Corporate Taxation and Investment

by

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ABSTRACT

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The three essays contained in this dissertation consider the effect of U.S. federal tax policy on the investment behaviors of large, publicly traded firms. Chapter 1 considers the effect bonus depreciation on physical capital investment. Chapter 2 tests whether dividend and capital gains taxation impact mergers and acquisitions, a special form of corporation investment. Chapter 3 documents and analyzes the business investment response to the Domestic Production Activities Deduction. In sum, the essays find that, over the last decade, corporate taxation and changes in corporate tax policies have had large impacts on the investment decisions of US corporations.

Chapter I: Does Corporate Governance Induce Earnings Management? Evidence from Bonus Depreciation and the Fiscal Cliff

Commonly-used corporate governance mechanisms can improve some aspects of managerial performance, but also encourage managers to focus on current financial statement earnings at the possible expense of long-run profits. This unintended effect is revealed by reactions to "bonus depreciation," a U.S. tax policy that encourages

investment by reducing the present value of tax liabilities without directly improving reported financial statement earnings. During the period 2000–2010, investment by better-governed firms responded less to bonus depreciation than did firms with less effective governance; for example, one percent greater managerial share ownership was associated with 22 percent less investment response to bonus depreciation. Similarly, share prices of poorly governed firms reacted most strongly to the surprise 2013 extension of bonus depreciation. Taken together, this evidence suggests that high-powered managerial incentives encourage earnings management behavior that is value-reducing in the context of bonus depreciation.

Chapter II: Dividend Taxation and Merger Behavior: A New View Explanation For The Post-Merger Performance Puzzle (with Nathan Seegert)

Mergers, on average, fail. A large literature in finance has documented this Post-Merger Performance Puzzle. The most regularly cited explanations for this empirical observation rely on managers making merger and acquisition (M&A) decisions based on personal hubris or empire building objectives. This paper proposes an alternative profit-maximizing explanation for merger "failures" in which dividend and capital gains taxation increases the cost of substitute investment opportunities. In this setting, "failed" mergers may be the result of profit-maximizing decisions. This theory is tested empirically using tax rate variation created by the 2003 Bush Tax Cuts. As the tax explanation would predict, long-run returns are 8 to 10 percent higher for dividend paying firms following the dividend tax rate drop. This theoretical explanation and empirical finding are especially significant given the enormous dollar value of M&A activity, which in the US between 2000 and 2012 amounted to over $12 trillion.

Chapter III: The Business Investment Response to the Domestic Production Activities Deduction

The Domestic Production Activities Deduction is a U.S. federal tax regulation that effectively lowers the corporate income tax rate on domestic manufacturing activities by 3.15%. By exploiting industry level variation in manufacturing activity, this paper analyzes the investment impact of the policy. Results indicate investment responds strongly to the policy – the average publicly traded firm increases investment as a percentage of installed capital by approximately 12% once the deduction is fully implemented. This large response suggests that the Domestic Production Activities Deduction, and more generally a drop in corporate income tax rates, is an investment stimulus policy far superior to other recent corporate tax incentives such as the Bush Tax Cuts and Bonus Depreciation.

CHAPTER I

Does Corporate Governance Induce Earnings Management? Evidence from Bonus Depreciation and the Fiscal Cliff

1.1 Introduction

Since Jensen and Meckling (1976), economists have understood that the actions of publicly traded corporations are greatly influenced by a separation of firm ownership and control. Shareholders, the owners of the firm, hire professional managers to control firm operations and make decisions on their behalf. This separation can give rise to a principal–agent problem if the objectives of the professional managers differ from those of the shareholders. These problems can be difficult to solve because shareholders cannot perfectly observe and evaluate the managers' decisions.

However, firm ownership can look towards corporate governance mechanisms, such as threat of takeover, discretionary payments, or equity packages, to align the objectives of the managers with their own. While strong corporate governance has the ability to align objectives and move the firm towards actions that are optimal for the shareholders, it may also generate an unintended and counterproductive side effect; strong corporate governance places pressure on managers to signal their value to shareholders by manipulating performance metrics that are easily observable to

shareholders.

Evidence indicates that in the corporate context there is a single most salient performance metric: "accounting earnings" or the bottom line number on a firm's income statement.[1] Because investors fixate on accounting earnings, managers facing strong corporate governance pressure are incentivized to manipulate accounting earnings possibly at the cost of long-term real economic benefits to the firm, a behavior known as "earnings management."[2]

The canonical example of earnings management behavior is the delay or cancellation of positive net present value investments because the project may adversely affect accounting earnings. In addition to investment, earnings management may distort firm financing and payout decisions, thereby depressing firm values and significantly impacting welfare for the economy as a whole.[3] Thus, while strong corporate governance may move the firm towards optimal behavior, it does so at the cost of increasing earnings management.

Despite the strong intuition, theoretical underpinnings, and anecdotal evidence that corporate governance induces earnings management, empirical analyses have not been able to confirm the hypothesis for two reasons. First, identifying instances in which managers choose to increase current accounting earnings by altering firm behavior is difficult. Second, levels of corporate governance and earnings management behavior are potentially simultaneously determined.

I rely on a corporate tax policy, "bonus depreciation," to address these issues and formally test whether corporate governance induces earnings management behavior.

[1]Publicly traded firms in the United States are required to prepare income statements under Generally Accepted Accounting Principles (GAAP). Audited income statements appear on firms' annual 10K financial reports.

[2]The accounting literature distinguishes two types of earnings management. Managers that manipulate discretionary information on financial statements, such as loan loss provisions, engage in "accruals management." Managers that alter firm behaviors to manipulate financial reporting engage in "real earnings management." In this research, I focus on the relationship between corporate governance and real earnings management.

[3]Stein (1989) shows that earnings management behavior can exist even in the context of efficient capital markets.

Bonus depreciation is a largely counter-cyclical corporate tax incentive that has been the primary investment stimulus tool in use in the US over the last decade. Bonus depreciation decreases the net present value cost of investment projects by accelerating the deduction for the costs of newly installed capital from taxable income.

While bonus depreciation effectively increases the economic value of investment projects, it leaves the accounting earnings associated with any potential project unchanged. Under Generally Accepted Accounting Principles (GAAP), the cost of new investments appears on the earnings statement only as the new capital investment is used up or economically depreciates over the life of the investment. Because the rate at which new capital economically depreciates is unaffected by tax depreciation rules, bonus depreciation does not affect the cost of investment on the earnings statement and therefore leaves accounting earnings unchanged.[4] This accounting treatment of bonus depreciation provides exogenous variation that can be used to identify earnings management behavior and test the governance hypothesis.

If managers seek to maximize only accounting earnings, then bonus depreciation has no effect on their objective function and does not alter their behavior. Alternatively, for managers that seek to maximize the economic value of the firm, bonus depreciation provides strong incentives for increased investment. The absence of response (or under-response)to the policy is evidence of earnings management. If the investment behavior of strongly governed firms is less responsive to bonus depreciation, then it can be interpreted as evidence that earnings management is a side effect of corporate governance practices. This research design avoids the simultaneity complications under the plausible assumption that corporate governance decisions are not made based on investment response to the tax policy.

Exploring heterogeneity of response among firms with varying levels of governance is exciting not only in that it may confirm earnings management as an unintended

[4]The discrepancy between the timing of expenses for tax and financial reporting purposes is recorded as the "temporary book-tax difference" on financial statements.

consequence of strong corporate governance but also from a tax policy perspective. Use of bonus depreciation and the design of the policy itself may have to be reconsidered in light of heterogeneous response especially considering the staggering magnitude of the policy: estimates suggest that in 2011 alone bonus depreciation stimulated approximately $50 billion in new investment.

1.1.1 Summary of the Paper

This paper makes contributions to the corporate finance literature on governance and the accounting literature on earnings management by extending models and empirical methods developed in the public finance literature to identify the effects of investment tax incentives. Section 1.2 reviews these literatures and several papers that have taken the first steps in addressing the corporate governance–earnings management connection. Additionally, in this section, I discuss the bonus depreciation tax policy as well as several papers that have addressed the impacts of the policy and the interaction of bonus depreciation with accounting rules.

Section 3.3 presents a formal model of investment response to tax policy when accounting earnings enter into the objective function. To test the connection between governance and earnings management, I embed governance into the model as a determinant of the extent to which the manager focuses on accounting earnings. The qualitative predictions of the model are (1) investment response to bonus depreciation is weaker when the manager is more focused on accounting earnings and (2) if governance increases accounting earnings focus, then the the most strongly governed firms will be the least responsive to the policy. To formally test the relationship between governance and earnings management, I impose functional form assumptions on the model and derive a linear equation, the parameters of which can be estimated by OLS regression. The linear estimating equation describes investment as a function of firm governance, a tax term describing bonus depreciation incentives, and the inter-

action of the two along with marginal Q to control for the value of investment. From the model's estimates, the parameter describing the relationship between corporate governance and earnings management can be recovered.

In Section 3.4, I detail the data sources and construction of key variables used in the analysis. I focus on two governance measures. The first follows Gompers, Ishii and Metrick (2003) in summarizing the corporate provisions that insulate managers from shareholder discipline contained in the Investor Responsibility Research Center (IRRC) database. The second is the percentage of equity held by the top executive as originally examined by Jensen and Murphy (1990) and more recently utilized in Chetty and Saez (2005). I construct a variable which captures bonus depreciation incentives based on the types and proportions of capital that different industries purchase following Cummins, Hassett and Hubbard (1994). Bonus depreciation most impacts industries that invest in long-lived assets. The dependent variable, new investment as a percentage of installed capital is easily observed in the Standard and Poor's COMPUSTAT database.

Section 1.5 discusses the identification of the model. With industry and year fixed effects, the effect of the tax policy is identified from variation in how strongly bonus depreciation affects different industries. Because there is not a significant amount of within-firm variation in the governance term, the interaction term is identified from how changes in the tax policy differentially affect firms across mean levels of governance.

Section 1.6 estimates the parameters of the formal model. Results indicate that, consistent with the corporate governance–earnings management hypothesis, investment response to bonus depreciation is concentrated among firms with weaker governance structures. Estimated parameters show a one standard deviation increase in governance increases accounting earnings focus by 26% relative to the least earnings-focused firms. When equity incentives are considered, a 1% increase in managerial

equity holdings increases earnings focus by 22%.

The estimated results of the formal model are reinforced and expanded in Section 1.7, which examines stock market returns following the extension of the bonus depreciation in the American Taxpayer Relief Act of 2012, the legislation which partially resolved the "fiscal cliff." Stock returns immediately following the surprise extension of the tax policy are higher for firms which stood to gain more from bonus depreciation and still higher for firms with low governance levels. I argue that in light of the investment response results, strong corporate governance structures, which increase earnings focus and therefore limit investment response to the tax policy, are value-decreasing in the context of bonus depreciation.

Section 1.8 concludes and discusses the implications of the empirical results for corporate governance and tax policy design. If shareholders have understood that strong corporate governance causes earnings management behavior then this concern could be driving the trend toward managerial entrenchment observed in the governance data. If, on the other hand, shareholders have not taken into account the unintended earnings management side effects of strong governance, then governance levels may be higher than optimal. That the firms with the lowest levels of governance and therefore most likely to suffer from principal–agent problems are the most responsive is concerning. Firms with severe principal–agent problems are most likely to make inefficient investment, finance, and payout decisions. The policy is particularly inefficient if it is only driving investment response among the least efficient firms. However, the heterogeneous response also suggests that private firms which do not have earnings management concerns will be even more responsive to the policy than the publicly traded firms examined here. This implication suggests the policy is more effective in stimulating investment than previously believed.

1.2 Related Literature

1.2.1 Corporate Governance

Since the 1970's, an active literature has developed that addresses the role of corporate governance in solving principal–agent problems of the firm. The first papers in the literature detailed how the separation of ownership and control within the firm affects firm behavior. Jensen and Meckling (1976) examined the impact of the agency problem on the method of finance. Grossman and Hart (1980) described its effects on takeover bids. Easterbrook (1984) formalized how dividend policy was altered in an agency setting. Later research examined possible solutions to these agency problems. Jensen (1986) suggested that the use of debt financing may discipline suboptimal investment behavior arising from abuse of free cash flows by self-interested managers. Shleifer and Vishny (1986) argued that large minority shareholder can overcome freeriding problems in effective monitoring of management and thereby mitigate agency problems. Jensen and Murphy (1990) empirically explored pay-for-performance incentives and their ability to align the incentives of top executives with those of the owners. The general conclusions of these studies were that agency costs were high and various governance mechanisms such as debt financing, strong monitoring, and incentive pay can and should be increased.

More recent empirical evidence has reinforced these conclusions. Bertrand and Mullainathan (2003) used exogenous decreases in corporate takeover probability to show that when managers are less subject to the threat of takeover, they prefer to "live the quiet life" and decrease effort-intensive investment behavior. Gompers et al. (2003) combined 24 governance provisions into an index that proxies for the strength of shareholder rights and found that equity returns for firms in the top decile of the index are larger than for firms in the bottom decile, suggesting that, over time, firms with better corporate governance perform better. Bebchuk, Cohen

and Ferrell (2009) reduced the Gompers et al. (2003) index to the six provisions that truly matter from a legal perspective and found that Tobin's Q, a measure of firm performance, monotonically decreases when managers are subject to less strict shareholder governance. [5]

While the majority of empirical results have highlighted the benefits of stronger governance, Jensen (2004) suggested that equity incentives may lead to unintended, counterproductive consequences. Jensen (2004) considered the effect of high managerial equity incentives when analysts project high earnings and stock prices are overvalued. Overvaluation places pressure on managers to increase accounting earnings often at the cost of real economic value. Jensen pointed out that the pressure to engage in earnings management behaviors to artificially inflate earnings to hit targets increases as management owns a larger portion of outstanding equity.

1.2.2 Earnings Management

Healy and Wahlen (1999) defined earnings management as "when managers use judgment in financial reporting to alter financial reports to either mislead stakeholders about the underlying economics performance of the company, or to influence contractual outcomes that depend on reported numbers." In their review they conclude that empirical evidence is consistent with firms altering financial statements via discretionary accountings of loan loss provisions and abnormal accruals prior to public securities offerings, to avoid violating contracts and increase corporate managers' compensation and job security (For an additional review of the earnings management literature, see Dechow and Skinner (2000)). In short, managers alter earnings by the use of discretionary accounting exactly when earnings mean the most to the firm.

While discretionary accounting may mislead investors, a more concerning type of earnings management is detailed in survey evidence by Graham, Harvey and Rajgopal

[5] I will make use of both the Gompers et al. (2003) "G Index" and the Bebchuk et al. (2009) "Entrenchment Index" in the empirical analysis presented in Section 1.6 and Section 1.7.

(2005). The authors survey more than 400 corporate financial executives on the relationship between equity performance and real business decisions. The responses show that the majority of financial managers believe the key metric in evaluating firms' performance is earnings (especially earnings per share), not cash flows. Additionally, they find the majority of respondents would not initiate a positive net present value project if it meant falling short of the current quarters' earnings projection and would give up economic value in exchange for smooth earnings performance. The respondents described a general trade-off between the need to "deliver earnings" and the making of long-run value-maximizing decisions. This survey evidence suggests not only that managers might use discretionary accounting practices to mislead shareholders, but also that they are pressured to distort real firm behaviors in order to manipulate short term accounting earnings. If the need to deliver accounting earnings affects real business decisions, then earnings management behaviors may have significant consequences for the long-run firm values and by extension for the economy as a whole.

Empirical evidence from the stock market supports the beliefs and actions of the corporate managers included in the survey. Sloan (1996) investigated the relationship between stock prices and movement in different financial indicators. He found that stock prices move in patterns that suggest that investors "fixate" on accounting earnings; stock prices do not reflect information contained in accruals or cash flows that impact only future earnings. Given this fixation on accounting earnings relative to other measures of future profitability, it is not surprising that corporate managers manipulate earnings via changes in discretionary accruals and long-run profit-maximizing behavior.

Erickson, Hanlon and Maydew (2004) provided an example of firms sacrificing real economic value to increase accounting earnings. They examined a sample of 27 firms that paid a total of $320 million dollars of real cash taxes on earnings that were

later alleged to be fraudulent. Shackleford, Slemrod and Sallee (2011) noted several other empirical explorations of real earnings management behavior and have taken the first steps towards modeling a firm that alters real economic activity to maximize a function of accounting earnings.

1.2.3 Governance and Earnings Management

Stein (1989) suggested that earnings management can exist in an efficient capital market and may be a function of governance. Stein suggests that short-run earnings manipulation at the cost of long-run real economic benefits can be viewed as the Nash Equilibrium outcome of a game between managers and the stock market. To induce the market to predict higher future earnings, managers engage in costly behaviors to improve short-term accounting earnings. In equilibrium, the market is not fooled by the enhanced short-run earnings, but the behavior persists because deviating from the equilibrium is strictly dominated from the perspective of the manager. Furthermore, the weight the manager places on short-term accounting earnings *increases* in the threat of takeover and the proportion of managerial compensation that is derived from equity incentives: two governance mechanisms. Crucially, as corporate governance measures are increased, the incentives for unintended counter-productive earnings management behavior are stronger.

A limited empirical literature has tested theories related to the Stein (1989) hypothesis that corporate governance increases focus on short-run accounting earnings. Meulbroek, Mitchell, Mulherin, Netter and Poulsen (1990) tested this hypothesis by examining research and development activity, a behavior which reduces short-term earnings but may lead to increased future profits. They found that anti-takeover measures reduce R & D spending, an empirical result that contradicts Stein's model but may be driven by the "quiet life" theory of governance addressed in Bertrand and Mullainathan (2003). More recent evidence also contradicts Stein's hypothesis.

Klein (2002) found that when audit committees or boards are independent of executive management, abnormal accruals are smaller. Xie, Davidson III and DaDalt (2003) and Zhao and Chen (2008) find that audit committee expertise in accounting, the frequency at which the board and audit committees meet, and staggered boards, another takeover defense, all decrease use of discretionary accruals.

1.2.4 Investment and Taxation

To test for earnings management behavior, I will rely on the theoretical and empirical tools developed to explore the impact of tax policy on investment behavior. Summers (1981), Poterba and Summers (1985), and Desai and Goolsbee (2004) built on the seminal Hall and Jorgenson (1967) paper and estimate models which measure investment as a function of marginal Q and a term that combines corporate income taxation, investment tax credits, the rate of tax depreciation, interest rates, and real rates of economic depreciation into a single "user cost of capital" measure. I utilize a modified user cost model to test the relationship between corporate governance and earnings management behavior.

1.2.5 Accelerated and Bonus Depreciation

When a firm invests in new capital, it can deduct the purchase price of the investment from its taxable income, thereby reducing its tax bill. In most cases, the firm cannot deduct the entire amount immediately. Under US law, the schedule of depreciation deductions is specified by the Modified Accelerated Cost Recovery System (MACRS). For each type of property, MACRS specifies a recovery period and a depreciation method that specifies how quickly and over what time frame the purchase price is to be deducted. When the rate of depreciation for tax purposes is faster than the true rate of economic depreciation on capital investments, depreciation is

said to be "accelerated."[6] Accelerated depreciation decreases the user cost of capital and effectively creates a tax subsidy on new equipment purchases.[7] While the US Government has used accelerated depreciation to encourage investment for more than 50 years, it has only recently employed the policy in a counter-cyclical manner (Gravelle (2013)).[8] "Bonus depreciation," the counter-cyclical manifestation of accelerated depreciation, is unique in its magnitude and its temporary nature. Under bonus depreciation, businesses can write off a specified percentage of new purchases immediately, thereby further accelerating depreciation and increasing the investment tax subsidy. Bonus depreciation was used to combat both the 2001 and the 2008 recessions and has been the primary tool used to stimulate business investment during the last decade. The White House estimates that bonus depreciation saved businesses approximately 55 billion present value dollars in corporate income taxes in each of the years 2010 and 2011.[9]

Much evidence suggests that business investment does respond to bonus depreciation, although as noted by House and Shapiro (2008), investment elasticity estimates are surprisingly small, given the temporary nature of the policy. The authors note that with price elasticity of supply and adjustment costs equal to zero, the elasticity of investment with respect to the changes in investment cost via temporary bonus depreciation should be infinite. Finding limited investment and supply price response, House and Shapiro conclude that convex adjustment costs within the firm must mute the investment response.

[6]The "true" rate of economic depreciation is how quickly the new capital actually deteriorates or is "used up."

[7]In order for bonus depreciation to decrease NPV costs of investment, the firm must have positive taxable income. Heterogeneous response by firms with different tax statuses is examined in Appendix 1.9.10. Results continue to exhibit strong heterogeneous investment response across governance levels.

[8]In 1954, depreciation rules were liberalized explicitly"to maintain the present high level of investment in plant and equipment" (Senate Finance Committee, quoted in Brazell, Dworin and Walsh (1989)). Legislation has changed the depreciation rules several times since then, but the intention to encourage investment through accelerated depreciation has persisted.

[9]In 2010, businesses could immediately deduct 50% of the cost of new investments; in 2011, 100%. When all equipment is immediately fully deductible, it is known as "expensing."

The notion that bonus depreciation can identify earnings management behavior and can used to test for the relationship between corporate governance and earnings management began with Neubig (2006), which suggested an alternative explanation for the tempered investment response to the policy. Neubig pointed out that, due to GAAP, bonus depreciation does not affect accounting earnings. If firms, as the earnings literature suggests, seek to maximize accounting earnings as opposed to net present value of cash flows (real economic value), their investment behavior will be unresponsive to bonus depreciation. Therefore, unresponsiveness in the face of the policy is evidence of earnings management behavior; firms focusing on accounting earnings do not increase investment despite a substantial subsidy.

Edgerton (2012) formalized Neubig's intuitive and elegant explanation for the relatively small elasticity and constructed a model of a firm that focuses attention on both true economic value and accounting earnings. By observing investment responses to different types of investment tax incentives that both do and do not affect accounting earnings, Edgerton estimateed that the average firm focuses 45% of their attention on accounting earnings and 55% of their attention on cash flows when making investment decisions.[10]

1.3 Modeling Governance and Investment Response to Bonus Depreciation

In this section, I build governance into the formal model of investment behavior presented in Edgerton (2012), in which managers make investment decisions to maximize a weighted sum of cash flows and accounting earnings. The key innovation of the model is that the weight placed on accounting earnings is a function of the strength of governance faced by management. The formal model generates a linear estimating

[10] Also see Edgerton (2012) for a comprehensive explanation and examples of how and why bonus depreciation effectively decreases net present value but leaves the accounting earnings associated with any given investment project unchanged.

equation that embodies the intuitive prediction that managers under strong corporate governance face high pressure to maximize accounting earnings and are therefore less responsive to bonus depreciation.

1.3.1 Model Preliminaries

Firms maximize a weighted average of their current and future present value net-of-tax cash flows (CF_t) and their accounting earnings (AE_t). Investment is financed using retained earnings.[11] The definition of cash flows is

$$CF_t = (1-\tau)[F(K_t) - p\psi(I_t, K_t)] + \tau\delta^T K_t^T - pI_t,$$

where τ is the corporate tax rate and p is the unit price of capital. $F(\cdot)$ is the net operating income function and is a function of K_t, the firm's capital stock. $\psi(\cdot)$ is the adjustment cost of investment, which is a function of I_t, investment, and capital stock. The firm's capital stock evolves according to the law of motion,

$$\dot{K}_t = I_t - \delta K_t \tag{1.1}$$

where δ is the real depreciation rate of the capital stock.[12] The cost of new investment, I_t, is pI_t.[13,14]

[11]The model can be extended to include debt finance with relative ease. Investment policy is identical when the firm invests with retained earnings or a combination of retained earnings and debt.

[12]This law of motion formulation assumes geometric capital stock depreciation. In reality, capital stock may depreciate at non-geometric patterns. This assumption is made for mathematic simplicity and does substantively influence the predictions of the model.

[13]If investment tax credits were offered, the investment would generate investment tax credits of pI_tITC. These credits would enter into accounting earnings identically and, therefore, investment response to ITCs will not be a function of α.

[14]The model abstracts from investment tax credits (ITCs) because they are not available to businesses during the estimation period. However, ITCs can be easily incorporated into the model. ITCs affect both cash flows and accounting earnings identically and therefore investment response to investment tax credits does not depend on α or determinants of α. This observation provides another test that the observed empirical findings are generated by the accounting treatment of bonus depreciation and is evidence of earnings management behavior. If investment response to ITCs

In addition to investment tax credits, the depreciation deductions permitted for tax purposes enter into the cash flow definition and may encourage investment behavior. These deductions are a function of the stock of the firm's past capital expenditures that have not been depreciated for tax purposes, K_t^T, and the statutory tax rate of depreciation, δ^T. I will refer to K_t^T as the "tax capital" of the firm. Tax capital evolves according to the law of motion,

$$\dot{K_t^T} = pI_t - \delta^T K_t^T. \tag{1.2}$$

The tax savings afforded by these deductions appears in the cash flows equation as $\tau\delta^T K_t^T$. The policy parameter δ^T determines the extent to which depreciation is accelerated for tax purposes and embodies the bonus depreciation policy.[15]

The firm's accounting earnings are defined as

$$AE_t = (1-\tau)[F(K_t) - p\psi(I_t, K_t) - \delta^B K_t^B].$$

Revenues $F(K_t)$ and adjustment costs $p\psi(I_t, K_t)$ enter into both after-tax cash flows and accounting earnings identically. However, the cost of investment, pI_t, and cash tax savings, $\tau\delta^T K_t^T$, do not appear in the accounting earnings equation at all. Instead,

is not heterogeneous across governance levels then evidence of the corporate governance–earnings management is reinforced.

Unfortunately, ITCs were last used in 1985 and corporate governance data is not available prior to 1991, so tests of this secondary hypothesis are challenging. However, in Appendix 1.9.12, I use 1991 governance data in an attempt to measure the degree of heterogeneous investment response to both ITCs and depreciation tax allowances in years surrounding the ITC repeal. The analysis finds no heterogeneity of response across governance levels to the ITC repeal. The absence of heterogeneity could be the result of either changes in within-firm governance between years 1985 and 1991 or support of the ITC hypothesis. The analysis presented in Robustenss Check 1.9.12 also finds no differences in investment response to changes in tax depreciation allowances. Again, this could be due to the poor measurement of mid 1980s governance using 1991 data. Alternatively, this result could be due to the fact that changes in depreciation were not nearly as salient as changes in bonus depreciation and were not the preeminent investment tax stimulus used during the 1980s, which were investment tax credits.

[15]This parameter is also assumed to be constant, and thus tax depreciation allowances are assumed to decline at a geometric rate. In reality, this is not the case. However, this abstraction does not substantively alter the predictions of the theory.

there appears a book measure of depreciation deductions, $\delta^B K_t^B$, and their associated tax savings, $\tau\delta^B K_t^B$. The cost of new investment only depresses accounting earnings as the capital depreciates for book purposes. Book capital evolves according to its own law of motion,

$$\dot{K_t^B} = pI_t - \delta^B K_t^B. \tag{1.3}$$

Thus, bonus depreciation, which increases δ^T and decreases the cash flow cost of investment, does not alter accounting earnings.

I assume the firm places a weight α on book earnings (BE) and a weight $(1-\alpha)$ on after-tax cash flows (CF) when choosing its investment. The firms solves

$$\max_{I_t, B_t} \int_0^\infty e^{-rt}[\alpha AE_t + (1-\alpha)CF_t]$$

subject to constraints (1), (2), (3), and (4).[16]

1.3.2 Corporate Governance and Book Earnings

To introduce the role of governance in earnings management behavior, I model the weight placed on accounting earnings, α, as a function of the governance in the

[16]The model and by extension the following empirical analysis does not consider the possible anticipatory effects of the policy; managers make investment decisions in response to contemporaneous depreciation tax policies. Of course, managers who place a positive weight on cash flows and anticipate the introduction of, or increase in, bonus depreciation would decrease current investment at low bonus levels and increase future investment at high bonus levels. If managers anticipate future decreases in bonus depreciation, they would act in reverse.

Anticipatory effects may impact estimates of the over-all effect of the policy on investment. The policy may look more effective than it if changes in the policy were impossible to predict and lasted indefinitely. However, anticipation should not affect the empirical test of the corporate governance–earnings management hypothesis. If information about the policy is uniform across different levels of governance, as is most plausible, then both low governance and high governance firms will change investment behavior in anticipation of policy changes in the same way and the anticipatory effects will be "differenced out."

firm, G,[17]

$$\alpha = f(G).$$

By taking the firm's first order condition with respect to investment and totally differentiating, I can solve for the derivative of investment with respect to tax depreciation allowances.[18]

$$\frac{\partial I}{\partial z^T} = [1 - f(G)]\frac{\tau}{1-\tau}\frac{1}{\psi_{II}}$$

where z^T, a transformation of δ^T, is the present value of future depreciation allowances for tax purposes.[19] When bonus depreciation is introduced or increased and tax depreciation allowances are accelerated, z^T increases. ψ_{II} is the second derivative of the adjustment cost function with respect to investment. The investment response to the bonus depreciation decreases as more weight is placed on accounting earnings. If $f(G)$ is an increasing function of G, then investment response to bonus depreciation decreases as the firm is more heavily governed.

1.3.3 Estimation

I approximate $f(\cdot)$ as a linear function,

$$\alpha = \gamma_G G, \tag{1.4}$$

[17] In Stein (1989), the manager makes a slightly different trade-off: short-run accounting earnings at the expense of long-run accounting earnings. This model is reconciled with Stein's trade-off by recognizing that investment increases long-run cash flows at the expense of long-run cash flows. When managers are more accounting earnings focused, they are less willing to make this trade-off and long-run firm value suffers as a consequence.

[18] The derivation of this condition is contained in Appendix 1.9.1.

[19] See Robustenss Check 1.9.1 for more details.

where γ_G defines how governance affects the accounting focus parameter α. Under the assumption of quadratic adjustment costs,[20] the investment ratio may be expressed as a linear function,

$$\frac{I_0}{K_0} = a + c\frac{\frac{\lambda_0}{p_0} - 1}{1-\tau} + c\frac{\tau z^T}{1-\tau} - c\frac{\gamma_G G \tau z^T}{1-\tau} + c\frac{(1-\tau z^B)\gamma_G G}{1-\tau},$$

which can be estimated using ordinary least squares regression of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1\frac{\tau z_{it}^T}{1-\tau_t} + \beta_2\frac{G_{it}}{1-\tau_t} + \beta_3\frac{G_{it}\tau z_{it}^T}{1-\tau_t} + \beta_4\frac{\frac{\lambda_{it}}{p_{it}}}{1-\tau_t} + \epsilon_{it}.$$

During the sample period that I examine, the corporate income tax rate τ does not change. Under these conditions, I can drop the corporate tax rates from the estimating equation and estimate

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{jt}^T + \beta_2 G_{it} + \beta_3 G_{it} z_{jt}^T + \beta_4\frac{\lambda_{it}}{p_{it}} + \epsilon_{it}. \tag{1.5}$$

The regression equation contains a tax term that describes the impact of the bonus depreciation z^T, a governance term, G, and their interaction as well as marginal Q (λ_{it}/p_{it}). In order to account for firm-level unobserved determinants of investment behavior and the endogenity of tax policy, I add firm and year fixed effects to the regression.

Estimates from this linear regression can be used to test the corporate governance–earnings management hypothesis. From (5), γ_G defines the relationship between governance and accounting earnings focus. This parameter of interest can be constructed

[20] The canonical quadratic adjustment equation employed by Desai and Goolsbee (2004) and others is

$$\psi(I_t, K_t) = \frac{1}{2c}\left[\frac{I_t}{K_t} - a\right]^2 K_t,$$

where c is an adjustment cost parameter.

by taking a ratio of coefficients from the regression, $\gamma_G = -\beta_3/\beta_1$. In intuitive terms, β_1 is the response by firms with a "zero" level of governance. β_3 is the amount that the β_1 coefficient changes when an additional unit of governance is added. It follows that γ_G is the fraction that the investment response decreases when governance increases by one unit relative to the response of the "zero" governance firms.

If γ_G is estimated to be positive, investment response to bonus depreciation is decreasing in the corporate governance measure, and empirical evidence indicates that the weight placed on accounting earnings is larger at higher levels of corporate governance. This result would strongly support the hypothesis that corporate governance induces earnings management behavior consistent with the evidence presented in Section 1.2.[21]

1.3.4 Endogenous α

One simple and plausible extension of the model would allow α to be a function of depreciation tax benefits in addition to governance. The logic behind this assumption is that managers, knowing that accounting earnings do not reflect the tax benefits of accelerated depreciation, may shift their focus towards cash flows when bonus depreciation is enacted or increased to better take advantage of the policy. With this extension, investment response to depreciation tax incentives would be positive, but would decrease more slowly in the level of governance. Thus, if α is a function of depreciation tax allowances, then the estimated γ_G from equation (1.5) would underestimate the impact of governance on the accounting earnings weight α.

[21] The investment equation implies that changes in marginal Q (λ/p) should have the same impact on the investment ratio as the Z Tax Term. Unfortunately, because proxies for marginal Q are often mismeasured, this result is typically not present in Q-theory empirical studies. See Cummins et al. (1994) and Cummins, Hassett and Oliner (2006) for potential solutions to the mismeasurement problem.

