

Do Investors Value Tax Investment Incentives? Evidence from Bonus Depreciation and the Fiscal Cliff

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Abstract

As 2012 drew to a close, the U.S. economy was speeding towards the “fiscal cliff,” a series of previously enacted laws that would come into effect on January 1 2013, simultaneously increasing taxes while decreasing spending. At the last possible moment, the U.S. Congress averted the crisis by passing the American Taxpayer Relief Act of 2012. In a surprise move, the act extended bonus depreciation, an investment tax incentive that decreases the present value cost of new capital investments. Using a differential effects event study methodology that relies on this surprise extension and industry variation in the generosity of policy, I estimate how much investors value bonus depreciation and tax investment incentives, more generally. Empirical results suggest stock prices increase by 0.5% for firms that benefit most from the extension of the policy. The results are not concentrated among the types of firms that have been shown to be the most responsive to bonus, suggesting investors value the cash flow effects of the policy but not the investment it stimulates.

Keywords :corporate taxation, event study, bonus depreciation

JEL Classification : H25; H32; E22

1 Introduction

As 2012 drew to a close, the U.S. economy was speeding towards the “fiscal cliff,” a series of previously enacted laws that would come into effect on January 1, simultaneously increasing taxes while decreasing spending. The crisis was amplified by political gridlock on Capital Hill and the fragile state of the recovering U.S. economy, which the Congressional Budget Office predicted would fall back into recession were the cliff not averted.

On January 1, 2013, at the proverbial 11th hour, President Obama, the Democratically controlled Senate, and a contingent of House Republicans agreed to pass the the American Taxpayer Relief Act of 2012 (ATRA) to stop the United States from plunging off the cliff. In addition to postponing the spending cuts, ATRA contained several tax provisions which had been part of negotiations over the last month. The bill also contained a big surprise: the extension of bonus depreciation at a rate of 50% for tax year 2013.

Bonus depreciation is an investment tax incentives that allows firms to immediately deduct a “bonus” percentage of the purchase price of new capital assets from their taxable income. The bonus deduction decreases the present value cost of new capital assets and thereby stimulates business investment. The U.S. federal government has relied on bonus depreciation to combat the 2001 and 2008 recessions, but as of the passage of ATRA in 2013 and still today, whether bonus depreciation is valued by the stock market and is of value to the economy as a whole, is an unanswered question.

This project uses the surprise extension of bonus depreciation, industry-level variation in the policy’s generosity, and a differential effects event study methodology to estimate the value of bonus depreciation to investors. I find that stock prices of the firms that benefited the most from bonus extension increase approximately 0.5% more than the prices of firms that benefited the least. In addition, I document that the increase *was not* concentrated amongst the firms that have been shown to be most responsive to the policy (financially constrained firms or firms with excess tax loss carry-forwards) but was concentrated amongst firms most in need of additional cash flows (firms with high debt ratios and low cash flows as a percentage of total asset). I interpret this finding to mean investors value the near-term cash flow effects of bonus depreciation but not the additional investment it stimulates.

These finding constitute an important contribution to the ongoing debate surrounding the policy. The criticisms of bonus are manifold. Critics of the policy argue that bonus only provides a timing benefit and not a nominal increase in cash flows. This criticism is amplified by the fact that accounting principles do not account for the time value of money and as a result, bonus does not affect financial statement earnings (Mills (2006)). In addition, bonus also only incentivizes equipment investment but total investment spending is increasingly being driven by investment in intangibles such as intellectual property, research and development, (Kahle and Stulz (2016)). Finally, only profitable firms benefit from bonus meaning the counter-cyclical policy may be least

effective among the most in-need firms (Neubig (2006)). While these critiques are well reasoned and accurate, recent empirical studies have found that business investment is responsive to bonus, suggesting that it is an effective investment stimulant (Zwick and Mahon (2017), Ohrn (2017b)). That investors value bonus depreciation but not necessarily the investment it incentivizes minimizes both the criticisms of the policy and the praise for its investment effects. The results of this study push the debate to consider the near-term cash flow effects as a primary channel through which accelerated depreciation can stimulate the economy.

To put it mildly, this debate is important. According to the Government Accountability Office, accelerated depreciation policies are the second largest U.S. corporate tax expenditure; in 2011, these policies decreased federal tax revenue by \$76.1 billion. Because of the size of the expenditure, the inclusion or exclusion of accelerated depreciation is often a key element of proposed reforms. Revenue-neutral reforms often offer up bonus to achieve lower statutory rates. More recent U.S. proposals have called for 100% bonus or immediate expensing on all capital assets. Carefully crafting tax reform to achieve policy objectives therefore requires a deep and nuanced understanding of bonus depreciation and its perceived value by investors.

To establish this study's key result – that stock prices of firms that benefit most from bonus increased relative to the prices of other firms after ATRA passage – I rely on industry-level variation in capital investment durability. Firms that typically invest in long-lived assets (as defined by tax depreciation rules) benefit substantially from bonus, whereas firms that invest in short-lived assets benefit little. I calculate abnormal stock returns for publicly traded corporations after the passage of ATRA then test for differential effects between long and short-lived asset firms.

There are three key threats to the study's empirical design. The first is that industry-level trends – and not the passage of ATRA – are driving the results. I address this threat by calculating abnormal returns both before and after ATRA passage. Abnormal returns of long and short-lived firms move in tandem before the fiscal cliff then diverge sharply immediately after the crisis is averted. The second threat is that industry-level shocks that coincide with the passage of ATRA are responsible for the estimated effect. Because these shocks need to coincide with ATRA passage, the prime candidates are any industry-level shocks that were generated by the bill, itself. ATRA included two other significant provisions related to corporate activities: the bill extended the R&D tax credit and the Section 179 deduction. I account for these shocks by controlling for effects of the R&D tax credit and limiting the analysis to firms that did not benefit from the Section 179 deduction. After accounting for these additional provisions, I continue to find evidence that investors value bonus depreciation. Third, the industry-level investment duration variables may mismeasure the effect of bonus. To address the potential measurement, I estimate, at the industry level, how taxable income responds to a dollar of capital expenditure in both bonus and non-bonus years. Using the estimates, I create an empirical measure of policy generosity. When I reestimate my headline specifications using the empirical measure, my results remain largely consistent.

While this study was designed primarily to help inform the bonus depreciation debate, it makes a significant contribution to several more broadly-defined literatures. This study and its results add to our understanding of the incidence of the corporate tax because they suggest that the corporate tax base, in addition to the statutory rate affect the value of corporations.¹ The results also add to our understanding of the empirical effects of accelerated depreciation.² Although this study is the first to examine stock price reactions to the fiscal cliff and ATRA passage, a number of papers explore how investor valuations respond to corporate tax reforms.³ Finally, the study’s findings reject the view that investors focus exclusively on short-term accounting earnings.⁴

2 Background: Bonus Depreciation and the Fiscal Cliff

2.1 Bonus Depreciation

Typically, businesses may deduct newly acquired assets from their taxable income according to the Modified Accelerated Cost Recovery System (MACRS) (detailed in IRS Publication 946). MACRS specifies the life and depreciation method for each type of potential investment / asset class. For equipment, lives can be 5, 7, 10, 15, or 20 years and the method is called the “declining balance switching to straight line deduction method.”

Table 1 illustrates the impact of 50% bonus depreciation on the cost of a \$100 investment that has a 7-year life. MACRS specifies that \$25 of the total investment may be deducted in the first year, then \$21.43 in the second, etc. With a federal tax rate of 35%, this leads to tax savings of \$8.75 in the first year, then \$7.50 in the second. Over the course of the 7 year life, all \$100 of the investment cost are deducted from taxable income, generating \$35 in total *nominal* tax shields. However, because the entire cost is not deducted from taxable income in the first year, the present value of tax savings associated with the investment are only worth \$28.79.⁵

¹The corporate tax incidence literature is highlighted by Harberger (1962), Kotlikoff and Summers (1987), Hassett, Mathur et al. (2006), Felix (2007), and Desai and Foley (2007).

²Hall and Jorgenson (1967) and Summers (1981) provide the theoretical foundation for this literature. The empirical literature is highlighted by Cummins, Hassett and Hubbard (1994), Chirinko, Fazzari and Meyer (1999), and Goolsbee (1998), House and Shapiro (2008), Edgerton (2012), Zwick and Mahon (2017), and Ohn (2017b)).

³Downs and Tehranian (1988) predicts and estimates stock prices responses to the Economic Recovery Tax Act of 1981. Cutler (1988), Poterba (1989), Lyon (1989), Bolster and Janjigian (1991), Givoly and Hayn (1991), and Edgerton (2011) examine stock prices responses to the Tax Reform Act of 1986. Lang and Shackelford (2000) and Sinai and Gyourko (2004) study the effects of Taxpayer Relief Act of 1997. Desai and Hines (2008) explore stock price reactions to a WTO ruling that outlawed Foreign Sales Corporation Rules, a subsidy to U.S. exporters. Bradley et al. (2013) documents responses to the Dividends Received Deduction that was included in the American Jobs Creation Act of 2004. Bradley, Dauchy and Hasegawa (2016) studies the stock price response to Japan’s move from a worldwide to a territorial regime.

⁴Graham, Harvey and Rajgopal (2005) reports corporate managers view earnings as the key metric for outsiders. Roychowdhury (2006) and Erickson, Hanlon and Maydew (2004) document situations in which managers give up real flow flows to increase accounting earnings.

⁵The \$28.79 is a function of the assumed discount rate of 10%. At higher discount rates, the present value of the tax shield will be lower. 10% is used in the example because it is often the rate used in corporate net present value

TABLE 1: EXAMPLE OF FEDERAL TAX IMPACT OF 50% BONUS

YEAR	1	2	3	4	5	6	7	8	TOTAL
MACRS DEDUCTION	25	21.43	15.31	10.93	8.75	8.74	8.75	1.09	100
τ_f X DEDUCTION	8.75	7.50	5.36	3.83	3.06	3.06	3.06	0.38	35
PV(τ_f X DEDUCTION)									28.79
50% BONUS DED.	62.5	10.72	7.65	5.47	4.37	4.37	4.37	0.545	100
τ_f X DEDUCTION	21.88	3.75	2.68	1.91	1.53	1.53	1.53	0.19	35
PV(τ_f X DEDUCTION)									31.89

Notes: This table calculates the present value of federal tax deductions for a \$100 investment under both a traditional 7-year accelerated depreciation regime and under a 50% bonus regime. The federal corporate tax rate is assumed to be 35%. The discount rate is assumed to be 10%.

