Corporate Tax Breaks and Executive Compensation

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Abstract

I analyze the effect of two corporate tax breaks, bonus depreciation and the Domestic Production Activities Deduction (DPAD), on executive compensation in publicly traded US firms. I find both tax breaks significantly increase executive compensation. For every dollar a firm benefits from the tax breaks, compensation of the firm's top five highest paid executives increases by 15 to 19 cents. These effects are much larger than the effect of corporate tax cuts on average wages, suggesting the tax breaks increase within-firm income inequality. The tax breaks increase compensation exclusively in firms with weaker governance structures.

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1 Introduction

Over the past 30 years, the compensation of CEOs and other corporate executives around the world has risen dramatically. The rise has been particularly spectacular at publicly traded US firms; between 1980 and 2008, average CEO pay at S&P 500 firms more than quintupled (Frydman and Jenter, 2010). At the same time, a less well-known trend has shaped the US economy: in the presence of increased pretax corporate profits, effective corporate income tax rates have decreased significantly (Dyreng, Hanlon, Maydew and Thornock, 2017).

These trends motivate an obvious, but empirically unaddressed question: Do corporate tax breaks increase executive compensation? There is, of course, mechanical reason to believe this relationship exists. Corporate tax breaks increase after-tax income that can be used to increase executive compensation via either a competitive market for managerial talent or rent capture by the executives. Understanding whether and to what extent tax breaks are used to increase executive compensation is important as policymakers, ostensibly, design corporate tax breaks to incentivize desired behaviors such as job creation, capital investment, or the adoption of clean energy sources, rather than to pad the pockets of corporate executives. Answers to these questions are also timely as the Tax Cuts and Jobs Act (TCJA) has accelerated the decline in effective corporate tax rates in the US and placed additional downward pressure on corporate tax rates worldwide.

In this study, I address this question by measuring the effect of two recent US federal corporate tax expenditures (or "breaks") on the value of compensation awarded to executives at large publicly traded corporations. I find both corporate tax breaks significantly increase executive compensation. I estimate that for every dollar generated by the tax breaks, compensation of the top five highest paid executives at publicly traded US firms increased by 15 and 19 cents.[1]

The first tax break I study, bonus depreciation, allows firms to deduct an additional percentage of the purchase price of new capital assets from their taxable income in the year they are purchased. This decreases the after-tax present value cost of new assets and dramatically decreases the current tax bill of firms that purchase large amounts of capital. I find that a one percentage point decrease in the cost of new investments due to bonus depreciation increases executive pay by 4.4%.

The second policy I study, the Domestic Production Activities Deduction (hereafter DPAD), allows firms to deduct a percentage of the income derived from domestic manufacturing activities from their taxable income. The DPAD decreases taxes paid by up to 3.15 percentage points, increasing after-tax cash flows substantially for domestic manufacturing firms. My preferred estimates suggest a one percentage point reduction in effective corporate income tax rates generated by the DPAD increases executive compensation by 3.2%.

[1] A well-established literature explores the empirical determinants of executive compensation. Some highlights include Kostiuk (1990), Sloan (1993), Mehran (1995), Hartzell and Starks (2003), Core, Guay and Larcker (2008), and Graham, Li and Qiu (2012). None of these papers estimates the effect of plausibly exogenous variation in effective corporate income tax rates on executive compensation.

To estimate these effects, I rely on detailed compensation data from the *Execucomp* database, well-established quasi-experimental variation in each tax break, and a modified difference-in-differences empirical framework. To identify the effect of bonus depreciation, I follow Zwick and Mahon (2017) in comparing executives in industries that, on average, invest in long-lived assets to executives at firms in industries that invest in short-lived assets. As long-lived assets are typically deducted from taxable income more slowly, bonus depreciation decreases the after-tax present value cost of these assets more than short-lived assets that are deducted more quickly. To identify the effect of the DPAD, I follow Ohrn (2018) in comparing executives in industries where a large portion of income is derived from domestic manufacturing – and therefore eligible for the DPAD – to executives in industries where only a small amount is classified as such. Comparing executives and their compensation packages across these dimensions as the policies are implemented and scaled yields difference-in-differences estimates of the effect of each policy.

The primary threat to the empirical identification of the effect of the tax breaks on executive compensation is that other shocks affecting executive pay covary with tax breaks. I address this threat in a number of ways. First, I implement dynamic difference-in-differences analyses, which show how the compensation of executives at treated firms evolve relative to the same outcomes at untreated firms over time. The dynamic analyses support the study's design, displaying both no differential pre-trends and larger differences between treated and control units when the tax breaks are particularly generous. Second, I estimate the effect of two placebo policies, one for each tax break. The bonus depreciation placebo is based on firms that invest in long-lived goods that do not qualify for bonus depreciation. The DPAD placebo is based on firms that derive a large percentage of income from domestic production, but are not currently taxable and therefore cannot benefit from the policy. By showing these placebos do not increase executive compensation, I reinforce the conclusion that the estimated effect of the tax breaks are due to the tax breaks themselves rather than other shocks to long-lived asset or domestic production intense industries. In addition to these checks, I show the tax break estimates are stable across a variety of empirical specifications designed to address the primary and other empirical concerns. While the assumption underlying the estimation strategy is fundamentally untestable, these checks limit the possibility that it does not hold.

In addition to understanding whether and by how much the tax breaks affect executive compensation, I design a number of tests to explore the mechanisms at play. One possibility is that the effect is purely mechanical in the sense that the tax breaks increase stock prices or firm performance and that compensation contracts are based on these measures. I find that controlling for contemporary and lagged changes in stock prices and return on assets (ROA), the measures upon which compensation contracts are most often based, has little effect on either estimate, suggesting the effects are not purely mechanical.[2]

[2]A well-developed literature in accounting asks a related but fundamentally different question: How do effective

Next, I perform a series of heterogeneity analyses exploring whether the increase in pay is due to a competitive market for managerial talent (Rosen, 1981; Kaplan and Rauh, 2009, 2013) or simply rent extraction by high powered executives (Bertrand and Mullainathan, 2001; Bebchuk, Fried and Walker, 2002; Bebchuk and Fried, 2003). In opposition to the competitive market view, I find the effects of the tax breaks are not concentrated among newly hired executives, where the effects of extra resources to bid for talent are most likely to be observed. In support of the rent extraction mechanism, I find the effects of the tax breaks are concentrated among firms with weaker governance structures. More precisely, the effects of the tax breaks are larger among firms (1) with charters and bylaws that better protect managers from shareholder discipline, (2) with a smaller percentage of shares held by the single largest institutional investor, and (3) with higher average executive tenure.[3] For firms with strong governance scores in at least two of these three metrics, I estimate a precise null effect of the tax breaks on executive pay, suggesting strong corporate governance can fully mitigate the compensation effects. Also in support of the rent extraction view, I find the effect of bonus depreciation is larger among CEOs and executives who sit on the board of directors. Overall, these results indicate that rent extraction rather than a competitive market for managerial talent is the mechanism by which the tax breaks precipitate increases in executive pay.

Other papers have shown that CEO and executive compensation often responds to "luck" in the form of energy prices, industry growth rates, or globalization (Bertrand and Mullainathan, 2001; Keller and Olney, 2017; Davis and Hausman, 2018). In one sense, the results presented herein are similar; executives that are lucky to be working at firms benefiting from tax breaks experience increases in their compensation. In another sense, however, these results are dramatically different as the sources of luck are controlled by the US government. Therefore, in contrast to sources of luck outside of the government's control, the tax breaks that I study (and potential future tax breaks) can be repealed or redesigned if the executive compensation effects are sufficiently undesirable.

Whether the tax breaks' effects on executive compensation are undesirable likely hinges on the extent to which the tax breaks affect the earnings of average workers and, as a result, income inequality. If, for instance, average worker wages also increase by similar percentages, then the fact that the tax breaks increase executive compensation seems fairly palatable. Unfortunately, this is likely not the case. A large body of research explores the effect of taxation on wages. A series of recent well-identified papers (Fuest, Peichl and Siegloch, 2018; Suárez Serrato and Zidar, 2016) suggest that for every 1% decrease in the net-of-corporate tax rate, average earnings of workers increase by less than 1%. My findings suggest that a one percent decrease in net-of-tax rates increases salaries by more than 2% for the top five highest paid executives at publicly traded firms.

corporate income tax rates respond to the metrics upon which executive performance is based? Papers in this literature include Phillips (2003), Gaertner (2014), and Powers, Robinson and Stomberg (2016).

[3] The use of these three particular measures of firm governance quality follow Bebchuk, Cohen and Ferrell (2009), Chetty and Saez (2005), and Bertrand and Mullainathan (2001), respectively.

Comparing these two elasticities implies that corporate tax breaks increase executive compensation more than average worker compensation and therefore increase within-firm income inequality.

This finding – that corporate tax breaks increase income inequality – is supported by recent studies that directly address this question. Dobridge, Landefeld and Mortenson (2019) use administrative tax data to directly measure the effect of the DPAD workers' taxable incomes. They find the DPAD increased incomes at the top of the earnings distribution but had no effect of incomes in the bottom half. Nallareddy, Rouen and Suárez Serrato (2018) show that cuts in state corporate income taxes also increase income inequality.

The results of this study speak directly to the effects of the Tax Cuts and Jobs Act of 2017 (TCJA). TCJA dramatically lowered the statutory corporate income tax rate and allowed firms to immediately depreciate all capital investments through 2022.[4] As these provisions are very similar to the DPAD and bonus depreciation, this study suggests the TCJA will increase the earnings of corporate executives and accelerate increases in income inequality in the US. To the extent that TCJA puts downward pressure on corporate tax rates around the world, similar effects may spread worldwide.

The remainder of the paper is organized as follows. Section 2 provides further details on the tax breaks I study. Section 3 present data sources, data definitions, and descriptive statistics. I outline the estimation strategy and present baseline results in Section 4. Section 5 presents a series of tests that scrutinize the identification strategy and baseline results. In Section 6, I explore the mechanisms at play. I discuss the magnitude of the estimated effects, relate the findings to income inequality, and consider how the results inform our understanding of the determinants of executive compensation in Section 7. Section 8 concludes.

2 The Tax Breaks

This section describes each tax break in detail. I choose to study these two tax breaks for four reasons. First, Steinmüller, Thunecke and Wamser (2019) note that the two main factors in determining effective corporate income tax rates are statutory tax rates and depreciation rules. By focusing on examples of these two most important factors, the validity of the study applies to the majority of effective tax rate changes. Second, as noted above, the two tax breaks are similar to the primary domestic provisions of TCJA. Third, the two tax breaks operate on the same firms over the roughly the same time period. Therefore, examining one while ignoring the other could potentially lead to biased estimates. Finally, recent research has carefully identified quasi-experimental variation in each tax break that I rely upon to estimate the effects of each.

[4]The TCJA also repealed ability of publicly traded companies to deduct performance-based compensation in excess of $1 million. The results of this study do not speak to the effect of this provision. De Simone, McClure and Stomberg (2019) find no evidence that this executive pay responded to the elimination of this deduction.

2.1 Bonus Depreciation

Typically, businesses cannot deduct the full price of newly installed assets from their taxable income in the year the assets are purchased. Instead, businesses are allowed to deduct only a portion of the price in each year of the asset's life according to the Modified Accelerated Cost Recovery System (MACRS) (detailed in IRS Publication 946). MACRS specifies both 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." Bonus depreciation allows for an additional "bonus" percentage of the total cost of new equipment purchases to be deducted from taxable income in the year the asset is purchased.[5] Because firms can deduct the new investments from their taxable income sooner, the present value of the deductions associated with an investment is larger and the after-tax present value cost of the investment is smaller.

Appendix A provides a numerical example of the effects of 50% bonus depreciation on both a 7-year and a 3-year asset. As I discuss in depth below, the effect of bonus depreciation is larger in the case of the longer-lived asset.

Panel (a) of Figure 1 displays bonus depreciation rates during the sample period. Bonus depreciation was first enacted as part of the Job Creation and Worker Assistance Act of 2002. Initially, bonus depreciation was offered at a rate of 30% and was applied to purchases made after September 11, 2001. In 2003, the additional first year deduction was increased to 50% through the end of 2004. Bonus depreciation was not available in 2005–2007, before it was reinstated in 2008 at the 50% rate. The 50% rate was available through the end of the sample period, except in 2011 when bonus depreciation was offered at a rate of 100% (100% is often called "expensing" or "immediate expensing").[6] The policy was implemented during the sample period in five separate bills. Several of these were signed at the 11$^{\text{th}}$ hour and two of these applied retroactively to investments made in the past. This piecemeal legislative implementation likely led to some significant uncertainty with respect to the tax break.

[Figure 1 about here]

The identification strategy that I employ to analyze the effects of bonus depreciation follows Cummins, Hassett, Hubbard et al. (1994), Desai and Goolsbee (2004), House and Shapiro (2008), Edgerton (2010), and Zwick and Mahon (2017) in comparing firms in industries that invest, on average, in longer-lived assets to firms in industries that invest in shorter-lived assets where asset lives are defined by MACRS. Bonus depreciation decreases the present value of investment costs

[5] During the sample period, bonus depreciation was not available for assets with tax lives longer than 20 years, mostly structures and intellectual property.

[6] 50% bonus depreciation was offered through the end of 2017 when TCJA replaced bonus depreciation with immediate expensing through 2022.

more for firms that invest in longer-lived assets because it accelerates deductions from further in the future. Consistent with this intuition, the Appendix A example shows bonus depreciation has a larger effect of the present value cost of a 7-year asset than on a 3-year asset.

Panel (c) of Figure 1 illustrates the quasi-experimental variation that I rely on by showing how much the present value costs of new investments change for firms in the top quartile of average asset life to firms in the lowest quartile of average asset life during the sample period.[7] When bonus depreciation is offered, the present value cost of new investments decreases for both quartiles. However, the decrease is larger for firms that invest in longer-lived assets as they are allowed to accelerate deductions from further in the future.[8]

A potential concern in using this cross-industry variation is that firms may shift their investment to assets with longer MACRS lives in response to the policy. In Appendix B, I use IRS Statistics of Income data to show that this is not the case; firms do not shift to assets with longer lives in response to bonus depreciation. Even if they did, this behavior would introduce measurement error into my bonus depreciation treatment variable and downward bias my estimates.

2.2 The DPAD

The DPAD is a federal US tax provision designed to encourage domestic manufacturing. The DPAD allows firms to deduct a percentage of "Qualified Production Activities Income" (QPAI) from their taxable income. As a result, the DPAD results in lower effective tax rates for firms that report a higher percentage of QPAI. QPAI is calculated as revenues from the sales of domestically produced goods less the cost of goods sold attributable to domestic production and other expenses related to domestic production. A firm's deduction is capped by both (1) 50% of its W-2 wages and (2) the firm's gross taxable income. While the first of these caps is unlikely to bind for large, publicly traded firms, the second is important. The gross taxable income cap means that firms in a tax loss position cannot claim and, therefore, do not benefit from the DPAD.

The DPAD was enacted as part of the American Jobs Creation Act (AJCA) of 2004.[9] AJCA stipulated (and it came to pass) that the policy was phased in during the years 2005–2010. The deduction was implemented at a rate of 3% in 2005, was scaled to 6% in 2007, and increased to its

[7] I provide a more detailed description of the construction of both the bonus depreciation and DPAD variables in the following section.

[8] A number of papers have used this cross-sectional comparison to estimate the effects on bonus depreciation on the US economy. House and Shapiro (2008) and Zwick and Mahon (2017) show bonus depreciation increases business investment. Edgerton (2010) shows the effect of bonus depreciation is concentrated among firms that are cash constrained, but not among firms that are presently nontaxable. Garrett, Ohrn and Suárez Serrato (2020) show local exposure to bonus depreciation increases employment but depresses wages. Ohrn (2019) uses state bonus depreciation adoption to estimate investment effects. His findings are similar to others in the literature, reinforcing the validity of the industry cross-sectional research design.