1.4 Data Construction and Descriptive Statistics

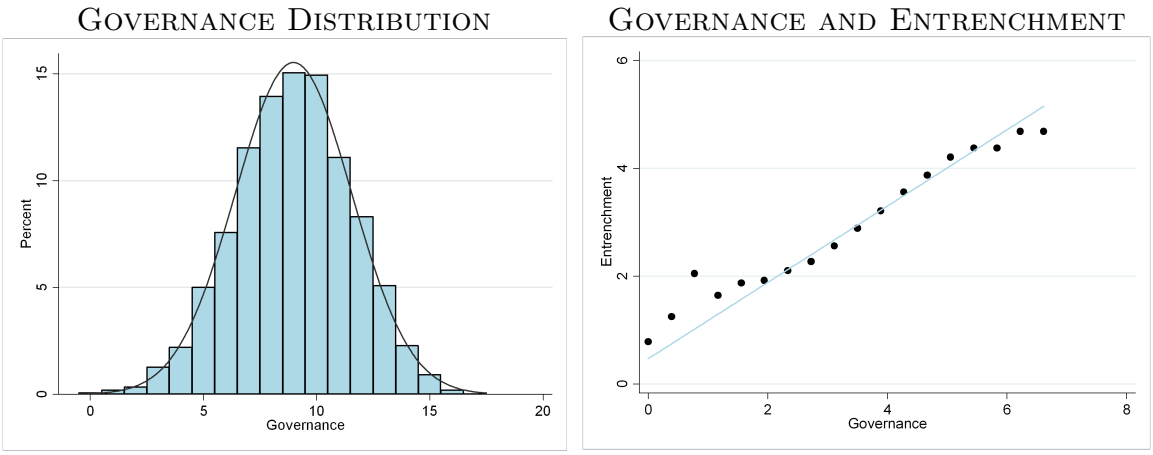
In order to examine the investment response to bonus depreciation across firms with different levels of corporate governance, I collect data from the RiskMetrics Governance Legacy Database, from the Standard and Poor's Execucomp database, from Internal Revenue Service documentation, from Bureau of Economic Analysis Capital Flows tables, and from Standard and Poor's Compustat CRSP combined database. The remainder of this section outlines the construction, measurement, and descriptive statistics of key variables.

1.4.1 Governance Index

Following Gompers et al. (2003), I construct a firm level measure of governance based on the 24 governance provisions contained in the RiskMetrics Governance Legacy Database. The majority of provisions recorded by Riskmetrics protect the manager from disciplinary actions on the part of the shareholders or protect the firm from takeovers. Gompers et al. (2003) construct a "G Index" in a simple, straightforward manner: for every firm, a point is added for every provision that restricts shareholder rights. I transform the "G Index" in an effort to make its interpretation more intuitive. To construct the "Governance" variable that I will use in the empirical analysis, I subtract "G Index" for each firm and year from the maximum "G Index" observed in the data.

The transformed "Governance" variable has the advantage over the "G Index" that it is increasing in proportion to the level of governance placed on the manager by the shareholders of the firm. A one point increase in the Governance variable means that the firm has one fewer provision in place to protect managers from shareholder discipline. For further ease of interpretation, I scale Governance by its standard deviation over the sample period, so that a one point increase in the standardized variable corresponds to a one standard deviation increase in governance relative to

Figure 1.1: Distribution and Covariance of Governance Variable



Notes: Figure 1 presents a histogram of the Governance variable overlaid with a normal distribution. Figure 2 presents the linear fit relationship between the Government and Entrenchment variables as well as a binned scatter plot of their relationship. The Governance variable is split into 17 equal-sized bins. For each bin, the average Entrenchment is plotted. The linear fit is predicted over unbinned data.

the average level of governance observed in the data.[22][23]

Bebchuk et al. (2009) constructed an "Entrenchment Index" from 6 of the original 24 provisions that they found most important from a legal and operational standpoint.[24] I transform and scale their index in the same manner as the "G Index" to create "Entrenchment." I use this measure as a robustness check in Appendix 1.9.4 and in the fiscal cliff analysis because data necessary to construct the Governance variable are unavailable.

Figure 1 presents a histogram of the Governance variable overlaid with a normal distribution. The governance variable is normally distributed with a median value of

[22]The G Index is available only for years 2000, 2002, 2004, and 2006. The Governance variable for years 2001, 2003, and 2005 is imputed as the value of the G Index for the previous year. The Governance variable for years 2007–2010 is constructed from the 2006 G Index. Appendix 1.9.5 presents several robustness checks to confirm that this simple imputation does not strongly influence empirical results. As Gompers et al. (2003) noted, there is little within-firm change in the index over time, so it is unsurprising that these checks do not strongly influence results.

[23]Data on corporate governance provisions has been collected by RiskMetrics for years 2007 to 2011. However, these data do not contain the full swath of provisions examined in Gompers et al. (2003) and thus the exact G Index cannot be constructed for these years.

[24]The Entrenchment Index focuses on 6 provisions: (1) Staggered Board, (2) supermajority to approve mergers, (3) limited ability to amend charter, (4) limited ability to amend bylaws, (5) poison pill, and (6) golden parachute.

9 and standard deviation of 2.557. Figure 2 compares Governance and Entrenchment across firms. The figure confirms that firms with high Governance measures, on average, have high Entrenchment measures of corporate governance.

1.4.2 Managerial Equity Percentage, "Shares"

The third measure of governance that I consider is the percentage of total shares held by the firm's highest-paid executive, which I label "Shares." I use this measure for two reasons. First, it is used in other papers, making my results comparable to an earlier literature. Second, results from Jensen and Murphy (1990) suggest that fractional ownership is a close proxy for pay–performance sensitivity for CEOs with non-negligible stockholdings. I follow Chetty and Saez (2005) in constructing this measure using the following method: (1) for each firm, the top executives are ordered by total compensation, then (2) the shares owned by highest-paid executive are divided by the total shares of the firm to find the percentage of the firm held by the top executive.[25] Shares owned by the executive is defined as the number "shares owned excluding options" plus the "number of shares vested" plus the "number of unexercised exercisable options."[26,27]

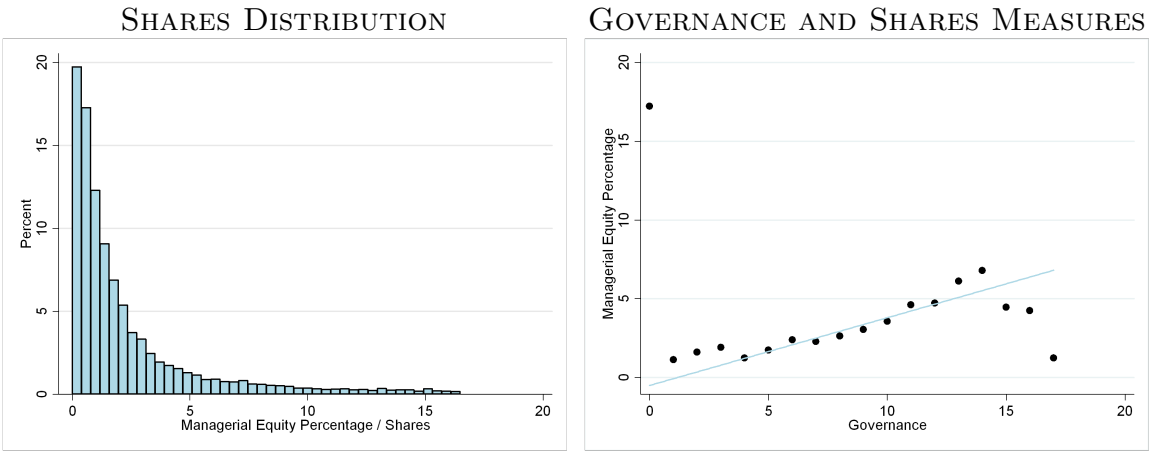
Figure 4 presents the relationship between Governance and Shares. The figure provides interesting insight into the use of governance provisions versus equity incentives to generate corporate control. Over the majority of governance measures, excluding the extremes, there is a strong positive linear relationship between the Governance

[25]Managerial equity percentage is only determined correctly using this method if the highest-paid executive is the manager. Empirically and anecdotally, this seems to be an accurate assumption.

[26]Due to reporting error, I observe 16 firm-year observations in which the"Shares" variable is greater than 100%. These observations are excluded from the analysis.

[27]Data on both managerial equity percentage and shareholder governance covers only approximately one-third of the companies listed in the Compustat CRSP Combined Database. The firms for which the data are available are not a random sample of publicly traded firms; Execucomp and Governance Legacy tend to cover only larger firms (Fortune 1500 firms). These large firms do the lion's share of investment, and thus the empirical results describe the majority of investment behavior by publicly traded firms. The applicability of the empirical results to the universe of publicly traded firms depends on how much the largest firms resemble and act like other publicly traded entities.

Figure 1.2: Distribution and Covariance of Shares Variable



Note: Figure 4 presents the linear fit relationship between Shares and Governance as well as the binned scatter plot of their relationship. The Governance variable is split into 20 equal-sized bins. For each bin, the average of the Shares variable is plotted. The linear fit is predicted over unbinned data.

variable and the managerial equity percentage. This suggests that for the majority of firms, governance provisions and equity incentives are complements in generating corporate control. The empirical analysis will consider investment response as a function of both measures of governance. Figure 4 suggests results should be similar, as Shares is a proxy for Governance and vice versa for the majority of firms.

However, for firms with very low levels of governance, managerial equity percentage is relatively high, in contrast to the overall positive relationship. The high managerial equity percentages suggest that relatively low-governance firms may have owner-managers, those who own a large voting block of shares and are also the firm's highest-paid employee. The owner-managers may at low cost insulate themselves from discipline or takeover from other shareholders via provisions. As a result, one might expect owner-managers to work at firms with low governance. For these owner-managers, principal–agent problems may not exist and predictions about earnings management and investment response to bonus depreciation may not be accurate. The visual evidence suggests that analysis should be limited to smaller values of managerial equity percentage in an effort to exclude owner-managers from the anal-

ysis.

The highest levels of governance do not correspond to high levels of managerial equity percentage. This suggests that, while over the majority of the governance distribution equity, incentives may be a complement to governance, at the highest levels of governance, where salaries are at the discretion of shareholders and the management is subject to takeover, equity incentives may be redundant in providing discipline.

1.4.3 Z Tax Term

Investment tax policy during this period affected only the present value of tax depreciation allowances, which I will label the "Z Tax Term."

$$z_t = b_t + (1 - b_t) \sum_{i=1}^{\infty} \frac{d_i}{(1+r)^i}$$

where z_t is the present value of tax depreciation allowances on \$1 of investment. It is composed of MACRS statutory depreciation allowances d_i and bonus depreciation b_t.

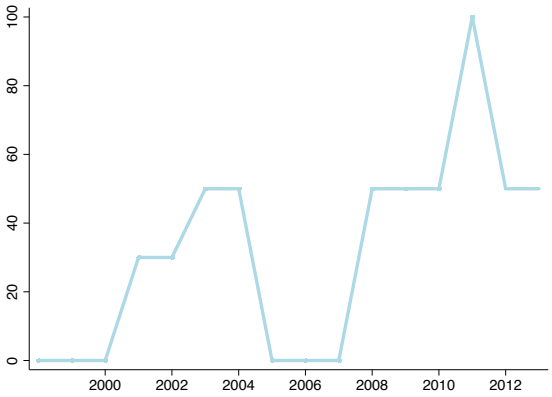
The Z Tax Term varies both over time and across different types of assets. Variation over time and within asset types is driven by "bonus depreciation" legislation.[28] The policy generally applies to all property with MACRS depreciation schedules of less than 20 years. Table 1 and Figure 5 display the bonus depreciation rates during the years 2000 to 2012.Variation in the Z Tax Term across asset types is driven by differences in tax depreciation rates and recovery periods for different types of capital. [29]

[28]Items of legislation that include bonus depreciation and their effect on the level of bonus depreciation are detailed in Appendix 1.9.3.

[29]IRS Publication 946 details how different types of assets may be depreciated. Assets may be depreciated using either the straight line method or the double declining balance method. Within each method, a recovery time period of 5 through 35 years may be applied. Generally, investment assets that have a longer service life must be recovered over a longer time period. Longer recovery results in lower present value of tax depreciation allowances. Both the system and length of recovery are specified for each type of investment in the IRS publication. For an extended discussion of the MACRS, see House and Shapiro (2008).

Figure 1.3: Available Bonus Percentage 2000-2013

For Qualifying Assets Purchased		Bonus
After	Before	
09/10/2001	05/06/2003	30%
05/05/2003	01/01/2005	50%
12/31/2004	01/01/2008	0%
12/31/2007	09/09/2010	50%
09/08/2010	01/01/2010	100%
12/31/2011	01/01/2013	50%



Ideally, firm-level investment data by asset type for each year would be available and a firm-specific weighted tax depreciation rate and Z Tax Term could be constructed. Unfortunately, firm-level data on investment by asset types are not available. In lieu of micro-level tax depreciation rates, I follow Cummins et al. (1994) and Desai and Goolsbee (2004) and construct industry-level present value tax depreciation rates using the Capital Flows table from the Bureau of Economics Analysis, which records industry-level investment by asset types.[30]

To construct industry-level rates, I (1) construct present value tax depreciation rates for each asset type in the BEA table. (2) For each industry, I weight the asset-level depreciation rates by the amount of investment made by each asset category for each industry. The industry-level BEA rates are matched to firms using the NAICS classification system. The industry-level tax depreciation rates are constructed only for equipment.[31] Once the present values of tax depreciation allowances are con-

[30]The BEA classifies investment into 51 categories; 28 are equipment and 23 are structures. Equipment categories include Computers and Peripheral Equipment, Mining and Oilfield Machinery, and Autos. Structures categories include Industrial Buildings, Residential Buildings, and Farm Nonresidential Structures. The BEA classifies firms into 123 industries which can be matched to 3-digit NAICS codes.

[31]Bonus depreciation cannot be applied the purchase of structures. A separate Z Tax Term can be constructed for structures, however, because the term does not vary within industries over time, when firm and year fixed effects are included in regression, a coefficient on the structures tax term cannot be separately identified.

Because bonus depreciation cannot be applied to the purchase of structures, the percentage of capital investment in structures as a fraction of total investment may also influence stock prices

structed at the industry-level, they are combined with bonus depreciation rates over time and the statutory tax rate to form the Z Tax Term.

For interpretability, I scale the Z Tax Term by the change in the present value of tax depreciation allowances when bonus depreciation varies from 0% to 100% for the firm with average-lived investment assets. As a result of this scaling, the coefficient on the Z Tax Term in regression can be interpreted as the increase in I_t/K_{t-1} for the average firm when the bonus goes from 0% to 100%.

1.4.4 Investment and Control Variables

The dependent variable in all regressions is the investment during the current period scaled by the stock of capital in place at the beginning of the period. This ratio is measured using Compustat data,

$$\frac{I_t}{K_{t-1}} = \frac{\text{capx}_t}{\text{ppent}_{t-1}}$$

where capx is capital expenditures and ppent is property, plant, and equipment.

In all investment regressions, I control for marginal Q. Additional possible determinants of investment, a measure of cash flows and a measure of financial distress, are included in select regressions. Appendix 3.9.2 details the construction of these variables. Following Desai and Gooslbee (2004) and others, I winsorize the investment, marginal Q, and control variables at the 1st and 99th percentiles to minimize the effects of misreported data.

1.4.5 Descriptive Statistics

Table 2 presents descriptive statistics on capital expenditure, the Z tax term, cash flow, marginal Q, cash flows and the financial constraint measure, both for the full

reactions to the bonus depreciation policy. Firms that invest a larger percentage in structures should have smaller abnormal returns after the extension of the policy. The event study results are unchanged when industry-level structures tax rates are included.

sample and then separately for governance sample (those firms for which governance and managerial equity data are available). Table 2 also presents descriptive statistics for the measures of corporate governance, Governance, Entrenchment, and Shares.

Firm-level data on investment, cash flows, financial constraints, and marginal Q are similar to the prior literature. The governance sample is composed of more mature firms. Consistent with their maturity, firms in the governance sample have larger cash flows, invest less relative to their stock of capital, and have lower values of marginal Q than the full sample. However, the governance sample is not dramatically different except for cash flows. The average investment as a fraction of existing capital observed is 0.255 in the governance sample, meaning that in each year the average firm invests an amount approximately equal to one-quarter of their existing capital stock.

The average firm in the governance sample has a Governance score of 9, meaning that the average firm has 9 fewer provisions protecting managers from shareholder discipline than the firm with the maximum number of these such provisions. The average value of Entrenchment is 3.758, meaning that the average firm has approximately 2.24 provisions protecting management from shareholders.

The average value of Shares is 3.66% and the distribution is skewed to the left; the modal managerial equity percentage is only 1.3%. 58% of top executives hold more than 1%, 27 hold more than 3%, and only 17.9 hold more than 5%.

1.5 Estimation Strategy

The estimating equation implied by the model in Section 3.3 is

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{jt}^T + \beta_2 G_{it} + \beta_3 G_{it} \tau z_{jt}^T + \beta_4 \left[\frac{\lambda_{it}}{p_{it}} - 1 \right] + \epsilon_{it}.$$

The Z Tax Term varies both across industries, due to MACRS regulations, and over time, due to bonus depreciation. With firm and year fixed effects, identification

Table 1.1: Descriptive Statistics Years 2000-2010

	Median	Mean	Std. Dev.	Obs.
Full Sample				
Cap Exp / Prop Plant Equip	0.197	0.357	0.544	76,497
Z Tax Term	0.487	0.483	0.036	92,311
Q/(1-τ)	2.130	4.482	10.074	93,823
Cash Flow / PPE	0.205	-1.403	8.295	71,659
K-Z Financial Constraint	0.227	0.006	2.720	75,164
Governance Sample				
Cap Exp / Prop Plant Equip	0.185	0.255	0.274	11,606
Z Tax Term	0.488	0.484	0.031	13,196
Q/(1-τ)	2.242	2.873	2.123	12,113
Cash Flow / PPE	0.409	0.599	2.572	11,314
K-Z Financial Constraint	0.395	0.308	1.419	11,718
Governance, Equity				
Governance	9	8.966	2.557	15,422
Bebchuk	4	3.758	1.277	15,422
Shares	1.302	3.661	6.726	19,976

Note: The investment and tax variables are provided for both the full sample and for the governance sample. The governance sample are firms for which both governance and managerial equity incentive data are available.

of the β_1 coefficient comes from how changes in bonus depreciation differentially affect industries. Industries that invest in longer-lived equipment benefit more from the policy than industries that invest in equipment that depreciates quickly for tax purposes.

The Governance variable varies across firms and over time. With firm fixed effects, the β_2 parameter is identified off of within-firm variation in the Governance variable. This variable is potentially endogenous to within firm variation in investment behavior. Shareholders could conceivably choose to significantly increase governance when

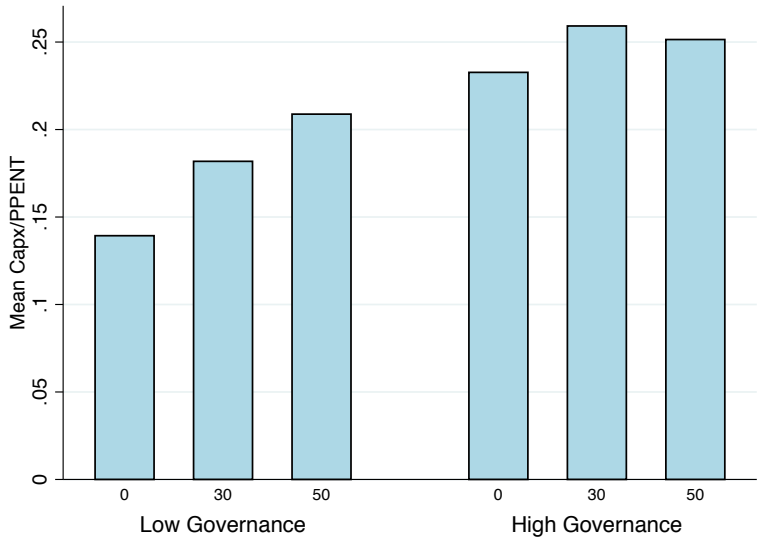
the firm increases investment behavior. However, because the parameter of interest is constructed as a ratio of β_1 and β_3, any impact of within-firm variation of investment on governance should not compromise testing of the primary empirical hypothesis. The crucial assumption is not that the level of governance is exogenous to investment, but that the level of governance is exogenous to investment response to bonus depreciation, which is a plausible assumption.

Because the Governance variable is relatively stable within firms over time (see Gompers et al. (2003)), identification of the β_3 parameter comes from variation in the mean governance level and variation across industries in how much bonus depreciation decreases the present value cost of investment.[32] The variable is larger when bonus depreciation hits firms with high levels of governance.

A potential threat to identification would arise if firms with low-governance levels invested primarily in long-lived assets, which would increase the impact of bonus depreciation on investment. If this were the case, then estimation would inaccurately attribute investment response to low levels of governance when only differential impacts of the tax policy across industries are driving investment behavior. One observation that mitigates this threat is that there appears to be significant variation in Governance levels within industries. As a result, there exists within industry variation in the interaction term. In Appendix 1.9.9, I add industry-year fixed effects to baseline regression to further alleviate this concern. With industry-year fixed effects, the β_3 coefficient is identified from within-industry variation in the interaction term, coming only from across firm differences in Governance levels. The drawback of using industry-year fixed effects is that the β_1 coefficient can no longer be estimated. However, the sign and magnitude of the interaction coefficient are similar to baseline results, suggesting that baseline results are not driven by a correlation of low

[32]Regressions that use mean Governance levels are presented in Appendix 1.9.5. Coefficients on the interaction parameter have magnitudes similar to baseline results, confirming that identification of β_3 is not driven by within-firm changes in Governance.

Figure 1.4: Investment by Bonus Level and Governance



Note: Mean Capx/PPENT is the mean level of Capx/PPENT controlling for marginal Q, cash flow, the K-Z measure of financial distress, and firm and year fixed effects. Firms are considered"High Governance" if their governance level is above the median level of observed governance. 0, 30 and 50 are levels of bonus depreciation in percentage terms.

governance and long-lived assets.

1.6 Investment Response to Bonus Depreciation

1.6.1 Visual Analysis of Investment Responsiveness to Bonus Depreciation

The investment response to bonus depreciation across different levels of Governance is presented in Figure 6. Figure 6 plots the mean investment levels at bonus levels of 0%, 30%, and 50% for Low and High Governance groups, controlling for marginal Q, controls for cash flow, financial distress, year fixed effects, and firm fixed effects. High Governance firms are defined as those with measures of Governance above the median. Firms with governance measures at or below the median level are classified as Low Governance.

Figure 6 presents compelling visual evidence that investment is less responsive to bonus depreciation for firms with high levels of governance. This evidence suggests that corporate governance induces earnings management behavior. For the Low Governance group, as bonus depreciation is increased and the net present value costs of investment decrease, investment increases. Evidence of investment responsiveness to bonus depreciation is not as clear for the High Governance group; investment is higher when bonus depreciation is set at 30% than 0%, but smaller at 50% than at 30%. The intuitive explanation for this unresponsiveness by High Governance firms is that the managers of these firms are highly incentivized to focus on maximizing accounting earnings, the most salient measure of corporate performance. Because accounting earnings are unaffected by bonus depreciation, firms with high levels of governance are unresponsive.[33]

1.6.2 Replicating Previous Literature

The first four columns of Table 3 replicate prior empirical studies of bonus depreciation both for all Compustat firms and for the smaller Governance sample. Specification (1) regresses I_t/K_{t-1} on the Z Tax Term and marginal Q, and includes year and firm fixed effects. Specification (2) repeats the regression from the first specification, but includes cash flow and financial distress controls. The Z Tax Term coefficient is interpreted as the increase in I_t/K_{t-1} that results from an increase in bonus depreciation from 0 to 100% for the firm with average MACRS statutory depreciation rates.

[33]Figure 6 also shows that High Governance firms invest more, on average, than Low Governance firms, regardless of the bonus depreciation level. This may also be a phenomenon of the accounting treatment of new investment expenditures. When accounting earnings are calculated, the expense for accounting earnings purposes is booked only as the new investments depreciate. Therefore, a manager choosing the investment level to maximize accounting earnings will invest more than a manager choosing the investment level to maximize cash flows, all else equal. Similarly, a manager choosing to increase earnings per share may increase investment levels without issuing new equity. I view this evidence as only suggestive given the potential endogeneity of the governance variable as discussed in Section 1.5.

Without additional controls for investment, a 100% increase in bonus depreciation is associated with an increase in I_t/K_{t-1} of 0.04, approximately an 11% increase in investment as a percentage of installed capital. When additional controls are added to the regression, the effect of a 100% increase in bonus depreciation is approximately a 4% increase relative to the mean investment level, suggesting that the controls are correlated with the tax policy. Specification (2) results are in line with the bonus depreciation literature and demonstrate the empirical puzzle, addressed by House and Shapiro (2008) and Edgerton (2012), that investment is not strongly responsive to bonus depreciation, despite the temporary nature of the policy and the policy's potential to significantly decrease the net present value costs of investment.

Specifications (3) and (4) repeat the regressions of specifications (1) and (2), but limit the sample to firms for which governance data was available. Specification (4) shows that the effect of moving from 0 to 100% bonus depreciation has an impact on investment that is very similar for the full sample and for the governance sub-sample.

1.6.3 Baseline Results

Baseline results presented in Specifications (5) and (6) of Table 3 show a strong heterogeneous response across different levels of governance. Consistent with the governance–earnings management hypothesis, firms with high levels of governance are less responsive to bonus depreciation. Specification (5) fits the linear estimating equation implied by the theoretical model to the data; specification (6) adds additional controls for cash flows and financial distress. In these regressions, the Z Tax Term can now be interpreted as the effect of increasing the bonus depreciation from 0 to 100% for the firm with the average MACRS statutory tax depreciation rates and a Governance score of 0. The regression predicts that for the least governed firms, increasing bonus depreciation from 0 to 100% results in an increase of I_t/K_{t-1} by 0.160 or a 42% increase relative to mean investment levels. This effect is large

and can viewed as how firms would respond to the policy if they placed the minimal amount of focus on accounting earnings. This effect is nearly 10 times as large as the effect for the firm with the mean level of governance.

The investment response to bonus depreciation decreases as the level of governance increases. The coefficient on the interaction term in (5) and (6) is interpreted as the change in the Z Tax Term coefficient resulting from a one standard deviation increase in Governance relative to the mean level. Each one standard deviation increase in Governance decreases the I_t/K_{t-1} response by 0.041 (approximately 25%). The γ_G presented in Table 3 is the percentage decrease in investment response to bonus depreciation that results from a one standard deviation increase in governance. γ_G is approximately 0.26 in specification (6), meaning that a one standard deviation increase in governance makes firms 25% less responsive to bonus depreciation. These results strongly support the theoretical hypothesis that more strongly governed managers focus their attention on accounting earnings. Strongly governed firms are less responsive to bonus depreciation and demonstrate more earnings management behavior. [34]

Marginal effects of bonus depreciation on investment at different levels of Governance are presented in Table 4. As a result of bonus depreciation going from 0 to 100%, investment percentage increases by 0.097 or 25% compared to average levels for firms with Governance level two standard deviations below the mean level. For firms with Governance levels one standard deviation below the mean, bonus depreciation increases investment percentage by 15%. Investment responses for firms at the mean level of Governance and with Governance one standard deviation higher than the mean are not statistically different from zero.

[34]Gompers et al. (2003) broke down the "G Index" into 5 categories: (1) tactics for delaying hostile takeovers, (2) voting rights, (3) director/officer protection, (4) other takeover defenses, and (5) state laws. The baseline regression is presented separately for each category and then for all the categories together in Appendix 1.9.7. The results indicate that no one category fully determines the heterogeneous investment response to bonus depreciation, suggesting that the Governance variable is an adequate measure of the overall level of governance faced by firm managers.

Table 1.2: Baseline Analysis 2000–2010, Governance Index

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Z Tax Term	0.040***	0.015	0.027*	0.017	0.177***	0.160***
	(0.010)	(0.010)	(0.015)	(0.014)	(0.033)	(0.031)
Governace					0.357***	0.342***
					(0.056)	(0.054)
Gov x Z TT					-0.043***	-0.041***
					(0.008)	(0.008)
γ_G					0.244***	0.259***
					(0.022)	(0.026)
Firms	12,932	12,047	1,944	1,911	1,944	1,911
Firms x Years	78,506	71,773	14,261	13,704	14,261	13,704

Notes: Specifications (1) through (4) present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specifications (5) and (6) include governance measures and present regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 \tau z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} \tau z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specifications (2), (4), and (6) include additional controls for financial distress and cash flows. All specifications include firm and year fixed effects and marginal Q. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

Note that the estimates suggest that investment responds *negatively* to bonus depreciation for firms with very high levels of governance. This result is not consistent with the behavior of economically rational actors or with the tax policy itself. Investment response to the policy should be bounded below by zero, because not only do firms not have to respond to bonus depreciation, but they can also choose not to take bonus depreciation and, instead, write off investment using statutory MACRS schedules.[35] Therefore, there must be other factors driving the negative estimated response.

[35]Knittle (2007) noted that only 55–63% of corporate investment actually claimed bonus depreciation during the 2002 to 2004 episode. The paper suggested that the low take-up rate was a product of three factors: the temporary nature of the policy, significant tax losses which mitigated the policy's impact, and the non-conformity of some state tax systems to the federal policy.

Table 1.3: Investment Response Marginal Effects 2000–2010

Governance Level Std. From Mean	-2	-1	0	+1	+ 2
$d(I_t/K_{t-1})$	0.097***	0.057***	0.015	-0.026	-0.067***
$/d$ Z TT	(0.022)	(0.018)	(0.016)	(0.018)	(0.021)
% of mean (I_t/K_{t-1})	25%	15%	3.9%	-6.8%	-17%

Notes: Table 4 provides marginal effects estimates of the change in I_t/K_{t-1} from an increase in bonus depreciation from 0 to 100% for firms at different levels of Governance. Marginal effects are provided for firms with mean level Governance and firms with Governance $\pm$ 1 and $\pm$ 2 standard deviations from the mean. Marginal effects are derived from the regression presented in specification (6) of Table 3. *** indicates statistical significance at the 1% level.

One possible explanation is that this estimation strategy may not sufficiently control for general equilibrium effects of the policy. As noted by Goolsbee (1998), investment tax incentives can affect the purchase price of capital, thereby depressing investment response to the policy. In the theoretical model, the price of investment goods should be reflected in marginal Q. Marginal Q may not sufficiently control for these general equilibrium effects. For the strongly governed firms, the tax policy does not increase the tax benefit of investment because managers care only to maximize accounting earnings. Strongly governed firms may, however, experience price increases in investment goods as a result of the policy. For strongly governed firms, there is no upside to the policy, only downside. Because governance varies significantly within industries, price increases in investment goods should not be a function of the governance level and should not effect the estimation of heterogeneous response to the policy or the relationship between corporate governance and earnings management behavior.[36]

However, due to the accounting treatment of the cost of investment, these general equilibrium effects may be unable to explain the negative responsiveness phenomena.

[36]While Goolsbee (1998) found that investment prices increase 3.5 to 7% when investment tax credits are increased by 10%, House and Shapiro (2008) found that investment prices were unresponsive to bonus depreciation in 2001 through 2004.

Recall that the purchase price of new capital does not affect accounting earnings; the cost of new investment is subtracted from accounting earnings only as the newly installed capital depreciates for book purposes. Thus, firms with high levels of governance that place a large weight on accounting earnings should not benefit from the tax policy nor be as significantly affected by potential investment price shocks as firms that place less emphasis on accounting earnings.

Another possibility is that the severity of the 2008 and 2009 recession is not sufficiently captured by the model. The model does not account for supply-side financing constraints, which were significant during the height of the recession. To test this explanation, I estimate specification (6) from Table 3 using only data prior to year 2008. Marginal effects from this temporally adjusted regression are presented in Table 5. During years prior to 2008, investment was more responsive to the tax policy. Firms with mean-level Governance increased investment as a percentage of installed capital by nearly 16%. Furthermore, the investment response of the most strongly governed firms was not statistically different from zero, suggesting that financing constraints, which were the largest when bonus depreciation was at its highest level (during the sample period), may be driving the negative responsiveness among the most highly governed firms.

Overall, the baseline analysis strongly supports the hypothesis that corporate governance induces earnings management behavior. Consistent with the hypothesis, more strongly governed firms are less responsive to bonus depreciation. Using the heterogeneous response to the policy, I estimate that a one standard deviation increase in Governance results in a nearly 25% increase in accounting earnings focus and by extension a 25% increase in earnings management behavior.

Table 1.4: Investment Response Marginal Effects, 2000–2007

Governance Level Std. From Mean	-2	-1	0	+1	+ 2
$d(I_t/K_{t-1})$	0.113***	0.079***	0.045***	0.010*	-0.024
$/d$ Z TT	(0.034)	(0.029)	(0.025)	(0.025)	(0.028)
% of mean (I_t/K_{t-1})	39%	27%	16%	3.4%	-8%

Notes: Table 5 provides marginal effects estimates of the change in I_t/K_{t-1} from an increase in bonus depreciation from 0 to 100% for firms at different levels of Governance. Marginal effects are provided for firms with mean-level Governance and firms with Governance ± 1 and ± 2 standard deviations from the mean. Marginal effects are derived from the regression presented in specification (6) of Table 3. *** indicates statistical significance at the 1% level.

1.6.4 Equity Incentive Analysis

Table 5 presents estimation results using Shares as the measure of corporate governance. This additional analysis has the advantage that the Shares variable is a cardinal measure of governance and a given value of Shares means the exact same thing for two different firms.

Specifications (1) and (2) fit the linear estimating equation derived in Section 3.3 to the data with and without additional controls from cash flows and financial distress. The Shares x Z Tax Term coefficient can be interpreted as how much less responsive an additional percentage of ownership makes I_t/K_{t-1} to bonus depreciation. Specifications (1) and (2) suggest that Shares has no impact on investment responsiveness, and therefore managerial equity incentives have no impact on investment response to taxation, a conclusion inconsistent with the hypothesis. However, as discussed in Section 3.4, the managers that hold a very high percentage of equity are more likely to be owner-managers of firms and therefore face no principal–agent problems nor the need to maximize accounting earnings to signal their value. To limit biases in the results created by potential owner-managers, in specifications (3) through (6), I progressively limit the sample to managers that hold less than 20, 15, 10 and 5% of

Table 1.5: Baseline Analysis 2000–2010, Managerial Equity Percentage

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Shares Restriction			$< 20\%$	$< 15\%$	$< 10\%$	$< 5\%$
Z Tax Term	0.032**	0.020	0.031**	0.025	0.027*	0.028
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.018)
Shares	0.009	0.012*	0.048***	0.041**	0.062**	0.098**
	(0.008)	(0.007)	(0.017)	(0.017)	(0.025)	(0.045)
Shares x Z TT	-0.001	-0.002	-0.007***	-0.006**	-0.009**	-0.014**
	(0.001)	(0.001)	(0.003)	(0.003)	(0.004)	(0.007)
γ_S	0.041	0.087	0.218*	0.235	0.316*	0.495*
	(0.035)	(0.076)	(0.124)	(0.146)	(0.181)	(0.290)
Firms	2,348	2,294	2,257	2,228	2,183	2,074
Firms x Years	17,352	16,592	15,973	15,664	15,110	13,716

Notes: Table 6 presents regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 \tau z_{it}^T + \beta_2 S_{it} + \beta_3 S_{it} \tau z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specifications (2) through (6) include additional controls for financial distress and cash flows. All specifications include firm and year fixed effects and marginal Q. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

total equity.

