Equity Financing, Dividend Taxes and Corporate "Non-Capital" Investment

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Abstract

I estimate that dividend taxes, by impacting the cost of equity financing, have large effects on the financing, investment, and real outcomes of many US public firms. But—in contrast with economists' longstanding focus on capital investment outcomes—I find these responses are mostly from smaller, cash-constrained firms through "non-capital" investment channels: R&D and operating expenditures. Exploiting a quasi-experiment that tracks financing and expenditure responses to the 2003 dividend tax cut, I estimate a large, immediate, and sustained increase in average equity financing ($+86\% \pm 11\%$) by these firms, reflecting a high elasticity to the cost of capital. Responsive firms put the cash substantially toward operating expenditures and R&D, rather than tangible investment. I also find higher job growth and long-run sales among the responsive firms. These results make sense, reconciling mixed evidence in recent research: because dividend taxes affect the cost of equity financing, the firms impacted most are those that actually rely on equity financing—smaller, often unprofitable, less capital-intensive firms who invest heavily in "non-capital" pathways.

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1 Introduction

Do dividend taxes, by reducing the after-tax returns to owners and investors, discourage businesses from undertaking new investments? For more than half a century, economists investigating this question have focused almost exclusively on capital investment responses, offering conflicting predictions, results, and conclusions (Modigliani and Miller, 1958; King, 1974; Poterba and Summers, 1983; Fazzari et al., 1987; Sinn, 1991; Devereux et al., 1994; Auerbach and Hassett, 2003, 2006, 2007; Korinek and Stiglitz, 2009; Chetty and Saez, 2010; Becker et al., 2013; Yagan, 2015; Alstadsæter et al., 2017; Moon, 2019; Boissel and Matray, 2019).

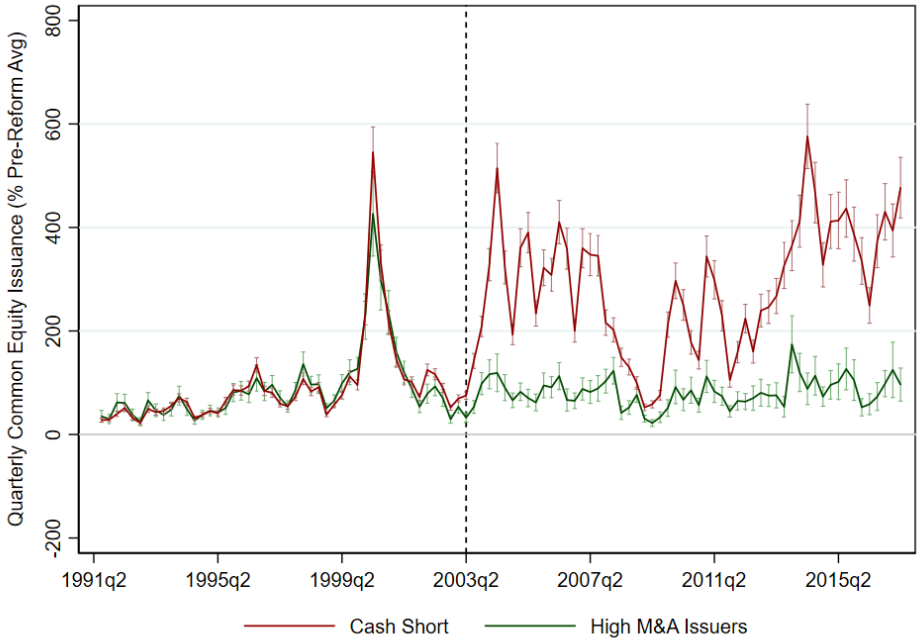
In this paper, I show that this longstanding focus on capital investment misses what are likely the most important real effects of dividend taxes. I present evidence of large, sharp, and sustained financing and investment responses to the 2003 dividend tax cut by many US public firms, but through "non-capital" investment pathways: R&D and operating expenditures. Not only do these findings uncover what appear to be broad and powerful effects, but more importantly they (a) intuitively track the mechanisms though which dividend taxes affect real firm outcomes, (b) offer insights about how firms respond to shocks affecting the cost of equity financing, and (c) provide a coherent resolution to ongoing debates in the literature.

What is the intuition for looking beyond capital investment? Two reasons. First, rather than affecting the cost of any particular investment, dividend taxes primarily affect the financing opportunities of firms that actually use equity financing. Dividend taxes create a "wedge" that reduces returns to equity, forcing shareholders to demand higher pre-tax returns. This raises the cost of equity financing relative to other sources, as potential investors now require larger stakes in the company to achieve the same expected return. At some point this extra dilution precludes financing and investment that would otherwise occur under a lower tax.

Second, equity financing (as opposed to debt financing) tends to be especially well-suited for firms that are less capital-intensive and more engaged in intangible investment, given their lack of available tangible assets for debt collateral, their uncertain cash flow, and the more speculative nature of their long-run prospects (Hall and Lerner, 2010; Brown et al., 2012; Hsu et al., 2014; Hall, 2002). Likewise, ample evidence suggests that R&D and intangible investment are sensitive to the availability of equity financing (Brown, Fazzari, and Petersen, 2009; Czarnitzki and Hottenrott, 2011; Hoberg and Maksimovic, 2015; Amore, Schneider, and Žaldokas, 2013).

In light of these two observations, I take a different approach than prior empirical investigations of payout taxes. Viewing the 2003 dividend tax cut as a shock to the cost and availability of equity financing—rather than to the incentives for capital investment directly—two clear hypotheses emerge. First, firms who use (or might use) equity financing should issue more stock

Figure 1: Equity Issuance by Cash Short vs. High M&A Issuer Firms, 1991-2017



Notes: Equity issuance is measured as the value of the split-adjusted change in shares outstanding on a quarterly basis, based on Fama and French (2005), scaled by lagged sales. See Equation 4 for the precise calculation. Equity issuance of each group is scaled by the pre-reform average (1991:Q3-2003:Q2). Firms in post-reform years are noparametrically weighted across 600 bins to match the distribution of firms in the two years prior to the tax cut in terms of sales and industry composition. Error bands are 95% confidence intervals.

after the tax cut. Second, a lot of this extra cash should be put toward productive uses other than tangible capital investments.

To test these hypotheses I use Compustat quarterly data on US public firms across a 26 year period from 1991 through 2017. Compustat is the best dataset for several reasons. First, the data can be linked to quarterly filings, which provide rich qualitative discussion about firm financing and expenditure decisions. As well, the quarterly frequency is essential to observe firm financing decisions in response to particular financial states—annual administrative data is too infrequent. Finally, the Compustat data include detailed balance sheet and cash flow statement information, which is critical for tracking where cash is spent.

To identify the effect of the 2003 tax cut on equity financing, I exploit a natural experiment inherent in the policy change. I utilize the fact that most US public firms (79%) issue stock every year for a variety of purposes, some of which are incentivized by the tax cut but others are not. For example, public offerings, private placements and other stock-for-cash sales are incentivized by a dividend tax cut for the reasons discussed above: the smaller tax "wedge" allows investors to enjoy higher after-tax returns and allows companies to raise more cash with less share dilution. On the other hand, equity issuance for mergers and acquisitions (M&A) is *not* incentivized by the tax cut.

The logic, as modeled formally in Section 3, can be summarized here succinctly. In a stock-for-stock M&A transaction, one company (the acquiror) acquires another company (the target) by issuing new stock to the target shareholders. In essence the acquiror is "buying" the target company not with cash, but with its stock. But in this case, the asset the acquiror is buying is *also* affected by the dividend tax cut. Thus, the incentive created by a dividend tax cut for the acquiror to issue more equity is offset by the increased after-tax value of the equity of the target, counteracting the incentive of potential acquirors to issue more equity.

With these incentive effects in mind, I isolate two sets of firms to serve as comparison groups for this investigation. The first group is comprised of firms that are in a state where they enjoy high marginal value from extra cash raised from stock issuance (i.e., firms who use or might use equity financing), and thus should be sensitive to the cost of equity financing. I refer to these firms as the "Cash Short" firms, as they have productive investment opportunities but need cash. The second group is comprised of firms in a state where they are likely to issue equity for M&A, and so I likewise refer to these as the "High M&A Issuer" firms. I empirically separate these two groups by drawing on indicators from the finance literature and prediction models, using a battery of alternative specifications to ensure robustness. In general, the Cash Short firms tend to be smaller (median \$12m total assets) and unprofitable, with low and precarious cash flow. They tend to be more heavily engaged in R&D and less capital intensive, and they constitute about 36% of observations over the sample period. By contrast, the High M&A Issuer firms are much larger (median \$750m total assets), very profitable, and more capital-intensive. They constitute about 18% of observations.

Both the Cash Short and the High M&A Issuer firms issue a great deal of equity procyclically, but while the former should be encouraged to issue extra equity by the dividend tax cut, the latter should be largely unaffected. Thus, the identifying assumption is that the two groups would have experienced parallel trends were it not for the dividend tax cut. As seen in Figure 1, there are remarkably stable pre-trends in equity issuance throughout the 12 years preceding the dividend tax cut, followed by a break immediately after the tax cut, with a sustained separation throughout the 14 years thereafter.

I estimate that the Cash Short firms exhibited a sharp 86% ($\pm$11%) increase in equity financing on average after the 2003 dividend tax cut, raising approximately \$132bn ($\pm$\$64bn) in extra cash through 2017.[1] I also estimate a large elasticity of equity financing to the cost of capital of -3.7 ($\pm$1.8), the first estimate of this parameter to my knowledge.[2] I find that these responses

[1] Note that the estimate for aggregate effect is noisier because it is sales-weighted. The point estimate for the percentage increase reflects a response by the average Cash Short firm.

[2] Note that this is an estimate for an aggregate financing response. The average response across firms is larger, as discussed in Section 6, reflecting how smaller, more cash-constrained firms exhibit a larger response.

are extremely robust: although magnitudes vary, the overall results are remarkably resilient to changes in the definitions of the comparison groups, the addition of controls, and changes to the regression specification. Overall, I find the strongest financing responses are among firms that are smaller, unprofitable, rely more on equity financing, and exhibit low capital intensity. The most responsive firms tend to be concentrated in a combination of "high-tech" industries (chemicals, computers, telecom, electrical components), health tech (pharmaceuticals, medical equipment), low-tangible asset industries (business and personal services), and industries with speculative outcomes (oil & gas).

How do these Cash Short companies appear to spend this extra cash? After accounting for firm size, I find that responsive firms appear to have put substantial portions of the extra capital they raised toward R&D (40%) and operating expenditures (54%), rather than tangible investment (approximately 1%).[3] If one treats a portion of firms' Selling, General, and Administrative (SG&A) expenses as intangible investment (as in Peters and Taylor, 2017, who use a 30% allocation), then the share attributable to intangibles increases to 46%. These investments appear to be productive, as I also find sharp increases in both average employment growth ($+10\text{pp} \pm 2\text{pp}$) and average longer-run sales ($+26\text{pp} \pm 10\text{pp}$) among Cash Short firms beginning immediately after the dividend tax cut, again sustained over the post-reform period. This result is consistent with previous findings that early access to funding for intangible investment can have strong positive longer-run effects (Howell, 2017).

These findings have important implications both economically and for policy design, by revealing how firms respond to a tax shock that affects the cost and availability of equity financing. In short, I find that firms with investment opportunities that would benefit from extra equity financing, but that are constrained from raising capital due to financing frictions and taxes, respond strongly to the reduced cost of equity capital. But this only describes a subset of firms, and these do not include the giants that constitute the bulk of corporate economic activity like Exxon, AT&T, Walmart, or General Motors.[4] Rather, because of the nature of equity financing and the types of firms that find it worthwhile, a shock to the cost of equity capital will affect firms such as small medical device manufacturers, pharmaceutical companies, software developers, clean tech firms, and business service firms. Thus, payout tax cuts—which may indeed have merit for other policy goals, such as reducing distortions to improve efficiency in financing and investment decisions overall—are not a well-targeted tool

[3] Note that this is not a reflection of aggregate dollar amounts across all Cash Short firms, but rather a measure of how the responsive firms were, on average, allocating the extra capital.

[4] Although fewer than 1 percent of US corporations have more than $100 million of annual gross receipts, these companies pay roughly two-thirds of corporate salaries, collect three-quarters of corporate receipts, and own over 90% of corporate depreciable assets. IRS Statistics of Income: Corporation Income Tax Returns Complete Report, 2018 Tables 2.1 and 3.1.

for stimulating new investment, particularly capital investment. As well, because this evidence highlights the existence of a market failure that undercuts investments by cash-constrained firms, there are likely better-targeted tax policies to address these concerns, such as a refundable qualified investment tax credit.

My findings contribute to several important areas of ongoing research. The most straightforward of these contributions is to the literature investigating the effects of shareholder taxation on firms, by revealing sizeable financing and real responses to the 2003 dividend tax cut. This paper thus addresses an unsettled debate among public economists about how the "Traditional View" and "New View" models of dividend taxation apply in practice, where the former predicts that dividend taxes discourage investment by making equity financing more costly (Harberger, 1962; Feldstein, 1970; Poterba and Summers, 1984), while the latter predicts that firms will largely be unaffected (King, 1977; Auerbach, 1979; Bradford, 1981). Recent empirical research has yielded mixed results: while a lack of capital investment response to the 2003 dividend tax cut appeared to support the New View (Yagan, 2015), research in international settings suggests sizable real responses to shareholder tax changes, in line with the Traditional View (Becker et al., 2013; Alstadsæter et al., 2017; Moon, 2019). My investigation helps coherently reconcile this apparent conflict. In line with the predictions of Auerbach and Hassett (2003), I clearly find that firms respond disparately depending on their marginal source of funding. Also, the magnitudes and the types of firms responding align closely with recent evidence supporting the Traditional View.[5] Hence, my results highlight the importance of identifying the mechanisms through which the dividend taxes affect firm outcomes, and using this intuition to identify the firms likely to respond.