[9] The DPAD was designed to replace a series of export incentives that were ruled illegal by the World Trade Organization. The final incentive in the series, the Extraterritorial Income Exclusion (ETI), allowed firms to deduct a percentage of exports from their taxable income. I control for the ETI throughout the analysis.

maximum rate of 9% in 2010.[10] Panel (b) of Figure 1 displays the DPAD rate (the percent of QPAI that can be deducted) in each year during the sample period. In contrast to bonus deprecation, the course of the DPAD was exactly prescribed in AJCA; increases in the generosity of the tax break were predictable and certain.

Assuming firms faced the maximum statutory corporate tax rate of 35%, once fully phased in, the DPAD decreased the effective tax rate on QPAI by 3.15 (=0.09 x 35) percentage points. How much the DPAD decreases the effective tax rate for a firm depends on the percentage of income defined as QPAI. In 2010, a firm that defined 75% of income as QPAI received a 2.3625 percentage point reduction in their effective tax rate via the DPAD whereas a firm that derives only 25% of their income from qualified production activities received a break of only 0.7875 percentage points.

I follow Ohrn (2018) in using IRS Statistics of Income data to calculate the percentage of income that qualifies for the deduction at the industry-by-firm-size level.[11] Scaling this quasi-experimental, cross-sectional variation by the DPAD rate in each year and the statutory tax rate then interacting the measure with an indicator for taxable status yields the effective tax rate reduction due to the DPAD received by a firm in a given year.[12]

Panel (d) of Figure 1 shows how the DPAD effective tax rate reduction evolves during the sample period for firms in the top and bottom quartiles of average QPAI% in 2005. The graph clearly demonstrates that firms with a large percentage of income derived from domestic manufacturing activities receive a larger and larger tax break as the DPAD rate is increased from 3 to 6 to 9%. Firms in the bottom quartile receive essentially no tax break during the sample period. That the tax break does not increase for firms in the bottom quartile suggests firms were not able to alter their production processes in any dramatic way to take advantage of the deduction. Thus, as was the case with bonus depreciation, the cross-sectional differences in the generosity of the tax break do not seem to be influenced by firm behaviors in this setting.

3 Data

To analyze the effect of the tax breaks on executive compensation, I build a dataset that combines executive-level compensation data from *Execucomp* with the quasi-experimental variation in each tax break, and firm-level financial statement data and governance variables from Compustat, Thomson Reuters, and Risk Metrics. The analysis dataset has 127,256 executive-by-year obser-

[10] For Oil related QPAI, the maximum rate is 6 percent.

[11] Several studies have used this variation to explore the effects of the policy on firm business activities. Ohrn (2018) shows that the DPAD caused firms to increase investment, payouts to shareholders, and equity finance (debt is less attractive at lower, DPAD-adjusted effective tax rates). Fich, Rice and Tran (2017) uses this variation to show firms use cash flows generated by the DPAD to fund merger and acquisition activity. Dobridge, Landefeld and Mortenson (2019) uses this variation to estimate the effect of the policy on wages across the income distribution. Lester (2019) compares firms the disclose DPAD benefit to a matched sample to estimate investment and other responses to the policy.

[12] I provide a more detailed description of the construction of the DPAD variable in the following section.

vations and covers 31,879 unique executives at 2,794 firms during the years 1998–2012. Table 1 presents descriptive statistics for the sample. In the remainder of this section, I describe each of the variables used in the analysis.

[Table 1 about here]

3.1 Executive Compensation and Characteristics

Executive compensation data is taken from the Compustat Execucomp database. Execucomp reports compensation of executives at large, publicly traded US firms. The main executive compensation outcome variable used in the analysis is **Total Comp Awarded** (referred to as TDC1 in *Execucomp* and often abbreviated throughout the text as simply Total Comp or Ln(Comp) when logs are taken). Total Comp Awarded is the total amount of compensation awarded to (but not necessarily realized) by the executive in a given year. Total Comp Awarded, as well as all other variables based on dollar values, are measured in real 2010 dollars. Total Comp Awarded is the sum of salary, bonus, the value of restricted stock granted, the estimated value of stock options granted (using a Black-Scholes calculation), and the value of long-term incentive payouts. The analysis sample is limited to the top five executives at each firm in each year in terms of Total Comp Awarded to avoid over-representation of any particular firm in the analysis.

Figure 2 describes the structure of Total Comp Awarded. Panel (a) shows how the average level of Total Comp Awarded and its different components evolved over the sample period. Panel (b) shows the percentage of Total Comp Awarded in each category over time. Average Total Comp Awarded is fairly stable during the sample period, except in 2000 due to a spike in the value of options awarded. Other forms of compensation are fairly stable in both levels and shares of total compensation during the period.

The average executive in the sample receives $2.73 million in compensation per year (see Table 1). For reference, households in the top 1% of the US income distribution reported just under $1.5 million in taxable income in 2010 (CBO, 2013). Therefore, the executives in this study represent earners at the very top of the US income distribution.

[Figure 2 about here]

In supporting analyses, I separate Total Comp Awarded into two components, **Total Current** and **Total NonCurrent**. Total Current is the sum of an executive's salary and bonus compensation; it is "current" in that it does not contain stock-based or incentive components whose value will be realized in the future. Total NonCurrent compensation is the value of restricted stock grants, stock options grants, and the value of long-term incentive payouts given to the executive during the year. All executive compensation variables as well as all firm level outcomes and controls are winsorized at the 1^{st} and 99^{th} percentiles to mitigate the effects of outliers on parameter estimates.

In addition to compensation data, *Execucomp* provides data on executive characteristics and positions. In most specifications, I include the log of **Experience** (measured as the number of years in the *Execucomp* database) and the executive's gender, which I code as the **Female** indicator variable. On average, executives have five years of experience. Only 6.2% of the sample are women. In Section 6, I explore whether effects are concentrated among New Hires, CEOs, and executives that are also members of the board. These groups constitute approximately 16%, 20%, and 33% of the sample, respectively.

3.2 Tax Policy Variables

3.2.1 BONUS

Recall that in the absence of bonus depreciation, firms deduct new equipment investments from their tax bill according to MACRS rules. Let z_0 represent the present value of the deduction created by \$1 of new equipment investment under MACRS. It then follows that z_0 multiplied by τ (the corporate income tax rate) is equal to the present value of the tax shield created by \$1 of new equipment investment.

Bonus depreciation allows firms to deduct an additional b percent of investment costs. The remaining $1-b$ is deducted according to the normal MACRS schedule. After incorporating bonus, the present value of the tax shield created by \$1 of investment can be written as

$$z\tau = [b + (1-b)z_0]\tau.$$

The **BONUS** variable used in the analysis is the percentage point decrease in the present value cost of new equipment investments due to bonus depreciation. This is equivalent to the increase in the tax shield generated by \$1 of new investment which can be written as written as

$$\textbf{BONUS} = (z - z_0)\tau.$$

I compute BONUS at the industry-by-time level using the bonus depreciation rates offered in each year and industry-level z_0 data from Zwick and Mahon (2017). The variation in z_0 is based on corporate tax return data which measures the investments made by firms in each industry in each MACRS asset category.

On average, bonus depreciation decreases the present value of new equipment investments by 1.065 percentage points during the full sample period. When firms are able to immediately deduct 50% of new assets via bonus depreciation, the incentive lowers the present value of these investments by just over 2 percentage points.

3.2.2 DPAD

As mentioned above, I follow Ohrn (2018) in constructing **DPAD** at the industry-by-size-by-year level to capture the percentage point reduction in effective tax rates generated by the DPAD. The key to constructing DPAD is the accurate measurement of QPAI%. Ohrn (2018) uses IRS Statistics of Income division data to calculate QPAI% at the industry level. For each industry, SOI provides total Income Subject to Tax and total Domestic Production Activities Deduction. Dividing total Domestic Production Activities Deduction by the DPAD rate yields total Qualified Production Activities Income. Dividing this amount by total Income Subject to Tax plus total Domestic Production Activities Deduction generates an industry-level measure of QPAI% in each year 2005–2012.[13] The industry-level QPAI% is then rescaled to account for differences in DPAD usage across firms of different sizes using data from the SOI Corporate Source Book. The resulting QPAI% measure varies across approximately 900 industry-size bins and over the years 2005–2012. To turn QPAI% into an effective tax rate reduction, I multiply it by the DPAD rate offered in each year and the 35% statutory corporate tax rate. Finally, Because the deduction is limited to firms with positive taxable income, I set DPAD equal to 0 for firms that report no taxable income in a given year.[14]

Once the DPAD is fully phased in at the 9% rate, it decreases the average effective tax rate that firms in the sample face by 0.9 percentage points. During this time, firms in the top quartile of DPAD benefit receive a 1.9 percentage point reduction in their effective tax rates due to the tax break.

3.2.3 ETI

Because the DPAD replaced the ETI, I am careful to control for its effects. I construct the **ETI** variable in a manner similar to the DPAD variable. ETI varies at the industry-level based on export intensity (data from USA Trade Online) and over time due to the timing of the policy. ETI measures the percentage point reduction in effective corporate income tax rates due to the export incentive.[15]

[13]A concern in relying on time-varying QPAI% is that firms may shift domestic manufacturing income into high DPAD years. Estimates are stable when I use average QPAI% over the full time period, alleviating this concern. Further, if firms were successful in shifting, DPAD would over estimate the generosity of the policy on treated firms and downward bias estimates of the effect of the DPAD on executive compensation.

[14]I follow Manzon Jr and Plesko (2001) and others in "grossing-up" federal income taxes plus deferred taxes by the federal statutory tax rate to construct a proxy for taxable income. In doing so, I acknowledge the concerns noted by Hanlon (2003) and others in estimating taxable income from financial statement data. These concerns are less severe in this context because I only use the taxable income to generate an indicator for taxable status. To the extent that I mismeasure taxable income, my estimates of the effects of the DPAD on executive compensation will be biased toward zero.

[15]Although the ETI is also a corporate tax break, I do not focus on estimating or interpreting its effects because (1) it was directed at a small subset of firms, (2) it was available for only a limited amount of time (2001–2004) and during this time was under constant litigation from the WTO, and (3) it does not represent similar contemporary policies as they have been ruled illegal under WTO standards.

3.3 Firm Control Variables

Execucomp data is linked to firm financial statement data from Compustat. In baseline specifications, I follow the intuition presented in Gabaix and Landier (2008) and control for **Firm Size** measured as the log of total assets. In other specifications, I control for the log of **R&D** expenditures as Garicano and Rossi-Hansberg (2006) showed that executive compensation is linked to technological change. To mitigate concerns that the tax breaks increase executive pay only via increased profitability or changes in stock price, in some specifications, I include controls for a firm's Return on Assets (**ROA**) and a firm's **Stock Return** (inclusive of dividend payments).

3.4 Governance Variables

In Section 6, I explore whether the tax breaks result in heterogeneous effects across firms with differing governance structures. I focus on three proxies for governance strength. The first, **Bebchuk Gov**, is a metric based on the Bebchuk, Cohen and Ferrell (2009) Entrenchment Index which measures the presence of up to six provisions in firm charter and bylaws that protect managers (mostly in the case of hostile takeovers). Bebchuk Gov varies from 0 to 6 where 6 represents the firms with the strongest shareholder governance.[16] The second measure, **Large Holder**, is the percentage of shares held by the largest single institutional investor (following Chetty and Saez (2005)). I construct this measure using 13f filing from Thomson Reuters. The third measure I use is **Executive Tenure**, the average tenure of the top five highest paid executives at the firm. Bertrand and Mullainathan (2001) use this same measure to proxy for governance, arguing that executives with longer tenure are more likely to be entrenched and less likely to be subject to shareholder scrutiny.

4 Estimation Strategy & Baseline Results

4.1 Estimation Strategy

To measure the effect of the tax breaks on executive compensation, I implement a modified difference-in-differences empirical strategy. I estimate parameters from regressions of the form

$$\text{Ln(Comp)}_{i,t} = \beta_0 + \beta_1[\text{BONUS}_{j,t-1}] + \beta_2[\text{DPAD}_{j,a,t-1}] + \gamma\mathbf{X}_{i,f,t-1} + \nu_t + \mu_f + \varepsilon_{i,t}, \quad (1)$$

where subscripts i, f, j, a, and t index executives, firms, industries, firm size classes, and time, respectively. In all specifications, I include year and firm fixed effects, $\nu_t + \mu_f$, to eliminate secular trends in executive compensation and level differences in pay across firms.[17] $\mathbf{X}_{i,f,t}$ represents an

[16] Note, in the original Bebchuk, Cohen and Ferrell (2009) Entrenchment Index, a score of six represents the most entrenched managers. Additional details on the construction of Bebchuk Gov are presented in Appendix C.

[17] I use firm fixed effects following the executive compensation literature and because the average executive appears in the data for fewer than four years. In Appendix D, I present baseline results with executive and executive-firm

array of control variables that vary across specifications. Following the executive compensation literature, I lag right hand side variables one period, recognizing that contracts are written in advance and therefore pay may take some time to incorporate changes in factors such as firm performance or, here, tax policy.[18] Coefficient β_1 is an estimate of the percent increase in executive compensation generated by a one percentage point decrease in the present value of investment costs due to bonus depreciation. Coefficient β_2 is the percent increase in executive compensation due to a one percentage point decrease in effective corporate income tax rates due to the DPAD.

Both β_1 and β_2 can be roughly interpreted as difference-in-differences estimates. β_1 is identified by comparing executive compensation in industries that invest in longer-lived assets (and therefore benefit more from bonus depreciation) relative to the increase in compensation in industries that invest in shorter-lived assets when bonus is turned on or increased. β_2 is estimated by comparing the increase in executive compensation in industry-firm-size bins in which a large amount of income qualifies for the DPAD relative to compensation in industry-firm-size bins in which a small amount of income qualifies when the policy in implemented and scaled.[19] Because most of the variation in the tax breaks is at the industry-level, I cluster standard errors at the 4-digit NAICS industry level (Bertrand, Duflo and Mullainathan, 2004; Cameron and Miller, 2015).[20]

The primary threat to the identification of the tax break parameters is that other industry-by-time or industry-firm-size-by-time shocks affecting executive compensation might covary with the policies. I address this threat in Section 5 by (1) performing dynamic difference-in-differences analysis to evaluate pretrends and the timing of the tax breaks impacts, (2) by performing placebo tests designed to show that effects are not driven by trends in high QPAI% firms or firms that tend to invest in long-lived assets, but rather by the tax breaks themselves, and (3) by showing that the estimates are stable across a variety of specifications formulated to address this and other threats.

4.2 Baseline Results

Table 2 presents baseline estimates of the effects of tax breaks on executive compensation. Specification (1) estimates the effect of the tax breaks in the presence of only firm and year fixed effects. Specification (2) adds the ETI control. Specifications (3) and (4) progressively add controls for executive experience and gender and then the time-varying control for Firm Size (Log(Assets)).

fixed effects. Despite a smaller sample and the fact that executives are often not around long enough to experience many changes in the tax breaks, the effect of bonus depreciation is positive, large, and statistically significant while the effect of the DPAD remains positive, relatively large, and statistically significant at the 10% level.

[18] In Appendix D, I estimate the contemporaneous effect of the tax breaks on executive compensation and find similar magnitudes to baseline results.

[19] Goodman-Bacon (2018) shows that difference-in-differences estimates may be biased when treatment timing is varied across treated units. As the tax breaks are implemented simultaneously for all units, the β_1 and β_2 estimates do not suffer from this treatment-timing induced bias.

