]In standard models, both the 2001 reduction in individual income tax rates and the 2001-legislated future reductions lowered S-corporations' cost of capital immediately in 2001 (Auerbach 1989).

[30]This null result can also be seen visually in Figure 2a.

cost of capital falling by similarly modest amounts both before and after 2003. Thus none of these varied tests suggests a violation of internal validity.

IV.F External Validity

The above results are local to the sample and do not necessarily apply to publicly traded corporations and to corporations that were smaller or larger than the size range analyzed here. I therefore conduct two additional analyses to test for suggestive evidence of different out-of-sample results. First, recall that publicly traded corporations were excluded from the main sample because all publicly traded corporations are C-corporations and thus may have no reasonable S-corporation counterparts. I nevertheless repeat the regressions of Table 2 on a broadened sample that includes the 76% of publicly traded corporation observations matched to tax data that also satisfy this paper's firm size restrictions. Publicly traded corporations are large, so these additional observations loom large in these size-weighted regressions. Online Appendix Table 7 shows that this inclusion leaves the results of Table 2 nearly unchanged.[31]

In a second test, Figures 3a-c display heterogeneity in the main overall difference-in-differences effects on investment, net investment, and employee compensation, respectively, by firm size decile. The graph is constructed by computing the deciles of the pooled C-corporation distribution of lagged revenue, using them to divide all corporations into size deciles, estimating equation (1) within each decile using the full set of lagged controls, and plotting the resulting regression coefficients, 95% confidence intervals, and the best unweighted linear fit through the coefficients.[32] The figures reveal three facts: no within-decile estimate is statistically significantly different from zero, each graph's cross-decile variance in point estimates is small relative to the standard deviation, and there is no upward or downward trend in any graph's point estimates. Hence if one were to extrapolate from these results, one would predict that the 2003 dividend tax cut had no real effects on C-corporations outside of this paper's size range. However, further research is necessary to support out-of-sample conclusions.

[31] Online Appendix Table 4 column 5 shows a more negative result when including all public corporations regardless of size.

[32] Each graph's y-axis is centered at zero and has total height equal to one standard deviation of the outcome used in the regression (reported in columns 2, 8, and 11 of Table 2). Each confidence interval is Bonferroni-adjusted for the fact that each graph tests multiple (ten) hypotheses; each interval would be 30% tighter if unadjusted (i.e. the t-statistic threshold for statistical significance at the 5% level is 2.81 rather than 1.96).

IV.G Potential Reallocation of Investment

The central question of this paper is whether the 2003 dividend tax cut increased the level of corporate investment and employee compensation. This section has found no detectable increase in these levels. I now briefly investigate the separate question of whether there is evidence to suggest that the dividend tax cut improved the allocative efficiency of investment, even if it did not increase its overall level. This possibility is motivated by a recent theoretical contribution (Chetty and Saez 2010, building on Shleifer and Vishny 1986) that argues that a dividend tax cut can reduce wasteful investment at some C-corporations (as shareholders improve monitoring and force managers to reduce wasteful investment spending) while increasing productive investment at other C-corporations (via the traditional cost-of-capital channel described below in Section VI.A), consistent with Swedish evidence (Alstadsæter, Jacob, and Michaely 2014). Among other predictions, this agency theory predicts that the subgroups of C-corporations that increased total payouts to shareholders the least are also the ones that most increased equity issuance.[33] Columns 4-5 of Table 3 repeat the heterogeneity analysis of Section IV.D for the outcomes of payouts and equity issuance. The results are noisy but no negative relationship is apparent between equity issuance and payouts when comparing coefficients across the columns. Hence, I do not find evidence in support of investment rebalancing across C-corporation subgroups.[34]

V Confirmation of Salience and Relevance

The previous section documented robust zero effects of the 2003 dividend tax cut on C-corporation investment and employee compensation. Whenever an intervention is found to have had no significant impact, an important concern for interpretation is that perhaps the intervention was simply not salient or relevant. A lack of salience is perhaps unlikely given the prominence and size of the 2003 dividend tax cut; more plausible is that unknown tax provisions neutralized the actual applicability of the tax cut. The dividend tax is assessed on dividend income, so I now test for an immediate impact of the dividend tax cut on dividends and on total payouts to shareholders (dividends plus share buybacks).

[33] Reduced wasteful investment results in increased payouts; increased productive investment is funded by increased equity issuance.

[34] Public corporations have much more dispersed ownership and thus may be more prone to agency problems than this paper's private corporations.

I focus on total payouts in the text and report the very similar dividend results in the appendix in order to allow the main results to speak to the unresolved academic debate on the effects of the 2003 dividend tax cut on total payouts. Chetty and Saez (2005) showed that the tax cut increased the dividends of publicly traded corporations. However, subsequent papers have questioned the relevance of this behavior by arguing that planned buybacks may have simply been relabeled as dividends, leaving total payouts unchanged (Blouin, Raedy, and Shackelford 2007; Brown, Liang, and Weisbenner 2007; Edgerton 2013).

V.A Effect on Payouts

Figure 2d plots the time series of mean payouts to shareholders from C-corporations and S-corporations in the unbalanced panel. Each corporation's payouts value is scaled by its lagged revenue in the spirit of Lintner (1956), though results are robust to this choice. The figure is then constructed exactly as in Figures 3a-c except for two differences. Because C-corporations pay taxes on annual corporate income at the entity level while S-corporation shareholders are liable for them at the shareholder level, S-corporations often pay higher levels of dividends (approximately ten times larger on average than C-corporations) to help shareholders cover these tax liabilities. Thus I account for level differences in pre-2003 scaled payouts by dividing firm i's scaled payouts in year t by the mean level of payouts for i's corporate type (C or S) in the pre-2003 period, essentially transforming the comparison into percentage terms.[35] Second, I account for slightly differential pre-trends by de-trending each series; I show below that the main qualitative result does not depend on de-trending.[36] To be concrete, the 2002 C-corporation data point means that the average C-corporation in 2002 paid out 0.34 cents per dollar of its lagged revenue, net of controls.

The figure shows that C-corporation and S-corporation payouts tracked each other in the five years before 2003, suggesting that in the absence of a tax change the two series would have continued to track each other after 2003. Then immediately after the dividend tax cut, C-corporation payouts spiked by 20% relative to S-corporation payouts and relative to the 2002

[35] C and S-corporation payouts may be expected *a priori* to track each other in percentage terms because S-corporation income tax liabilities are approximately a flat percentage of income, and a corporate finanace tradition conceives of firms paying out a set fraction of after-tax earnings (Lintner).

[36] The C-corporation series has a slightly steeper downward trend, consistent with the well-documented twenty-year decline in dividend payments (Chetty and Saez 2005), combined with the fact that S-corporation dividends include payouts intended to cover tax payments that need not have been in secular decline.

difference, and remained elevated above S-corporation payouts through the end of the sample.

The first row of Table 4 columns 1-3 formalizes this visual evidence by replicating columns 1-3 of Table 2 for the scaled payouts outcome; Table 4 columns 4-6 report estimates for analogous regressions that allow for differential pre-2003 trends (see footnote 25). To test for a statistically significant increase immediately in 2003, each column also reports coefficients from a separate regression that is analogous to the main specification (1) except that it replaces the post-period indicators with indicators for each post-period year. That is, I estimate:

$$(3) \quad PAYOUTS_{it} = \alpha_1 CCORP_{i,t-2} + \mathbf{X}_{i,t-2}\boldsymbol{\beta} + \mathbf{YEAR}_t \quad + \mathbf{CCORP}_{i,t-2} \times \mathbf{YEAR}_{i,t}\boldsymbol{\delta}$$

where $\mathbf{CCORP}_{i,t-2} \times \mathbf{YEAR}_{it}$ is a vector of six indicators for each year $T \in \{2003, 2004, 2005, 2006, 2007, 2008\}$, each equal to one if and only if $t = T$ and corporation i was a C-corporation in year t-2.[37] The coefficient vector $\boldsymbol{\delta}$ contains the coefficients of interest: the effect of the tax cut on C-corporation payouts from the pre-period to each post-period year, net of the change in S-corporation payouts. For brevity, Table 4 reports only the estimates I refer to the main text; see Online Appendix Tables 8 and 9 for full results for the payouts outcome and the dividends-only outcome, respectively.

Across all specifications and samples, I find a large and statistically significant effect on C-corporation payouts. Column 2 reports that in the unbalanced panel with the full set of controls, I estimate that the dividend tax cut caused an immediate 21.5% increase in C-corporation payouts in 2003, with a t-statistic over 5, implying an elasticity of payouts with respect to one minus the top statutory dividend tax rate of 0.50 (reported in Online Appendix Table 8). The remaining columns report similar or larger estimates when considering all years, when de-trending, and in the balanced panel. Appendix Table 9 reports similar estimates for the outcome of dividends only. I conclude that the 2003 dividend tax cut was immediately salient and relevant to C-corporations.

V.B Compatibility of the Payouts and Investment Results

Standard models of dividend taxation abstract from cash and debt and assume that every dollar of increased payouts substitutes for a dollar of investment; the significant payouts effect may

[37] Columns 4-6 of Table 4 report estimates when an additional term—$CCORP_{i,t-2} \times t$—is included in the regression in order to allow for differential pre-trends.

therefore appear at first glance incompatible with the null investment result. However, the payouts effect was large in percentage terms but small in dollar terms relative to all other balance sheet flows and the investment effect's standard error, so the results are consistent with a small dollar-for-dollar reduction in investment, or with a mere reshuffling of corporate financial claims (e.g. a little less cash or a little more debt) and no reduction in investment.[38] The main relevance of the payouts result for this paper is that it validates the empirical design and salience.

VI Economic Interpretation and Policy Implications

The previous sections documented that the 2003 dividend tax cut was immediately salient and relevant but had no detectable impact on investment or employee compensation. This section considers reasons for the null investment result and asks under what circumstances would future dividend tax cuts be expected to have large and positive real effects. I begin by noting that a near-zero dividend tax elasticity of investment implies either a small dividend tax elasticity of firms' cost of capital, or a small cost-of-capital elasticity of investment, or both. I then detail whether and why either elasticity would likely have been small and the implications for the real effects of future alternative dividend tax reforms. The section ends with a discussion of the payouts response.

VI.A Economic Interpretation

The prediction that a dividend tax cut can substantially increase investment derives from models that are referred to as representing the "traditional view" (Harberger 1962, 1966; Feldstein 1970; Poterba and Summers 1985). Traditional-view models feature permanent dividend tax cuts and firms that finance marginal investments with newly issued equity.[39] A dividend tax cut reduces firms' cost of capital—the pre-tax rate of return required on marginal investments—because it reduces the taxes that must be paid when profits are distributed to shareholders; this induces

[38] The standard error on the investment effect (Table 2 column 2) implies a 95% upper bound reduction in investment of $\$87,557$ per C-corporation, while the payouts response (Table 4 column 2) implies a payouts increase of $\$59,922$ per C-corporation.

[39] Similar qualitative predictions obtain when firms finance investment with risky debt, since debt holders often become equity holders after bankruptcy reorganization. Dai, Shackelford, Zhang, and Chan (2013) formulate a related argument based on financing constraints with similar predictions.

firms to raise new investment funds and increase investment.[40]

I now derive a quantitative traditional-view prediction for the elasticity of investment with respect to one minus the dividend tax rate ("the dividend tax elasticity of investment"). I do so by multiplying a traditional-view parameterization of the elasticity of the cost of capital with respect to one minus the dividend tax rate ("the dividend tax elasticity of the cost of capital") by empirical estimates of the elasticity of investment with respect to the cost of capital ("the cost-of-capital elasticity of investment").

Desai and Goolsbee (2004) parameterize the workhorse traditional model (Poterba and Summers 1985) as follows. A C-corporation faces a cost of capital equal to:

$$\frac{r}{(1-\tau_{inc})\left[(1-\tau_{div})p+(1-\tau_{acg})(1-p)\right]}$$

where r is the economy's rate of time preference, τ_{inc} is the corporate income tax rate, τ_{div} is the tax rate applied to dividends and other payouts,[41] p is the share of earnings paid out rather than retained, and τ_{acg} is the effective tax rate on accrued capital gains.[42] The effective tax rate on accrued capital gains represents a combination of future payouts (taxed at τ_{div}), future realized capital gains (taxed at the statutory capital gains tax rate), and bequests (taxed at the estate tax rate). Based on their reading of the literature, Desai and Goolsbee assume a payouts share of earnings equal to 0.5 and an effective tax rate on accrued capital gains equal to one-quarter of the top statutory rate.[43] Combining these parameters with the decrease in the top statutory dividend tax rate from 44.7% to 20.8% yields an elasticity of the cost of capital with respect to one minus the payout tax rate of -0.411. Hassett and Hubbard (2002) summarize the recent empirical literature as reaching a consensus range for the cost-of-capital elasticity of investment of -0.5 to -1.0.[44]

[40] In terms Tobin's q (1969), q always equals 1 under the traditional view: the marginal dollar invested within the firm generates the same after-tax return as outside options, and investment must rise after a dividend tax cut in order to maintain $q = 1$.

[41] Most private C-corporation payouts are taxed at the dividend tax rate; see footnote 13.

[42] Poterba and Summers allow r to depend negatively on p so that the required rate of return is lower for corporations that pay dividends, e.g. because regular dividends may have signalling value. Dividend-paying private corporations tend to pay dividends frequently but in irregular amounts so I ignore this dependency here.

[43] The top statutory capital gains rate equals approximately the top dividend tax rate of 20.8%; it is quantitatively irrelevant whether one uses this value or a five-percentage-points-higher pre-2003 rate.

[44] The investment time horizon that these estimates are based on varies but a two-year-or-shorter horizon is common (e.g. Cummins, Hassett, and Hubbard 1994 and Caballero, Engel, and Haltiwanger 1995). Note that in the very long run after adjustment to a new steady-state capital stock, measured elasticities of invetment scaled by lagged tangible capital will be zero, but recall that this paper's results hold even when scaling investment by

Multiplying these elasticities together, one obtains a predicted range of the dividend tax elasticity of investment of 0.21 to 0.41. These predicted elasticities are 2.5 to 5 times as large as this paper's estimated 95% confidence upper bound (0.08). Hence, either the consensus range for the cost-of-capital elasticity of investment or the parameterized tax elasticity of the cost of capital, or both, failed to materialize.

There is no obvious reason to believe that corporations would have been unusually unresponsive to cost-of-capital changes in the 2003-2008 time period. Fixed costs to capital stock adjustment can temporarily mute investment responses to cost-of-capital changes (Caballero, Engel, and Haltiwanger 1995), but the 2003 dividend tax cut was passed at the end of a cyclical downturn in investment, so corporations are unlikely to have been particularly far from any positive investment thresholds. The short-run supply of capital assets may be inelastic (Goolsbee 1998), but this cannot explain the lack of a relative change (between C- and S-corporations) in investment expenditures (price times quantity, not just quantity).

There are at least three reasons that the true cost-of-capital elasticity of investment may be smaller than the Hassett-Hubbard consensus range. First, a large time series literature dating back to Eisner's (1969, 1970) responses to Hall and Jorgenson (1967) finds small cost-of-capital elasticities of investment, and the newer estimates that underlie the modern consensus range employ reasonable but difficult-to-verify structural assumptions (e.g. Caballero, Engel, and Haltiwanger 1995). Second, these newer estimates may reflect intertemporal substitution over short horizons (c.f. Caballero 1994 and Cummins, Hassett, and Hubbard 1994) or relaxation of financing constraints (e.g. Zwick and Mahon 2014) that would apply, for example, to temporary accelerated depreciation but likely not to a dividend tax cut.[45] Third, there may be publication bias toward statistically significant empirical results (Card and Krueger 1995) and such bias could have led to the publication of erroneously large estimates.

Because this paper is fundamentally concerned with the effects of the dividend tax cut, I proceed by taking as given the Hassett-Hubbard consensus range for the cost-of-capital elasticity of investment and turning to why the dividend tax elasticity of the cost of capital could have been small and the implications for the real effects of future alternative dividend tax cuts.

pre-2003 tangible capital (see Online Appendix C.ii and Online Appendix Table 5).

[45] In other words, cost-of-capital formulas could be misspecified in the sense that a unit reduction in the cost of capital due to temporary accelerated depreciation affects investment more than a unit reduction due to other tax changes.