My results also speak to literature on equity financing and capital structure, specifically to questions regarding which firms issue stock and why (Fama and French, 2005; DeAngelo et al., 2010; Huang and Ritter, 2021) how policies impact issuance decisions (Gustafson and Iliev, 2017), and how costs of financing impact capital structure (Myers and Majluf, 1984; Myers, 2001; Frank and Goyal, 2003; Baker and Wurgler, 2002; Frank and Goyal, 2008; Graham and Leary, 2011), especially through the effects of tax policy (Doidge and Dyck, 2015; Heider and Ljungqvist, 2015; Graham, 2000; Lin and Flannery, 2013). The paper also speaks to literature on financing constraints (Fazzari et al., 1987; Kaplan and Zingales, 1997; Whited and Wu, 2006; Hadlock and Pierce, 2010; Farre-Mensa and Ljungqvist, 2016) by investigating specifically how cash-constrained firms respond to a shock affecting the cost and availability of equity financing. In particular, this paper makes a contribution to this literature by estimating an elasticity of

[5] Moon (2019) confirms a much stronger response by cash-constrained firms.

equity financing to the cost of capital for Cash Short firms.

Finally, this paper contributes to a rapidly growing literature on the importance of intangible investment, and how that investment is affected by the availability of financing. Intangible investment is growing in importance in the economy, becoming an increasingly large part of overall corporate investment (Corrado and Hulten, 2010; Corrado et al., 2012; Haskel and Westlake, 2017; Falato et al., 2020). Unlike tangible capital, which is well suited for debt financing, R&D and other intangible investment is often financed with equity because it has uncertain prospects and offers little collateral value, but yet has a potentially lucrative payout (Hall and Lerner, 2010; Hsu et al., 2014). This project thus builds on empirical research on R&D and intangible investments by firms, particularly how taxes impact these activities (Gale and Brown, 2013; Rao, 2016; Mukherjee et al., 2017; Brown et al., 2017; Guceri and Liu, 2019; Agrawal et al., 2020; Akcigit et al., 2022). It also contributes to literature highlighting the importance of the availability of equity finance for the funding of intangible investment (Brown et al., 2009, 2012; Acharya and Xu, 2017; Hottenrott and Peters, 2012), in particular by offering new evidence regarding the impact of a broad financing shock on intangible investment outcomes.

2 Background on the Tax Cut

The Jobs and Growth Tax Relief and Reconciliation Act ("JGTRRA") was enacted on May 23, 2003. The concept was first introduced by President Bush on January 7, when he proposed a complete elimination of the double-taxation of distributed corporate profits (at which point he contended that the tax cut would "provide capital" for businesses "to build factories" and "to buy equipment," following the predictions of traditional models for capital investment).[6] The proposal was unanticipated, and the ultimate passage of the law was far from certain even in its modified compromise form, justifying the use of the tax cut as an instrument for the effect of dividend tax cuts in many studies since then.[7]

Prior to JGTRRA, dividends were taxed as ordinary income. JGTRRA changed this by taxing dividends instead at the long-term capital gains rate, which was also reduced by the new law (from a top rate of 20% to 15%).[8] The change was retroactive to January 1, 2003. The exact rate reduction was determined by the type of recipient: for tax-exempt investors, foreign investors, and corporations there was no effect, but for US individuals the rate reduction

[6] President Bush's Remarks to the Economic Club of Chicago in Chicago, Illinois. January 7, 2003. *Public Papers of the Presidents of the United States.*

[7] See Auerbach and Hassett (2007) for the discussion of the timing and unanticipated nature of the tax cut.

[8] Note that to be taxed at the lower rate, the dividend must be "qualified" dividends. Generally this requires the dividends be paid by US corporations or corporations traded on a US stock market, and that the shareholder meets a 60-day holding period requirement.

depended on their taxable income. For all computations of elasticities, I follow Yagan (2015) in using the rate change estimated by the OECD: a reduction from a top combined rate of 44.7% to 20.8%, after factoring state and local taxes as well.[9]

The shareholder tax rates established in JGTRRA were originally set to expire on January 1, 2008, but they were subsequently extended in 2005 and 2010, and made permanent in 2012.[10] And while JGTRRA represents the most substantial shareholder-level tax reform in decades, it is not the only one. Several other federal tax laws affecting dividend and capital gains rates were enacted during my 26-year investigation period, but all of these were much smaller in magnitude, were generally more anticipated, and received much less public attention than the dividend tax cut in JGTRRA.[11]

Other important law changes occurred contemporaneously in 2003. First, JGTRRA also included investment tax incentives targeting small businesses (increasing bonus depreciation and expensing caps), which I consider as a confounding factor that could cause an upward bias in my (already quite low) estimates of effects on capital expenditure during the 2003-2008 period.[12] Another important contemporaneous law was the Medicare Prescription Drug, Improvement, and Modernization Act of 2003, enacted in December of that year: it subsidized the pharmaceutical industry with new regulations and through the establishment of Medicare Part D. I perform robustness tests excluding pharmaceutical companies to ensure that my results are robust to any contamination from this policy change.

3 Theoretical Framework

Dividend taxes are predicted to affect investment outcomes by reducing returns to shareholders, in particular by distorting the cost and availability of equity financing. But the presence or absence of these distortions depends on the firm's marginal source of financing—or, more precisely, whether the firm has a high marginal value of extra cash from equity financing.

[9] See OECD Tax Database Table II.4 (http://www.oecd.org/tax/tax-policy/tax-database.htm).

[10] The rates were extended until January 1, 2011 by the Tax Increase Prevention and Reconciliation Act of 2005, until January 1, 2013 by the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, and made permanent by the Middle Class Tax Relief and Job Creation Act of 2012.

[11] The Taxpayer Relief Act, enacted August 5, 1997, reduced the top marginal capital gain rate from 28% to 20%. The Patient Protection and Affordable Care Act, enacted March 23 2010, added a 3.8% surtax to the net investment income of high-income individuals, applying to dividend and capital gain income beginning on January 1, 2013. The American Taxpayer Relief Act of 2012, which primarily raised the ordinary income tax rates on high earners (which received most of the attention leading up to its enactment) raised the long-term capital gain and dividend tax rate on the highest bracket from 15% to 20%.

[12] The bonus depreciation provisions permitted an additional first-year depreciation deduction equal to 50% of the adjusted basis for certain qualified property, generally tangible property and improvements. The business expensing provisions raised the expensing cap from $25,000 to $100,000 for qualifying property (generally tangible property used in the ordinary course of business, as well as computer software). *See* Joint Committee on Taxation, 2005. *General Explanation Of Tax Legislation Enacted In The 108th Congress.*

On the one hand, "Cash Short" firms may experience quite large incentive effects for additional equity financing and investment after a dividend tax cut. These are firms who have productive investment opportunities and have a high marginal value of extra cash from equity financing, but are constrained in part by a high dividend tax. This outcome is predicted by the Traditional View. On the other hand, there should be no effects if a firm has low marginal value from extra equity financing, and instead relies on retained earnings to finance its investments. This outcome is predicted by the New View.

This framework, although appealing in its simplicity, poses a significant empirical challenge: if New View firms aren't engaging in equity financing in the first place, how can they serve as a comparison group to identify and estimate the effects of a dividend tax cut on Cash Short firms, whose issuance patters are highly procyclical? I overcome this challenge by extending the theoretical framework to "High M&A Issuers:" firms with low marginal value for equity financing (like New View firms) but who still tend to engage in stock-for-stock M&A, and thus issue a great deal of equity procyclically. The circumstances of M&A create incentives similar to New View firms, so that these firms should not experience incentive effects from a dividend tax cut, thus providing a valid comparison group for analysis.

In this section I formalize these predictions in a simple single-stage model, based on Becker et al. (2013) and Alstadsæter et al. (2017).

3.1 Model: Two Classic Views of Dividend Taxation

Consider a firm that faces an investment opportunity, and the owner must decide now (in t_1) whether to pursue the opportunity, and if so, how to finance it. The investment requires some amount of cash I, and will generate (in expectation) an amount $I + \pi(I)$ in period t_2, where the amount $\pi(I)$ is the discounted profit after corporate income tax.[13] Assume that the firm will pay out all profits to its shareholders as dividends in t_2, where dividend income is taxed at the rate τ_d. Note that only the profit $\pi(I)$ is taxed, and not the return of capital I.[14] Assume further that if the firm owner chooses to pursue the investment opportunity, the owner may finance the chosen amount I either with retained earnings R or with equity financing E. Finally, assume that investors have an opportunity cost of capital ρ, equal to the generic after-tax return achieved by investing in competitive capital markets. Will the owner pursue the opportunity, and if so, how will it be financed?

Consider two cases, where the firm relies on different sources of funding. In the first case,

[13] Note this framework is intentionally flexible to accommodate both continuous and discrete investment opportunities.

[14] As defined in IRC §316, only distributions from a firm's current or accumulated earnings and profits constitute taxable dividends.

assume that the firm has a high marginal value of the extra cash raised from equity financing—in other words, that the firm's marginal source of funding is equity financing, thus corresponding to the Traditional View. For this firm, the return on the investment will be subject to the dividend tax upon the payout in t_2, and so the after-tax dividend to shareholders will be $(1-\tau_d)\pi(E)$. As a result, the investment will only be undertaken so long as:

$$(1-\tau_d)\frac{\partial \pi(E)}{\partial E} > \rho \tag{1}$$

If the dividend tax is cut to $\tau_d' < \tau_d$, the pre-tax return required to satisfy this first order condition is thus lower. Hence, for these firms whose marginal source of funding is equity financing, a dividend tax cut is predicted to prompt additional equity issuance to finance extra investment.

How much extra equity issuance? The answer depends on the profit function $\pi(I)$, which in turn is dictated by the nature of the investment opportunity and the firm's circumstances. In Appendix A.1 I generate a simple numerical example demonstrating that even with a simple profit function the increase in equity issuance from a dividend tax cut could be very large, easily more than doubling the equity issuance by the firm.

Note that any firm with sufficiently high $\frac{\partial \pi(E)}{\partial E}$ will find it profitable to take advantage equity financing. But if $\frac{\partial \pi(E)}{\partial E}$ is low, the firm will not. This could be because the firm lacks investment opportunities or because the firm has access to other preferred sources of funding.

Now, return to the firm above, but assume that its marginal source of funding is retained earnings, thus corresponding to the New View. Retained earnings are a preferred source of investment financing from a tax perspective, because they represent "trapped equity" within the firm that will be subject to a dividend tax whether they are distributed in t_1 or reinvested and paid out in t_2. Moreover, issuing additional equity would cause the firm owners to dilute their return on any investment, which is unnecessary if the firm has sufficient cash reserves available. Thus, a firm with a great deal of retained earnings held as cash has a low $\frac{\partial \pi(E)}{\partial E}$.

In this case, because the equity is trapped and is ultimately subject to the dividend tax, the firm will only reinvest the retained earnings so long as:

$$(1-\tau_d)\frac{\partial \pi(R)}{\partial R} > (1-\tau_d)\rho \quad \text{or, equivalently,} \quad \frac{\partial \pi(R)}{\partial R} > \rho \tag{2}$$

The dividend tax has no impact on the reinvestment decision, as the two terms cancel out. Likewise, a tax cut to τ_d' also has no effect.

At first, it might seem that the New View firms offer an appealing comparison group against

the Traditional View firms to identify the effect of a dividend tax cut. However, they are actually quite problematic because they are not predicted to issue equity in the first place. What would be ideal is a group that issues a great deal of equity procyclically, but whose issuance and investment decisions should not be affected by the dividend tax cut. I discuss such a group below.

3.2 Extending the Model to M&A

The model above only contemplates equity issuance in the form of stock sales to raise cash. But this is far too narrow. In reality, a significant majority of public firms (79%) issue equity every year in a variety of forms, ranging from public offerings and private placements to stock compensation, option and warrant exercises, securities conversions, and M&A. In each case, stock is being exchanged for some other item of value, whether it's cash, labor, elimination of debt, or interest in another company. The incentive effects of a dividend tax cut depend on the details of this exchange.

The Traditional View framework applies to many of these types of equity issuance. Ultimately, its predictions apply when stock is being exchanged for an asset or service that is not directly affected by the dividend tax cut.[15] In each such case, the dividend tax cut raises the value of the stock relative to the item for which it is exchanged, incentivizing the exchange from the firm's perspective. Thus, the predictions apply not only to stock issuance intended to raise cash (e.g., public offerings, private sales, equity financing facilities, etc.), but also to many other types of issuance including stock as payment (e.g., to settle debts) or employee compensation. The predictions generally apply as well to options and warrants: following the formula of Black and Scholes (1973), the value of options and warrants rises after a dividend tax cut.[16] The ap-

[15] "Direct" because the model does not attempt to account for dynamic general equilibrium effects.