[20] DPAD variation also comes from firm size and taxable status variation in the percentage of income to which the tax break applies. Both theoretically (Cameron and Miller, 2015) and in practice, clustering at the industry-level produces more conservative inference than clustering at the industry-by-firm-size level or firm level.

Specification (5) adds firm-level ROA and Log R&D. Across all five baseline specifications, the effects of both tax breaks are positive, statistically significant, and fairly stable.[21]

[Table 2 about here]

A “bad controls” concern may arise when I include time-varying controls for firm size, ROA, and R&D in Specifications (4) and (5) (Angrist and Pischke, 2008). More precisely, the concern is that if the tax breaks affect executive compensation through their effect on these controls then including them will shut down causal channels and bias the tax break estimates. I address this concern in two ways. First, I estimate whether the tax breaks actually affect the potentially concerning controls. Second, in the following section, I include a number of controls that are defined based on pre-treatment characteristics and, therefore, cannot suffer from a “bad controls” problem.

Appendix E presents the estimates of the effect of the tax breaks on the Table 2 controls as well as a number of other firm outcomes. Indeed, it seems that both ROA and R&D, the controls in Specification (5), are affected by the tax breaks. Firm size, the most powerful firm-level predictor of executive pay, is not affected by either tax break. Given these findings, I designate Specification (4) as my preferred specification and use this specification and its tax break estimates as my benchmarks moving forward. The other estimates presented in Appendix E show that business activity responds to the tax breaks for this sample of large publicly traded firms in much the same way as in samples used in other studies. Consistent with Zwick and Mahon (2017), bonus depreciation increases investment. Consistent with Ohrn (2018), the DPAD increases investment, decreases debt usage, and increases payouts. The firm level analysis also confirms the first stage effects; bonus depreciation decreases the after-tax cost of new investments while the DPAD decreases the firm effective tax rate.

The preferred specification from Table 2 suggests a one percentage point decrease in the present value cost of new investments increases executive pay by 4.4% while a one percentage point reduction in effective corporate income tax rates due to the DPAD increases compensation by 3.2%. I discuss and contextualize these magnitudes in Section 7. In the following section, I subject these estimates to a number of checks to assure the reader of their validity.

5 Identification Strategy Scrutiny

5.1 Dynamic Difference-in-Differences Analysis

The estimated effects of the tax breaks on executive compensation may be an artifact of differential trends between treated and control groups rather than direct results of the tax policies. To

[21]The estimated coefficients on each of the control variables are in line with prior findings and in accord with predictions. Male executives and executives with more experience are paid more. Executive compensation is higher at larger and more profitable firms. The ETI does not affect executive compensation, likely owing to the uncertainty surrounding the policy.

address this concern, I estimate differences in compensation between the most and least treated executives in each year for each policy. To do this, I replace each tax break in Equation (1) with its identifying cross-sectional variation interacted with year fixed effects. For bonus depreciation, I run the regression

$$\text{Ln(Comp)}_{i,t} = \beta_0 + \sum_{k=1998}^{2012} (\beta_k[(1-z_0)\tau\mathbb{1}(k)]) + \beta_1[\text{DPAD}_{j,a,t}] + \gamma\mathbf{X}_{i,f,t} + \nu_t + \mu_f + \varepsilon_{i,t} \tag{2}$$

where $(1-z_0)\tau$ is the bonus depreciation cross-sectional variation, which is equal to the percentage point reduction in bonus depreciation that a firm would receive if bonus depreciation were set to 100%.[22] $\mathbb{1}(k)$ is an indicator equal to 1 in year k. Other specification choices mimic Specification (4) of Table 2. The coefficients $\beta_{1998} - \beta_{2012}$ describe differences in executive compensation between firms with high and low benefit from bonus depreciation relative to the differences in 2001.

Panel (a) of Figure 3 presents the $\beta_{1998} - \beta_{2012}$ coefficients with corresponding 95% confidence intervals. For scale, Panel (b) adds these coefficients to trends in the average of Ln(Comp) during the period. Four takeaways are readily apparent. First, coefficient estimates are relatively small and close to zero in years 1998–2001. That is, there are no clear pretrends prior to policy implementation.[23] Second, upon bonus depreciation implementation in 2002, executive compensation at firms in longer-lived industries increases sharply relative to compensation in shorter-lived industries, suggesting a causal effect of the tax break on executive compensation.[24] Third, there is no obvious reversal of this effect when bonus depreciation is not offered in years 2005–2007. This finding is consistent either with downward wage rigidity among executives or perhaps asymmetric effects of the tax break as in Benzarti, Carloni, Harju and Kosonen (2020). Fourth, differences in compensation remain large and elevated when bonus depreciation is reintroduced in 2008 suggesting the average effects of the tax break are not short-lived or corrected via firm-level governance mechanisms.

[Figure 3 about here]

I analyze the dynamic effects of the DPAD on executive compensation in a similar manner by estimating coefficients from a regression of the form

$$\text{Ln(Comp)}_{i,t} = \beta_0 + \sum_{k=1998}^{2012} (\beta_k[\text{QPAI\%}_{j,a}\mathbb{1}(k)]) + \beta_1[\text{BONUS}_{j,t}] + \gamma\mathbf{X}_{i,f,t} + \nu_t + \mu_f + \varepsilon_{i,t} \tag{3}$$

[22]This benefit is larger for firms that investment in longer-lived assets and have lower z_0, the present value of tax deductions under MACRS. Notice, there is no benefit for firms with $z_0 = 1$, those that could hypothetically deduct all of their investments from their taxable income immediately under MACRS.

[23]The 1999 coefficient is statistically significant. In the following section, I show the statistical significance of this coefficient is specification-specific and not indicative of violations of the underlying DD identifying assumption.

[24]The 2002 coefficient is elevated, but not statistically significant, suggesting a delayed effect and reinforcing the choice to use lagged right hand side variables in regression specifications.

where QPAI% is the industry-firm-size average percent of income eligible for the DPAD deduction, which is set to zero for firms that have negative taxable income because they cannot benefit from the tax break.

Figure 4 presents coefficients $\beta_{1998} - \beta_{2012}$ in Panel (a) and the coefficients added to average compensation trends in Panel (b).[25] As was the case with bonus depreciation, coefficients are relatively small and close to zero in years 1998–2004 suggesting differences in pretrends do not undermine the baseline policy estimates. The coefficient in 2002 is statistically significant, but seems to be a product of the larger variation in DPAD coefficient estimates rather than differential trends.

Interestingly, there does not seems to be any effect of the DPAD on compensation just after the tax break was implemented in years 2005–2007. However, in years 2008–2012, differences in compensation are large and statistically significant.[26] This increase in coefficients happens one year after the DPAD was increased in generosity from 3 to 6% in 2007. The lag between policy implementation and observable differences in executive compensation is likely due to two primary factors. First, the deduction rate was small is years 2005 and 2006. Then in 2007, it *doubled* in generosity. If it takes one year for the tax breaks to affect compensation, then 2008 might be the year we would expect to see a real effect. Second, due to uncertainty surrounding implementation and the complexity of the policy, very few firms claimed the deduction in early years. Lester and Rector (2016) shows the percent of corporate tax filers claiming the deduction doubled between 2005 and 2007.

[Figure 4 about here]

Despite the delayed response of executive pay to the DPAD, the estimates presented in Figure 4 show a causal effect of the tax break on executive compensation; differences in compensation between executives in DPAD-eligible firms and non-eligible firms are small and close to zero prior to policy implementation and when the policy is new and not very generous, but large when the deduction large. In sum, the dynamic analyses across both tax breaks suggest (1) that executive pay did not differ in ways that would invalidate the empirical analysis in the pre-period of either policy and (2) that the two tax breaks had a substantial effect on executive compensation.

5.2 Robustness to Alternative Specifications

Table 3 presents a host of alternative specifications that are designed to demonstrate the robustness of the baseline results or rule out alternative explanations for the estimated responsiveness of

[25] Here, β_{2004} is normalized to zero.

[26] In Appendix F, I test whether this pattern in the DPAD dynamic estimates is due to the 2008 recession. To do so, I limit the analysis to firms that maintained positive taxable income throughout the recession. The pattern of coefficients is similar among this subsample, suggesting the recession is not the cause of the estimated dynamic coefficients in Figure 4.

executive compensation to the tax breaks. In Specification (1), I include controls that are based on pre-period firm characteristics. In particular, I measure average firm size, ROA, and R&D for each firm in the 1999–2001 period, then interact tercile indicators for each with year fixed effects. These controls flexibly eliminate concerns that correlations between firm size, profitability, or R&D activity and the tax breaks affect the tax policy estimates. With the pre-period controls, the estimates suggest both tax breaks have large and statistically significant effects. That these results are stable relative to those in Specifications (4) of Table 2 also suggests that "bad controls" issues do not substantially bias the baseline estimates.

[Table 3 about here]

In Specification (2), I directly address concerns that differential trends may be affecting the estimates. To do so, I measure firm-level pre-period growth rates in executive compensation for each firm. Then, I interact quintile indicators for pre-period firm growth with year fixed effects. With these controls, parameters are estimated only within groups of firms that had similar pre-period growth rates in executive compensation. Here, too, the effect of each tax break remains large, positive, and statistically significant.

In Figure 5, I show that the dynamic DD patterns presented in the preceding subsection are robust to (1) controlling for pre-period firm characteristics as in Table 3 Specification (1), (2) to controlling for pre-period growth trends in executive compensation as in Table 3 Specification (2), and to (3) including no firm level controls. There are three key takeaways. First, when no firm level controls are included, the dynamic coefficients are very similar to the baseline dynamic estimates (Figures 3 and 4). Second, when I include either pre-period firm characteristics interacted with year fixed effects or pre-period compensation growth rates interacted with year fixed effects, pre-period coefficients continue to exhibit no concerning trends and are, in fact, closer to zero and statistically insignificant in every year for both policies. Third, when these alternative control functions are included, bonus depreciation coefficients remain large, positive, and statistically significant in all years after 2002 and DPAD coefficients remain large, positive, and statistically significant after 2007. Overall, the dynamic estimates are robust suggesting pre-period firm characteristics that are correlated with the tax breaks and differential pre-period growth trends do not drive the dynamic estimates.

[Figure 5 about here]

In Specification (3) of Table 3, I limit the analysis to domestic firms only.[27] As Keller and Olney (2017) show, executive compensation is correlated with globalization, measured as industry-level export intensity. That the tax break coefficients estimated based only on domestic firms – those

[27] I classify firms as "domestic" if they report no pretax foreign income in years 1999–2001.

less likely to be exporters or subject to globalization trends – are large and positive suggests that export intensity does not drive the results. Here, the DPAD coefficient is now quite large, but no longer statistically significant, likely due to the much smaller sample (43,496 as opposed to 127,256 observations).

As a final check, I explore whether a select number of outliers are driving the estimated effects. As a first step in this check, I create bin-scatter plots for each tax break to visually assess whether outliers might bias overall effects. These are presented Figure 6. In Panel (a), residualized values of the Ln(Comp) are averaged then plotted across 30 equal sized BONUS bins. The outcome variable has been residualized to exclude the effects of executive controls, firm size, ETI, DPAD and year and firm fixed effects. Given this residualization, the slope of the line, which is based on the unbinned data corresponds to the baseline BONUS estimate from Specification (4) of Table 2. Panel (b) does the same thing for the DPAD variable. For both tax breaks, the bulk of the binned data suggest a strong positive relationship. However, average values of residualized compensation at the extreme right of the distribution of each tax break are quite far from the regression line, suggesting that – yes – outliers may affect estimates, potentially significantly. In Specification (4) of Table 3, I winsorize both tax breaks at the 2^{nd} and 98^{th} percentiles then re-estimate the effect of the tax breaks on the Ln(Comp). The DPAD estimate is essentially unaffected while the BONUS estimate is larger, suggesting outliers actually push down the BONUS estimate. I rely on baseline estimates rather than those based on winsorized tax break variables as they are more conservative.

[Figure 6 about here]

5.3 Placebo Tests

I now implement two placebo tests, one for each tax break, designed to show that the tax breaks themselves, rather than other shocks to salaries of executives in long-lived or domestic manufacturing intense industries, are responsible for the the baseline policy estimates.

The bonus depreciation placebo relies on the fact that only equipment investments qualified for bonus depreciation during the sample period. This limitation results in a set of industries that invested heavily, on average, in long-lived assets classified as structures and intellectual property that did not qualify for bonus depreciation. Industries that invested in five times more structures and intellectual property than equipment are identified as placebo industries.[28] To implement the placebo analysis, I generate **BONUS Placebo** $= b \times 35 \times$ an indicator for placebo industries where b is the is the bonus depreciation rate. BONUS Placebo is scaled such that coefficient estimates are interpreted as the percent increase in compensation of executives in placebo industries due to a one percent decrease in the after-tax present value cost of investments they would receive if all

[28] Garrett, Ohrn and Suárez Serrato (2020) first proposed this placebo. Industries represented by NAICS codes 2111, 4821, 5311, 7111, 7112, 7211, 7212, and all of sector 81 invested in 5 times more ineligible than eligible capital during the sample period.

their investments qualified. The BONUS Placebo analysis will be concerning if it returns estimates that are large and positive as it would indicate shocks in long-lived asset industries unrelated to the tax break are driving the policy estimates.

To create the DPAD placebo, I reconstruct the DPAD variable replacing the taxable indicator with an indicator for nontaxable status. The DPAD placebo is equal to the percentage point decrease in the effective tax rate that a firm would receive if it were taxable. Here, too, the placebo estimate will be concerning if they are large and positive because they will indicate shocks to domestic manufacturing intense firms that receive no tax benefit increase executive compensation.

Table 4 presents placebo results. Focusing on Specification (3), in which I have replaced both tax breaks with their placebo counterparts, the BONUS placebo has a small and statistically insignificant effect while the DPAD placebo has a negative and marginally significant effect.

I provide dynamic estimates for each placebo tax break in Figure 7. BONUS placebo results are presented in Panel (a), which show relative increases in executive salaries exactly when bonus depreciation is not offered in years 2005–2007. These differences melt when the policy is again offered in 2008–2012.[29] With respect to the DPAD placebo, the dynamic estimates do not coincide with the implementation of the tax break or increases in its generosity. Based on the placebo estimates in Table 4 and these dynamic estimates, I conclude that shocks to compensation in long-lived industries or domestic manufacturing industries that are unrelated to the tax breaks, themselves, and are not responsible for the baseline policy estimates.

To summarize, the tests presented in this section support the internal validity of the study's design. The dynamic difference-in-differences estimates, placebo tests, and alternative specifications all suggest both tax breaks led to large increases in executive compensation.

6 Mechanisms

I now move on to identify the mechanism or mechanisms by which the tax breaks increased executive compensation. In general, there are three different pathways by which the tax breaks may increase executive pay. The first is simply via a mechanical effect; the tax breaks may lead to increases in the performance metrics upon which compensation levels are contractually based. The second pathway is via a highly competitive market for managerial talent. That is, the tax breaks increase after-tax cash flows which can be used to attract scarce, high value managers. Third, it could be that executives benefit via rent extraction. I explore these possibilities below by controlling for mechanical determinants of executive compensation then estimating heterogeneous effects of the tax breaks for new executives, executives in positions of power, and across a number of firm-levels measures of corporate governance strength.

[29] The rise in years 2005–2007 is likely related to the housing and real estate bubble as the placebo industries were heavily invested in real estate.