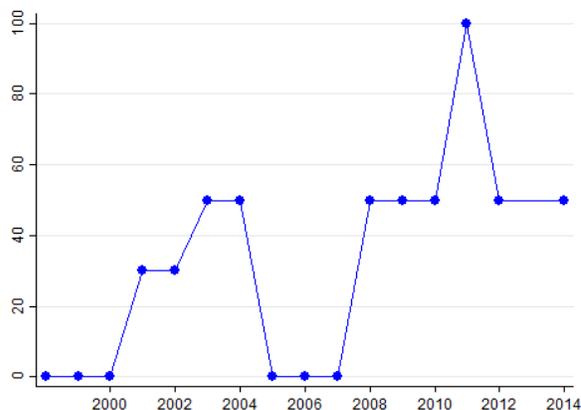
Bonus depreciation allows for an additional percentage of the total cost to be deducted in the first year. In the example, 50% percent bonus depreciation allows 50 additional dollars to be deducted in the first year the investment is made. The remaining \$50 of the cost is then deducted according to the original 7 year MACRS schedule. With 50% bonus there are now tax savings associated with the investment of \$21.88 in the first year, \$3.75 in the second year, etc. Thus, bonus depreciation accelerates the deduction of the investment and its associated tax savings. Because firms benefit from the tax savings earlier, the present value of the investment’s tax shield increases to \$31.89 and the present value cost of the investment decreases by 3.1% (=31.89-29.79).

FIGURE 1: FEDERAL BONUS DEPRECIATION

(A) BONUS RATES

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	01/01/2015	50%

(B) OVER TIME



Notes: Figure 1 presents the maximum federal bonus depreciation rate offered in each year, 1998 to 2014.

calculations.

Bonus depreciation was first enacted in 2001 at a rate of 30%. It was originally intended to be a temporary and counter-cyclical policy. As shown in Figure 1, in 2003, the additional first year deduction was increased to 50%. The bonus was not extended for years 2005, 2006, and 2007, but was reinstated in 2008 at the 50% rate. After 3 years at 50%, the bonus rate was increased to 100% in 2011 (often called expensing). Since 2011, bonus has held steady at 50% but was only enacted retroactively for 2014 in December of that year.

Bonus depreciation constitutes a substantial investment incentive. Zwick and Mahon (2017) reports that 50% bonus depreciation decreases the present value after-tax cost of new investments by 2.8 percentage points. For the publicly traded firms examined herein, the incentive is slightly less generous. I estimate that 50% bonus depreciation decreases the cost of new investments by 2.23 percentage points for the average firm in the analysis sample.

2.2 The Fiscal Cliff and the American Taxpayer Relief Act of 2012

The U.S. “fiscal cliff” was created by a series of expiring tax cuts and previously legislated spending reductions set to go into effect on January 1, 2013. The Congressional Budget Office (CBO) estimated that – if left unaddressed – the fiscal cliff would increase government revenue by 19.63% while decreasing spending by 0.25% (compared to 2012 levels) and would have plunged the U.S. economy into recession. The macroeconomic concerns raised by the CBO analysis were especially prescient given the economy’s sluggish recovery after the 2007–2009 recession; in December of 2012, as the U.S. prepared to go over the fiscal cliff, the unemployment rate was still hovering around 8%.

The tax side of the fiscal cliff was created by “sunset” provisions included in the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) and the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA) which are together often referred to the “Bush Tax Cuts.” EGTRRA reduced the rates of individual income taxes, increased contribution limits for defined contribution plans and IRAs, increased defined benefit compensation limits, generally made estate and gift taxes less punitive. JGTRRA increased the exemption amount for the individual Alternative Minimum Tax and lowered taxes of income from dividends and capital gains. All provisions in both bills were set to sunset or expire on January 1, 2011. However, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended the tax cuts until January 1, 2013 when they were again, legislated to sunset.

The Budget Control Act of 2010 (BCA), a truly unique piece of legislation, created the spending side of the fiscal cliff. In 2010, the U.S. national debt level was fast approaching the “debt ceiling” or the maximum level of debt the U.S. government was allowed to hold. In convincing the Republican Congress to increase the ceiling (a necessity to avoid sovereign default), Democrats agreed to pass legislation – the BCA – that created an incentive to pass future legislation that would curb government spending. The BCA had two main components. First, the bill created a Joint Select

Committee (often referred to as the “Super Committee”) composed of half Democrats and half Republicans to produce deficit reduction legislation by November 23, 2011, that would be immune from amendments or filibuster. The second component of the BCA promised that if Congress failed to pass a deficit reduction bill by January 1, 2013 that contained at least \$1.2 trillion in spending cuts over the next ten years (including those proposed by the Super Committee), then “sequestration,” or across-the-board cuts in both mandatory and discretionary spending in the amount of \$1.2 trillion (less any cuts agreed upon by the Super Committee). The sequestration was designed to be unpleasant for both parties and to create a reason to work together toward a mutually acceptable slate of deficit reduction policies.

The Super Committee was not successful. On November 21, the committee concluded its work, issuing a statement that began: “After months of hard work and intense deliberations, we have come to the conclusion today that it will not be possible to make any bipartisan agreement available to the public before the committee’s deadline.” The failure of the Super Committee passed the full responsibility to find \$1.2 trillion in cuts to Congress.

Heading into December of 2012, no headway in averting the cliff had been made. A plan passed by the Democratic-controlled Senate to extend the Bush Tax Cuts to all but the highest earners (that did not include bonus depreciation) was rejected by the Republican-controlled Congress. On December 3, 2012, John Boehner, acting on behalf of the congressional Republicans, sent a letter to President Obama detailing their fiscal cliff plan. The proposal was based largely on the Bowles-Simpson Tax Plan (work that was generated by The National Commission on Fiscal Responsibility and Reform). A centerpiece of the Republican plan was a reduction in the corporate tax rate paid for by elimination of all tax exemptions including bonus depreciation.

The Republican plan was rejected by Obama and Democratic senators who began crafting their own last-minute solution behind closed doors. The solution would have to be universal enough to entice a significant number of Republican members of Congress to step across the aisle and vote on the bill. Finally, after the United States technically went over the cliff, on January 1, 2013, at around 2am, the Senate passed a compromise bill, the American Taxpayer Relief Act of 2012, by a margin of 898. That afternoon, The House passed the bill with two thirds of the supporting votes coming from Democrats and one third from Republicans. Late on January 2nd, President Obama signed the bill into law.

The main provisions of ATRA delayed sequestration for two months, increased marginal income and capital gains tax rates relative to their 2012 levels for high income earners, phased out tax deductions and credits for high income earners, set estate taxes at 40% for large estates, altered the AMT, allowed payroll tax cuts to expire, and finally extended a number of corporate tax breaks including Section 179 expensing, the R&D tax credit, and the bonus depreciation at the 50% rate.

2.3 The Extension of Bonus Depreciation via ATRA

This study’s identification strategy (which is further discussed in Section 5) is based on the assertion that the ATRA extension of bonus depreciation which was set to expire on January 1, 2013, was a surprise to investors. To support this assertion, I present four pieces of supporting evidence.

1. Reports that were available to lawmakers as of December 2012 suggested corporate investment was unresponsive to bonus depreciation. An August 2012 Congressional Research Services report (Guenther (2012)) summarized the state of the academic literature at the time, stating “Three studies, two from 2006 and the other from 2007, provide additional support for the view that temporary accelerated depreciation is largely ineffective as a policy tool for economic stimulus.”
2. Negotiations surrounding the fiscal cliff centered on four pieces of legislation: H.R. 8, the Job Protection and Recession Prevention Act of 2012, H.R. 6684, the Spending Reduction Act of 2012, S 3412, the Middle Class Tax Cut Act and H.R. 15, the Middle Class Tax Cut Act (which mirrors the Senate-passed bill with substantial similarities). No draft of any of these bills ever contained a provision that extended bonus depreciation.
3. No major news organization (New York Times, Wall Street Journal, Fox News) mentioned bonus depreciation in coverage of the fiscal cliff prior to ATRA passage.
4. Many trade journals, and industry blogs noted that the inclusion of bonus depreciation in the fiscal cliff resolution came as a surprise. TEQLease Capital blogged “Congress also surprised many by extending the Bonus Depreciation allowance on qualified new equipment through 2013 for businesses” (Capital (2013)). On January 1, 2013, Guggenheim Capital put out a research report stating “Another surprise, the bill has a one year extension of 50% bonus depreciation” (Krueger (2013)). Finance and Commerce reported “The equipment purchases measure [meaning bonus] was a surprise” (Newmarker and Anderson (2013)). Forconstructionpros.com wrote “Another surprise is the extension of the 50% Bonus Depreciation (new equipment only) for 2013” (Barteki (2013)).

Overall, the evidence indicates that indeed, the extension of bonus depreciation via ATRA was a surprise to investors. Before moving on to consider how the surprise extension affected investor valuation of corporate assets, I pause to make two points. First, January 2nd was a Monday meaning any leaked knowledge of last minute fiscal cliff negotiations that occurred over the December 31 / January 1 weekend would be capitalized into asset prices on Monday January 2nd. As a result, throughout the rest of the paper, I consider January 2nd the event day (or day 0).

The second point is that in addition to bonus depreciation, ATRA extended Section 179 expensing and the R&D tax credit. To isolate the effect of bonus extension on investor valuation, the empirical methodology must account for the additional business provisions. I describe how I alter the methodology to account for these provisions in Section 5.

3 The Value of Extending Bonus Depreciation

To understand the channels by which the 2012 bonus extension affects shareholder valuation of publicly traded firms, I add bonus depreciation to a two-period representative firm model in the spirit of Poterba and Summers (1985). The firm ends period 1 with earnings, R_0 , and must decide how much to invest in to maximize shareholder value, V , which is equal to the present value of after-tax dividends paid at the end of periods 1 and 2 – in this case, the present value of after-tax dividends. The maximization problem can be written as

$$E[V] = \max_I (1 - \tau_d) \left[D_1(I^*) + \frac{D_2(I^*)}{1 + r} \right]$$

where D_1 and D_2 are dividend payments in periods 1 and 2, which depend on the level of investment, I . r is the risk-adjusted rate of return demanded by investors. τ_d is the dividend tax rate. The firm finances the investment using period 1 retained earnings, R_1 .⁶ All earnings that are not invested are paid out as a dividend in period 1; $D_1 = R_0 - I$. Investment generates pretax profits in period 2 according to the concave production function $\Pi(I)$. Profits are taxed at τ_c , the corporate income tax rate. The real value of I depreciates at rate δ . Portion z of the investment may be depreciated for tax purposes, meaning depreciation allowances are worth $\tau_c z I$ to shareholders. At optimal investment level, I^* , the value of the firm is equal to

$$V = (1 - \tau_d) \left[R_0 - I^* + \frac{(1 - \tau_c)[\Pi(I^*)] + (1 - \delta)I^* + \tau_c z I^*}{1 + r} \right].$$

Under MACRS rules, z_0 of the investment may be depreciated during period 2. Bonus depreciation allows an additional percentage, b , to also be depreciated in period 2. Thus, z is a function of bonus level, b ;

$$z = b + (1 - b)z_0.$$

To see how bonus depreciation affects shareholder valuation, I take the derivative of V with respect to b :

$$\frac{\partial V}{\partial b} = \underbrace{\frac{1 - \tau_d}{1 + r} \tau_c I_0^* \frac{\partial z}{\partial b}}_{\text{Statutory Effect}} + \underbrace{(1 - \tau_d) \left[-1 + \frac{(1 - \tau_c)\Pi'(I^*) - \delta + \tau_c z}{1 + r} \right]}_{\text{Dynamic Effect}} \frac{\partial I}{\partial z} \frac{\partial z}{\partial b}. \quad (1)$$

The derivative is composed of two channels by which bonus depreciation affects firm valuation: the Cash Flow Channel and the Investment Effect Channel. The Cash Flow Channel represents the

⁶The method of financing does materially affect the model's conclusions or the empirically testable hypotheses presented below.

increase in firm value due to increased near-term cash flows generated by bonus given investment is fixed at level I^* . An increase in b increases z and, in turn, decreases the present value of tax payments. This decreases the cost of fixed investment level I^* and, as a result, increases shareholder value by $\frac{1-\tau_d}{1+r} \tau_c I_0^* \frac{\partial z}{\partial b}$. The Investment Effect Channel represents the increase in valuation that is due to marginal investments that occur because bonus decreases the present value cost of new investments.