[16] By warrants, I refer to securities sold by the firm (or tacked on to another transaction as a sweetener) that endow the holder with a right to purchase common shares at a pre-defined exercise price before an expiration date. Options are assumed to have similar terms, but are often awarded as executive compensation rather than sold to investors.

The price of an option can be modeled in a simplified way following Black and Scholes (1973):

$$C = S \cdot N(d_1) - Xe^{-r \cdot t} \cdot N(d_2) \quad \text{where} \quad d_1 = \frac{\ln\left(S/X\right) + t \cdot \left(r + \sigma^2/2\right)}{\sigma\sqrt{t}} \quad \text{and} \quad d_2 = d_1 - \sigma\sqrt{t}$$

where C is the market value of the call option, S is the price of the underlying security, X is the exercise price, t is the time to expiration, r is the risk-free rate, σ^2 is the variance of the rate of return on the underlying security, and $N(d_1)$ is the cumulative normal density function evaluated at d_1.

The variance of the rate of return on the stock will increase after the dividend tax cut because only distributions from earnings and profits are taxed as dividends. Thus, the distribution is wider in profitable states but unchanged in unprofitable states. Thus the market price of the option rises and enables the firm to sell the warrant for a higher price, raising more capital.

Note as well that these incentives may be attenuated or exacerbated by certain technical aspects of warrants or options, such as the interplay between the recognition of ordinary income by the investor and the offsetting deduction available to the firm. In a state where the warrants are exercised in the money, the firm enjoys an influx of capital equal to the exercise price while the investor recognizes ordinary income on the spread. The firm

plication is more complex for securities where a significant portion of the value is attributable to their non-equity aspects, such as convertible bonds or preferred stock. Fortunately, these latter securities make up only a small portion of the equity issuance observed in this study.

The incentive effects are quite different for M&A, however. In contrast with the Traditional View, a dividend tax cut should have minimal effects on overall equity issuance for M&A. The logic is similar to that of the New View: in a merger, the invested capital is also "trapped equity" that will be subject to the dividend tax regardless of whether the merger occurs, and so a dividend tax has no effect on issuance or investment incentives, *ceteris paribus*. The logic is explained below.

M&A can take many forms, but in essence all forms have a common economic structure: the shareholders of the acquiring company compensate the shareholders of the target company in exchange for their interest in the target company. This exchange is typically done in one of two ways: the acquiring company can pay the target shareholders in cash (a "cash merger"), or the acquiring company can issue new shares to the target shareholders, so that they become minority shareholders in the resulting combined company (a "stock-for-stock" merger). Stock-for-stock M&A by public firms represents a very large, highly cyclical amount of equity issuance.

In a stock-for-stock merger, the target shareholders act a bit like investors in the acquiring company: rather than contributing cash in exchange for stock of the acquiror, they are contributing the value of their business. Note that this value not only includes existing assets, but also expectations of future profits. Importantly, this value is "trapped equity" because it is still within the target company, and thus all future profits will be subject to the dividend tax. Thus, the situation is similar to the New View, except that in this case the trapped equity is being invested by target shareholders, rather than being drawn from retained earnings.

If we assume that the target shareholders expect a pre-dividend-tax return of ρ on their interest in the target company, and if the acquiring company must issue some amount of equity E to compensate the target shareholders for their interest in the company, then the first order condition can be written as:

$$(1-\tau_d)\frac{\partial \pi(E)}{\partial E} > (1-\tau_d)\rho \quad \text{or, equivalently,} \quad \frac{\partial \pi(E)}{\partial E} > \rho \tag{3}$$

Note that this is exactly analogous to the New View prediction in Equation 2. Thus, a change in τ_d does not affect either the equity issuance or acquisition decision.

may also take a deduction for the amount of ordinary income recognized by the investor, which may not be of value if the firm is unprofitable. (Note that the trade-offs are different for qualified options, but these constitute the minority of options.) Thus the warrant represents a trade-off: on the one hand, this is less cash value to the firm upon exercise than if the firm had sold new stock at that time, but on the other hand the firm received some capital sooner.

3.3 Model Predictions and Interpretation

The model offers two core predictions for this paper. First, when it comes to equity financing, firms with high $\frac{\partial \pi(E)}{\partial E}$ should issue additional equity to finance extra investment after the dividend tax cut. These will be firms who have productive investment opportunities, and thus have a high marginal value of extra cash, but who would otherwise be constrained in their ability to issue a desired amount of equity under a higher dividend tax. Hence, "Cash Short" firms. Second, firms engaging in stock-for-stock M&A but that have low $\frac{\partial \pi(E)}{\partial E}$ for equity financing should continue to issue equity largely unaffected by the dividend tax cut. Hence, "High M&A Issuers" as a comparison group.

To elaborate on the first prediction, what does it mean for a firm to be "constrained" in this context? One can think of the dividend tax a creating a "wedge" that raises the cost of equity financing relative to other sources of funding. The firm is "constrained" by the dividend tax to the extent this wedge precludes what would otherwise be the firm's optimal course of action.[17] But note that this constraint may be external or internal. On the one hand, it could be the result of skeptical investors, who—despite the firm's desire to secure additional financing—are unwilling to invest due to dividend taxes on top of transaction costs, asymmetric information, agency costs, and other frictions. These firms are well described by the literature on financing constraints. But it could also be the case that the firm has perfect access to equity markets, and arrives at an interior optimum that shifts after the tax cut. After all, the dividend tax lowers the return for current shareholders, meaning they are less willing to dilute their stake to finance a new investment opportunity. These possibilities are demonstrated with numerical examples in Appendix A.1.

3.4 Additional Considerations: Debt, Capital Gains, General Equilibrium

The model above is highly simplified, and does not account for several factors that could be important in financing and payout decisions. First, it does not offer clear predictions for the effects of a dividend tax cut on capital structure. On the one hand, a dividend tax cut would encourage firms to shift away from debt toward equity to the extent they are good substitutes, but on the other hand the lower investment hurdle rates and the extra safety offered by the availability of equity financing may encourage extra debt issuance. Which effects dominate? I investigate this question as part of my empirical analysis.

Second, the model does not account for share repurchases, which have grown in popularity as a form of payouts since the late 1990s. Unlike dividends, the tax liability for repurchases

[17] This interpretation draws upon Fazzari et al. (1987); Kaplan and Zingales (1997).

depends upon the investors' tax basis in the company's stock. Investors with a basis equal to (or greater than) the repurchase price face no capital gains tax liability (or realize a loss), even if the company has significant earnings and profits. But even so, gains are still taxed, meaning that capital gains rate changes create functionally similar financing and investment incentives as a dividend tax (*see* Moon, 2019; Becker et al., 2013, for a more detailed discussion). I handle this concern in two ways. I net out share repurchases from my measure of equity issuance, as repurchases will otherwise bias upward the estimated effect on equity issuance by Cash Short firms.[18] I also factor in the change in the capital gains rate into the cost of capital when calculating elasticities of Cash Short responses, since these will also affect returns on equity investment.

Third, the analysis of M&A is highly simplified. The modeled transaction is assumed to be a tax-free stock-for-stock merger, but the merger could also be taxable. In that case the target shareholders would recognize capital gain on the sale of their stock to the extent the price exceeds basis. However, since capital gains rates were only modestly affected by JGTRRA relative to dividends, the effects should be small. As well, the dividend tax cut may change the sorting and efficiency of M&A transactions (Ohrn and Seegert, 2019), but my analysis is not concerned with the exact pairings of targets and acquirors, but rather magnitudes of equity issued, thus mitigating these concerns.

Finally, the model does not account for general equilibrium effects of the tax cut. It does not consider the dynamic effects of the tax cut on aggregate demand, or the indirect price effects of the tax cut through shifts in aggregate investment (for example, effects on ρ resulting from capital reallocation to equity-issuing firms). However, these affects are only a concern to the extent they differentially affect the two comparison groups.

4 Data and Empirical Strategy

4.1 Data

I use Compustat quarterly data on US public firms across a 26 year period from 1991 through 2017.[19] As is customary, I exclude financial and utilites firms (SIC codes 4900-4999 and 6000-6999), as they have unique payout motives (Fama and French, 2001; Dittmar, 2000). Altogether there are 13,148 firms and 447,013 firm-quarters included in this investigation.

Compustat is the best dataset to carry out this investigation, for several reasons. First, it is

[18] Share repurchases would otherwise appear as negative equity issuance, making equity issuance by High M&A Issuer firms look lower than it actually is.

[19] Certain quarterly variables are only available beginning in the late 1980s, making 1991 the earliest possible year to begin. I stop prior to the TCJA to avoid possible contaminating effects.

essential in this project to distinguish between different types of equity issuance, *i.e.*, to determine whether the firm is issuing stock to raise cash or acquire another company. The Compustat data can be linked to companies' quarterly filings, which provide rich qualitative discussions about firm financing decisions and acquisitions. As well, these management discussions offer insights about expenditure choices, which I use to confirm my empirical results.

Second, the quarterly frequency is essential to observe firm financing decisions in response to particular financial states. The model in Section 3 predicts that firm responses to a dividend tax change will depend on the firm's financial circumstances. Annual administrative data is far too infrequent for this task, as it is impossible to know when the firm issues equity over the course of the year, and what the financial state of the firm is at the time of issuance.

Finally, the Compustat data include detailed balance sheet and cash flow information. Prior studies have focused primarily on capital investment responses, but to understand broader "non-capital" responses, it is essential to observe a full cash flow statement.

4.2 Measuring Equity Issuance

There are multiple ways to calculate equity issuance, and my analysis is robust to different measures. My default measure is the preferred measure of Fama and French (2005), which they describe as the "most accurate" measure of equity issuance, with some modifications. It is the market value of the quarterly change in the split-adjusted shares outstanding, then adjusted further for share buybacks and scaled by 2 years of lagged sales:

$$E_q = \frac{(Shares_q^{SA} - Shares_{q-1}^{SA}) \times \frac{1}{2}(Price_q^{SA} + Price_{q-1}^{SA}) + Buybacks_q}{\frac{1}{2}\sum_{t=1}^{t=8} Sales_{q-t}} \tag{4}$$

Scaling by sales allows comparisons across firm sizes. Sales are floored at \$100k to prevent unintended effects from firms with small or negative sales (the results are robust to higher or lower floors). The results are robust to other scaling variables, including lagged assets and revenue, but sales is the best measure for scaling: unlike assets, it is not directly impacted by the issuance of equity, and unlike revenue, it does not include unusual revenue events. I also adjust the equity issuance measure by netting out share repurchases, as these have become increasingly popular among large and profitable firms in the past two decades. Without this adjustment, the estimated results would be much larger because repurchases would be counted as negative issuance (predominately by large firms).

To focus as exclusively as possible on equity financing and M&A, rather than picking up smaller securities conversions or options exercises, as a default measure I set equity issuances below 3% of lagged sales to 0. However the results are largely unchanged by eliminating, raising,

or lowering this restriction.

For robustness, I also consider three other measures of equity issuance, but each has drawbacks (see Fama and French, 2005). First, I consider stock sales scaled by lagged sales. However, sales do not adequately capture stock issued in mergers or awards to employees, or any other issuance that does not generate a cash flow to the firm. Second, I use a book measure of equity issuance: the change in shareholder equity net of the change in retained earnings. However, this measure will not accurately capture the value of equity issued in certain mergers, stock options, or stock dividends. Finally, I use the SDC Platinum measure of proceeds from new common issuance. However, the number of observations is small compared to the number of issues observed in the full Compustat dataset. As well, by recording announcements rather than executions, the timing, magnitude, and frequency may not align with actual issuance, and may undercount certain types of issuance.

4.3 Identifying Cash Short Firms

The model in section 3 predicts that the firms affected by a dividend tax cut will be those that have a high marginal value of extra cash from equity financing, but are constrained in part by a high dividend tax. These qualities are fundamentally unobservable, so one must adopt a method using observable data to approximate these qualities. Several approaches are possible: for instance, a full theoretical model in the style of (Whited and Wu, 2006), or a formula in the style of (Kaplan and Zingales, 1997), among others. In an effort to take an approach as robust as possible to any arbitrary decisions of a researcher, I use a battery of coarse indicators based on finance literature, in the style of Becker et al. (2013).