When the sample is limited to managers who own less than 20% of total equity, an additional percentage of ownership makes managers approximately 21.8% less responsive to bonus depreciation. When the sample is limited further to 10%, each additional percentage of firm ownership makes managers approximately 31.6% less responsive to bonus depreciation. All in all, these results provide strong evidence of heterogeneous investment response to bonus depreciation and identify an impact of governance on earnings management behavior; the firms most responsive to bonus depreciation are those in which the managers are the least governed and have the least strong incentives to focus on earnings instead of cash flow maximization.

As Figure 4 demonstrates, Shares and Governance are strongly correlated. Thus the Shares results do not necessarily capture a different channel of governance, but rather reinforce the Governance analysis. As Shares and Governance increase together or as the general level of shareholder discipline increases, investment response to bonus depreciation decreases. In this setting, it seems reasonable to run an empirical horse race to determine which type of governance is driving the results. Appendix 1.9.6 presents specifications including both Governance and Shares. The Governance variable generates a large heterogeneous investment response, while the Shares variable does not impact investment or its response. This horse race indicates that management exposure to potential shareholder discipline is more important than equity incentives in motivating accounting earnings focus and earnings management behavior.

1.6.5 Investment Response Summary

Investment response to bonus depreciation is heterogeneous across different levels of Governance and managerial equity percentage. A one standard deviation increase in the Governance variable results in a 25% decrease in investment response to bonus

depreciation. Professional managers that own an additional one percentage point of total firm equity are 21.8% less responsive to bonus depreciation. This heterogeneity of investment response to bonus depreciation is in line with the intuitive theory that stronger corporate governance forces managers to focus on the most salient measure of corporate performance, accounting earnings, perhaps at a large long-term cost to shareholders.

1.7 Stock Price Response to Extension of Bonus Depreciation

The American Taxpayer Relief Act of 2012 (ATRA) was passed by the United States Congress on January 1, 2013, and signed into law by President Barack Obama the next day. The act partially resolved the United States "fiscal cliff" by addressing certain provisions of the Economic Growth and Tax Relief Reconciliation Act of 2001 and the Jobs and Growth Tax Relief Reconciliation Act of 2003 (known together as the "Bush tax cuts"), which had been temporarily extended by the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 but were set to expire on December 31, 2012. In a surprise move, the ATRA extended bonus depreciation at a rate of 50% through the end of 2013.[37] The fact that the extension of bonus depreciation was largely unexpected creates a natural experiment that can be used to corroborate investment results that indicate strong corporate governance

[37]In September 2012, Gary Guenther of the Congressional Research Service published a report on bonus depreciation that concluded, Evidence indicates that the expensing allowances probably have no more than a minor effect on business investment. Citing the probable expiration of the policy, finance websites proclaimed, Buying equipment this month, rather than next, could save you on taxes (finance-commerce.com) Dont wait on those fixed asset acquisitions (www.forbes.com/sites/anthonynitti). When the provision was extended leasing and industry websites took notice. Congress also surprised many by extending the Bonus Depreciation allowance on qualified new equipment (www.teqlease.com/2013/01/08/the-fiscal-cliff-deal-saves-bonus-depreciation/) One major surprise was a generous renewal of Sec. 179 and bonus depreciation rules that have allowed high-income farm operations to shelter sizable incomes in recent years. (http://www.dtnprogressivefarmer.com). The surprise is confirmed empirically. See Figures 9 and 10.

induces earnings management behavior.

To examine the impact of the surprise extension of bonus depreciation, I rely on event study methodology. To use the ATRA event study to examine the impact of governance and earnings management, I empirically address two questions. First: are abnormal returns higher for firms that, on average, invest in longer lived equipment assets, (those with on-average slower statutory depreciation rates) i.e. those who stand to gain the most from the extension of bonus depreciation? Second: are abnormal returns to the policy relatively higher for firms with weaker corporate governance? If both questions are answered in the affirmative, then the ATRA event study provides additional support that governance encourages earnings management behavior. In light of the investment response to bonus depreciation, the answers to these questions also address whether, at least in the context of bonus depreciation, the market values low governance, which allows managers to respond to the policy.

1.7.1 Cumulative Abnormal Returns

In order to perform an event study, abnormal returns are computed for each firms for the days after the event occurs and are multiplicatively compiled to produce cumulative abnormal returns that describe by how many percentage points a stock over- or under-performs its expected return t days after the event. I rely on the Fama-French Value Weighted Three Factor Model (Fama and French (1992), Fama and French (1993)) to generate expected returns and then compare this prediction against the actual observed stock returns to generate the abnormal and cumulative abnormal returns.[38] The cumulative abnormal return, CAR_{it}, will be the dependent

[38]More precisely: using daily stock data from CRSP for the month prior to the passage of the ATRA, I regress the return for each firm above the risk free rate, $R_{it} - R_{ft}$, on three factors: (1) the market return over the risk-free rate $R_{mt} - R_{ft}$, (2) the value-weighted return on small firms over the value-weighted return on large firms SMB, and (3) the value-weighted return on high book-to-market value firms minus the return on low book-to-market value firms HML. The regressions produce coefficients β, γ, and δ for each firm. I then use these coefficients to predict each individual firm's performance after the passage of the ATRA. How much the firm over or underperforms this

variable in the fiscal cliff event study. It is defined as the Cumulative Abnormal Return for firm i, t days after the passage of the ATRA. The unit of CAR_{it} is percentage points.

1.7.2 Dependent Variables

1.7.2.1 Deprec

I summarize the MACRS statutory tax depreciation allowances on one dollar of new investment as Deprec.

$$\text{Deprec} = \sum_{i=1}^{\infty} \frac{d_i}{(1+r)^i}$$

where d_i is the amount of tax depreciation allowed by MACRS accounting standards in year i. Deprec is the net present value of statutory tax depreciation allowances. This variable is constructed at the industry level using data from the BEA and IRS publications in the manner described in Section 3.4. The average tax depreciation allowance per dollar of investment is \$0.88. In the regression analysis, this variable is scaled by its standard deviation for ease of interpretation. Deprec is larger when the net present value of statutory tax depreciation allowances is high. As discussed in Section 3.4, when firms have higher Deprec measures, they stand to gain little from the extension of bonus depreciation. The sign of the coefficient on this variable will depend on whether investors value only accounting earnings or a combination of

prediction during a trading day is the firm's abnormal performance, a;

$$a_{it} = \underbrace{[R_{it} - R_{ft}]}_{\text{actual}} - \underbrace{[\hat{\beta}_i(R_{mt} - R_{ft}) + \hat{\gamma}_i(\text{SMB}) + \hat{\delta}_i(\text{HML})]}_{\text{estimated}}.$$

Once the abnormal returns have been estimated, I construct Cumulative Abnormal Returns for each firm t days after the passage of ATRA 2012, CAR_{it}. The multiplicative cumulative abnormal returns are often referred to as Buy-and-Hold Abnormal Returns or BHARS. In constructing traditional CARS, one simply adds abnormal returns together. This procedure, however, is not appropriate when abnormal returns are defined in percentage points above or below predicted returns.

accounting earnings and real economic value (cash flow, in the model). If investors care only about accounting earnings, then the tax policy will not benefit them, and cumulative abnormal returns should be unrelated to the Deprec variable. If, however, investors value real economic earnings, then returns should be higher for firms with lower Deprec rates and the coefficient on Deprec should be negative in the days after the passage of ATRA 2012.

1.7.2.2 Entrenchment

I use Entrenchment as defined in Section 3.4 as the governance measure in the fiscal cliff event study. Entrenchment is used in this analysis because the data necessary to construct the Governance variables is not available in recent years.[39] The mean level of Entrenchment is 3.61. There is no reason that the level of governance within the firm should have any effect on cumulative abnormal returns after the passage of ATRA 2012.

1.7.2.3 Deprec x Entrenchment

The interaction term specifies the heterogeneity of stock price response to the surprise extension across firms with varying levels of governance. If investors place any value on firm cash flows/real economic value, then they should value not only the policy itself, but also low governance levels, which allow managers to respond to the policy. Again, the sign on the coefficient depends on whether or not investors value only accounting earnings or a combination of accounting earnings and cash flow. If

[39]How the IRRC records these 6 provisions changed in 2007, so the Entrenchment index that I construct for the event study analysis is not directly comparable the Entrenchment variable from years prior to 2007. Median and mean Entrenchment measures are similar between the 2000–2010 sample and the 2011 sample. Percentages of each provision are also comparable, despite the changes in IRRC reporting standards. The Entrenchment measure as I have constructed it here is one point higher if the firm does not have a provision specifying staggered appointment of board members, if the firm does not need a supermajority to amend the charter, does not need a supermajority to amend firm bylaws, does not need a supermajority to approve mergers, does not have poison pills, or does not have golden parachutes.

investors value only accounting earnings, then the coefficient on the interaction term should be zero. If, however, investors place some value on cash flows, then investors would prefer managers that are able to respond to the policy, i.e., those in firms with low governance levels. If this is the case, then investors value low Deprec and low Entrenchment, and cumulative abnormal returns should be positively related to the interaction variable.

1.7.3 Event Study Results

Table 7 presents the event study results.[40] Each column represents a separate regression as the dependent variable evolves from cumulative abnormal returns 1 day after passage ATRA 2012 to 6 days after the passage of ATRA 2012. The dependent CAR variable is regressed on the governance measure, Entrenchment, the present value of statutory tax depreciation allowances, Deprec, and the interaction of the two variables.[41] Looking across the table from left to right, the reader can see how the effect of governance, potential benefit from the extension of bonus depreciation, and the interaction of the two are related to cumulative abnormal returns over time.

The event study results suggest that investors value not only bonus depreciation, but also low levels of governance, which allow firms to respond to the tax policy. The Deprec coefficient is negative and statistically different from zero 2, 3, and 4 days after the passage of ATRA 2012. These results indicate that abnormal returns are higher for firms with lower MACRS depreciation rates – those firms that stand to benefit from the extension from a cash flow perspective. Cumulative abnormal returns after the passage of ATRA 2012 indicate that investors value bonus depreciation.

[40] Appendix 1.9.11 presents two placebo event studies. Using the estimated parameters from the Fama French Value-Weighted Three Factor Model, I produce CARs beginning on December 10, 2012, and then again for January 15, 2013. No coefficients from either event study are estimated to be statistically different from 0 at the 95% level. In the December 10 placebo, the Deprec coefficient does have a positive coefficient different from zero at the 90 percent level.

[41] Cash flows are included in all regressions to control for firms' ability to respond to bonus depreciation.

The coefficient on the interaction of Deprec and Entrenchment is positive and statistically different from zero 2, 3, 4, and 5 days after the passage of ATRA 2012, suggesting that for firms that stand to gain from bonus depreciation, low values of governance are valued by investors. Consistent with our hypothesis, abnormal returns are the highest for firms that should respond to bonus depreciation (those with low Deprec measures) and for those that do respond to the policy (those with low governance measures). Taken together, this evidence suggests that, in the context of bonus depreciation, strong governance, which places managerial focus on accounting earnings and limits the firms ability to respond to the extension of the policy, is value decreasing. An alternative way to view these results is that investors do not value strong governance, in the context of bonus depreciation, because it induces earnings management behavior and limits response to the tax policy; earnings management behavior is this setting is value decreasing.

I focus on the third column of table 7 to examine the magnitude of the point estimates. Three days after the passage of ATRA 2012, a one standard deviation decrease in the present value of MACRS statutory tax depreciation allowances results in a 0.644 percentage point over-performance. The coefficient on the interaction term is equal to 0.457. The interpretation of this estimate is that for a firm whose benefit from the policy is one standard deviation above the mean, a one standard deviation decrease in governance increases cumulative abnormal return by an additional 0.457 percentage points. These estimates are consistent with back-of-the envelope calculations that utilize results from the investment response analysis; details are provided in Appendix 1.9.13.

Marginal effects of an additional standard deviation Deprec are presented across various levels of governance in Table 8. When governance levels are low and the firm is responsive to bonus depreciation (as determined in the investment analysis), the extension of the bonus has a large impact on abnormal returns. However, when

Table 1.6: Americian Taxpayer Relief Act 2012 Event Study Results

Dependent Variable	CAR_1	CAR_2	CAR_3	CAR_4	CAR_5	CAR_6
Entrenchment	-0.049	-0.043	-0.031	-0.095	-0.075	-0.031
	(0.102)	(0.096)	(0.118)	(0.127)	(0.147)	(0.176)
Deprec	-0.000	-0.448**	-0.644***	-0.429**	-0.361	-0.095
	(0.322)	(0.187)	(0.168)	(0.176)	(0.222)	(0.292)
Entrenchment x Deprec	0.251	0.411***	0.457**	0.465**	0.320	0.186
	(0.211)	(0.149)	(0.183)	(0.177)	(0.214)	(0.248)
Observations	1,189	1,189	1,189	1,189	1,189	1,189

Table 7 presents results for regressions of the form

$$CAR_t = \beta_0 + \beta_1 \text{ [Entrenchment]} + \beta_2 \text{ [Deprec Rate]} + \beta_3 \text{ [Entrenchment X Deprec Rate]}$$

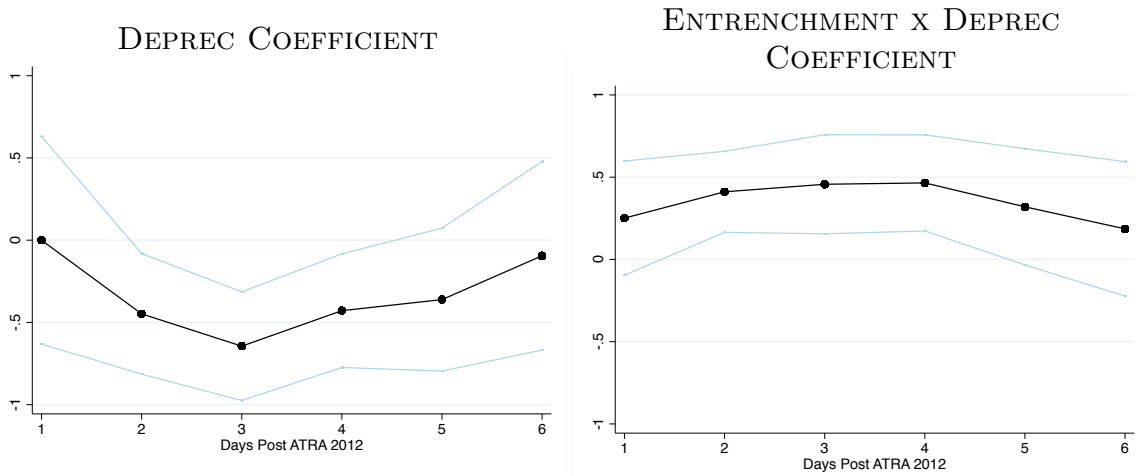
CAR_t is the cumulative abnormal return t trading days after the American Taxpayer Relief Act of 2012 was signed into law on January 1, 2013. Controls for cash flow are included in each regression. Standard errors are robust to heteroskedasticity. *** indicates statistical significance at the1 % level, ** at 5%, and * at 10%.

Table 1.7: Cumulative Abnormal Returns Marginal Effects

Governance Level Std. From Mean	-2	-1	0	+1	+ 2
$d(CAR_3)$	-1.558***	-1.101***	-0.644***	-0.187	0.267
$/d$Deprec	(0.466)	(0.305)	(0.181)	(0.190)	(0.321)

Notes: Table 8 provides marginal effects estimates of the change in cumulative abnormal returns 3 days after the passage of ATRA 2012 resulting from a one standard deviation increase in depreciation rates. Marginal effects are provided for firms with mean level Governance and firms with Governance $\pm$ 1 and $\pm$ 2 standard deviations from the mean. Marginal effects are derived from the regression presented in column 3 of Table 7. *** indicates statistical significance at the 1% level.

Figure 1.5: Event Study Results



Note: Figure 7 and Figure 8 graph regression coefficients on Deprec and Entrenchment x Deprec. Each data point is from a different regression where the dependent variable, cumulative abnormal return, changes with the number of days after the passage of ATRA 2012. 95% confidence bands are shown in blue. The Deprec coefficient can be interpreted as how much higher the cumulative abnormal return is in percentage points when a firm's statutory tax depreciation rates increase by one standard deviation relative to the average. The Entrenchment x Deprec coefficient can be interpreted as how much larger the Deprec coefficient is when the governance measure increases by one standard deviation relative to mean.

governance measures are high, the effect of the bonus on abnormal returns is not statistically different from zero. Again, bonus depreciation is valued by the market, and the value of the policy is larger among those firms with low levels of governance, who will be most responsive to the policy.

1.7.4 Visual Representation of Event Study Results

Figures 7 and 8 present the event study results from Table 7 visually. Each data point represents a coefficient from a different regression where the CAR dependent variable is changing over time. Blue lines represent lower and upper bounds predicted with 95% confidence. From the visual representation of the regression results, one may observe that the Deprec coefficient is negative and statistically different from zero 2, 3, and 4 days after the passage of ATRA 2012. Figure 8 shows that the interaction coefficient is positive and statistically different from zero 2, 3, 4, and 5

days after the passage of ATRA 2012.

One concern with these results in that they are driven by pre-trends and not a product of the event. To address these concerns, figures 9 and 10 present CARs that are constructed beginning 5 days prior to the passage of ATRA 2012. The disadvantage of constructing CARs that begin prior to the event is that additional variation unrelated to the event is introduced.

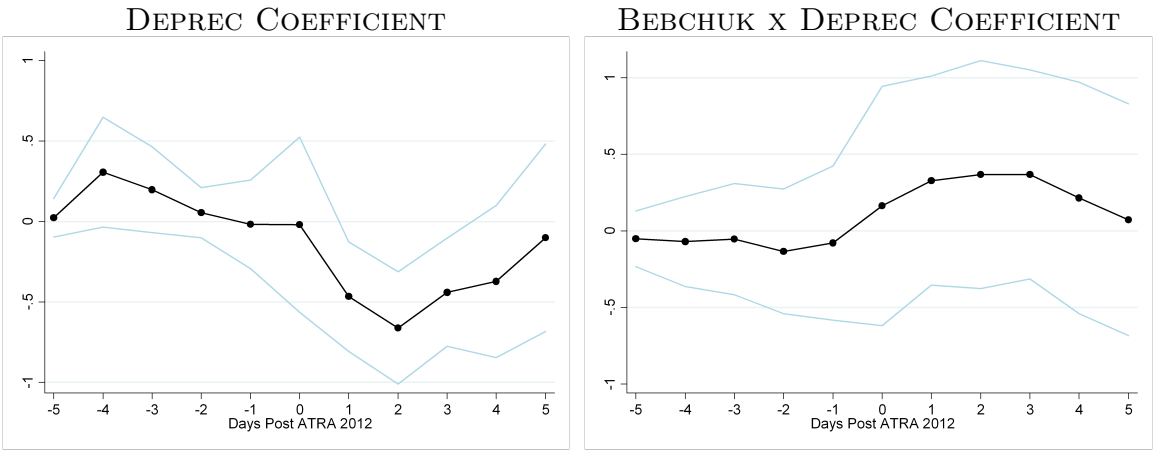
Cumulative abnormal returns are close to zero (and not statistically different from zero) in the days prior to the event, confirming that the event was a surprise. Upon impact, the Deprec coefficient drops and the interaction coefficient increases substantively. The magnitude of the point estimates in the days after the event is very close to coefficients depicted in Figures 7 and 8. Clearly, pre-trends are not driving the event study results.

While the Deprec coefficient remains statistically different from zero 1, 2, and 3 days after passage of ATRA 2012, the interaction coefficient does not. Again, the decrease in the precision of the estimate is due to increased variance in the CARs. Because abnormal returns are uncorrelated with the interaction term in days prior to the event, additional variance is introduced into the construction of CARs in days after the event and as a result the standard errors increase. Due to this increased variance unrelated to the event itself, CARs constructed beginning only on the date of the event are typically used to estimate the impact of the policy.

1.7.5 Fiscal Cliff Event Study Summary

Firms that invest in longer-lived equipment assets and stand to gain the most from bonus depreciation have higher than average cumulative abnormal returns following passage of ATRA 2012. A one standard deviation decrease in statutory tax depreciation rates results in more than a one-half percentage point higher cumulative returns 3 days after passage. Cumulative abnormal returns are relatively higher for firms

Figure 1.6: Event Study Results with Pre-trends



Note: Figure 9 and Figure 10 graph regression coefficients on Deprec and Entrenchment x Deprec. Each data point is from a different regression where the dependent variable, cumulative abnormal return, changes with the number of days after the passage of ATRA 2012. 95% confidence bands are shown in blue. The Deprec coefficient can be interpreted as how much higher the cumulative abnormal return is in percentage points, when a firm's statutory tax depreciation rates increase by one standard deviation relative to the average. The Entrenchment x Deprec coefficient can be interpreted as how much larger the Deprec coefficient is when the governance measure increases by one standard deviation relative to mean.

with low levels of governance. The event study results suggest that investors value bonus depreciation and firms that have traditionally been most responsive to the policy, those with low levels of governance with low incentives to focus on accounting earnings or engage in earnings management behavior. In the context of bonus depreciation, earnings management behavior, a product of aggressive corporate governance, is value decreasing.

1.8 Conclusion and Implications for Governance and Policy

The accounting treatment of bonus depreciation makes possible the identification of earnings management behavior, in which managers distort firm activities in order to manipulate accounting earnings. Inaction in the face of bonus depreciation is consistent with the type of earnings management documented by Graham et al. (2005), in which managers may sacrifice positive NPV investment projects in order to

meet earnings targets. This research has documented that this earnings management behavior is concentrated among firms with strong corporate governance and is the first to confirm that, as hypothesized by Stein (1989), stronger corporate governance forces managers to focus on maximizing current accounting earnings at the expense of long-run real economic benefit. Stock price responses to the passage of The American Taxpayer Relief Act of 2012 suggest that earnings management behavior is both concentrated among strongly governed firms and is value decreasing in the context of bonus depreciation.

These findings have potential implications for the role of corporate governance and for the use of bonus depreciation. Shareholders should be aware that equity incentive or the threat of takeover may induce earnings management and should take this cost into effect when making governance decisions. Trends in corporate governance suggest that perhaps shareholders are already aware of these costs and are insulating managers to avoid them. Gompers et al. (2003) documented a slow-moving trend towards less corporate governance as a result of the firms enacting provisions that limit the reach of shareholders. If shareholders choose to enact these policies optimally, then the benefits of these policies must outweigh the costs. The cost of these provisions is that they may exacerbate principal–agent problems. The benefits are less clear. However, this research has identified that lower levels of governance and less shareholder discipline may allow managers to focus on economic value maximization, as opposed to accounting earnings. If shareholders understand this connection and its potentially large distortionary consequences, then the need to limit earnings management may be driving trends towards managerial entrenchment.

The documented heterogeneous investment response among firms with varying levels of governance explains why bonus depreciation has been less effective than many had believed it would be. Firms with low levels of shareholder oversight and lower incentives for earnings management behavior are very responsive to the policy.

This indicates that the policy would have been more effective were it not for the accounting treatment of tax depreciation allowances.

That the policy was less effective at increasing investment during the recessions of 2001 and 2008 is unfortunate. This heterogeneous response may be extra unfortunate from a welfare perspective. The firms that have been observed to be the most responsive to the policy are those with low levels of shareholder control. These are also the firms with the most significant separation of ownership and control. Previous research has shown that weakly governed managers are most likely to make decisions that are not in the best interests of shareholders with respect to financing, payout policy, and merger behavior. If the least-efficient firms are the most responsive, the macroeconomic stimulus aspect of the policy is doubly dubious: for the average firm, bonus depreciation is relatively ineffective at stimulating investment; and the subpopulation of firms that is responsive is composed of corporations that may make investment decisions not in the best interest of shareholders.

On the other hand, the heterogeneous investment response uncovered in this paper may provide evidence that the policy is more effective than previously believed and may have an unintended progressivity born of its accounting treatment. Given that the most responsive firms are those that focus the least on earnings management, then private firms, which have no reason to engage in earnings management, may be more responsive to bonus depreciation than the publicly traded firms under study in this research. This possibility, if true, would have three important implications. First, if private firms are more responsive to bonus depreciation, then estimates of the effect of bonus depreciation on investment using only publicly traded firms may underestimate the true impact of the policy. Second, private firms have ostensibly less separation of ownership and control (or at least have large block holding owners) and therefore may make more efficient investment decisions than the poorly governed but very responsive publicly traded firms. Finally, because private firms tend to be

smaller, the policy may have an aspect of built-in progressivity, perhaps making the policy extra appealing from an equity standpoint.

1.9 Appendices

1.9.1 Derivation of Investment Behavior Equation

The firm solves,

$$\max_{I_t, B_t} \int_0^\infty e^{-rt}[\alpha AE_t + (1-\alpha)CF_t]$$

subject to

$$\begin{aligned}
\dot{K_t} &= I_t - \delta K_t \\
\dot{K_t^T} &= pI_t - \delta^T K_t^T \\
\dot{K_t^B} &= pI_t - \delta^B K_t^B.
\end{aligned}$$

The Hamiltonian:

$$\begin{aligned}
\mathcal{H} = \int_0^\infty e^{-rt}[&\alpha[(1-\tau)[F(K_t) - p\psi(I_t, K_t) - rD_t - \delta^B K_t^B]] \\
&+ (1-\alpha)(1-\tau)[F(K_t) - p\psi(I_t, K_t) - rD_t] + B_t + \tau\delta^T K_t^T - pI_t]]dt \\
&- \int_0^\infty \lambda_t(\dot{K_t} - I_t + \delta K_t)dt \\
&- \int_0^\infty \lambda_t^B(\dot{K_t^T} - pI_t + \delta^T K_t^T)dt \\
&- \int_0^\infty \lambda_t^T(\dot{K_t^B} - pI_t + \delta^B K_t^B)dt. \qquad (1.6)
\end{aligned}$$

The first order conditions are:

$$0 = \frac{\partial \mathcal{H}}{\partial I_t} = e^{-rt} pITC - e^{-rt}(1-\tau)p\psi_I I_t, K_t + \lambda_t + p\lambda_t^B + p\lambda_t^T, \tag{1.7}$$

$$0 = \frac{\partial \mathcal{H}}{\partial K_t} = e^{-rt}(1-\tau)[F_K(K_t) - p\psi_K(I_t, K_t)] + \dot{\lambda}_t - \lambda_t \delta, \tag{1.8}$$

$$0 = \frac{\partial \mathcal{H}}{\partial K_t^B} = e^{-rt}\alpha(\tau - 1)\delta^B + \dot{\lambda_t^B} - \lambda_t^B \delta^B, \tag{1.9}$$

$$0 = \frac{\partial \mathcal{H}}{\partial K_t^T} = e^{-rt}(1-\alpha)\tau\delta^T + \dot{\lambda_t^T} - \lambda_t^B \delta^T. \tag{1.10}$$

Solving for the shadow value of an additional dollar's worth of book and tax capital respectively in the steady state yields:

$$\lambda_t^B = \alpha(\tau - 1)e^{-rt}\frac{\delta^B}{r + \delta^B} \text{ and} \tag{1.11}$$

$$\lambda_t^T = (1-\alpha)\tau e^{-rt}\frac{\delta^T}{r + \delta^T}. \tag{1.12}$$

For ease of notation, I define z^B and z^T as the present values of future depreciation allowances for book and tax purposes, respectively,

$$z^B = \int_0^\infty e^{-rs}\delta^B e^{-\delta^B s}\frac{\delta^B}{r + \delta^B}$$

$$z^T = \int_0^\infty e^{-rs}\delta^T e^{-\delta^T s}\frac{\delta^T}{r + \delta^T}.$$

Plugging (8) and (9) into (4) and solving for the derivative of the adjustment cost function, λ_I, yields the investment behavior equation,

$$\psi_I = \frac{\frac{\lambda_0}{p_0} - ((1-\alpha) + \alpha z^B - \tau[(1-\alpha)z^T + \alpha z^B] - ITC}{1-\tau}.$$

1.9.2 Investment Control Variables

The marginal value of an additional dollar of investment (marginal Q), is measured as the ratio of the market value of equity plus the book value of liabilities excluding deferred taxes, divided by the book value of assets,

$$Q_t = \frac{\text{prcc}_t \times \text{csho}_t + \text{at}_t - \text{ceq}_t + \text{txdb}_t}{\text{at}_t},$$

Where prcc is the price of outstanding shares, csho is the number of outstanding shares, at is total assets, ceq is outstanding equity and txdbt is the differed tax liabilities.

Measures of cash flow and financial distress are constructed following Kaplan and Zingales (1997). "Cash Flow/PPE" is defined as

$$\text{Cash Flow}_t = \frac{\text{ib18}_t + \text{dp14}_t}{\text{ppent8}_{t-1}}.$$

This ratio is the income before extraordinary items plus depreciation and amortization, scaled by the capital stock at the beginning of the year.

"K-Z financial constraint" is defined as

$$\text{K-Z financial constraint}_i t = -39.368X\frac{\text{dvp}_t + \text{dvc}_t}{\text{at}_{t-1}} - 1.315X\frac{\text{che}_t}{\text{at}_{t-1}} + 3.139X\frac{\text{dltt}_t + \text{dlc}_t}{\text{dltt}_t + \text{dlc}_t + \text{seq}_t}$$

Financial Constraint proxies for financial constraint as a linear combination of (1) common and preferred dividends paid as a fraction of total assets, (2) liquid assets as a fraction of total assets, and (3) debt as a fraction of debt plus equity.

1.9.3 Bonus Depreciation Legislation

- The Job Creation and Workers Assistance Act of 2002 enacted 30% bonus depreciation for property placed into service after September 10, 2001.

- The Jobs and Growth Tax Relief Reconciliation Act of 2003 increased the bonus level to 50% for property placed into service after May 5, 2003, and before January 1, 2005.

- Bonus depreciation expired December 31, 2004.

- The Economic Stimulus Act of 2008 reintroduced the bonus depreciation at a 50% rate for capital placed into service after January 1, 2008.

- American Recovery and Reinvestment Act of 2009 extended the bonus at the 50% rate through 2009.

- The Small Business Jobs and Credit Act of 2010 further extended the depreciation at the same rate through 2010. However, SBJCA was not signed into law until September 27, 2010, so for the majority of 2010 businesses may have been under the impression that the bonus depreciation might not be available on new capital expenditure.

- The Tax Relief and Unemployment Insurance Reauthorization and Job Creation Act of 2010 (signed on December 17, 2010) raised the bonus rate to 100% for property placed into service after September 8, 2010, and before January 1, 2012. Property placed into service during 2012 garnered the 50% bonus.

- The American Taxpayer Relief Act of 2012 extended bonus depreciation at a rate of 50% for 2013.

Table 1.8: Entrenchment Investment Analysis

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Z Tax Term	0.027*	0.017	0.077***	0.075***	0.123***	0.136***
	(0.015)	(0.014)	(0.028)	(0.027)	(0.034)	(0.034)
Entrench			0.161***	0.170***	0.236***	0.242***
			(0.052)	(0.054)	(0.063)	(0.062)
Entrench x Z TT			-0.019**	-0.021***	-0.030***	-0.032***
			(0.008)	(0.008)	(0.009)	(0.009)
γ_B			0.239***	0.267***	0.203***	0.203***
			(0.044)	(0.056)	(0.051)	(0.055)
Firms	1,944	1,911	16,19	1,592	1,576	1,543
Firms X Years	14,261	13,704	12,364	11,926	8,122	7,831

Notes: Specifications (1) and (2) present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}$$

for the governance subsample. Specifications (3) through (6) include governance measures and present regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 E_{it} + \beta_3 E_{it} z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specifications (2), (4), and (6) include additional controls for cash flows and financial distress. The time period for specifications (1) through (4) is the years 2000–2010. Specifications (5) and (6) focus on years 2000–2006. γ_G represents how much less responsive a firm is to the bonus depreciation when the Entrenchment measure of governance is increased one standard deviation relative to the mean. All specifications include marginal Q and firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

1.9.4 Entrenchment Investment Analysis

Appendix C presents key results using "Entrenchment" as defined in Section 5.1.2. During the full sample of years, firms with the lowest measures of governance and average rates of statutory tax depreciation increase their investment percentage by 7.5 percentage points when bonus depreciation increases from 0 to 100%. A one standard deviation increase in Bebchuk decreases investment responsiveness by 27%. Results are similar when the sample is restricted to years 2000–2006.

1.9.5 Investment Analysis Robustness to Interpolation

Appendix 1.9.5 addresses Governance imputation concerns. In (1) analysis is limited to years prior to 2007, when the method of interpolation used to construct the governance measure is least likely to skew results. In (2), Governance measures for 2001, 2003, and 2005, are interpolated by average Governance in the two closest years. 2007, 2008, 2009, and 2010 data are extrapolated from 2000 to 2006 trends in the observed measure. (3) limits analysis using average interpolation to years 2000–2006 to allay concerns that data imputation using trends are driving results. In (4) the average Governance measure is used. Heterogeneous investment response to bonus depreciation is present and of similar magnitude in all results.

1.9.6 Governance and Shares Analysis

Appendix 1.9.6 presents specifications with both Governance and Shares variables and their interactions with the Z Tax Term. Specifications (2) through (6) progressively limit analysis to firms that are more likely to have professional managers.