Assuming that, as documented above, the ATRA extension of bonus depreciation was a surprise from the perspective of both investors and managers, two empirically testable hypotheses can be derived from Equation (1). First, the increase in shareholder valuation, $\frac{\partial V}{\partial b}$, is an increasing function of the effect of bonus on depreciation allowances, $\frac{\partial z}{\partial b}$. Because $\frac{\partial z}{\partial b} = 1 - z_0$, the effect of bonus on depreciation allowances is a decreasing function in z_0 or more simply: the effect of bonus is the highest for firms that have lower values of z_0 – those firm that invest more heavily in long-lived assets (as defined by MACRS). Hypothesis 1 follows directly.

Hypothesis 1. *If investors value bonus depreciation, after the passage of ATRA, shareholder value will increase more for those firms that invest in long-lived assets and therefore benefit the most from bonus depreciation extension.*

The second hypothesis explores whether investors place value on the Investment Effect Channel in addition to the Cash Flow Channel. The Cash Flow Channel mechanically increases the after-tax profits of the firm and therefore must increase investor valuation (especially if firms are in need of cash). The Investment Effect Channel of bonus depreciation, on the other hand, depends crucially on the responsiveness of investment to depreciation allowances, $\frac{\partial I}{\partial z}$. If investors care about the investment response, then increases in valuation will be concentrated amongst the most investment-responsive firms.

Hypothesis 2. *If investors value the additional investment stimulated by bonus then, after the passage of ATRA, increases in shareholder value due to bonus depreciation will be concentrated amongst firms whose investment will be the most responsive to the policy.*

To test Hypothesis 1, I estimate whether (abnormal) increases in stock prices following ATRA passage are concentrated among firms that invest in long-lived assets. To test Hypothesis 2, I rely on findings presented in Zwick and Mahon (2017) which show substantial heterogeneity in investment responsiveness to bonus depreciation. Financially constrained firms are substantially more responsive to the policy. Firms with large amounts of tax loss carry-forwards (TLCFs), that will not benefit from the policy immediately, are completely unresponsive. Therefore, by examining whether the Hypothesis 1 estimates are concentrated among financially constrained firms with and firms with limited TLCFs, I can test whether investors place value on increases in investment that are incentivized by accelerated depreciation policies.

4 Data

To test Hypotheses 1 and 2, I construct a measure of $\partial z/\partial b$ using investment-type-by-industry data, a measure of abnormal changes in shareholder valuation based on firm-level stock price data, and control and heterogeneity variables using financial statement data from Compustat. Descriptive statistics for all variables are presented in Table 2.

4.1 Bonus Variables

I follow Cummins et al. (1994), Desai and Goolsbee (2004), House and Shapiro (2008), Edgerton (2010), and Zwick and Mahon (2017) in constructing an industry-level measure to capture the effects of ATRA bonus depreciation extension. Under a tax regime without bonus depreciation, firms deduct a portion of the purchase price of new assets from their tax bill each year according to the Modified Accelerated Cost Recovery System (MACRS). The discounted value of MACRS depreciation deductions on a dollar of new capital expenditures equals

$$z_0 = a_0 + \sum_{t=1}^T \frac{a_t}{(1+r)^t}$$

where a_t is the allowable deduction per dollar of investment in year t , T is the life of the investment, and r is risk-adjusted rate the firm uses to discount future cash flows. MACRS determines the life of the investment and annual allowable deductions based on the type of investment. Investments such as computers are depreciated faster for tax purposes than mining and oilfield machinery. Prescribed depreciation schedules for all investment types are detailed in IRS Publication 946.

I calculate z_0 for each investment type detailed in IRS publication 946 using a 7 percent discount rate. Then, I compute z_0 at the 4-digit NAICS level as a simple average using BEA data on industry-level shares in each investment type.

Under a 50% bonus depreciation regime, z , the present value of depreciation allowances per dollar of investment is equal to $0.5 + 0.5z_0$. Assuming the extension was a complete surprise, the increase in z due to the extension was $0.5 + 0.5z_0 - z_0 = 0.5 - 0.5z_0$. Multiplying this increase by the corporate income tax rate, $\tau_c = 35\%$, yields, **BONUS**, the industry-level decrease in the present value after-tax cost of new capital expenditure due to the ATRA extension of bonus depreciation:

$$\mathbf{BONUS} = (0.5 - 0.5z_0) \times 0.35.$$

BONUS varies at the industry level depending on the present value of MACRS depreciation allowances for the industry's average capital investment.

In the majority of the analysis, I assume that investors do not perfectly observe z_0 in the past nor can they perfectly predict z_0 in the future. Therefore, I construct I heuristic measure of **BONUS**,

High Bonus, which is equal to one if the firm is in the top half of the BONUS distribution and 0 otherwise. **Low Bonus** (which I only use descriptively in the text) is the antithesis of High Bonus. Low Bonus is equal to one when firms are in the bottom half of the BONUS distribution.

To address potential mismeasurement of BONUS (and High Bonus inherently), I use financial statement data to empirically estimate how bonus affects depreciation allowances at the industry level. This analysis yields **Empirical Bonus** and **High Empirical Bonus**. Detailed notes on their construction are presented in Section 7.3.

TABLE 2: DESCRIPTIVE STATISTICS

	MEAN	STD DEV	10TH PERCENTILE	90TH PERCENTILE	OBS
<i>Bonus Depreciation Variables</i>					
BONUS	2.234	0.918	1.675	2.527	4,293
HIGH BONUS	0.564	0.496	0	1	4,293
EMPIRICAL BONUS	0.138	0.257	-0.0757	0.360	4,289
HIGH EMPIRICAL BONUS	0.421	0.494	0	1	4,293
<i>Outcome Variable</i>					
BUY-AND-HOLD ABNORMAL RETURN (BHAR)	0.0553	6.033	-5.326	5.426	4,293
<i>Control Variables</i>					
LOW INVESTMENT	0.223	0.416	0	1	4,293
AVG R&D	0.175	0.853	0	0.186	4,293
AVG ROA	-0.0189	0.351	-0.157	0.155	4,293
AVG LOG ASSETS	6.469	2.525	3.036	9.727	4,293
AVG CASH FLOW	-1.620	13.08	-2.043	2.348	4,293
AVG FINANCIAL CONSTRAINT	-5.230	1.624	-7.149	-2.923	4,293
AVG DEBT RATIO	0.608	0.414	0.212	0.920	4,293
FIRM AGE	19.14	12.76	6	43	4,293
TLCFS PER ASSETS	0.724	2.680	0	1.257	4,293
<i>Heterogeneity Variables</i>					
LR CASH ETR	0.119	0.362	-0.0552	0.394	4,292

Note: Table 2 presents descriptive statistics for the variables used in the empirical analysis. The data consist of firm-level observations that had at least three years of data prior to ATRA2012 and had non-missing values for BONUS, Buy-and-Hold Abnormal Returns, and all control and heterogeneity variables.

4.2 Abnormal Returns

I construct **Buy-and-Hold Abnormal Returns** of **BHARs** to measure abnormal changes in shareholder valuation following ATRA passage. The constructing of BHARs follows a three step procedure. First, I estimate how percentage changes in stock prices of each firm in the sample respond to the three Fama and French (1993) “factors” during the event period, defined as starting 5 market days prior to ATRA passage and extending 15 days after passage.⁷ Then, using the three factor coefficients, I predict how stock prices should have changed in each day during the event window and use these predictions to generate abnormal returns for each firm on each day. Finally, I multiplicatively accumulate the abnormal returns starting at ATRA passage to produce BHARs.⁸ A firm’s BHAR at $t = t1$ is equal to the difference in its actual stock market performance and its predicted performance assuming a stock is bought at $t = 0$ (ATRA passage) and held until $t = t1$.

$$\text{BHAR}_{it} = \prod_{t=0}^{t=t1} (1 + R_{it}) - \prod_{t=0}^{t=t1} (1 + E[R_{it}])$$

where R_{it} is the return for firm i on day t and $E[R_{it}]$ is the predicted return. In the majority of the empirical analysis, I focus on the 5-day BHAR (calculated 5 days after ATRA passage) but the results are robust to using BHARs calculated at various time horizons.

4.3 Control and Heterogeneity Variables

Two other provisions in ATRA were directed at businesses. First, ATRA extended the Research and Experimentation (R&D) Tax Credit. Second, ATRA extended the 2012 Section 179 allowance levels. Section 179 allows firms to expense (fully depreciate) investments below a legislated threshold. The ATRA provision allowed firms to fully deduct all investments up to \$500,000. However, if a firm placed more than \$2 million of assets into service during the year, then for every dollar of investment after \$2 million, the Section 179 deduction was phased out dollar-for-dollar. The upshot is that for firms that invest less than \$500,000 per year, bonus has no effect and the effect of bonus is mitigated for firms that make less than \$2.5 million in investments.

To measure the effect of the R&D credit extension, I calculate **Avg R&D** as the average 2010–2012 value of R&D expense scaled by total assets. To account for the Section 179 extension, I calculate **Low Investment** (and symmetrically **High Investment**), an indicator equal to 1 if the average value of capital expenditures during years 2010–2012 was less than \$2.5 million, the dollar value at which Section 179 no longer affects the marginal cost of investment.

⁷Using the Fama French Three Factor Model as opposed to a different expected return model likely has little effect on the results. Fama (1998) suggests that because abnormal returns generated in short-run event studies (a few days) around a cleanly dated event are close to zero, the model for expected returns does not have a big effect on inferences about abnormal returns.