6.1 Mechanical Effects

Executives' bonus pay are usually based on accounting measures of firm performance, in particular ROA (Frydman and Jenter, 2010) while the value of stock-based pay is directly tied to stock price growth. If the tax breaks increase ROA and stock price growth, then the estimated impact of the tax breaks on executive compensation could be due to a purely mechanical and non-discretionary process. To test whether this is the case, I add lagged and current measures of ROA and stock price growth to the baseline model. If the effect is purely mechanical, then adding these controls should result in tax policy estimates close to zero. I add these controls in Specification (1) of Table 5. The effects of both tax breaks remains large and statistically significant suggesting that the tax breaks affect compensation mostly through non-mechanical channels.

[Table 5 about here]

As a second exploration of potential mechanical effects, I estimate the effects of the tax breaks on different components of compensation. Specifications (2) and (3) of Table 5 focus on Current Compensation (only salary and bonus compensation), and NonCurrent Compensation (stock-based pay and other forms of compensation). The estimates demonstrate that bonus depreciation affects executive pay only through Current compensation while the DPAD affects only NonCurrent compensation. The results in Specification (4) also show that the DPAD leads to a shift in income from Current to NonCurrent compensation. These results are inconsistent with mechanical effects for two reasons. First, due to accounting rules, bonus depreciation does not affect a firm's ROA because it leaves accounting depreciation unchanged (Edgerton, 2012). Therefore, the mechanical effects of bonus depreciation should only affect NonCurrent compensation. This is not the case. Second, as the results in Appendix E show, the DPAD has a large and positive effect on ROA, but DPAD does not affect Current compensation which is based in large part on ROA and related measures.

While the Table 5 results are not consistent with the mechanical pathway, they are consistent with the legislative and cash flow natures of each policy. Consider first bonus depreciation, which increases near term cash flows and was implemented in a piecemeal fashion, sometimes retroactively. This led to unexpected and uncertain increases in cash which could be used to increase salaries and bonuses, the cash-based components of compensation. In contrast, the policy permanence of the DPAD led to more certain future cash flows and an executive preference for stock-based pay that would reflect these future flows. That the effect on different components of compensation matches the cash flows generated by each policy further validates the study's design.

6.2 Heterogeneity by Executive Position

In Table 6, I test whether the effects of the tax breaks are concentrated among executives with different positions at the firm. In Specification (1), I interact the tax breaks with an indicator equal to one for executives in their first year with a firm.[30] If the effect of the tax breaks operated mainly through a competitive for managerial talent, then we would expect the effects to be concentrated among new contracts which would be more common among new hires. That the interactions between the tax breaks and the new hire indicator are both small and statistically insignificant represents a piece of evidence against the competitive market mechanism.

[Table 6 about here]

In Specifications (2) and (3), I interact the tax breaks with indicators for CEO and for Board Member. Note that most CEOs sit on the board of directors so the interactions in Specification (3) essentially tell us how the effects are concentrated among CEOs and other executives sitting on the board of directors. The Specification (2) and (3) results suggest (1) that the effects of bonus depreciation, but not the DPAD, are larger for CEOs and Board Members and (2) that the policies have positive and statistically significant effects on executives not serving as CEOs or as board members. Interpreting these results in light of the fact that bonus depreciation only affects cash-based compensation (Specifications (2) and (3) Table 5) suggests that executives in particularly powerful positions are able to capture unexpected increases in cash flows due to bonus depreciation. Overall, the heterogeneity results by executive position suggest the effects of the cash flows are not concentrated among new hires, where a market for managerial talent is most likely to be at play, and are sometimes larger for executives in more powerful positions who may be better equipped to extract rents.

6.3 Heterogeneity by Governance Measures

If rent extraction is responsible for the larger benefits of the tax breaks that accrue to executives in positions of power then strong corporate governance structures may mitigate their effects. I test this hypothesis in Table 7. In Specification (1), I include interactions between the tax breaks and "$\mathbb{1}$(Strong Governance)," an indicator denoting whether firms are in the top/bottom third of firms with best governance structures according to the Bebchuk, Cohen and Ferrell (2009) Entrenchment Index. In Specification (2), I follow Chetty and Saez (2005) in testing whether the effect of the tax break is mitigated in firms with a single large institutional shareholder.[31] To do so, I interact the tax breaks with an indicator denoting whether the firm is in the top/bottom third of the "Large Holder" distribution. In Specification (3), I follow Bertrand and Mullainathan (2001) in considering management relatively immune from shareholder governance at firms with executives with longer

[30] I use the full Execucomp database rather than just the dataset based on top five highest paid executives to construct this measure. This reduces the possibility that an executive was classified as a new hire after an increase in their salary moved them into the top five highest paid category.

[31] Recent research has shown that large *passive* institutional investors are not necessarily strong principals (Schmidt and Fahlenbrach, 2017). However, passive ownership was less than 10% of total equity ownership during the sample period as opposed to 40% today (Anadu, Kruttli, McCabe and Osambela, 2020).

tenure. Here, I interact the tax breaks with an indicator equal to 1/0 for firms in the bottom/top third of the Executive Tenure distribution.[32] Specification (4) includes all three interactions. In Specification (5), I interact the tax break with $\mathbb{1}$(Combined Governance), an indicator equal to one for firms that are in the top tercile in any two of the three governance indicators that I use in Specifications (1)–(4). If the tax breaks are mitigated in firms with better shareholder governance and less entrenched managers then the interactions terms should all be negative.

[Table 7 about here]

Specifications (1) and (2) show that the effect of the DPAD, but not bonus depreciation, is mitigated in firms with the lowest entrenchment measures and in firms with the largest institutional shareholders. The Specification (3) results suggest that both tax breaks have less effect on compensation in firms with shorter executive tenures. In Specification (4), the signs of all the interactions are fairly large and negative in sign although only statistically in three of the six interactions. I take this as strong, but suggestive evidence that all of the governance measures may mitigate the effects. I use the term "suggestive" in interpreting the results as only 23,441 observations occur in the top or bottom terciles of all three governance measures. In Specification (5), the interaction terms on the Combined Governance indicator are negative and statistically significant at the 1% level. Importantly, we see the coefficient sizes on the interactions are nearly the same magnitude – but in the opposite direction – as the tax break effects, themselves. This indicates that among firms in the top tercile of at least two governance measures, the tax breaks have a precisely estimated null effect on executive compensation. Put differently, strong governance structures have the power to fully mitigate the effects of the tax breaks on executive compensation. Overall, Table 7 provides strong evidence that the tax breaks have smaller effects in better governed firms and therefore supports the rent capture mechanism.

7 Discussion

Thus far, this study has shown that tax breaks for corporations lead to increases in compensation for the highest paid executives at large publicly traded US companies. In this section, I provide a natural characterization of the magnitude of the estimated effects. I then discuss how these magnitudes compare to previous studies that examine the effect of corporate taxes on wages and what this comparison means for the effects of the tax breaks on income inequality. Finally, I synthesize the evidence presented in Section 6 to provide new evidence on the determinants of executive compensation.

[32] I construct all three indicators based on firm-level averages during the entire sample period. In Appendix H, I test whether the tax breaks affect the governance measures upon which the indicators are based. The tax breaks do not have statistically significant effects on any of the measures. The effect sizes also suggest the tax breaks do not affect the firm-level indicators as they are not large enough to move firms from one tercile of any distribution to the other.

7.1 Results Magnitude

To better understand the magnitudes of the estimated effects, I now use my preferred estimates (Specification (4), Table 2) to measure the increase in the compensation of the five highest paid executives at a firm associated with a dollar generated by the tax breaks. I begin with bonus depreciation. The average value of BONUS during the years 2001–2012 was 1.54. The 1.54 percentage point decrease in the PV of investment costs increased compensation of the five highest paid executives at a firm by 6.78% (=4.4% $\times$ 1.54) or by $924,000.[33]

In thinking about the cash flows generated by the policy, recall that bonus depreciation accelerates tax deductions from the future to the present. As a result, there are two ways to think about the cash flows generated by a one unit increase in BONUS. The first is simply the cash generated in a given year, ignoring the resulting lower cash flows in the future. The second is the present value of cash flows, which takes into account the intertemporal displacement of the tax shield. While the first way is clearly incomplete, it may be the way that unsophisticated or captured compensation committees measure their available funds or justify their compensation decisions.

During the years 2001–2012, the average bonus depreciation rate was 43%. The average firm in the sample made $315 million in investments per year. Firms were taxable during this period 75% of the time. As a result, bonus depreciation increased cash flows in any given year by about $101 million per year per firm (=$315 million $\times$ 43% $\times$ 75%) when future cash flows are ignored. Comparing the $924,000 to $101 million suggests that just over 0.9% of cash flows generated by bonus depreciation go towards executive pay.

When we instead correctly consider the intertemporal nature of the tax break, this statistic is more alarming. Bonus depreciation decreased the present value costs of investment by 1.54% for the average firm during the years 2001–2012. This decreased the present value costs of investment by only $4.85 million per year for the average firm. Comparing the $924,000 increase in compensation to this $4.85 million increase in *present value* cash flows suggests that for every present value dollar generated by the tax break, compensation of the top five highest paid executives at a firm increased by 19 cents.

The DPAD calculation is more straightforward as there is no time value of money consideration. Here, a one percentage point decrease in effective tax rates due to the DPAD increases the compensation of the top five highest paid executives by $455,000. The average firm that benefited from the DPAD reported $297 million in taxable income per year so the one percentage point decrease in effective tax rate increased after-tax cash flows by $2.97 million for the average firm. Comparing the $455,000 to the $2.97 million suggests that for every dollar generated by the DPAD, compensation of the five highest paid executives at a firm increased by just over 15 cents.

[33] The base here is the average compensation awarded from Table 1, $2.726 million $\times$ 5.

7.2 Tax Breaks and Income Inequality

Whether these tax breaks and decreases in corporate taxation, more generally, lead to income inequality depends on earnings responses for the average worker. If earnings for the average worker respond to corporate tax cuts in magnitudes similar to the earnings of top executives then corporate taxation may not exacerbate income inequality. If, however, average earnings are less responsive, then these tax breaks and decreases in corporate taxation will result in increases in income inequality.

I begin this investigation by comparing the findings in this study to those of a large, well-established literature that estimates the effect of corporate taxation on average wages.[34] In general, papers in this literature conclude that a one percent increase in the net of corporate tax rate (reflecting a decrease in the tax rate) increase wages by less than one percent. Fuest, Peichl and Siegloch (2018) provide the most state-of-the-art estimates of this elasticity and find that a one percent increase in the net-of-tax rate (reflecting a decrease in the tax rate) increases wages by 0.39 percent.[35]

Focusing on the DPAD, I find that a one percentage point decrease in effective tax rates increases executives pay by 3.34%. Translating this into a net of tax rate elasticity, I find that a one percent increase in the net of corporate tax rate increases the pay of top executives by 2.2%. Comparing this number to Fuest, Peichl and Siegloch (2018)'s 0.39 suggests corporate tax cuts increase executive pay by more than five times as much as the pay of the average worker. It follows that if average wages respond to the DPAD in the way Fuest, Peichl and Siegloch (2018) suggest, the DPAD and corporate tax cuts generally lead to increases in income inequality. A point to highlight is these increases in income inequality all come from within-firm changes in incomes. If the tax cuts benefit some firms and not others, then the within-firm and extra-firm effects on income inequality may be even larger.[36]

While the conclusion that corporate tax cuts increase within-firm income inequality is striking, it is not wholly unexpected in the context of a number of recent studies. Dobridge, Landefeld and Mortenson (2019) use administrative tax data to directly measure the effect of the DPAD on workers' taxable incomes. They find the DPAD increased incomes at the top of the earnings

[34] Highlights of this literature include Felix (2009) Arulampalam, Devereux and Maffini (2012) Liu and Altshuler (2013), Clausing (2013), Suárez Serrato and Zidar (2016) and Fuest, Peichl and Siegloch (2018).

[35] A related statistic is the burden of the corporate tax on labor. Fuest, Peichl and Siegloch (2018) show their elasticity suggests about 50 percent of the corporate tax burden is born by workers. This is a relatively middleground estimate. Suárez Serrato and Zidar (2016) find workers bear 30-35% of the burden. Desai and Foley (2007) find up to 75 percent of the burden is born by workers. Almost all papers find workers bear less than 100 percent burden and therefore face a net-of-tax wage elasticity of less than unity.

[36] Song, Price, Guvenen, Bloom and Von Wachter (2019) show that most increases in US income inequality since the late 1970s come from between- rather than within-firm differences in income inequality. Given this context, the findings presented here suggest a nonneglible portion of the increases in within-firm income inequality may be due to decreases in corporate income tax rates. Kline, Petkova, Williams and Zidar (2017) and Piketty, Saez and Stantcheva (2014) present two potential alternative sources of increases in within-firm inequality.

distribution but had no effect of incomes in the bottom half. In a related study, Nallareddy, Rouen and Suárez Serrato (2018) show that state corporate tax cuts also increase income inequality. Finally, Garrett, Ohrn and Suárez Serrato (2020) show that local exposure to bonus depreciation decrease average wages. Contrasting this finding with the bonus depreciation estimates I provide here suggests bonus depreciation also increased income inequality.

7.3 Determinants of Executive Compensation

The level and rise of executive compensation in the US and around the world has led to a healthy debate regarding the determinants of executive pay. While some have argued that executive pay is simply the natural outcome of a labor market in which firms optimally compete for scarce managerial talent (Rosen (1981), Kaplan and Rauh (2009), Kaplan and Rauh (2013)), others contend that executive pay represents a form of rent extraction and that the level and structure of pay are decided by the executives themselves (Bertrand and Mullainathan (2001), Bebchuk, Fried and Walker (2002), Bebchuk and Fried (2003)).

While the results in this study are not fully conclusive, on net, they do seem to suggest the effect of the tax breaks on executive compensation is due to rent extraction rather than a well-functioning market for managerial talent. To summarize, the evidence for the rent extraction mechanism that I have discussed this far is as follows. (1) The effects of the tax breaks were not concentrated among new hires, where pay increases due to competition for managerial talent are most likely to be observable. (2) The effect of bonus depreciation was concentrated among executives in positions of power (CEO, board members). (3) The effects of the tax breaks are mitigated in firms with strong corporate governance structures. In addition, I note two other pieces evidence for the rent extraction mechanism implied by my findings. First, the placebo DPAD analysis showed that executive pay did not increase in domestic manufacturing firms that did not benefit from the DPAD. This suggests that DPAD-benefiting firms were not bidding for talented managers at similar firms as we might expect in a well-functioning market for managerial talent. Second, given that the tax breaks were exogenous and determined by an interaction of federal policy and fairly immutable firm characteristics, the executives did nothing to actually earn the compensation increases. To the extent that the same mechanisms are at play generally in determining executive compensation, these findings together suggest large portions of the level and recent rise in executive pay are generated by rent extraction.

8 Conclusion

This is the first study to measure the effect of corporate tax breaks – in the form of accelerated depreciation or reductions in effective income tax rates – on executive compensation. The results suggest that a large portion of the benefits generated by the tax breaks go directly to executives in the form of higher compensation. For every dollar the tax breaks generate for a firm, compensation awarded to the highest paid executives at the firm increases by between 15 and 19 cents. These magnitudes are much higher than the wage gains for average workers in response to comparable tax cuts. The divergence in executive and average worker responses suggests US federal corporate tax breaks increase income inequality between workers at the same firm.

Even more concerning, the effects of the tax breaks on executive compensation are concentrated exclusively in poorly governed firms, where managers are entrenched against shareholder discipline. The implication is that the executive compensation response is not in the best interest of shareholders and is generated via rent extraction by corporate executives.

These findings have direct implications for the design of optimal tax policy. In crafting corporate tax breaks policymakers traditionally weigh the revenue cost of tax breaks against the desired behaviors they hope to generate, be it increased investment, elevated R&D spending, or job creation. This study suggests that policymakers should factor in the cost of direct payments to corporate executives and subsequent increases in income inequality when they consider future tax cuts. Had these costs been fully considered when TCJA was designed and implemented, the resulting reform would likely have looked substantially different.