Table 1.9: Robustness to Interpolation

Dependent Variable	Cap Ex / PPE			
Specification	(1)	(2)	(3)	(4)
Z Tax Term	0.197***	0.160***	0.197***	0.124***
	(0.050)	(0.031)	(0.050)	(0.026)
Governance	0.358***	0.342***	0.358***	
	(0.076)	(0.054)	(0.076)	
Gov x Z TT	-0.042***	-0.041***	-0.042***	
	(0.011)	(0.008)	(0.011)	
$\overline{\text{Gov}}$ x Z TT				-0.036***
				(0.006)
γ_G	0.212***	0.314***	0.194***	0.290
	(0.031)	(0.067)	(0.063)	(0.027)
Firms	1,873	1,972	1,932	1,917
Firms x Years	9,257	13,131	8,684	16,859

Notes: Specifications (1) through (3) present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specification (1) uses the Governance variable as defined in Section 5.1.1, but limits the analysis to years 2000 to 2006. Specifications (2) and (3) use Governance constructed by interpolating the measure for year 2001, 2003, 2005, and years 2007–2010. Specification (2) uses data for years 2000 to 2010; the time period is limited to years 2000–2006 in Specification (3). γ_B represents how much less responsive a firm is to the bonus depreciation when the Governance measure of governance is increased one standard deviation relative to the mean. All specifications include controls for marginal Q, cash flows, and financial distress and firm and year fixed effects.

Table 1.10: Baseline Analysis 2000–2010, Managerial Equity Percentage

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Shares Restriction			$< 20\%$	$< 15\%$	$< 10\%$	$< 5\%$
Z Tax Term	0.155***	0.150***	0.159***	0.152***	0.166***	0.153***
	(0.031)	(0.031)	(0.032)	(0.032)	(0.034)	(0.036)
Governance	0.315***	0.321***	0.324***	0.323***	0.334***	0.310***
	(0.054)	(0.056)	(0.057)	(0.058)	(0.060)	(0.064)
Gov x Z TT	-0.039***	-0.040***	-0.040***	-0.040***	-0.042***	-0.040***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Shares	-0.000	-0.003	0.023	0.008	0.041*	0.070
	(0.006)	(0.006)	(0.016)	(0.018)	(0.024)	(0.044)
Shares x Z TT	0.000	0.000	-0.003	-0.001	-0.006	-0.010
	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)	(0.007)
Firms	1,619	1,592	1,571	1,557	1,526	1,453
Firms x Years	12,364	11,926	11,535	11,348	10,992	10,071

Notes: Table 5 presents regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 \tau z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} \tau z_{it}^T + \beta_3 S_{it} + \beta_4 S_{it} \tau z_{it}^T + \beta_5 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specifications (2) through (6) include additional controls for financial distress and cash flows. All specifications include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

Table 1.11: Decomposing the Governance Index

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Z Tax Term	0.050	-0.013	0.117***	0.118***	0.221***	0.379***
	(0.043)	(0.018)	(0.023)	(0.029)	(0.042)	(0.061)
Voting	0.062					0.092
	(0.059)					(0.059)
Voting x ZTT	-0.009					-0.013
	(0.008)					(0.008)
Delay		-0.108*				-0.213***
		(0.057)				(0.066)
Delay x ZTT		0.016**				0.030***
		(0.008)				(0.009)
Protection			0.400***			0.319***
			(0.059)			(0.059)
Protection x ZTT			-0.052***			-0.041***
			(0.008)			(0.008)
State				0.148***		0.118***
				(0.034)		(0.034)
State x ZTT				-0.022***		-0.018***
				(0.005)		(0.005)
Other					0.524***	0.454***
					(0.088)	(0.103)
Other x ZTT					-0.065***	-0.056***
					(0.012)	(0.014)

Notes: Specifications (1) through (5) present coefficients from regressions of the form:

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} u z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specification (6) includes all sub-indexes and their interaction with the Z Tax Term. All specifications include marginal Q and firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%. $i = 1,911$, $i \times t = 13,704$.

1.9.7 Decomposing the Governance Index

In Appendix 1.9.7, the effect of Governance Sub-Indexes are analyzed separately.

1.9.8 Standard Errors Clustered On Industry

In Appendix 1.9.8, the baseline analysis is repeated with standard errors clustered by industry to alleviate concerns that correlation in errors is at the industry, and not the firm, level. Standard error estimates are very similar to baseline results.

Table 1.12: Baseline Analysis, Standard Errors Clustered by Industry

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Z Tax Term	0.040**	0.015	0.027	0.017	0.177***	0.160***
	(0.018)	(0.016)	(0.023)	(0.021)	(0.033)	(0.052)
Governance					0.357***	0.342***
					(0.056)	(0.092)
Gov x Z TT					-0.043***	-0.041***
					(0.008)	(0.012)
γ_G					0.244***	0.259***
					(0.033)	(0.034)
Firms	12,932	12,047	1,944	1,911	1,944	1,911
Firms x Years	78,506	71,773	14,261	13,704	14,261	13,704

Notes: Specifications (1) and (2) present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}$$

for the governance subsample. Specifications (3) through (6) include governance measures and present regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Specifications (2), (4), and (6) include additional controls for cash flows and financial distress. The time period for specifications (1) through (4) is the years 2000–2010. Specifications (5) and (6) focus on years 2000–2006. γ_G represents how much less responsive a firm is to the bonus depreciation when the Governance is increased by one standard deviation relative to the mean. All specifications include marginal Q and firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

1.9.9 Industry x Year Fixed Effects

One concern in identifying the heterogeneous investment response to bonus depreciation is that Governance levels may be higher for the least responsive industries, those with the fastest statutory tax depreciation rates. To alleviate concerns, I include industry-year fixed effects to identify heterogeneous response within industries. Because the Z Tax Term is identified exclusively from differences across industries over time, it is perfectly collinear with the industry-year fixed effects and is dropped when industry-year fixed effects are included for the 123 BEA industries as in specifications (1) and (2). In specifications (3) and (4) industry-year fixed effects are included for industries defined by 2-digit NAICS codes. Heterogeneous investment response to bonus depreciation is present in all specifications.

1.9.10 Taxable Status and Investment Response

Firms that have tax loss carry-forwards should be unresponsive to bonus depreciation. If firms are strongly governed because they have performed poorly in the past, then the most strongly governed firms are likely to have tax loss-carry-forwards and should be unresponsive to bonus depreciation. In this case, empirical analysis excluding measures of tax status would show that strongly governed firms are less responsive to bonus depreciation. To alleviate concerns of this nature, I include three different measures of tax status and tax status interacted with the Z Tax Term to baseline regressions.

$\mathbb{1}$**(TLCF)** The first measure of taxable status is an indicator for whether the firm has any tax loss carry-forwards. The variable is equal to 1 when the firm reports a positive number of tax loss carry-forwards. The indicator is equal to zero if the firm reports 0 tax loss carry forwards or if the value is missing but the firm reports a positive number for Property Plant and Equipment. When the indicator is turned

Table 1.13: Including Industry x Year FE

Dependent Variable	Cap Ex / PPE			
Specification	(1)	(2)	(3)	(4)
Z Tax Term			0.108***	0.094***
			(0.034)	(0.033)
Governance	0.192***	0.183***	0.288***	0.282***
	(0.040)	(0.040)	(0.055)	(0.054)
Governance x ZTT	-0.020***	-0.018***	-0.033***	-0.033***
	(0.005)	(0.005)	(0.008)	(0.008)
$Q/(1-\tau)$	0.020***	0.017***	0.028***	0.024***
	(0.006)	(0.005)	(0.006)	(0.005)
Additional Controls		✓		✓
Firms	1,944	1,911	1,944	1,911
Firms x Years	14,261	13,704	14,261	13,704

All specifications present regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} z_{it}^T + \beta_4 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

All specifications include firm and year fixed effects. Specifications (1) and (2) include Industry x Year FE for the BEA Industries. Specifications (3) and (4) include Industry x Year FE for the industries defined by 2 digit NAICS industries. Additional controls include Cash Flows and Financial Distress. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

on, firms should be less responsive to bonus depreciation.

TLCF The second measure of taxable status is the level of tax loss carry-forwards reported by the firm. The variable is set equal to zero if the value is missing but the firm reports a positive number for Property Plans and Equipment. When firms have more tax loss carry-forwards, they should be less responsive to bonus depreciation. I scale this variable to be a number between 0 and 100.

MTR The third measure of taxable status is a simulated marginal tax rate constructed by Blouin, Core and Guay (2010). I use the marginal tax rate after interest deductions have been accounted for. When this number is higher, firms should be more responsive to bonus depreciation. The simulated tax rates take on values between 0 and 1.

I perform analysis using both contemporaneous taxable status measure and once-lagged measures to control for potential endogenous. Odd-numbered specifications reported below use the contemporaneous tax status measure. Even-numbered specifications use the lagged tax status.

The results of the tax-status analysis continue to show substantial heterogeneity in investment response to bonus depreciation. The magnitude of the heterogeneity is similar to the magnitude of the heterogeneity in the baseline results. The regression analysis also indicates that taxable status plays a role in determining investment response to bonus depreciation. Specification (1) results suggest that firms that have tax loss carry-forwards are more than 50% less responsive to bonus depreciation. Specification (5) results suggest that a 10% increase in simulated marginal tax rates makes firms approximately 50% more responsive to bonus depreciation.

Table 1.14: Investment Responsiveness and Tax Status

Dependent Var	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Z Tax Term	0.165***	0.161***	0.182***	0.156***	0.055	0.054
	(0.032)	(0.032)	(0.042)	(0.040)	(0.056)	(0.057)
Gov x Z TT	-0.041***	-0.040***	-0.043***	-0.040***	-0.038***	-0.039***
	(0.008)	(0.007)	(0.010)	(0.009)	(0.007)	(0.008)
$\mathbb{1}$(TLCF)	0.168*	0.143				
	(0.098)	(0.104)				
$\mathbb{1}$(TLCF) x Z TT	-0.025*	-0.022				
	(0.014)	(0.015)				
TLCF			0.006	-0.002		
			(0.004)	-0.002		
TLCF x Z TT			-0.001*	-0.000		
			(0.001)	(0.001)		
MTR					-1.390	-1.285
					(1.004)	(0.968)
MTR x ZTT					0.263*	0.256*
					(0.145)	(0.140)
Firms	1,911	1,911	1,471	1,479	1,809	1,810
Firms x Years	13,704	13,692	8,505	8,534	13,080	13,113

Notes: All specifications present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 z_{it}^T + \beta_2 G_{it} + \beta_3 G_{it} z_{it}^T + \beta_4 \text{TAX}_{it} + \beta_5 \text{TAX} \tau z_{it}^T + \beta_6 \frac{\lambda_{it}}{p_{it}} + \epsilon_{it}.$$

Where TAX is an indicator for tax loss carry-forwards in specifications (1) and (2), is the level of tax loss carry-forwards in (3) and (4), and is the Blouin et al. (2010) estimated marginal tax rate in (5) and (6). Specifications (2), (4), and (6) use the lagged tax variable to avoid endogeneity concerns. All specifications control for marginal Q, financial distress, and cash flows and include firm and year fixed effects. Standard errors are clustered at the industry level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

Table 1.15: Event Study Placebos

Event Study Placebo 1: December 10, 2012

Dependent Variable	CAR_1	CAR_2	CAR_3	CAR_4	CAR_5	CAR_6
Bebchuk	0.049	-0.001	0.042	0.046	0.085	0.128
	(0.042)	(0.058)	(0.073)	(0.079)	(0.072)	(0.084)
Deprec	-0.030	0.217*	0.345*	0.382	0.203	0.168
	(0.108)	(0.129)	(0.206)	(0.260)	(0.180)	(0.194)
Bebchuk x Deprec	-0.063	0.012	0.152	0.121	0.149	-0.063
	(0.088)	(0.117)	(0.137)	(0.146)	(0.126)	(0.137)
Observations	1,189	1,189	1,189	1,189	1,189	1,189

Event Study Placebo 2: January 15, 2013

Dependent Variable	CAR_1	CAR_2	CAR_3	CAR_4	CAR_5	CAR_6
Bebchuk	0.017	0.095	0.055	0.037	0.030	0.024
	(0.048)	(0.066)	(0.097)	(0.111)	(0.135)	(0.157)
Deprec	-0.143	-0.157	-0.238	-0.331	-0.339	-0.214
	(0.213)	(0.424)	(0.411)	(0.528)	(0.516)	(0.577)
Bebchuk x Deprec	-0.054	-0.012	0.145	0.244	0.305	0.214
	(0.065)	(0.097)	(0.110)	(0.152)	(0.193)	(0.204)
Observations	1,189	1,189	1,189	1,189	1,189	1,189

Table X presents results for regressions of the form

$$CAR_t = \beta_0 + \beta_1 \text{ [Bebchuk]} + \beta_2 \text{ [Deprec Rate]} + \beta_3 \text{ [Bebchuk X Deprec Rate]}$$

CAR_t is the cumulative abnormal return t trading days after Pacebo Dates December 10, 2012 and January 15, 2013. Results include industry fixed effects and control for Cash Flow. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** statistical significance 1% level, ** at 5%, and * at 10%.

1.9.11 Event Study Placebo Tests

1.9.12 Investment Impact of ITC Repeal

In this section, I test a secondary hypothesis of the theoretical model presented in Section 4. The model predicts that while investment response should be heterogeneous to bonus depreciation via the Z Tax Term, investment should not be heterogeneous in response to investment tax credits, which affect both flows and accounting earnings;

$$\frac{\partial I/K}{\partial ITC} = \frac{1}{1-\tau} \qquad \frac{\partial I/K}{\partial \tau z^T} = \frac{1-\alpha}{1-\tau}.$$

If, in fact, investment response to ITC is not heterogeneous across firms with varying levels of governance, then there is additional evidence that bonus depreciation take-up is limited due to its accounting interactions and that bonus depreciation is a nice natural experiment to test for the relationship between governance and earnings management.

To test the theory, I will run regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 \frac{ITC^T_{it}}{1-\tau_t} + \beta_2 \frac{\tau z^T_{it}}{1-\tau_t} + \beta_3 \frac{G_{it} ITC^T_{it}}{1-\tau_t} + \beta_4 \frac{G_{it} \tau z^T_{it}}{1-\tau_t} + \beta_5 \frac{\frac{\lambda_{it}}{p_{it}} - 1}{1-\tau_t}$$

on data that includes changing tax depreciation rates and investment tax credits. If the coefficient β_3 is equal to zero, then the subsidiary model prediction is confirmed. Coefficient β_4 should be greater than zero if investment response to changes in statutory depreciation rates is heterogeneous in the governance measure. However, I expect to find no heterogeneous response, because statutory tax depreciation rates were not the primary investment stimulus tool used during the new sample period; the ITC was.

The ITC was retroactively repealed in 1985 by The Tax Reform Act of 1986.

This analysis will focus on the period around the repeal, years 1981 to 1987, three years prior to and three years after repeal. During this time, top statutory tax rates and statutory depreciation rates were also in flux. The analysis accounts for these changes.

Governance Data: The IRRC began collecting corporate governance data in 1990. This data will be projected back to the time sample of interest. This presents possible measurement error into the analysis. However, as Gompers et al. (2003) pointed out, governance variables are relatively stable over time. I will test both the Governance and Entrenchment measures in the following analysis.

Tax Variables: I construct the Z Tax Term as in Section 3.4. The construction of the investment tax credit variable,

$$\text{ITC Tax Term} = \frac{ITC_i t}{1 - \tau_t},$$

is similar. Dale Jorgenson provides ITC data on 44 different types of assets. For each asset class, both the ITC rate, which varies over time, and the ITC basis (whether the type of asset qualified for the tax credit) is provided. Using the 1982 BEA Capital Flow Table, the percentage of investment in each asset type by each industry is constructed. These weights are combined with ITC rates and bases to create industry-level ITC rates that vary over time. Variation over time in the ITC is driven by reforms in 1982 and 1985, when the ITC was ultimately (and retroactively) repealed. Variation across industries is driven by the percentage of investment eligible for the tax credit in each industry. The impact of the investment tax credit is identified by industry-level differences in the percentage of capital expenditures that are eligible for the investment tax credit. When the credit is repealed in 1985, it is most detrimental to the industries where a large percentage of capital expenditure used to be eligible for the credit.

Other Data: All other variables are constructed as in Section 5.

Table 1.9.121 provides descriptive statistics for the 1981-1987 analysis. The Governance sample are larger firms for which the governance variables are available. These firms tend to invest less as a percentage of capital. They also have larger cash flows. The investment tax credit ranges from 0 to 10% over the sample, 0 to 0.187 when scaled by the top statutory tax rate.

Results: Table 1.9.122 provides regression results for the 1981–1987 ITC analysis. Specifications (1) and (2) examine the effect of the ITC Tax Term and the Z Tax Term for the full sample with and without additional controls. The results suggest that the general population of firms is very responsive to changes in both investment tax credits and depreciation allowances. When the sample is limited to the Governance Sample in specifications (3) and (4), the results are less extreme and not statistically different from zero. This is most likely due to the small sample size.

In specification (5), Governance, Governance interacted with the ITC Tax Term, and Governance interacted with the Z Tax Term are added to the regression. The coefficients on the interaction terms are not statistically different from zero for either tax variable, suggesting no heterogeneity in response to changes in either type of investment tax incentives. Specification (6) repeats the analysis using the Entrenchment governance variable. Results are similar, again suggesting no heterogeneity of response.

While this analysis is plagued by a relatively small sample size and possible mismeasurement of the governance variables, it does not strongly contradict the main results presented in this paper. If this analysis found that strongly governed firms decreased their investment behavior the least when the investment tax credit was repealed, it would call into question the heterogeneity that supports the connection between governance and earnings management.

TABLE 1.16: DESCRIPTIVE STATISTICS, YEARS 1981–1987

	Median	Mean	Std. Dev.	Obs.
Full Sample				
Cap Exp / Prop Plant Equip	0.204	0.433	0.765	36,977
Z Tax Term	0.715	.0696	0.066	50,104
ITC Tax Term	0.167	0.109	0.082	50.104
Q/(1-τ)	1.212	1.817	1.866	34,675
Cash Flow / PPE	0.204	-0.040	2.758	37,405
K-Z Financial Constraint	0.463	0.373	2.135	40,158
Governance Sample				
Cap Exp / Prop Plant Equip	0.206	0.311	0.424	5,783
Z Tax Term	0.714	0.690	0.071	6,979
ITC Tax Term	0.167	0.111	0.082	6,979
Q/(1-τ)	1.197	1.567	1.100	5,811
Cash Flow / PPE	0.302	0.500	0.944	5,751
K-Z Financial Constraint	0.138	0.118	1.398	6,594
Governance, Equity Incentives				
Goernance	8	8.085	2.897	8,027
Entrenchment	4	4.066	1.363	8,027

Note: Table 1.9.121 provides descriptive statistics for the 1981–1987 analysis. The investment and tax variables are provided for both the full sample and for the governance sample. The governance sample are firms for which data are available. Table X also provides governance data for years 1981–1987.

TABLE 1.17: INVESTMENT TAX CREDIT ANALYSIS 1981–1987

Dependent Variable	Capital Expenditure / Property Plant Equipment					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
ITC Tax Term	3.794***	3.730***	1.143	0.770	0.336	0.297
	(1.347)	(1.238)	(1.386)	(1.367)	(1.369)	(1.352)
Z Tax Term	4.060***	3.407***	1.620*	0.943	1.029	0.963
	(0.981)	(0.941)	(0.942)	(0.908)	(1.410)	(1.361)
Gov x ITC TT					0.049	
					(0.069)	
Gov x Z TT					0.002	
					(0.181)	
Entrench x ITC TT						0.097
						(0.114)
Entrench x Z TT						0.009
						(0.308)
$Q/(1-\tau)$	0.024***	0.026***	0.077***	0.039*	0.039**	0.038*
	(0.006)	(0.007)	(0.023)	(0.020)	(0.020)	(0.020)
Additional Controls		✓		✓	✓	✓
Firms	7,497	7,280	988	950	950	950
Observations	30,126	29,299	5,340	5,222	5,222	5,222

Notes: Specifications (1) through (4) present regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 \frac{ITC_{it}^T}{1-\tau_t} + \beta_2 \frac{\tau z_{it}^T}{1-\tau_t} + \beta_3 \frac{\frac{\lambda_{it}}{p_{it}}}{1-\tau_t}.$$

Specifications (5) and (6) include governance measures and present regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 \frac{ITC_{it}^T}{1-\tau_t} + \beta_2 \frac{\tau z_{it}^T}{1-\tau_t} + \beta_3 \frac{G_{it} ITC_{it}^T}{1-\tau_t} + \beta_4 \frac{G_{it} \tau z_{it}^T}{1-\tau_t} + \beta_5 \frac{\frac{\lambda_{it}}{p_{it}} - 1}{1-\tau_t}.$$

All specifications include the structures tax term. Specifications (2) and (4) through (6) include additional controls for cash flow and financial distress.
All specifications include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

1.9.13 Reconciling Investment and Event Study Results

This robustness check uses investment response results to predict stock market price responses to the 50% bonus deprecation extension analyzed in Section 1.7. The back of the envelope calculations produce estimates surprisingly similar to event study results. That the magnitudes of investment and stock price response and comparable strengthens the findings presented in each disjoint analysis.

- Using results from the investment response analysis, the effect extension of bonus depreciation at a rate of 50% can be calculated. According the the investment response results, for a firm with the average level of governance, investment does not respond to bonus depreciation. For the average firm, the benefit of bonus depreciaiton comes exclusively from decreases in the net present value costs of investment. For a firm with mean Deprec, 50% bonus decreases NPV investment price by \$0.21. For the average firm in the sample, this amounts to a decrease of \$6.573 million and results in a net income of 2.08%. For a firm that invests in longer-lived equipment and has Deprec one standard deviation below the mean, the cost of investment decreases by \$0.035 per dollar which decreases the cost of investment by \$10.995 million and increases income by 3.47%. Under the overly-simple assumption that income is a perfect proxy for firm value, upon announcement of 50% bonus depreciation, the value of firms that have one standard deviation lower Deprec should increase by 1.39% more than firms with mean Deprec levels. This is the exact interpretation of the Deprec coefficient in the event study analysis. The event study analysis found this number to be 0.644%.

- As the level of governance decreases, bonus depreciation is more effective at stimulating investment. While the firm with mean levels of governance does not increase investment in response to bonus deprecation, a firm with governance

one standard deviation below the mean increases investment percent by 2.85% in response to 50% bonus depreciation. This increase is equivalent to $8.921 million in additional investment. Using marginal Q to translate investment into firm value, this investment response increases the value of the less-governed firm by $25.38 million or 0.46% of the value of the average firm in the sample. The event study analysis concludes firm values with governance levels one standard deviation below the mean experience abnormal returns of 0.457 % more than firms with mean governance levels.

CHAPTER II

Dividend Taxation and Merger Behavior: A New View Explanation for the Post-Merger Performance Puzzle (with Nathan Seegert)

2.1 Introduction

Mergers and acquisitions are a large part of the United States economy. Between 2000 and 2012, the dollar value of merger and acquisition activity in the US was $12.78 trillion. Mergers are critical to economic growth because, done well, they can capitalize on positive synergies and economies of scale, thereby increasing efficiency and creating value for shareholders. However, executed poorly, mergers can dampen innovation, decrease efficiency, and destroy shareholder value. Because of the scale and significance of this topic, large literatures in finance and economics have developed that discuss possible mechanisms which distort merger and acquisition behavior. In this paper, we examine dividend taxation and its effect on merger behavior. We posit that dividend taxation lowers the synergy threshold for profit maximizing mergers and makes potentially inefficient mergers more attractive to firms. We find strong empirical support for the this profit maximizing explanation, demonstrating long-run returns are 8 to 10 percent higher for dividend paying firms following the 2003 US dividend tax reform.

There is reason to believe that merger and acquisition behavior is being distorted. The finance literature documents that on average twenty-four months after a merger returns are eighteen percent lower than would be expected in the absence of the merger ((Gregory 1997), (Myers 1984), (Agrawal and Madelker 1990), (Agrawal, Jaffee and Madelker 1992)). This empirical puzzle seems to be robust across countries and through time despite the fact that researchers have been discussing it for twenty years ((Agrawal and Jaffee 2000)). Furthermore, it seems difficult to reconcile this empirical puzzle with a model in which firms seek to maximize shareholder value. This difficulty has inspired many behavioral explanations, such as CEO hubris.

We propose an alternative theory for this puzzle in which value-maximizing behavior in the presence of dividend taxation may result in inefficient mergers and negative post-merger performance. A representative shareholder considers two profitable investment opportunities an outside investment and a merger. The outside opportunity differs from the merger in that in order to engage in the outside investment the shareholder must distribute funds and therefore pay dividend taxes. The merger generates no tax costs, but may destroy the some of the value of the target firm due to mismanagement or other possible issues. The shareholder weighs the tax cost of the outside investment (which is larger in the presence of high dividend tax rates) against the value that may be destroyed by the merger. When tax rates high, value destroying mergers are relatively more attractive and may be profit maximizing. Therefore, when the cost of distributing funds through dividend payments is distorted by the dividend tax, firms substitute towards mergers and acquisitions as the preferred investment method.

This tax mechanism implies that in reaction to a dividend tax rate decrease, long-run post-merger returns should be higher for firms paying a dividend and should be unchanged for firms not paying a dividend. We test this implication using variation created by the 2003 dividend tax reform. Our empirical examination uses data

on nearly 7,000 acquisitions by publicly traded companies between 1998 and 2010. We collect data from Bureau Van Dijks Amadeus Zephyr database, the Compustat North American Fundamentals Quarterly database, and the Center for Research in Security Prices (CRSP) database. In later analyses we extend this data to the years 1992 to 2012, over 20,000 acquisitions by publicly traded companies, using Thomson and Reuters SDC database. We implement a difference-in-difference empirical strategy motivated by the theoretical model's result that post-merger long-run returns should be affected by a dividend tax change for firms paying a dividend but should be unaffected for firms not paying a dividend. In this specification, we use firms that distribute retained earnings through repurchases of shares as a benchmark to control for other time-varying factors. Firms active in repurchasing shares are a good benchmark because they are similar to firms that pay dividends based on observable characteristics, and are unaffected by the dividend tax change. Furthermore, using firms actively repurchasing shares as the control group we empirically test and fail to reject the common trend assumption, the key identifying assumption of the difference-in-difference specification.

This paper contributes to both the economics literature on corporate taxation and the finance literature on mergers and acquisition behavior. We make three significant contributions. First, we provide a possible profit maximizing explanation for the post-merger performance puzzle. Second, we provide empirical evidence supporting the profit maximizing explanation, demonstrating the distortion due to dividend taxation is real and empirically large enough to explain the puzzle.

2.2 Documenting and Explaining Merger Behavior

Two literatures have developed which separately explore aspects of merger and acquisition behavior that we seek to study. The first literature is concerned with documenting and explaining why mergers fail relative to benchmark trends. The

second literature explores the impact of taxation on mergers.

2.2.1 The Post-Merger Performance Puzzle

(Franks, Harris and Titman 1991) was the first paper devoted entirely to explaining long-run post-merger performance. The paper introduces techniques for analyzing post-merger performance that the subsequent literature follows. (Franks et al. 1991) describe the amount a firm was under- or over-performing over time by comparing a counterfactual performance with the firm's actual performance, measured by its stock price. The cumulative difference between the counterfactual performance and the actual performance of the firm is defined as the Cumulative Abnormal Return or CAR. Subsequent literature improves upon the methods for predicting counterfactual performance, but the (Franks et al. 1991) framework of studying CARs for individual firms and the Cumulative Average Abnormal Return (CAAR) for all merging firms is the benchmark in this field of study.

(Franks et al. 1991) investigates 399 acquisitions, both mergers and tender offers, that occurred during the period 1975-1984, where both the acquirer and the target were on NYSE/AMEX. The (Franks et al. 1991) findings suggest that cumulative average returns for acquiring firms are not statistically different from zero, however the subsequent literature finds different results using (Franks et al. 1991)'s methods. For example, (Agrawal et al. 1992) repeat the work done by (Franks et al. 1991) but extend the time period to cover the years 1955 to 1987 and exclude tender offers from the sample, which would otherwise bias the results towards zero. (Agrawal et al. 1992) report five-year CAARs of -0.1026, (interpreted as ten percentage points under-performance relative to counterfactual stock performance). (Agrawal and Madelker 1990) find very similar results to (Agrawal et al. 1992) when the counterfactual performance is adjusted to control for firm size and the book-to-market ratio.

(Gregory 1997) provides the most comprehensive study of post-merger performance to date. The paper computes counterfactual performance using multiple benchmarks. Furthermore, the study, which examines mergers in the United Kingdom (UK) between 1984 and 1992, provides an out-of-sample test of the merger-failure phenomenon observed in the United States. Gregory finds two-year buy-and-hold (or multiplicative) CAARs which vary between -0.1182 and -0.18 using six different counterfactual models. All point estimates are statistically different from zero.

The survey work by (Agrawal and Jaffee 2000) covers these results and lists several other similar findings. They conclude "Taken together, we believe that the post Franks, Harris, and Titman (1991) articles suggest strong evidence of an anomaly following mergers." The empirical anomaly that mergers often result in poor performance and that this trend is consistent over time is often called the post-merger performance puzzle.

2.2.2 Possible Explanations

Several mechanisms have been offered to explain the post-merger failure puzzle. (Agrawal and Madelker 1990) propose two mechanisms for abnormal negative post-merger performance: speed of adjustment and size of the merger. The speed of adjustment hypothesis posits that post-merger abnormal returns are the result of the market reacting positively to the merger upon announcement. To test this hypothesis they attempt to determine whether abnormal returns upon announcement are negatively correlated with post-merger cumulative abnormal returns. Looking at post 1960 data they find no evidence of negative correlation, suggesting that the speed of adjustment is not the mechanism driving the post-merger failure puzzle. (Agrawal and Madelker 1990) also examines whether the size of the merger, which may impact the speed at which information is capitalized into the price of the acquiring firm stock, impacts firm CARs. They again find no empirical relationship. (Franks et

al. 1991, Loughran and Vijh 1997) also find no connection between the size of the merger and the post-merger cumulative abnormal return.

Another proposed mechanism, based on work by (Myers 1984), is that firms with private information about the value of their own stock are able to buy companies at a discount using their stock when it is overvalued. (Loughran and Vijh 1997) find support for this mechanism by demonstrating that mergers paid for with stock fail more often. However, (Gregory 1997) finds evidence that abnormal returns are highest for mergers paid for with a combination of stock and cash. In addition, if method of payment were the mechanism driving the post-merger failure the new information should be capitalized into the share price immediately upon merger, not over a period of 24 to 50 months which the literature focuses on.

A theory referred to as "performance extrapolation" has also been considered to explain the post-merger performance puzzle. (Rau and Vermaelen 1998) posits that the market over-values actions of firms that have performed well in the past. Thus, upon announcement of a merger the market overvalues the activities of these "glamour" firms. Similarly, the market undervalues mergers performed by firms with poor past performance, or "value" bidders. As the information of the true value of the merger is revealed, the glamour firm prices drop and the value firm prices increase. (Rau and Vermaelen 1998) cite past literature which links higher announcement returns to higher Q-ratios. (Rau and Vermaelen 1998) find modest evidence that long-run under-performance is linked to glamour firms. However, their findings are inconsistent with method of payment explanations. Their findings are also inconsistent with the (Agrawal and Madelker 1990) results, which do not demonstrate a negative relationship between announcement abnormal performance and subsequent cumulative abnormal returns.

To summarize the post-acquisition stock performance literature, there is ample evidence from a number of studies using varied methodologies and samples to demon-

strate that acquiring firms under-perform relative to predicted counterfactual performance. Several explanations have been advanced to account for this apparent anomaly but none have been widely accepted. The post-merger performance puzzle remains an open question two decades after (Franks et al. 1991) first described it.

2.2.3 Mergers and Taxation Literature

We posit that taxation may, at least in part, explain the post-merger performance puzzle. While this is a new mechanism for the literature following (Franks et al. 1991), the effect of taxation on merger behavior has been studied in the corporate taxation literature.

(Auerbach and Reishus 1987) examine mergers that occurred before 1986. During this time period, acquiring firms could gain windfall tax benefits generated by mergers (especially through the acquisition of tax loss carry-forwards or the basis step-up of assets). (Auerbach and Reishus 1987) offer preliminary results that suggest: 1) many acquisitions provide an opportunity for acquiring firms to receive some sort of tax benefit, 2) in a small minority of cases, these benefits are large relative to the value of the acquiring firm, and 3) even in cases where relatively large tax benefits exist, there is no strong evidence that this is the driving force in the merger. In addition to the benefits of attaining tax loss carry-forwards, (Auerbach and Reishus 1987) also identify a possible tax wedge; when transactions are made via nontaxable stock transactions, the shareholders of the acquiring company may pay a premium because they are able to diversify their portfolio without realizing capital gains. Given this tax wedge theory, the acquirer should realize larger gains when paying with stock.[1] Although (Auerbach and Reishus 1987) do not find strong evidence that merger behaviors are driven by tax attributes of mergers, the authors do find that tax loss carry-forwards, at least prior to 1987, are the most beneficial tax attributes

[1]This theory runs counter to the method of payment empirical findings.

of acquired firms.

A subsequent paper by the same authors, (Auerbach and Reishus 1988), present empirical findings that support the theory that some types of tax benefits can influence merger behavior. (Auerbach and Reishus 1988) find that tax loss carry-forwards (TLCFs) on the part of the acquiring firm do influence the takeover of firms that earn positive income. In these cases, the TLCFs can be used to offset the income of the acquired firm. (Auerbach and Reishus 1988) also find that firms that issue share repurchases in the two yeas prior are less likely to merge which is "hard to reconcile with the theory that firms seek acquisitions to free trapped equity." This pattern does not exist in our data.

In reviewing the results from the 1987 and 1988 Auerbach and Reishaus papers, the reader should keep in mind that many of the tax benefits of mergers were eliminated in provisions contained in Tax Reform Act of 1986.