⁸Following the event study literature, I accumulate returns starting on the day of the event for the majority of the empirical analysis. However, in Section 6.1, I accumulate returns starting 15 (market) days prior to ATRA passage.

In most empirical specifications, I include additional firm-level controls to eliminate differences in BHARs due to firm characteristics unrelated to the passage of ATRA. Most of the controls are averaged during the years 2010–2012 to . These controls are denoted “Avg.” **Avg ROA** is the average return on assets. **Avg Cash Flow** is measured as average income before extraordinary items plus depreciation and amortization divided by lagged property, plant, and equipment. **Avg Firm Size** is the average of the log of total assets. **Avg Financial Constraint** is the average financial constraint measure from Hadlock and Pierce (2010) and is constructed as $-0.737 \times \text{size} + 0.043 \times \text{size}^2 - 0.04 * \text{age}$ where size is the minimum of total assets in 2004 dollars and \$4.5 billion and age is the minimum of the number of years a firm has been in the COMPUSTAT database and 37. **Avg Debt Ratio** is the average of total debt dividend by total assets. Firm Age is equal to the number of years a firm has been cataloged on the Compustat database. **TLCFs per Asset** is the 2012 value of tax loss carry-forwards scaled by 2012 total assets.

4.4 Additional Heterogeneity Variables

In addition to TLCFs per Asset, Avg Debt Ratio, Avg Financial Constraint, Avg Firm Size, and Firm Age, I construct **LR Cash ETR** and to explore heterogeneous responses of stock prices to bonus extension. LR Cash ETR is the sum of cash taxes paid during the years 2010–2012 divided by the sum of pretax income during the same years.

5 Empirical Strategy

If the surprise ATRA bonus extension is valued by investors, then BHARs after ATRA passage should be higher for firms that benefit the most from the policy. To test this hypothesis, I use OLS regression to test whether BHARs in High BONUS industries are larger than BHARs in Low BONUS industries. The simplest regression specification that accomplishes this goal is

$$\text{BHAR}_{i,t} = \beta_0 + \beta_1[\text{High BONUS}]_i + \mathbf{X}'_i\boldsymbol{\gamma} + \epsilon_i \quad (2)$$

where $\text{BHAR}_{i,t}$ is the Buy-and-Hold Abnormal return t days after ATRA passage, High BONUS is a firm-level indicator equal to 1 for the 50% of firms that benefit the most from bonus depreciation extension, and \mathbf{X}'_i is the set of firm-level control variables that are incorporated to eliminate differences in BHARs due to firm characteristics unrelated to High BONUS. In Specification (2), β_1 is the parameter of interest and is interpreted as the percentage point increase in stock prices for High BONUS versus Low BONUS firms. Hypothesis 1 suggests β_1 will have a positive sign.

There are two key threats to the identification of the β_1 parameter. The first is that even prior to ATRA passage, abnormal returns (and consequently BHARs) between High BONUS and Low BONUS industries are significantly different for reasons wholly unrelated to bonus depreciation. I

address this threat in Section 6.1 by calculating BHARs beginning 15 (market) days prior to ATRA passage. Using these “pretrend” BHARs, I show no divergence in stock prices between High and Low BONUS firms prior to ATRA passage.

The second threat is that industry-level shocks correlated with High BONUS that coincide with the passage of ATRA are responsible for any observed differences in BHARs. Because these shocks need to coincide with ATRA passage, the two prime candidates (as discussed above) are shocks due to the extension of the R&D tax credit and shocks due to the extension of the Section 179 deduction at the \$500,000 level. I account for R&D this shock by including in the regression Avg R&D.⁹ By including Avg R&D, only information orthogonal to Avg R&D is used to estimate β_1 .

The extension of Section 179 means that the effect of bonus is mitigated on firms that invest less than \$2.5 million because \$500,000 of their investments can be immediately expensed. I account for the extension of Section 179 in two ways. First, I estimate Specification (2) using only the sample of High Investment firms, those that usually invest more than \$2.5 million and therefore are unaffected by the Section 179 deduction. Alternatively, I estimate a second specification that includes an interaction between High BONUS and Low Investment:

$$\begin{aligned} \text{BHAR}_{i,t} = & \beta_0 + \beta_1[\text{High BONUS}]_i + \beta_2[\text{Low Investment}]_i \\ & + \beta_3[\text{High BONUS} \times \text{Low Investment}]_i + \mathbf{X}'_i\boldsymbol{\gamma} + \epsilon_i. \end{aligned} \quad (3)$$

In this alternative specification, β_1 now describes how BHARs differ for High vs. Low BONUS firms that do more than \$2.5 million in investment and $\beta_1 + \beta_3$ describes the same difference amongst Low Investment firms. If the High Investment / Low Investment variable perfectly categorizes firms based on whether they will be affected by Section 179 or not, then β_3 should be negative and equal in absolute magnitude to β_1 , meaning there is no difference between High and Low BONUS firm BHARs for Low Investment firms. However, because Low Investment is measured using retroactive data, it is most likely an imperfect measure. Nonetheless, β_3 should be negative meaning there is a smaller difference in BHARs between High and Low BONUS firms amongst Low Investment firms.

6 **Headline Results**

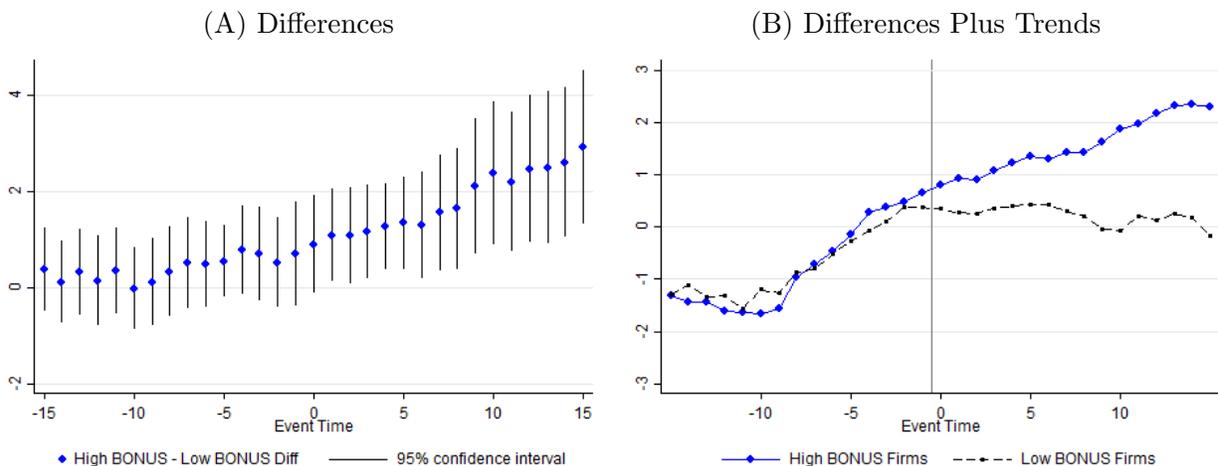
6.1 **Nonparametric Results**

Before presenting results from the regression models described above, I pause to present a simple non-parametric analysis of the extension of bonus depreciation via ATRA. To do so, I begin by

⁹Every year since 1981, firms have been given a tax credit for R&D. However, this credit has expired 9 times and has been extended (often retroactively) 15 times (Hoopes (2016)). Based on the tax credit’s history, I assume the average investor (and corporate manager) believed the tax credit would be available to firms during 2013 whether it was extended as part of ATRA or later in the year and, as a result, stock prices of firms that do the most R&D should not increase relative to low R&D firms after ATRA passage.

creating a new series of BHARs that begin 15 (market) days prior to ATRA passage. I then calculate average BHARs for High BONUS and Low BONUS firms during the 15 days prior to ATRA passage and 15 days after ATRA passage. I then compare the average BHARs across the two groups using t-tests. Panel (A) of Figure 2 presents these differences and 95% confidence intervals. The nonparametric results suggest that during no day prior to ATRA passage was there a statistically significant (5% level) difference in average BHARS between the two groups. However, beginning one day after ATRA passage, the average BHAR for High BONUS firms is larger and statistically different than the average BHAR for Low BONUS firms, indicating that stock prices for High BONUS firms increased relative to Low BONUS firms after ATRA passage. The difference increases steadily during days 1 through 15 indicating that investors' valuations took time to adjust which is unsurprising given the complexity of the policy and the general turmoil that characterized the U.S. economy immediately before and after The Fiscal Cliff.

FIGURE 2: RAW BHAR DIFFERENCES BETWEEN HIGH AND LOW BONUS FIRMS



Notes: Panel (A) plots coefficients from a regression of BHARs on High BONUS where the BHARs vary from day -15 to +15. Vertical lines represent 95% confidence intervals. In Panel (B) these raw differences are added to BHAR trends. To add the trends, for each day, one half of the coefficient from Panel (A) is subtracted from the average BHAR to create the Short-lived asset firm line. Then, for each day, one half of the coefficient from Panel (A) is added to the average BHAR to create the Long-lived asset firm line. Finally, the two lines are equalized in days prior to the event by subtracting the average difference during days -15 to -1 to eliminate level-difference prior to ATRA2012.

To better visualize the nonparametric estimates, I create difference-in-differences-like plots by adding the estimates to overall BHAR trends using the three-step following procedure. First, for each day, one half of the estimated difference is added to the average BHAR across both groups to create the High BONUS firms line. Then, for each day, one half of the estimated difference is subtracted from the average BHAR across both groups to create the Low BONUS firms line.

Finally, the two lines are equalized in days prior to the event by subtracting the average difference between the lines during days -15 to -1 to eliminate any level-difference between Low and High BONUS firms prior to ATRA passage.

The Panel (B) difference-in-differences plots show that Low and High BONUS abnormal BHARs track each other very closely prior to ATRA passage then diverge sharply as the surprise extension of bonus depreciation is announced. Overall, the nonparametric visual evidence presented in Figure 2 (1) suggests differential trends across Low and High BONUS firms in the pre-period are not responsible for the estimated effects of bonus extension and (2) provides a series of visual placebos that indicate no false positives in the days prior to ATRA passage.

6.2 Regression Results

Table 3 presents the baseline estimates of the effect of bonus depreciation extension on abnormal returns. Standard errors in Table 3, as well as throughout the paper, are clustered at the industry level.¹⁰ Overall, the results suggest that BHARs increase more for High BONUS than Low BONUS firms after ATRA passage suggesting that investors do, indeed, value bonus depreciation.

Specification (1) regresses 5-day BHARs on High BONUS without any additional controls for the full analysis sample. The High BONUS coefficient is equal to 0.426 and marginally statistically significant (10% level) suggesting abnormal returns for High BONUS firms increased by 0.426 percentage points relative to Low BONUS firms 5-days after ATRA passage.¹¹ Specification (2) adds Avg R&D to control for the extension of the R&D tax credit. Adding the R&D control increases the High BONUS coefficient to a statistically significant 0.474. In Specification (3) the full set of firm-level controls are added. With the full set of controls, the High BONUS coefficient suggests High BONUS stock prices increased by 0.444% more than Low BONUS stock prices 5 days after ATRA passage.