The results presented herein also speak to the need for better corporate governance. In the case of the tax breaks, better corporate governance eliminated the ability of executives to capture the rents created by the tax breaks. As a result, better corporate governance also limited the income inequality effects of the bill. Therefore, to the extent that policies can be designed to mitigate principal agent problems and enhance shareholder power, they can also temper the newly uncovered rent extraction and income inequality costs of corporate tax breaks.

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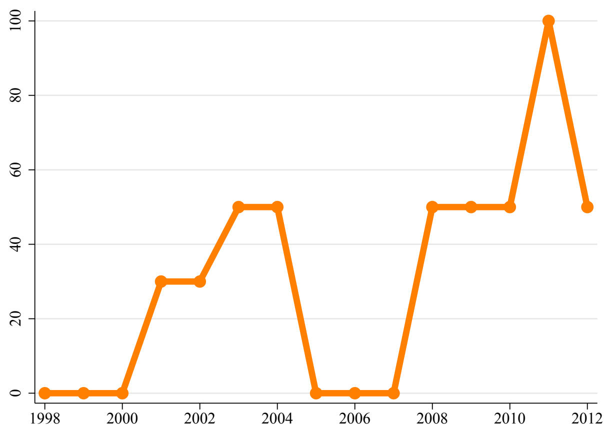
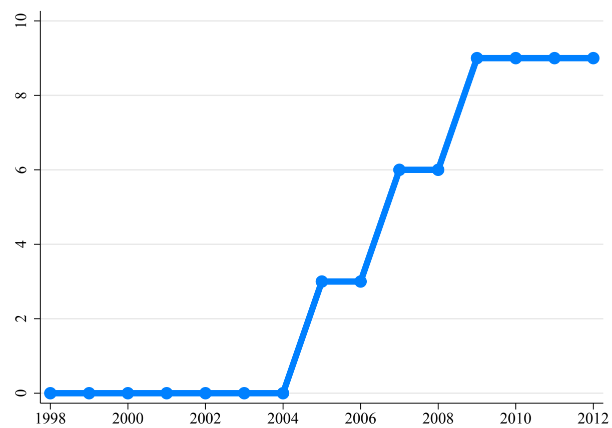
Figures

Figure 1: Bonus Depreciation and DPAD Rates and Empirical Variation over time

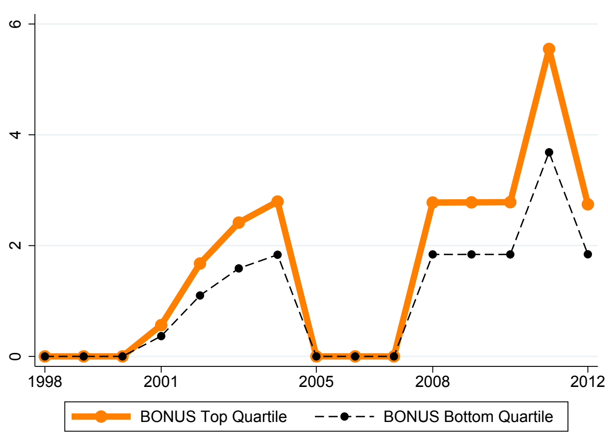
(a) Bonus depreciation rate (%)



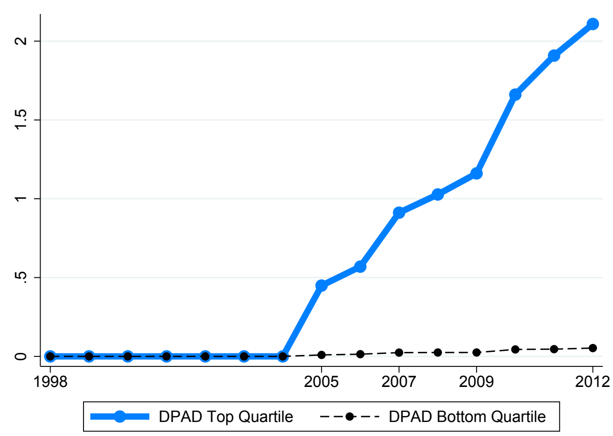
(b) DPAD rate (%)



(c) BONUS for Top vs. Bottom Quartile



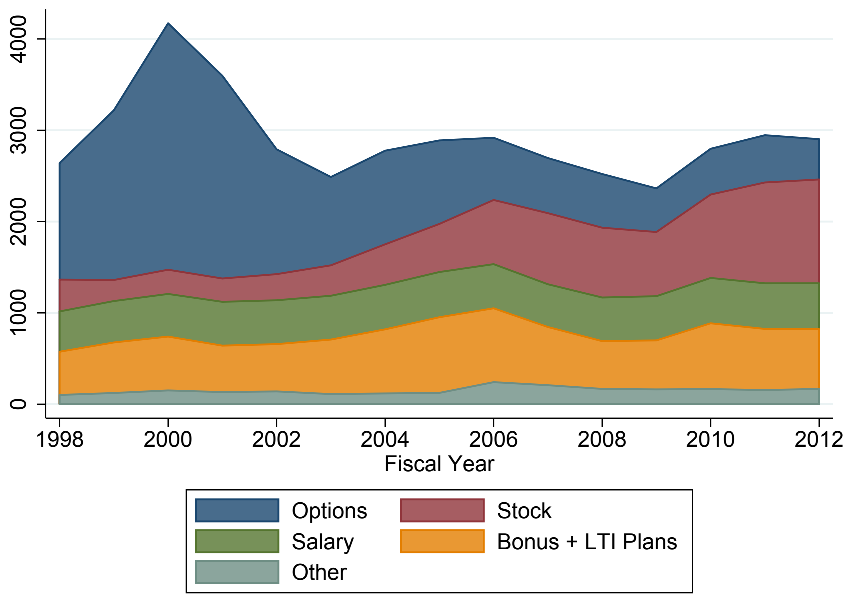
(d) DPAD for Top vs. Bottom Quartile



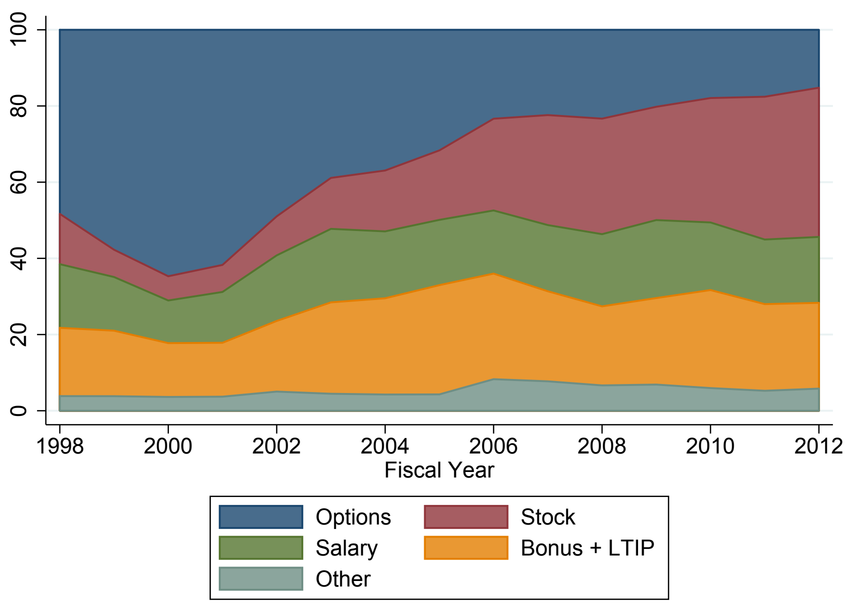
Notes: Figure 1 shows how statutory and empirical bonus depreciation and DPAD rates vary during the sample period, 1998–2012. Panel (a) displays the bonus depreciation rate offered in each year. Panel (b) displays the DPAD rate in each year. Panel (c) shows the percentage point reduction in the present value of new investments due to bonus depreciation for firms in the top and bottom quartile of bonus depreciation benefit in each year. Panel (d) displays the percentage point reduction in effective corporate income tax rates for firms in the top and bottom quartile of DPAD benefit in each year. *Source*: IRS publications and authors calculations based on IRS Statistics of Income, Zwick and Mahon (2017), and Compustat data.

Figure 2: Structure of Executive Compensation for Analysis Sample

(a) Compensation Levels by Category ($1,000s)



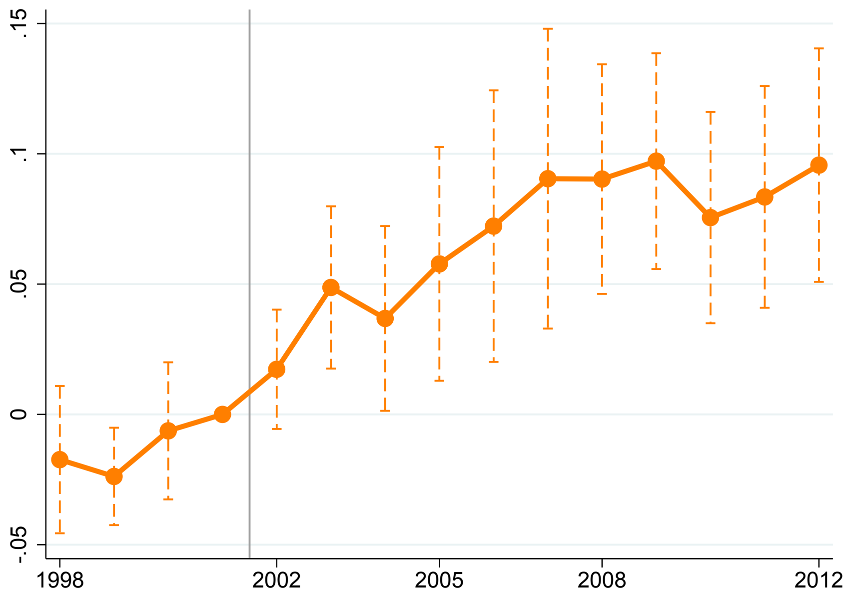
(b) Percent of Total Compensation by Category



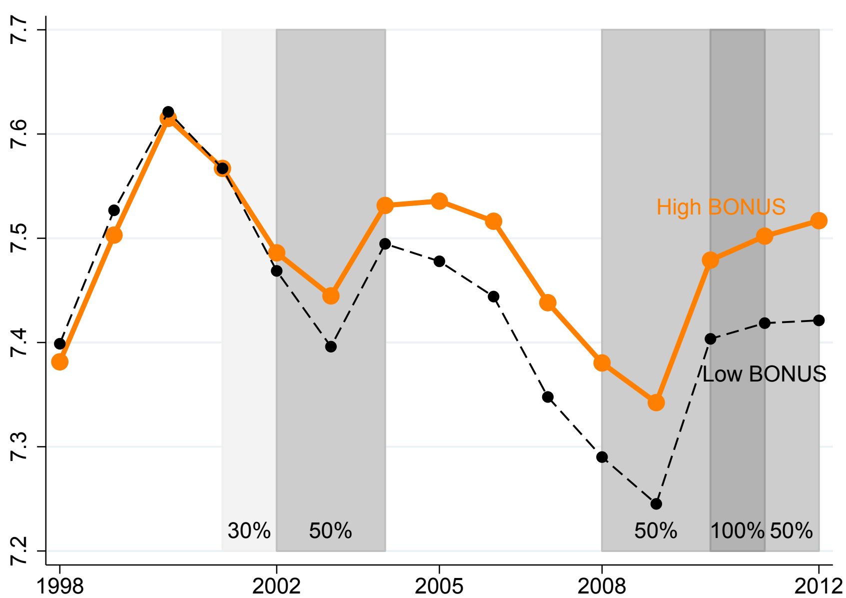
Notes: Figure 2 describes the level and composition of Total Compensation Awarded during the sample period, 1998–2012, across five different compensation categories: Options, Stock, Salary, Bonus and Long-term Incentive Plans, and All Other Compensation. Panel (a) displays the levels of each compensation category in thousands of 2010 dollars. Panel (b) describes the percentage of Total Compensation Awarded in each category in each year. The value of Options is measured using the Black-Scholes model. *Source: Execucomp* database.

Figure 3: Bonus Depreciation Dynamic Difference-in-Differences Estimates

(a) BONUS Coefficients



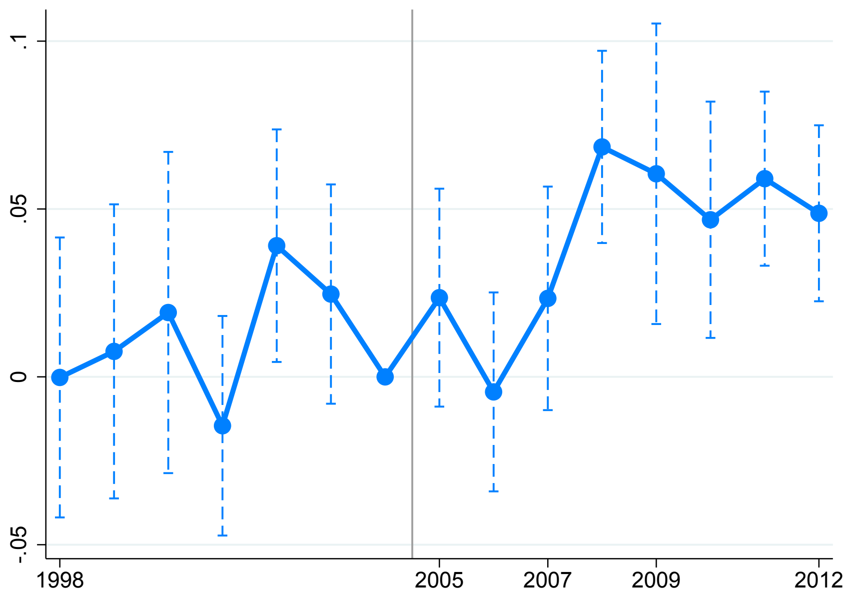
(b) Compensation Trend + Bonus Coefficients



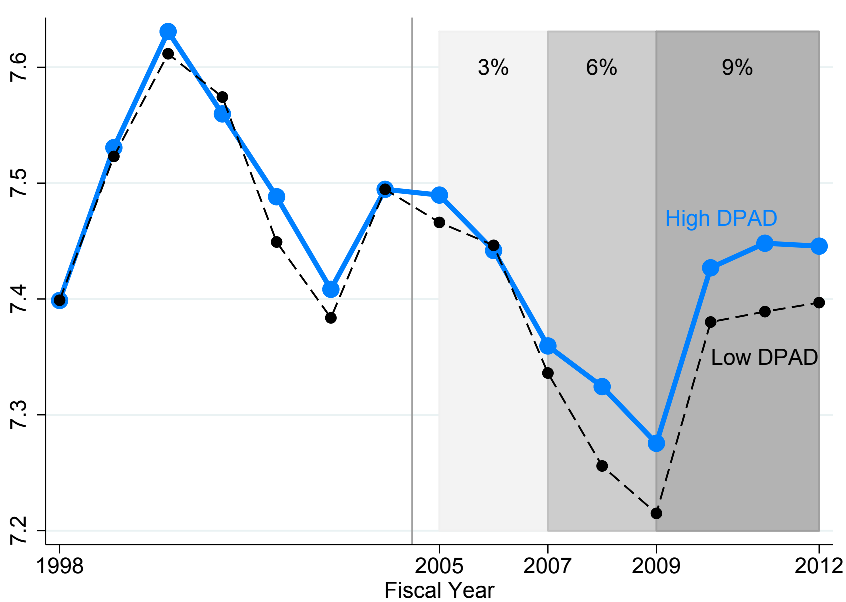
Notes: Figure 3 presents Dynamic Difference-in-Differences estimates as described in Section 5.1. Panel (a) displays $\beta_{1998} - \beta_{2012}$ corresponding to estimating equation (2) where the 2001 coefficient has been normalized to 0. Estimates have been scaled to represent a one IQR difference in BONUS Placebo treatment. Vertical bands represent 95% confidence intervals. In Panel (b), the panel (a) estimates are added to the trend in average Ln(Comp). Background shading is darker when bonus depreciation is more generous.