VI.B Policy Implications of a Small Cost-of-Capital Change

Explanations for why the large 2003 dividend tax cut could have caused a small reduction in the cost of capital fall into either of two lines of reasoning: *traditional-view models are the wrong models*, or *traditional-view models are correct but the above parameterization is wrong.* Each line of reasoning clarifies the circumstances under which future dividend tax cuts would be expected to substantially increase investment

(i) Wrong Model. The leading alternative to the traditional view—called the "new view" (also called the "trapped equity view"; King 1977; Auerbach 1979; Bradford 1981)—can explain the null result on investment. New-view models feature firms with profits from pre-existing operations that are abundant enough to fund all profitable investment.[46] Because those pre-existing profits will inevitably be subject to dividend taxes (whether paid out immediately, or retained for investment and paid out in the future), a permanent dividend tax cut increases the post-tax return on investment by the same factor that it increases the opportunity cost of investment.[47] Thus the new view predicts that a permanent dividend tax cut affects firm value but does not affect the cost of capital and does not affect corporate investment.[48]

The policy implication of the new view is that dividend tax cuts typically do not reduce firms' cost of capital and thus are typically not useful tools for increasing investment. The exception would be if a dividend tax cut today signalled that dividend tax rates would fall even further in the future. This is possible, though the policy debate since 2003 has centered on keeping top dividend tax rates constant or increasing them.[49]

Of course even if the new view characterizes most firms, the traditional view may characterize

[46] Access to riskless debt generates similar results because interest payments are not subject to dividend taxes.

[47] To see this in a simple riskless two-period setup in which all profits in the second period are paid out as dividends, consider a new-view firm in a small-open economy that begins the first period with abundant past profits. It chooses how much to retain for investment (equal to past profits minus dividend payouts) by equating the return on marginal investment to the opportunity cost of that investment: $(1 - \tau_{DIV})(1 - \tau_{INC}) f'(PASTPROFITS - PAYOUTS) = (1 - \tau_{DIV}) r$, where τ_{DIV} is the dividend tax rate, τ_{INC} is the business income tax rate, $f'(\cdot)$ is a concave gross profit function, and r is the fixed return available on outside investments. A reduction in the dividend tax rate increases both sides of the equation by the same factor, inducing no change in optimal investment. In terms of Tobin's q (1969), q is less than one in the new view by an amount that varies proportionally with one minus the dividend tax rate.

[48] An anticipated dividend tax cut would induce an increase in investment before the tax cut, which Figure 2a suggests did not happen. See Poterba and Summers (1985), Ayers, Cloyd, and Robinson (2002), and Auerbach and Hassett (2007) for evidence of effects on firm value.

[49] In fact, the new view implies that reducing the dividend tax rate to a minimum conceivable rate could actually reduce investment because dividend tax rates could then only rise (Korinek and Stiglitz 2009).

other firms (Auerbach and Hassett 2002; Dhaliwal, Krull, Li, and Moser 2005), especially start-ups that may be particularly reliant on external equity financing. This paper's main analysis sample contains many start-ups, but most firms are not young: the median firm age studied here is 22 years, and only one of the one hundred most valuable publicly traded companies in the United States was founded since 2003.[50] The implication would be that the effect of dividend tax cuts on the U.S. capital stock may grow large as start-ups (traditional-view firms) gradually replace mature (new-view) firms over the very long run, but the near-term effect may be small because mature firms dominate U.S. production.

(ii) Wrong Parameterization. An alternative explanation of the null investment result is that the traditional view correctly models firms' investment decisions and that alternative dividend tax cuts can substantially reduce firms' cost of capital and thereby increase investment, even if the 2003 dividend tax cut in this sample did not. There are at least three distinct versions of this explanation. Considered together, the implication is that it may be difficult for policymakers to implement an alternative dividend tax cut that has substantially larger near-term effects.

First, the returns to new investment can take years to accrue in the form of higher profits that can be paid out to shareholders, and a dividend tax cut reduces the cost of capital for new investment only insofar as those payouts will be taxed at the new low rate. The 2003 dividend tax cut originally carried an expiration date of 2009 before being extended to 2013 and then being made permanent at nearly the full rate reduction (see Section II.B). It is therefore possible that a dividend tax cut with no initial default expiration date would have substantially reduced the cost of capital, even if the 2003 dividend tax cut did not.[51] In this case, modern democracies may be unable to guarantee the permanence necessary for a dividend tax cut to substantially reduce firms' cost of capital and thus increase investment. For example, the Tax Reform Act of 1986 reduced the top personal income tax rate to 28% in 1988 with no default expiration date, but the rate was subsequently raised to 39.6% in 1993. Looking globally, a majority of the G7 economies (Japan, Italy, the United States, and the United Kingdom) have substantially raised or lowered their top dividend tax rates since 2003.[52]

[50] Inference on start-ups is also challenging because the counterfactual (e.g. perhaps not founding the company in the first place) may be difficult to discern.

[51] That is, with respect to the traditional-view parameterization, perhaps the assumed change in the dividend tax rate was too large.

[52] Japan lowered its top rate from 43.6% to 10%; Italy raised its top rate from 12.5% to 20%; and the UK raised its top rate from 25% to 36% (OECD 2012). These figures include average sub-national top rates.

Second and despite stock price evidence that the tax cut was unanticipated (Auerbach and Hassett 2007), perhaps C-corporations had been expecting to enjoy low dividend taxes at some point in the future and thus had been investing at a permanently higher rate even before the tax cut.[53] Under this candidate explanation, a future dividend tax cut would increase investment only if its magnitude exceeded expectations or if it increased expectations of future cuts.

Third and although substantial corporate profits are subject to dividend taxation—about $300 billion in 2008 and similar in magnitude to total taxable capital gains—it is possible that most profits from private C-corporations escape dividend taxation and are instead taxed as capital gains in corporate acquisitions, as bequests subject to the estate tax, or not at all through various capital income exclusions.[54] This would imply that a future dividend tax cut could substantially increase near-term investment if the dividend tax base were substantially broadened, such as by lowering the dividend tax rate relative to the capital gains tax rate. However, there may be political impediments to doing so: U.S. policymakers have historically kept tax rates on taxable dividend income weakly greater than those on taxable capital gains, perhaps because most Americans hold small portions of their assets in stocks relative to housing (Campbell 2006) and may be more receptive to low tax rates on capital gains.[55]

VI.C The Payouts Response

This paper shows that the 2003 dividend tax cut increased total corporate payouts. This increase was small in dollar terms and may have been irrelevant for real outcomes (see Section V.B), but the effect is relevant for the study of corporate finance and I now discuss its potential drivers and outline directions for future research.

Traditional-view models do not explain the payouts response.[56] A new-view explanation

[53] That is, with respect to the parameterization, perhaps the assumed tax change was again too large.

[54] That is, with respect to the parameterization, perhaps the assuemd value of p was too large. Payouts can escape taxes if they are distributed in the form of bequested corporate equity below the estate tax threshold, if the corporate stock is held in tax-favored investment accounts or by untaxed entities like pension funds (though this is unlikely for most private corporations), or if private C-corporations preparing to distribute earnings manage to meet S-status requirements and switch tax status (though switching is relatively rare).

[55] All forms of capital income accrue very disproportionately to high-income Americans, but Republican lawmakers in 2003 explained that in contrast to cutting dividend taxes, "millions of Americans understand the power of cutting the tax on capital gains" making low capital gains tax rates "easier to sell" (http://www.nytimes.com/2003/05/08/us/as-bush-tax-plan-falters-conservatives-find-a-silver-lining.html).

[56] The exception is the traditional-view model of Poterba and Summers (1985) which allows for a dividend tax cut to immediately increase payouts (and investment) when payouts such as regular dividends carry signalling value. This is unlikely to be relevant for the private corporations studied here.

of the payouts response is that firms viewed the tax cut as temporary and thus engaged in intertemporal tax arbitrage by distributing payouts before tax rates rise (Korinek and Stiglitz 2009). The time series of payouts provide one reason to doubt this mechanism: Figure 2d and Table 4 suggest that payouts did not decline substantially after 2004 when President Bush won reelection and his party won control of both houses of Congress, which likely reduced expectations of a near-term rise in dividend taxes and hence incentives for immediate tax arbitrage (Korinek and Stiglitz).[57] However, this is not conclusive because expectations are not observable, because various concerns may govern the timing of tax-arbitraging payouts, and because of sampling and specification uncertainty. Chetty and Saez (2010) show that the new view can explain the payouts increase as a permanent dividend tax cut causing dispersed shareholders to incur the monitoring costs necessary to prevent wasteful investment by managers. This too is possible, though such agency problems would be expected to be least severe among private corporations, whose shareholders are typically concentrated.

Three under-emphasized mechanisms may instead explain the payouts response. First, the dividend tax cut raised the value of C-corporation equity (Auerbach and Hassett 2007), so owners of illiquid private C-corporation stock may have increased payouts in order to rebalance their portfolios or to re-optimize consumption among themselves and their heirs. Second, the dividend tax cut could have induced controlling owners to use payouts for their own liquidity, against the interests of minority shareholders and similar to tunneling (Johnson, La Porta, Lopez-de-Silanes, and Shleifer 2000). Third, high dividend tax rates incent owner-managers to avoid or evade taxes by paying out earnings as officer compensation or purchasing consumption goods through the corporation (Gordon and Slemrod 2000); the tax cut reduced the benefits of such behavior and may have caused C-corporations to increase formally-labeled payouts. These effects are observationally equivalent in the data available to me, but testing among these various mechanisms is an interesting area for future research.

[57] The 2004 Democratic presidential challenger John Kerry pledged to repeal the tax cut for high-income Americans and at one point was the front-runner according to betting markets (Auerbach and Hassett 2007).

VII Conclusion

The 2003 dividend tax cut was one of the largest changes ever to a U.S. capital income tax rate and was intended to increase corporate investment and labor utilization, beginning in the near term. This paper used a large sample of tax returns from large private corporations—some subject to dividend taxation (C-corporations) and others not (S-corporations)—to test whether these real goals were achieved in a firm size range that employs most U.S. private sector workers. I estimate that the tax cut caused no change in C-corporation investment or employee compensation relative to S-corporations. Evidence of an immediate increase in payouts confirms salience and relevance. External validity remains an open question, but neither broadening the sample to include publicly traded corporations nor heterogeneity by firm size suggests different out-of-sample results.

The findings contrast with evidence of large real effects of numerous other fiscal policies. Economically, the null result implies either that the dividend tax cut had little effect on firms' cost of capital, or that investment responded to cost-of-capital changes substantially less than recent evidence would have predicted, or both. The tax cut could have failed to reduce the cost of capital either because marginal investments are funded out of retained earnings and riskless debt as in "new view" models of dividend taxation (King 1977; Auerbach 1979; Bradford 1981) or because of particular features of the tax regime. Each potential mechanism suggests that it may be difficult for policymakers to implement an alternative dividend tax cut that has substantially larger near-term effects.

References

Alstadsæter, Annette, Martin Jacob, and Roni Michaely. 2014. "Do Dividend Taxes Affect Corporate Investment?" Mimeo.

Auerbach, Alan J. 1979. "Wealth Maximization and the Cost of Capital." *Quarterly Journal of Economics*, 93(3): 433-46.

Auerbach, Alan J., and Kevin A. Hassett. 1992. "Tax Policy and Business Fixed Investment in the United States." *Journal of Public Economics*, 47: 141-170.

Auerbach, Alan J., and Kevin A. Hassett. 2002. "On the Marginal Source of Investment Funds." *Journal of Public Economics*, 87: 205-232.

Auerbach, Alan J., and Kevin A. Hassett. 2007. "The 2003 Dividend Tax Cuts and the Value of the Firm: An Event Study." In *Taxing Corporate Income in the 21st Century*: 93-126.

Ayers, Benjamin C., C. Bryan Cloyd, and John R. Robinson. 2002. "The Effect of Shareholder-Level Dividend Taxes on Stock Prices: Evidence from the Revenue Reconciliation Act of 1993." *Accounting Review*, 77(4): 933-947.

Blouin, Jennifer, Jana S. Raedy, and Douglas A. Shackelford. 2011. "Dividends, Share Repurchases, and Tax Clienteles: Evidence from the 2003 Reductions in Shareholder Taxes." *Accounting Review*, 86(3): 887-914.

Bradford, David F. 1981. "The Incidence and Allocation Effects of a Tax on Corporate Distributions." *Journal of Public Economics*, 15(1): 1–22.

Brown, Jeffrey R., Nellie Liang, and Scott Weisbenner. 2007. "Executive Financial Incentives and Payout Policy: Firm Responses to the 2003 Dividend Tax Cut." *Journal of Finance*, 62(4): 1935-65.

Caballero, Ricardo J. 1994. "Comment on 'A Reconsideration of Investment Behavior Using Tax Reforms as Natural Experiments'." *Brookings Papers on Economic Activity*, 1994(2): 1-74.

Caballero, Ricardo J., Eduardo M. R. A. Engel, and John C. Haltiwanger. 1995. "Plant-Level Adjustment and Aggregate Investment Dynamics." *Brookings Papers on Economic Activity*, 2: 1-54.

Campbell, John. 2006. "Household Finance." *Journal of Finance*, 61(4): 1553-1604.

Card, David and Alan B. Krueger. 1995. "Time-Series Minimum-Wage Studies: A Meta-Analysis." *American Economic Review*, 85(2): 238-243.

Chetty, Raj. 2012. "Bounds on Elasticities with Optimization Frictions: A Synthesis of Micro and Macro Evidence on Labor Supply." *Econometrica*, 80(3): 969-1018.

Chetty, Raj, John N. Friedman, Nathaniel Hilger, Emmanuel Saez, Diane Whitmore Schanzenbach, and Danny Yagan. 2011. "How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project STAR." *Quarterly Journal of Economics*, 126(4): 1593-1660.

Chetty, Raj, and Emmanuel Saez. 2005. "Dividend Taxes and Corporate Behavior: Evidence from the 2003 Dividend Tax Cut." *Quarterly Journal of Economics*, 120(3): 791-833.

Chetty, Raj, and Emmanuel Saez. 2010. "Dividend and Corporate Taxation in an Agency Model of the Firm." *American Economic Journal: Economic Policy*, 2:1-31.

Cohen, Darrell S., Dorthe-Pernille Hansen, and Kevin A. Hassett. 2002. "The Effects of Temporary Partial Expensing on Investment Incentives in the United States." *National Tax Journal*, LV(3): 457-466.

Cummins, Jason G., Kevin A. Hassett, and R. Glenn Hubbard. 1994. "A Reconsideration of Investment Behavior Using Tax Reforms as Natural Experiments." *Brookings Papers on Economic Activity*, 1994(2): 1-74.

Dai, Zhonglan, Douglas A. Shackelford, Harold H. Zhang, and Chongyang Chen. 2013. "Does Financial Constraint Affect the Relation between Shareholder Taxes and the Cost of Equity Capital?" *Accounting Review*, 88(5): 1603-1627.

Desai, Mihir and Austan D. Goolsbee. 2004. "Investment, Overhang, and Tax Policy." *Brookings Papers on Economic Activity*, 2004(2): 285-338.

Dhaliwal, Dan, Linda Krull, Oliver Zhen Li, and William Moser. 2005. "Dividend Taxes and the Implied Cost of Equity Capital." *Journal of Accounting Research*, 43(5): 675-708.

DiNardo, John, Nicole Fortin, and Thomas Lemieux. 1996. "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach." *Econometrica*, 64(5): 1001-1044.

Edgerton, Jesse. 2013. "Four Facts about Dividend Payouts and the 2003 Tax Cut." *International Tax and Public Finance*, 20(5): 769-784.

Eisner, Robert. 1969. "Tax Policy and Investment Behavior: Comment." *American Economic Review*, 59(3): 379-388.

Eisner, Robert. 1970. "Tax Policy and Investment Behavior: Further Comment." *American Economic Review*, 60(4): 379-388.

Feldstein, Martin S. 1970. "Corporate Taxation and Dividend Behaviour." *Review of Economic Studies*, 37(1): 57-72.

Goolsbee, Austan. 1998. "Investment Tax Incentives, Prices, and the Supply of Capital Goods." *Quarterly Journal of Economics*, 113(1): 121-148.

Gordon, Roger and Joel Slemrod. 2000. "Are 'Real' Responses to Taxes Simply Income Shifting between Corporate and Personal Tax Bases?" In *Does Atlas Shrug: The Economic Consequences of Taxing the Rich*, ed. Joel Slemrod, 240–79. Cambridge, MA: Harvard Press.

Hall, Robert E. and Dale W. Jorgenson. 1967. "Tax Policy and Investment Behavior." *American Economic Review*, 57(3): 391-414.

Harberger, Arnold C. 1962. "The Incidence of the Corporation Income Tax." *Journal of Political Economy*, 70(3): 215-40.

Harberger, Arnold C. 1966. "Efficiency Effects of Taxes on Income from Capital." In *Effects of Corporation Income Tax*, ed. M. Krzyzaniak, 107-17. Detroit: Wayne State University Press.

Hassett, Kevin A. and R. Glenn Hubbard. 2002. "Tax Policy and Business Investment." In Alan J. Auerbach and Martin Feldstein, editors, *Handbook of Public Economics*, 1293–1343.

House, Christopher L. and Matthew D. Shapiro. 2008. "Temporary Investment Tax Incentives: Theory with Evidence from Bonus Depreciation." *American Economic Review*, 98(3): 737-768.

Hubbard, R. Glenn, N. Gregory Mankiw, John B. Taylor, and Kevin A. Hassett. 2012. "The Romney Program for Economic Recovery, Growth, and Jobs." http://www.docstoc.com/docs/125714335/Romney-Tax-Reform-White-Paper, last accessed December 19, 2012.

Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. 2006. "Household Expenditure and the Income Tax Rebates of 2001." *American Economic Review*, 96(5): 1589-1610.

Johnson, Simon H., Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer. 2000. "Tunnelling." *American Economic Review*, 90(2): 22-27.

King, Mervyn A. 1977. *Public Policy and the Corporation.* London: Chapman and Hall.

Kitchen, John and Matthew Knittel. 2011. "Business Use of Special Provisions for Accelerated Depreciation: Section 179 Expensing and Bonus Depreciation, 2002-2009." Mimeo.

Korinek, Anton, and Joseph E. Stiglitz. 2009. "Dividend Taxation and Intertemporal Tax Arbitrage." *Journal of Public Economics*, 93(1–2): 142-59.

Lintner, John. 1956. "Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes." *American Economic Review*, 46(2): 97-113.

Mian, Atif and Amir Sufi. 2012. "The Effects of Fiscal Stimulus: Evidence from the 2009 Cash for Clunkers Program" *Quarterly Journal of Economics*, 127(3): 1107-1142.

Poterba, James M. 2004. "Taxation and Corporate Payout Policy." *American Economic Review*, 94(2): 171-175.

Poterba, James M., and Lawrence H. Summers. 1983. "Dividend Taxes, Corporate Investment, and 'Q'." *Journal of Public Economics*, 22: 135-167.

Poterba, James M., and Lawrence H. Summers. 1985. "The Economic Effects of Dividend Taxation." In *Recent Advances in Corporate Finance*, ed. Edward I. Altman and Marti G. Subrahmanyam, 227–84. Homewood, IL: Dow Jones-Irwin Publishing.

Rivest, Louis-Paul. 1994. "Statistical Properties of Winsorized Means for Skewed Distributions." *Biometrika*, 81(2): 373-383.

Ryan, Paul. 2011, 2012. "The Path to Prosperity." http://budget.house.gov/uploadedfiles/pathtoprosperityfy2012.pdf and http://budget.house.gov/UploadedFiles/Pathtoprosperity2013.pdf last accessed December 19, 2012.

Shleifer, Andrei and Robert W. Vishny. "Large Shareholders and Corporate Control." *Journal of Political Economy*, 94(3): 461-488.

Skinner, Douglas J. 2008 "The Evolving Relation between Earnings, Dividends, and Stock Repurchases." *Journal of Financial Economics*, 87(3): 582-609.

Zwick, Eric and James Mahon. 2014. "Do Financial Frictions Amplify Fiscal Policy? Evidence from Business Investment Stimulus." Mimeo.

Online Appendix A: Variable Definitions in Terms of Tax Return Line Items

Section III.C listed economic definitions of all variables used in this paper. This appendix defines variables in terms of line items on tax forms.

Investment equals the sum of Form 4562 lines 8, 14, 19a-19i column (c), 20a-20c column (c), and 21. Form 4562 is filed alongside either Form 1120 or Form 1120S in order to claim investment depreciation deductions.

Tangible capital assets is reported on Form 1120 or Form 1120S Schedule L (balance sheet) column (d) line 10b.[58]

For C-corporations, employee compensation equals the sum of Form 1120 lines 13, 23, 24, and Schedule A line 3. For S-corporations, employee compensation equals Form 1120S lines 8, 17, 18, and Schedule A line 3.

For C-corporations, dividends equals the sum of Form 1120 Schedule M-2 lines 5a and 5c. For S-corporations, dividends equals Form 1120S Schedule K line 17c. These fields are sources of NIPA dividend aggregates.

Treasury stock is reported on Form 1120 Schedule L column (d) line 27 for C-corporations or on Form 1120S Schedule L column (d) line 26 for S-corporations.

Total paid in capital equals the sum of the equity capital stock and additional paid-in capital. Equity capital stock is reported on Form 1120 Schedule L column (d) line 22b for C-corporations and Form 1120S Schedule L column (d) line 22 for S-corporations. Additional paid-in capital is reported on Form 1120 and Form 1120S Schedule L line 23. Note that these equity valuations are book concepts.

Assets is reported on Form 1120 and Form 1120S Schedule L column (d) line 15 and includes financial assets (e.g. cash), inventories, tangible assets (e.g. investment purchases), and intangible assets (e.g. goodwill).

Revenue equals operating revenue and is reported on Form 1120 and Form 1120S line 1c; this excludes non-operating income such as gains from selling used capital goods.

Profit margin is the ratio of operating profit to revenue. For C-corporations, operating profit equals the sum of Form 1120 lines 1c, 12, 18, 19, 20, and 25, minus the sum of lines 2 and 27. For S-corporations, operating profit equals the sum of Form 1120S lines 1c, 7, 13, and 14, minus the sum of lines 2 and 20.

Cash equals the sum of column (d) lines 1, 4, 5, and 6 on Schedule L of Form 1120 or Form 1120S.

Debt equals the sum of column (d) lines 16-21 on Schedule L of Form 1120 or Form 1120S.

NAICS is reported on Form 1120 Schedule K line 2a and Form 1120S Schedule B line 2a.[59]

For C-corporations, incorporation date is reported on Form 1120 Box C. For S-corporations, incorporation date is reported on Form 1120S Box E.

[58] This excludes passive securities, inventories, depletable assets (e.g. oil deposits), land, and non-depreciable intangible assets (e.g. goodwill). Tangible capital assets is computed according to standard book accounting practices and equals the purchase price of all investment goods currently in use by the corporation, less accumulated book depreciation (as opposed to accumulated tax depreciation, which is affected by temporary accelerated depreciation).

[59] Corporations whose closest return to 2003 was filed before 1999 have 4-digit SIC classifications rather than 6-digit NAICS; I impute a 6-digit NAICS to each 4-digit SIC using the universe of corporations that filed tax returns in both 1998 and 1999 and use the first two digits of this imputed 6-digit NAICS for 2-digit NAICS.

Online Appendix B: Reweighting

Section III.E verbally described the application of the reweighting method of DiNardo, Fortin, and Lemieux (DFL 1996) to flexibly control for any time-varying industry-firm-size shocks. DFL-reweighting is similar to matching but is less parametric. As mentioned in that section, this reweighting does not drive the paper's main results. This appendix specifies the formula for the final weight on every observation used in every table and graph.

DFL reweighting is useful when comparing outcomes across groups g (e.g. corporation types and years) that differ along observable traits (e.g. the S-corporation sample has a larger share of big construction firms than the C-corporation sample). One wants to reweight the sample to hold "fixed" the distribution of observable traits across groups. To do so, one first divides all observations into bins b according to the traits (e.g. small construction firms, big construction firms, etc.). Then one inflates or deflates weights in every group-bin so that the within-group distribution of weights across bins equals the original cross-bin distribution of weights in some base group $\underline{g}$ (e.g. C-corporations in 2002). For example, if the 1998 S-corporation group has relatively more big construction firms than the 2002 C-corporation group, then the DFL procedure will down-weight big construction firms and up-weight small construction firms in the 1998 S-corporation group. In this way, DFL holds fixed the distribution of observable traits across groups.

This paper's main analyses (Figure 2, Table 2, and all appendix tables) compare outcomes across corporation types and time, so I DFL-reweight across 22 (= 2 corporation types × 11 years 1998-2008) groups g. I define the base group $\underline{g}$ to be the 2002 C-corporation group. I implement DFL-reweighting to control for any industry and firm-size differences; I therefore use each observation's two-digit industry and firm size (revenue averaged over the preceding two lags) to bin it into one of 190 (= 19 two-digit industries × 10 within-industry size deciles) bins b, where the bins are defined using the within-industry size deciles of 2002 C-corporations. Recall that in order to make the results dollar-weighted, each observation is initially weighted by its firm size (revenue averaged over the preceding two lags); let $size_j$ denote note this initial weight on firm-year observation j. Let b denote the bin and let g denote the group that observation j falls in. The final weight w on observation j equals:

$$w_{jbg} = size_j \left(\frac{\sum_{j' \in b \,\cap\, j' \in \underline{g}} size_{j'}}{\sum_{j' \in b \,\cap\, j' \in g} size_{j'}} \right) \left(\frac{\sum_{j' \in g} size_{j'}}{\sum_{j' \in \underline{g}} size_{j'}} \right) \tag{4}$$

where j' denotes firm-year observations generally.

To explain the formula, note that the two parenthetical factors each equal 1 for every observation j that is in the base group $\underline{g}$, so every observation in the base group has final weight equal to its size $size_j$. Every observation not in the base group has final weight that is smaller or greater than its size, depending on whether its bin is overrepresented or underrepresented in its group relative to the base group. The first parenthetical factor is the key factor: it ensures that within every group g, the ratio of the sum of final weights in an industry-size bin b (e.g. top-decile construction firms) to the sum of final weights in any other industry size bin b' (e.g. bottom-decile construction firms) is identical to the corresponding ratio in the base group $\underline{g}$. The second factor ensures that the sum of each group's final weight equals the sum of that group's original weight (i.e. $\sum_{j' \in g} w_{j'bg} = \sum_{j' \in g} size_{j'}$, $\forall g$); without this factor, the procedure would impose that the sum of each group's final weight equals the sum of the base group's original weight (i.e. $\sum_{j' \in g} w_{j'bg} = \sum_{j' \in \underline{g}} size_{j'}, \forall g$) regardless of the relative size of that group's observations in the raw data.

This paper's main heterogeneity analysis (Table 3) reports coefficients from triple-difference regressions between corporation types (C vs. S), time period (pre-2003 vs. post-2003), and firm trait rank (top quintile vs. bottom quintile). Hence for the regressions underlying this table, I construct weights using equation (4) in which groups g denote one of 44 type-year-trait groups (one for each corporation type, year 1998-2008, and top or bottom quintile), base group $\underline{g}$ denotes 2002 top-quintile C-corporations, and industry-size bins b are defined according to the within-industry size-decile distribution of top-trait-quintile C-corporations in 2002.[60]

Finally, this paper's detailed firm size heterogeneity analysis (Figure 3) reports coefficients from difference-in-differences regressions within each firm size decile. Thus for the regressions underlying these graphs, I construct weights using equation (4) in which groups g denote one of 220 type-year-decile groups (= 2 corporation types $\times$ 11 years 1998-2008 $\times$ 10 firm size deciles where the deciles are defined over the pooled C-corporation sample), base group $\underline{g}$ denotes 2002 fifth-decile C-corporations, and bins b denote one of 19 two-digit industries. Corporations are unweighted in Table 1, Figure 1, and Appendix Figure 1.

[60]The exceptions are the triple-difference regressions by firm size, which can be reweighted only across 19 industry bins since the top and bottom firm size quintiles of course do not overlap.

Online Appendix C: Additional Robustness Checks (results reported in Online Appendix Tables 4-5)

Online Appendix Tables 1-3 and 7 replicate the paper's primary results (reported in Table 2) across four alternative sample frames, variable definitions, and specifications: allowing for differential pre-2003 trends, scaling by lagged revenue instead of lagged tangible capital or vice versa, restricting the analysis to years 1998-2004 only, and including all public corporations that satisfy the paper's sample restrictions other than being privately held, respectively. Those robustness checks are detailed in the text in Section IV.B and IV.F and in the notes to those tables.

Online Appendix Tables 4-5 report results for additional robustness checks for the paper's main specification. This appendix supplements the details listed in those tables' notes.

(C.i) Online Appendix Table 4

The paper's main specification is equation (1) estimated in the main analysis sample with the paper's standard set of controls: year fixed effects, indicators for two-digit NAICS industry classification, and quartics in age, lagged revenue, lagged profit margin, and revenue growth from the second to the first lag. The estimated effect of the 2003 dividend tax cut on corporate investment in this main specification is reported in Table 2 column 2. For easy reference, Online Appendix Table 4 column 1 reprints Table 2 column 2.

Some corporations have foreign operations that yield special tax treatment. Online Appendix Table 4 column 2 repeats the main specification on the main analysis sample excluding corporations with an indication of foreign operations, defined as listing a positive foreign tax credit on its $t - 2$ tax return (Form 1120 Schedule J line 5a or Form 1120S Schedule K line 14l).

Some corporations, especially those managed directly by a small number of owners, may relabel corporate income as officer bonuses, changing the tax treatment of that income. Column 3 repeats the main specification on the main analysis sample excluding corporations with high officer compensation, defined as having a top-quintile value of officer compensation to revenue in year $t - 2$ following quintile definitions used in Section IV.D.

The Tax Reform Act of 1986 altered incentives to operate as an S-corporation relative to a C-corporation. Column 4 repeats the main specification on the main analysis sample excluding corporations with an incorporation date lying before 1986.

Because there are few extremely large S-corporations and all S-corporations are privately held, the main analysis sample excludes corporations with lagged assets greater than $1 billion (or lagged revenue greater than $1.5 billion) and corporations that were ever publicly held through the previous year. Column 5 repeats the main specification on an analysis sample that applies no lagged asset or lagged revenue upper bound and applies no privately-held restriction and thus includes all public corporations that could be matched to the SOI data and survive the remaining sample restrictions.

Dividend-paying C-corporations may be expected to respond differently from non-dividend-paying C-corporations. Column 6 repeats the main specification on the main analysis sample restricted to dividend-paying corporations, defined as those with a positive dividend in year $t - 2$.

Young corporations may be expected to respond differently from older corporations, for example if they are less able than older corporations to fund profitable investments using retained earnings (see Section VI for theoretical motivation). Column 7 repeats the main specification on the main analysis sample restricted to young corporations, defined as those with bottom-quintile age following quintile definitions used in Section IV.D.

Salinger and Summers (1983) argued that firm capital stocks estimated using recursions on investment flows are superior to annually reported capital stocks, and some influential subsequent papers (e.g. Cummins, Hassett, and Hubbard 1994; Desai and Goolsbee 2004) scale investment by such estimated capital stocks in their empirical analyses. Column 8 repeats the main specification on the main analysis sample except that the dependent variable (investment) is scaled by lagged Salinger-Summers-estimated capital stocks rather than lagged tangible capital. To compute Salinger-Summers-estimated capital stocks, I follow Cummins, Hassett, and Hubbard (documented in their Appendix B) and Desai and Goolsbee (documented in their Appendix A) by estimating the declining balance depreciation rate that is consistent with each firm's initial and terminal reported tangible capital assets under perpetual inventory accounting. Specifically for each firm i, I solve for δ_i in the non-linear equation:

$$K_{iT} = K_{i0}\left(1 - \delta_i\right)^{T} + I_{i1}\left(1 - \delta_i\right)^{T-1} + ... + I_{i,T-1}\left(1 - \delta_i\right) + I_{iT}$$

where K_{it} denotes tangible capital assets for firm i in year t and where year 0 corresponds to the first year and year T corresponds to the last year observed in the SOI data for firm i in years 1996-2008.[61] Then for each firm, I use the estimated $\hat{\delta}_i$, actual annual values of investment I_{it}, and actual initial and terminal values of tangible capital assets K_{i0} and K_{iT} to estimate intermediate tangible capital assets $\hat{K}_{i1}, ..., \hat{K}_{i,T-1}$. I then compute lagged tangible capital assets for each firm-year observation as in the main sample, using this estimated path of tangible capital assets $K_{i0}, \hat{K}_{i1}, ..., \hat{K}_{i,T-1}, K_{iT}$ rather than the actual reported path $K_{i0}, K_{i1}, ..., K_{i,T-1}, K_{iT}$ from the firm's annual balance sheet.

The DFL-reweighting used in the main specification controls non-parametrically for differences across C- and S-corporations along two dimensions known to predict investment behavior: firm size and industry. Propensity-score matching is a more-parametric and less-data-demanding weighting technique that permits flexible reweighting along many dimensions known to predict investment behavior. Column 9 repeats the main specification on the main analysis sample with propensity-score matching following Dehejia and Wahba (2002) instead of DFL reweighting.