Specification (4) makes the first attempt to control for the extension of the Section 179 deduction by limiting the analysis to High Investment firms that are less likely to be affected by the Section 179 deduction. As expected, limiting the sample to High Investment firms increases the High BONUS estimate. Among High Investment firms, High BONUS 5-day BHARs are 0.469 percent higher (with 95% confidence) than Low BONUS 5-day BHARs.

Specification (5) controls for the extension of Section 179 by including Low Investment and

¹⁰Cameron and Miller (2015) suggests that clustering at the treatment level in cross-sectional OLS studies achieves accurate standard error estimates. Because BONUS, the treatment variable in this context, is defined at the industry level, I cluster standard errors at the industry level. However, because in the majority of the paper, I use the High BONUS indicator instead of BONUS, standard errors may be artificially small when High BONUS is used. I address this concern in Section 7.2 by using permutation methods to compute non-parametric p -values for the parameters of interest in my preferred specification. The results suggest that clustering at the industry-level produces accurate standard error estimates.

¹¹This estimate is different from the 5-day BHAR difference presented in Panel (A) of Figure 2 because, following the event study literature, the BHARs for the empirical analysis are constructed starting on the day of the event.

Low Investment interacted with High BONUS to the regression. When the interaction is included, the High BONUS coefficient is equal to 0.499. As expected, the sign on the interaction term is negative (but statistically insignificant) indicating that the effect of bonus extension is muted – but certainly not zero – among Low Investment firms. These results indicate (1) that stock prices increase more for High than Low BONUS firms after ATRA passage and (2) that while the Low Investment variable is not measured perfectly it does a reasonable job of capturing firms that do and do not benefit from Section 179 expensing.¹²

TABLE 3: EFFECT OF HIGH BONUS ON BHARS

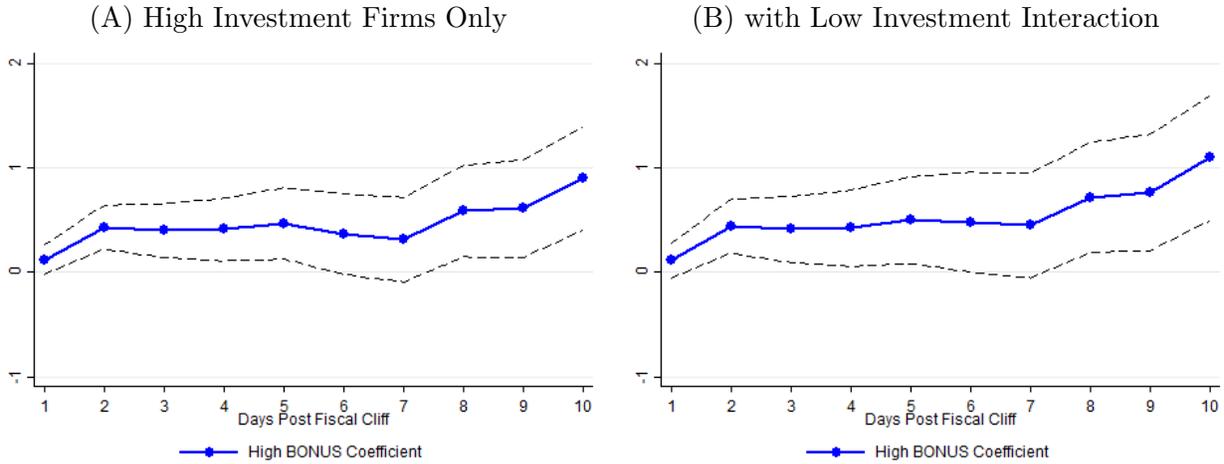
DEP VAR.	5-DAY BUY-AND-HOLD ABNORMAL RETURN					
	ALL FIRMS	ALL FIRMS	ALL FIRMS	HIGH INV.	ALL FIRMS	DEC FYR
SAMPLE SPECIFICATION	(1)	(2)	(3)	(4)	(5)	(6)
HIGH BONUS	0.426*	0.474**	0.444**	0.469**	0.499**	0.612**
	(0.226)	(0.204)	(0.211)	(0.213)	(0.240)	(0.282)
LOW INVESTMENT					-0.297	-0.614
					(0.597)	(0.698)
HIGH BONUS					-0.186	-0.056
x LOW INV.					(0.627)	(0.727)
R&D CONTROL		✓	✓	✓	✓	✓
OTHER CONTROLS			✓	✓	✓	✓
FIRMS	4,293	4,293	4,293	3,337	4,293	3,171

Notes: This table reports estimates of the effect of the ATRA 2012 bonus depreciation extension on stock prices. The dependent variable in all specifications is the Buy-and-Hold Abnormal Return calculated five days after passage of ATRA 2012. High Bonus is the dependent variable in all specifications. Specification (2) includes Avg R&D to the regressions. Specifications (3)–(6) include the full set of controls described in Table 2. Specification (4) limits the analysis to firms that invested more than 2 million, on average, during the prior three years. Low Investment and Low Investment interacted with High Bonus are added to Specifications (5) and (6). Specification (6) limits the analysis to firms with December fiscal years—those that filed form 10-K on December 31, 2012.

Specification (6) limits the analysis to firms with fiscal years ending on December 31 to normalize the amount of financial information available to investors as of ATRA passage. Among this group, the High BONUS coefficient is equal to 0.612.

¹²As noted above, if High/Low Investment were measured perfectly and investors perfectly understood the mechanics of both Section 179 and bonus depreciation policies, then the interaction coefficient would necessarily be equal in magnitude to the High BONUS coefficient.

FIGURE 3: EFFECT OF HIGH BONUS ON BHARS



Notes: Figure 3 displays High BONUS coefficients from regressions of BHAR on High BONUS as the BHAR outcome varies from 1 to 10 days after ATRA2012 passage. Panel (A) coefficients correspond to Specification (2) with the full suite of controls but limits the analysis to firms that investment more than \$2.5 million, on average. Panel (B) coefficients correspond to Specification (3) that includes Low Investment and Low Investment interacted with High BONUS. The dashed lines represent 95% confidence intervals on the High BONUS coefficients.

A concern is that BHARs calculated at different time horizons after ATRA passage may yield different results. I address this concern by re-estimating Specifications (4) and (5) from Table 3 using 1-day through 10-day BHARs. Panel (A) of Figure 3 displays the Specification (4) High BONUS coefficient estimates with corresponding 95% confidence intervals while Panel (B) displays the Specification (5) High BONUS estimates and confidence intervals.

Both panels show that the High Bonus Coefficient is positive for 1-day through 10-day BHARs. In both panels, the High BONUS coefficient is statistically different from zero at all time horizons save from the 1-day and the 7-day horizon. The results suggest that the biggest jumps in the coefficient occur on days 2, 8, and 10. That the coefficients steadily increase suggest it took investors time to capitalize on the extension of the policy, perhaps due to its complexity and its unexpected nature. Overall, the Figure 3 analysis suggests the baseline empirical results are largely robust to varying BHAR time horizons.

Overall, the empirical analysis presented thus far strongly supports Hypothesis 1. After the ATRA extension of bonus depreciation, stock prices increase approximately 0.5 percentage points more for firms that reside in industries that invest in longer-lived assets and therefore benefit relatively more from the extension. Consistent with the extension of Section 179 in the same bill, the stock price increase is concentrated among firms that make more than \$2.5 million in capital investments per year, on average. These headline finding suggests that investors, do indeed, value bonus depreciation and tax investment incentives, more generally.

7 Results Scrutiny

Before moving on to establish several additional empirical results, I now pause to scrutinize the headline findings (those pertaining to Hypothesis 1) presented above. I first show that the results are essentially unchanged when Cumulative Abnormal Returns are used instead of Buy-and-Hold Abnormal Returns. Second, I validate the clustering procedure and standard error estimates via permutation test. Third, and finally, I verify the measurement of the High BONUS treatment variable by re-running the Table 3 analysis using an empirically constructed measure of bonus depreciation benefit.

7.1 Cumulative Abnormal Returns

Cumulative abnormal returns (CARs), as opposed to BHARs, are often used in event studies. Typically, the longer-run the outcome, the more important that BHAR vs. CAR decision becomes (Fama (1998)). Here, because I focus on a short (5-day) event window, the choice likely makes little difference. Nonetheless, I show that the results are robust to CAR outcomes. The date $t1$ CAR is defined as

$$CAR_{t1} = \sum_{t=0}^{t=t1} AR_t$$

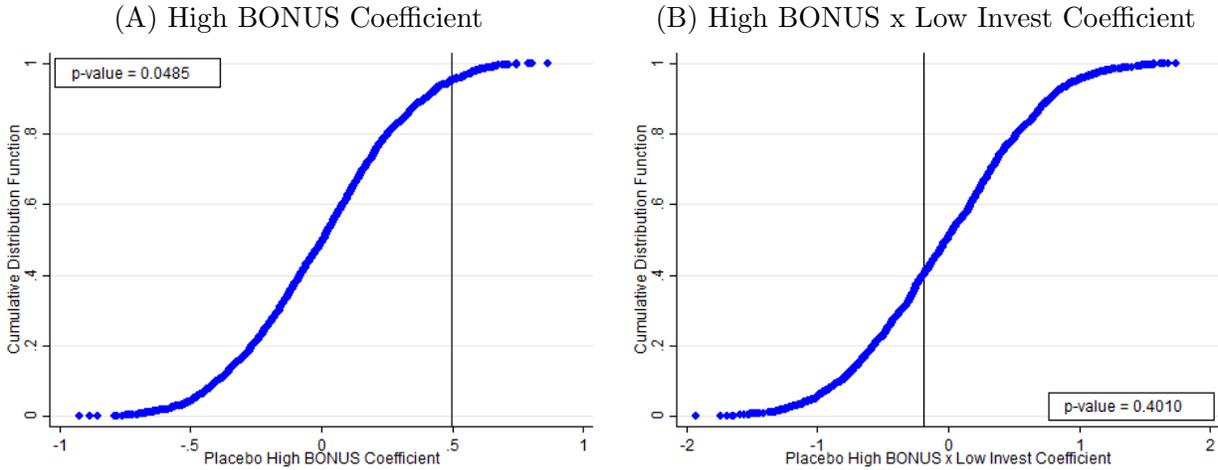
where AR_t is the abnormal return on date t .

Appendix A repeats the Table 3 and Figure 3 analyses using CAR outcome variables. Overall, using CAR outcomes produces slightly larger High BONUS point estimates. For example, Appendix Table 7 Specification (4) which includes the full set of controls and limits the analysis to High Investment firms, shows a High BONUS point estimate of 0.587 instead of the 0.469 High BONUS coefficient from the BHAR analysis.