In total, I use six different indicators to identify Cash Short firms. For each indicator, unless otherwise specified, I categorize firm-quarters as Cash Short if they are in the bottom quintile across the 1991-2017 period. First, I use two measures of small size: lagged total assets, and lagged sales revenue. Size is an important indicator in the firm lifecycle literature, and smaller firms tend to rely more heavily on equity issuance for financing (Berger and Udell, 1998; Carpenter and Petersen, 2002a,b; Frank and Goyal, 2003; Fama and French, 2005). Second, I use lagged tangible assets, as this indicates how difficult it may be for firms to post collateral for debt financing (Campello and Giambona, 2013; Falato et al., 2020; Almeida and Campello, 2007). Third, I use the Hadlock and Pierce (2010) measure of financing constraints, as this measure is designed to capture a broad array of public firms that would ideally utilize additional external financing.[20] Finally, I use two measures of cash flow, intended to capture how difficult

[20]The measure of financing constraints developed by Hadlock and Pierce (2010) applies across a broad array of public firms, making it well-suited for this study, as opposed to other measures of financing constraints more

Table 1: Pre-Reform Descriptive Statistics

	Cash-Short				High M&A Issuers			
	Mean	10th	Median	90th	Mean	10th	Median	90th
Characteristics								
Lagged Total Assets ($m)	57.9	2.5	11.8	83.3	1,263	202	750	3,276
Lagged Sales ($m)	60.5	1.2	10.6	75.6	1,219	110	653	3,272
Lagged Tangible Assets ($m)	26.4	0.5	3.5	29.9	601	27	251	1,696
Lagged Profit Margin (%)	-55	-181	-8.8	12	14	3.1	15	33
Employment	297	9	63	373	5,338	366	2,746	14,062
Outcomes								
Total Equity Issuance ($m)	12.2	0.0	1.0	28.4	84.3	1.4	30.6	253.8
Scaled Equity Issuance (%)	92	0.0	5.9	301	38	0.2	4.7	88
Scaled CapEx (%)	15.6	0.6	4.3	55	17.2	2.2	8.5	47
Scaled Operating Exp. (%)	180	71	112	372	110	70	98	152
Scaled R&D (%)	63	0.0	11	239	13.7	0.0	5.0	28
Firm Quarters	107,666				40,522			

Notes: Dollar amounts are in millions. Percentages are of the previous two years of sales, other than profit margin, which is caluclated as 1 minus the previous two years of operating expenditures over sales revenue. Winsorization is conducted as described in Section 4.

it is for the firm to finance its activities with internal financing. The first of these ratio of lagged cash flow to lagged total assets as used in Becker et al. (2013). The second of these is a measure I construct using naive regression forecasts of revenue and operating expenditures: firms identified as having insufficient forecasted revenue to cover their operating expenses are categorized as Cash Short.[21]

Although I use the Hadlock and Pierce (2010) measure of financing constraints to help identify Cash Short firms, it is important to point out that being Cash Short is distinct from being financially constrained as contemplated in the finance literature. The above Cash Short indicators are meant to specifically capture a proclivity for equity financing, not external financing generally. Thus, my investigation focuses on a narrower scope of firms. The Hadlock and Pierce (2010) measure is still applicable, however, as it is designed to apply broadly across the Compustat population and overlaps heavily with firms engaged equity financing.

Although it is important for robustness that each of the six Cash-Short indicators works separately, my preferred and default measure throughout the remainder of the paper is the union of all six indicators. That is, if a firm-quarter observation is categorized as Cash Short by any of the six indicators, it's categorized as Cash Short for the default indicator.

Table 1 presents descriptive statistics for the Cash Short firms in the pre-reform period. A

focused on subsets of public firms.

[21] I use a simple naive regression forecast, where each quarter is forecasted using ten years of lags, to predict year-ahead revenue and operating expenditure. Firms with insufficient cash holdings and forecasted revenue to cover their operating expenditures are categorized as Cash Short.

few points stand out. First, the 107,666 firm-quarter observations constitute a sizable portion (36%) of all firm-quarter observations in the pre-reform period, indicating the size of the group under investigation. Second, the firms are generally quite small: although the top deciles of firm observations have over $83m in total assets and $75m in lagged sales, the medians have only $12m and $11m, respectively. That said, they still employ a large number of workers, with the median firm observation having 63 employees. Third, these firms are generally unprofitable. This indicates difficulty in generating revenue, meaning that the firms will have to rely on external financing (especially on equity, given questionable cash flows). Fourth, the scaled equity issuance is quite high, but this is largely driven by the upper end of the distribution. Fifth, the Cash Short firms are not expecially capital intensive, spending half on CapEx relative to sales as the High M&A Issuer firms. Finally, the Cash Short firms are very R&D intensive, spending double the amount of the High M&A Issuers at the median and ten-fold in the top decile.

4.4 Identifying High M&A Issuers

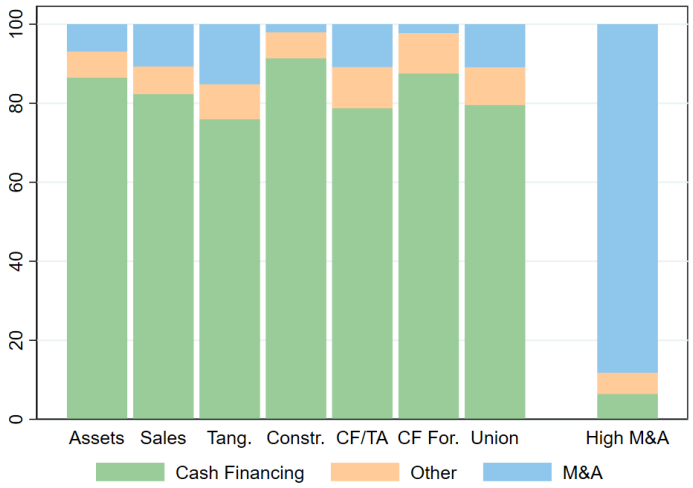
To identify the High M&A Issuers, I employ a simple logistic regression model to generate propensity scores for large M&A issuance. I merge data on the value of stock-for-stock M&A transactions from the Securities Data Corporation with the Compustat data. I generate a binary dependent variable spanning all observations with nonmissing equity issuance data, equal to 1 if more than half of the firm's equity issuance over the next four quarters is for M&A and 0 otherwise. My predictor variables are the lags of log total assets (and its squared term), log tangible assets, book leverage, sales growth over the previous two years, the sales-to-asset ratio, and the log of the previous two years of lagged sales. I rank all firm-quarters by their propensity score, and I categorize the top quartile as "High M&A Issuers."

Table 1 presents descriptive statistics for the High M&A Issuer firms in the pre-reform period. A few points stand out, largely in contrast to the observations about the Cash Short firms. First, these firms are very large, with medians of $750m total assets and 2746 employees. They are also very profitable, generating a 15% profit margin. Relative to the Cash Short firms, they are also more capital intensive and engage less in R&D.

4.5 Validation

How well does the above empirical approach identify the intended sets of firms for the analysis? The Cash Short group should demonstrate a proclivity for issuing equity to raise cash, while the High M&A Issuer group should demonstrate a proclivity for issuing equity for M&A. I test this

Figure 2: Types of Equity Issued by Cash Short vs. High M&A Issuers



Notes: The colors of each bar indicate the share of equity issued by type for each group. The first six bars correspond to the six Cash Short indicators, and the seventh is the Union of the six. The far right bar is the High M&A group. Equity counting toward "Cash Financing" includes any issuance that either raises cash or is covered by the Traditional View incentives described in Section 3, including public offerings, private placements, equity issued as payment or compensation, options and warrants. Equity counting toward M&A includes either stock-for-stock M&A or equity issuance to raise cash to fund a cash merger or acquisition. All other types of issuance (generally preferred stock and debt conversions) fall into "Other."

by randomly selecting 100 quarterly filings of firms with nonzero equity issuance measures and categorizing their primary purpose of equity issuance. The results are presented in Figure 2. It is clear that indeed the Cash Short firms are overwhelmingly issuing equity for a cash financing purpose, while the High M&A Issuers are overwhelmingly issuing equity for M&A.

4.6 Estimation Approach

I estimate the effects of the dividend tax cut on equity financing and expenditure by Cash Short firms using a differences and differences analysis against the High M&A Issuers. The identifying assumption is that the groups would trend parallel were it not for the dividend tax cut.

Equation 5 is my main specification to produce all figures, unless otherwise specified:

$$E_{fnq} = \alpha + \sum_{\substack{\mathcal{T}=-11 \\ \mathcal{T}\neq 0}}^{\mathcal{T}=14} \mathbb{1}\{year = \mathcal{T}\} \times \beta_{\mathcal{T}} Short_{fnq} + \theta Short_{fnq} + \delta_f + \gamma_{nq} + \varepsilon_{fnq} \tag{5}$$

The regression is estimated on quarterly data in the 26-year period between 1991:Q3 and 2017:Q2. The annotations f, n, and q refer to firm, industry, and quarter, respectively. Industries, unless otherwise specified, are the 30 Fama-French industries based on 4-digit SIC codes. E is equity issuance by a firm in a given quarter, as measured in Equation 4. (Note that E is replaced with appropriate expenditure measures when estimating the effects on expenditures.) *Short* is a dummy that takes the value 1 if the firm-quarter is Cash Short, 0 if the firm-quarter

is a High M&A Issuer. The *Short* dummy is interacted with annual dummies to estimate the differences between the two groups in a given year, where years are specified in four-quarter intervals before or after the tax cut, which occurred roughly at the end of 2003:Q2. The vectors δ and γ represent firm and industry-by-quarter fixed effects, respectively.

Since the identification assumption is parallel trends, I scale the dependent variable for all observations in each of the two groups by their groups' pre-reform mean, multiplied by 100. As a result, the interpretation of a point estimate of 50 is that the Cash Short group is trending above the High M&A Issuer group in that given year by 50 p.p. relative to the Cash Short group's pre-reform mean. If both groups trend parallel in proportion to their pre-reform means, then the point estimates will be 0.

Note that this specification is intentionally unbalanced. That is, firms can move into or out of the Cash Short and High M&A Issuer categories in any given quarter. This is important because the the tax cut will affect any firm in a Cash Short state even long after it has been enacted, even if that firm had previously been a very large and profitable firm. The goal is thus to determine how firms respond to being in a Cash Short state, and how that response changes after the tax cut.

To address concerns about possible changes in composition resulting from an unbalanced specification, I weight all post reform observations within each of the two groups to achieve a the same distribution as the years shortly before the tax cut. More precisely, I create a 30x20 "grid" of bins, where firm observations in each year are categorized into one of 600 bins according to their industry (30) and lagged total assets (20). I weight the bins in all post re-form years to match the distribution of firms in the two years prior to the tax cut.

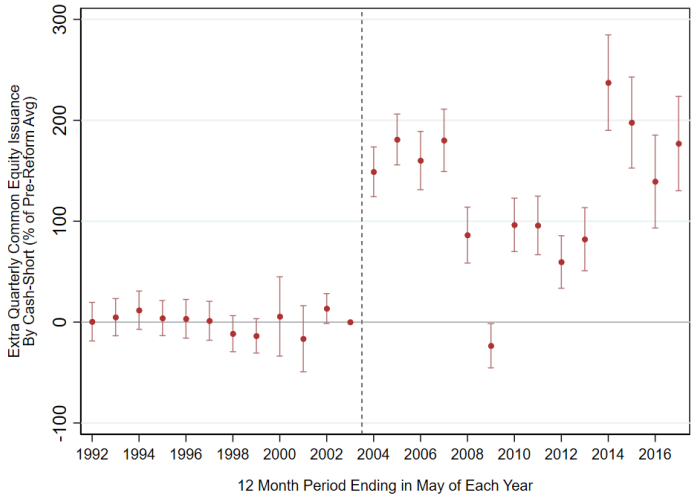
Due to volatility across the 26 year period, I winsorize the data at the 3%/97% threshold across the entire period, and at the 5%/95% threshold within each quarter, unless otherwise specified. While magnitudes are sensitive to the choice of winsorization (heavier winsorizing tends to dampen magnitudes), the overall results are not.

To estimate average effects across the post-reform period, I run the following specification:

$$E_{fnq} = \alpha + \beta Post_q \times Short_{fnq} + \theta Short_{fnq} + \delta_f + \gamma_{nq} + \varepsilon_{fnq} \tag{6}$$

Analogous to the interpretation above, in this specification β is interpreted as the extra equity issued by the Cash Short group over the High M&A Group on average in the post-reform period, as a percentage of their pre-reform means.

Figure 3: Extra Equity Issuance by Cash Short Firms



Notes: Includes firm and industry-by-quarter fixed effects. Regression is given in Equation 5. Each point estimate is the coefficient on a dummy variable for Cash Short interacted with the year (i.e, 4-quarter periods before and after reform). Post-reform observations are noparametrically weighted across 600 bins to match the distribution of firms in the 2 years prior to the tax cut in terms of sales and industry composition. Observations are scaled by pre-reform means of their respective groups, so that the point estimates can be interpreted as the p.p. increase of Cash Short firms over High M&A Issuers relative to their pre-reform means. Error bands are 95% confidence intervals with standard errors clustered by firm.