Figure 4: DPAD Dynamic Difference-in-Differences Estimates

(a) DPAD Coefficients



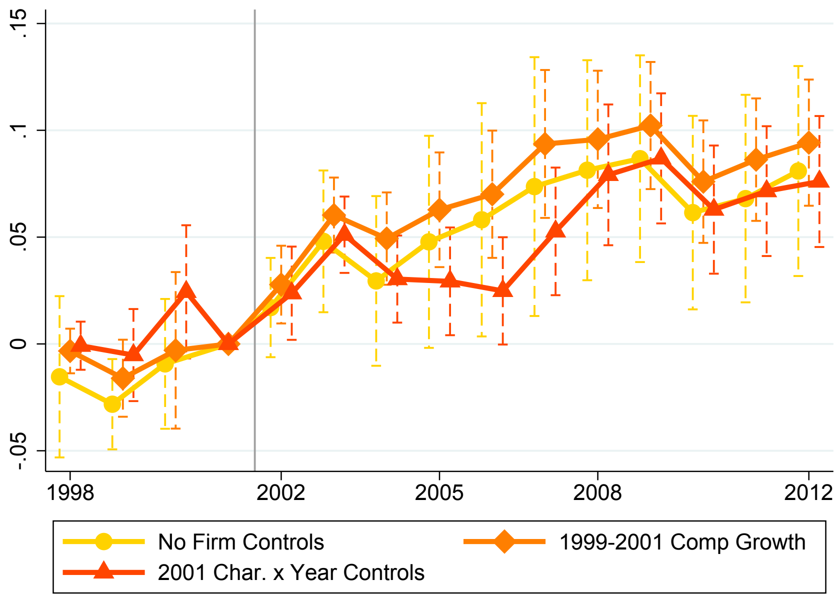
(b) Compensation Trend + DPAD Coefficients



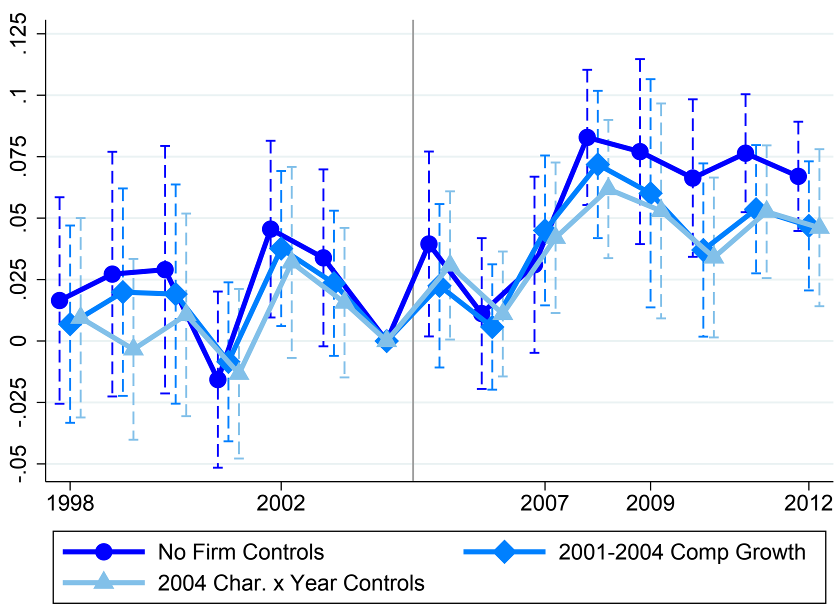
Notes: Figure 4 presents Dynamic Difference-in-Differences estimates as described in Section 5.1. Panel (a) displays $\beta_{1998} - \beta_{2012}$ corresponding to estimating equation (3) where the 2004 coefficient has been normalized to 0. DPAD is scaled such that the coefficients represent the difference between firms that derive 100% of their income from domestic manufacturing activities and firms that no income from domestic manufacturing activities. Vertical bands represent 95% confidence intervals. In Panel (b), the panel (a) estimates are added to the trend in average Ln(Comp). Background shading is darker when the DPAD is offered at higher rates.

Figure 5: Robustness of Dynamic Difference-in-Differences Estimates

(a) BONUS Robustness



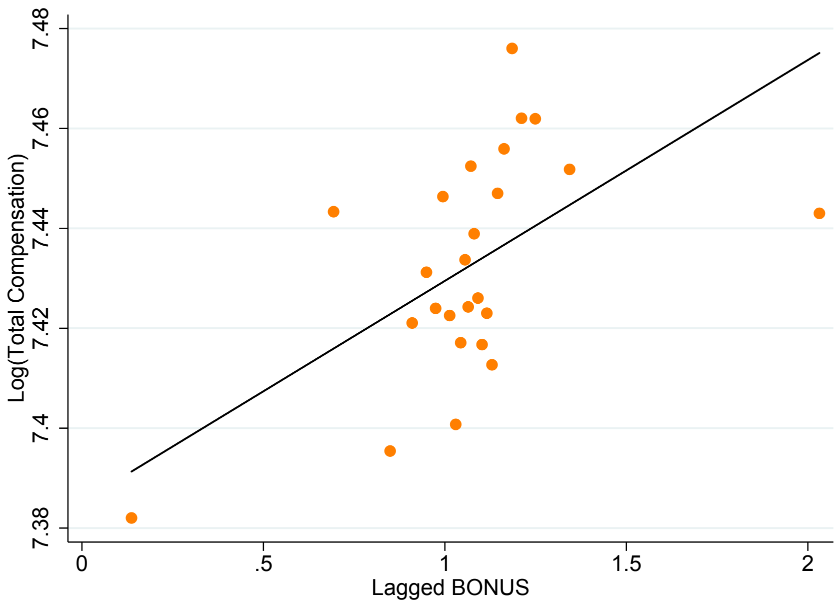
(b) DPAD Robustness



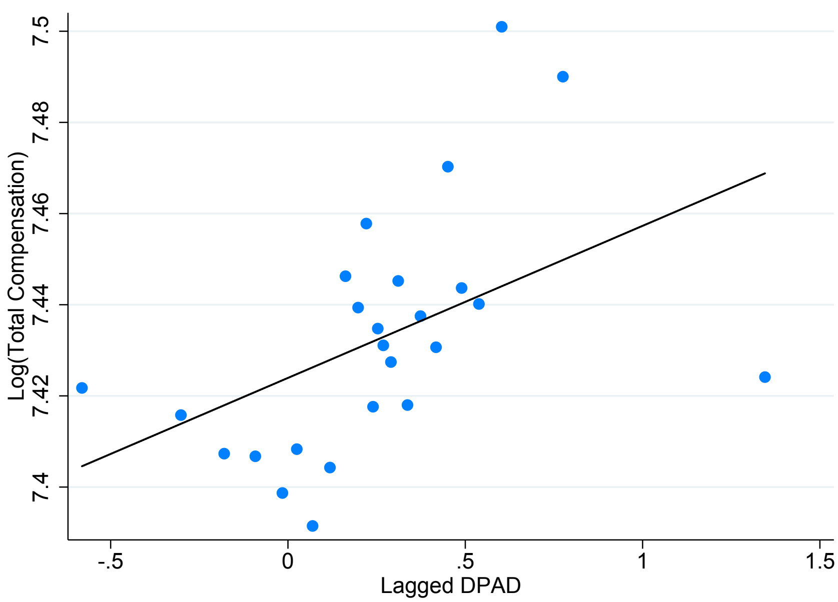
Notes: Figure 5 shows how the coefficient estimates presented in Figure 3 panel (a) and Figure 4 panel (a) vary when alternative control variables are included in the model. The first alternative model includes no firm controls. The second alternative model includes quintiles of total compensation growth in the pre-period interacted with year indicators. The third alternative model includes pre-period terciles of firm size, ROA, and R&D expenditure per dollar of sales interacted with year indicators. All models include year and firm fixed effects as well as controls for executive experience and gender. Figure A3 presents each of these overlaid plots separately.

Figure 6: Effect of Tax Breaks on Executive Compensation; Binscatter Graphs

(a) BONUS



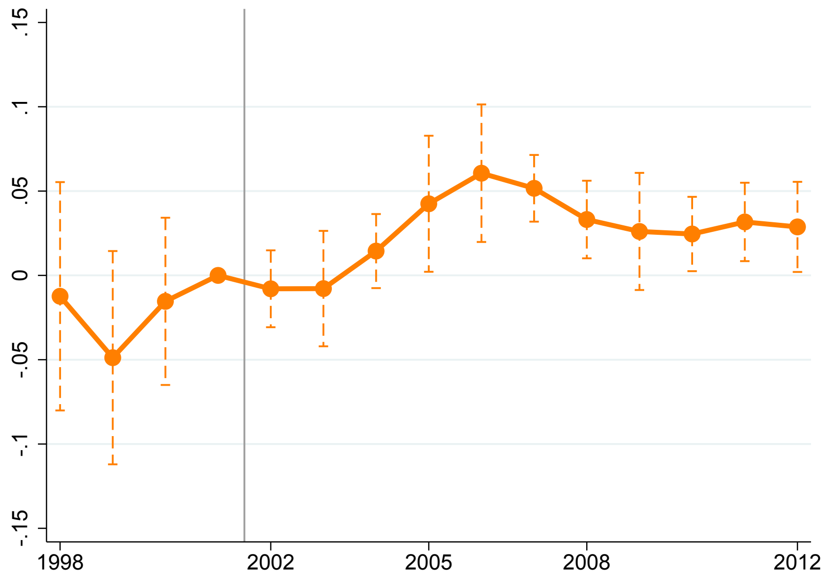
(b) DPAD



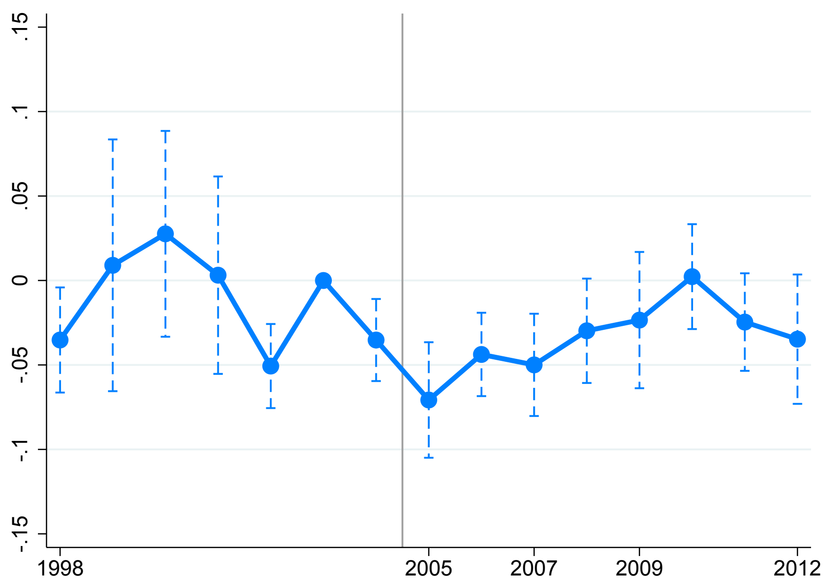
Notes: Figure 6 presents binscatter plots showing the effect of each tax break on Ln(Comp). Black lines are linear projections based on the underlying data. Binscatter plots are conditional means of the outcome on bins of the tax breaks after conditioning on all controls. In creating each plot, the outcome variable has been residualized to exclude the effects of all firm, executive, and tax policy control variables as well as year and firm fixed effects. The resulting relationships and linear predictions (based on un-binned data) correspond to the Lagged BONUS and Lagged DPAD estimates from Specification (4) of Table 2.

Figure 7: Dynamic Differences-in-Differences Placebo Tests

(a) BONUS Placebo



(b) DPAD Placebo



Notes: Figure 7 presents Dynamic Difference-in-Differences estimates $\beta_{1998} - \beta_{2012}$ corresponding to estimating equations (2) and (3) when the time-invariant BONUS and DPAD component have been replaced with the time-invariant components of BONUS Placebo and DPAD Placebo. Panel (a) estimates have been scaled to represent a one IQR difference in BONUS Placebo treatment. The estimates in panel (b) are scaled such that the coefficients represent the difference between loss-making firms that derive 100% of their income from domestic manufacturing activities and loss-making firms that derive no income from domestic manufacturing activities. Vertical bands represent 95% confidence intervals.

Tables

Table 1: Descriptive Statistics

	Mean	Std. Dev.	25th Percentile	75th Percentile	Obs.
Policy Variables					
BONUS	1.065	1.286	0.000	1.931	127,256
BONUS (50% rate)	2.088	0.544	1.857	2.144	51,367
DPAD	0.253	0.568	0.000	0.065	127,256
DPAD (9% rate)	0.904	1.076	0.000	1.893	24,912
Executive Compensation					
Total Comp Awarded	2.726	3.977	0.728	2.936	127,256
Total Current	0.769	0.803	0.344	0.868	127,256
Total NonCurrent	1.956	3.528	0.259	2.033	127,256
Executive Characteristics					
Experience	5.056	3.810	2.000	7.000	127,256
Female	0.062	0.241	0.000	0.000	127,256
New Hire	0.164	0.370	0.000	0.000	127,256
CEO	0.196	0.397	0.000	0.000	127,256
Board Member	0.327	0.469	0.000	1.000	127,256
Firm Controls					
ETI	0.141	0.385	0.000	0.000	127,256
Ln Firm Size	7.572	1.759	6.333	8.707	127,256
ROA	0.024	0.193	0.009	0.073	127,256
Ln R&D Exp	1.754	2.099	0.096	3.504	127,256
Stock Return	0.258	1.400	-0.133	0.239	122,718
Governance Measures					
Bebchuk Governance	3.570	1.442	3.000	5.000	89,964
Largest Instit. Holder %	0.095	0.164	0.066	0.115	103,823
Executive Tenure	8.165	4.765	5.000	11.000	127,256

Notes: Table 1 presents descriptive statistics for the analysis sample. The unit of observation is an executive in a given year, 1998–2012. DPAD is the percentage point reduction in effective tax rates generated by the DPAD. BONUS is the percentage point reduction in the present value of investment prices due to bonus depreciation. Total Comp Awarded is the total compensation awarded to an executive. Total Current is the sum of salary and bonus paid to an executive. Total Non Current is the sum of all non salary and non bonus compensation paid to an executive. All compensation measures are presented in millions of dollars. Experience is the number of years an executive is in the sample prior to the current year. Female is an indicator equal to 1 if the executive is a woman. New Hire is an indicator equal to 1 in the first year an executive is paired with a given firm in the database. CEO is an indicator equal to 1 if the executive is listed as a firm's CEO. Board Member is an indicator equal to 1 if the executive serves on the firm's board of directors. ETI is the percentage point reduction in a firm's effective tax rate due to the ETI. Ln Firm Size is the log of a firm's total assets. ROA is a firm's ratio of earnings to total assets. Ln R&D Exp is the log a firm's total R&D expenditure. Strong Governance is a governance measure ranging from 0 to 6 based on the Bebchuk, Cohen and Ferrell (2009) Entrenchment Index. Largest Instit. Holder % is the percentage of outstanding shares held by the largest single institutional shareholder. Executive Tenure is the total number of years each executive works at given firm. The analysis sample are the executives at firms with non-missing data for BONUS, DPAD, Total Comp Awarded, Total Current, Total NonCurrent, Experience, Female, ETI, Ln Firm Size, ROA, Ln R&D Exp. The analysis sample is composed of 127,256 executive-year observations. These observations represent 31,879 unique executives working at 2,794 unique firms.