7.2 Permutation Test

To provide a comprehensive series of placebo tests and simultaneously allay concerns that the industry-level clustering procedure overrejects the null hypothesis when I use the High BONUS indicator treatment, I implement a permutation test similar to those used in Chetty, Looney and Kroft (2009) and Zidar (2015). To perform the test, each industry is randomly assigned –without replacement – another industry’s High BONUS treatment. Then, I re-estimate Specification (5) from Table 3 using the placebo treatment. High BONUS and High BONUS x Low Investment point estimates estimates are recorded and the procedure is repeated another 1,999 times to produce the plots in Figure 4.

FIGURE 4: PLACEBO COEFFICIENT CDFs



Notes: Panels (A) and (B) of Figure 4 plot empirical distributions of placebo coefficients for High Bonus and High Bonus x Low Tax. Each CDF is constructed by regressing the 5-Day Buy-and-Hold Abnormal Returns on 2,000 randomly assigned High Bonus and High Bonus x Low Tax treatments and controls as in Specification (5) of Table 3. To create the random treatments, each industry is assigned another industry’s actual High Bonus treatment (0 or 1) without replacement. High Bonus is then interacted with each firm’s actual Low Invest (0 or 1) to create the High Bonus x Low Tax treatment. No parametric smoothing is applied: the CDF appears smooth because of the large number of points used to construct it. The vertical lines show the treatment effect estimate reported in Specification (4) of Table 3. In Panel (A), 97 out of the 2000 (4.85 percent) of placebo coefficients are larger than the estimated effect. In Panel (B), 802 out of the 2000 (40.1 percent) of placebo coefficients are smaller than the estimated effect.

Panel (A) of Figure 4 displays an empirical CDF of the 2,000 High BONUS placebo coefficients while Panel (B) displays the interaction coefficients. No parametric smoothing is applied; the CDFs look smooth because of the large number of points used to construct them. The vertical black line in each panel represents the Table 3 Specification (5) point estimates. For High Bonus, 97 of the 2000 (4.85 percent) placebo coefficients are larger than the estimated effect suggesting a non-parametric p -value of 0.0485. For the interaction term, 802 out of the 2000 (40.1 percent) of placebo coefficients are smaller than the estimated effect suggesting a non-parametric p -value of 0.401. These non-parametric p -values closely match the p -values produced by the Table 3 analysis that suggest (1) that clustering at the industry-level produces accurate standard errors and (2) that random differences in industry-level BHARs are unlikely to generate the estimated High BONUS effects.

7.3 Empirical Measurement of BONUS

A potential criticism of the headline results presented thus far is that the BONUS and by extension High BONUS may be mismeasured. To address this concern, I construct an empirical measure

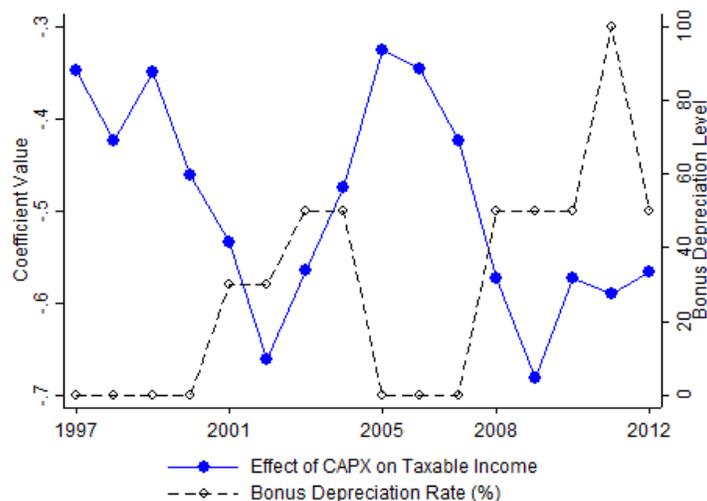
of BONUS, **Empirical BONUS**. I then use Empirical BONUS to reproduce the headline results presented in Table 3 and Figure 3.

To motivate the construction of Empirical BONUS consider that when bonus depreciation is turned off, a dollar of capital expenditure reduces a firm’s taxable income less than a dollar of capital expenditure when bonus is turned on. Therefore regressing taxable income on capital expenditure should yield a larger capital expenditure coefficient in bonus years relative to non-bonus years.

I calculate **Taxable Income** (net of capital expenditures) following Hanlon, Kelley Laplante and Shevlin (2005) as U.S. federal taxes paid plus foreign taxes paid grossed up by 0.35, the corporate income tax rate, minus the change in tax loss carry forwards net of capital expenditure. Then, for each industry I regress taxable income on capital expenditure separately in bonus and non-bonus years.¹³ I take the difference between the non-bonus year capital expenditure coefficient (which should be negative) and the bonus year coefficient (which should be more negative) to construct an industry-level empirical measure of the effect of bonus depreciation on the after-tax cost of investment.

As a check the validity of this approach, consider the capital expenditure coefficient for the full sample estimated in each year 1997–2012. Figure 5 plots the the coefficient series against the level of bonus depreciation.

FIGURE 5: EFFECT OF CAPITAL EXPENDITURE ON TAXABLE INCOME



Notes: Figure 5 presents regression coefficients of taxable income net of capital expenditure on capital expenditure for each year 1997 to 2012.

¹³I use only December fiscal year firms so their investment data lines up with bonus levels which usually change on the calendar year.

The figure shows that, as expected, the capital expenditure coefficient is significantly more negative in bonus years indicating that a dollar of capital expenditure in these years generates more first year tax depreciation and yields lower present value investment costs. This aggregate series validates the measurement of Empirical BONUS and by extension, the Empirical BONUS results I present below.

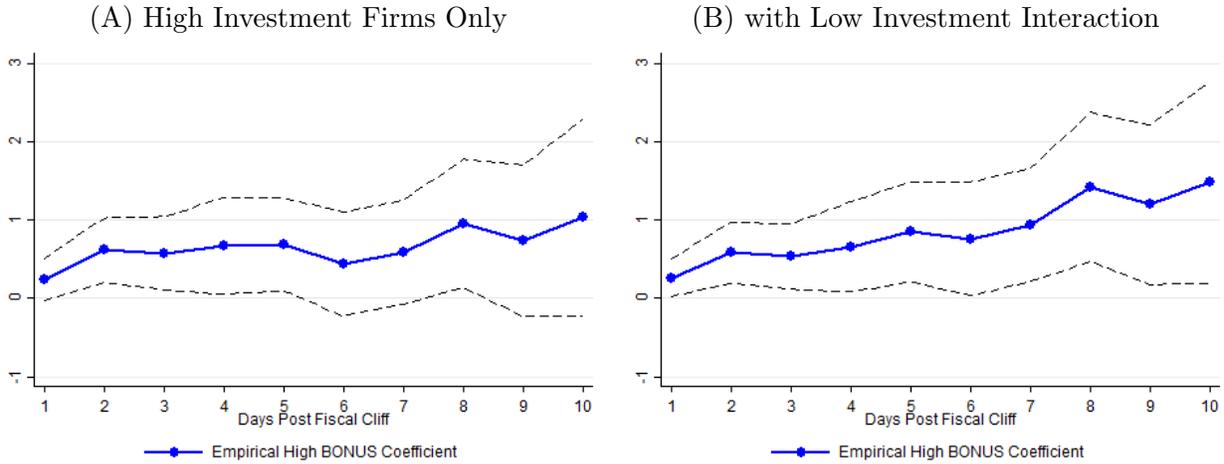
From Empirical BONUS, I derive an indicator variable **Empirical High BONUS**, which is equal to 1 if a firm resides in an industry in the top half of the Empirical BONUS distribution and 0 if not. I then re-run the headline analysis using Empirical High BONUS. The results are presented in Table 4 and Figure 6.

TABLE 4: EFFECT OF EMPIRICAL BONUS INDICATOR ON STOCK PRICE

DEP VAR. SAMPLE SPECIFICATION	5-DAY BUY-AND-HOLD ABNORMAL RETURN				
	ALL FIRMS (1)	ALL FIRMS (2)	ALL FIRMS (3)	HIGH INV. (4)	ALL FIRMS (5)
HIGH EMPIRICAL BONUS	0.551*	0.451*	0.535*	0.619**	0.697**
	(0.278)	(0.270)	(0.293)	(0.283)	(0.287)
LOW INVESTMENT					-0.194
					(0.535)
HIGH EMPIRICAL BONUS X LOW INVESTMENT					-1.044
					(0.759)
FIRMS	3,171	3,171	3,171	2,533	3,171
R&D CONTROL		✓	✓	✓	✓
OTHER CONTROLS			✓	✓	✓
FIRMS	3,171	3,171	3,171	2,533	3,171

Notes: This table reports estimates of the effect of the ATRA 2012 bonus depreciation extension on stock prices. The dependent variable in all specifications is the Buy-and-Hold Abnormal Return calculated five days after passage of ATRA 2012. Empirical High BONUS is the dependent variable in all specifications. Specification (2) includes Avg R&D to the regressions. Specifications (3)–(5) include the full set of controls described in Table 2. Specification (4) limits the analysis to firms that invested more than 2 million, on average, during the prior three years. Low Investment and Low Investment interacted with High Bonus are added to Specification (5).

FIGURE 6: EFFECT OF EMPIRICAL HIGH BONUS ON STOCK PRICES



Notes: Figure 6 displays Empirical High BONUS coefficients from regressions of BHAR on Empirical High BONUS as the BHAR outcome varies from 1 to 10 days after ATRA2012 passage. Panel (A) coefficients correspond to Specification (2) with the full suite of controls but limits the analysis to firms that investment more than \$2 million, on average. Panel (B) coefficients correspond to Specification (3) that includes Low Investment and Low Investment interacted with High Empirical BONUS. The dashed lines represent 95% confidence intervals on the High BONUS coefficients.

All Table 4 and Figure 6 point estimates are remarkably similar to the headline results presented in Table 3 and Figure 3. The proximity of the estimates suggests the two treatment variables accurately classify industries as in the top half or in the bottom half in terms of the benefits of bonus depreciation and cross-validate both the High BONUS and High Empirical BONUS results.¹⁴

8 Additional Results

Overall, the CAR analysis, the permutation tests, and the Empirical BONUS support the conclusion that investors valued the ATRA extension on bonus depreciation. I now engage in two subsidiary empirical analyses that enhance the headline results. In the first, I test Hypothesis 2 by examining heterogeneous effects of the policy across groups of firms that differ in their responsiveness to bonus. I then extend the analysis to examine the effect of a (more) continuous measure of bonus benefit.