5 Results

5.1 Equity Issuance

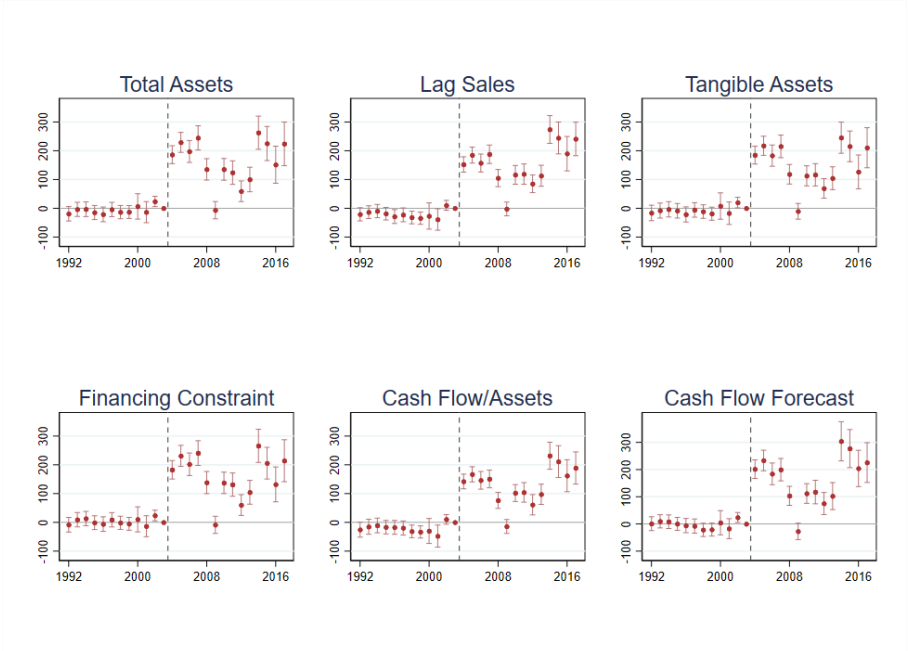
The equity issuance response to the dividend tax cut by Cash Short firms appears large, sharp, and sustained. Figure 3 presents the main results from Equation 5. For the 12 years leading up to the dividend tax cut, the Cash Short and High M&A Issuers exhibit extremely similar patterns in quarterly common equity issuance, lending strong evidence to validate the core identifying assumption of parallel trends. Immediately after the tax cut, however, there is a large and sudden increase in equity issuance by Cash Short firms relative to the High M&A Issuers, a break that is generally sustained throughout the post-reform period. I estimate that Cash Short firms increased their equity issuance on average by 86% ($\pm$11%) in the post-reform period over what their equity issuance would have been otherwise.[22]

These results are extremely robust. As seen in Figure 11 in the Appendix A.3, the results hold for a balanced panel, where the categorizations of firms as Cash Short or High M&A Issuer are determined at the time of the tax change. They also hold for a specification that includes a battery of controls, including quartics of lags of: the sales-to-assets ratio, sales growth over the previous year, book leverage ratio, and Tobin's Q.[23] As well, as seen in Figure 4, the

[22] I calculate this by using Equation 6 to estimate extra equity issuance (scaled by lagged sales) relative to the pre-reform mean, and then use this to back out the counterfactual post-reform equity issuance.

[23] Certain common controls like size, age, and profitability are too highly correlated with the categorizations to serve as useful controls.

Figure 4: Different Cash Short Indicators



Notes: Each Cash Short indicator corresponds to a single indicator discussed in Section 4. Other details are the same as Figure 3.

results are robust to the choice of indicator used to identify Cash Short firms. While the default indicator (the union of all six indicators) is preferred, discussed above in Section 4, each Cash Short indicator exhibits extremely similar results independently. Finally, as seen in Figure 12, although the Fama and French (2005) split-adjusted market measure of equity issuance is preferred (as discussed in Section 4), the sharp break at the time of the tax cut followed by higher equity issuance is clearly observable in different measures of equity issuance. The results are also robust to changes in the thresholds and methodology used to identify the Cash Short and High M&A Issuer groups. For example, even though the bottom quintile is used for the Cash Short indicators, the results remain strong at other thresholds. This conclusion applies as well to changes in the High M&A Issuer threshold. For the High M&A Group, the results are also robust to changes in the logistic prediction model, and the results are similar even if blunt indicators are used to approximate likely M&A activity.[24]

To estimate aggregate effects on the overall magnitude of equity issuance, I run Equation 6 weighted by the previous two years of sales. I estimate that equity issuance by Cash Short firms has been approximately 68% (±33%) higher than it would have been without the tax cut, or roughly $132bn (±$64bn) in total financing through 2017.[25] Although this sales-weighted

[24]For example, as observed in Fama and French (2005), firms that are particularly large and profitable tend to issue a good deal of equity for M&A. My results are extremely similar if instead of using a propensity score model to identify the High M&A Issuers, I instead simply categorize firms in the top half of both lagged total assets and lagged profitability as High M&A Issuers.

[25]To calculate this aggregate effect in a way that avoids the outsize effects of a relatively small and noisy set of

estimate is noisier, this is a sizable amount compared to the total value of all equity issuance by Cash Short firms in the post-reform period of $326bn.[26]

The estimated effects of the dividend tax are largest for firms that are smaller, less profitable, and that have low tangible assets, as seen in Figure 13. As well, the effects appear strongest on the intensive margin, as firms that have recently issued more equity tended to have larger increases after the dividend tax cut.

The estimated impacts on equity issuance across industries are presented in Figure 14 in Appendix A.3. The effects are not concentrated in any particular industry or sector, but rather spread widely across many. That said, there tends to be a larger effect on firms that are in "high-tech" industries (such as chemicals, computers, telecom, electrical components), health tech (pharmaceuticals, medical equipment), low-tangible asset industries (business and personal services), and industries with speculative outcomes (oil & gas). In short, these observations (in combination with the types of firms that exhibited the strongest responses, discussed above) align with the discussion in Hall and Lerner (2010), in that these firms have traits that position them well to take advantage of lower cost equity financing.

5.2 Capital Structure

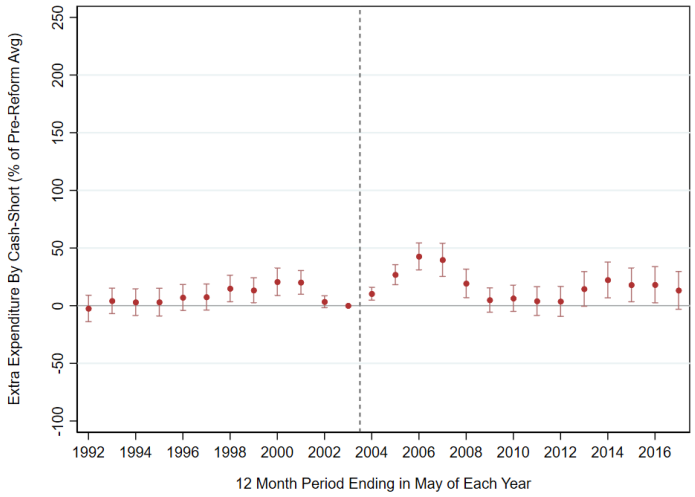
As discussed in Section 3, theory provides opposing predictions about the direction of the effect on capital structure: while the substitution effect suggests that firms will shift away from debt toward more equity financing, the combination of owners' payout incentives and a better capitalized balance sheet encourage more debt. Which effects dominate?

As seen in Figure 15 in Appendix A.3, the payout and balance sheet effects appear to have dominated the substitution effect. The Cash Short firms clearly did not reduce debt after the tax reform, and even tended to issue additional debt. As well, the average book leverage ratio of Cash Short firms rose from 0.26 in the pre-reform period to 0.37 in the post-reform period. Thus, it appears Cash Short firms took advantage of the opportunity to issue additional debt, which contributes to the financing of the additional expenditure observed below. This finding is also corroborated in the financing regression in Table 3, where it's clear that Cash Short firms enjoyed net inflows of additional debt financing after the tax cut.

high-sales firms, as a conservative measure I exclude Cash Short firms with lagged sales over the median amount, roughly $150 million annually.

[26] This total is calculated using the Fama and French (2005) split adjusted measure. It also excludes small issuances (below 3% of lagged sales) to avoid picking up smaller securities conversions or options exercises.

Figure 5: Extra Capital Expenditures by Cash Short Firms



Notes: Specification is the same as in Figure 3, but dependent variable is next eight quarters of capital expenditure scaled by previous two years of sales. Axes are scaled so that they are comparable with Figure 6 and Figure 7.

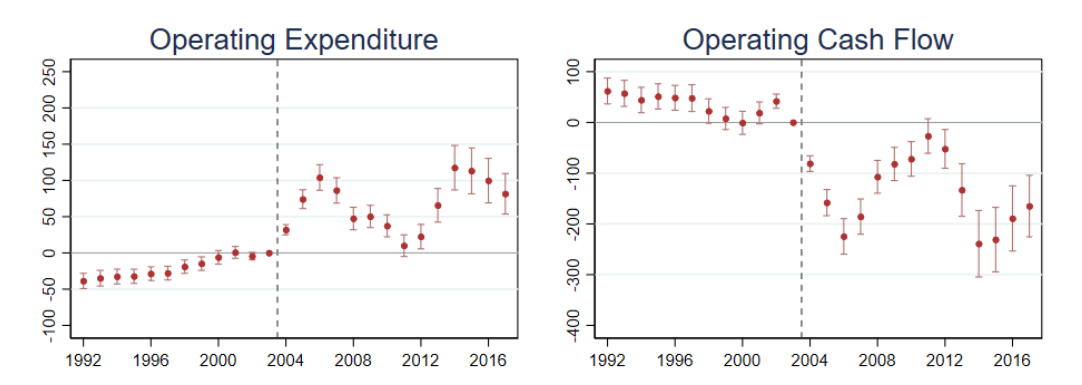
5.3 Expenditure

Although prior empirical work on payout taxes has focused on capital investment outcomes, I find that an overwhelming majority of the extra financing appears to be devoted to "non-capital" investments, notably R&D and operating expenditures (particularly SG&A). I show this with two approaches. First, I run the regression in Equation 5, but using as the dependent variable the sum of the next eight quarters of expenditure, scaled by lagged sales and by the pre-reform mean, just as in the case of equity. The interpretation is thus analogous: the point estimates indicate the average extra expenditure by Cash Short firms over the High M&A firms relative to their respective pre-reform means. I repeat this analysis for different categories of expenditure. This first approach thus gives an impression of how a given expenditure category changes for the average Cash Short firm, but it does not give a sense of how dollar magnitudes compare across categories. For that, I employ a second approach that allows a relative comparison of dollar expenditures across different categories by the average Cash Short firm, discussed below.

The premise of this section is that the extra cash inflow from equity financing must go somewhere: either spent or held as cash & cash equivalents. The cash flow statement breaks down the aggregate inflow and outflow over a given period (quarterly in this case) into three major categories: operating cash flow, investment cash flow, and financing cash flow.[27] These three categories, which may each be positive or negative, sum to equal the change in the firm's

[27]Operating cash flow generally includes operating revenues (e.g. sales revenue), net of expenses like salaries, rents, production costs, and R&D. Investment cash flow generally includes income from sales of tangible assets or securities net the firm's investments in capital expenditures, securities, or acquisitions. Financing cash flow generally includes proceeds from sales of equity or debt net of repurchases and payouts to investors.

Figure 6: Extra Operating Expenditure vs. Cash Flow by Cash Short Firms



Notes: Specification is the same as in Figure 3, but dependent variable is next eight quarters of operating expenditure (left) and operating cash flow (right), scaled by previous two years of sales. Axes are scaled so that they are comparable with Figure 5 and Figure 7.

cash holdings.[28] The equation must balance: extra inflow results in extra cash holdings, extra outflow draws down cash holdings. I use these relationships to identify extra expenditures financed by the extra equity issuance.

The results for the first test (*i.e.*, documenting the average response) on capital expenditure are presented in Figure 5. The results are decidedly underwhelming relative to the changes in equity financing. Although there is a small bump in the 2000s, this extra investment is tiny relative to the amount of capital raised through equity issuance. As well, evidence from the public finance literature suggests this bump may be best attributable to unrelated but contemporaneous investment tax incentives targeting small businesses (Zwick and Mahon, 2017).[29] Thus, the main takeaway is that the equity financing does not appear to be directed toward capital investment.

In stark contrast, the results for operating expenditures in Figure 6 are much larger and reflect both the pattern and magnitudes seen in the equity issuance estimates.[30] The right panel shows the net operating cash-flow, which almost exactly mirrors operating expenses. This juxtaposition reveals that the extra expenditures were not financed by profits, but by other sources, and in patterns very similar to the observed extra equity issuance.

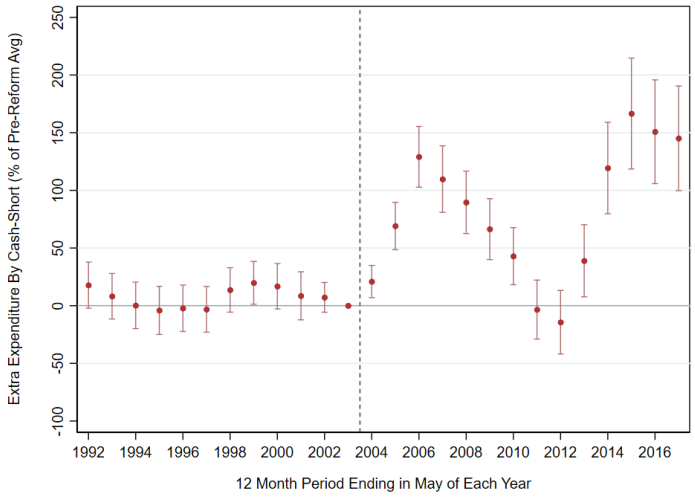
The results are even more stark for R&D expenditures, seen in Figure 7. The Cash Short firms were already intensively investing in R&D prior to the tax cut (as seen in Table 1), but yet immediately after the tax cut there is a large jump, indicating that they are investing an extra

[28] There are of course other adjustments, such as for exchange rates in the case of multinational businesses.

[29] Also in the JGTRRA were various investment incentives including increased small business deductions for tangible property investment and bonus depreciation. See Section 2 and footnote 12 for a discussion. Zwick and Mahon (2017) investigated the responses to these incentives and found that small businesses exhibited a 95% larger response than larger businesses.

[30] Note that the operating expenditure variable is from the income statement. Data on specific cash outflows is not available for operating cash flows.

Figure 7: Extra R&D Expenditures by Cash Short Firms



Notes: Specification is the same as in Figure 3, but dependent variable is next eight quarters of R&D expenditure scaled by previous two years of sales. Axes are scaled so that they are comparable with Figure 5 and Figure 6.