The corporate finance literature presented here predicts that taxation should be a driving force behind mergers if 1) the tax attributes of acquiring or acquired firms may be better used after the merge or 2) if there exists some "trapped equity" incentives that make mergers more attractive options than some opportunity cost of outside investment. While strong empirical results are generally lacking in this literature, some of these theories may be applied to help us understand the post-merger performance puzzle. Our theory seeks to bridge the gap between these two literatures. We explain that mergers, and in particular inefficient mergers, are driven by tax-motivated incentives.

2.3 Conceptual Framework

2.3.1 A Framework of Substitute Investment Strategies

Consider a representative shareholder seeking to maximize the value of Firm A. At the outset, the value of Firm A is denoted V_A. Assume the shareholder is the firm's sole decision maker, thus the firm is immune to issues of agency. The shareholder considers redirecting some of the capital from Firm A towards investment in a second firm, Firm B. The shareholder has two alternative methods to invest in Firm B. The first method involves distributing funds from Firm A and purchasing Firm B via an "outside" investment. In this scenario, firm B would operate independently of Firm A. The distribution of funds triggers taxation at rate θ. The shareholder values firm B at V_B. If we consider the cost of Firm B is C_B, then the shareholder is willing to engage in the outside investment only if

$$V_A + V_B - C_B - \theta C_B \geq V_A.$$

That is, the joint investment is only optimal if the values of Firms A and B minus the cost of Firm B and the tax cost of distributing funds is greater than the value of the original firm. Put differently, the investment in Firm B is only optimal if

$$V_B - C_B \geq \theta C_B, \tag{2.1}$$

the net value of investing in B exceed the tax cost of distributing the funds necessary for the purchase. If $\theta = 0$ and distributions are not taxed, outside investment in B is only optimal if the net value of B, $V_B - C_B$, is positive. When tax costs are positive, the wedge between V_B and C_B must be even higher in order for the investment to be profit maximizing.[2]

[2]There are several potential explanations for the existence of this wedge. For instance, the shareholder may possess private information regarding the value of B. Alternatively, information

Alternatively, the representative shareholder may acquire Firm B through corporate M&A activities. The "merger" investment differs from the outside investment in two ways. First, the shareholder does not have to distribute funds in order to finance the acquisition and therefore avoids the tax cost of the investment. Second, the merger generates synergy specific to the A and B combination, ξ_{AB}.[3] This synergy parameter captures the fact that once the merger in performed, the performance of Firm B inherently depends on how the shareholder operates B and its resources and/or how its operations interact with those of Firm A. For instance, if the merger may create synergistic value by generating vertical supply chain integration. Alternatively, the shareholder of Firm A may not operate Firm B as efficiently as the original Firm B management team and the acquisition may actually destroy value. Thus, the synergy parameter may take on both positive and negative values.

A merger is only profit maximizing if

$$V_A + V_B - C_B + \xi_{AB} \geq V_A,$$

the value of the Firm A plus the net value of Firm B and the synergy between A and B outweighs the value of the initial investment in only Firm A. Rewriting the inequality in terms of the net value of B yields

$$V_B - C_B \geq -\xi_{AB}, \tag{2.2}$$

which differs from equation (2.1) in that $-\xi_{AB}$ may take on positive or negative values depending on whether the merger is value creating or value destroying. If the

asymmetries or agency issues may be depressing market's valuation of B and thereby driving down the cost of Firm B investment. The simple observation that individual investors often sell one stock in order to buy another that they believe will garner higher returns confirms the existence of such wedges.

[3]The cost of Firm B is assumed to be identical whether the investment is made via outside investment or merger investment.

synergy parameter is positive, then the shareholder may optimally invest in Firm B via a merger even when the net value of Firm B is negative (as long as it is less negative than $-\xi_{AB}$). When ξ_{AB} is negative and the merger is value destroying, the merger is still optimal as long as the net value of Firm B outweighs the synergy costs.

Assuming that ξ_{AB} is positive, there are no values of $V_B - C_B$ at which investment in B will take place via private investment. To see this, first assume that $V_B - C_B < -\xi_{AB}$. On this range of Firm B net value, no investment in B will take place as $V_B - C_B$ is negative (so private investment is sub-optimal) and large enough in magnitude to eclipse the value of any potential synergies. When $-\xi_{AB} < V_B - C_B < \theta C_B$, then the merger is profit maximizing while the private investment is not. When $\theta C_B < V_B - C_B$, both investment strategies are profitable, however the merger is always preferred because not only does the merger avoid the tax cost of investing in Firm B, but it creates positive synergistic value for the shareholder.

However, when the synergies created by the merger are value destroying, the private investment may be a substitute for the merger and the trade-off between the two methods is governed by the tax rate on distributed funds. Assuming that either investment strategy is profitable (that is, inequalities (2.1) and (2.2) hold) then the merger is the profit maximizing choice for the shareholder as long as

$$\xi_{AB} \geq -\theta C_B. \tag{2.3}$$

That is, as long as the synergies from the merger (which may be negative) are higher than the tax costs of the private investment. The threshold at which the merger is the preferred investment strategy is increasing in the tax rate on distributed funds. If the tax rate is zero, then no mergers will take place because the private investment has no costs outside of C_B but the merger incurs the synergy cost. Only when taxes on distributed earnings are positive, are inefficient mergers potentially profit

maximizing choices. As the tax rate increases, the threshold at which the merger is optimal decreases. Said differently, taxes on distributions increase the cost of the substitute investment strategy making even inefficient mergers more attractive to the decision making shareholder.

Given this discussion, the expected value of the merger may be written as

$$V_M = \left[V_B - C_B + \xi_{AB} \;\middle|\; \xi_{AB} \geq -\theta C_B \right]$$

where the synergy parameter may be negative as long as the tax costs outweigh any value destroying synergies created by the merger. From this expression, the formal theoretical hypothesis upon which the remainder of this paper is based may be constructed.

Hypothesis 1. The expected value of profit maximizing merger is decreasing in the tax rate on distributed earnings, θ.

Given that both the outside investment and merger investment generate positive profits, the merger is more profitable whenever the tax costs of the outside investment outweigh any negative merger synergies. At higher rates of taxation on distributed earnings, the tax costs of the outside investment increase and the synergy threshold at which the merger is the preferred option decreases. When the threshold decreases, the expected value of an observed profit maximizing merger decreases. More succinctly, an increased tax rate on distributed earnings drives down the minimum profit maximizing merger synergy and lowers the bottom end of the distribution of the values profit maximizing mergers. As a result, the expected value of any observed profit maximizing merger is lower.

Hypothesis 1 may also be understood by examining the expected value of an observed profit maximizing merger both in a zero and positive tax environment. When the tax rate on distributed earnings is zero, the merger synergy threshold is

zero and the merger is only the profit maximizing investment option if it generates positive synergies. The expected value of any observed merger is then weakly greater than $V_B - C_B$ because ξ_{AB} is constrained to be weakly greater than zero. When the tax rate on distributions is positive, the lower threshold of profit maximizing synergies is driven below zero. When the threshold is below zero, the expected value of profit maximizing mergers is now weakly less than $V_B - C_B$.

When the tax rate on distributed earnings is positive, mergers may be both profit maximizing from the perspective of a representative shareholder and "failures" from the perspective of the greater economy. The merger is profit maximizing as long as it is profitable and more profitable than the substitute outside investment option. With positive tax rates, negative synergy mergers may be profit maximizing but the value of the two firms prior to the merger $V_A + V_B$ is strictly greater than the value of the two firms after the merger, $V_A + V_B + \xi_{AB}$.

2.3.2 Investor Valuation and the Post-Merger Performance Puzzle

Before moving on to discuss the empirical strategy that will be used to test Hypothesis, 1. First consider how the Hypothesis may help explain the post-merger performance puzzle. The stock price response to the merger decision is driven by the valuation of the merger by minority non-controlling investors. Assume the minority investors accurately value V_B and C_B but cannot perfectly value the synergies created by the merger, ξ_{AB}. If investors do not take into account the tax costs of the substitute private investment, then they assume the merger will only be undertaken when synergies are value creating. Thus, investors will value the merger as

$$V_I = \left[V_B - C_B + \xi_{AB} \;\middle|\; \xi_{AB} \geq 0 \right].$$

In reality, the merger may be the best investment strategy as long as the synergies destroy less value than the tax cost of the private investment. Thus, as noted above, the real value of the merger, V_M, is

$$V_M = \left[V_B - C_B + \xi_{AB} \;\middle|\; \xi_{AB} \geq -\theta C_B \right].$$

This divergence in the expected value of the merger from the investor's perspective versus the true value of the merger as understood from the perspective of the representative shareholder provides a profit maximizing explanation for the long-run cumulative abnormal stock returns of firms following acquisitions. Upon announcement/acquisition stock returns for the acquiring firm are on average positive. However, in the long-run, abnormal returns are depressed for the acquiring firm up to 2 years after the merger, resulting in long-run negative stock performance relative to pre-merger performance. This pattern is consistent with investors initially valuing the firm at V_I then revaluing the merger towards V_M as the value of the merger synergy parameter is slowly revealed.

2.4 Data Collection and Construction

To test Hypothesis 1, we collect data describing merger and firm characteristics. The abnormal performance of the acquiring firm post-merger are compiled using this data and details are provided in appendix 2.8.1. The sources, collection, and cleaning of these data are described in the following three subsections. The last subsection uses these data to report descriptive statistics and test assumptions of the empirical design.

2.4.1 Merger Data

Merger characteristics are taken from the Bureau Van Dijk Amadeus Zephyr database, with permission of Zephyr. We examine mergers that occurred between the dates of January 1, 1998 and December 31, 2010. We restrict our sample in several ways. First, acquisitions made by private companies not listed on the NYSE or NASDAQ are excluded because they lack a stock price by which to measure performance. We further limit our sample to 100 percent acquisitions to avoid merger type effects. Finally, we exclude firms with more than twenty 100 percent acquisitions during our sample period.[4] This exclusion limits the effects from overlapping mergers and excludes mostly large banking firms from our sample.

The Zephyr database has extensive data on mergers and acquisitions. For our analysis the most pertinent features capture the timing of the merger, including the announcement and official date, and merger type. We match the merger data from Zephyr with data from CRSP and Compustat databases.

2.4.2 Stock Prices and Firm Characteristics

Stock prices are taken from the CRSP database. These data allows us to calculate the abnormal returns for acquiring firms (using the month end closing stock price) and the dollar value of repurchased shares (using the quarter end closing stock price). Acquiring firm characteristics are taken from the Compustat North American Fundamentals Quarterly database. From the Compustat database we extract acquiring firm data on dividends, share repurchases, assets, sales, and retained earnings.

Cash dividends paid per year are referred to simply as dividends throughout this paper. Compustat provides the dividends paid as a number reported quarterly that accumulates throughout the year. To transform the variable into cash dividends paid per quarter, we use the accumulating variable value for the first quarter of the year

[4]The results are robust to setting other limits on the maximum number of mergers per firm.

and then for each subsequent quarter take the difference in the accumulating variable to be the cash dividends paid in that quarter. These values are used to determine which firms regularly pay a dividend to identify them as the treatment group in the empirical analysis.

Compustat provides data on shares repurchased starting with the first quarter of 2004. We follow (Stephens and Weisbach 1998) in imputing shares repurchased as the dollar value of decreases in shares outstanding from Compustat. This method is internally valed as it closely approximates repurchase behavior in years when Compustat records actual repurchase data. As with the dividends, these values are used to determine which firms regularly repurchase shares to identify them as the control group.

Throughout the proceeding analysis, we also use firm controls in an effort to eliminate any correlation between merging behavior, payout behavior, firm size, retained earnings, and productivity. To control for these characteristics, we include in our analysis assets, retained earnings, percent cash merger, sales, percent stock merger, marginal q, and the book-to-market ratio. We average these by firm for the two years prior to the merger to attain average firm characteristics.

2.4.3 Descriptive Statistics

The empirical strategy compares long-run stock returns of dividend paying firms making acquisitions before and after the dividend tax rate change in 2003. The empirical strategy uses firms that regularly repurchase shares to control for all other time varying variables that may affect long-run stock returns after an acquisition. Table 2.1 demonstrates the similarity of firms that regularly pay a dividend and firms that repurchase shares. On average, dividend firms have more retained earnings but fewer assets than firms that repurchase shares, however they are more similar in these categories than firms that do neither or both. In fact, across most of these statistics

firms that pay dividends and firms that repurchase shares are more similar than firms that do neither or both, supporting the use of firms that repurchase shares as a control for firms that pay a dividend.

Table 2.1: Descriptive Statistics

	(1) Dividend Only	(2) SBB Only	(3) Neither	(4) Dividend and SBB
Retained Earnings	374.3	182.7	-268.9	2,009
	(1,040)	(2,264)	(3,104)	(5,636)
Total Assets	3,141	3,796	1,242	17,967
	(10,919)	(27,569)	(4,268)	(81,356)
Cash Flow	0.144	0.185	0.114	0.201
	(0.331)	(0.444)	(0.696)	(0.318)
Marginal q	2.058	2.377	3.227	2.019
	(1.315)	(1.505)	(2.258)	(1.212)
CAR 12 mo.	-5.322	-5.419	-9.223	-5.040
	(29.37)	(30.80)	(40.27)	(23.00)
CAR 24 mo.	-17.73	-18.38	-27.52	-13.34
	(18.53)	(19.32)	(23.79)	(13.77)
Observations	382	1,841	861	2,555

Notes: These descriptive statistics support the use of firms that repurchase shares as the benchmark, or control, for firms that pay a dividend based on the similarity across these observable characteristics.

Dividend Only: firms that regularly pay a dividend but have not repurchased shares.

SBB only: firms that regularly repurchase shares but have not paid a dividend.

Neither: firms that do not distribute retained earnings regularly.

Dividend and SBB: firms that regularly pay dividends and repurchase shares.

The advantage of using a difference-in-difference (DD) strategy is that it is able to control for differences in unobservable characteristics between dividend and share re-

purchasing firms that may affect long-run stock returns after an acquisition. Despite the advantages of the (DD) strategy, a smaller concern remains that unobservable characteristics will change affecting dividend paying firms and share repurchasing firms differentially. This concern is a violation of the common trend assumption, the key identifying assumption in difference-in-difference empirical strategies. Formally, the common trend assumption states that the effect of changes in unobservable variables will have the same effect on the two subgroups. This assumption is empirically testable by regressing,

$$CAR_{i,t} = \beta_0 + \sum_k \delta_k \lambda_k + \sum_k \gamma_k \lambda_k \mathrm{x} d_{D,i} \tag{2.4}$$

where long-run stock returns are given by our twenty-four month CAR estimates, λ_k are year fixed effects, and $d_{D,i}$ is an indicator variable of whether the firm pays out dividends or not.[5] The coefficients on the year fixed effects, δ_k, estimate the common trend. The coefficients on the year fixed effects interacted with the dividend firm indicator, γ_k, estimate the difference in trend between firms that pay a dividend and firms that repurchase shares. Therefore, a failure to reject the joint test that all γ_k are zero is a failure to reject the common trend assumption.

Table 2.2 reports this empirical test of the common trend assumption for three subgroups: firms that pay dividends, firms with a low percentage of institutional ownership, and firms that pay dividends and have a low percentage of institutional ownership. Column (1) reports that none of the coefficients of the year fixed effects interacted with the dividend firm indicator are statistically significant. The joint F-test fails to reject the null, and therefore, the common trend assumption, at the fifty percent level. Similarly, Columns (2) and (3) report that none of the coefficients on the other subgroups are statistically significant and the F-test fails to reject at the

[5]This regression is run only over firms that pay dividends or share repurchases. Firms that do not distribute retained earnings or distribute using both dividends and share repurchases are excluded.

thirty-seven and forty-six percent levels respectively.

Table 2.2: Common Trend Assumption

	Dividend	Low Inst.	Div x Low Inst.
1998	-4.289	-3.046	-2.508
	(3.036)	(1.868)	(3.220)
1999	-7.901	-6.658	-6.120
	(5.032)	(4.424)	(5.147)
2000	2.790	3.807	6.095
	(5.911)	(5.623)	(6.110)
2001	-1.720	-0.650	1.731
	(4.625)	(4.095)	(5.018)
2002	-0.193	0.962	3.325
	(5.314)	(4.862)	(5.880)
R^2	0.029	0.030	0.033
Observations	2223	2223	2223
F-stat	0.87 d.f. 5	1.09 d.f. 5	0.94 d.f. 5
p-value	0.500	0.365	0.457

Notes: The estimation equation is run over the set of firms paying a dividend paying or repurchasing shares, excluding firms that do neither or both: $CAR_{i,t} = \beta_0 + \sum_k \delta_k \lambda_k + \sum_k \gamma_k \lambda_k \mathrm{x} d_{D,i}$.

2.5 Empirical Design and Results

The goal of the empirical strategy is to separate the effect of the dividend tax on the quality of acquisitions undertaken from other unobserved factors that may have changed between 1998 and 2010.[6] We use variation in the dividend tax rate,

[6]The capital gains tax also decreased in 2003, but by only 5 percent. Using firms that repurchase shares, that may be affected by the capital gains tax reform, will bias our estimates toward zero.

across firm payout strategies, and across firm percentage institutional ownership to identify the effect. The Jobs and Growth Tax Relief Reconciliation Act of 2003 cut the tax rate on qualified dividends from the ordinary income tax rates to the long-term capital gains tax rate.[7] For top income tax payers this effectively lowered the tax rate on dividends from 38.6 percent to 15 percent.[8] This tax rate change gives us variation in the dividend tax rate across the years in our sample. The dividend tax rate change may not be the only relevant factor to acquisition policy that changed in our sample years. For example, differences in market conditions before and after 2003 could cause differences in performance. To control for these other time-varying factors we use variation across firms in payout strategy. Specifically, we use firms that distribute profits through share repurchases as a benchmark to control for all other time-varying factors. Firms that repurchase shares are a good benchmark because they are similar in terms of observable characteristics, as Table 2.1 demonstrates, and firms that repurchase shares are unaffected by the dividend tax rate change.

A difference-in-difference (DD) specification is used to exploit the variation in the dividend tax rate and across firm payout strategies. The goal is to isolate the effect of taxation on the performance of firms after an acquisition by comparing differences in performance before and after the tax rate change for firms affected by the tax rate change relative to firms unaffected by the tax rate change. To isolate this effect, we limit our sample in two ways. First, we use only firms that regularly pay

[7] A dividend is a qualified dividend if 1) it was paid after December 31, 2002, 2) paid by a U.S. corporation or other entity that qualifies for benefits under U.S. tax laws and treaties and 3) the stock most have been held 60 days during the 121-day period that begins 60 days before the ex-dividend date.

Dividend Tax Rate Change

Income Level 2002	Tax Rate 2002	Income Level 2003	Tax Rate 2003
0 - $6,000	10	0 - $7,000	5
$6,000 - $27,950	15	$7,000 - $28,400	5
$27,950 - $67,700	27	$28,400 - $68,800	15
$67,700 - $141,250	30	$68,800 - $143,500	15
$141,250 - $307,050	35	$143,500 - $311,950	15
over $307,050	38.6	over $311,950	15

[8]

a dividend and firms that regularly repurchase shares, excluding firms that do both or neither. Second, we limit the sample to firms with a low percentage of institutional ownership because many institutions are exempt from the dividend tax and therefore, firms with a high percentage of institutional ownership will be unaffected by the change: (Michaely 1991, Robin 1991, Lakonishok and Vermaelen 1986). The dependent variable of interest is the cumulative abnormal returns twenty-four months after an acquisition, though other months are examined in appendix 2.8.2. The specification includes dummy variables for being a dividend paying firm, d_D, and being in the high dividend tax years 1998-2002, d_0, and the interaction term, which is the (DD) estimate. Finally, the specification includes time fixed effects λ_t and merger specific covariates $\mathbf{z}$ as given by

$$R = \beta_0 + \beta_1 d_D + \beta_2 d_0 + \delta_1 d_D d_0 + \lambda_t + \boldsymbol{z\gamma} + u \tag{2.5}$$

where the subscripts for time, t, and merger, i, have been suppressed. The coefficient of interest is δ_1 which captures the effect of high dividend tax rates on the stock return performance of dividend paying firms after an acquisition.

Alternatively, we can estimate a difference-in-difference-in-difference (DDD) specification using the variation across firms with high and low institutional ownership. This specification allows us to control for time-varying factors that affect all dividend paying firms and all firms with a low percentage of institutional ownership. However, we are unable to control for unobserved time varying factors which differentially affect dividend paying firms with a low percentage of institutional ownership. Though, this concern is dampened by the fact that we fail to reject the common trend assumption, reported in Table 2.2.

As in the (DD) specification, the dependent variable of interest in the (DDD) specification is the cumulative abnormal returns twenty-four months after an acqui-

sition. In addition to the indicator variables for being a dividend paying firm, d_D, and being in the high dividend tax years 1998-2002, d_0, from the (DD) specification we now include an indicator variable for being a firm with lower than 50 percent institutional ownership, d_L, and the additional interaction terms, $d_0 d_L$, $d_D d_L$, and the (DDD) estimate $d_0 d_D d_L$.[9] Once again, the specification includes time fixed effects λ_t and merger specific covariates $\mathbf{z}$ as given by

$$R = \beta_0 + \beta_1 d_D + \beta_2 d_0 + \beta_3 d_L + \delta_1 d_D d_0 + \delta_2 d_0 d_L + \delta_3 d_D d_L + \delta_4 d_0 d_D d_L + \lambda_t + \boldsymbol{z\gamma} + u \quad (2.6)$$

where the subscripts for time, t, and merger, i, have been suppressed. The coefficient of interest δ_4 captures the policy effect of higher dividend taxation on a firm's long-run stock returns after an acquisition.

2.5.1 Non-Parametric Difference-in-Difference Analysis

Table 2.3 calculates the unconditional means of the twenty-four month CARs for each of the eight subgroups. The third row calculates the differences between the high-tax and low-tax period for firms paying dividends and repurchasing shares with high and low institutional ownership. Row (3) Column (1) reports that dividend paying firms with low institutional ownership performed 5.47 percent worse in the high tax period than in the low tax period. This simple difference conflates the tax rate change and all other unobserved changes, creating the need for a benchmark to compare it to. Column (2) in Row (3) provides this benchmark, reporting that firms that repurchase shares with low institutional ownership performed 3.8 percent better in the high tax period than in the low tax period. This difference implies market conditions for acquisitions were better in the high-tax period, 1998-2002, than in the low-tax period, 2003-2010. Thus in the counterfactual case without a tax rate change

[9]The results are robust to specifying the percentage of institutional ownership as a continuous variable instead of a dummy variable.

we would have expected dividend paying firms to perform better in the high-tax period, contrary to what we observe. Taken together these two differences imply that the higher taxes in the high-tax period led dividend paying firms with low institutional ownership to perform 9.27 percent worse than they would have with the lower tax rates. This result is the non-parametric difference-in-difference (DD) estimate that corresponds to the parametric estimates in section 2.5.2 (Table 2.4 Column (1)).

Table 2.3: Non-Parametric Estimates

	Low Institution Ownership		High Institution Ownership		
	Dividends	Share Purchases	Dividends	Share Purchases	
High-Tax	-21.36	-21.46	-19.84	-16.91	
Low-Tax	-15.89	-25.26	-16.84	-16.35	
Differences	-5.47	3.8	-3	-.56	-6.83

Notes: This table reports the mean levels of the cumulative abnormal returns 24 months after an acquisition. The top row reports $\bar{R}_{0,D,L}, \bar{R}_{0,S,L}, \bar{R}_{0,D,H}, \bar{R}_{0,S,H}$ and the second row reports $\bar{R}_{1,D,L}, \bar{R}_{1,S,L}, \bar{R}_{1,D,H}, \bar{R}_{1,S,H}$.

Columns (3) and (4) in Row (3) repeat this exercise for firms with high levels of institutional ownership. These differences report dividend paying firms with high institutional ownership performed 2.44 percent worse in the high-tax period than in the low-tax period, relative to firm's that repurchase shares. This 2.44 percent difference may be due to time-varying differential effects on firms paying a dividend and firms repurchasing shares. If this is the case then we want to control for this difference and subtract it off of the policy effect found for firms with a low percentage of institutional ownership. However, this 2.44 percent difference may be due to the fact that firms with a high percentage of institutional share holders are still affected by

the dividend tax rate, but to a lesser extent. In this case we would not want to subtract this effect off of the policy effect found for firms with a low percentage of institutional ownership because it will bias the policy effect toward zero. The difference between the tax effects for low institutional ownership firms and high institutional ownership firms gives the result that dividend paying firms with low institutional ownership performed 6.83 percent worse because of the high tax rates. This result is the non-parametric triple difference estimate that corresponds to the parametric triple difference estimates reported in section 2.5.2 (Table 2.5 row 7 Column (2)).

2.5.2 Parametric Difference-in-Difference Analysis

This section reports the parametric difference-in-difference (DD) and difference-in-difference-in-difference (DDD) estimates from the empirical models in equations (2.5) and (2.6). These estimates demonstrate higher dividend tax rates in the late 1990s and early 2000s led firms to perform 8 to 10 percent worse two years after an acquisition relative to what their returns would have been with the lower dividend tax rates after 2003. This evidence is consistent with the the model in section 2.3 which demonstrates dividend paying firms have an incentive, proportional to the dividend tax rate, to make acquisitions with negative net synergies. Section 2.6 runs several alternative specifications to rule out other possible models, including payment method and firm monitoring, that could explain this result. Together these sections provide strong evidence in support of the theoretical model and the negative impact of dividend taxation on merger and acquisition behavior.

Table 2.4 reports the parametric difference-in-difference (DD) estimates for the sub-sample of firms with a low percentage of institutional ownership. Limiting the sample to firms with a low percentage of institutional ownership concentrates the analysis on firms most likely to be affected by the dividend tax rate change, since many

institutional shareholders are tax-exempt.[10] In all three specifications the difference-in-difference estimator is statistically and economically significant. Specification (2) controls for firm characteristics such as sales, marginal q, retained earnings, and total assets and specification (3) includes year fixed effects. The point estimates are similar across these specifications, estimating post-merger long-run returns were 8 to 10 percent lower because of higher dividend taxation.

Table 2.4: Difference-in-Difference Estimates: Low Institutional Firms Sub-Sample

	(1)	(2)	(3)
Dividend Firms β_1	8.387***	5.559*	8.826**
	(2.143)	(3.167)	(3.097)
High-Tax β_2	3.286	0.895	0.736
	(2.146)	(1.850)	(4.350)
Dividend x High-Tax δ_1	-9.271**	-8.004*	-9.911**
	(4.922)	(4.133)	(4.291)
Firm Controls		✓	✓
Year Fixed Effects			✓
R^2	0.010	0.076	0.108
Observations	927	798	798

Notes: This table reports difference-in-difference estimates. The dependent variable is the cumulative abnormal return 24 months after an acquisition. Robust standard errors are in parentheses. The results remain statistically significant clustering at the group level (e.g. firms that pay dividends and are in the high-tax years 1998-2002) and clustering by firm.

[10]The (DDD) specification uses the full sample of firms that pay dividends or repurchase shares and includes a third difference for firms with low and high percentages of institutional ownership. The (DD) estimates are robust to using the full sample and controlling for the level of institutional ownership.

Table 2.5 reports the parametric difference-in-difference-in-difference (DDD) estimates using the full sample of mergers by firms paying dividends or repurchasing shares. This specification is more flexible than the (DD) estimates and is able to further control for differences between firms that repurchase shares and firms that pay a dividend by using the difference between them in the sub-samples of firms with low and high percentages of institutional ownership. However, to the extent that firms with high percentages of institutional share holders are affected by the dividend tax rate change then the (DDD) estimates will be an underestimate of the true policy effect of higher dividend taxation. Specification (1) runs the (DD) specification using the full sample of mergers by firms paying dividends or repurchasing shares. The (DD) estimate is statistically significant and has a smaller point estimate, -3.773, than in Table 2.4 because it conflates firms with tax-exempt shareholders with firms with taxable shareholders. The (DDD) estimate, given by δ_4 is statistically and economically significant across all specifications. Specification (2) does not control for firm controls or year fixed effects and therefore, exactly replicates the non-parametric estimates in Table 2.3. Controlling for year fixed effects and firm controls increases the magnitude of the point estimate from -6.836 to -10.704. The point estimates are similar across these specifications and similar to the (DD) results, estimating post-merger long-run returns were 8 to 10 percent lower because of higher dividend taxation.

TABLE 2.5: DIFFERENCE-IN-DIFFERENCE-IN-DIFFERENCE ESTIMATES

	(1)	(2)	(3)	(4)	(5)
Dividend Firms β_1	2.319**	-0.495	-0.565**	-1.354***	-2.178***
	(1.093)	(1.172)	(0.172)	(0.010)	(0.233)
High-Tax β_2	-0.542	-0.558	-13.398***	-0.922***	-8.663***
	(0.948)	(1.118)	(1.202)	(0.109)	(1.943)
Low Inst. Ownership β_3		-8.915***	-10.566***	-6.453***	-8.101***
		(1.470)	(0.481)	(0.926)	(0.533)
Dividend x High-Tax δ_1	-3.773**	-2.437	-0.548	-1.162*	1.501**
	(1.922)	(2.717)	(0.491)	(0.529)	(0.609)
High-Tax x Low Inst. δ_2		4.366**	7.328***	3.591***	6.359***
		(2.154)	(0.583)	(0.564)	(0.511)
Dividend x Low Inst. δ_3		9.868***	11.520***	8.143***	11.281***
		(2.432)	(0.449)	(0.390)	(0.391)
Div x H-T x Low Inst. δ_4		-6.836*	-7.954***	-8.282***	-10.704***
		(4.033)	(0.698)	(0.058)	(0.827)
Year Fixed Effects			✓		✓
Firm Controls				✓	✓
R^2	0.089	0.082	0.125	0.061	0.129
Observations	2223	2223	2223	2223	2223

Notes: This table reports difference-in-difference-in-difference (DDD) estimates. The dependent variable is the cumulative abnormal return 24 months after an acquisition. Robust-clustered standard errors are in parentheses. The standard errors are clustered at the group level (e.g. firms that pay dividends, have low institutional ownership, and are in the high-tax years 1998-2002). The results remain statistically significant without clustered standard errors.

2.5.3 Graphical Difference-in-Difference Analysis

Figure 2.1 demonstrates the (DDD) estimation graphically, expanding the analysis from twenty-four months after an acquisition to any month between one and thirty. Each sub-figure graphs the average long-run returns before and after the tax rate change. Firms that repurchase shares and have a high percentage of institutional ownership are shown in Figure 2.1(A), and with a low percentage of institutional ownership in Figure2.1(B). Below that firms that pay dividends and have a high percentage of institutional ownership are shown in Figure 2.1(C), and with a low percentage of institutional ownership in Figure 2.1(D).

The theory suggests firms that distribute retained earnings through share repurchases should not be affected by the dividend tax rate change. To the extent that there are no other unobserved changes between the high-tax and low-tax periods, this suggests the long-run returns for these firms should look similar before and after the dividend tax rate change. For almost all months between one and thirty months after an acquisition the long-run returns look very similar before and after the dividend tax reform, denoted by the similarities in the blue solid (high-tax period) and red dashed (low-tax period) lines in Figures 2.1(A) and 2.1(B). This suggests unobservable changes between the high-tax and low-tax periods are minimal. Similarly, the theory suggest firms that have shareholders that are tax-exempt from the dividend tax, measured here by the percentage institutional ownership, should also not be affected by the dividend tax rate change. Therefore, to the extent that firms with a high percentage of institutional ownership are tax-exempt, the blue solid line and red dashed lines in Figure 2.1(C) should also be similar, absent any other unobservable changes. In contrast, to the previous three figures, the theory suggests firms paying a dividend with taxable shareholders should be affected by the dividend tax reform and cause a difference in the high-tax period (blue solid) line and low-tax period (red dashed) line in Figure2.1(D).

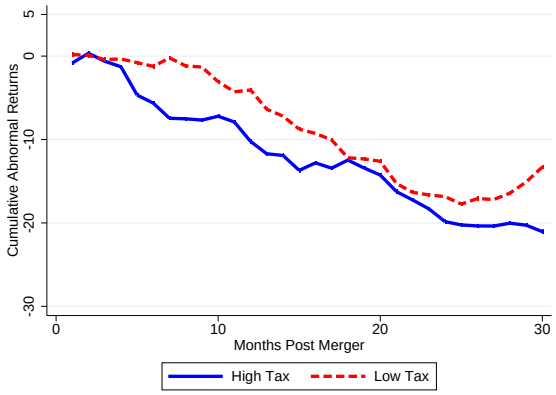
These figures support the empirical analysis demonstrating the returns in the high-tax and low-tax periods are similar for firms repurchasing shares and firms paying a dividend but with tax-exempt shareholders while the low-tax period led to higher returns for firms paying a dividend with non-tax-exempt shareholders. Formally, the policy effect is captured by subtracting the difference in lines in Figures 2.1(A), 2.1(B), and 2.1(C) from the difference in lines in Figure 2.1(D). These graphs suggest the empirical results in Table 2.5 are robust to using any month between one and thirty months after an acquisition as the dependent variable.

Figure 2.1: Difference High-Tax and Low-Tax Time Periods

(a) Share Repurchases and High Institutional Ownership

(b) Share Repurchases and Low Institutional Ownership

(c) Dividend and High Institutional Ownership



(d) Dividend and Low Institutional Ownership

2.6 Durability Of Empirical Results

This section presents several robustness tests which reinforce the baseline estimates in Tables 2.4 and 2.5 and strengthen the connection between the empirical results and the theoretical model. For these robustness tests, we rely on additional data from Thomson and Reuters' Securities Data Company (SDC) to expand the time series to the years 1992-2012. The SDC data allows us to examine smaller subsets, such as non-cash mergers and mergers done by firms not paying a dividend, because the data set more than doubles the initial set of mergers considered from just under 7,000 to just over 20,000. While the SDC data increases the number of observations, it does so by using data up to 10 years on both sides of the tax rate change in 2003. Using data further from the tax rate change in 2003 increases the possibility of conflating effects, for example other tax rate changes in the 1990s. On whole, these robustness checks provide further evidence that dividend taxes distort merger and acquisition behavior and that this tax mechanism may be responsible for the post-merger performance puzzle.