8.1 Testing Hypothesis 2; Heterogeneity

Hypothesis 2 suggest that if investors value investment responsiveness to bonus depreciation then the stock price reaction to ATRA bonus extension should be concentrated among firms that are most

¹⁴Interestingly, while BONUS and Empirical BONUS both place industries in the correct ball park, they are (positively but) not strongly correlated suggesting possible measurement error at the industry-level in at least one of the two measures.

likely to respond to the policy. Zwick and Mahon (2017) suggests that firms that are financially constrained are more responsive to the policy because bonus increases immediate cash flow per dollar of investment. Zwick and Mahon (2017) further shows that firms with large amounts of tax loss carry-forwards are completely unresponsive to the policy because they receive no immediate benefit from the policy. Therefore, to test whether investors value investment responsiveness to bonus, I explore heterogeneous effects across Avg Firm Size and Firm Age (number of years on the Compustat Database), the two best predictors of financial constraint, as well as Avg Financial Constraint (Hadlock and Pierce (2010)), and TLCFs per Asset. I also test whether there exists heterogeneity across Avg Debt Ratio and Avg Cash Flow because presumably firms that have high debt ratios and low cash flows (but are not necessarily financially constrained) would benefit more from the Cash Flow Effect of bonus extension than firms in less immediate need of cash flow. Finally, I explore heterogeneity across LR Cash ETR as firms with higher effective tax rates should benefit more from the policy extension. On the other hand, investors may assume firms that actively pursue lower effective tax rates may be more likely to take advantage of the policy.

To perform the heterogeneity test, for each heterogeneity variable, I create a **Heterogeneity Indicator** equal to 1 if the firm is in the top half of the heterogeneity variable distribution and equal to 0 if not. I then interact the heterogeneity variable with High BONUS and estimate parameters from the following specification:

$$\begin{aligned} \text{BHAR}_{i,t} = & \beta_0 + \beta_1[\text{High BONUS}]_i + \beta_2[\text{Heterogeneity Indicator}]_i \\ & + \beta_3[\text{High BONUS} \times \text{Heterogeneity Indicator}]_i + \mathbf{X}'_i\boldsymbol{\gamma} + \epsilon_i. \end{aligned}$$

where as in Specifications (2) and (3), \mathbf{X}'_i is the full set of firm-level control variables defined in Section 4. Table 5 reports interaction coefficients from the estimates.

Specification (1)–(3), which measure heterogeneity by financial constraint and financial constraint determinants are not statistically different from zero suggesting firms investors do not believe financially constrained firms benefit more from the policy extension. The effect of High BONUS is also not concentrated among firms with low TLCFs (Specification (4)). In sum, investors do not value the extension of the policy more among firms that have been shown to be most responsive to bonus in the past suggesting investors do not value additional investment stimulated by the policy.

If investors do not value investment responsiveness, then they must value the policy extension's Cash Flow Effects. In accord with this conclusion, Specifications (5) and (6) of Table 5 show that stock prices responses to bonus extension are concentrated among high debt ratio and low cash flow firms (controlling for financial constraint). These firms have low cash flows but high cash obligations and therefore are likely to benefit the most from increased cash flows due to policy extension even at fixed investment levels.

TABLE 5: HETEROGENEOUS EFFECTS

DEP VAR.	5-DAY BUY-AND-HOLD ABNORMAL RETURN						
SPECIFICATION	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HIGH BONUS							
X FIRM SIZE	0.416						
	(0.525)						
X FIRM AGE		0.071					
		(0.342)					
X FINANC. CONSTRAINT			-0.223				
			(0.479)				
X TLCF ASSETS				-0.120			
				(0.297)			
X DEBT RATIO					0.816**		
					(0.390)		
X AVG CASH FLOW						-0.937**	
						(0.414)	
X LR CASH ETR							-0.387
							(0.371)
FIRMS	4,293	4,293	4,293	4,293	4,293	4,293	4,292

Notes: Table 5 explores heterogeneous effects of High BONUS on 5-day BHARS. To construct each specification, an interaction term is added to the Table 3, Specification (4). The interaction term is constructed by first generating an indicator equal to 1 if the firm is in the top half of the heterogeneity variable distribution. The indicator is then interacted with High BONUS. The heterogeneity variable is TLCFs Per Assets in Specification (1), LR Cash ETR in (2), Avg Debt Ratio in (3), Avg Financial Constraint in (4), Avg Foreign Percent in (5), and Average Firm Size in (6).

The interaction term from Specification (7) indicates that stock prices responses to bonus extension are not concentrated among firms with high effective tax rates. While this finding could be due to the transitory nature of tax status, it may also indicate that some investors believe bonus depreciation is valuable to tax aggressive firms. I further explore this counter-intuitive result in Section 8.2.

From the heterogeneity analysis, I conclude that investors do not value investment responses to bonus depreciation, but instead value the increased near-term cash flow generated by the policy.

8.2 Continuous BONUS Treatment Analysis

As a empirical exercise, I relax the assumption that investors do not perfectly observe BONUS in the past / perfectly predict BONUS in the future and regress 5-day BHARs directly on the industry-level BONUS variable. Table 6 presents the results.

TABLE 6: EFFECT OF CONTINUOUS BONUS ON STOCK PRICE

DEP VAR.	5-DAY BUY-AND-HOLD ABNORMAL RETURN					
SAMPLE SPECIFICATION	ALL FIRMS	ALL FIRMS	ALL FIRMS	HIGH INV.	HIGH TAX	LOW TAX
	(1)	(2)	(3)	(4)	(5)	(6)
BONUS	0.031 (0.128)	-0.007 (0.124)	1.275*** (0.455)	1.208*** (0.441)	1.577*** (0.404)	-0.295 (0.972)
BONUS ²			-0.136*** (0.042)	-0.127*** (0.040)	-0.168*** (0.038)	0.025 (0.098)
FULL CONTROLS		✓	✓	✓	✓	✓
FIRMS	4,293	4,293	4,293	3,337	3,361	932

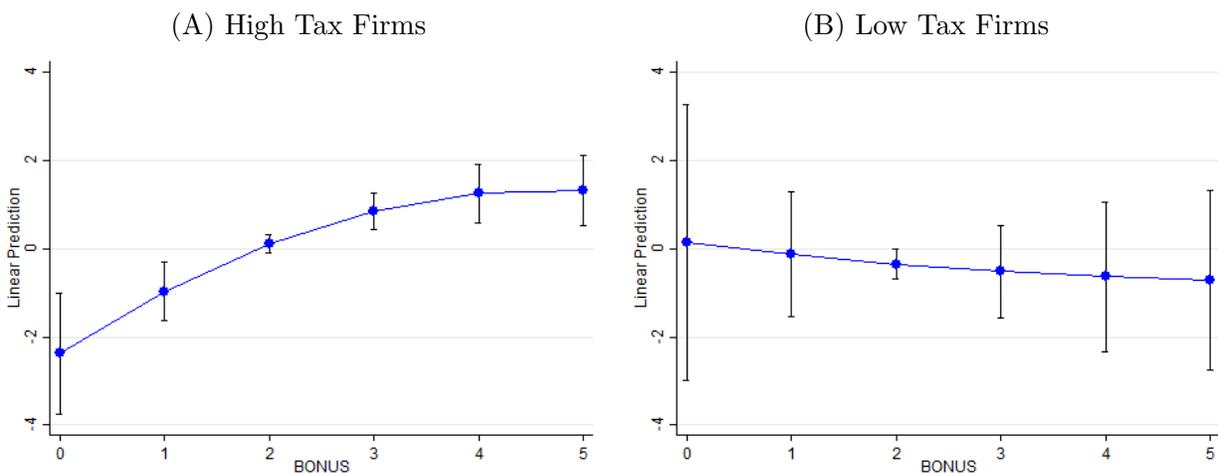
Notes: Table 6 reports estimates 5-day BHARs regressed on BONUS, a continuous measure of the effect of bonus depreciation. Specifications (2)–(6) add the full suite of control variables. Specifications (3)–(6) include a quadratic BONUS term. Specification (4) limits the analysis to firm investing more than \$2.5 million per year, on average. Specification (5) limits the analysis to firms in the top half of the LR Cash ETR distribution. Specification (6) limits the analysis to firms in the bottom half of the LR Cash ETR Distribution.

In Specification (1), when no controls are added, I find no effect of BONUS on 5-day BHARs. When the full set of controls is added in Specification (2), again, there is no effect. The simplest explanation for the Specification (1) and (2) results, is that, as presumed throughout the analysis up to this point, investors cannot precisely gauge the effects of BONUS at the fine industry level.

On the other hand, investors may not relate bonus extension value to BONUS in a linear manner. For example, investors may not differentiate between 1 and 1.5 percent reductions in investment costs but may see enormous value in 4 versus 3 percent reductions. To flexibly explore these types of beliefs, in Specification (3), I add a quadratic term to the regression. When the regression term is added, BONUS has a large and statistically significant coefficient while the quadratic BONUS term is estimated to be negative meaning investors value an extra percentage point reduction in investment costs less at high reduction levels. Similar results are presented in Specification (4), which focuses on High Investment firms. In Specification (5) and (6), I re-address the counter-intuitive LR Cash ETR heterogeneity results presents in Table 5 by splitting the sample based on

LR Cash ETR. Firms with 0 or positive LR Cash ETRs are included in Specification (5) while firms with negative LR Cash ETRs are included in Specification (6). The Specification (5) results show, again, that investors value BONUS but value incremental benefits of BONUS less at higher policy values. In contrast, but intuitively, investors do not seem to value the policy at all among low ETR firms. To better appreciate the quadratic effects of bonus extension, I plot the marginal effects of the policy extension in Figure 7.

FIGURE 7: PREDICTED EFFECTS OF CONTINUOUS BONUS ON BHARS



Notes: Figure 7 displays predicted 5-day Buy-and-Hold Abnormal Returns as a function of BONUS. Panel (A) is produced using estimates from the quadratic BONUS specification for firms in the top half of the LR Cash ETR distribution (Specification (5) of Table 6). Panel (B) is produced using estimates from the quadratic BONUS specification for firms in the bottom half of the LR Cash ETR distribution (Specification (6) of Table 6).

Panel (A) uses the results from Specification (5) of Table 6 to plot the marginal effects of extension for high tax firms for firms at BONUS level 0, 1, 2, 3, 4, and 5 (corresponding to the percentage point reduction in present value of investment costs due to bonus extension). Panel (B) uses the Specification (6) results to plot the effects for low tax firms. While Panel (A) shows positive but decreasing effects of BONUS, Panel (B) shows essentially no impact for firms at all BONUS levels.

The quadratic results presented in Table 6 which are represented by the shape of the Panel (A) curve are interesting and unexpected. Firms that benefit little from the policy – 0 or 1 percentage points – see negative returns after ATRA extension while firms that benefit 3 to 5 percent see positive returns. However, the stock price response is essentially the same at BONUS levels at 3 percentage points and above. While the quadratic analysis seems to better address the ETR heterogeneity, it also presents two questions: (1) why are returns negative for some firms and (2), why would investors not value 5 percent firms more than 3 percent?