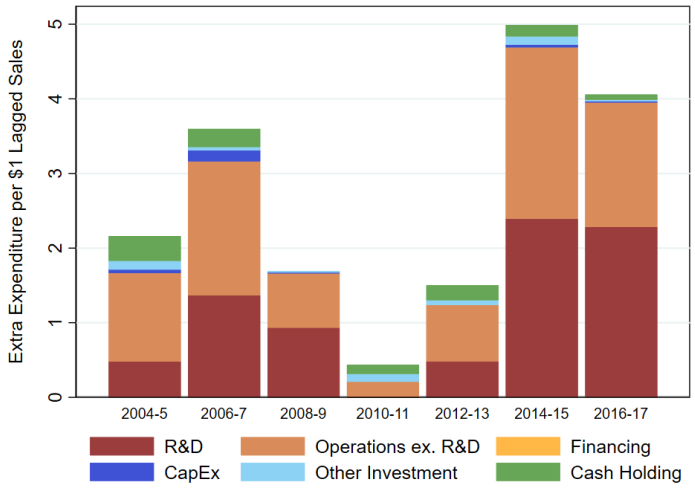
amount equal to over 100% of the pre-reform mean. Once again, the pattern closely resembles that of equity issuance.

While the above results offer a sense of relative changes within expenditure categories, a second test permits a more direct comparison of how the average Cash Short firm makes allocations of the extra financing across different expenditure categories. The results are presented in Figure 8, interpreted as "how many extra dollars of expenditure did the average firm allocate to a given category relative to a dollar of lagged sales?" In other words, this graph is a reflection of where extra cash was devoted across categories, after accounting for firm size using lagged sales. I find that only a tiny amount (roughly 1%) is allocated to capital expenditures. By comparison, roughly 40% is devoted to R&D and 54% to operating expenditures. Using the broader definition of intangible investment as R&D plus 30% of SG&A expenditure (as in Peters and Taylor, 2017) suggests that 46% is devoted to intangible investment. There are also small amounts devoted to extra cash holdings and other investments such as securities.

5.4 Employment and Long Run Sales

Are these extra investments productive? Evidence from employment outcomes and longer run sales suggest that they indeed are. Figure 9 presents the results for employment growth before and after the tax cut. The specification is the same as the main equity issuance regression in Equation 5 and Figure 3, but where the dependent variable is calculated as the percent change in the number of employees reported at the end of the firm's current fiscal year over the average

Figure 8: Extra Expenditures by Cash Short Firms on Average, by Category



Notes: Graph corresponds to **??**. Regressions specification is given by Equation 6, except that dependent variable is the next eight quarters of expenditure in the given category. The dependent variables are not scaled by pre-reform means, so the point estimates can be interpreted as extra dollars of expenditure by the average Cash Short firm per dollar of lagged sales over the previous two years.

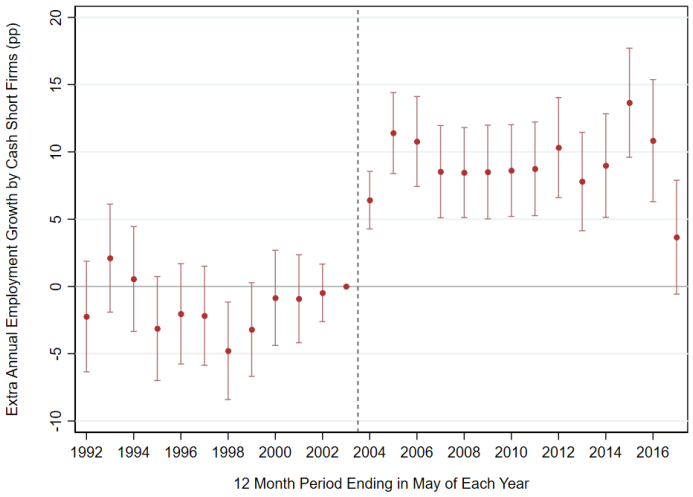
of the previous two years' employment.[31] The break at the time of the tax cut is sharp, and I estimate that the Cash Short firms exhibited an extra 10pp (±2pp) growth over the High M&A Issuers in the post-reform period.

Figure 10 presents the results for longer run outcomes, measured by observing future sales. Sales are likely the best measure for longer run performance, because assets will fluctuate with financing and revenue can be volatile (e.g., revenue can jump if the company sells off assets, sending an incorrect signal). Again, the specification is the same as in Equation 5 and Figure 3, but with a different dependent variable: the percent change in sales calculated by using average of the next 5 years of sales revenue over the preceding two years of sales revenue.

The results in Figure 10 are striking, but also require some extra explanation. In the post-reform period, the average Cash Short firm appears to grow an additional 26pp (±10pp) of sales revenue over the next five years above Cash High Firms, relative to their previous two years of sales, indeed a very large amount. One caveat, however, is that this result excludes the tails of the long run sales distribution to focus on "typical" firms. The sales outcomes are highly volatile and cyclical, where top-performing firms do very well in booms and poor-performers do very badly in recessions, and this phenomenon is much stronger for Cash Short firms. To mitigate this volatility near the tails, I trim the data (rather than winsorizing) to 20%/80%. This strict trimming means that the results should be interpreted as reflecting the performance of "average" or "median" firms, rather than the population of Cash Short firms. It is nevertheless highly informative, when interpreted appropriately.

[31] Employment data is only available annually on 10-Ks, not quarterly.

Figure 9: Employment Response



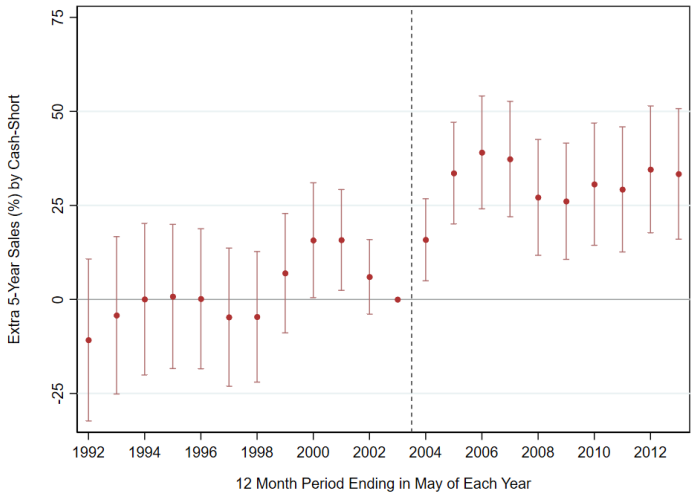
Notes: The dependent variable is calculated as the percent change in the number of employees reported at the end of the firm's current fiscal year over the average of the previous two years' employment. (Employment data is only available annually on 10-Ks, not quarterly.) Other details are the same as Figure 3.

6 Economic Interpretation

The results in this paper support a coherent narrative about how firms respond to a policy shock that lowers the cost of equity financing. Firms that have a high marginal value of extra cash from equity financing, but that are at least partly constrained from raising capital on account of the dividend tax, appear to respond quite strongly to the tax cut by issuing substantially more equity. These responsive firms are ones that are well-poised to avail themselves of equity financing, as described in corporate finance literature (Hall and Lerner, 2010; Brown et al., 2012; Hsu et al., 2014; Hall, 2002). They are smaller, unprofitable firms with low tangible capital and tenuous cash flows. These firms are also in industries that are speculative, high-tech, or service-oriented. Likewise, they tend to use the proceeds for investments other than capital investment.

This narrative nicely reconciles the contrasting theories of the "Traditional View" and the "New View," as well as contrasting evidence in recent literature. Under the Traditional View, firms are responsive to the reduced cost of capital, raise additional cash, and increase investment. Under the New View, firms draw upon sources of finance other than equity, and so are unaffected by the tax cut. I confirm, as predicted by Auerbach and Hassett (2003), that both views are accurate, but for different firms. What was missing from the framework of these two competing theories was a practical articulation of what causes firms to fall under the ambit of the Traditional View as opposed to the New View. This paper provides that missing piece.

Figure 10: Long Run Sales Response



Notes: The dependent variable is the percent change in sales, calculated by using average of the next 5 years of sales revenue over the preceding two years of sales revenue. Due to high volatility in the tails, observations are trimmed at the 20%/80% thresholds. Other details are the same as Figure 3.

6.1 Elasticity of the Financing Response

Having identified a set of responsive firms, it is important to succinctly measure the magnitude of their response in a way that can inform future policy discussions. I estimate a large elasticity of equity financing with respect to the cost of capital for Cash Short firms. Following literature back to Poterba and Summers (1983), the corporate cost of equity capital—i.e., the pre-tax return required to make an equity-financed investment worthwhile—can be written:

$$Cost\ of\ Capital\ = \frac{\rho}{(1-\tau_{corp})\left[\phi(1-\tau_{div})+(1-\phi)(1-\tau_{cap})\right]}$$

The three tax rates are the corporate income tax rate τ_{corp}, the dividend tax rate τ_{div}, and the long-term capital gains tax rate τ_{cap}, while ϕ reflects the share of future profits paid out as dividends. As in Section 3, ρ is the opportunity cost of capital. Parameterizing the model following Yagan (2015) and Desai and Goolsbee (2004), I estimate an elasticity for equity financing to cost-of-capital of -3.7 (± 1.8).[32]

At the time of writing, it does not appear that this parameter has been estimated before, making it difficult to corroborate. That said, two pieces of evidence suggest the reasonableness of this estimate. First, Moon (2019) estimates an investment elasticity for cash-constrained

[32]To calculate this, I use the results of the sales-weighted regression in Table 2 in subsection A.2, which is the most applicable for macroeconomic interpretations. Using the main equity regression would suggest a larger and more precise elasticity of -4.8 (± 0.6), which would be interpreted as the estimated elasticity of the average firm in the Cash Short sample, unweighted by sales. This calculation assumes a corporate income tax rate of 35%, a dividend tax rate reduction from 44.7% to 20.8%, a capital gains rate reduction from 24.7% to 19.7%, and a payout ratio of 0.5, where ρ is assumed to be the contemporaneous 1-year treasury rate of 1.01%.

firms after a capital gains tax cut, calculating an elasticity to the net-of-tax rate of 2.86 (which is similar to my estimated financing elasticity when measured by the net of tax rate, at 3.1 $\pm$1.5). Second, I also calculate the average response in terms of R&D investment, and compare that to existing literature. I calculate an elasticity of R&D to the cost of capital of -1.8 (± 0.4), falling within the range of past findings (Wilson, 2009; Agrawal, Rosell, and Simcoe, 2014; Hall, 1993; Hines Jr, Hubbard, and Slemrod, 1993; Bloom, Griffith, and Van Reenen, 2002; Ladinska, Non, Straathof, et al., 2015). These two comparisons suggest that my estimated financing elasticity is indeed reasonable.

Because this parameter is important, it equally important to interpret it correctly. My estimation reflects a sales-weighted average across the firms I identify as Cash Short firms. Only a subset of all corporations rely on equity financing as a margnial source of finance, with some more so than others. In fact, the unwewighted average elasticity (as opposed to sales-weighted) is -4.8 (± 0.6), suggesting that low-sales firms tended to respond more strongly. To apply this parameter going forward, it is thus important to assure it is applied to a representative population of firms that is neither too broad or too narrow.

A final point of consideration is the payout ratio ϕ. I assume an even split between dividends and capital gains for payouts to investors, but if firms increasingly resort to buybacks (as has been the trend), the effects of a dividend tax cut on the cost of capital will be dampened, and thus so will any equity financing response.

6.2 Extension to Private Firms

An important question that this paper cannot answer is whether these results apply to private firms. Public capital markets offer an efficient way for firms to access a deep and broad reservoir of equity financing, and it's unclear whether the results may be extended to private financing markets. The best evidence comes from Alstadsæter et al. (2017) and Moon (2019), who evaluate responses of private firms to a payout tax changes in Sweden and Korea, respectively, and find that there is a strong response especially by cash-constrained firms. There is also support from Zwick and Mahon (2017), who find small and low-cash firms respond significantly more to investment incentives than larger firms. In addition, most of the stock sales I observe by Cash Short firms appear to be in the form of private placements, warrants, and options, which do not make use of public markets. These observations, together with my estimated elasticities above, suggest that the response may well have been quite strong for unlisted firms as well.

7 Tax Policy Implications

There is a long and rich literature about optimal policy regarding dividend taxes, discussing both "corporate integration" proposals that aim to improve efficiency as well as distributional concerns that arise from payout tax cuts.[33] While these topics are important, my paper focuses on a narrower aspect of the 2003 dividend tax cut: what it reveals about financing constraints and investment responses.

A central motivation behind the tax cut was the stimulation of the economy through additional capital investment. My results, complementing those of Yagan (2015), suggest that the policy was poorly targeted and overbroad for this objective. I find that only a subset of firms are highly sensitive to the cost of equity financing, and that these firms are generally quite small. In contrast, it is large corporations that dominate the playing field: among US corporations, fewer than 1 percent have more than $100 million of annual gross receipts, but these giants pay roughly two-thirds of all corporate salaries, collect three-quarters of all corporate receipts, and own over 90% of corporate depreciable assets.[34] The mechanism of action behind the dividend tax cut—reducing the cost of capital to encourage additional equity financing—entirely misses these outsize firms, which have sufficiently low marginal values of cash from equity financing that they are not motivated to issue any new equity in response to a reduced cost of capital.[35] Not to mention that the tax cut wholly neglects business entities other than C-corporations, including S-corporations, partnerships, and sole proprietorships.