Table 2: Effect of Tax Breaks on Executive Compensation

	(1) Ln(Comp)	(2) Ln(Comp)	(3) Ln(Comp)	(4) Ln(Comp)	(5) Ln(Comp)
Lagged BONUS	0.0300**	0.0301**	0.0380***	0.0442***	0.0435***
	(0.0122)	(0.0123)	(0.0127)	(0.0117)	(0.0114)
Lagged DPAD	0.0387***	0.0390***	0.0390***	0.0334***	0.0324***
	(0.0127)	(0.0117)	(0.0116)	(0.0127)	(0.0124)
Lagged ETI		0.00372	-0.00378	-0.0126	-0.0119
		(0.0263)	(0.0246)	(0.0207)	(0.0206)
Log(Experience)			0.318***	0.309***	0.308***
			(0.00761)	(0.00787)	(0.00787)
Female			-0.175***	-0.175***	-0.175***
			(0.0139)	(0.0133)	(0.0132)
Lagged Firm Size				0.176***	0.173***
				(0.0181)	(0.0206)
Lagged ROA					0.0895***
					(0.0307)
Lagged R&D					-0.00444
					(0.0149)
Year FE	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Tax Controls		✓	✓	✓	✓
Exec Controls			✓	✓	✓
Fize Size Control				✓	✓
ROA, RD Controls					✓
Observations	127,256	127,256	127,256	127,256	127,256

Notes: Table 2 presents coefficient estimates of the effect of BONUS and DPAD on executive compensation from a regression in the form of (1). The outcome variable in all specifications is the Ln(Comp). Specification (2)–(5) progressively add the ETI control, executive characteristic controls for Log Experience and Female, firm size, ROA, and the log of R&D. All firms level control variables are lagged one year. All specifications include firm and year fixed effects. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry level. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effect of Tax Policy on Executive Compensation; Alternative Specifications

	(1)	(2)	(3)	(4)
	Ln(Comp)	Ln(Comp)	Ln(Comp)	Ln(Comp)
Lagged BONUS	0.0374***	0.0523***	0.0407***	0.0527***
	(0.0105)	(0.0110)	(0.0130)	(0.0127)
Lagged DPAD	0.0332***	0.0337**	0.0568	0.0350**
	(0.0118)	(0.0159)	(0.0357)	(0.0168)
Year FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
2004 Char. x Year FE	✓			
Growth Trend x Year FE		✓		
Domestic Firms			✓	
Winsorized Tax Breaks				✓
Observations	105,261	92,146	43,496	124,862

Notes: Table 3 presents coefficient estimates of the effect of BONUS and DPAD on executive compensation from a regression in the form of (1). All specifications includes controls for Log Experience, Female, Lagged ETI as well as firm and year fixed effects. Specification (1) includes terciles of average firm size, ROA, and log R&D expenditures from 1999–2001 interacted with year fixed effects. Specification (2) includes the firm size control as well as fixed effects for quintiles of firm-level executive compensation growth from 1998–2001 interacted with year fixed effects. Specifications (3) and (4) include the firm size control and focus only on firms that have no international presence, and use measured of the tax breaks that are winsorized at the 2^{nd} and 98^{th} percentiles. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry level.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Effect of Placebo Tax Breaks on Executive Compensation

	(1) Ln(Comp)	(2) Ln(Comp)	(3) Ln(Comp)
Lagged BONUS	0.0427***		
	(0.0121)		
Lagged DPAD		0.0342***	
		(0.0131)	
Lagged DPAD Placebo	-0.0269*		-0.0287*
	(0.0143)		(0.0147)
Lagged BONUS Placebo		0.0121	0.00541
		(0.0255)	(0.0260)
Year FE	✓	✓	✓
Firm FE	✓	✓	✓
Controls	✓	✓	✓
Observations	127,256	127,256	127,256

Notes: This table shows the effect of the BONUS and DPAD placebos on the Log of Total Compensation. Specification (1) presents estimates of Lagged BONUS and the Lagged DPAD Placebo on the Log of Total Compensation. Specification (2) presents estimates of Lagged DPAD and the Lagged BONUS Placebo on the Log of Total Compensation. Specification (3) presents estimates of the Lagged BONUS Placebo and the Lagged DPAD Placebo on the Log of Total Compensation. All specifications include firm and year fixed effects, controls for executive experience and gender and lagged log firm size. Standard errors are presented in parentheses and are clustered at the four-digit NAICS level.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Effect of Tax Breaks on Compensation Components and Composition

	(1) Ln(Comp)	(2) Ln(Current)	(3) Ln(NonCurr)	(4) Current/Total
Lagged BONUS	0.0489***	0.0377***	0.0150	0.00170
	(0.0115)	(0.0118)	(0.0291)	(0.00634)
Lagged DPAD	0.0248**	-0.00297	0.0578**	-0.0132***
	(0.0122)	(0.00975)	(0.0235)	(0.00458)
Year FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Stock Price, ROA Controls	✓			
Baseline Controls	✓	✓	✓	✓
Observations	122,535	127,256	125,563	127,256

Notes: Table 5 presents coefficient estimates of the effect of BONUS and DPAD on various measures of compensation from a regression in the form of (1). The outcome variable in Specification (1) is Ln(Comp). The outcome variable in Specification (2) is the log of Total Current compensation (the sum of salary and bonus). The outcome variable in Specification (3) is the log of Total Non Current compensation (total compensation minus salary and bonus). The outcome variable in Specification (4) is the ratio of Total Current compensation to Total Compensation. All specifications control for firm size and firm and year fixed effects as well as controls for executive experience and gender and firm size. Standard errors are presented in parentheses and are clustered at the four-digit NAICS level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Heterogeneity by Executive Position

	(1) Ln(Comp)	(2) Ln(Comp)	(3) Ln(Comp)
Lagged BONUS	0.0457***	0.0389***	0.0311**
	(0.0155)	(0.0134)	(0.0134)
Lagged DPAD	0.0335*	0.0318**	0.0275**
	(0.0175)	(0.0128)	(0.0122)
Lagged BONUS × New Hire	-0.00527		
	(0.00496)		
Lagged DPAD × New Hire	0.00106		
	(0.0172)		
Lagged BONUS × CEO		0.0135**	
		(0.00551)	
Lagged DPAD × CEO		0.0132	
		(0.0194)	
Lagged BONUS × Board Member			0.0219***
			(0.00662)
Lagged DPAD × Board Member			-0.000837
			(0.0146)
Year FE	✓	✓	✓
Firm FE	✓	✓	✓
Controls	✓	✓	✓
Observations	127,256	127,256	127,256

Notes: Table 6 explores heterogeneity in the effect of the tax breaks on compensation by executive position. All specifications are based on Specification (4) from Table (2) but now add interactions between the tax breaks and indicators for executive positions. Interactions between the tax breaks and the New Hire indicator and the New Hire indicator, itself, are included in Specification (1). Interactions between the tax breaks and the CEO indicator and the CEO indicator, itself, are included in Specification (2). Interactions between the tax breaks and the Board Member indicator and the Board Member indicator, itself, are included in Specification (3). All specifications include firm and year fixed effects as well as controls for executive experience, gender, and firm size. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry level.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Heterogeneity by Governance Measures

	(1) Ln(Comp)	(2) Ln(Comp)	(3) Ln(Comp)	(4) Ln(Comp)	(5) Ln(Comp)
Lagged BONUS	0.0473***	0.0397***	0.0443***	0.0454***	0.0333***
	(0.0110)	(0.0123)	(0.00994)	(0.0125)	(0.00953)
Lagged DPAD	0.0468***	0.0619***	0.0553***	0.0810**	0.0668***
	(0.0170)	(0.0177)	(0.0173)	(0.0326)	(0.0215)
L.BONUS × $\mathbb{1}$(Bebchuk Gov)	-0.0112			-0.0340***	
	(0.00707)			(0.00907)	
L.DPAD × $\mathbb{1}$(Bebchuk Gov)	-0.0301*			-0.00752	
	(0.0172)			(0.0337)	
L.BONUS × $\mathbb{1}$(Large Holder)		-0.00907		-0.0193	
		(0.00635)		(0.0123)	
L.DPAD × $\mathbb{1}$(Large Holder)		-0.0623***		-0.0365	
		(0.0168)		(0.0268)	
L.BONUS × $\mathbb{1}$(Exec Tenure)			-0.0476***	-0.0271**	
			(0.00721)	(0.0110)	
L.DPAD × $\mathbb{1}$(Exec Tenure)			-0.0424***	-0.0493*	
			(0.0157)	(0.0262)	
L.BONUS × $\mathbb{1}$(Combined Gov)					-0.0316***
					(0.00805)
L.DPAD × $\mathbb{1}$(Combined Gov)					-0.0666***
					(0.0221)
Year FE	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Observations	59,423	69,211	84,801	23,441	49,415

Notes: Table 7 explores heterogeneity in the effect of the tax breaks on compensation by measures of corporate governance. All specifications are based on Specification (4) from Table (2) but now add interactions between the tax breaks and indicators for corporate governance measures. Specifications (1) and (4) include interactions between Lagged BONUS and Lagged DPAD with "Large Holder," an indicator equal to 1/0 for firms in the top/bottom tercile of the Largest Instit. Holder % distribution. Specification (2) and (4) include interactions between Lagged BONUS and Lagged DPAD with "Strong Gov," an indicator equal to 1/0 for firms in the top/bottom tercile of the Bebchuk Governance distribution. Specification (3) and (4) include interactions between Lagged BONUS and Lagged DPAD with "Short Tenure," an indicator equal to 1/0 for firms in the top/bottom tercile of the Executive Tenure distribution. Specification (5) includes interactions between Lagged BONUS and Lagged DPAD with "Combined Gov," an indicator equal to 1 for firms defined as 1 for at least two of Large Holder, Strong Gov, and Short Tenure and 0 for firms that not defined as a Large Holder, Strong Gov, and Short Tenure firms. All specifications include firm and year fixed effects as well as controls for executive experience and gender and firm size. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry level.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Online Appendices

Appendix A Effect of Bonus on PV Cost of Investment

Table A1 provides examples of the effect of 50% bonus depreciation on the present value after-tax cost of two assets, one with a 7-year MACRS life, the other with a 3-year MACRS life. In both examples we assume a firm makes a $100,000 investment and that the firm faces a statutory effective income tax rate of 35% (as was the case in the US during the sample period).

Panel (a) illustrates the 7-year asset example. In the absence of bonus depreciation, MACRS specifies that $25,000 of the total investment may be deducted in the first year, then $21,430 in the second, etc. With a federal tax rate of 35%, this leads to tax savings of $8,750 in the first year, then $7,500 in the second. Over the course of the 7 year life, all $100,000 of the investment cost are deducted from taxable income, generating $35,000 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 $28,790.[37] The present value cost of the investment is the initial $100,000 minus the present value of the tax shield, $28,790, which is equal to $71,210.

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 $50,000 more to be deducted in the first year the investment is made. The remaining $50,000 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 $21,880 in the first year, $3,750 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 $31,890 and the present value cost of the investment decreases by 3.1 percentage points, from $71,210 to $68,110.

Panel (b) displays an identical exercise, but assumes the asset is deducted according to the 3-year MACRS schedule. The after-tax present value cost of the $100,000 investment is now $66,790 in the absence of bonus depreciation. The present value cost of the 3-year asset is lower than the present value cost of the 7-year asset because all $100,000 of the purchase price are deducted more quickly resulting in a larger present value tax shield and a lower present value cost of investment.

50% bonus depreciation decreases the present value cost of the 3-year asset from $66,790 to $65,900, or by 0.89 percentage points. Bonus depreciation has a smaller percentage point (and percent) impact on the after-tax present value cost of the 3-year asset than on the after-tax present value cost of the 7-year asset. This is because in the case of the 7-year assets, bonus depreciation accelerated deductions from further in the future, thereby increasing the present value of the deductions by more.

The comparison between the effects of bonus depreciation on the 7-year asset versus the 3-year asset perfectly illustrates the identification strategy used in this paper; bonus depreciation has a larger effect on the present value cost of investments for firms that invest in longer-lived assets, on average.

[37] The $28,790 is a function of the assumed discount rate of 10%. At higher discount rates, the present value of the tax shield will be lower.

Table A1: Example of Effect of Bonus Depreciation on Present Value Cost of Investment

(a) Effect of 50% Bonus Depreciation on 7-year Asset Class Investment

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
Present Value (τ_f x Deduction)									28.79
Present Value Cost of Investment									71.21
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
Present Value (τ_f x Deduction)									31.89
Present Value Cost of Investment									68.11

(b) Effect of 50% Bonus Depreciation on 3-year Asset Class Investment

Year	1	2	3	4	5	6	7	8	Total
MACRS Deduction	58.33	27.78	12.35	1.54	0	0	0	0	100
τ_f x Deduction	20.42	9.72	4.32	0.51	0	0	0	0	35
Present Value (τ_f x Deduction)									33.21
Present Value Cost of Investment									66.79
50% Bonus Ded.	79.165	13.89	6.175	0.725	0	0	0	0	100
τ_f x Deduction	27.71	4.86	2.68	2.16	0.25	0	0	0	35
Present Value (τ_f x Deduction)									34.10
Present Value Cost of Investment									65.90

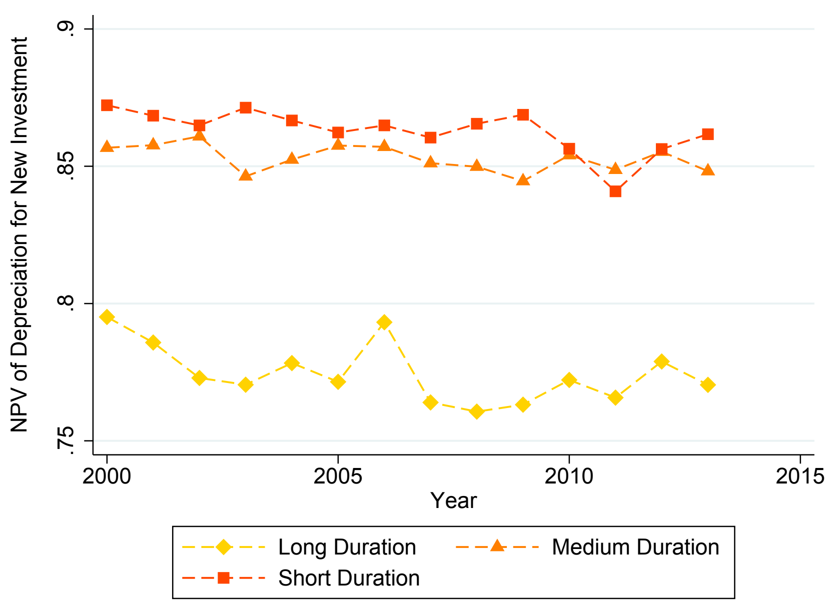
Notes: Table A1 shows the effects of 50% bonus depreciation on the present value of tax deductions associated with two $100,000 investments. In Panel (a), the investment is made is an asset with a 7-year MACRS life. In Panel (b), the investment is made in an asset with a 3-year MACRS life. The federal corporate tax rate in both panels is assumed to be 35%. The discount rate in both panels is assumed to be 10%. All numbers are in thousands of dollars.