Specifically, I implement a version of the caliper matching utilized in Dehejia and Wahba (2002) that permits easy comparison to this paper's DFL weights and maintains the dollar-weighting described in Online Appendix A. Specifically within each year, I estimate a probit regression of the C-corporation indicator on quartics in the six traits used in Table 3—lagged revenue, age, lagged revenue growth, lagged profitability, lagged cash as a fraction of lagged total assets, and lagged leverage—along with two-digit industry and year fixed effects and use the resulting coefficients to construct a propensity score for each firm equal to the estimated probability that the firm is in the treatment group (i.e. is a C-corporation) based on those controls. Let bin b_t denote the decile of the firm-year's propensity score, where each bin $b_t \in \{1, 2, ..., 10\}$ comprises firm-year observations with a propensity score in the range $[b/10 - .1, b/10]$. I then up-weight or down-weight S-corporations within each bin b_t so that the sum of final S-corporation weights in any bin b_t equals the sum of final C-corporation weights in that bin. For comparability to the final weights detailed in Online Appendix A, let group

[61] A solution to the non-linear equation was found for 99.9% of firms; the remaining 0.1% are excluded from the regression underlying column 8. For the few instances in which a single firm appears in multiple non-contiguous sets of years 1996-2008, I estimate a separate depreciation rate for each set.

marker g equal the C-corporation indicator, and let $\underline{g}$ denote C-corporations. Then the final propensity-score weight w on firm-year observation j equals:

$$w_{jb_tg} = size_j \quad \frac{\sum_{j' \in b_t \,\cap\, j' \in \underline{g}} size_{j'}}{\sum_{j' \in b_t \,\cap\, j' \in g} size_{j'}}\Bigg) \quad \frac{\sum_{j' \in g} size_{j'}}{\sum_{j' \in \underline{g}} size_{j'}}\Bigg)$$

Comparison of this equation to the equation (4) shows that these propensity-score weights differ from the DFL weights in that more traits than just size and industry are used to construct the bins b. To ensure overlap within each propensity-score bin, I set to missing any observations jb_tg with no corresponding observations $j'b_tg'$ for $j \neq j'$ and $g \neq g'$; this sets only nine observations to missing.

Finally and in a related vein, column 10 repeats the main specification on the main analysis sample with no reweighting (i.e. with weight $w_j = size_j, \forall j$). All specifications continue to yield statistically insignificant estimates of the effect of the 2003 dividend tax cut on C-corporation investment, except for one that yields a marginally significant negative estimate.

<u>(C.ii) Online Appendix Table 5</u>

The paper's main specification (equation 1) follows the investment literature by scaling annual investment by lagged (averaged over the previous two years) tangible capital assets. If C-corporations immediately adjusted to a higher steady state capital stock by making very large investments in 2003, investment divided by lagged tangible capital would not be elevated after 2004 when lagged capital would equal the new steady state—driving estimated effects of the dividend tax cut on investment toward zero by construction.[62] In practice, C-corporation investment was unusually low immediately after the tax cut (see Online Appendix Table 3) and adjustment to new steady state capital stocks appears to take years due to adjustment costs (e.g. Auerbach and Hassett 1992). I nevertheless address such concerns in Online Appendix Table 5 by repeating the paper's main specification when scaling investment by time-invariant pre-2003 measures of firm capital stocks.

Columns 2-6 repeat the paper's main specification on the main analysis sample, restricted to "firm-era" observations (i.e. either the pre-2003 era or the post-2003 era) on firms that are in my sample for a specific number of years around 2003 and computing investment as average annual investment divided by pre-2003 lagged tangible capital. Specifically, each column corresponds to a year radius $S \in \{1, 2, 3, 4, 5\}$. For a given radius S, I restrict the pre-2003 subset of the main analysis sample to firms with observations in all years $[2003 \,\square\, S, 2002]$ and restrict the 2003-and-beyond subset to firms with observations in all years $[2003, 2002 + S]$. I then estimate equation (1) at the firm-era level in which the scaled investment dependent variable for firm i in era $E \in \{0, 1\}$ (referring to the pre-2003 era or the 2003-and-beyond era, respectively) equals the firm's average annual investment in the era divided by the earliest lagged capital value in

[62] In steady state with no technology growth, investment divided by lagged capital equals the depreciation rate; taxes and other prices affect only the scale of the steady state.

the era in this subset:

$$INVESTMENT_{i0} = \frac{\frac{1}{S}\sum_{s=1}^{S} I_{i,2003-s}}{\frac{1}{2}\left(K_{i,2001-S} + K_{i,2002-S}\right)}$$
$$INVESTMENT_{i1} = \frac{\frac{1}{S}\sum_{s=1}^{S} I_{i,2003+s}}{\frac{1}{2}\left(K_{i,2001} + K_{i,2002}\right)}$$

where I_{it} and K_{it} denote the firm's investment and tangible capital assets in year t, respectively.[63]

For example, consider column 4, which uses radius $S = 3$. I restrict the pre-2003 subset of the main analysis sample to firms with observations in all years 2000-2002, and I restrict the 2003-and-beyond subset to firms with observations in all years 2003-2005. I then condense pre-2003 observations to one observation per firm with $INVESTMENT_{i0} = [(I_{i2000} + I_{i2001} + I_{i2002})/3]/[(K_{i1998} + K_{i1999})/2]$ and condense post-2003 observations to one observation per firm with $INVESTMENT_{i1} = [(I_{i2003} + I_{i2004} + I_{i2005})/3]/[(K_{i2001} + K_{i2002})/2]$. Because these specifications scale annual investment by pre-2003 measures of the firm's capital, any post-2003 increases in investment are not reflected in larger denominators. Relative to the paper's main result (reprinted in column 1), columns 2-6 report typically more negative and insignificant effects of the 2003 dividend tax cut on C-corporation investment.

[63] This differs from the firm-year observations in the main analysis sample in which $INVESTMENT_{it} = I_{it}/[(K_{i,t-1} + K_{i,t-2})/2]$. I do not require firms to be present in both eras. The regression controls for the standard set of lagged controls, defined over the same years as the earliest lagged capital.

Online Appendix D: Controlling for Contemporaneous Tax Changes (results reported in Online Appendix Table 6)

The paper's identifying assumption is that C- and S-corporation outcomes would have trended similarly in the absence of the 2003 dividend tax cut. As mentioned in Section II.B, accelerated depreciation allowances and small changes to other tax rates were enacted 2001-2003, and these contemporaneous tax reforms could in principle have affected C- and S-corporations differently enough to confound the paper's quasi-experiment. Specifically, the Economic Growth and Tax Relief Reconciliation Act of 2001 ("EGTRRA") instituted a gradual reduction in the top federal individual ordinary income tax rate from 39.6% to 39.1% in 2001, 38.6% in 2002-2003, 37.6% in 2004-2005, and 35% in 2006. The Job Creation and Worker Assistance Act of 2002 ("JCWAA") instituted accelerated depreciation for equipment and light structures investment, allowing firms to immediately deduct from their taxable income 30% of the purchase price of eligible investment placed into service between September 11, 2001 and September 11, 2004. The 2003 tax reform increased the accelerated depreciation allowance from 30% to 50% through December 31, 2004, accelerated from 2006 to 2003 the reduction in the top individual ordinary income tax rate to 35%, and reduced the top individual capital gains tax rate from 20% to 15%. The Economic Stimulus Act of 2008 reinstated for 2008 the temporary accelerated depreciation provisions of the 2003 tax reform.[64]

As detailed in Section IV.E, the pre-2003 enactments of EGTRRA and JCWAA provide reduced-form "placebo" tests for quantitatively important effects of both accelerated depreciation and the change in the top ordinary income tax rate. The results of these tests suggest no important violations of the identifying assumption. This online appendix details additional tests that control for the effects of these contemporaneous tax changes on investment incentives, the results of which are reported in Online Appendix Table 6 columns 4-10. The controls barely change the results. Econometrically, the reason is that the contemporaneous tax changes either (in the cases of accelerated depreciation and the capital gains tax rate) had similar effects on investment incentives for C-corporations and S-corporations or (in the case of the ordinary income tax rate) affected S-corporation incentives relative C-corporation incentives similarly before and after 2003.

(D.i) Reduced-Form Controls for the Effects of Accelerated Depreciation

The temporary accelerated depreciation provisions of JCWAA and the 2003 tax reform have been found to have had quantitatively large effects on investment (House and Shapiro 2008; Zwick and Mahon 2014)—likely due to some combination of inducing substantial intertemporal substitution (House and Shapiro) or substantially relaxing financing constraints (Zwick and Mahon) in ways that the relatively small changes in the ordinary income tax rate and the capital gains tax rate likely did not.[65] Hence, temporary accelerated depreciation could be a particularly quantitatively important confound. Below, I include structural controls for the

[64] EGTRRA was introduced into Congress in May 2001 and signed into law on June 7, 2001. JCWAA was introduced into Congress in October 2001 and signed into law on March 9, 2002. The Economic Stimulus Act of 2008 was introduced into Congress in January 2008 and signed into law on February 7, 2008.

[65] House and Shapiro argue that temporary accelerated depreciation induces especially large increases in investment because the intertemporal elasticity of investment approaches infinity for infinitely-lived capital goods. Zwick and Mahon argue that the observed effects of accelerated depreciation are inconsistent with intertemporal substitution alone but can be explained by a relaxation in financing constraints induced by accelerated depreciation.

effects of accelerated depreciation on investment incentives, but I first include reduced-form controls for these effects, with results reported in Online Appendix Table 6 column 4.

Corporations deduct the nominal cost of each investment purchase from their annual taxable income in a series of annual deductions over an "asset life" (also known as a recovery period) that depends on the durability of the investment property. For example, cars are assigned an asset life of five years while warehouses are assigned an asset life of thirty-nine years. New purchases of investment property with asset lives of twenty years or less were eligible for accelerated depreciation, and within that eligible category, property with longer asset lives received greater subsidies because of discounting (see e.g. House and Shapiro 2008). Thus to control flexibly for the effects of temporary accelerated depreciation across firms with different asset life mixes, I control for a very flexible function of each firm's asset life mix interacted with year fixed effects. Specifically, I use the itemized investment fields of Form 4562 to construct two variables for each firm-year observation: $ELIGIBLESHARE_{it}$ equal to the share of firm i's investment over years $t \square 2$ and $t \square 1$ with an asset life of twenty years or less, and $MEANELIGIBLELIFE_{it}$ equal to the mean asset life of firm i's investment over years $t \square 2$ and $t \square 1$ with asset life of twenty years or less.[66] I then construct a quartic in $ELIGIBLESHARE_{it}$ and a quartic in $MEANELIGIBLELIFE_{it}$ and fully interact those quartics together and also with year fixed effects, yielding a new 208-variable ($= 4 \times 4 \times 13$) vector of controls to include in the main investment specification. These interactions flexibly absorb time-varying nonlinear effects of these two variables on investment.

Column 4 displays the estimated effect of the 2003 dividend tax on C-corporation investment after controlling for this flexible vector of asset life controls. The addition of this vector of controls barely changes the point estimate and confidence interval. The econometric reasons are straightforward. First, the main specification is reweighted on two-digit NAICS industry codes within each year, so cross-industry differences were already flexibly controlled for. Second and sufficient on its own, the distribution of asset lives of C-corporations and S-corporations in my sample are nearly identical: the C-corporation means of $ELIGIBLESHARE_{it}$ and $MEANELIGIBLELIFE_{it}$ are 85% and 6.05 years, while the S-corporation means are 84% and 6.04 years, respectively, implying that accelerated depreciation subsidized investment similarly for the two types of corporations.

(D.ii) Structural Controls for the Combined Effect of Contemporaneous Tax Changes

(a) Primary specification and inputs. Whereas column 4 flexibly controls for the effect of accelerated depreciation only, columns 5-10 use the investment model of Auerbach and Hassett (1992, hereafter "AH") to control for the combined effect of contemporaneous changes in the top individual ordinary income tax rate, the capital gains tax rate, and accelerated depreciation on firms' (user) cost of capital: the required pre-tax rate of return on marginal investments.

An extensive literature in the 1980s (e.g. Summers 1981; Abel 1982; Feldstein 1982; Auerbach and Hines 1987; Auerbach 1989) extended the canonical model of investment, taxes, and the cost of capital (Hall and Jorgenson 1967) to encompass microfounded adjustment costs and

[66] More precisely, eligible property comprises property depreciable under the General Depreciation System (GDS) of the Modified Accelerated Cost Recovery System with an asset life of 20 years or less. Property required to be depreciated under the Alternative Depreciation System (ADS, typically property installed outside the United States) was not eligible regardless of asset life, so the small fraction of investment depreciated under ADS is not included in $ELIGIBLESHARE_{it}$ or $MEANELIGIBLELIFE_{it}$. I assume that the small fraction of investment expensed under Section 179 was eligible.

more features of the tax code. Linearizing from a firm's steady state and still ignoring certain features of the tax code such as dividend taxation and tax loss asymmetries, AH solved for a representative firm's optimal investment path as a direct function of tax rates (rather than an indirect function of the shadow price of capital "q") in discrete time, applied it to aggregate U.S. time series data, and reported estimates of adjustment costs and of cost-of-capital effects on investment that are useful in the present exercise. I now reprint AH's key investment equation for easy reference here, specify this paper's empirical implementation which closely follows AH and Cohen, Hansen, and Hassett (2002), and report the regression results.

AH consider a representative forward-looking value-maximizing U.S. firm that smooths its investment over time because of quadratic adjustment costs. AH derive the firm's optimal investment rule in which investment is high relative to lagged capital assets when the present year's or immediately upcoming years' costs of capital are low relative to its steady-state value and when the firm's capital stock is low relative to its steady-state value. Specifically, optimal investment approximately equals:

$$\text{(4)} \qquad \frac{I_t}{K_{t-1}} = \left[\left(\frac{1-\mu_1}{\alpha}\right) + n + \delta_t\right] - \left(\frac{1-\mu_1}{\alpha c_K^*}\right) E_t \sum_{s=t}^{\infty} w_{s-t} c_s \left(K_{t-1}\right)^{\alpha}$$

where I_t denotes investment in year t, K_{t-1} denotes the lagged tangible capital stock, α is a measure of the curvature of the production function, n is the trend growth-rate of total factor productivity, the terms w_{s-t} are geometrically declining weights that sum to one and are a function of adjustment cost parameters, μ_1 is a function of adjustment cost parameters, δ_t denotes the stochastic year-t depreciation rate with $E(\delta_t) = \bar{\delta}$, c_K^* denotes the steady-state value of the summation, and c_s denotes a measure of the cost of capital for investment purchases made in year s:

$$c_s = \frac{(1-\square_s)\left(\rho + \bar{\delta} + \frac{\square_{s+1}-\square_s}{1-\square_s}\right) g}{\left(1-\tau_s^{biz}\right)\theta_s}$$

where τ_s^{biz} denotes the business income tax rate in year s, g denotes the relative price of capital goods, θ_s denotes stochastic productivity in year s, ρ is the discount rate applied to the firm's risky cash flows, and $\square_s$ denotes the present-value of tax savings from depreciation deductions D_{z-s} per dollar of investment:

$$\text{(5)} \qquad \square_s = \sum_{z=s}^{\infty} (1+r)^{-(z-s)} \tau_z^{biz} D_{z-s}$$

where r equals the economy's risk-free rate of return.[67] AH focus on C-corporations, so τ_s^{biz} in AH's empirical implementation refers to the corporate income tax rate. As in AH, let "cost of capital" COC_t refer to the summation term, which is a weighted average of current and future capital costs for a given steady state: $COC_t = E_t \sum_{s=t}^{\infty} w_{s-t} c_s \left(K_{t-1}\right)^{\alpha}$. AH parameterize the future stream of costs of capital for each year t in 1953-1988, estimate the best-fit rate of geometric decline in weights w_{s-t} for aggregate equipment investment and separately for aggregate structures investment, and estimate equation (4) for equipment investment and separately for structures investment by regressing aggregate investment as a share of lagged capital on a constant and on the cost of capital.

[67] I omit the investment tax credit from equation (5) since that has long since been repealed.

In Online Appendix Table 6, I repeat the paper's main specification on the main analysis sample while controlling additionally for the two potential firm-year-level omitted variables illuminated by equation (4): the cost of capital encompassing all taxes except for dividend taxes (COC_{it}, which varies by firm-year according to the corporation type, tax regime, and firm's asset mix) and the depreciation rate (δ_{it}, which varies by firm-year according to the firm's asset mix). I compute each firm-year's cost of capital COC_{it} equal to the AH cost of capital COC_t, averaged over the firm's asset mix and under the firm type's business income tax rate:

$$COC_{it} = E_t \sum_{s=t}^{\infty} \sum_{a \in A} \lambda_{it}^{a} w_{s-t}^{a} c_{ccorp(i),s}^{a} \left(K_{i,t-1}\right)^{\alpha} \qquad (6)$$

where $ccorp(i)$ denotes whether firm i is a C-corporation and where a denotes an asset life category within the full set of asset life categories A.[68] I follow Cohen, Hansen, and Hassett (2002, hereafter "CHH") in computing asset-life-specific costs of capital, which I then weight by each firm's asset life mix. Specifically, the cost of purchasing a dollar of asset type a in year s equals:

$$c_{ccorp(i),s}^{a} = \frac{\left(1 - \square_{ccorp(i),s}^{a}\right)\left(\rho_{ccorp(i),t} + \delta^{a} + \frac{\square_{ccorp(i),s+1}^{a} - \square_{ccorp(i),s}^{a}}{1 - \square_{ccorp(i),s}^{a}}\right) g}{\left(1 - \tau_{ccorp(i),s}^{biz}\right)\theta_{is}}$$

where $\tau_{ccorp(i),s}^{biz}$ equals the expected (at time t) corporate income tax rate in year s if i is a C-corporation and equals the expected top individual ordinary income tax rate in year s if i is an S-corporation, $\square_{ccorp(i),s}^{a}$ equals $\square_{s}^{a}$ (equation 5) under the corresponding set of $\tau_{ccorp(i),z}^{biz}$ values and under the depreciation schedule for property of asset type a, δ^{a} equals the fixed economic depreciation rate of property in asset type a, and $\rho_{ccorp(i),t}$ (following CHH's extension of AH) is a weighted average of required rates of return on debt and equity:

$$\rho_{ccorp(i),t} = \bar{b}\left[\frac{(r+\pi)\left(1 - \tau_{ccorp(i),t}^{biz}\right)}{1 - \tau_{t}^{ord}} - \pi\right] + \left(1 - \bar{b}\right)\left[\frac{r^{e} + \pi\tau_{t}^{acg}}{1 - \tau_{t}^{acg}}\right]$$

where $\bar{b}$ is the average debt share of enterprise value, π denotes the inflation rate, τ_{t}^{ord} denotes the top individual ordinary income tax rate, r^{e} equals the rate of return on equity, and τ_{t}^{acg} equals the tax rate on accrued capital gains. The weight w_{s-t}^{a} refers to either an equipment weight or a structures weight, depending on asset type a. Asset life share λ_{it}^{a} equals the share of firm i's total investment across years $t-2$ and $t-1$ that was in asset category a.[69]

I follow CHH as closely as possible in parameterizing equation (6).[70] Specifically, I follow CHH in assuming $\bar{b} = .4$, $r = .025$, $\pi = .03$, and $r^{e} = .1$ and computing $\tau_{ccorp(i),s}^{biz}$ as equal to 1.3 times the statutory top business income tax rate (either corporate income tax rate or ordinary

[68] See Online Appendix D.i for a description of asset lives.