But some firms did respond quite strongly to the reduced cost of equity capital. The findings in this paper suggest that many smaller, cash-constrained firms, despite having productive

[33] A rich and longstanding literature exists on considering the benefits of "corporate integration," eliminating the double-taxation of the corporate entity and investors to decrease distortions (*see* Hubbard, 1993; Graetz and Warren Jr, 2016; Avi-Yonah and Chenchinski, 2011). The Treasury Department also issued a detailed report summarizing policy alternatives (US Treasury Dept., 1992, *Report of the Department of the Treasury on Integration of the Individual and Corporate Tax Systems: Taxing Business Income Once*). Indeed, before the Bush Administration settled on a compromise that became the dividend tax cut, the gist of its initial proposal was to "end double taxation on dividends." (President Bush's Remarks to the Economic Club of Chicago in Chicago, Illinois. January 7, 2003. *Public Papers of the Presidents of the United States. See also*, Joint Committee on Taxation, 2005, *Description Of Revenue Provisions Contained In The President's Fiscal Year 2004 Budget Proposal.*) In this regard, a lower dividend tax could reduce or eliminate distortions that: favor debt over equity financing, disincentivize payouts and thus keep capital inefficiently reinvested in corporations with fewer growth opportunities, favor certain forms of payouts over others, and favor passthroughs over the corporate form. (For a survey of the debt-equity distortion, see De Mooij (2012). For discussion and empirical tests of the allocation of capital after lower payout taxes, see Becker et al. (2013); Alstadsæter et al. (2017).) The stakes are high for these issues, as there are of course significant equity-efficiency trade-offs to consider as well Chetty and Saez (2005). Over $2.4tn of tax-preferred dividends have been paid out since 2003 (IRS Statistics of Income, Individual Income Tax Returns: Complete Reports). Over one third of this income has accrued to the top 0.1% of earners Saez and Zucman (2016).

[34] *See* footnote 4.

[35] Note that the marginal value of extra cash may be low for a number of reasons: the firms may have exhausted low-hanging investment opportunities, they may have ample cash holdings or sufficient cash flow to finance any investments on the horizon, or they may have enough tangible capital to take on debt to finance their investments rather than relying on equity.

investment opportunities, are limited in their ability to finance those investments by taxes and other financing frictions. Debt financing, which is comparatively favored in the tax code by the existence of interest deductions, is often not viable for these firms because of their low collateral value, low or inconsistent cash flows, or the speculative nature of their long-run prospects. Instead, they must rely on equity financing, which comes with high asymmetric information costs (Myers and Majluf, 1984), resulting in a market failure where the productive investment is not made. In a perfect world we would not want tax policy to discriminate between firms, but in light of these market imperfections, is there perhaps a more targeted policy that could support the equity financing or investment efforts of these cash-constrained firms?

An attempt to subsidize equity financing already exists in the federal tax code, but there are numerous issues that raise concerns about its efficacy. Enacted in 1993 with the aim to subsidize equity financing by small businesses, the "qualified small business stock" provisions of Section 1202 offer a capital gains exclusion for long-term holders of stock issued by certain small C-corporations with total assets under $50 million.[36] Prior research has indicated that this provision has helped small businesses raise additional capital (Guenther and Willenborg, 1999). But the design of the policy is complex with somewhat arbitrary boundaries, creating both inefficient distortions and opportunities for substantial tax avoidance. The $50 million asset cap used to determine the eligibility of issuers poorly targets cash-constrained companies, creates incentives to slow the company's growth, and leaves room for shenanigans around intangible assets that are difficult to value.[37] Also, eligibility restrictions exclude some industries in which firms may be more well-suited to rely on equity financing.[38] Perhaps most concerning of all, however, is the opportunity the provision creates for strategic tax avoidance by sophisticated investors, which turns the provision into a taxpayer-funded subsidy for wealthy individuals rather than for cash-constrained firms with productive investment opportunities.[39] An effective

[36] *See* Joint Committee on Taxation, 1993, *Summary of the Revenue Provisions of the Omnibus Budget Reconciliation Act of 1993. See also* Viswanathan (2020), Viard (2012) and Lee et al. (2020a) for discussions of the provision and its history.

[37] The asset calculation for eligibility generally considers basis and old fair market values of assets rather than current fair market value. Assets of the corporation are measured as the sum of cash, the fair market value of any property contributed to the corporation at the time of the contribution, and the adjusted basis of other assets (IRC §1202(d)(2)). Thus, a company with low-basis intangibles generated by the company could own assets substantially greater than $50 million in value but still qualify for the provision. As noted by Viswanathan (2020), Lyft had a valuation substantially in excess of $50 million while still qualifying as an eligible small business. Even if valuable assets are contributed to the corporation, if they are not traded on a market (namely intangibles), it is difficult for authorities to assess the reported valuation. In addition, businesses are disqualified if they ever exceed the $50 million limit, including immediately after an equity financing (IRC §1202(d)(1)). Thus, a growing company requiring additional capital for productive investments may face perverse incentives to seek a smaller than optimal amount of financing, or to intentionally slow its growth to retain its eligibility for subsidized financing.

[38] In this paper I show how firms in low-tangible asset industries, high-tech industries, and speculative industries tend to respond more to the lower cost of equity capital. Yet Section 1202 excludes businesses involving health and engineering services, as well as extractive industries (IRC §1202(e)(3)).

[39] See Lee et al. (2020a), Lee et al. (2020b), and Lee et al. (2020c) for discussions of different strategies. In

policy to lower the cost of capital for cash-constrained firms requires more calibrated targeting, simpler rules, and better guardrails.

It is important to realize, however, that even a simple, well-targeted policy with effective anti-abuse rules may still result in much of the tax benefit accruing to investors rather than cash-constrained firms. This is a consequence of demand and supply elasticities. A golden rule of public economics is that the benefit (or burden) of a subsidy (or tax) is not determined by the statutory rule of who receives the subsidy or who must pay the tax, but rather by the elasticities of the market participants. If the company sells its equity in a competitive capital market, where investors compete over expected gains (thus bidding up the stock price), the value of a tax subsidy should accrue predominantly to the firm. This assumption underlies my model in Section 3 as well as the theory in much of the literature on financing constraints (e.g. Kaplan and Zingales, 1997), as public markets are indeed quite competitive. But if the investor has market power (which could be the case in private capital markets), or if firms are more inelastic than the investors, then more of the benefit of the tax subsidy would accrue to the investor. An analysis of the likely incidence is thus a critical prerequisite for any targeted equity financing subsidy.

A more direct alternative to address the market failure of underfunded investment by these cash-constrained firms is to subsidize the investment directly, rather than to subsidize equity financing. But this would require a departure from the current policy governing investment expenses, which does little to accommodate unprofitable, cash-constrained firms. In general, businesses may depreciate or amortize their investments over time, and in some cases may expense them in the year the investment is made. There are also credits against businesses' tax liability for certain specific investments, such as green energy and low-income housing.[40] Even when it comes to stimulus packages, recent policy toward small businesses has focused on offering additional deductions for capital investments.[41] But deductions and non-refundable credits only reduce the tax liabilities of profitable ventures, rather than putting cash into the

general, with appropriate planning, investors can: (a) roll over gains held less than the minimum 5 years into new qualifying investments to avoid gain recognition; (b) gift or transfer qualifying stock to family or to a trust to minimize the effect of a $10 million-per-taxpayer limitation (a practice known as "stacking"); and (c) strategically contribute higher-basis assets to small corporations and time the sale of higher-basis qualifying stock to exclude gain above the $10 million-per-taxpayer limit.

[40]The general business tax credit includes credits for equipment to produce green energy and for the construction, acquisition, or rehabilitation of low-income housing, as well as numerous other activities (IRC §38).

[41]In response to the 2001 and 2008 recessions, the stimulus packages included additional deductions for capital investment as their primary tax support for small businesses. The two main growth incentives for businesses in the Jobs and Growth Tax Relief Reconciliation Act of 2003 were bonus depreciation and increased section 179 expensing for small businesses, both targeting capital investment. The American Recovery and Reinvestment Act of 2009 likewise included extra section 179 expensing, as did the Hiring Incentives to Restore Employment Act of 2010. *See* Joint Committee on Taxation, 2005, *General Explanation Of Tax Legislation Enacted In The 108th Congress* and Joint Committee on Taxation, 2011, *General Explanation Of Tax Legislation Enacted In The 111th Congress*.

hands of cash-constrained firms. Although these deductions and credits can be carried forward, cash-constrained firms may not survive to reap the benefits. The results in my paper suggest that the availability of cash is an important barrier to investment for these firms. This finding corroborates the work of Zwick and Mahon (2017), who find that although small firms are substantially more responsive to investment incentives than large firms, these small firms *only* respond if the incentive generates a cash benefit for the firm immediately.

These considerations apply in particular to R&D and intangible investment. The evidence in this paper suggests that many of the firms responsive to the reduced cost of equity are in high-tech industries, and that intangible investment constitutes a significant portion of the investment response. R&D is also a public good in that it advances knowledge and technology, so it is especially unfortunate if underinvestment occurs as a result of financing constraints. But yet the tax code provides little opportunity for small, cash-constrained firms to realize cash benefits from investment in the near term. Taxpayers may deduct or amortize intangible-producing expenses.[42] Additionally, there is a tax credit to encourage experimentation activities.[43] But again, these provisions function more as a reward for successful firms that become profitable than as a boost for cash-constrained firms looking to finance investments.[44] It is perhaps no surprise that 89% of research credit subsidies go to businesses with over $100 million in annual receipts.[45] Through this lens, the current policy framework also tends to discourage competitive entry in innovative industries, favoring incumbents.

In light of these observations, an alternative policy might take the form of a refundable investment credit for qualified businesses, where the eligible investment extends beyond capital investment. Although a refundable credit actively puts cash into the hands of qualifying businesses, from a taxpayer perspective the effect is not practically different from a non-refundable tax credit used by a large profitable firm. But in this case the subsidy not only addresses underinvestment in light of positive externalities (e.g. energy credits, the low-income housing tax

[42]The tax treatment of the expense will depend on the nature of the expense. Certain expenses like employee wages and advertising are deductible immediately (IRC §162). Research and experimentation costs, however, must be capitalized and amortized over a five-year period (IRC §174). (This rule applies for tax years beginning after December 31, 2021. In prior tax years, expenses could be deducted immediately. The rule was amended by the TCJA in 2017 because "tangible and intangible property created through research and experimentation activities provide value to a business beyond a single tax year." HR Rep. No. 409, 115th Cong., 1st Sess. 282 (2017).) Acquired intangible assets are generally amortized over a fifteen-year period (IRC §197). Finally, other intangible assets, the expense for which could not be deducted, are generally depreciated over the course of their useful lives or over a fifteen-year period (IRC §167).

[43]The credit is for activities to discover information that is technological in nature, relying on physical, biological, engineering, or computer sciences (IRC §41).

[44]Note that the Protecting Americans From Tax Hikes Act of 2015 permitted companies small companies to apply up to $250,0000 of the credit against social security payroll taxes, so long as they had both (a) under $5 million in gross receipts and (b) fewer than five years of positive gross receipts. *See* Joint Committee on Taxation, 2017, *General Explanation Of Tax Legislation Enacted in 2015*. While this amendment indeed provides a quicker cash benefit, the benefit is smaller for firms with fewer employees.

[45]IRS Statistics of Income, Corporation Research Tax Credit, Figure B.

credit, or the research tax credit), but also as a result of asymmetric information and other frictions that constrain financing opportunities. And while the policy would involve line-drawing for firm eligibility, and would require careful drafting of anti-abuse rules, it could nevertheless serve as a welfare-promoting second-best solution given the policy constraints.

8 Conclusion

Ever since the seminal work of Modigliani and Miller (1958), research on the real effects of dividend taxation has focused overwhelmingly on capital investment responses. In this paper I show that this focus appears to have overlooked substantial effects on both firm financing and investment through "non-capital" pathways by smaller, cash-constrained firms. This finding also helps reconcile what have seemingly been conflicting observations in empirical literature.

The empirical innovation in this paper is to frame the tax cut as a shock to the cost of equity financing—rather than a change in the cost of capital for a particular type of investment—and thus to focus on identifying the financing response before identifying an investment response. To accomplish this, I exploit the fact that equity issuance for M&A (as opposed to equity issuance to raise cash for other purposes) is both procyclical and should theoretically not be incentivized by the tax cut. I thus use firms with a high propensity for stock-for-stock M&A as a comparison group to identify the effect of the tax cut on equity issuance by firms likely to issue equity to raise cash, whose incentives are affected by the tax cut. My results indicate that smaller, cash-constrained firms responded quite strongly to the tax cut. Not only did they raise a substantial amount of additional capital through equity issuance, but the primary investments financed were "non-capital" in nature: namely operating expenditures and R&D.

Perhaps the most valuable insights arise from the observation of which firms are affected and why. The highly responsive firms are not large, cash-rich corporations, but rather small, cash-constrained firms that are often unprofitable with low tangible capital. They have high marginal values of extra cash, but are unable to raise their optimal amount of capital on account of frictions and taxes, resulting in underfunded productive investments. So even though a broad dividend tax cut may not be wise policy to achieve a specific objective of incentivizing additional capital investment, the results here suggest that there may nevertheless be value to a more targeted policy approach that helps firms overcome these constraints.