First, we present baseline specifications (as in Table 2.5) using the expanded data set. The results are reported in Table 2.6. Using this data two additional tests are run and reported in the appendix. Appendix 2.8.2 tests the robustness of our baseline results to considering different time horizons. Appendix 2.8.2 tests whether the results are biased due to mergers that occur in quick succession. These tests suggest that the results are robust to different time horizons and the bias from mergers occurring in succession is small. Furthermore, these tests suggest the baseline estimates may be underestimates of the true policy effect of higher dividend taxation.

Second, we examine two alternative models which could generate our baseline results. Regression results are presented in Tables 2.7 and 2.8. We find no evidence that the method of payment nor shareholder monitoring models are able to explain the change in post-merger long-run returns reported in this paper.

2.6.1 Parametric Difference-in-Difference Analysis Using SDC Data

Table 2.6 presents baseline specifications as in Tables 2.4 and 2.5 using the expanded data set. Column (1) reproduces the (DD) results reported in Column (3) of Table 2.4. The magnitudes of the (DD) estimates, -9.911 and -9.289, are close in both data sets, though the estimate in Table 2.6 is not statistically significant. The (DDD) estimates in Column (5) of both Table 2.5 and 2.6 are also similar, -10.704 and -14.872, and statistically significant. The similarities between the estimates using the Zephyr and SDC data sets provides some additional confidence in these estimates and lessens the concern of possible biases in the SDC due to the longer time series.

Table 2.6: Robustness: New Data Set 1992-2012

	(1)	(2)	(3)	(4)	(5)
Dividend Firms β_1	10.844	1.312	1.320***	-0.003	-0.083
	(6.900)	(1.071)	(0.088)	(0.060)	(0.062)
High-Tax β_2	3.954	-11.942***	-13.261***	-11.371***	-14.441***
	(11.548)	(1.751)	(1.462)	(0.071)	(1.088)
Low Inst. Ownership β_3		-4.623	-5.594***	-9.998***	-11.075***
		(4.650)	(0.148)	(0.091)	(0.550)
Dividend x High-Tax δ_1	-9.289	6.461***	6.461***	6.752***	7.117***
	(7.689)	(1.816)	(0.172)	(0.038)	(0.220)
High-Tax x Low Inst. δ_2		0.711	1.775***	11.358***	12.295***
		(5.425)	(0.213)	(0.006)	(0.595)
Dividend x Low Inst.δ_3		4.328	5.589***	8.879***	10.263***
		(4.714)	(0.134)	(0.015)	(0.552)
Div x H-T x Low Inst. δ_4		-2.692	-3.943***	-13.657***	-14.872***
		(5.510)	(0.154)	(0.073)	(0.645)
Year Fixed Effects	✓		✓		✓
Firm Controls	✓			✓	✓
Low Inst. Subset	✓				
R^2	0.094	0.067	0.128	0.056	0.131
Observations	665	4207	4207	4207	4207

Notes: This table repeats the estimates in Table 2.5 with mergers data from Thomson and Reuters Securities Data Company (SDC) years 1992-2012. The dependent variable is the cumulative abnormal return 24 months after an acquisition. Robust standard errors are in parenthesis. Standard errors are clustered at the group level for the (DDD) specification. Statistical significance denoted, 10 percent *, 5 percent **, and 1 percent ***. The results are robust without clustering the standard errors and clustering at the firm level.

2.6.2 Method of Payment Alternative Explanation

This subsection tests whether the merger method of payment could explain the (DD) and (DDD) results. The finance literature, notably ((Travlos 1987), (Wansley, Lane and Yang 1983), and (Martin 1996), have found a link between the method of payment and abnormal returns: cash payments are correlated with larger negative abnormal returns. The following analysis tests whether the negative abnormal returns observed in this paper are due to tax effects or effects associated with cash financing.

To separate these effects we run two different specifications, the first reported in Columns (2) and (5) and the second in Columns (3) and (6) of Table 2.7. The first specification runs the benchmark analysis on the subset of mergers that were financed with less than 50 percent cash payments. Here we find the magnitude of the (DD) and (DDD) estimates increase in this subset, strengthening the empirical results and contrary to what we would expect if the empirical results were due to method of payment effects.

The second specification replaces the indicator variable for firms that pay a dividend with an indicator variable for 100 percent cash financed mergers, and then runs the analysis on the subset of mergers by non-dividend paying firms. If method of payment effects could explain the empirical results we would expect to see the (DD) and (DDD) results to look similar in this specification. In contrast, estimates of $\tilde{\delta}_1$ and $\tilde{\delta}_4$ are the opposite sign and statistically significant at the 1 percent level. These results corroborate the tax mechanism in explaining the empirical results and furthermore, suggest the tax effect may be the mechanism driving the method of payment correlation noted in the finance literature.

Table 2.7: Alternative Explanation: Method of Payment

	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Firms β_1	10.844	15.779		-0.083	1.704	
	(6.900)	(10.687)		(0.062)	(2.645)	
Cash Payments $\tilde{\beta}_1$			-10.980***			3.150***
			(0.000)			(0.469)
High-Tax β_2	3.954	4.789	-6.896***	-14.441***	-15.618***	-4.867
	(11.548)	(14.397)	(0.000)	(1.088)	(5.669)	(2.748)
Low Inst. Ownership β_3				-11.075***	-14.944	-3.194***
				(0.550)	(10.061)	(0.407)
Dividend x High-Tax δ_1	-9.289	-20.614*		7.117***	3.287	
	(7.689)	(12.064)		(0.220)	(4.259)	
Cash x High-Tax $\tilde{\delta}_1$			14.154***			-4.168***
			(0.001)			(0.536)
High-Tax x Low Inst. δ_2				12.295***	20.309*	-1.639**
				(0.595)	(12.005)	(0.457)
Dividend x Low Inst.δ_3				10.263***	11.976	
				(0.552)	(10.205)	
Cash x Low Inst. $\tilde{\delta}_3$						-2.323*
						(0.932)
Div x H-T x Low Inst. δ_4				-14.872***	-21.408*	
				(0.645)	(12.225)	
Cash x H-T x Low Inst. $\tilde{\delta}_4$						7.913***
						(1.215)
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
$< 50\%$ Cash Mergers		✓			✓	
Non Dividend Firm Mergers			✓			✓
R^2	0.094	0.040	0.018	0.131	0.126	0.185
Observations	665	233	90	4207	2876	3419

Notes: This table reports the estimates limiting the data to mergers paid with less than 50 percent cash, (2) and (5), mergers made by firms not paying a dividend, (3) and (6), and the benchmark

specifications with all of the data, (1) and (4). Specifications in (1), (2), and (3) limit the data to firms with low percentages of institutional ownership. The dependent variable is the cumulative abnormal return 24 months after an acquisition. Robust standard errors are in parenthesis. Standard errors are clustered at the group level for the (DDD) specification. Statistical significance denoted, 10 percent *, 5 percent **, and 1 percent ***. The results are robust without clustering the standard errors and clustering at the firm level. Data comes from Thomson and Reuters Securities Data Company (SDC) and Compustat, years 1992- 2012.

2.6.3 Shareholder Monitoring Alternative Explanation

(Chetty and Saez 2010) provide a second alternative hypothesis that may be able to explain the empirical results presented in this paper based on firm monitoring by shareholders. The shareholder monitoring model predicts that when the dividend tax rate decreases, shareholders will increase their monitoring of corporate managers. This increase in monitoring could generate the increased acquisition performance that we observe after the 2003 dividend tax reform if our measure of tax status, low percentage of institutional ownership, is also measuring monitoring within the firm. According to this shareholder monitoring model, the increase in monitoring and by extension increase in acquisition performance should be larger when the firm has large block shareholders with strong incentives to monitor.

To test the ability of the monitoring model to explain the DD and DDD empirical results we observe, we replace the indicator variable for low institutional ownership with an indicator variable for firms with a low percentage of stock owned by the top five shareholders and the top shareholders generally. The percentage of the firm owned by a few shareholders is a measure of the monitoring within a firm because a shareholder with a larger percent of the firm's stock will have a greater incentive to monitor the firm. In contrast, this is not a good measure for tax status as the top shareholders of a firm may be taxable.

If monitoring is able to explain the empirical results we would expect the specifica-

tions with the measures of percentage owned by top shareholders to be similar to the results in the benchmark specifications. In contrast, the (DD) estimates in Columns (2) and (3) and the (DDD) estimates in Columns (5) and (6) have the opposite sign as the benchmark model and are not statistically significant. These empirical results are inconsistent with the shareholder monitoring model but are consistent with the tax mechanism.

Table 2.8: Alternative Explanation: Firm Monitoring

	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Firms β_1	10.844	3.028	2.502	-0.083	1.276***	1.732***
	(6.900)	(2.786)	(3.397)	(0.062)	(0.126)	(0.082)
High-Tax β_2	3.954	-14.272***	-12.117**	-14.441***	-12.742***	-12.692***
	(11.548)	(5.104)	(6.007)	(1.088)	(1.458)	(1.484)
Low Inst. Ownership β_3				-11.075***		
				(0.550)		
Top Inst. $\tilde{\beta}_3$					-0.680	
					(2.418)	
High Inst. $\tilde{\beta}_3$						-0.322
						(3.169)
Dividend x High-Tax δ_1	-9.289	2.581	2.842	7.117***	5.958***	5.597***
	(7.689)	(4.057)	(4.443)	(0.220)	(0.206)	(0.150)
High-Tax x Low Inst. δ_2				12.295***		
				(0.595)		
Dividend x Top $\tilde{\delta}_3$					1.802	
					(2.503)	
Dividend x High $\tilde{\delta}_3$						0.840
						(3.188)
Div x H-T x Low Inst. δ_4				-14.872***		
				(0.645)		
Div x H-T x Top $\tilde{\delta}_4$					0.313	
					(2.917)	
Div x H-T x High $\tilde{\delta}_4$						1.157
						(3.582)
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
Low % Top 5 Sub-Sample		✓				
Low % Top Holders Sub-Sample			✓			
R^2	0.094	0.124	0.118	0.131	0.124	0.124
Observations	665	652	638	4207	4207	4207

Notes: This table reports the benchmark specifications in (1) and (4). Specification (2) limits the data to firms with a low percentage of stock held by the top five shareholders. Specification (3) limits

the data to firms with a low percentage of stock held by top shareholders generally. Specifications (5) and (6) replace the indicator variable on low institutional ownership (used to control for the tax status of the shareholders) with an indicator variable for firms with a low percentage held by the top five shareholders, (5) , and an indicator for firms with a low percentage held by top shareholders generally, (6), (used to control for the level of monitoring in the firm). The dependent variable is the cumulative abnormal return 24 months after an acquisition. Robust standard errors are in parenthesis. Standard errors are clustered at the group level for the (DDD) specification. Statistical significance denoted, 10 percent *, 5 percent **, and 1 percent ***. The results are robust without clustering the standard errors and clustering at the firm level. Data comes from Thomson and Reuters Securities Data Company (SDC) and Compustat, years 1992- 2012.

2.7 Conclusion

Mergers and acquisitions continue to be an important way for economic activity to be reorganized; as the first half of 2013 saw $437 billion in merger and acquisition transactions. Our intutive profit maximizing framework demonstrates a potentially large distortion in merger and acquisition behavior caused by the dividend tax. Empirically, we find long-run returns are 8 to 10 percent higher as a result of lower dividend taxation that resulted from the 2003 dividend tax reform in the US. These findings suggest the deadweight loss caused from dividend taxation could be a significant drag on the economy.

The intuitive profit maximizing investment framework presented in this paper provides a new explanation for the post-merger performance puzzle ((Agrawal and Jaffee 2000)). This model differs from other proposed mechanisms to explain this empirical puzzle in that it does not rely on explanations of agency or asymmetries of information.

The intuition for the tax mechanism in the follows from the insight that outside investments are substitutes for mergers and acquisitions. Without dividend taxation the firms only make an acquisition when the expected net synergies from the acqui-

sition are positive. In contrast, with dividend taxation, mergers that are inefficient and destroy value may be a profit maximizing option. This leads firms that maximize shareholder value to sometimes make acquisitions with negative net synergies and depresses the expected value of any observed merger.

Through a series of empirical tests we find strong evidence that dividend taxation is distorting merger and acquisition behavior. The empirical results corroborate the theoretical claim that the distortion due to the dividend tax is economically large. This suggests that the tax mechanism we propose is large enough to explain the post-merger performance puzzle. Furthermore, these results on the distortion of the dividend tax is important for policy makers to consider when determining if and how to tax dividends.

2.8 Appendices

2.8.1 Generating Cumulative Abnormal Returns

We estimate the cumulative abnormal returns using the same method as (Gregory 1997) and (Agrawal et al. 1992) to match the post-merger performance puzzle literature. Our results are robust to alternative estimates of long-run stock returns, see (Bessembinder and Zhang 2013)'s recent advance, but we report estimates following (Gregory 1997)'s method for better comparability. The difference-in-difference empirical strategy we use controls for any bias from the cumulative abnormal return estimation because the procedure is the same for all subgroups in the sample. Therefore, each of the subgroups are evaluated on a level playing field.[11] The cumulative average return at time t is the multiplicative sum of abnormal returns from period 1 to t where the abnormal return for firm i at time t is calculated as the actual performance of the firm at time t minus the performance of the firm specific benchmark. The firm specific benchmark is the predicted counterfactual performance of firm i at time t in the hypothetical world where the firm did not merged.

In generating CARs for acquiring firms, the choice of benchmark generating model and the time period over which to estimate the coefficients of the model are important decisions that must be considered carefully. Following the comparative analysis by (Gregory 1997) we use the Fama French Value-Weighted Three Factor Model described in (Fama and French 1992, Fama and French 1993). The model is described in depth below. The monthly return of the firm, R_{it} minus the risk free rate of return, R_{ft}, is regressed on 1) the performance of the market R_{mt} minus the risk free rate, 2) the value weighted return on small firms minus the value weighted return on large firms, SMB, and 3) the value weighted return on high book-to-market value firms minus the value weighted return of low book to market value firms.

[11] The difference-in-difference empirical strategy is not able to control for heterogeneous biases across subgroups but this concern seems small given the subgroups in this analysis.

Abnormal Returns Model: (Fama and French 1992, Fama and French 1993) Value Weighted Three Factor Model:

$$a_{it} = R_{it} - [R_{ft} + \hat{\beta}_i(R_{mt} - R_{ft}) + \hat{\gamma}_i(\text{SMB}) + \hat{\delta}_i(\text{HML})] \tag{2.7}$$

$$\text{CAR}_{it} = \prod_{j=1}^{t}(1 - (a_{ij}/100)) \tag{2.8}$$

$$\text{CAAR}_t = \frac{1}{n}\sum_i \text{CAR}_{it} \tag{2.9}$$

where

a_{it} =the abnormal return on company i in month t

R_{it} =return on company i in month t;

R_{ft} =risk-free (treasury bill) return in month t;

R_{mt} =return on market in month t;

SMB =the value-weighted return on small firms minus the value-weighted return on large firms;

HML =the value-weighted return on high BMV firms minus the value-weighted return on low BMV firms.

CAR_{it} =the cumulative abnormal return for firm i in month t

CAAR_t =the cumulative average abnormal return in month t

(Gregory 1997) highlights the importance of the choice of time period over which to estimate the coefficients of the model, demonstrating a significant bias when using pre-event data. Thus, we use post-event data to estimate the model and generate abnormal returns, cumulative abnormal returns, and cumulative average abnormal returns. We generate CARs using up to 24 months of post return data (subject to availability). We limit our sample to firms that have at least 12 months of post-merger

data available, excluding firms that do not continue to operate or were themselves purchased. This data limitation likely biases our CAR estimates towards insignificance. We are able to use acquisitions in the last year of our sample, 2010, by using stock price data through 2012 to estimate CARS.

Figure 1 depicts the CAAR estimates, from one month to thirty months after an acquisition, for the eight separate groups used in the difference-in-difference-in-difference empirical method we employ. Twenty-four months after an acquisition the CAAR estimates are approximately -18 percentage points below benchmark returns and are statistically significant from zero at the 1 percent confidence level. These estimates are very similar to (Gregory 1997) Fama French CAAR estimates despite a different set of mergers and time period. These estimates reinforce that the post-merger performance puzzle is still a prominent empirical phenomenon. As several authors have pointed out, the fact that this phenomenon continues to exist more than 20 years after the puzzle was first identified and after several explanations have been suggested means that economists still do not understand why firms continue to merge despite these failing market outcomes.

2.8.2 Varying Performance Time Horizons

This subsection tests the robustness of our baseline results to considering different time horizons. The results in Table 2.9 reports the (DD) and (DDD) estimates using long-run returns 24, 18, and 12 months after the acquisition. The benchmark analysis, repeated in Columns (1) and (4), uses 24 months after an acquisition for comparability with much of the post-merger performance puzzle literature. For both the (DD) and (DDD) estimates the magnitudes are largest after 18 months, though the (DD) results are not statistically significant. This pattern suggests the negative synergies are fully realized somewhere between 12 and 18 months after the acquisition and implies that the baseline (DD) and (DDD) estimates, reported in Tables 2.4 and

2.5, may underestimate the effect of dividend taxation on acquisition performance.

Table 2.9: Robustness: Varying Performance Outcome Time Horizons

	24 Month	18 Month	12 Month	24 Month	18 Month	12 Month
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Firms β_1	7.223	14.849**	10.844	0.974***	-0.394*	-0.083
	(8.016)	(7.515)	(6.900)	(0.111)	(0.177)	(0.062)
High-Tax β_2	11.617	-2.691	3.954	-6.376**	-11.966***	-14.441***
	(14.584)	(14.125)	(11.548)	(2.397)	(1.431)	(1.088)
Low Inst. Ownership β_3				-8.400***	-14.073***	-11.075***
				(0.761)	(0.433)	(0.550)
Dividend x High-Tax δ_1	-6.845	-12.608	-9.289	5.574***	6.777***	7.117***
	(9.670)	(8.626)	(7.689)	(0.318)	(0.366)	(0.220)
High-Tax x Low Inst. δ_2				9.770***	12.450***	12.295***
				(0.780)	(0.533)	(0.595)
Dividend x Low Inst.δ_3				8.825***	14.907***	10.263***
				(0.829)	(0.456)	(0.552)
Div x H-T x Low Inst. δ_4				-14.114***	-18.229***	-14.872***
				(0.837)	(0.560)	(0.645)
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
R^2	0.026	0.070	0.094	0.023	0.049	0.131
Observations	665	665	665	4207	4207	4207

Notes: This table reports estimates for 24, 18, and 12 months after an acquisition for both the difference-in-difference (DD) and the difference-in-difference-in-difference (DDD) specification. Robust standard errors are in parenthesis. Standard errors are clustered at the group level for the (DDD) specification. Statistical significance denoted, 10 percent *, 5 percent **, and 1 percent ***. The results are robust without clustering the standard errors and clustering at the firm level. Data comes from Thomson and Reuters Securities Data Company (SDC) and Compustat, years 1992 - 2012.

2.8.3 Eliminating Mergers in Quick Succession

One concern with the data set constructed for the baseline analyses is that a single acquiring firm may perform several mergers in quick succession. If one merger closely

follows another then the long-run returns of the second may conflate the effects from the previous merger. To manage this concern, we perform (DD) and (DDD) analyses excluding mergers that occur in quick succession. Results are presented in Table 2.10.

Table 2.10: Robustness: Eliminating Mergers in Quick Succession

	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Firms β_1	10.844	10.857	13.100*	-0.083	-0.002	-0.144
	(6.900)	(7.571)	(7.854)	(0.062)	(0.065)	(0.138)
High-Tax β_2	3.954	0.707	3.112	-14.441***	-14.101***	-14.760***
	(11.548)	(13.111)	(13.133)	(1.088)	(1.541)	(1.578)
Low Inst. Ownership β_3				-11.075***	-12.320***	-15.433***
				(0.550)	(0.747)	(0.637)
Dividend x High-Tax δ_1	-9.289	-9.363	-12.423	7.117***	4.559***	4.890***
	(7.689)	(8.903)	(9.289)	(0.220)	(0.485)	(0.545)
High-Tax x Low Inst. δ_2				12.295***	10.680***	14.083***
				(0.595)	(0.821)	(0.658)
Dividend x Low Inst.δ_3				10.263***	10.040***	12.221***
				(0.552)	(0.765)	(0.646)
Div x H-T x Low Inst. δ_4				-14.872***	-11.925***	-15.101***
				(0.645)	(0.878)	(0.728)
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
Mergers Within 2 Years Dropped		✓			✓	
Mergers Within 3 Years Dropped			✓			✓
R^2	0.094	0.071	0.065	0.131	0.112	0.119
Observations	665	376	315	4207	3011	2234

Notes: This table reports the robustness specifications limiting the data by dropping mergers that occurred within 2 years of another merger in the same firm, (2) and (5), 3 years of another merger in the same firm (3) and (6) and the benchmark specifications with all of the data, (1) and (4). The dependent variable is the cumulative abnormal return 24 months after an acquisition. Robust standard errors are in parenthesis. Standard errors are clustered at the group level for the (DDD) specification. Statistical significance denoted, 10 percent *, 5 percent **, and 1 percent ***. The results are robust without clustering the standard errors and clustering at the firm level. Data comes from Thomson and Reuters Securities Data Company (SDC) and Compustat, years 1992- 2012.

Columns (1) and (4), in Table 2.10, are the benchmark estimates using the full data set from Table 2.6. Columns (2) and (5) exclude mergers that occurred fewer than 2 years after another merger within the acquiring firm. Similarly, Columns (3) and (6) exclude mergers that occurred fewer than 3 years after another merger. The (DD) and (DDD) estimates remain similar to the benchmark estimates in both of these sub-samples. The estimates in Columns (3) and (6) are actually larger in magnitude than the benchmark model and the (DDD) estimate is statistically significant. These results suggest that the bias from conflating mergers is small, which is consistent with the fact that most acquiring firms in the sample make only one acquisition during the sample period and that the distribution of the number of mergers per acquiring firm is roughly exponential.

CHAPTER III

The Business Investment Response to the Domestic Production Activities Deduction

3.1 Introduction

In the past several years, significant research efforts have been directed towards studying the impact of corporate tax reform on corporate behavior. A particularly large amount of attention has been given to the impacts of the "Bush Tax Cuts," which significantly reduced the top rate on individual dividend and capital gains income and to "Bonus Depreciation," which accelerates the deduction of new investment spending and thereby reduces the present value cost of physical capital. In contrast, very little academic study has been concentrated on a third major corporate tax expenditure implemented during the 2000s, the Domestic Production Activities Deduction.

The Domestic Production Activities Deduction (DPAD) allows tax payers to deduct a percentage of income derived from domestic manufacturing activities from their taxable income. The DPAD thus effectively lowers a business's effective corporate income tax rate.[1] By lowering the effective tax rate on domestic manufacturers,

[1]The DPAD was signed into law in 2004 in response to a World Trade Organization ruling that outlawed use of the Extraterritorial Income exclusion, a US tax policy that allowed firms to deduct the a portion of income derived from exports. The replacement of the ETI exclusion is

Congress hoped to "make our manufacturing, service, and high-technology businesses and workers more competitive and productive both at home and abroad."[2]

This paper is the first (to the author's knowledge) to directly examine whether the DPAD affects firm behavior. In particular, the research contained herein tests whether corporate investment responds to the DPAD. Business investment seems a natural first investigation into the effects of the policy given that "Investment is of paramount importance for both business cycle fluctuations and long term economic growth."[3] Additionally, investment stimulus is cited as the primary goal of the DPAD, the Bush Tax Cuts, and Bonus Depreciation. Thus, comparing the effects of the three policies which more broadly represent three different tax levers can shed light on which policy is most effective at stimulating business investment, a reduction in the corporate income tax rate, a reduction in distributed earnings rates, or an acceleration of depreciation allowances.

The research design exploits industry level variation in the percentage of income that is eligible for the deduction as derived from the IRS Statistics of Income Business Tax Statistics database. Firms that belong to industries that derive a large portion of income from domestic manufacturing activities (such as construction and agricultural firms) see a significant reduction in their average effective statutory corporate income rate while firms residing in industries that are not domestic manufacturing intensive (such as real estate and transportation) are left essentially unaffected by the policy. The investment response to the policy should be concentrated among firms in domestic manufacturing intensive industries that experience significant reductions in their effective tax rates and large increases in their effective rate-of-return on investment.

The benefit of using industry level variation in domestic manufacturing intensity is that the measure is plausibly exogenous with respect individual firm decisions. Empirical observations reinforce this exogeneity assumption; the percentage of income

[2]Language taken from the American Jobs Creation Act of 2004.
[3]Language taken from Goolsbee (1998).

derived from domestic manufacturing activities is stable across industries and over time suggesting that a large number of firms are not making choices that confound the quasi-experimental DPAD treatment. The most pressing potential concern in using industry level variation to test the investment effects of the DPAD is that industry trends may drive the empirical results. However, due to significant variation within large economic sectors, the impact of the DPAD may be tested within sectors thereby eliminating any concerns that sector-time trends such as, for example, increasing demand for construction relative to agricultural products, might be responsible for empirical results.

The core result of this research is that, for listed firms contained in the Compustat database, the DPAD significantly increases investment activities. Upon full implementation, the DPAD increases investment as a percentage of installed capital by 12.113% for a firm with the average percentage of income derived from domestic production. For a firm whose income is all eligible for the deduction, investment as a percentage of installed capital increases by more than 30%. Even if one assumes that these effects capture only a temporary investment spike in response to the policy, the DPAD is still seems to be more effective at stimulating investment than either the Bush Tax Cuts or Bonus Depreciation. This result is robust to alternative investment specifications, alternative controls, and sector-by-year fixed effects. The policy is especially effective at stimulating investment among credit constrained firms suggesting the policy provides slack in the budget constraint.

This work is indebted to and humbly contributes to a large literature concerning both the theoretically and empirically effects of tax policy on business investment. The theoretical foundations of this literature are provided by Hall and Jorgenson (1967), King (1977), Auerbach (1979), Bradford (1981), Summers (1981), Poterba and Summers (1985), and Desai and Goolsbee (2004). The empirical study of tax incentives and investment response is highlighted by Cummins et al. (1994), Goolsbee

(1998), Edgerton (2010), Yagan (2013), and Zwick and Mahon (2014). An in depth discussion of a selected few of these works is reserved for the last section in which the DPAD is compared to that of other tax policies in light of several alternative theoretical models.

The paper is organized as follows: Section 3.2 provides an in-depth explanation of the DPAD. Section 3.3 provides a simple conceptual framework that captures the effect of the policy on investment behavior paying close attention to potential heterogeneous responses to the policy based on financial constraint and taxable status. The framework produces several testable hypotheses which are subsequently taken to the data. Section 3.4 discusses the data sources, construction of key variables, and descriptive statistics. Section 3.5 describes the empirical strategy and key identifying assumptions necessary to accurately capture the investment effects of the DPAD. Baseline investment results are presented in Section 3.6 and investment heterogeneity results are presented in Section 3.7. Section 3.8 concludes by comparing the DPAD to other tax policies designed to encourage investment and outlining directions for future research.

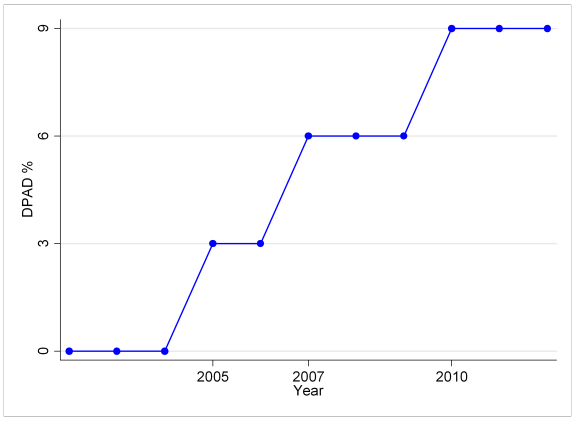
3.2 The Domestic Production Activities Deduction

The Domestic Production Activities Deduction (DPAD) was enacted as part of the American Jobs Creation Act of 2004. In its simplest form, the DPAD is a federal corporate tax deduction that allows firms to deduct a percentage "Qualified Production Activities Income" from their taxable income. The DPAD effectively lowers the effective corporate income tax rate on income derived from domestic manufacturing. The policy was not implemented at its maximum rate and was instead phased in during the years 2005 to 2010. Three pieces of information are key to understanding the policy: the rate of the deduction, the definition of Qualified Production Activities Income (QPAI), and other factors limiting DPAD application.

The deduction was implemented at a rate of 3% in 2005, increased to 6% in 2007, and reached its maximum rate of 9% in 2010. Figure 3.1 presents the DPAD rates during the phase-in period. Given a statutory corporate income tax rate of 35%, these rates reduced the effective tax rate on QPAI by 1.05% in 2005 and 2006, by 2.10% in 2007–2009, and ultimately by 3.15% in years 2010 and beyond. How much these rates affect behavior depends on the percentage of income that a firm derives from QPAI (its QPAI %). If a firm has 100% QPAI, then their effective rate drops 3.15% when the DPAD is fully phased in at 9%. Firms that claim 50% of income as QPAI see an effective rate drop of 1.575%. Effective tax rates of firms that derive no income from domestic production are completely unaffected (at least in partial equilibrium). Understanding the exact definition of QPAI is critical to understanding this differential policy treatment and the estimated effects of the policy and is discussed next.

FIGURE 3.1: DPAD PHASE-IN

For QPAI Earned		DPAD %
After	Before	
	01/01/2005	0%
05/05/2004	01/01/2007	3%
12/31/2006	01/01/2010	6%
12/31/2010		9%



Notes: Figure 3.1 lists and plots the percentage of qualified production activities income that may be deducted from taxable income via the DPAD.

QPAI is equal to the excess (if any) of the firm's Domestic Production Gross Receipts (DPGR) over the Domestic Production Gross Costs (DPGC). DPGR is defined as any income that is derived from

- Lease, rental, license, sale or exchange of goods manufactured in the United States
- Construction and engineering and architectural services performed in the United States
- Except sale of prepared foods and energy transmission

And DPGC are defined as

- Costs of goods allocable to DPGR
- Other deductions, expenses or losses directly allocable to DPGR or
- A ratable portion of other expenses not directly allocable to such receipts

An item qualifies as produced in the United States if at least 20% of the total costs are the result of direct labor and overhead costs from US–based operations.

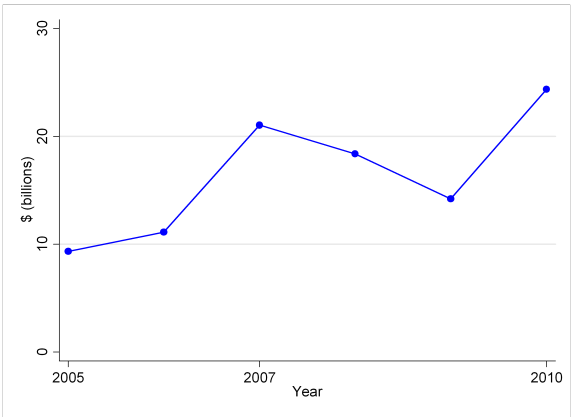
Finally the deduction is limited in two ways. First, the deduction may not exceed 50% of W-2 wages paid by the firm. Second, the deduction may not exceed gross adjusted income (taxable income).

While the 3.15% maximum rate reduction may not seem large on firm-by-firm basis, the policy actually constitutes a significant tax expenditure at the national level. Figure 3.2 details the total taxable income deductions resulting from the DPAD and total tax expenditure on the policy (assuming a corporate rate of 35% on all income). In 2010 when the DPAD reached 9%, corporations were able to deduct more than $24 billion from their taxable income at a cost of more than $8.5 billion to US government. Given the price tag of the policy it seems prudent to examine whether the DPAD affects business investment and hence macro-level economic growth.

FIGURE 3.2: DPAD DEDUCTION

YEAR	$ (BILLIONS)	$(BILLIONS) $\times\tau$
2005	9.332	3.266
2006	11.106	3.887
2007	21.058	7.3703
2008	18.374	6.320
2009	14.198	4.970
2010	24.365	8.528

Notes: Source: IRS Statistics of Income. Corporate statutory rate $\tau = .35$



3.3 Conceptual Framework and Empirical Hypotheses Generation

To guide the empirical analysis carried out in Sections 3.6 and 3.7, this section presents a simple model of investment in the presence of the Domestic Production Activities deduction, investment incentives, financial constraints, and heterogeneous tax positions. The model presented here follows the recent work by Zwick and Mahon (2014) which nicely combines the Neoclassical investment models of Abel (1982) and Hyashi (1982) with the Stein (2003) model of costly external finance. The model produces several testable implications. First, investment increases due to the Domestic Production Activities Deduction and increases more for firms that derive a larger proportion of income from Qualified Production Activities. This baseline result is complemented by two predictions of investment response heterogeneity: (1) firms that are financially constrained will be less responsive to the policy, and (2) firms that are less likely to be taxable when income is derived from investment activities will be less responsive to the deduction.

3.3.1 Framework Primitives

Consider a firm making a one shot investment decision. The firm begin with initial retained earnings R_0 and chooses the level of investment I in an effort to maximize after tax profits. Future profits are given the concave function, $\pi(I)$. Future profits are taxed at the proportional rate τ. The DPAD allows the firm to deduct a percentage d of qualified income from its taxable income. The percentage of income that qualifies for the deduction is ρ.[4] The firm discounts the after-tax profits at the risk-adjusted rate r, thus the firms discounted after tax profits can be written as

$$\frac{[1-\tau(1-\rho d)]\pi(I)}{1+r}.$$

The DPAD may be further generalized to consider a state in which the firm is nontaxable. When the next dollar of income does not increase the firm's tax bill, then the firm can only realize the benefit of the deduction if it is carried forward to decrease taxable income in a future taxable state. The generalized version of d can be written as

$$d(\beta,\gamma) = \gamma d(\beta) + (1-\gamma)\beta\phi d(1),$$

where $\gamma \in \{0,1\}$ is an indicator for current tax state and ϕ is a discounter that reflects both the expected arrival time of the taxable state and the discount rate applied to the future and subsequent periods when the firm switches. Note that for the nontaxable firm, β applies to all future deductions; even when β equals one, ϕ is less than one and the value of the deductions are lower when the firm is nontaxable.