[69] In years with accelerated depreciation, I impute accelerated depreciation allowances pro-rata to eligible investment categories. Investment in these and other GDS investment categories constitute the vast majority of investment in my sample. Because five years is the modal GDS asset life, I assume that the small share of investment expensed under Section 179 or as listed property has an asset life of five years. Because ADS asset lives are typically a few years longer than the properties' corresponding GDS asset lives, I assume that the small share of investment in the ADS class life category has an asset life of nine years.

[70] I thank Kevin Hassett for kindly providing template code from CHH.

income tax rate) in order to account for inventory tax penalties.[71] I further follow CHH by using depreciation schedules for each asset type a assuming the half-year convention as reported in IRS Publication 946 and in assuming that the level-shifter $g\left(K_{i,t-1}\right)^{\alpha}/\theta_{is}$ equals unity.[72] I depart from CHH in areas necessary to conform to conventions used in the main text: I use state-plus-federal tax rates rather than just federal tax rates and (as in Desai and Goolsbee 2004) I assume that the tax rate on accrued capital gains equals one-quarter the statutory rate rather than the full statutory rate.

Finally and in addition to the firm-year-level asset life weights λ^a_{it} defined above, I extend CHH by constructing asset-life-specific depreciation rates, defining equipment investment and structures investment in terms of asset lives, and specifying a reasonable and minimally complicated path of tax rate expectations for this analysis. For each asset type a, I assign an economic depreciation rate δ^a equal to 47.3% of the best-fit non-accelerated-depreciation tax depreciation rate for that asset type.[73] I compute the firm-year-level economic depreciation rates δ_{it} equal to the average across economic depreciation rates δ^a, weighted by the firm's asset-life weights:

$$\delta_{it} = \sum_{a \in A} \lambda^a_{it} \delta^a$$

I use AH's main equipment weight estimates (declining at rate .583) for asset lives of less than ten years and AH's main structures weight (declining at rate .95, indicating higher adjustment costs) for asset lives of ten years or more.[74] I follow AH in assuming that terminal tax rates (year-2008 in this sample) are expected to last forever whereas temporary accelerated depreciation is not. Except for terminal tax rates, I assume that tax reforms come as a surprise when legislated and are expected to be enacted as legislated.[75]

This paper's cost-of-capital measure is similar in both levels and in estimated investment effects to earlier work. This paper's overall mean level of the cost of capital is 0.24, compared

[71] Reducing inflation and other rates to reflect the lower interest rate environment of the 2000s changes little, as does ignoring the inventory adjustment.

[72] This latter simplification is without loss of generality in the empirical analysis to the extent that productivity shocks are at the industry-year level and is shown below to have an evidently minor effect on both the levels and the observed investment effects of the cost of capital. This has the advantage of avoiding strong production function assumptions such as those adopted and rejected empirically by AH (p.154).

[73] House and Shapiro (2008, Appendix Table 2) assign economic geometric depreciation rates from Fraumeni (1997) to many types of investment. These economic depreciation rates are on average 47.3% of the corresponding best-fit geometric depreciation rate—reflecting the fact that economic depreciation is slower than tax depreciation in the United States even without accelerated depreciation (Auerbach 1989; House and Shapiro). In regressions of investment divided by lagged capital on the estimated economic depreciation rate of the firm's asset life mix δ_{it}, I obtain a very significant coefficient with magnitude close to one as would be expected near steady state, providing validation for these economic depreciation rates.

[74] That is, $w^a_{s-t} = (1/.583 - 1)(1/.583)^{-(s-t+1)}$ (see AH Table 2 column 1) for asset types with lives less than ten years and $w^a_{s-t} = (1/.95 - 1)(1/.95)^{-(s-t+1)}$ for other asset types (see AH Table 3 column 1). In the property classifications of Publication 946, light structures predominate beginning with asset lives of approximately 10 years (House and Shapiro).

[75] For example, the analysis makes the following assumptions. Firms before year 2001 expected pre-2001 tax rates to last forever. Firms in 2001 and 2002 expected the individual ordinary income tax rate to decline gradually through 2006 as legislated in 2001, were surprised when the 2003 tax reform accelerated that decline, and expected these declines to last forever. Firms were surprised when JCWAA introduced accelerated depreciation, when the 2003 tax reform expanded it, and when the Economic Stimulus Act of 2008 reinstated it. Firms in years 2002-2004 expected accelerated depreciation to be repealed beyond 2004 as legislated, and firms in year 2008 expected it to be repealed beyond 2008 as legislated.

to AH's mean of 0.21 (reported on AH p.153). At the asset-type-year level, this paper's cost of capital measures are similar to CHH's (reported in CHH Table 2). Finally, the estimated effect of the cost of capital on investment as a share of lagged capital in this paper (i.e. the coefficient on the cost of capital in the regression underlying Online Appendix Table 6 column 7, detailed below) equals □0.457, which is larger in magnitude and not significantly different from the average of AH's estimates of □0.253 for equipment investment and □0.045 for (quantitatively much less important) structures investment.

(b) Primary results. Online Appendix Table 6 column 7 repeats this paper's main investment specification on the main analysis sample with controls for the effects of contemporaneous non-dividend-tax changes specified above: the cost of capital COC_{it} and the depreciation rate δ_{it}. Relative to the paper's main results (reprinted in column 1), these controls have almost no effect on the point estimate and standard error. Column 8 controls for a quartic in the cost of capital rather than just linearly, with very similar results. Columns 5-6 show the same when controlling only for the depreciation rate or only for the cost of capital.[76]

Econometrically, the coefficient on the cost of capital in the regression underlying column 7 is substantial and negative (mentioned above), but the cost of capital is largely uncorrelated with the key interaction term (between the C-corporation indicator and the post-2003 indicator). Thus the omission of the cost of capital from the main specification induces little omitted variables bias. Economically, the cost of capital variable is conditionally uncorrelated with the interaction term because accelerated depreciation and the capital gains tax rate reduction had similar effects on the cost of capital for C- and S-corporations and because the reduction in the top individual ordinary income tax rate reduced S-corporations' cost of capital by similar magnitudes both before and after 2003. I explained in Online Appendix D.i why accelerated depreciation had similar effects across C- and S-corporations. The capital gains rate affects C- and S-corporations similarly via the discount rate $\rho_{ccorp(i),t}$. The legislated path of top ordinary income tax rate reductions immediately lowered S-corporations' cost of capital because economic depreciation is slower than tax depreciation, shown analytically in the very similar setup of Auerbach (1989 Section 3B).

(c) Extended cost-of-capital specification and results. This appendix's primary results implement a close analogue of AH's original empirical analysis in ignoring effects of contemporaneous tax changes on steady-state values of the cost of capital and the firm's capital stock when computing the cost of capital control COC_{it}. This omission need not be innocuous *a priori*: for example, temporarily low costs of capital under accelerated depreciation could in principle have induced firms to overshoot their target steady-state capital stocks by the end of 2004, implying unusually low investment in 2005 in spite of a lower value of COC_{it} for S-corporations relative to the pre-2003 period. Thus as an extra precaution though under strong assumptions, I extend AH's production function assumptions in order to account empirically for the expected path of capital stocks for C-corporations and S-corporations in an "extended" measure of the cost of capital $EXTENDEDCOC_{it}$ and control for this extended measure in the paper's main specification.

[76] When failing to control for the omitted variable δ_{it}, the coefficient on COC_{it} is mechanically biased toward one, since firms specializing in long-lived capital obviously have lower investment rates (see equation 4). Controlling for δ_{it} yields a negative coefficient on COC_{it} as expected. AH control for economic depreciation rates by running separate regressions for each asset type (equipment and structures).

AH's investment rule (equation 4) characterizes the law of motion of a representative firm's capital stock given adjustment costs, technology, and a path of tax rates: the firm increases its capital stock K_{t-1} on net if and only if the current capital stock and the current and near-term capital costs are sufficiently low (i.e. if and only if $E_t \sum_{s=t}^{\infty} w_{s-t} c_s \left(K_{t-1}\right)^{\alpha} < c_t^* \left(K_t^*\right)^{\alpha}$) and to a degree that depends on the adjustment costs (μ_1) and the curvature of the production function (α). I therefore consider a representative C-corporation and a representative S-corporation (each with a corporation-type-specific asset life mix, averaged over the corporation type's observations 1998-2008) that was at its steady state in years 1998-2000, before the tax reforms considered here. Assuming $\alpha = .5$ (the midpoint of the feasible range) and solving for the μ_1 consistent with $\alpha = .5$ and AH's cost of capital coefficients, I compute the estimated path of each representative corporation-type's capital stock $\hat{K}_{ccorp(i),t}$ and steady state capital stock $\hat{K}^*_{ccorp(i),t}$.[77] I then compute $EXTENDEDCOC_{it}$ as the main cost of capital COC_{it}, multiplied by a steady state factor indicating how much the current cost of capital and capital stock deviate from their steady-state values:

$$EXTENDEDCOC_{it} = COC_{it} \left(\frac{\left(\hat{K}_{ccorp(i),t-1}\right)^{\alpha}}{COC^*_{it} \left(\hat{K}^*_{ccorp(i),t}\right)^{\alpha}} \right)$$

This equals one in steady state and is less than one when the firm's cost of capital is sufficiently low relative to its steady value or when the firm's capital stock is sufficiently low relative to its steady state value.

Online Appendix Table 6 columns 9-10 report results for the estimated effect of the dividend tax cut on investment when controlling for $EXTENDEDCOC_{it}$, instead of controlling for COC_{it} as in columns 7-8. The results change very little. Econometrically, the reason is that $EXTENDEDCOC_{it}$ does not differ tremendously from COC_{it}. Economically, the reason is that AH's estimates (and a large but contentious literature) imply that adjustment costs are substantial, inducing substantial investment smoothing and thus no capital stock overshooting that could make $EXTENDEDCOC_{it}$ substantially different from COC_{it} over time.

As a final discussion, note that the placebo test results from Section IV.E (indicating that S-corporation investment did not rise significantly relative to C-corporation investment in years 2001-2002) may appear to conflict with the result from this cost-of-capital exercise that the cost of capital has a negative effect on investment and in which S-corporations' cost of capital fell relative to C-corporations' 2001-2002. In fact, the 95% confidence interval lower bounds on the placebo tests are consistent with sizeable cost-of-capital effects on investment given the relatively small change in the cost of capital for S-corporations relative to C-corporations 2001-2002. Alternatively and due to frictions not present in standard models like AH, it is possible that investment responds more to accelerated depreciation (e.g. due to financial frictions as in Zwick and Mahon 2014) than to small changes in business income tax rates (e.g. due to optimization frictions as in Chetty 2012). By this alternative account, the zero result in the

[77] AH report that the value of α implied by their empirical results exceeds the feasible range $[0, 1]$ and statistically rejects the value (zero) implied by constant returns to scale. For AH's production function $F(K) = AK^{1-\alpha}$ and steady-state Euler equation $F'(K_t^*) = \left[\left(\rho + \bar{\delta}\right)\left(1 - \square_t^*\right) g / \left(1 - \tau_t^{biz^*}\right)\right]$ where $(\cdot)_t^*$ denotes an exepcted steady state value as of year t, the firm's steady state targeted capital stock grows between year $t-1$ and t by factor $\left[\left(1 - \tau_t^{biz^*}\right) / \left(1 - \tau_{t-1}^{biz^*}\right)\right]^{1/\alpha} \left[\left(1 - \square^*_{t-1}\right) / \left(1 - \square^*_t\right)\right]^{1/\alpha}$. This year-on-year growth factor is all that is needed to compute the time path of each corporation type's capital stock in this exercise.

placebo test is unsurprising given that the 2001-2002 cost-of-capital reduction for S-corporations was driven by the relatively small change in S-corporations' business income tax rate rather than by accelerated depreciation. Distinguishing between these explanations is left to future work. Regardless, none of the tests reported in Online Appendix 6 suggests that the paper's main estimate of the effect of the dividend tax cut on investment is confounded by effects of contemporaneous tax changes.

References Used Only in the Online Appendix

Abel, Andrew B. 1982. "Dynamic Effects of Permanent and Temporary Tax Policies in a q Model of Investment." *Journal of Monetary Economics*, 9: 353-373.

Auerbach, Alan J. 1989. "Tax Reform and Adjustment Costs: The Impact of Investment on Market Value." *International Economic Review*, 30(4): 939-962.

Auerbach, Alan J., and James R. Hines. 1987. "Anticipated Tax Changes and the Timing of Investment." In *The Effects of Taxation on Capital Accumulation*, ed. Martin Feldstein, 163-200. Chicago: University of Chicago Press.

Feldstein, Martin. 1982. "Inflation, Tax Rules, and Investment: Some Econometric Evidence." In *Inflation, Tax Rules, and Capital Formation*, ed. Martin Feldstein, 243-286. Chicago: University of Chicago Press.

Salinger, Michael and Lawrence H. Summers. 1983. "Tax Reform and Corporate Investment: A Microeconometric Simulation Study." In *Behavioral Simulation Methods in Tax Policy Analysis*, ed. Martin Feldstein, 247-288. Chicago: University of Chicago Press.

Summers, Alan J. 1989. "Taxation and Corporate Investment: A q-Theory Approach." *Brookings Papers on Economic Activity*, 1981(1): 67-140.

TABLE 1
Unweighted Summary Statistics for the Main Analysis Sample

	C-corporations				S-corporations			
	Mean (1)	Median (2)	10th pctile (3)	90th pctile (4)	Mean (5)	Median (6)	10th pctile (7)	90th pctile (8)
Characteristics:								
Lagged revenue	69,214,032	26,410,150	3,310,941	164,050,464	76,377,272	42,265,004	5,385,821	169,980,800
Lagged assets	45,330,360	16,945,392	1,878,245	105,045,088	35,529,524	19,258,636	3,002,156	74,923,672
Lagged tangible capital assets	10,803,074	2,041,562	118,378	25,007,676	7,826,240	2,281,994	173,325	17,449,492
Lagged profit margin	-0.03	0.04	-0.09	0.17	0.08	0.06	-0.01	0.25
Lagged revenue growth	0.15	0.03	-0.21	0.45	0.10	0.03	-0.18	0.34
Lagged cash / lagged assets	0.18	0.10	0.01	0.47	0.17	0.10	0.01	0.46
Lagged leverage	0.68	0.66	0.21	1.00	0.63	0.66	0.16	0.97
Age	26	22	6	52	27	23	7	51
Outcomes:								
Investment	2,245,204	249,801	1,185	4,599,334	1,909,465	308,066	4,502	3,803,072
Investment / lagged tangible capital assets	1.608	0.153	0.001	0.767	1.112	0.166	0.005	0.791
Net investment	440,842	-19,591	-1,280,729	1,756,233	349,969	-21,495	-988,169	1,572,145
Net investment / lagged tangible capital assets	0.870	-0.034	-0.286	0.459	1.715	-0.030	-0.254	0.454
Employee compensation	12,410,943	3,843,863	324,038	28,162,686	11,265,016	5,013,783	452,621	24,175,638
Employee compensation / lagged revenue	0.291	0.160	0.028	0.492	0.188	0.131	0.027	0.376
Payouts	659,858	0	0	443,330	3,486,271	684,450	0	7,762,084
Payouts / lagged revenue	0.015	0.000	0.000	0.011	0.093	0.016	0.000	0.169
Dividends	531,236	0	0	250,080	3,410,537	658,080	0	7,599,040
Dividends / lagged revenue	0.012	0.000	0.000	0.006	0.092	0.016	0.000	0.166
Equity issued	2,754,047	0	0	572,898	276,790	0	0	389
Equity issued / lagged revenue	0.239	0.000	0.000	0.013	0.023	0.000	0.000	0.000
Number of firm-year observations	195,033				137,996			
Number of firms	43,988				32,113			

Notes: This table lists unweighted summary statistics for C-corporations (whose dividends are taxable) and S-corporations (whose dividends are not taxable) in this paper's main analysis sample: an unbalanced panel of annual corporate income tax returns, comprising all observations from the IRS Statistics of Income stratified random sample in years 1998-2008 in which the filing corporation had between $1 million and $1 billion in lagged assets and $500,000 and $1.5 billion in lagged revenue, was private through the previous year, and is not in the finance or utilities industries. "Lagged" denotes "averaged over the two preceding lags". Revenue equals operating revenue. Assets equals the book value of assets. Tangible capital assets, also called capital, equals the book value of tangible capital assets (e.g. excluding cash and patents). Profit margin equals one minus the ratio of operating costs to revenue. Cash equals liquid current assets. Leverage equals the book value of non-equity liabilities divided by assets (this is greater than one when accumulated losses exceed paid-in equity). Age equals the year of the return minus the year of incorporation. Investment equals the cost of all newly purchased tangible capital assets. Net investment equals the annual dollar change in tangible capital assets. Employee compensation equals the sum of all non-officer wages, salaries, benefits, and pension contributions. Dividends equals cash plus property distributions to shareholders. Payouts, also called total payouts to shareholders, equals dividends plus share buybacks (non-negative annual changes in treasury stock). Equity issued equals non-negative annual changes in paid-in capital. C- vs. S-status is defined as of the second lag; corporations can switch status if they meet the legal requirements but fewer than 4% ever switched in this sample. All monetary figures are in 2010 dollars.