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A Appendices

A.1 Effects on Equity Financing: A Stylized Numerical Example

If this model of dividend taxation in section 3 is accurate, how much extra equity issuance could we expect from a tax cut the size of the JGTRRA 2003 cut? As the discussion of the model is rather abstract, I consider a numerical example of a hypothetical firm with an investment opportunity to demonstrate how a tax cut can prompt a great deal of equity issuance or none at all, depending on the firm's investment opportunities and financial circumstances.

Assume that a firm discovers an especially lucrative investment opportunity, with expected profit equal to the square root of the capital invested $\sqrt{I}$, but with a minimum required investment of \$20. The firm has \$100 of retained earnings and \$100 of paid-in capital. Assume a dividend tax rate $\tau_d = 0.447$, and an opportunity cost of capital $\rho = 0.05$. Thus the firm is trading with a market cap of \$165.[46] The firm can sell additional equity for financing if needed.

I consider several cases. First, assume that the firm's paid-in capital and retained earnings are already invested, so that the firm has zero cash reserves. Under the tax rate $\tau_d = 0.447$, the firm will optimize at an interior solution by issuing \$30 of new equity to finance the investment. But if the tax is cut to $\tau_d' = 0.208$, the firm will now optimize by issuing \$62 of new equity, a 107% increase. With the burden of the dividend tax now reduced, the firm has moved from one interior optimum to another.

Second, consider a firm that suffers from asymmetric information, so that investors require double the opportunity cost of capital in expectation (10%). In this scenario, no equity will be issued under the tax rate $\tau_d = 0.447$: to satisfy the price required by investors, the owners are not able to raise \$20 without diluting their shares sufficiently to make the project unprofitable for them. But under the lower tax rate $\tau_d' = 0.208$, the firm would optimally issue \$28 in new equity to finance the project. In this case, equity is issued where it was not possible under the higher tax rate.

Note that these first two examples correspond to different situations covered by the Traditional View. In the first example, the firm reaches an interior optimum prior to the tax cut, and then moves to a preferred interior optimum after the cut. In the second example, the firm is pushed to a corner solution due to the financing constraints. The dividend tax cut enables the firm to reach an interior solution.

Third, consider a firm with large cash reserves. Assume the firm now has \$150 of retained earnings, all of which are held in cash. In this case, the firm will not issue any new equity under

[46] The return of paid-in capital is not subject to dividend taxation.

either tax regime, because the retained earnings are more than enough to finance the optimal choice of investment. Note that this example reflects the logic of the New View as modeled in section 3.

Finally, consider a firm with no cash reserves but with a less appealing investment opportunity. This opportunity returns only $\frac{\sqrt{I}}{2}$. In this case, the firm will not undertake the investment under either tax regime, because the return is simply not high enough. This firm reflects how important the function governing the return on investment is: a firm with sufficiently low $\frac{\partial \pi(E)}{\partial E}$ will not respond to the dividend tax cut by issuing more equity, regardless of cash reserves.

These four cases demonstrate just how powerfully a dividend tax cut can affect financing and investment decisions for some firms, while having no effect on others. In particular, it highlights how important it is to isolate firms with high marginal values of extra cash to identify the effects of the tax cut.

A.2 Regression Estimates

Table 2: Equity Issuance Responses

Specification	Main	Balanced	Controls	Sales-Weighted
	(1)	(2)	(3)	(4)
Post x Cash Short	**134.50**	**126.60**	**105.50**	**78.49**
	(8.90)	(9.45)	(7.81)	(17.81)
Firm Fixed Effects?	Yes	Yes	Yes	Yes
Industry × Quarter Fixed Effects?	Yes	Yes	Yes	Yes
Observations	230,890	161,908	216,340	194,547
Clusters (Firms)	10,251	3,018	9,780	9,122
R-squared	0.388	0.331	0.426	0.304

Notes: Regressions specification is given by Equation 6. Clustered standard errors in parentheses. Post-reform observations are noparametrically weighted across 600 bins to match the distribution of firms in the 2 years prior to the tax cut in terms of sales and industry composition. Observations are scaled by pre-reform means of their respective groups, so that the point estimates can be interpreted as the p.p. increase of Cash Short firms over High M&A Issuers relative to their pre-reform means. For Controls regression, controls include quartics of of lags of: the sales-to-assets ratio, sales growth over the previous year, book leverage ratio, and Tobin's Q. For Sales-Weighted regression, large firms with greater than median lagged sales (roughly $150 million) are excluded as a conservative measure and also to minimize the influence of very large but less sensitive firms.

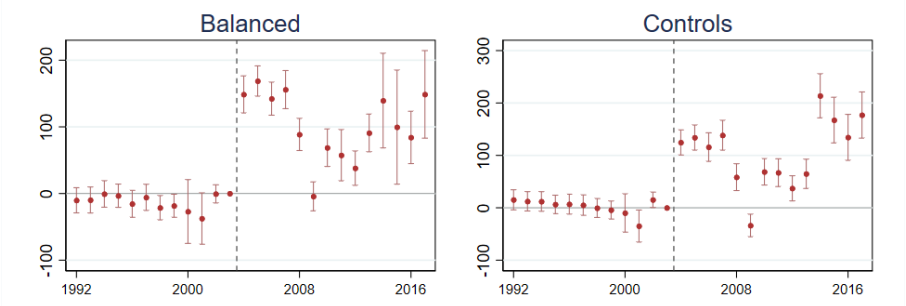
Table 3: Expenditure Responses by Cash Short Firms

Specification	R&D	Operating (ex R&D)	Financing	CapEx	Other Invest.	Cash Holding
	(1)	(2)	(3)	(4)	(4)	(4)
Post x Cash Short	**1.01**	**1.38**	**-3.83**	**0.03**	**0.06**	**0.08**
	(0.13)	(0.12)	(0.31)	(0.02)	(0.02)	(0.02)
Firm Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Quarter Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	123,448	199,566	191,325	194,724	194,611	199,641
Clusters (Firms)	5,460	8,799	8,674	8,694	8,690	8,802
R-squared	0.789	0.752	0.728	0.697	0.347	0.266

Notes: Table corresponds to Figure 8. Regressions specification is given by Equation 6, except that dependent variable is the next eight quarters of expenditure in the given category. The dependent variables are not scaled by pre-reform means, so the point estimates can be interpreted as extra dollars of expenditure by Cash Short firms per dollar of lagged sales over the previous two years.

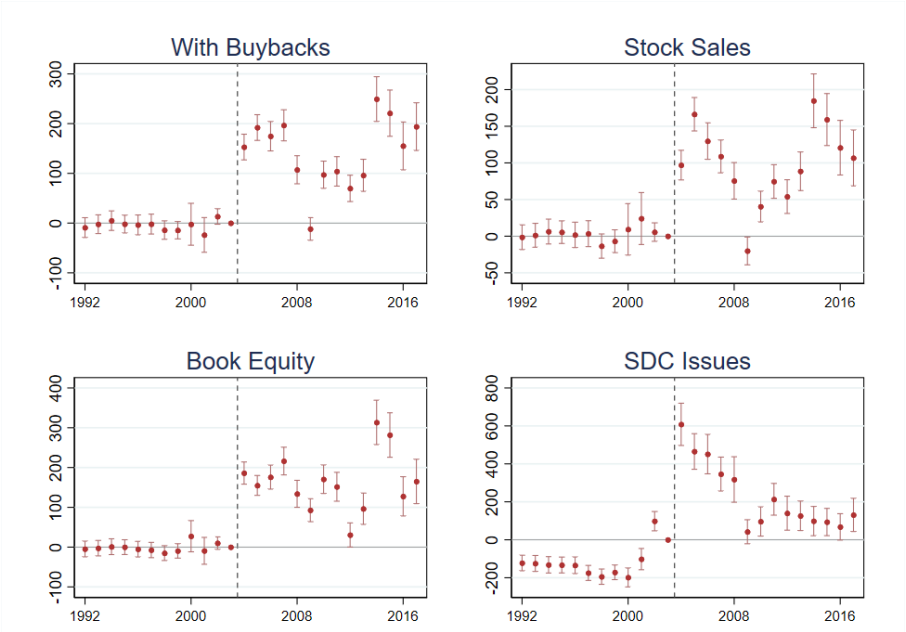
A.3 Additional Figures

Figure 11: Robustness



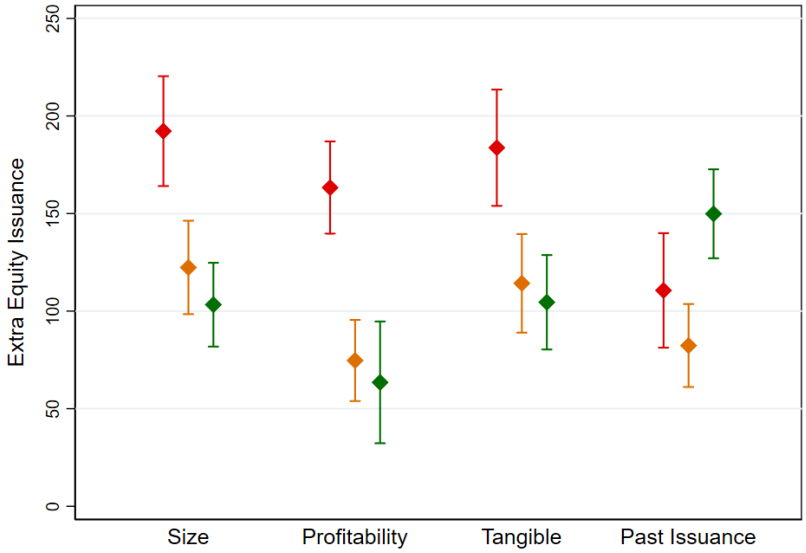
Notes: For balanced panel, the group assignment is defined at the time of the reform. For controlled regression, controls include quartics of of lags of: the sales-to-assets ratio, sales growth over the previous year, book leverage ratio, and Tobin's Q. Other details are the same as Figure 3.

Figure 12: Different Measures of Equity Issuance



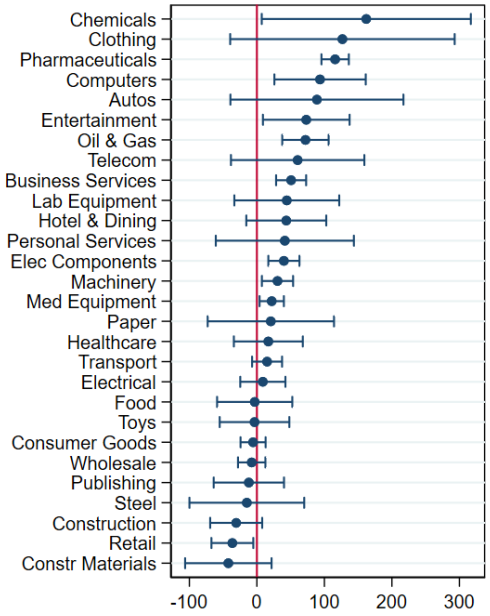
Notes: In each panel, a different measure of equity issuance is used for the Cash Short firms: the preferred measure but without netting out buybacks, the cash flow from stock sales, the change in book value of equity, and SDC equity issuance announcements. Other details are the same as Figure 3.

Figure 13: Decomposition of Cash Short Firms



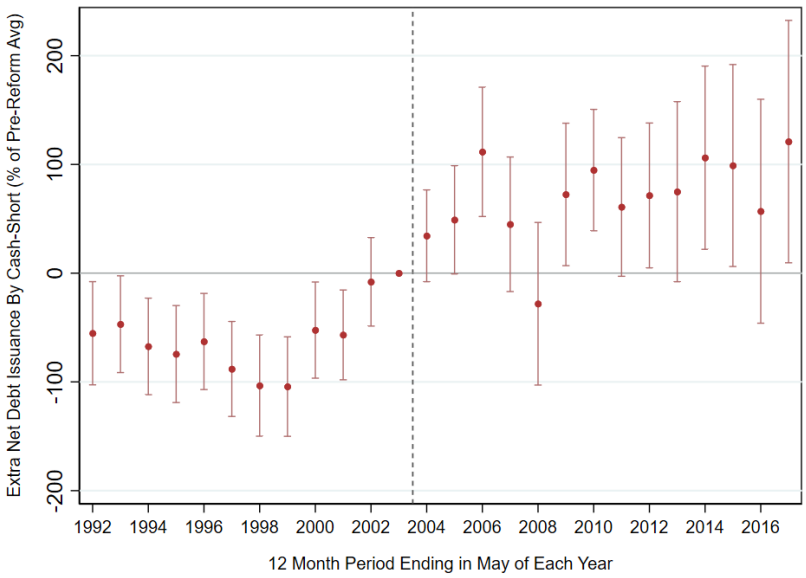
Notes: These reflect point estimates and confidence intervals for regressions as specified in Equation 6, but where separate regressions are run for each decomposition of the Cash Short group. The red corresponds to the bottom third of the Cash Short group by the given metric, the yellow the middle third, and the green the top third. Observations are scaled by pre-reform means of their respective groups, so that the point estimates can be interpreted as the p.p. increase of Cash Short firms over High M&A Issuers relative to their pre-reform means.

Figure 14: Responses Across Industries



Notes: Data points correspond to the point estimates for Equation 6, where the regression is run separately by industry for the Cash Short firms (the High M&A Issuers are kept as a group in each regression). Error bands are 95% confidence intervals with standard errors clustered by firm.

Figure 15: Net Debt Changes by Cash Short Firms



Notes: Changes in net debt are defined as long term issuance net of long term reductions, plus short term changes in net debt, all scaled by the previous two years of sales. Other details are the same as Figure 3.