Appendix B Stability of Sector-Level Investment Types Over Time

In this appendix, I show the stability of sector-level z_0 measures during the period 2000–2012. To do so, I start with sector-level Form 4562 data from the IRS's Statistics of Income division. The aggregated, sector-level data details investment levels for each possible MACRS asset-life (3-year, 5-year etc.). Using the percentages of investment in each category and MACRS depreciation schedules and assuming a 10% discount rate, I calculate sector-level measures of z_0, the present value of tax depreciation on a dollar of investments. I then sort sectors into terciles according to their 2000 z_0 values. Figure A1 plots z_0 during the years 2000–2012 for each tercile. Overall, Figure A1 shows z_0 is fairly stable across sectors. The implication is that firms are not significantly altering their mix of investments across MACRS asset classes in response to the policy.

The stability of investment patterns across MACRS categories is likely due to the fact that most MACRS categories are defined by asset "use" rather than asset "type." For example, assets used for wholesale trade are depreciated over a five year period while assets used for textile manufacturing are depreciated over a seven year period. As a result, the same asset used in different industries is depreciated over different horizons. This means firms are less able to re-optimize the types of investments they make to take advantage of bonus depreciation.

Figure A1: Stability of Sector-Level z_0 Measure Over Time



Notes: Figure A1 presents average z_0 measures across sectors for three groups of sectors sorted according to their 2000 z_0. Sector-level z_0 measures are constructed from IRS Statistics of Income sector-level aggregate Form 4562 data which details the percent of investment in each MACRS asset-life category.

Appendix C Bebchuk Governance Variable Construction

I use the Risk Metrics Governance and Governance Legacy datasets to construct the Bebchuk Gov measure used in the Table 7 analysis. The Governance Legacy dataset documents governance metrics for publicly traded firms in even years 1998–2006. The Governance dataset does the same in all years 2007–2011. I follow Bebchuk, Cohen and Ferrell (2009) in constructing an Entrenchment Index that can range from 0 to 6. The index is one point higher (1) if a super majority of shareholders must approve a merger or takeover, (2) if executives have a golden parachute (a large guaranteed payment if they are dismissed after a merger or takeover), (3) if management can enact poison-pill defenses to make a takeover less attractive, (4) if shareholders have limited abilities to amend the company's charter, (5) if shareholders have limited abilities to amend the company's bylaws, and (6) if the company elects board members using staggered elections. For years with no governance data, I use the measure from the previous year.

Appendix D Alternative Identification Strategies

Table A2: Effect of Tax Breaks on Executive Compensation; Alternative ID Strategies

	(1) Ln(Comp)	(2) Ln(Comp)	(3) Ln(Comp)	(4) Ln(Comp)
Lagged BONUS	0.0435***	0.0344***	0.0347***	
	(0.0114)	(0.00987)	(0.00880)	
Lagged DPAD	0.0324***	0.0217*	0.0204*	
	(0.0124)	(0.0132)	(0.0119)	
BONUS				0.0334***
				(0.00995)
DPAD				0.0412***
				(0.0104)
Year FE	✓	✓	✓	✓
Firm FE	✓	✓		✓
Exec FE		✓		
Exec x Firm FE			✓	
Controls	✓	✓	✓	✓
Observations	127,256	120,269	119,287	119,275

Notes: Table A2 explores how coefficient estimates of the effect of BONUS and DPAD differ when alternative identification strategies are used. All Specificaitons are based on Specification (4) from Table (2). Specificaion (1) reproduces the estiamtes from Specification (4) from Table (2). Specification (2) includes executive firmed effects. Specification (3) includes executive x firm fixed effects instead of executive and firm fixed effects. Specification (4) replicates the Specification (1) strategy, but employs contemporaneous measures of BONUS and DPAD rather than lagged values. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix E Effect of Tax Breaks on Firm Business Activities

In this appendix, I estimate the effect of the tax breaks on business activities for the sample of firms in the analysis dataset. I implement a firm level regression of business outcomes on the two tax breaks. Results are presented in Table A3. In Column (8), I implement a regression in the style of Dyreng and Lindsey (2009) to estimate the effect of bonus depreciation on after-tax present value investment costs per dollar of investment and the effect of the DPAD on effective tax rates. To do so, I regress taxes paid scaled by assets on taxable income scaled by assets and capital expenditure scaled by assets as well as BONUS interacted with capital expenditure scaled by assets and DPAD interacted with taxable income scaled by assets. The coefficient on the BONUS interaction is the percentage point reduction in after-tax investment costs due to bonus depreciation. The coefficient on DPAD interaction is the percentage point reduction in effective tax rates due to the DPAD. These coefficients should be equal to unity if the treatment variables are correctly specified.

Consistent with Zwick and Mahon (2017), I find bonus depreciation increases capital investment, but has no effect on payouts. Interestingly, among the analysis sample, bonus depreciation decreases debt usage. This finding is not consistent with Zwick and Mahon (2017), but likely due to the very different samples. Consistent with Ohrn (2018), the DPAD increases capital expenditure, lowers debt usage, and increases payouts. Neither policy affects assets. The DPAD has a weak effect on stock return. The DPAD increases R&D while bonus depreciation decreases R&D. This finding is consistent with the investment incentive inducing a substitution toward investment and away from R&D. The DPAD increases ROA while bonus depreciation does not. This is consistent with the logic presented in Edgerton (2012) which shows bonus depreciation does not affect accounting earnings.

The BONUS $\times$ CX coefficient in Specification (8) suggests a one percentage point increase on BONUS decreases the after-tax cost of investment by 0.921 percentage points. The DPAD $\times$ PI coefficient in the same regression means a one percentage point decrease in DPAD decreases effective tax rates by 1.77 percent. Both of these coefficients are statistically different from zero at the 99% level. They are also statistically indistinguishable from unity at standard levels of statistical significance. In sum, the findings in Specification (8) show that there is a strong first stage effect of both tax breaks and that the tax breaks are correctly specified.

Table A3: Effect of Tax Breaks on Firm Outcomes

	(1) Ln(CX)	(2) Debt Ratio	(3) Payouts / L.SL	(4) Ln(Assets)	(5) Stock Return	(6) Ln(R&D)	(7) ROA	(8) US Fed Tax
BONUS	0.110***	-0.0187**	-0.00325	0.00196	-0.0136	-0.0580***	0.00802	
	(0.0235)	(0.00881)	(0.00219)	(0.0130)	(0.0138)	(0.0139)	(0.00531)	
DPAD	0.0537***	-0.0172***	0.00523***	0.00437	0.0449**	0.0995***	0.0138***	
	(0.0173)	(0.00575)	(0.00162)	(0.0174)	(0.0181)	(0.0234)	(0.00445)	
PI								0.146***
								(0.00630)
CapX								0.0426***
								(0.00639)
BONUS × CX								-0.00921***
								(0.00185)
DPAD × PI								-0.0177***
								(0.00420)
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	
Observations	24,150	26,064	25,411	26,135	25,511	26,135	26,128	21,885

Notes: Table A3 presents coefficient estimates of the effect of BONUS and DPAD on firm outcomes. The observational unit in each specification is a firm in a given year. The outcome variable in Specification (1) is the log of capital expenditure. The outcome variable in Specification (2) is the debt ratio. The outcome variable in Specification (3) is total payouts scaled by lagged sales. The outcome variable in specification (4) is firm size. The outcome variable in specification (5) is the stock return. The outcome in Specification (6) is Log R&D. The outcome in Specification (7) is ROA. The outcome in specification (8) is taxes paid scaled by total assets. All dependent variables in Specification (8) are scaled by assets. All specifications include firm and year fixed effects and other firm outcomes except when those mechanically related to the outcome variables. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry-level.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

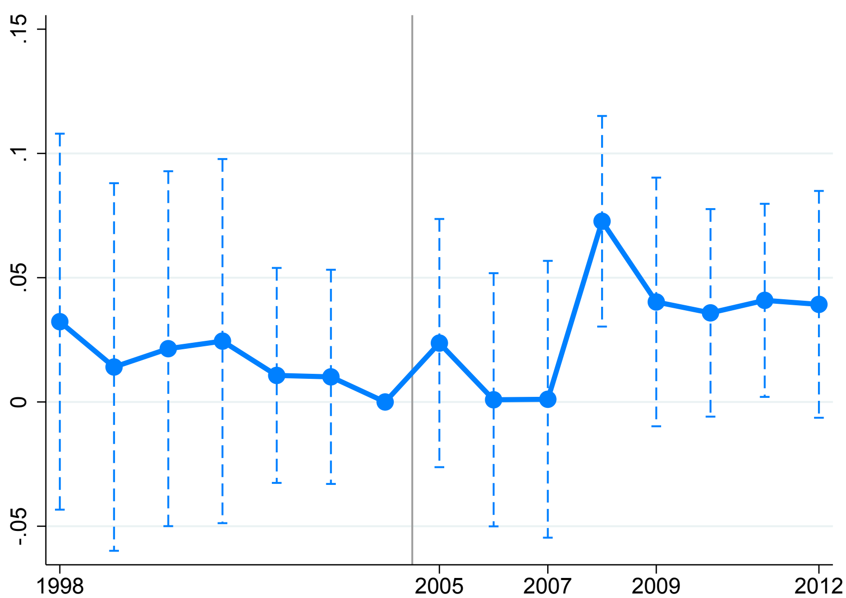
Appendix F Great Recession and the DPAD

In this appendix, I limit the Dynamic DD DPAD analysis to executives in firms that were taxable during the years 2008–2010. By limiting the analysis in this way, I focus only on firms that could benefit from the DPAD due to their taxable status and to firms that were less affected by the recession. The dynamic coefficient pattern is similar to the pattern presented in Figure 4 in that the effect of the DPAD is concentrated in years 2008 and beyond. That this same pattern exists among the sample of only taxable firms suggests that the recession itself is not responsible for the dynamic coefficient pattern. The pattern also suggests that the DPAD and not taxable status itself, drive the larger coefficient estimates in years 2008–2012.

When the baseline regression is run on this subsample of firms, the coefficient on Lagged DPAD is 0.29. The p-value on the estimate is less than 0.05 despite the dramatically reduced sample size (43,574 as opposed to 127,256 observations).

Figure A2: DPAD Dynamic DD Estimates; Taxable Firms in Years 2008–2010

(a) DPAD Coefficients

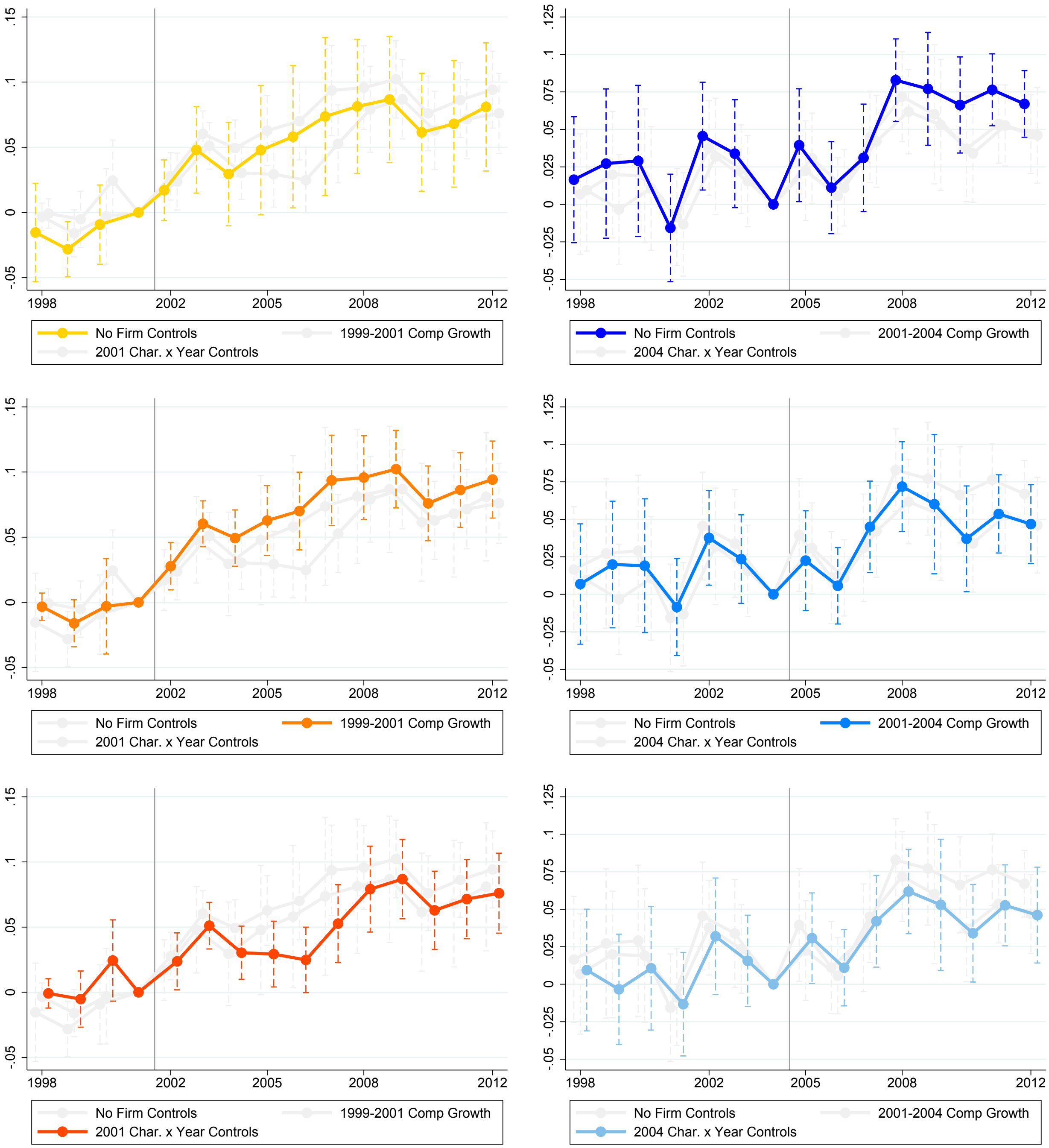


Notes: Figure A2 presents Dynamic Difference-in-Differences estimates as in Figure 4 where the sample is limited to firms that were taxable in years 2008–2010, during the Great Recession. The coefficients are scaled such that the coefficients represent the difference between firms that derive 100% of their income from domestic manufacturing activities and firms that no income from domestic manufacturing activities. Vertical bands represent 95% confidence intervals.

Appendix G Separated Figure 5 Plots

Figure A3: Robustness of Dynamic Difference-in-Differences Estimates

(a) BONUS (b) DPAD



Notes: Figure A3 presents each of the overlaid plots presented Figure 5 separately.

Appendix H Effect of Tax Breaks on Firm Governance Measures

Table A4: Effect of Tax Breaks on Firm Governance Measures

	(1) Large Holder	(2) Bebchuk Gov	(3) Executive Tenure
Lagged BONUS	0.00131*	-0.0284	-0.0519
	(0.000770)	(0.0183)	(0.0477)
Lagged DPAD	-0.00160	0.0403	0.0364
	(0.000976)	(0.0277)	(0.0489)
Year FE	✓	✓	✓
Firm FE	✓	✓	✓
Controls	✓	✓	✓
Observations	21,266	18,163	26,183

Notes: Table A4 shows how the tax breaks affect firm-level governance measures. The observational unit in each specification is a firm in a given year. All specifications are based on Specification (4) from Table (2) and include firm and year fixed effects as well as controls for controls for lagged ETI and lagged firm size. The outcome variable in Specification (1) is Large Instit. Holder %. The outcome variable in Specification (2) is Bebchuk Governance. The outcome variable in Specification (3) is Executive Tenure. Standard errors are presented in parentheses and are clustered at the four-digit NAICS industry level.
$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$