[4]In this simple framework, ρ is assumed to be fixed over time. One can imagine a more complicated version of the model in which firms may expend resources in an effort to increase ρ by changing its business model or reclassifying earnings as qualified income. Unfortunately, without firm level data on the DPAD over time, it is hard to test predictions from this extension. Reassuringly, the percentage of QPAI seems to be stable over time both for the population as a whole and for each specific industry allaying concerns that the most active margin of response to the DPAD is not through ρ. See Figure 3.3 for a visual representation of these findings.

In additional to the DPAD, the firm can deduct a portion of the cost of the investment over time as the investment depreciates for tax purposes. The value of the deduction z is worth more to the firm if the investment can be written off more quickly or the firm discounts the future less aggressively.[5] Additional theoretical discussion of z and bonus depreciation is left out here as it is not central the DPAD analysis.[6]

External finance matters for all investment exceeding current cash flow. During the investment period, the firm faces an external finance wedge that is linear in expenses net of cash flows, that is,

$$c(I) = \lambda[(1 - \tau z)I - R_0],$$

where λ can be thought of as the shadow price on a borrowing constraint that may or may not bind now or in the future. Thus, a dollar of cash inside the firm is worth $1 + \lambda$ due to costly external finance.

3.3.2 Optimal Investment

The firm's optimal investment condition is found by maximizing the firm's objective function,

$$\max_I \left\{ \frac{[1 - \tau(1 - \rho d)]\pi(I)}{1 + r} - (1 - \tau z)I - \lambda(1 - \tau z)I \right\},$$

[5]During the last decade, the rate at which investment depreciates for tax purposes has been accelerated in an effort to stimulate investment. This largely counter-cyclical policy is known as Bonus Depreciation. Bonus Depreciation allows firms to write off a percentage of the purchase price of new capital in the first year in addition to write-offs specified in the statutory tax depreciation schedules. The empirical analysis will control Bonus Depreciation by empirically constructing z and simultaneously estimating its effect of investment.

[6]For an in depth treatment of z, including its construction both analytically and empirically and its impact on investment see Ohrn (2014), Edgerton (2012), and Zwick and Mahon (2014).

with respect to I, where terms not involving I have been suppressed. Under the assumption of concave π, the problem yields a unique interior solution characterized by the first order condition

$$\frac{[1-\tau(1-\rho d)]\pi'(I^*)}{1+r} = (1+\lambda)(1-\tau z).$$

The optimal investment rule is intuitive; the firm chooses I to set the after-tax discounted future benefits of the marginal dollar of investment equal to the after tax price of investment and the cost of external finance. The DPAD increases d and thereby increases the benefits to investment. Investment is thus increasing in the percentage of QPAI that the firm may deduct from its taxable income. The effects of an increase in d are only distinct from the effects of a decrease in τ in that a decrease in the statutory rate would be mitigated to some degree by a reduction in the tax benefits to investment through τz.

3.3.3 Testable Hypotheses

The DPAD increases the after-tax marginal benefit of investment and thus increases the firm's level of investment; $\partial I/\partial d > 0$. From this intuitive result, three testable hypotheses may be derived. The first may be considered the baseline empirical hypothesis. The second and third testable hypotheses describe heterogeneity in the baseline response based on financial constraint and tax status.

Hypothesis 2. Investment responds more strongly to the DPAD for industries that derive a larger percentage of income from QPAI; $\partial^2 I/\partial d\partial\rho > 0$.

When the DPAD is offered or increased, d, the percentage of QPAI that may be deducted from taxable income increases. The effect of the policy is amplified by the percentage of income that may be classified as QPAI, ρ. This result is intuitive – firms that are more domestic production intensive effectively receive a more generous

per dollar deduction and as a result increase their investment more in response to the introduction or increase in the DPAD. This hypothesis is empirically testable because ρ varies substantially across industries. Section 3.4 describes the construction of industry level ρ and its variance across both the population of corporate taxpayers and across listed firms. If the DPAD does effectively stimulate investment, then the elasticity of investment with response to the DPAD should be higher for industries with high levels of ρ.

The second empirically testable hypothesis concerns how investment response to the DPAD varies based on a firms cost of external financing or more generally its level of financial constraint.

Hypothesis 3. Investment responds more strongly to the DPAD for firms that are financially constrained; $\partial^2 I/\partial d\partial\lambda > 0$.

For both the constrained and unconstrained firms, the DPAD increase the marginal return on investment. For the constrained firm, the policy is doubly beneficial as it also provides for additional investment slack. The change in the optimal level of investment is thus larger for firms that are financially constrained. Empirically, the level of financial constrain that a firm faces will be represented by the financial constraint index created by Hadlock and Pierce (2010) Index. Construction of the HP Index is discussed in Section refdata. If financial constraints do affect the investment response to the DPAD, then the elasticity of investment with respect to the DPAD $\partial^2 I/\partial d\partial\lambda$ should be larger for firms with higher HP Index scores. If, on the other hand, financial constraint does not play a role in investment response then there should be no heterogeneity in the investment response to the DPAD across the HP Index.

The third testable hypothesis concerns the heterogeneity in response to the DPAD across tax status and future tax status.

Hypothesis 4. Investment responds more strongly to bonus depreciaiton for firms that expect to be taxable when income is subject to DPAD; $\partial I/\partial d|_{\gamma=1} > \partial I/\partial d|_{\gamma=0}$.

The third hypothesis relates strongly to earlier research by Auerbach (1986) and Edgerton (2010). These studies elucidate the idea that the effectiveness of counter-cyclical fiscal stimulus in the form of investment tax incentives may be undermined if firms are non-taxable either due to their possession of tax loss carry-forwards or a less than zero amount of taxable income. The papers provide two key incites: First, investment response to investment tax stimulus is heterogeneous across tax status - firms that are currently taxable are more responsive to the credit. Second, when these polices are used in a counter-cyclical manner, then they are employed when firms are most likely to have tax losses and therefore the mean level impact of the policy is dragged down.

The hypothesis differs slightly in that the heterogeneity in response is across future tax status not current tax status. This is because the DPAD effectively lowers the tax rate on earned income only if the firm is taxable when the income derived from investment is earned, not upon the investment itself. This prediction suggests that lowering the tax rate on earned income instead of providing tax incentives to lower the cost of investment may be a better counter-cyclical policy option.

While this hypothesis provides a very exciting policy implication, it may be challenging to examine empirically. To begin to understand the empirical difficulties presented, it is instructive to just how much work has gone into correctly approximating a firms *current* taxable status and tax rate. Plesko (2003) and Edgerton (2010) both provide very careful methods to construct an indicator of taxable status (1 for positive marginal tax rates, 0 for zero marginal tax rate) using publicly available accounting data. Graham (1996), Graham (2000), and Blouin et al. (2010) attempt to go one step further by constructing marginal tax rates based on both current taxable status and the probability of future current taxable status. To test the difference in response to the DPAD based on only future taxable status, the analysis contained in Section 3.6 will use measures of current tax status and marginal tax

rates. Whether the empirical results support the third hypothesis depends crucially on whether current and future tax status are strongly correlated.

3.4 Data Sources, Construction, and Descriptive Statistics

In order to empirically examine the investment response to the DPAD and test the hypotheses presented in Section 3.3, data from several sources must be compiled. Industry level data on the DPAD are taken from the IRS Statistics of Income Corporate Tax Statistics website.[7] Data on firm level financial statement variables are taken from the COMPUSTAT North American Annual database. Data needed to construct a measure of present value tax depreciation allowances for new investment are taken from the BEA and the IRS. Finally, marginal tax rates as computed in Blouin et al. (2010) are available on the Wharton Research Data Services (WRDS) Platform.

3.4.1 QPAI Percent

The effect of the DPAD differs across firms based on the percentage of income is derived from qualified production activities (ρ in Section 3.3). For example, at a 35% statutory corporate income tax rate, a 9% DPAD deduction would result in an effect rate drop of 3.15% for a 100% QPAI firm but in only a 1.575% for a 50% QPAI firm. The effect of the DPAD policy may therefore be estimated by examining differential impact across QPAI %.

QPAI % can be constructed at the industry level using information provided by the IRS Statistics of Income Division. Table 7 provides information on net taxable income and the DPAD for 17 sectors and 77 more finely defined industries.[8] Data in Table 7 are compiled from all Corporations that filed a tax return during the year.

[7] The data are specifically taken from the SOI Tax Stats Table 7: Corporate Returns with Net Income; years 2005 - 2010.

[8] Appendix 3.9.1 provides definitions of DPAD and Net Income from the IRS Statistics of Income.

The IRS sectors and industries correspond to NAICS 4 digit industries which allow IRS data to be matched to financial statement data at the industry level. QPAI % is equal to qualified income divided by total income. To find qualified income, the DPAD in total dollars is divided by the DPAD rate, which varies during years 2005-2010 as described in Section 3.2.

Table 3.1 and Figure 3.3(A) present descriptive statistics for QPAI % over time, across sectors, and across industries within the manufacturing and information sectors. The average QPAI % during all years 2005 - 2010 is 25.528%. The percentage is lowest in 2005, the first year the DPAD was available, but then levels out to an average percentage between 25.487 and 27.588 during years 2006-2010. This economy wide trend is similar within sectors and industries. The stability of the trend after the first year suggests that firms manufacturing vs. non-manufacturing mixes are relatively fixed over time. If firms were able to easily manipulate this mix in response to tax incentives, then as the deduction increased, QPAI % would have also increased.

Critically, the stability of QPAI % over time points to the exogenity of QPAI % (essentially the treatment variable in the empirical analysis) with respect to investment (the dependent variable). If investment behavior increased QPAI %, and therefore the intensity of the treatment, QPAI % would increase over time for the economy as a whole and more for industries that investment more. The stability ot QPAI % is in-line with these predictions at neither economy nor industry level suggesting QPAI % is an acceptable tool to analyze the impact of the DPAD on investment.

Not only does QPAI % seem to be exogenous with respect to investment, but it also varies significantly across major economic sectors and even within sectors at finer industry level. Figure 3.3(B) presents the average QPAI % over years 2005-2010 for each of the 17 economic sectors. The most QPAI intensive sector is construction followed closely by agriculture, information, and manufacturing. While the construction and agricultural sectors report more than 60% of their income as QPAI, eight sectors

including real estate, healthcare, and finance reports less than 10% of their income as QPAI (The financial sector is excluded from the formal empirical analysis.). The variation within sector and across industries is almost as striking. Figures 3.3(C) and (D) present average QPAI % over years 2005-2010 for the industries contained in the manufacturing and information sectors. In the manufacturing sector, the majority of industries report more than 50% of income as QPAI but several industries including oil and gas, apparel, and leather manufacturing reports less than 30% of income as QPAI. In the information sector, QPAI % varies from just less than 80% QPAI to less than 20%. The within sector is especially appealing because the impact of the DPAD is identified even when sector fixed effects and trends are included in the analysis.

Table 3.1: QPAI % for IRS Sample

Variable	Year(s)	Median	Mean	10th pctile	90th pctile
QPAI %	2005-2010	9.394	25.538	0.291	71.127
QPAI %	2005	7.979	21.098	0.098	67.005
QPAI %	2006	9.571	25.487	0.156	74.922
QPAI %	2007	9.361	27.588	0.370	68.330
QPAI %	2008	10.696	26.219	0.524	70.171
QPAI %	2009	8.588	27.046	0.307	77.863
QPAI %	2010	10.013	25.883	0.280	73.811
Industries			77		
Industries x Years			462		

Notes: Table 3.1 provides descriptive statistics for the variable QPAI % for the IRS Sample – all corporations that filed a tax return during the year in question. QPAI % is defined as the percentage of taxable income that is derived from Qualified Production Activities.

DPAD is the variable that captures the deduction is the empirical analysis. DPAD is equal to the QPAI % multiplied by the deduction percent and intuitively is the implicit rate of tax deduction ($d\rho$ in Section 3.3). Here QPAI % is the average within each industry over years 2005-2010. For a 100% QPAI industry, the DPAD is equal to the DPAD rate but for a 50% QPAI industry, DPAD is only equal to half of the statutory deduction. DPAD varies over time because the deduction increases over time and across industries because they differ in their QPAI %.

Table 3.2 reports average QPAI % and DPAD for the Compustat Sample both over all years 2005-2010 and for each year 2005 to 2012. The average QPAI % is significantly higher for the Compustat Sample than for all corporate taxpayers meaning that firms in the Compustat sample are more concentrated in high QPAI % industries than the general population of corporate tax filers. However, because the lion's share of investment behavior is undertaken by listed firms contained in the Compustat Sample, results from the empirical analysis describe a large majority of the corporate population.

DPAD or the effective deduction rate varies from less than 0.882% in 2005 to 2.521% in 2010. The increase in the effective deduction over time is driven primarily by the increase in the statutory rate rather than an increase in the QPAI %. Given a statutory corporate tax rate of 35%, once fully phased in (2010 and beyond) the policy provides the average firm in the Compustat Sample with a effective rate reduction of 0.875 percentage points.

Table 3.2: QPAI, DPAD % for Investment Sample

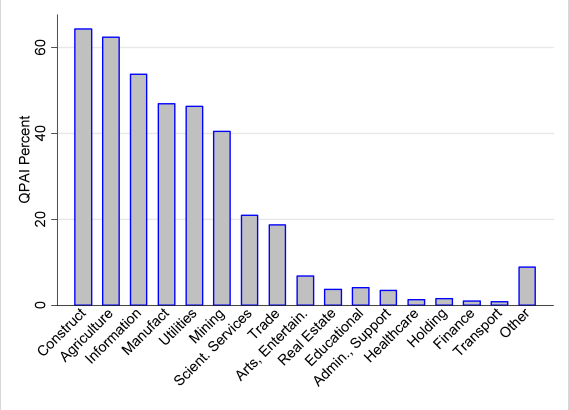
Variable	Years	Median	Mean	10th pct	90th pct
QPAI%	2005 - 2012	41.335	38.7431	3.471	66.660
DPAD	2005 - 2012	2.298	2.409	0.208	4.729
DPAD	2005 - 2006	1.149	0.882	0.022	1.850
DPAD	2007 - 2009	2.298	1.729	0.045	3.699
DPAD	2010 - 2012	3.447	2.521	0.067	5.542
Firms		11,189			
Firms x Years		72,341			

Notes: Table 3.2 presents QPAI % and DPAD for years 2005-2012 for the Compustat Sample - listed firms with non-zero financial statement variables needed for baseline regression analysis. QPAI % is the percentage of income derived from qualified production activities and eligible for the domestic production activities deduction. DPAD is equal to QPAI % multiplied by the statutory rate of the deduction. DPAD can be interpreted as the effective rate of the deduction given a fixed QPAI %.

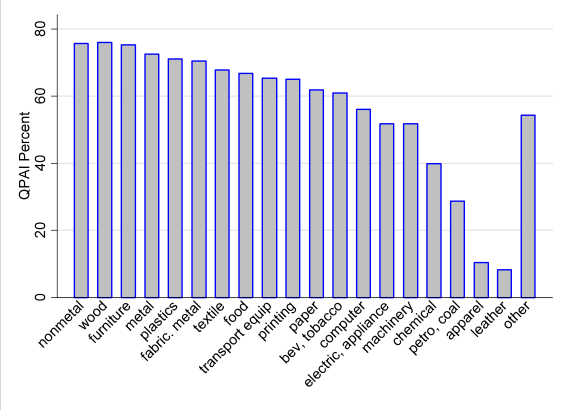
Figure 3.3: QPAI Percent

(a) QPAI Percent 2005-2010

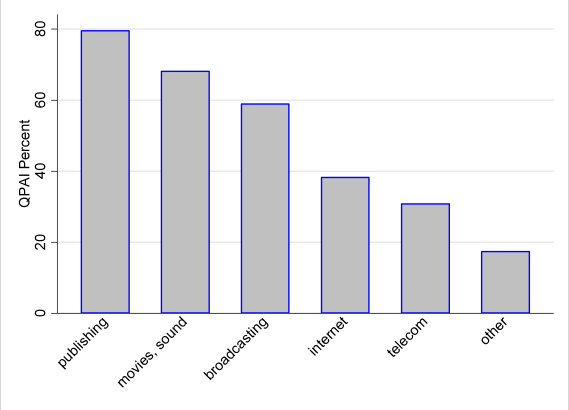
(b) QPAI by Sector



(c) Manufacturing Industries



(d) Information Industries



Note: Figures 1a - 1d present percentages of Qualified Production Income as a percentage of total income. QPAI percentage is calculated the Domestic Production Deduction divided by Income Subject to Tax as defined by the IRS Statistics of Income Division. Figure 1a presents QPAI averaged across all corporations for years 2005 - 2010. Figure 2 presents QPAI for each major production section averaged across all years 2005 - 2010. Figure 3 presents QPAI for each major industry in the manufacturing sector averaged across all years 2005 - 2010. Figure 4 presents QPAI for each major industry in the information sector averaged across all years 2005 - 2010.

3.4.2 Bonus Depreciation

During the time period that will be considered in the empirical analysis, a second tax policy, Bonus Depreciaiton, potentially affects investment and must be controlled for in order to accurately estimate the effects of the DPAD. Bonus depreciation works by increasing the present value of tax depreciation allowances available on $1 dollar of investment, here called the **Z Tax Term**. If firms can immediately expense investment (bonus equal to 100% as in 2011) then the Z Tax Term is equal to 1 because the firm can deduct $1 from its current tax bill. If firms cannot immediately deduct the entire purchase price of the investment from taxable income and must deduct some portion of the cost in the future, then the present value of tax depreciation allowances is less than $1 because future deductions are worth less in a present value sense. For details on the construction of the Z Tax Term, please refer to Ohrn (2014). The average value of the Z Tax Term for the investment sample is 0.917.

3.4.3 Firm Level Financial Statement Variables

Compustat provides financial statement data for firms listed on a major stock exchange and required to file their financial information annually with the U.S. Securities and Exchange Commission. Compustat data easily allows for the construction of the dependent investment variable and determinants of investment in addition to DPAD.

The dependent variable in all regressions contained in the body of the paper is **Investment Percent** which is equal to capital expenditure in the current year scaled by the lagged value of property plant and equipment.[9] Table 3.3 provides descriptive

[9]The baseline investment analysis uses Investment Percent as the dependent variable in an effort to make results directly comparable to prior research on investment behavior among Compustat firms (Cummins et al. (1994), Desai and Goolsbee (2004), Edgerton (2010), Ohrn (2014)). The baseline results are , however, robust to alternative investment variables; baseline analyses using the log of capital expenditure are presented in Appendix 3.9.3. Investment reponse to the DPAD is nearly identical under this alternative specification.

statistics for Investment Percent as well as other investment control variables. The mean value of investment percent is 0.450 with a median value of 0.196 meaning the average (median) firm replaces approximately 45% (20%) of their capital stock in a given year. The skewness of this variable is consistent with lumpy investment behavior; firms engage in large investment projects but not every year.

The additional controls that are included in the analysis and may be derived directly from Compustat data are **Marg Q** and **Cash Flow**. Marg Q controls for a firm's investment opportunities and Cash Flow controls for any investment response that may be driven by new cash on hand. Both controls have been empirically linked to investment behavior.

3.4.4 HP Index of Financial Distress

A measure of financial distress is included in the analyses to control for the effects of financing on investment in the baseline analyses and to examine the heterogeneity of investment response across firms with varying levels of financial constraint to support the second empirically testable hypothesis generated by the conceptual framework. The empirical analysis with rely on the **HP Index** as derived in Hadlock and Pierce (2010). Hadlock and Pierce (2010) find measures of financial constraint that have been used in the past (investment cash-flow sensitivity from Fazzari, Hubbard and Petersen (1988), the KZ Index from Kaplan and Zingales (1997), the Whited Wu Index from Whited and Wu (2006)) are not particularly effective at predicting financial constraint as measured by detailed qualitative information contained in financial filings. Instead, Hadlock and Pierce find that firm size and age are particularly useful predictors of financial constraint. They construct an aggregate measure of financial constraint that decreases at a decreasing rate in firm size and decreases linearly in firm age. The exact construction of the HP Index is described in Appendix 3.9.2. Table 3.3 reports descriptive statistics for the HP Index.

3.4.5 Tax Status Variables

Several variables are used to capture current and future taxable status. The simplest measure of current tax status is $\mathbb{1}$**(Tax Loss)**, an indicator for whether the firm has negative taxable income.[10] To take account of the magnitude of tax losses, the continuous variable **Tax Loss** may also be used where Tax Loss is equal to negative taxable income when taxable income is less than zero and equal to zero when taxable income is equal to or greater than zero. In the investment sample, approximately 49% of firm-year observations report negative taxable income. For firms both positive and negative taxable income, the average firm has 26 million in tax losses. Among, firms with tax losses, the average firm has $86 million in tax losses. This number is however, heavily skewed towards zero; the median firm with negative taxable income reports on $8 million in losses.

The third measure of taxable status, **MTR**, is a simulated marginal tax rate constructed by Blouin et al. (2010). The marginal tax rates are both a function of a firms current taxable status and whether the growth trajectory of the firm will make the firm taxable in the future. The average MTR for the investment sample is 0.195 meaning the simulated tax rate on the marginal dollar of income is 19.5%. The MTRs generated by Blouin et al. (2010) are only available for years 2000-2010.

[10] Taxable income is constructed as

$$\text{Taxable Income}_t = \frac{\text{txfed}_t + \text{txfo}_t}{\tau_t} + \text{tlcf}_t - \text{tlcf}_{t-1}$$

following the reasoning laid out in Hanlon (2003). txfed is the federal tax bill reported. txfo is foreign taxes paid. tlcf is the level of tax loss carry-forwards and τ is the corporate tax rate.

Table 3.3: Additional Descriptive Statistics for Investment Sample

	Median	Mean	10th pctile	90th pctile
Investment Percent	0.196	0.450	0.033	0.821
Z Tax Term	0.924	0.917	0.876	0.952
Marg Q	1.493	4.630	0.835	4.986
Cash Flow	0.160	-8.368	-27.864	1.746
HP Index	-4.172	-4.129	-6.629	-1.626
$\mathbb{1}$(Tax Loss)	1.000	0.491	0.000	1.000
Tax Loss	0.000	23.423	0.000	24.000
MTR	0.224	0.202	0.021	0.347
Dec Fiscal Year	1.000	0.682	0.000	1.000
Domestic	1.000	0.672	0.000	1.000
Firms			11,189	
Firms x Years			72,341	

Notes: Table 3.3 reports the mean, median, 10th percentile, and 90th percentile statistics for the outcome variable (investment percent), control variables (Z Tax Term, Marg Q, Cash Flow, and HP Index), and sample splitting variables (Foreign, Foreign percent, and December Fiscal Year) for the main investment analysis sample. Tax Loss is measured in millions of dollars.

3.4.6 Fiscal Year Ends and Foreign Operations

Two variables are used to limit the sample to those firms that are potentially most affected by the DPAD. The first, **Dec Fiscal Year**, is an indicator equal to 1 if the firm's fiscal year ends in December and equal to 0 if the firms fiscal year ends in another month (usually March, June, or September). If firms have a December fiscal year, then the information contained in their financial statements lines up perfectly with the implementation of the DPAD – for instance, all qualified income earned in fiscal year 2004 was not subject to the DPAD and all qualified income earned in 2005 was eligible. On the other hand, qualified income earned during fiscal year 2005 for firms with June fiscal years ends may or may not be eligible for the deduction. Limiting the analysis to Dec Fiscal Year firms removes this potential source of measurement error from the analysis. 68.2% of the investment sample have fiscal years ending in December.

In several graphical analyses, the investment analysis is limited to firms that do or do not report only domestic income. Firms that report only domestic income are labeled as **Domestic**. If firms reports positive foreign income, then they presumably have foreign operations and a portion of the investment observed by the researcher may be attributable to foreign operation which generate foreign income not eligible for the DPAD. If on the other hand firms report no foreign income, then the DPAD is available for all qualified income and tests of the investment stimulus effect of the DPAD are much cleaner. 67.2% of firms in the investment sample report no income from foreign operations.

3.4.7 Winsorizing

Variables that potentially suffer from misreporting are Winsorized at the 1% level in an effort to limit the effects of outliers.[11] All results are robust to both more aggressive Winsorizing at the 5% level and to the absence of Winsorizing.[12] The Winsorized variables are Investment Percent, Marg Q, Cash Flow, HP Index, and Tax Losses. DPAD is left un-Winsorized because it is a product of statutory rates (3, 6, and 9%) and QPAI % which is an industry level aggregate variable and therefore already void of potential individual outliers. For the same reason, the Z Tax Term is left un-Winsorized. MTRs are constructed to vary between 0 and the top statutory tax rate. No MTR observations fall outside of these values and therefore MTRs are left unaltered. All indicator variables ($\mathbb{1}$(Tax Loss), Dec Fiscal Year, Domestic) are unaffected by the Winsorizing procedure.

3.5 Empirical Design and Identification

The investment impact of the DPAD may be empricailly estimated because the policy differentially affects firms that based on the percentage of income that they derive from QPAI. When the deduction is implemented and subsequented increased, the investment behaviros of the high QPAI firms may be measured against the investment behaviors of the low QPAI firms.

This differences-in-differences (DD) estimation strategy may be carried out using standard OLS regression techniques. The baseline DD specification is given by

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=2}^{n} \beta_s \text{Control}_s + \eta_i + \gamma_t + \epsilon_{it}$$

where i indexes firms, j index industries, and t indexes time. η and γ are firm and

[11] More precisely, observations in the bottom and top 0.5% of observations are replaced with the observations at the 0.5% and 99.5% percentile.

[12] Available upon request from the author.

year fixed effects. In this DD specification, $DPAD$ is akin to the interaction term because it is equal to ρd in terms corresponding to the conceptual model or equal to the treatment (d) multiplied by the intensity of the treatment (ρ). ρ, which varies by firm but is fixed over time, and d, which varies over time but not by firm, are not included in the regression separately as they are captured by firm and year fixed effects.

Variation in $DPAD$ is at the industry-by-year level, so identification of the β_1 coefficient is generated from how different industries respond to the policy. The key identifying assumption is that the policies are independent of other industry-by-year shocks. To address this concerns, robustness checks are performed in which sector-by-year fixed effects, sector specific linear time trends, or sector specific quadratic time trends are included in baseline regressions. These controls account for variation at the sector level over time. With these controls, identification of the β_1 coefficient comes from how different industries within the same sectors respond to the DPAD. For example β depends on how apparel manufacturing, a low QPAI % industry in the manufacturing sector, responds to the policy compared to how furniture manufacturing, a high QPAI % industry in the manufacturing sector, responds to the policy. Reassuringly, included sector-by-year fixed effects or time trends actually increases the estimated magnitude of the policy, suggesting that sector-by-year trends do not drive empirical identification.

To test for heterogeneity in investment response across varying level of financial constraint and tax status, the DD estimation strategy is implemented for different groups of firms (high vs. low financial constraint / currently taxable vs. currently untaxable). The β_1 coefficient is then compared across the groups of firms. This technique thereby implements a differences-in-differences-in-differences (DDD) strategy; the DD coefficient is again differenced across groups that potentially respond heterogeneously to the policy. This DDD implementation is more flexible and therefore

preferably to simply including a DDD term ($\rho \times d \times$ group) and cross terms in the regressions because it allows for controls to differentially affect investment across the comparison groups.

3.6 Investment Response

3.6.1 Baseline Graphical Analysis

Figure 3.4 presents a visual representation of the baseline DD research design described in Section 3.5. To construct the figures, cross sectional regressions are run in each year of the outcome variable on a rich set of controls for financial constraint, investment opportunity, cash flow, and tax depreciation allowances. The predicted values are then averaged separately for the treatment and control groups in each year. For comparability, the predicted group mean for each group in year 2002 is subtracted and the predicted mean for all firms in 2002. The treatment group is defined as firms with above 40% of income derived from QPAI and the control group are those firms with below 40% of income derived from QPAI.[13] The difference between the group mean of the treatment and control groups in years after the implementation of the DPAD in 2005 versus the the difference is years prior provides the DD estimate and quantifies the effect of the DPAD policy.

From Figure 3.4(A), the effect of the policy is immediately apparent. The investment behaviors of the treatment and control groups move in step during years 2002 to 2004 then diverge substantially in 2005 and beyond with the treatment group doing more investment. This striking change in investment between treatment and control group strongly supports the hypothesis that the DPAD increases investment and increases investment more among firms with a large percentage of income eligible for the deduction. A discussion the magnitude of the the investment impact is postponed

[13]The median value of QPAI is 41.335 median for the investment sample.

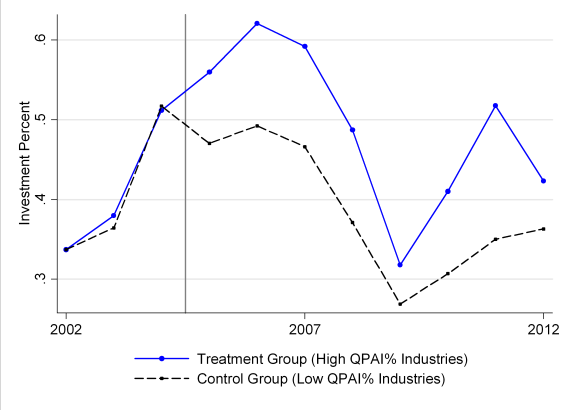
until Subsection 3.6.2.

Figure 3.4(A) provides two additional insights. First, the nearly identical investment behavior between the treatment and control groups in years 2002 to 2005 assures that pretrends are not a concern. These years further provide placebo tests of the natural experiment and show no false positives. Second, investment behaviors diverge upon initiation of the policy but do not appreciably diverge further when the deduction is increased in 2007. There are two possible explanations for this result: either the recession of 2008 and 2009 is affecting investment behavior in a way does not allow for response by either group or, alternatievly, firms responded to the policy as if it were implemented at its long-term rate of 9%. The second result is not unintuitive given the observation that the income derived from investment projects initiated in 2005 may not arrive until 2010 and/or the *majority* of income from investment projects initiated in 2005 may arrive after 2010.

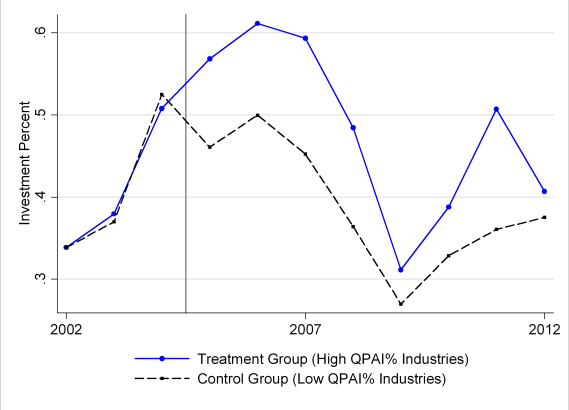
Figures 3.4(B) - 3.4(D) plot the same group means for only firms with December fiscal years, for firms that only report domestic income in years prior to 2005, and for firms that report some foreign income in years prior 2005. Consistent with the discussion presented in Section 3.4, the graphical analysis supports the assertation that investment behaviors of firms with December fiscal years and firms who claim no foreign income respond even more strongly to the introduction of the DPAD than the general Compustat population.

Figure 3.4: Investment Response Graphical Diff-in-Diff

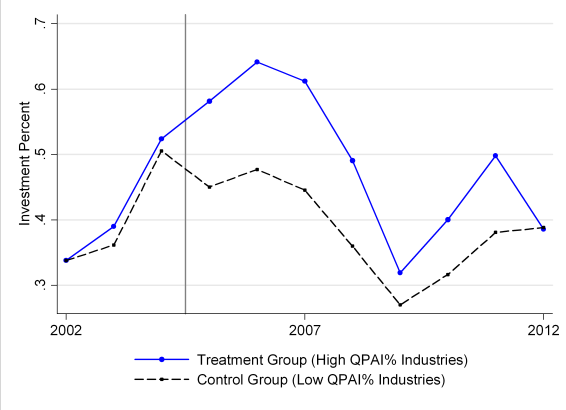
(a) All Firms



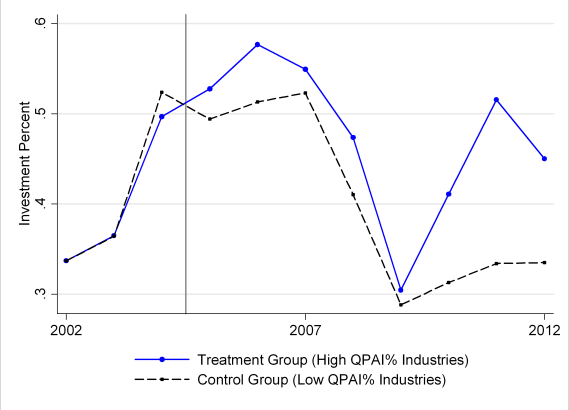
(b) December Fiscal Year Firms



(c) Domestic Firms



(d) Foreign Firms



Notes: Figures 3.4(A) - 3.4(D) plot the mean investment percent over time for groups sorted according to their industry-based treatment intensity. The intensity of the treatment depends on the percentage of income that is eligible for the Domestic Production Activities Deduction and therefore qualifies as Qualified Production Activities Income. The Treatment Group (Control Group) is defined as firms within industries in which more than (less than) 40% of income is derived from Qualified Production Activities. The treatment years are years 2005-2012 as the DPAD increases from 0 to 3 to 6 to 9% in 2005, 2007, and 2010. The averages plotted here are derived through the following procedure: cross-sectional regression of investment percent on controls for tax depreciation allowances, cash flows, and financial constraint are run in each year. Residual group means for the treatment and control group are then calculated and added to the mean investment percent for each year. Finally, group means in year 2002 are subtracted from all observations and the overall mean investment percentage in added to ease the comparison of trends. All means are count weighted.

3.6.2 Baseline Regression Analysis and Policy Magnitude

Table 3.4 presents the baseline regression analysis. Across all specifications, the coefficient on $DPAD$ is positive and statistically different from zero with at least 95% certainty. The precision and magnitude of the coefficient estimate increase when other determinants of investment behavior are added to the regression, when the analysis is limited to firms with December fiscal year ends, and when the analysis is restricted to years prior to the 2008 and 2009 recession.