TABLE 2

Effect of the 2003 Dividend Tax Cut on Investment, Net Investment, and Employee Compensation

A. Investment

Dependent variable:	Investment					
Dep. var. winsorized at:	95th percentile			99th percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged capital)		($ per 96-97 cap.)
	(1)	(2)	(3)	(4)	(5)	(6)
C-Corp × Post-2003	0.0008	-0.0002	-0.0063	-0.0104	-0.0118	-0.1884
	(0.0044)	(0.0042)	(0.0226)	(0.0068)	(0.0066)	(0.1483)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.07	0.53	0.01	0.05	0.55
Pre-2003 C-corp mean	0.2428	0.2428	0.2939	0.2828	0.2828	0.3682
Pre-2003 C-corp s.d.	0.2514	0.2514	0.3070	0.4181	0.4181	0.6478
Implied ε wrt $(1-\tau_{div})$	0.01	0.00	-0.05	-0.09	-0.10	-1.18
	[-0.08, 0.09]	[-0.08, 0.08]	[-0.4, 0.3]	[-0.19, 0.02]	[-0.2, 0.01]	[-3.01, 0.64]

B. Net Investment and Employee Compensation

Dependent variable:	Net Investment			Employee compensation		
Dep. var. winsorized at:	95th percentile			95th percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged revenue)		($ per 96-97 rev.)
	(7)	(8)	(9)	(10)	(11)	(12)
C-Corp × Post-2003	0.0048	0.0042	-0.0110	-0.0013	-0.0013	0.0083
	(0.0041)	(0.0039)	(0.0116)	(0.0025)	(0.0020)	(0.0062)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.04	0.20	0.00	0.37	0.87
Pre-2003 C-corp mean	0.0421	0.0421	0.0885	0.1647	0.1647	0.1727
Pre-2003 C-corp s.d.	0.2541	0.2541	0.2732	0.1415	0.1415	0.1450
Implied ε wrt $(1-\tau_{div})$	0.26	0.23	-0.29	-0.02	-0.02	0.11
	[-0.18, 0.71]	[-0.19, 0.66]	[-0.88, 0.3]	[-0.09, 0.05]	[-0.07, 0.04]	[-0.05, 0.27]

Notes: This table reports difference-in-differences estimates of the effect of the 2003 dividend tax cut on real outcomes. All columns display the coefficient on the interaction between a C-corporation indicator and an indicator for the year being 2003 or later, from a regression of the outcome on this interaction, a C-corporation indicator, year fixed effects and possibly additional controls. "Lagged controls" indicates that the regression includes two-digit NAICS industry fixed effects and quartics in age, lagged revenue, lagged profit margin, and revenue growth. "Firm FE's" indicates that the regression includes firm fixed effects. The unbalanced panel is this paper's main sample; see Table 1 for details. The balanced panel is constructed similarly, except the sample restrictions apply only to years 1996-1997 and observations are required in all years 1998-2008. Before the regression, each observation's outcome value is scaled by either the firm's tangible capital assets or its revenue (see Online Appendix Table 2 for alternative scalings) averaged over the two preceding lags in the unbalanced panel and over 1996-1997 in the balanced panel, and then winsorized (top-coded) at the level indicated. The regressions are dollar-weighted (each observation is weighted by its lagged or 1996-1997 revenue) and they flexibly control for any time-varying industry or firm-size shocks by non-parametrically reweighting the S-corporation sample within every year to match the distribution of C-corporations across 190 industry-firm-size bins as detailed in Section III.E. Elasticity equals the reported coefficient divided by the pre-2003 C-corporation outcome mean, divided by the percent change in one-minus-the-top-statutory-dividend-tax-rate (the top rate fell from 44.7% to 20.8%). Standard errors are clustered by firm. See Online Appendix Tables 1-7 for robustness checks.

TABLE 3
Effect Heterogeneity

Dependent variable:	Investment ($ per lagged capital)	Net investment ($ per lagged capital)	Employee comp. ($ per lagged revenue)	Payouts (%)	Equity issued ($ per lagged revenue)
	(1)	(2)	(3)	(4)	(5)
C-Corp × Post-2003					
× High lagged revenue	0.0103	-0.0017	-0.0042	-3.6	-0.0009
	(0.0127)	(0.0102)	(0.0054)	(8.9)	(0.0004)
× High age	0.0104	0.0003	-0.0055	40.0	0.0003
	(0.0168)	(0.0144)	(0.0060)	(10.4)	(0.0006)
× High lagged rev. growth	-0.0069	-0.0164	-0.0006	-8.5	-0.0005
	(0.0160)	(0.0165)	(0.0082)	(11.0)	(0.0008)
× High profit margin	-0.0265	0.0103	-0.0106	97.9	0.0020
	(0.0167)	(0.0140)	(0.0109)	(16.0)	(0.0012)
× High cash/assets	-0.0212	-0.0217	-0.0120	34.7	-0.0006
	(0.0155)	(0.0148)	(0.0115)	(12.2)	(0.0011)
× High leverage	-0.0030	0.0144	-0.0120	-59.6	-0.0002
	(0.0199)	(0.0190)	(0.0101)	(17.8)	(0.0012)

Notes: This table reports triple-difference estimates of the effect of the 2003 dividend tax cut. Each cell represents a separate regression and reports the coefficient on the triple interaction of a C-corporation indicator, an indicator for the year being 2003 or later, and an indicator for the firm being in the top quintile rather than the bottom quintile (the middle three quintiles are omitted) of the trait specified in the row heading (see Table 1 for definitions). The specifications underlying each cell of columns 1-3 are identical to the difference-in-differences spefications underlying Table 2 columns 2, 8, and 11, respectively, except that each regression fully interacts the top-quintile indicator with the C-corporation and post-2003 indicators. Similar to Table 2, regressions are dollar-weighted (each observation is weighted by its lagged revenue) and flexibly control for any time-varying industry and firm-size shocks by non-parametrically reweighting the S-corporation sample within every year and quintile to match the distribution of C-corporations across 190 industry-firm-size bins; the exception is regressions by the lagged-revenue trait which can be reweighted only across 19 industry bins since the top and bottom quintiles do not overlap in size. Column 4 makes the same modifications to the difference-in-difference regression underlying Table 4 column 2. Column 5 replicates this table's column 3 for the outcome of equity issued. Standard errors are clustered by firm.

TABLE 4
Effect of the 2003 Dividend Tax Cut on Total Payouts to Shareholders

Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	(%)	(%)	(%)	(%)	(%)	(%)
	(1)	(2)	(3)	(4)	(5)	(6)
C-Corp × Post-2003	23.4	27.6	78.1	39.4	45.5	53.6
	(3.6)	(3.3)	(8.0)	(7.3)	(6.5)	(15.1)
C-Corp × Year-2003	18.1	21.4	58.5	26.2	30.5	45.1
	(4.3)	(4.1)	(8.8)	(4.8)	(4.6)	(11.3)
C-Corp × Year-2004	32.1	35.6	66.6	43.3	48.3	48.8
	(5.2)	(5.0)	(11.4)	(6.5)	(6.2)	(10.4)
C-Corp × Year-2005	26.8	29.8	81.4	41.2	46.0	59.1
	(5.8)	(5.5)	(12.4)	(8.2)	(7.5)	(16.6)
Lagged controls		X			X	
Firm FE's			X			X
Pre-trend controls				X	X	X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
Pre-2003 C-corp mean ($ per lagged revenue)	0.0031	0.0031	0.0061	0.0031	0.0031	0.0061

Notes: This table reports difference-in-differences estimates of the effect of the 2003 dividend tax cut on total payouts to shareholders (dividends plus buybacks). The first row of columns 1-3 use the same specifications, controls, scaling, weights underlying Table 2 columns 10-12 except that before the winsorizing and in order to account for large level differences in pre-2003 payouts (see Table 1 and the y-axes of Figure 2d), each firm i's payouts in year *t* is divided by the mean level of payouts for *i*'s corporate type (C or S) in the pre-2003 period, essentially transforming the comparison into percentage terms. The second-through-fourth rows of each column report results from a separate regression in which the C-corp × post-2003 interaction term is replaced with a vector of interactions between the C-corporation indicator and post-2003 year indicators; see Online Appendix Table 8 for additional reported coefficients. Columns 4-6 modify the specifcations of columns 1-3 in order to allow for differential pre-2003 trends; see Section V.A for the specification and Online Appendix Table 1 for analogous specifications for real outcomes. Standard errors are clustered by firm. See Online Appendix 9 for results on the outcome of dividends only.

ONLINE APPENDIX TABLE 1
Effect of the 2003 Dividend Tax Cut on Investment, Net Investment, and Employee Compensation Allowing for Differential Pre-2003 Trends

A. Investment

Dependent variable:	Investment					
Dep. var. winsorized at:	95^{th} percentile			99^{th} percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged capital)		($ per 96-97 cap.)
	(1)	(2)	(3)	(4)	(5)	(6)
C-Corp × Post-2003	-0.0123	-0.0157	-0.0600	-0.0213	-0.0255	-0.2278
	(0.0124)	(0.0119)	(0.0278)	(0.0196)	(0.0191)	(0.0810)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.07	0.53	0.01	0.05	0.55
Pre-2003 C-corp mean	0.2428	0.2428	0.2939	0.2828	0.2828	0.3682
Pre-2003 C-corp s.d.	0.2514	0.2514	0.3070	0.4181	0.4181	0.6478
Implied ε wrt $(1-\tau_{div})$	-0.12	-0.15	-0.47	-0.17	-0.21	-1.43
	[-0.35, 0.11]	[-0.37, 0.07]	[-0.9, -0.04]	[-0.49, 0.14]	[-0.52, 0.1]	[-2.43, -0.43]

B. Net Investment and Employee Compensation

Dependent variable:	Net Investment			Employee compensation		
Dep. var. winsorized at:	95^{th} percentile			95^{th} percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged revenue)		($ per 96-97 rev.)
	(7)	(8)	(9)	(10)	(11)	(12)
C-Corp × Post-2003	0.0246	0.0217	-0.0463	0.0054	0.0044	0.0034
	(0.0124)	(0.0119)	(0.0348)	(0.0057)	(0.0047)	(0.0061)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.04	0.20	0.00	0.37	0.88
Pre-2003 C-corp mean	0.0421	0.0421	0.0885	0.1647	0.1647	0.1727
Pre-2003 C-corp s.d.	0.2541	0.2541	0.2732	0.1415	0.1415	0.1450
Implied ε wrt $(1-\tau_{div})$	1.35	1.20	-1.21	0.08	0.06	0.05
	[0.01, 2.69]	[-0.09, 2.48]	[-2.99, 0.58]	[-0.08, 0.23]	[-0.07, 0.19]	[-0.12, 0.21]

Notes: This table replicates Table 2 except that it allows for differential pre-2003 trends by including an interaction between the post-2003 indicator and a year variable, as well as interacting the C-corporation indicator and the C-Corp × Post-2003 interaction with the year variable. The reported coefficient equals the estimated effect of the tax cut averaged over the post-2003 period, equal to the coefficient on the C-Corp × Post-2003 interaction plus 2005.5 times the coefficient on the C-Corp × Post-2003 × year interaction, since 2005.5 is the mid-point of the post-2003 period. See the notes to Table 2 for additional details.

ONLINE APPENDIX TABLE 2
Effect of the 2003 Dividend Tax Cut on Investment, Net Investment, and Employee Compensation
Alternative Scalings

A. Investment

Dependent variable:	Investment					
Dep. var. winsorized at:	95^{th} percentile			99^{th} percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged revenue)		($ per 96-97 rev.)	($ per lagged revenue)		($ per 96-97 rev.)
	(1)	(2)	(3)	(4)	(5)	(6)
C-Corp × Post-2003	-0.0022	-0.0021	-0.0002	-0.0036	-0.0033	-0.0005
	(0.0005)	(0.0004)	(0.0012)	(0.0007)	(0.0007)	(0.0017)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.16	0.64	0.01	0.13	0.63
Pre-2003 C-corp mean	0.0243	0.0243	0.0319	0.0292	0.0292	0.0368
Pre-2003 C-corp s.d.	0.0322	0.0322	0.0409	0.0524	0.0524	0.0602
Implied ε wrt ($1-\tau_{div}$)	-0.21	-0.20	-0.01	-0.29	-0.26	-0.03
	[-0.3, -0.12]	[-0.28, -0.12]	[-0.19, 0.16]	[-0.4, -0.17]	[-0.37, -0.16]	[-0.24, 0.18]

B. Net Investment and Employee Compensation

Dependent variable:	Net Investment			Employee compensation		
Dep. var. winsorized at:	95^{th} percentile			95^{th} percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged revenue)		($ per 96-97 rev.)	($ per lagged capital)		($ per 96-97 cap.)
	(7)	(8)	(9)	(10)	(11)	(12)
C-Corp × Post-2003	-0.0001	-0.0001	-0.0007	-0.0103	-0.0538	0.1570
	(0.0003)	(0.0003)	(0.0012)	(0.1076)	(0.0949)	(0.1564)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.05	0.23	0.02	0.18	0.90
Pre-2003 C-corp mean	0.0025	0.0025	0.0074	3.1821	3.1821	2.8741
Pre-2003 C-corp s.d.	0.0262	0.0262	0.0280	3.9833	3.9833	3.6007
Implied ε wrt ($1-\tau_{div}$)	-0.13	-0.11	-0.23	-0.01	-0.04	0.13
	[-0.75, 0.49]	[-0.7, 0.48]	[-0.94, 0.49]	[-0.16, 0.15]	[-0.17, 0.1]	[-0.12, 0.37]

Notes: This table replicates Table 2 except that outcomes that were scaled by lagged tangible capital are now scaled by lagged revenue, and vice versa. See the notes to that table for details.