There are three reasons low BONUS firms may see negative returns even though they benefit some from bonus extension. First, abnormal returns may be generated by investors selling low BONUS stock and buying high BONUS stock after ATRA passage. Second, even though low and high BONUS firms reside in different industries they may vie for the same consumer demand (think electronics versus food and gaming). The third is that bonus may cause universal investment prices to increase for firms across all industries (Goolsbee (1998)).

There are two possible explanations for the uniform stock price response for 3, 4, and 5 percent firms. Again, this may signal limited information on the part of investors. Investors may know (as indicated by the majority of the empirical analyses) that industries in the top half of the BONUS distribution benefit more from bonus extension but may not be able to differentiate among the top half of industries. Alternatively, in concert with the heterogeneity findings presented in Table 5, if investors think 4 and 5 percent firms are the most likely to increase investment in response to bonus but do not value the investment increase, then, on net, firms that benefit 4 and 5 percent may be only as valuable as firms that benefit 3 percent.

While the continuous BONUS analysis yields some additional insights, on the whole, it fully supports the conclusions reached by examining the stock price response to the heuristic High BONUS indicator. Additionally, the increasing-at-a-decreasing-rate effects may be construed to suggest that, as predicted, investors did not precisely predict the benefits of bonus extension across industries.

9 Discussion of Results

9.1 Insights into Investor Valuation of Accelerated Depreciation Policies

To specify how bonus depreciation, and accelerated depreciation policies more generally, affect firm values, I now calculate the elasticity of firm value with respect to the after-tax, present value cost of investment. In the absence of bonus depreciation, an average dollar of capital investment generates 0.88 present value dollars of depreciation allowances (average z_0 from Section 4). This means that the after-tax present value cost of the average dollar of capital investment is \$0.692 ($=1 - .35 \times 0.88$). Bonus extension decreased this cost by 0.0257 for High BONUS firms but by only 0.0179 for Low BONUS firms. Thus, bonus extension decreased the after-tax present value investment cost by 1.1571% for High BONUS relative to Low BONUS firms.¹⁵ Thus, the policy lowered investment costs by 1.1571% more for High BONUS than Low BONUS firms.

The headline empirical result presented herein (Table 3 Specification (5)) is that stock prices of firms that benefited the most from the extension of bonus depreciation (High BONUS firms)

¹⁵For High BONUS firms, the after-tax, present value cost of investment per dollar of investment expenditure was 0.6663 ($=1 - 0.35 \times 0.88 - 0.0257$) post ATRA passage. For Low BONUS firms, the same figure was 0.6741 ($=1 - 0.35 \times 0.88 - 0.0179$). Thus, High BONUS costs were 1.1571% ($=(0.6663 - 0.6741) / 0.6741 \times 100$) lower than Low BONUS firms after the bonus extension.

increased by 0.499% more than those firms that benefited the least from the extension of the policy (Low BONUS firms). Scaling the 0.499% by the relative decrease in High BONUS vs. Low BONUS after-tax present value investment costs of 1.1571% yield an elasticity of 0.431 meaning a one percentage point decrease in present value investment costs increases stock prices by 0.431%.

Note that this elasticity represents a lower bound. Although I have provided substantial evidence that investors did not expect ATRA to extend bonus depreciation, to the extent that investors placed some positive probabilistic weight on bonus extension, the extension of bonus will yield a smaller decrease in High BONUS relative to Low BONUS investment costs and an elasticity larger than 0.431. For example, if investors expected 50% bonus to be part of the fiscal cliff package with 50% probability then bonus extension would yield an elasticity of $0.431 \times (1/0.5) = 0.862$. Therefore, the relatively substantial size of the elasticity, itself, provides some evidence that the ATRA extension of bonus was a true surprise.

To provide some context for this estimate consider that during the years 2010, 2011, and 2012, the average firm in the sample purchased \$264 million of new capital per year. Based on this number, a one percent decrease in after-tax investment costs via bonus extension would lower the after-tax cost of investment by \$2.64 during 2013. Because the average firms reports pretax income of \$325 million per year during this same period, a one percent decrease in investment costs constitutes about a 0.812% increase in income.¹⁶ So, by this calculation, a 0.812% increase in pretax income translates into a 0.431% increase in share price. Whether these number are reasonable in relation to one another depends wholly on (1) how heavily investors discount future earnings and (2) whether investors believed the ATRA extension of bonus was permanent. I explore these questions and discuss how this study's findings provide insights into investor behavior, more generally, in the following section.

9.2 Insights into Investor Behavior More Generally

9.2.1 Earnings Fixation

Mills (2006) explains that while accelerated depreciation policies increase the present value of firm cash flows, they do not affect accounting earnings (or "book earnings"). As a result, Neubig (2006) and Edgerton (2012) argue that because investors seem to fixate on accounting earnings (Sloan (1996), Graham et al. (2005)), investors do not care about bonus depreciation and, in turn, corporate managers will not alter their investment strategies in response to accelerated depreciation policies.

The findings in this paper do not support these conclusions. I find that investors value bonus depreciation and therefore must place some weight on the present value of firm cash flows, not

¹⁶The decrease constitutes a much higher percent of taxable income. However, it is hard to calculate how much because all measures of average taxable income during the period are negative.

just accounting earnings. This result is consistent with recent empirical evidence that firms are quite responsive to accelerated depreciation policies (see Zwick and Mahon (2017), Ohn (2017a), Ohn (2017b), and Maffini, Xing and Devereux (2017)). If shareholders only cared about accounting earnings then perfectly incentivized managers would not increase investment in response to accelerated depreciation policies.

9.3 Myopia

The 0.431 elasticity is fairly large. The magnitude of the results could suggest that shareholders are focused on near-term earnings. This explanation is supported by Zwick and Mahon (2017) which documents that firms with tax loss carry-forwards are completely unresponsive to bonus depreciation.

On the other hand, the fairly large elasticity could instead signal that investors believed that bonus depreciation was here to stay. If the fiscal cliff couldn't put an end to bonus depreciation, perhaps it was to be a permanent part of the tax code. This explanation would suggest that investors were clairvoyant with respect to bonus; bonus depreciation has, indeed, been available to businesses at a 50% since ATRA passage.

10 Conclusion

This study has documented that stock prices of firms that benefit the most from bonus depreciation increased relative to those that benefit the least after the ATRA extension of bonus. The differential price responses are concentrated amongst firms that are in need of cash but not amongst firms that have been shown to increase investment in response to the policy. In short, investors value the cash flow generated by the policy but not the investment it stimulates. These findings constitute several important lessons for economists and policy makers.

Debates regarding the use of bonus depreciation and accelerated depreciation policies often center of the investment stimulus effects of the policies. The primary lesson for policymakers is that bonus may have a significant effect on corporate behavior in important ways other than through capital investment. Additional cash generated by the policy may reduce the risk of bankruptcy and pay for investments in intangibles.

For economists, the lessons are somewhat contradictory. Because investors value a policy that increases firm cash flows but not accounting earnings, the results indicate that investor behavior can best be described as rational. On the other hand, the magnitude of the estimated elasticity of firm value with respect to the present value investment costs suggests investors are excessively myopic when evaluating firm performance.

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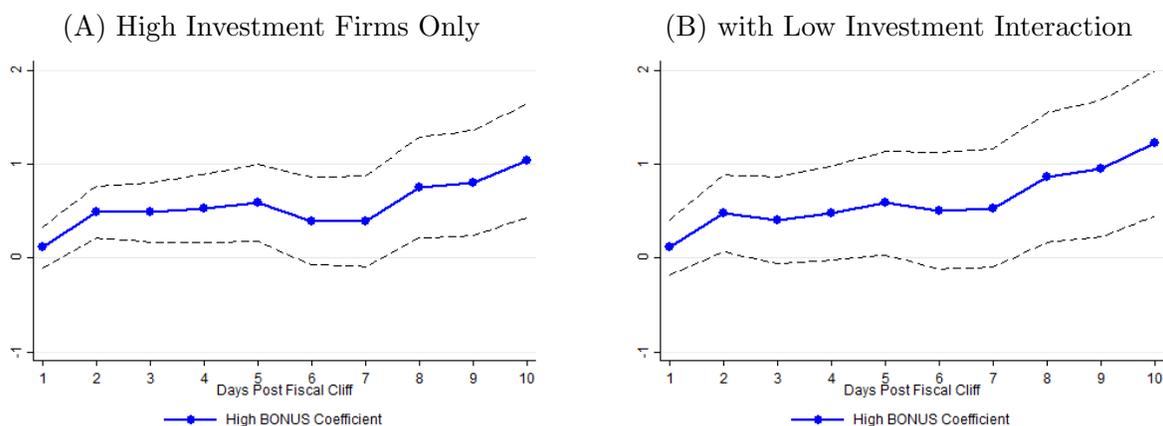
Appendix A Cumulative Abnormal Return Analysis

TABLE 7: EFFECT OF HIGH BONUS ON CUMULATIVE ABNORMAL RETURNS

DEP VAR. SAMPLE SPECIFICATION	5-DAY CUMULATIVE ABNORMAL RETURN					
	ALL FIRMS (1)	ALL FIRMS (2)	ALL FIRMS (3)	HIGH INV. (4)	ALL FIRMS (5)	DEC FYR (6)
HIGH BONUS	0.585** (0.238)	0.597** (0.235)	0.494* (0.272)	0.587*** (0.223)	0.587** (0.262)	0.832*** (0.304)
LOW INV.					-0.261 (0.834)	-0.126 (0.877)
HIGH BONUS x LOW INV.					-0.351 (0.795)	-0.662 (0.909)
R&D CONTROL		✓	✓	✓	✓	✓
OTHER CONTROLS			✓	✓	✓	✓
FIRMS	4,293	4,293	4,293	3,337	4,293	3,171

Notes: In all specifications, the dependent variable is the 5-day CAR and the dependent variable is High Bonus. Specification (2) includes Avg R&D to the regressions. Specifications (3)–(6) include the full set of controls described in Table 2. Specification (4) limits the analysis to firms that invested more than \$2.5 million, on average, during the prior three years. Specification (6) limits the analysis to firms with December fiscal years.

FIGURE 8: EFFECT OF HIGH BONUS ON CARs



Notes: Figure 8 displays High BONUS coefficients from regressions of CAR on High BONUS as the CAR outcome varies from 1 to 10 days after ATRA2012 passage. Panel (A) coefficients correspond to Specification (2) with the full suite of controls but limits the analysis to firms that investment more than \$2 million, on average. Panel (B) coefficients correspond to Specification (3) that includes Low Investment and Low Investment interacted with High BONUS. The dashed lines represent 95% confidence intervals on the High BONUS coefficients.