The policy variable is scaled such that the $DPAD$ coefficient may be interpreted as the increase in investment percent resulting from an increase in the deduction from 0 to 9% for a firm with 100% of income eligible for the deduction. Specification (1) regresses investment percent on only $DPAD$ and firm and year fixed effects. Specification (2) includes controls for investment tax incentives, financial constraint, investment opportunities, and cash flow as well as firm and year fixed effects. The $DPAD$ coefficient in (2) is equal to 0.141 and statistically significant at the 1% level, meaning that the full implementation of the policy increases investment percent by 0.141 for a firm 100% of income derived from qualified production activities. Given the mean investment percent is 0.450, the full implementation of the policy increases investment percent by 31.3% if all income is derived from domestic production. The magnitude of the investment response to the policy is lower for the firm with the average QPAI%. In the Compustat sample, on average, firms only derive 38.7% of their income from qualified production activities. Thus, a firm that claims 38.7% of income as qualified increases investment percent by 0.055 or 12.113% in response to the full implementation of the DPAD.

The investment response to the policy may also be interpreted as an elasticity of investment percent with respect to the DPAD adjusted corporate tax rate, $\tau(1 - \rho d)$. The full implementation of the policy decreases a firm's corporate statutory tax rate by 9% and increases investment percent by 31.3% resulting in an elasticity of

investment percent to corporate income tax rate of 3.47.[14] This elasticity is large relative to studies focusing on the investment impact of the bonus depreciation Desai and Goolsbee (2004), Edgerton (2010). However, the magnitude is unsurprising given arguments by Neubig (2006), Edgerton (2012), and Ohrn (2014) which assert that the accounting treatment of bonus depreciation undermines its effectiveness as an investment stimulus tool.[15] Additionally, this elasticity may be interpreted as a short run response. If there is some optimal concave time path of additional investment in response to the introduction of the policy then this estimate may be capturing a large initial increase in investment.

Specifications (3) and (4) limit the (1) and (2) analysis to firms with December fiscal years. For firms with December fiscal year ends, the introduction and subsequent increases in the policy line up with the start of their fiscal years thus providing a cleaner test of the effects of the policy. The magnitude of the $DPAD$ coefficient estimated in specification (4) is larger than in specification (2), providing some evidence that noisiness in the data is introduced when fiscal year and the implementation of policy do not align.

[14]The elasticity of investment with respect to the net of tax rate, $1 - \tau(1 - \rho d)$, is 6.52 and comparable to net of tax elasticity of 7.2 of investment to bonus depreciation reported by Zwick and Mahon (2014).

[15]Because the DPAD affects both accounting earnings and cash flows equivalently, the response should be and is empirically larger.

Table 3.4: Baseline DPAD Investment Response

Dependent Variable:	Investment Percent				
Specification	(1)	(2)	(3)	(4)	(5)
DPAD	0.099**	0.141***	0.162**	0.191***	0.262***
	(0.049)	(0.050)	(0.068)	(0.068)	(0.096)
Z Tax Term		0.067***		0.127***	-0.036
		(0.024)		(0.034)	(0.056)
HP Index		-0.170***		-0.159***	-0.310***
		(0.017)		(0.022)	(0.026)
Marg Q		-0.002***		-0.002***	-0.001
		(0.000)		(0.001)	(0.001)
Cash Flow		-0.009***		-0.009***	-0.010***
		(0.000)		(0.001)	(0.001)
Dec. Fiscal Year End			✓	✓	
Prior to 2008					✓
Adj. R-Square	0.009	0.114	0.010	0.115	0.149
Firms	11,189	11,189	7,873	7,873	9,588
Firm x Years	72,341	72,341	49,338	49,338	44,532

Notes: Specifications (1) through (4) present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=1}^{n} \beta_s \text{Control}_s + \epsilon_{it}.$$

In specifications (2), (4), and (5), controls for bonus depreciation, financial distress, marginal Q, and cash flows are included. In specifications (3) and (4), the analysis is limited to firms with December fiscal year ends. Specification (5) is limited to years prior to 2008. All specifications include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

Specification (5) limits the analysis to years prior to 2008. In the restricted time domain, the investment response to the DPAD is larger. This finding is consistent

with both larger short-run responses and perhaps a general lack of financing in 2008 and 2009 preventing firms from investment regardless of whether they were "treated" to a drop in their effective corporate income tax rate.

Table 3.5 repeats the preferred specificaiton (2) from Table 3.4 but includes sector-by-year fixed effects, sector linear time trends, and quadratic time trends in specifications (1), (2), and (3) respectively. Fixed effects and trends are included in order to be sure that trends in one sector versus another (such as trends in the manufacturing sector versus trends in information sector) are not driving the main empirical results. When sector controls are included, the estimates of the $DPAD$ coefficient are large and postive suggesting that the policy is effective at stimulating investment within sector and is not driven by sector level trends in investment behavior.[16]

[16]A large majority of Compustat firms are located in the manufacturing sector.

Table 3.5: Investment Analysis with Sector FE and Trends

Dependent Variable:	Investment Percent		
Specification	(1)	(2)	(3)
DPAD	0.551***	0.509***	0.503***
	(0.125)	(0.112)	(0.113)
Sector x Year FE	✓		
Sector Linear Time Trends		✓	
Sector Quadratic Time Trends			✓
Adj. R-Square	0.120	0.126	0.126
Firms	10,936	10,267	10,267
Firm x Years	70,746	60,154	60,154

Notes: Specifications (1) through (4) present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=1}^{n} \beta_s \text{Control}_s + \epsilon_{it}.$$

All specifications include firm and year fixed effects and controls for bonus depreciation, financial distress, marginal Q, and cash flows. Specification (1) includes Sector x Year Fixed Effects. Specification (2) includes sector specific linear trends. Specification (3) includes sector specific quadratic time trends. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

To summarize the findings of Section 3.6, there is strong support for **Hypothesis 1**; firms that derive a large portion of income from domestic manufacturing activities and thus may deduct a large percentage of profits from taxable income via the DPAD are more responsive to the policy than firms that are not significant domestic producers. Overall, the DPAD has a strong and positive effect on investment that most affects precisely the target of the policy – domestic manufacturers.

The robustness of this finding is strengthened by three additional results: (1) the response is stronger among firms whose financial data is recorded to align with the implementation of the policy suggesting that the mean investment response is downward biased via minor measurement error, (2) the response is sharper among firms that operate exclusively within the borders of the US suggesting foreign firms which record investment in foreign operations and US operations together are also undermining the baseline estimate of the policy's effect, and (3) the effect of the policy is strong and positive even in the presence of sector level fixed effects and thus the primary findings are not driven by any sector trends.

While the empirical findings strongly support **Hypothesis 1**, the empirical evidence is less clear in regard to the heterogeneity hypotheses, **Hypothesis 2** and **Hypothesis 3**. The empirical analysis continues by exploring investment responses to the DPAD according to level of financial constraint and tax status. In a manner similar to the baseline analysis, graphical analysis is presented first, followed by regression results.

3.7 Investment Response Heterogeneity

3.7.1 Heterogeneity Graphical Analysis

Figure 3.5 repeats the methods used to create Figure 3.4 (described in Subsection 3.6.1) separately for four groups of firms. Panel (A) focuses the analysis on firms

that have below median level of averaged financial constraint during the years prior to DPAD implementation in 2005.[17] In contrast, Panel (B) examines firms with above median level of averaged financial constraint prior to 2005. The investment response of the unconstrained firms to the policy can be said to be at best lukewarm. In years 2005 through 2009, there seems to be very little difference between the behaviors of the high and low QPAI firms (the treatment and control groups). The difference between the treatment and control groups does increase in years 2010-2012, once the policy is fully implemented. In contrast, the investment behaviors of the financially constrained treatment and control groups diverge sharply upon implementation of the policy. This divergence is large and evident in all years prior to 2012. The graphical evidence provides clear support for **Hypothesis 2**; financially constrained firms seem to be much more responsive to the DPAD policy. The slack in the borrowing constraint created by the policy seems, at least from the graphical analysis presented in Figure 3.5, to be a significant driver of investment response to the DPAD. Additional discussion of the effect of the policy on the borrowing constraint is postponed until regression results are presented in Subsection 3.7.2.

The graphical DD analysis is applied to Taxable and Non Taxable firms in panels (C) and (D). The definition of Taxable used in the graphical analysis is whether the firms had positive taxable income in more than 3/4 of years prior to the implementation of the DPAD.[18] The definition of Non Taxable is firms which reported positive taxable income in fewer than 1/4 of years prior to policy implementation. As in the financial constraint graphical analysis, the heterogeneity across firms is an ex-ante description of firm characteristics in an effort the avoid endogeneity concerns; for

[17] The difference in the investment divergence between treatment and control groups across the two panels may be interpreted as a triple differenced estimation strategy. Put differently, the difference between the DD results in Panels (A) and (B) reveals heterogeneous response among financial constrained and unconstrained firms.

[18] For most firms, tax status is available for years 2001 - 2004. Firms have fewer than 4 observations prior to policy implementation only if the firms was added to the Compustat database after 2001 or if data needed to derive the taxable income variable was missing.

example, firms with high QPAI % that are more responsive to the policy may be more likely to be Non Taxable after the DPAD is enacted because their investment expenditure significantly decreases taxable income levels.

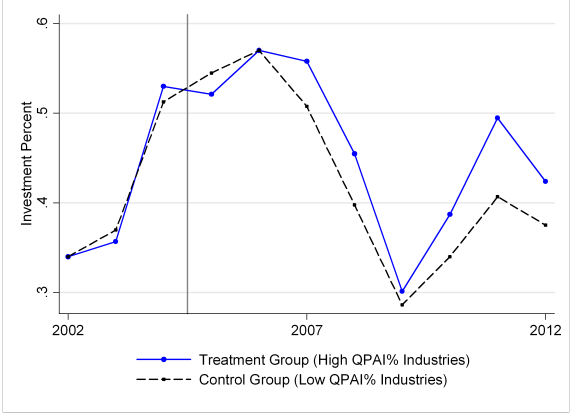
Both Taxable and Non Taxable treatment groups increase investment relative to the control groups suggesting the investment response to the policy is positive regardless of ex-ante tax status. Interestingly, the investment divergence is larger for the Non Taxable firms in years 2005 to 2008. If current tax status is strongly correlated with future tax status, then this result lies in direct opposition to **Hypothesis 3** – those firms that are less likely to be taxable once the policy is implemented and therefore less likely to benefit from the policy are most responsive to it.

There are however, several other plausible scenarios under which these graphical findings either do not conflict with the tax status hypothesis or may, in fact, support the hypothesis. Under tax status mean reversion, the firms that are currently non-taxable may be more likely to be taxable in the future. This assumption could be born of lumpy investment behavior, those firms making large investments now could have low taxable income but plan to reap higher future profits. In this case, Non Taxable firms now are Taxable in the future and are likely to benefit from the deduction thereby explaining the relatively strong investment response among the Non Taxable group. Alternatively, current Tax Status may contain no information about future Tax Status. Under this assumption, the graphical results are not surprising.

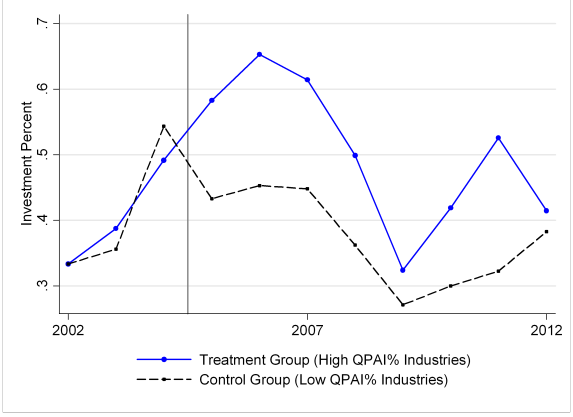
Finally, taxable income may not be directly tied to corporate profits. Firms that report low or zero taxable income may be using tax shields such as debt to actively lower taxable income. Under this interpretation, the firms reporting tax losses in a majority of years prior to 2005 are those firms most actively pursuing tax minimizing strategies. These tax minimizers may be precisely those firms that expend resources to optimally respond to tax incentives. This reasoning would suggest that tax minimizers may increase investment most in response to the DPAD.

Figure 3.5: Heterogeneous Investment Response Graphical Diff-in-Diff

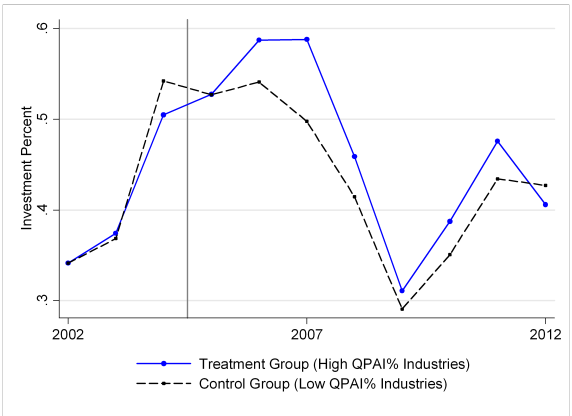
(a) Unconstrained Firms



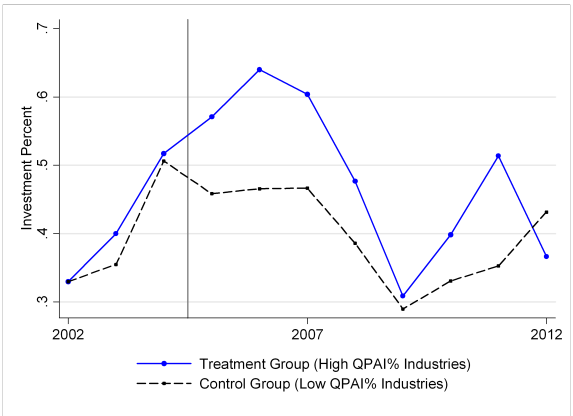
(b) Constrained Firms



(c) Taxable



(d) Non Taxable



Notes: Figure 3.5 plots the mean investment percent over time for groups sorted according to their industry-based treatment intensity. The intensity of the treatment depends on the percentage of income that is eligible for the Domestic Production Activities Deduction and therefore qualifies as Qualified Production Activities Income. The Treatment Group (Control Group) is defined as firms within industries in which more than (less than) 40% of income is derived from Qualified Production Activities. The treatment years are years 2005-2012 as the DPAD increases from 0 to 3 to 6 to 9% in 2005, 2007, and 2010. The averages plotted here are derived through the following procedure: cross-sectional regression of investment percent on controls for tax depreciation allowances, cash flows, and financial constraint are run in each year. Residual group means for the treatment and control group are then calculated and added to the mean investment percent for each year. Finally, group means in year 2002 are subtracted from all observations and the overall mean investment percentage in added to ease the comparison of trends. Unconstrained firms have less than median level average HP Index during years prior to 2005. Taxable (Non Taxable) firms are those with taxable income in at least (less than) half of the years prior to 2005. All means are count weighted.

3.7.2 Heterogeneity Regression Analysis

The heterogeneity graphical findings are echoed by the regression analysis presented in Tables 3.6 and 3.7. Specifications (1) and (2) in Table 3.6 presents the baseline regression of Investment Percent on $DPAD$ separately for firms with below median and above median ex ante financial constraint. Both sets of firms respond positively to the DPAD. From Specification (1), a 100% QPAI firm that is less financially constrained increases Investment Percent by 0.058 or 12.8% in response to full implementation of the policy. Whereas, from Specification (2), a 100% QPAI firm that is more financially constrained increases Investment Percent by 0.223 or nearly 50%. This divergence in responses between the more and less constrained firms suggests that the financial slack created by the policy plays an important role in investment behavior. If borrowing constraints matter for investment response then external financing must be costly suggesting a world in which information asymmetries and principal-agent problems are prevalent. Furthermore, the findings reiterates the sentiment of recent research suggesting that financial constraint actually amplifies the effect of investment stimulus policies.

While the magnitude of the difference in these responses is large, the difference between these point estimates is not statistically different from zero at even the 10% level. The statistical imprecision of the estimates may be due to a limited sample size, a weak relationship between ex ante measures of financial constraint and financial constraint upon DPAD implementation, or median sample split being sub-optimal in this context. While the first concern cannot be addressed without access to better data, the latter two concerns are addressed in Specifications (3)–(6) of Table 3.6. Specifications (3) and (4) limit analysis to years prior to 2008 when ex ante financial constraint data are better predictors of financial constraint during implementation. Following this logic, the difference in investment response between constrained and unconstrained firms is large and statistically significant. In years 2005-2007, all of

the response to the DPAD policy was driven by financially constrained firms.

Specifications (5) and (6) limit the DPAD analysis to firms below the 80th percentile of ex ante financial constraint and above 80th percentile of financial constraint. The sample split is moved to isolate the top end of the distribution of financially constrained firms. Compustat firms are generally very large and well established, thus facing little financial constraint on average. Thus, only a small subset of Compustat firms may face hard budget constraints and be affected by additional financing slack generated by the DPAD. This sample split generates extreme response heterogeneity. The investment behavior of firms that are not financially constrained is not statistically different from zero. On the other hand, the average firms (in terms of QPAI%) increases investment percent in response to the policy by 42%. The different in investment response between these groups of firms is statistically different from zero at the 10% level. Overall, the graphical and regression evidence supports the **Hypothesis 2** prediction that financially constrained firms are more responsive to the DPAD.

Table 3.6: Investment Response and Financial Constraint

Dep. Variable:	Investment Percent					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
HP Index Split	<Medan	>=Median	<Median	>=Median	>80%	>=80%
DPAD	0.058*	0.223*	-0.032	0.466**	0.063	0.545**
	(0.030)	(0.114)	(0.052)	(0.204)	(0.040)	(0.258)
Equality Test	P = 0.160		P = 0.018**		P= 0.064*	
Prior to 2008			✓	✓		
Adj. R-Square	0.016	0.124	0.011	0.154	0.030	0.159
Firms	3,782	4,763	3,743	4,743	6,518	2,027
Firm x Years	31,296	31,294	20,531	22,141	50,080	12,510

Notes: All specifications present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=2}^{n} \beta_s \text{Control}_s + \epsilon_{it}.$$

All specifications include controls for bonus depreciation, marginal Q, and cash flows. Specifications (1) and (3) limit the analysis to firms with below median levels of financial constraint as measured by the HP Index. Specifications (2) and (4) limit the analysis to firms with above median levels of financial constraint. Specifications (5) and (6) limits analysis to firms with above and below the 80th percentile of financial constraint respectively. Specifications (3) and (4) limits the analysis to years prior to 2008. The equality test measures whether the $DPAD$ coefficient is equal in specifications (1) and (2), (3) and (4), and (5) and (6); P-values are presented. All specifications include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

As with the financial constraint analysis, regressions focused on Tax Status heterogeneity echo graphical results. Specifications (1) and (2) split the sample in the

same way as the graphical analysis. The Taxable firms analyzed in Specification (1) of Table 3.7, those with fewer than 2 years of tax losses in years prior to 2005, are positively responsive to the policy with a $DPAD$ coefficient of 0.118. The $DPAD$ coefficient for Non Taxable firms, presented in Specification (2), is larger but not statistically different from zero, perhaps owing to a smaller sample of firms that were not taxable for more than 2 years during years prior to 2005. The behavior of one group cannot with any confidence be said to be different than that of the other. Again, several plausible explanations are possible to reconcile this finding with **Hypothesis 3**. These include mean reversion of tax status, minimal relation between current and future taxable status, and tax loss as a signal of general responsiveness of corporate behavior to tax policy. Additionally, as noted by Edgerton (2010), "one cannot rule out, however, the possibility that difficulties in measuring firms ' taxable status drive the relative unimportance of taxable status observed in the Compustata data."

Specifications (3) and (4) split the sample based on whether firms always (3) or never (4) have taxable income in years prior to 2005. Again, the difference in behavior between the two groups is not statistically different from zero. If anything, the patterns seem to suggest that firms that never have taxable income in years 2001-2005 are more responsive to the policy. This finding may gently push support towards tax reversion or tax avoidance explanations.

Specifications (5) and (6) use estimated marginal tax rates to split the analysis instead of taxable income measures. The analysis is split at the median average MTR during years 2001 to 2005. The results are strikingly similar to the alternative tax loss splits. Firms with below median ex ante MTRs seem to be more responsive to the DPAD. The difference in behaviors is again not statistically different from zero. The results presented in Table 3.7 are robust to many different sample splits both on ex-ante measures of taxable income and MTR – firms that are currently less profitable and thereby have lower measures of taxable income and MTR seem to be

more responsive to the DPAD in terms of point estimates. The difference in behaviors between the two groups are never statistically different from zero.

While the graphical and regression analyses provide strong support for the prediction of heterogeneous response based on financial constraint, the analyses do not provide strong empirical support for **Hypothesis 3**. Both of these findings speak to the progressivity of the DPAD policy. Theory predicted the DPAD to provide more benefit to firms that were financially constrained but profitable and therefore taxable. While the first prediction was progressive in that it benefits the firms that need financing the most, the second prediction was regressive in that it benefited most those firm with high measures of taxable income. Empirically, however, investment response is concentrated only based on financial constraint not tax status, a finding that supports only the progressive theoretical prediction.

Table 3.7: Investment Response and Tax Status

Dep. Variable:	Investment Percent					
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Tax Loss Split	<2 Yr	>2 Yr	Taxable	Tax Loss		
MTR Split					>21%	<=21%
DPAD	0.118*	0.152	0.073	0.291	0.054	0.207*
	(0.062)	(0.120)	(0.075)	(0.268)	(0.042)	(0.124)
Equality Test	P = 0.802		P = 0.433		P= 0.245	
Adj. R-Square	0.109	0.141	0.125	0.110	0.013	0.159
Firms	4,148	3,050	3,376	1,162	2,692	3,600
Firm x Years	31,379	20,526	24,596	6,529	22,533	23,063

Notes: All specifications present coefficients from regressions of the form

$$\frac{I_{it}}{K_{i,t-1}} = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=2}^{n} \beta_s \text{Control}_s + \epsilon_{it}.$$

All specifications include controls for bonus depreciation, marginal Q, and cash flows. Specifications (1) and (2) split the sample based on whether the firm is taxable in fewer than 2 or more than 2 years during the period 2002-2004. Specifications (3) and 42) split the sample based on whether the firm is taxable in all years or no years during the period 2002-2004. Specifications (5) and (6) limit the analysis to firms with above/below median average MTRs during years 2001-2004. The equality test measures whether the $DPAD$ coefficient is equal in specifications (1) and (2), (3) and (4), and (5) and (6); P-values are presented. All specifications include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

3.8 Conclusions and Future Directions

The conclusions of this research, while exciting in their own right, are most enlightening when compared to the behavioral impacts of other recently enacted corporate tax incentives. In particular, the effects of the DPAD may be readily compared to responses to the Bush Tax Cuts (as studied by Chetty and Saez (2005) and Yagan (2013)) and to responses to Bonus Depreciation (as studied by Edgerton (2010), Zwick and Mahon (2014), and Ohrn (2014)). In doing so, one can draw more general conclusions about the impact of reductions in corporate income tax rates (DPAD) to reduction in capital gains and dividend tax rates (Bush Tax Cuts) to investment incentives (Bonus Depreciation).

3.8.1 Comparing the DPAD and the Bush Tax Cuts

The Jobs and Growth Tax Relief Act of 2003 reduced the top tax rate on dividend income in the US from 38.6% to 15% and the top rate on capital gains from 20% to 15%. These "Bush Tax Cuts" were predicted by President George W. Bush, himself, to provide "near-term support to investment" and "capital to build factories, to buy equipment, [and] hire more people." In short, these tax cuts were sold to the American people on the auspices that they would increase business investment, a key driver of macro-level economic activity. The tax cuts, however, induced no increase in investment and, in fact, led to an increase in total payouts to shareholders - a behavior that could be considered essentially the opposite of corporate investment (Yagan (2013)).

Where the Bush Tax Cuts failed to produce the desired investment response, this research suggests the DPAD was remarkably successful. For the average listed firm, the DPAD increased investment as a percentage of installed property plant and equipment by 12.113%. If this result is generalized to the corporate income tax rate, a 1% reduction in the corporate income tax rate results in a more than a 3% increase in

investment as a percentage of installed capital stock. The lesson to be taken from this comparison is simple: if the government wishes to stimulate corporate investment and is choosing between a reduction in taxation on payouts to shareholders or a reduction in taxation on corporate profits, the income taxation lever is the superior tool.

From a theoretical point of view, this superiority result may be unsurprising depending on one's opinion regrading the marginal source of corporate finance. In models where marginal investments are funded from retained earnings and riskless debt as opposed to equity issuance and risky debt (King (1977), Auerbach (1979), Bradford (1981)), decreases in the corporate income tax rate should increase investment behavior while decreases in dividend and capital gains taxation should have no effect of investment – a result know as the dividend taxation neutrality. Alternatively, models in which firms finance investment though equity issuance and risky debt would predict that both levers should positively impact business investment.

3.8.2 Comparing the DPAD and Bonus Depreciation

Bonus Depreciation, as discussed in Section 3.4, is a business investment stimulus policy that has been used off and on and in varying intensities since 2001. The policy theoretically works to stimulate investment by accelerating the rate at which investments may be depreciated and deducted from taxable income. This acceleration decreases the present value price of new investment purchases.[19] The effect of the policy on Compustat firms who are responsible for the majority of US business investment has been lukewarm at best. House and Shapiro (2008), Edgerton (2010), and Ohrn (2014) all report that the policy is not as effective as theory would predict. Ohrn (2014) reports that 100% bonus depreciation policy induces the average firm to increase investment as a percentage of property, plant, and equipment by a mere 4.2%

[19]In order for Bonus Depreciation to be an effective investment stimulus, firms must positive rates of return on investment or be financially constrained. Under these conditions, receiving tax depreciation allowances today as opposed to in the future decreases the price of investment.

relative to statutory IRS depreciation rates. This estimated mean level investment response cannot be statistically differentiated from a zero response. Again, in contrast to this investment stimulus policy option, this study finds the DPAD effectively increases investment.

Several explanations may be offered for why the DPAD has succeeded where bonus depreciation has been generally ineffective. In fact, Neubig (2006) offers seven reasons that firms would prefer a corporate income tax rate cut to an acceleration of tax deprecation allowances. The two most applicable to understanding the investment stimulus effects of the two policies are: (1) Bonus depreciation offers only a timing benefit that does not increase the financial statement earnings associated with any given investment project. A drop in the corporate tax rate, on the other hand, offers real tax savings and as a result a lower financial statement effective tax rate. (2) Bonus depreciation only benefits tangible assets. A drop in the income tax rate incentivizes investment in both tangible and intangible assets which may be complements in the production process. Given this reasoning, its no wonder that the DPAD, which effectively decreases the corporate income tax rate, is a more effective investment stimulus policy than bonus depreciation.[20]

3.8.3 Future Work: the DPAD, Corporate Profits, and Corporate Payouts

While this research has presented strong evidence that the DPAD effectively increased investment among domestic producers, there is much more work to be done regarding this policy. Does the DPAD induce multinational firms to relocate production activities to the United States? Do firms increase their taxable income in

[20]While Bonus Depreciation may be a poor investment stimulus tool, its cost at least from a government budget perspective is zero. Government budgets do not use discounting in constructing their outlays. Thus, allowing firms to deduct new investment from taxable income now as opposed to in two or three years costs the same from a budgeting perspective. This budgeting nuance may explain why the Bonus Depreciation was extended several times even after exhaustive research efforts both by academics and government agencies concluded the policy was ineffective.

response to the policy? Do firms increase dividends and share repurchases in response to the policy? Do firms hire more workers or increase wages as a result of the policy? The exogenous variation in QPAI % used in this study may be combined with data from the BEA Survey of Foreign Direct Investment, IRS Corporate Income Tax Returns, and the Longitudinal Employer–Household Dynamics to answer these important questions.

Until these question are answered, at the very least, the DPAD seems to be the investment stimulus tool that policymakers have been trying to find. In contrast to other ineffective federal tax policies, firms increase investment in response to the DPAD. The DPAD is especially effective for the ideal policy target, firms that are domestic manufacturers and are financially constrained.

3.9 Appendces

3.9.1 Data Definitions from IRS "Corporate Returns - Explanation of Terms"

Income Subject to Tax: This was generally the amount of income subject to tax at the corporate level. For most corporations, income subject to tax consisted of net income minus the "Statutory Special Deductions" described in this section. However, there were certain exceptions. S corporations were usually not taxable at the corporate level and so did not have income subject to tax. Some, however, had a limited tax liability on capital gains and so were included in the statistics for this item. Likewise, regulated investment companies and real estate investment trusts generally passed their net income on to be taxed at the shareholder level; but any taxable amounts not distributed were included in income subject to tax. Because insurance companies were permitted to use reserve accounting for tax purposes, insurance income subject to tax was based on changes in reserve accounts; life insurance companies could also have been allowed an additional special deduction (discussed in Statutory Special Deductions). Consolidated returns that contain life insurance subsidiaries were not allowed to offset all of the life insurance subsidiarys gains by losses from nonlife companies, so it was possible for such a consolidated return to show no net income but still have a positive amount of income subject to tax.

Statutory Special Deductions: Statutory special deductions in the tables was the sum of the deductions for net operating loss carryovers from prior years and the special deductions for dividends and other corporate attributes allowed by the Code. These deductions were in addition to ordinary and necessary business deductions and were shown in the statistics as deductions from net income. In general, net income less statutory special deductions equaled income subject to tax. The following components of Statutory Special Deductions are shown separately in Table 20.

Domestic Production Deduction: The Domestic Production Deduction (DPD) was added as part of the American Jobs Creation Act and is available for Tax Years beginning after December 31, 2004. By keeping manufacturing and software development activities in the United States, exporters may claim a deduction for a percent of their income from qualified exports. The provision, which can be found under code section 199, was largely written to satisfy WTO objections to Extraterritorial Income (ETI) and Foreign Sales Corporation provisions. The credit is figured on Form 8903.

3.9.2 Investment Control Variables

- **Marg Q**

  Marginal Q or Tobin's Q is the marginal value of an additional dollar of investment. Marg Q is empirically measured as the ratio of the market value of equity plus the book value of liabilities excluding deferred taxes, divided by the book value of assets,

$$Q_t = \frac{\text{prcc}_t \times \text{csho}_t + \text{at}_t - \text{ceq}_t + \text{txdb}_t}{\text{at}_t},$$

  Where prcc is the price of outstanding shares, csho is the number of outstanding shares, at is total assets, ceq is outstanding equity and txdbt is the differed tax liabilities.

- **Cash Flow**

  The measure of cash flow is constructed following Kaplan and Zingales (1997). "Cash Flow/PPE" is defined as

$$\text{Cash Flow}_t = \frac{\text{ib18}_t + \text{dp14}_t}{\text{ppent8}_{t-1}}.$$

  This ratio is the income before extraordinary items plus depreciation and amortization, scaled by the capital stock at the beginning of the year.

- **HP Index**

  Hadlock and Pierce (2010) propose a measure of financial constraint based on firm size and age.

$$\text{HP Index} = -0.737 * \text{size} + 0.043 * \text{size}^2 - 0.04 * \text{age}$$

  where size = min{assets in 2004 dollars, \$4.5 billion} and age = min$\{age, 37\}$.

3.9.3 Log Capx Investment Analysis

Table 3.8: Log CapX Investment Analysis

Dependent Variable:	Log Investment				
Specification	(1)	(2)	(3)	(4)	(5)
DPAD	0.146*	0.303***	0.232**	0.388***	0.012
	(0.081)	(0.063)	(0.100)	(0.078)	(0.092)
Z Tax Term		-0.079***		-0.109**	-0.037
		(0.030)		(0.044)	(0.054)
HP Index		-1.279***		-1.274***	-1.254***
		(0.019)		(0.022)	(0.024)
Marg Q		0.007***		0.007***	0.008***
		(0.001)		(0.001)	(0.001)
Cash Flow		-0.000		-0.000	-0.001***
		(0.000)		(0.000)	(0.000)
Dec. Fiscal Year			✓	✓	
Prior to 2008					✓
Adj. R-Square	0.062	0.305	0.071	0.307	0.286
Firms	12,302	12,302	8,850	8,850	10,480
Firm x Years	77,536	77,536	54,150	54,150	46,998

Notes: Specifications (1) through (4) present coefficients from regressions of the form

$$\ln(I_{it}) = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=1}^{n} \beta_s \text{Control}_s + \epsilon_{it}.$$

In specifications (2), (4), and (5), controls for bonus depreciation, financial distress, marginal Q, and cash flows are included. In specifications (3) and (4), the analysis is limited to firms with December fiscal year ends. Specification (5) is limited to years prior to 2008. All specifications include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

3.9.4 Investment Analysis with Alternative Controls

Table 3.9: Investment Analysis with Alternative Controls

Dependent Variable:	Investment %		Log Capx	
Specification	(1)	(2)	(3)	(4)
DPAD	0.064	0.115*	0.090	0.193**
	(0.048)	(0.066)	(0.071)	(0.087)
Dec. Fiscal Year End		✓		✓
Adj. R-Square	0.018	0.021	0.096	0.101
Firms	10,480	7,463	13,211	9,644
Firm x Years	67,336	46,346	89,107	62,811

Notes: Specifications (1) through (4) present coefficients from regressions of the form

$$\text{Investment Var} = \beta_0 + \beta_1 DPAD_{jt} + \sum_{s=1}^{n} \beta_s \text{Control}_s + \epsilon_{it}.$$

All specifications include firm and year fixed effects, the Z Tax Term and ten piece linear splines in assets, sales, profit margin, and firm age. Specification (1) includes Sector x Year Fixed Effects. In specifications (1) and (2), the dependent investment variable is Capital Expenditure scaled by lagged Property, Plant, and Equipment. In specifications (3) and (4) the dependent investment variable is the log of Capital Expenditure. Specifications (2) and (4) limit the analysis to firms with December fiscal year ends. Standard errors are clustered at the firm level and are robust to heteroskedasticity. *** indicates statistical significance at the 1% level, ** at 5%, and * at 10%.

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