ONLINE APPENDIX TABLE 3
Effect of the 2003 Dividend Tax Cut on Investment, Net Investment, and Employee Compensation
Years 1998-2004 Only

A. Investment

Dependent variable:	Investment					
Dep. var. winsorized at:	95^{th} percentile			99^{th} percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged capital)		($ per 96-97 cap.)
	(1)	(2)	(3)	(4)	(5)	(6)
C-Corp × Post-2003	-0.0145	-0.0136	-0.0256	-0.0312	-0.0299	-0.1467
	(0.0053)	(0.0051)	(0.0235)	(0.0085)	(0.0083)	(0.1204)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	232,787	232,787	54,488	232,787	232,787	54,488
Clusters (firms)	63,048	63,048	7,784	63,048	63,048	7,784
R^2	0.01	0.07	0.52	0.01	0.05	0.50
Pre-2003 C-corp mean	0.2428	0.2428	0.2939	0.2828	0.2828	0.3682
Pre-2003 C-corp s.d.	0.2514	0.2514	0.3070	0.4181	0.4181	0.6478
Implied ε wrt $(1-\tau_{div})$	-0.14	-0.13	-0.20	-0.26	-0.24	-0.92
	[-0.24, -0.04]	[-0.22, -0.03]	[-0.56, 0.16]	[-0.39, -0.12]	[-0.38, -0.11]	[-2.4, 0.56]

B. Net Investment and Employee Compensation

Dependent variable:	Net Investment			Employee compensation		
Dep. var. winsorized at:	95^{th} percentile			95^{th} percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged revenue)		($ per 96-97 rev.)
	(7)	(8)	(9)	(10)	(11)	(12)
C-Corp × Post-2003	-0.0050	-0.0040	-0.0312	-0.0040	-0.0035	0.0041
	(0.0052)	(0.0050)	(0.0146)	(0.0024)	(0.0020)	(0.0052)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	232,787	232,787	54,488	232,787	232,787	54,488
Clusters (firms)	63,048	63,048	7,784	63,048	63,048	7,784
R^2	0.02	0.05	0.23	0.00	0.37	0.91
Pre-2003 C-corp mean	0.0421	0.0421	0.0885	0.1647	0.1647	0.1727
Pre-2003 C-corp s.d.	0.2541	0.2541	0.2732	0.1415	0.1415	0.1450
Implied ε wrt $(1-\tau_{div})$	-0.27	-0.22	-0.82	-0.06	-0.05	0.05
	[-0.83, 0.28]	[-0.76, 0.32]	[-1.56, -0.07]	[-0.12, 0.01]	[-0.1, 0.01]	[-0.08, 0.19]

Notes: This table replicates Table 2 except that it restricts the sample to years 1998-2004 only. See the notes to that table for details.

ONLINE APPENDIX TABLE 4
Effect of the 2003 Dividend Tax Cut on Investment
Alternative Sample Frames, Variable Definitions, and Reweighting

Variation:	No variation (reprinted from Table 2 column 2)	Excluding corporations with foreign operations	Excluding corporations with high officer compensation	Excluding corporations founded before 1986	No firm-size or publicly traded restriction	Restricting to dividend-paying corporations	Restricting to young corporations	Scaling investment by Salinger-Summers (1983) capital stocks	Propensity-score matching instead of DFL-reweighting	No reweighting
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C-Corp × Post-2003	-0.0002	-0.0005	0.0015	-0.0010	-0.0247	-0.0095	-0.0251	0.0010	0.0032	0.0019
	(0.0042)	(0.0043)	(0.0044)	(0.0110)	(0.0125)	(0.0059)	(0.0169)	(0.0044)	(0.0055)	(0.0040)
N (firm-years)	333,029	318,899	275,729	117,721	368,383	131,313	61,782	332,756	333,020	333,029
Clusters (firms)	73,188	72,253	64,081	32,359	78,480	34,832	23,008	73,098	73,187	73,188
R^2	0.07	0.07	0.06	0.08	0.10	0.07	0.09	0.06	0.06	0.06
Pre-2003 C-corp mean	0.2428	0.2441	0.2385	0.2655	0.2158	0.2277	0.2805	0.2552	0.2395	0.2379
Pre-2003 C-corp s.d.	0.2514	0.2562	0.2455	0.3097	0.1954	0.2133	0.3334	0.2655	0.2476	0.2430
Implied ε wrt $(1-\tau_{div})$	0.00	0.00	0.01	-0.01	-0.27	-0.10	-0.21	0.01	0.03	0.02
	[-0.08, 0.08]	[-0.08, 0.08]	[-0.07, 0.1]	[-0.2, 0.18]	[-0.53, 0]	[-0.21, 0.02]	[-0.48, 0.07]	[-0.07, 0.09]	[-0.07, 0.13]	[-0.06, 0.09]

Notes: This table reports results from repeating the paper's main investment regression specification (underlying Table 2 column 2) under alternative sample frames, variable definitions, and reweighting not already considered in Online Appendix Tables 1-3. For easy reference, column 1 reprints Table 2 column 2; see the notes to that table for specification details. The remaining columns replicate this main specification except for the variation specified in the column heading. Column 2 excludes corporations with an indication of foreign operations (defined as receiving a positive foreign tax credit in year *t-2*). Column 3 excludes corporations with high officer compensation (defined as having a top-quintile value of officer compensation divided by revenue in year *t-2*). Column 4 excludes corporations founded before the Tax Reform Act of 1986. Column 5 removes the paper's firm size upper bounds and privately held requirement and thus includes all publicly traded corporations that could be matched to the SOI data and survive the remaining sample restrictions. Column 6 restricts the sample to dividend-paying corporations (defined as those with a positive dividend in year *t-2*). Column 7 restricts the sample to young corporations (defined as those with bottom-quintile age). Column 8 scales investment by estimated capital stocks, computed using recursions on investment flows as in Salinger and Summers (1983); 0.1% of firms are excluded because estimated capital stocks could not be computed. Column 9 flexibly controls for differences between C- and S-corporations using propensity-score matching as in Dehejia and Wahba (2002) based on the full set of controls used in the main specification and the traits used in Table 3, rather than DFL-reweighting; nine observations are excluded from the regression because of insufficient overlap across treatment (C-corporations) and control (S-corporations) along within-year propensity score deciles. Column 10 implements no reweighting. See Online Appendix C.i for full detail.

ONLINE APPENDIX TABLE 5
Effect of the 2003 Dividend Tax Cut on Investment
Scaling Investment by Pre-2003 Measures of Tangible Capital Assets

Sample variation:	No variation (reprinted from Table 2 column 2) (1)	2002 versus 2003 (2)	2001-2002 versus 2003-2004 (3)	2000-2002 versus 2003-2005 (4)	1999-2002 versus 2003-2006 (5)	1998-2002 versus 2003-2007 (6)
C-Corp × Post-2003	-0.0002	-0.0223	-0.0193	0.0050	-0.0068	-0.0167
	(0.0042)	(0.0061)	(0.0070)	(0.0082)	(0.0098)	(0.0112)
N (firm-years)	333,029	77,994	67,163	49,798	31,066	27,355
Clusters (firms)	73,188	44,683	41,495	34,593	21,991	19,974
R^2	0.07	0.08	0.07	0.08	0.09	0.09
Pre-2003 C-corp mean	0.2428	0.2022	0.2176	0.2457	0.2670	0.2901
Pre-2003 C-corp s.d.	0.2514	0.2114	0.2050	0.2204	0.2367	0.2505
Implied ε wrt $(1-\tau_{div})$	0.00	-0.26	-0.21	0.05	-0.06	-0.13
	[-0.08, 0.08]	[-0.39, -0.12]	[-0.35, -0.06]	[-0.1, 0.2]	[-0.23, 0.11]	[-0.31, 0.04]

Notes: This table reports results from repeating the paper's main investment regression specification (underlying Table 2 column 2) when scaling investment by time-invariant pre-2003 measures of firm capital stocks. For easy reference, column 1 reprints Table 2 column 2; see the notes to that table for specification details. The remaining columns replicate this main specification except that they restrict to "firm-era" observations (i.e. either the pre-2003 era or the post-2003 era) on firms that are in my sample for a given number of years around 2003 (specified in the column heading) and compute investment as average annual investment divided by the earliest lagged tangible capital value available for that firm-era in the truncated time series. See Online Appendix C.ii for full detail. To convey the algorithm by example, consider the specification underlying column 4. I first restrict the pre-2003 subset of the main analysis sample to firms with observations in all years 2000-2002, and I restrict the post-2003 subset to firms with observations in all years 2003-2005. I then condense pre-2003 observations to one observation per firm with the dependent variable equal to $[(I_{i2000}+I_{i2001}+I_{i2002})/3]/[(K_{i1998}+K_{i1999})/2]$ where I_{it} and K_{it} denote firm i's investment and tangible capital in year t, respetively, and condense post-2003 observations to one observation per firm with the dependent variable equal to $[(I_{2003}+I_{2004}+I_{2005})/3]/[(K_{2001}+K_{2002})/2]$. Because these specifications scale annual investment by pre-2003 measures of the firm's capital, any post-2003 increases in investment are not reflected in larger denominators in the scaled investment dependent variable.

ONLINE APPENDIX TABLE 6
Effect of the 2003 Dividend Tax Cut on Investment
Placebo Tests and Controls for Contemporaneous Tax Changes

Type of test:	None (Table 2 column 2)	Pre-period placebos		Reduced-form cost-of-capital controls	Structural cost-of-capital controls					
Sample years:	All	1998-2001	1998-2000 and 2002	All	All	All	All	All	All	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C-Corp × Post-2003	-0.0002			-0.0021	-0.0013	-0.0018	-0.0011	-0.0012	-0.0013	-0.0019
	(0.0042)			(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0044)
C-Corp × Post-2001		0.0095	0.0130							
		(0.0067)	(0.0071)							
Additional covariates:										
Asset life mix (quartics) × Year FE's				X						
Depreciation rate					X		X	X	X	X
AH cost of capital (linear)						X	X			
AH cost of capital (quartic)								X		
Extended AH cost of capital (linear)									X	
Extended AH cost of capital (quartic)										X
N (firm-years)	333,029	115,679	117,484	333,029	333,029	333,029	333,029	333,029	333,029	333,029
Clusters (firms)	73,188	48,110	52,807	73,188	73,188	73,188	73,188	73,188	73,188	73,188
R^2	0.07	0.06	0.07	0.09	0.08	0.08	0.08	0.08	0.08	0.08
Pre-2003 C-corp mean	0.2428	0.2668	0.2668	0.2428	0.2428	0.2428	0.2428	0.2428	0.2428	0.2428
Pre-2003 C-corp s.d.	0.2514	0.2627	0.2627	0.2514	0.2514	0.2514	0.2514	0.2514	0.2514	0.2514
Implied ε wrt $(1-\tau_{div})$	0.00	0.08	0.11	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02
	[-0.08, 0.08]	[-0.03, 0.2]	[-0.01, 0.23]	[-0.1, 0.06]	[-0.09, 0.07]	[-0.1, 0.06]	[-0.09, 0.07]	[-0.09, 0.07]	[-0.09, 0.07]	[-0.1, 0.06]

Notes: This table reports results from varying the paper's main investment regression specification (underlying Table 2 column 2) in order to conduct placebo tests or to control for effects of contemporaneous tax changes on firms' user cost of capital. For easy reference, column 1 reprints Table 2 column 2; see the notes to that table for specification details. The remaining columns replicate this main specification except for the variation specified in the column heading and control rows. Columns 2-3 restrict the sample to the years specified in the column heading and replace the post-2003 indicator with a post-2001 indicator equal to 1 if the observation is from year 2001 or beyond. Column 4 includes controls for full interactions between a quartic in the share of the firm's lagged investment (summed over the previous two lags) made in accelerated-depreciation-eligible property (i.e. property with asset lives that were eligible for accelerated depreciation 2001-2004 and in 2008), a quartic in the mean asset life of the firm's lagged bonus-eligible investment, and year fixed effects. Column 5 includes controls for the mean depreciation rate of the firm's lagged investment, computed based on the firm's lagged investment asset life mix and the economic depreciation rates by asset life reported in House and Shapiro (2008). Columns 6-8 include controls for the firm-year's user cost of capital as a function of accelerated depreciation, the top corporate income tax rate, the top individual ordinary income tax rate, and the top individual capital gains tax rate as derived in Auerbach and Hassett (1992) and following closely the empirical implementations of Auerbach and Hassett and of Cohen, Hansen, and Hassett (2002). Columns 9-10 repeat columns 7-8 using a fuller and more structural cost-of-capital measure based on Auerbach and Hassett that accounts for tax-induced changes in firms' steady-state costs-of-capital and capital stocks. See Online Appendix D for full detail.

ONLINE APPENDIX TABLE 7
Effect of the 2003 Dividend Tax Cut on Investment, Net Investment, and Employee Compensation Including Publicly Traded Corporations

A. Investment

Dependent variable:	Investment					
Dep. var. winsorized at:	95th percentile			99th percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged capital)		($ per 96-97 cap.)
	(1)	(2)	(3)	(4)	(5)	(6)
C-Corp × Post-2003	-0.0023	-0.0019	-0.0768	-0.0081	-0.0072	-0.3312
	(0.0052)	(0.0050)	(0.0598)	(0.0076)	(0.0073)	(0.2953)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	356,758	356,758	93,621	356,758	356,758	93,621
Clusters (firms)	77,323	77,323	8,511	77,323	77,323	8,511
R^2	0.01	0.08	0.55	0.01	0.06	0.60
Pre-2003 C-corp mean	0.2479	0.2479	0.3033	0.2835	0.2835	0.3671
Pre-2003 C-corp s.d.	0.2532	0.2532	0.3227	0.3962	0.3962	0.6031
Implied ε wrt $(1-\tau_{div})$	-0.02	-0.02	-0.59	-0.07	-0.06	-2.09
	[-0.12, 0.07]	[-0.11, 0.07]	[-1.48, 0.31]	[-0.19, 0.06]	[-0.18, 0.06]	[-5.73, 1.56]

B. Net Investment and Employee Compensation

Dependent variable:	Net Investment			Employee compensation		
Dep. var. winsorized at:	95th percentile			95th percentile		
Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	($ per lagged capital)		($ per 96-97 cap.)	($ per lagged revenue)		($ per 96-97 rev.)
	(7)	(8)	(9)	(10)	(11)	(12)
C-Corp × Post-2003	0.0005	0.0011	-0.0277	-0.0013	-0.0013	0.0255
	(0.0048)	(0.0046)	(0.0119)	(0.0033)	(0.0026)	(0.0091)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	356,758	356,758	93,621	356,758	356,758	93,621
Clusters (firms)	77,323	77,323	8,511	77,323	77,323	8,511
R^2	0.02	0.06	0.22	0.01	0.38	0.86
Pre-2003 C-corp mean	0.0484	0.0484	0.0984	0.1883	0.1883	0.2050
Pre-2003 C-corp s.d.	0.2671	0.2671	0.2940	0.1551	0.1551	0.1689
Implied ε wrt $(1-\tau_{div})$	0.02	0.05	-0.65	-0.02	-0.02	0.29
	[-0.42, 0.47]	[-0.38, 0.48]	[-1.2, -0.1]	[-0.1, 0.06]	[-0.08, 0.05]	[0.09, 0.49]

Notes: This table replicates Table 2 except that it includes all publicly traded corporations that satisfy the sample restrictions (other than being privately held) listed in the notes to Table 1. See the notes to those tables for details. Publicly traded corporations were omitted from the main sample because all public corporations are C-corporations and thus may have no reasonable S-corporation counterparts.

ONLINE APPENDIX TABLE 8
Effect of the 2003 Dividend Tax Cut on Total Payouts to Shareholders (Full Results)

Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	(%)	(%)	(%)	(%)	(%)	(%)
	(1)	(2)	(3)	(4)	(5)	(6)
A. Overall Difference-in-Differences Estimates						
C-Corp × Post-2003	23.4	27.6	78.1	39.4	45.5	53.6
	(3.6)	(3.3)	(8.0)	(7.3)	(6.5)	(15.1)
Lagged controls		X			X	
Firm FE's			X			X
Pre-trend controls				X	X	X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.13	0.54	0.01	0.13	0.54
Pre-2003 C-corp mean ($ per lagged revenue)	0.0031	0.0031	0.0061	0.0031	0.0031	0.0061
Implied ε wrt $(1-\tau_{div})$	0.54	0.64	1.81	0.91	1.05	1.24
	[0.38, 0.7]	[0.49, 0.79]	[1.44, 2.17]	[0.58, 1.24]	[0.76, 1.35]	[0.55, 1.92]
B. Year-by-Year Difference-in-Differences Estimates						
C-Corp × Year-2003	18.1	21.4	58.5	26.2	30.5	45.1
	(4.3)	(4.1)	(8.8)	(4.8)	(4.6)	(11.3)
C-Corp × Year-2004	32.1	35.6	66.6	43.3	48.3	48.8
	(5.2)	(5.0)	(11.4)	(6.5)	(6.2)	(10.4)
C-Corp × Year-2005	26.8	29.8	81.4	41.2	46.0	59.1
	(5.8)	(5.5)	(12.4)	(8.2)	(7.5)	(16.6)
C-Corp × Year-2006	16.5	21.5	78.5	34.0	41.2	51.8
	(5.8)	(5.5)	(13.1)	(9.3)	(8.4)	(20.7)
C-Corp × Year-2007	15.4	21.3	78.1	36.0	44.4	46.9
	(5.7)	(5.4)	(12.7)	(10.3)	(9.2)	(23.0)
C-Corp × Year-2008	30.1	34.6	105.3	53.9	61.3	69.7
	(6.2)	(5.8)	(13.9)	(11.7)	(10.4)	(24.1)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.13	0.54	0.01	0.13	0.54
Implied 2003 ε wrt $(1-\tau_{div})$	0.42	0.49	1.35	0.61	0.71	1.04
	[0.22, 0.61]	[0.31, 0.68]	[0.95, 1.75]	[0.39, 0.83]	[0.49, 0.92]	[0.53, 1.56]

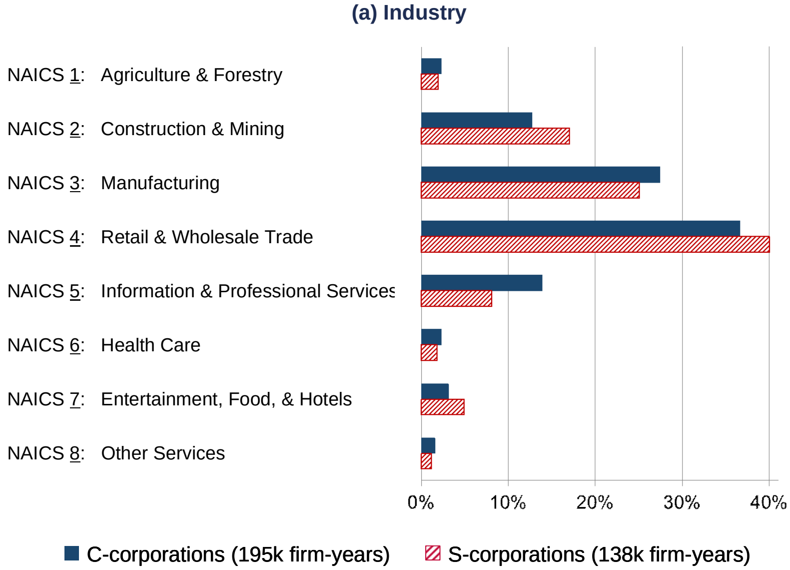
Notes - This table reports full results from the regressions underlying Table 4. See the notes to that table for details.

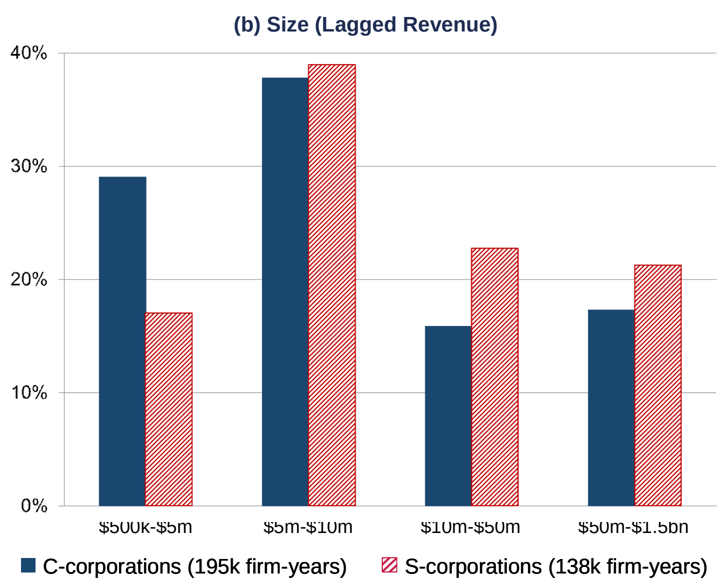
ONLINE APPENDIX TABLE 9
Effect of the 2003 Dividend Tax Cut on Dividend Payouts to Shareholders

Panel:	Unbalanced		Balanced	Unbalanced		Balanced
	(%)	(%)	(%)	(%)	(%)	(%)
	(1)	(2)	(3)	(4)	(5)	(6)
A. Overall Difference-in-Differences Estimates						
C-Corp × Post-2003	28.5	32.7	76.2	45.5	52.0	51.7
	(3.9)	(3.6)	(7.8)	(7.7)	(6.9)	(15.2)
Lagged controls		X			X	
Firm FE's			X			X
Pre-trend controls				X	X	X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.13	0.57	0.01	0.13	0.57
Pre-2003 C-corp mean ($ per lagged revenue)	0.0022	0.0022	0.0048	0.0022	0.0022	0.0048
Implied ε wrt $(1-\tau_{div})$	0.66	0.76	1.76	1.05	1.20	1.20
	[0.48, 0.83]	[0.59, 0.92]	[1.41, 2.12]	[0.7, 1.4]	[0.89, 1.52]	[0.51, 1.89]
B. Year-by-Year Difference-in-Differences Estimates						
C-Corp × Year-2003	20.0	23.3	63.2	28.6	33.0	49.9
	(4.4)	(4.3)	(9.2)	(5.0)	(4.8)	(11.4)
C-Corp × Year-2004	35.3	38.9	66.4	47.2	52.4	48.5
	(5.4)	(5.2)	(11.3)	(6.8)	(6.5)	(10.6)
C-Corp × Year-2005	31.5	34.5	70.6	46.8	51.7	48.3
	(6.1)	(5.8)	(11.5)	(8.6)	(8.0)	(16.3)
C-Corp × Year-2006	26.3	31.5	77.3	44.8	52.4	50.5
	(6.3)	(6.0)	(12.4)	(9.9)	(9.1)	(20.2)
C-Corp × Year-2007	22.3	28.4	78.3	44.1	53.0	47.1
	(6.1)	(5.8)	(12.4)	(10.9)	(9.8)	(23.0)
C-Corp × Year-2008	35.5	40.3	101.6	60.7	68.7	65.9
	(6.7)	(6.3)	(14.0)	(12.4)	(11.1)	(24.5)
Lagged controls		X			X	
Firm FE's			X			X
N (firm-years)	333,029	333,029	85,624	333,029	333,029	85,624
Clusters (firms)	73,188	73,188	7,784	73,188	73,188	7,784
R^2	0.01	0.13	0.57	0.01	0.13	0.57
Implied 2003 ε wrt $(1-\tau_{div})$	0.46	0.54	1.46	0.66	0.76	1.15
	[0.26, 0.66]	[0.35, 0.73]	[1.05, 1.88]	[0.44, 0.89]	[0.55, 0.98]	[0.64, 1.67]

Notes - This table replicates Online Appendix Table 5 except that it replaces the dependent variable outcome of total payouts with the outcome of dividends only.

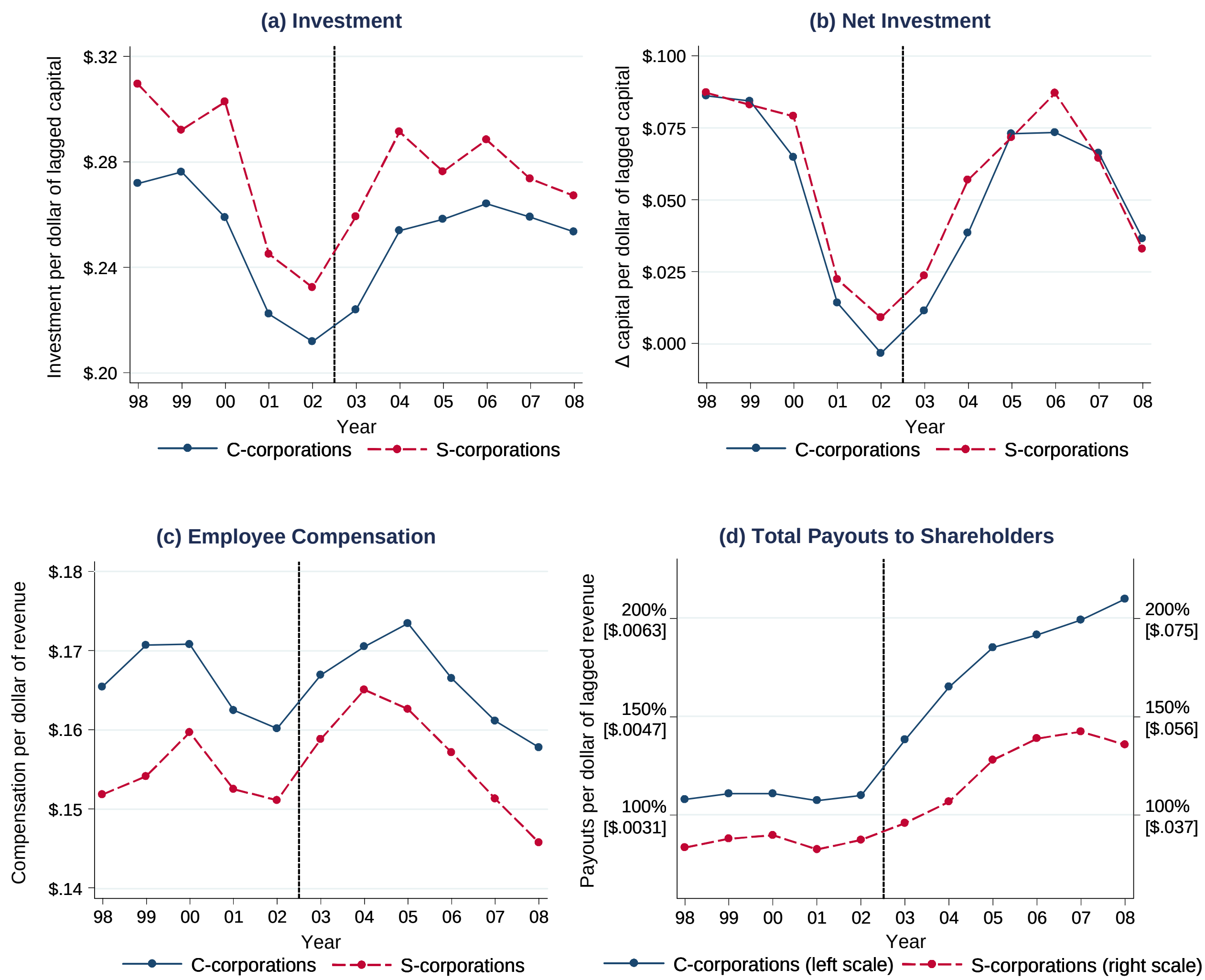
FIGURE 1
Industry and Size Distribution of the Main Analysis Sample





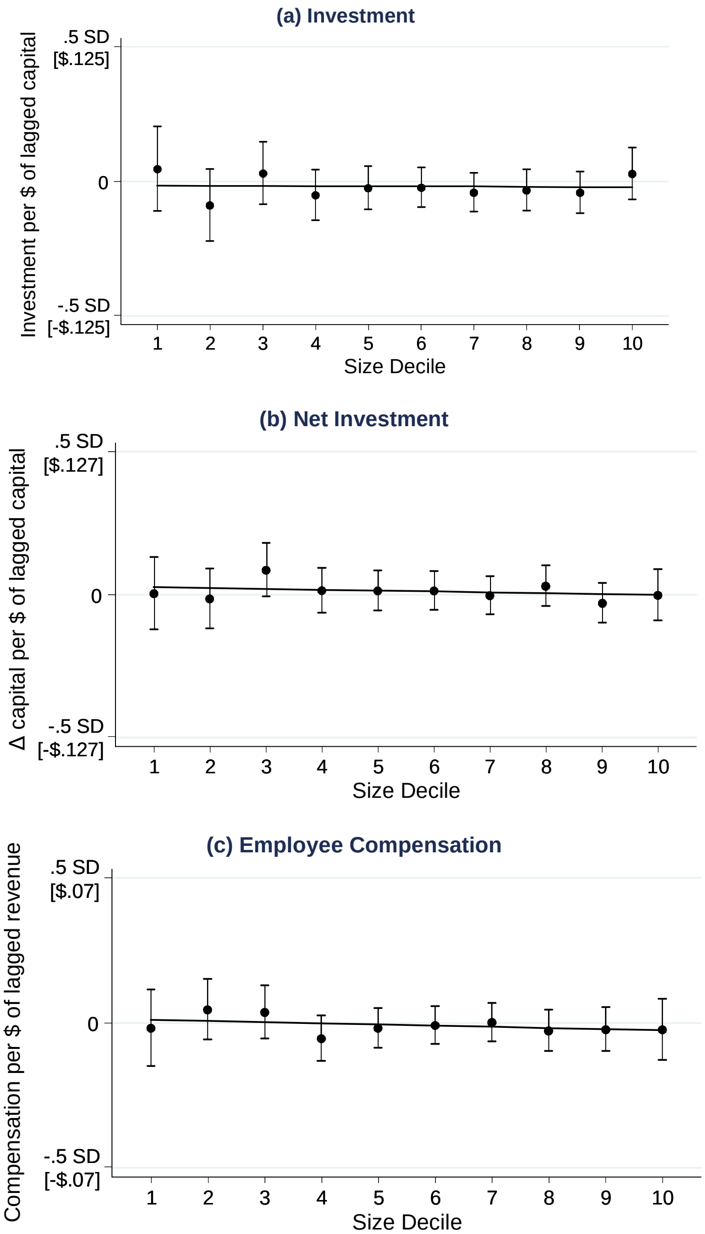
Notes: This figure plots the industry and size mix of the C-corporations (whose dividends are taxable) and S-corporations (whose dividends are not taxable) in this paper's main analysis sample. Each graph's bars sum to 100% within corporation type. "Lagged revenue" denotes operating revenue averaged over the preceding two lags. This sample is an unbalanced panel of annual corporate income tax returns, comprising all observations from the IRS Statistics of Income stratified random sample in years 1998-2008 in which the filing corporation had between $1 million and $1 billion in lagged assets and $500,000 and $1.5 billion in lagged revenue, was private through the previous year, and is not in the finance or utilities industries. All analyses flexibly control for any time-varying industry or firm-size shocks by non-parametrically reweighting the S-corporation sample within every year to match the distribution of C-corporations across 190 industry-firm- size bins as detailed in Section III.E. C- vs. S-status is defined as of the second lag; corporations can switch status if they meet the legal requirements but fewer than 4% ever switched in this sample. See Table 1 for summary statistics.

FIGURE 2
Effects of the 2003 Dividend Tax Cut



Notes: These figures plot the time series of annual mean outcomes for C-corporations and S-corporations in the main analysis sample net of a rich set of controls. Investment equals the cost of all newly purchased tangible capital assets. Net investment equals the annual dollar change in tangible capital assets. Employee compensation equals the sum of all non-officer wages, salaries, benefits, and pension contributions. Total payouts to shareholders equals dividends plus share buybacks (non-negative annual changes in treasury stock). Each graph is constructed by scaling each observation by either the firm's tangible capital assets or revenue averaged over the two preceding lags; winsorizing (top-coding) observations at the 95^{th} percentile; regressing this scaled outcome variable within every year on a C-corporation indicator, two-digit NAICS industry fixed effects, and quartics in age, lagged revenue, lagged profit margin, and revenue growth; and requiring that the vertical distance between the two lines equals the regression coefficient on the C-corporation indicator and that the weighted average of the lines equals the sample average in that year. The regressions are dollar-weighted (each observation is weighted by its lagged revenue) and flexibly control for any time-varying industry or firm-size shocks by non-parametrically reweighting the S-corporation sample within every year to match the distribution of C-corporations across 190 industry-firm-size bins as detailed in Section III.E. The payouts graph is included as a test for an immediate behavioral response in financial outcomes and differs from the other graphs in two ways that account for income-tax-induced differences in baseline payout levels and for slightly differential pre-trends as detailed in Section V.A.

FIGURE 3
Effects by Size Decile



Notes: This graph plots estimated within-size-decile effects of the 2003 dividend tax cut in the main analysis sample. Variables are defined, scaled, and winsorized as detailed in Figure 2. Each y-axis height equals one standard deviation of the outcome. Each graph is computed by binning corporations into deciles according to the unweighted deciles of the pooled C-corporation lagged revenue distribution, and then within each decile estimating a regression of the outcome on a C-corporation indicator, the interaction of a C-corporation indicator and post-2003 indicator, year fixed effects, two-digit NAICS industry fixed effects, and quartics in age, lagged revenue, lagged profit margin, and revenue growth. Each graph plots the coefficients on the interaction term with Bonferroni-corrected 95% confidence intervals to adjust for multiple (ten) hypothesis testing; uncorrected confidence intervals are one-third tighter. Standard errors are clustered by firm. The solid line is the best unweighted linear fit through the coefficients. Observations are weighted analogously to Figure 2.

ONLINE APPENDIX FIGURE 1
Industry and Size Distribution of the U.S. Population of Corporations

Notes: This figure plots the U.S. population distribution of C-corporations and S-corporations across broad (1-digit NAICS) industry categories, within the most numerous narrow (3-digit NAICS) industry category, and revenue bins. Each graphs's bars sum to 100% within corporation type. The sample underlying panels (a)-(c) comprises the universe of corporate income tax returns from tax year 2002 that satisfy the size and industry restrictions applied to the paper's main sample: assets between $1 million and $1 billion, revenue between $500,000 and $1.5 billion, and any industry other than finance and utilities. These full-population data were drawn from unedited population data at the IRS; these data lack several of the variables necessary for this paper's analysis and so are used only for this figure. Panel (d) illustrates a particular C-corporation and S-corporation operating at similar scale in the same narrow industry in the same local market (suburban Chicago) by plotting their store locations; tax data were not used in any way to construct this panel. Home Depot, Inc., the largest U.S. home improvement retailer, is a publicly-traded corporation and is thus a publicly-known C-corporation. Menard Inc., the third-largest U.S. home improvement retailer, is a pubicly-known S-corporation from a 2003 press story (http://www.insidemilwaukee.com/Article/242011-BigMoney). Store locations were derived from Google Maps.