The Effect of Tax Incentives on U.S. Manufacturing: Evidence from State Accelerated Depreciation Policies

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Abstract

Since 2002, the U.S. federal government has relied on two special tax incentives, bonus depreciation and Section 179 expensing, to stimulate business activity. When the federal policies were instituted, many states adopted them. Others did not. Using a modified difference-in-differences framework, this paper estimates the manufacturing sector response to state adoption of the policies. The analysis suggests that both policies significantly increase investment. Employment and total production are also impacted, but only several years after state adoption. The decoupled investment and labor responses suggest that the incentives accelerated the automation of the U.S. manufacturing sector.

Keywords : bonus depreciation, Section 179, taxation, state and local taxation, investment
JEL Classification : H25; E22, H5, H71

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1 Introduction

In 2002 and again in 2008, the U.S. federal government enacted bonus depreciation, a policy that allowed firms to immediately deduct a "bonus" percentage of the purchase price of new capital assets from their taxable income. During the same decade, the federal government also significantly increased the allowance for Section 179 expensing, which *also* accelerated the tax deduction associated with new investment. Both investment tax incentives significantly decreased the present value cost of new capital assets and were intended to stimulate both business investment and employment.

Because state corporate tax bases are intimately tied to the federal base definition, when bonus was enacted and Section 179 allowances were increased, U.S. states had to decide how to respond to the changes. Many states chose to adopt bonus and conform to the federal Section 179 allowance. Other states decided to partially alter their tax base definition. Finally, a portion of states did not respond to the federal tax incentives at all.

This paper uses this variation in state policies, industry-by-state manufacturing data from the Annual Survey of Manufacturers, and a modified difference-in-differences empirical strategy to estimate how manufacturing activity – as measured by investment, compensation, employment, and total production – responds to both bonus depreciation and Section 179 depreciation allowances. I find state bonus adoption and Section 179 conformity both have a large and significant impact on investment activity. However, because firms only apply bonus depreciation to capital expenditures in excess of the Section 179 allowance, the effect of each policy is tempered as the state-level generosity of the other is increased.

Due to this interaction, quantifying the impact of either policy requires that the level of the other be specified. For example, from the perspective of bonus: this paper's estimates suggest that when state Section 179 allowances are set to zero, state-level adoption of 50% bonus increases investment by 8.75%. However, when state Section 179 allowances are increased by $100,000, the state adoption of 50% bonus increases investment by only 3.75%. From the perspective of Section 179, increasing state Section 179 allowances by $500,000 increases investment by 11.00% when no state bonus is in place but the effect decreases by 0.50 percentage points for every 10 percentage point increase in state bonus depreciation.

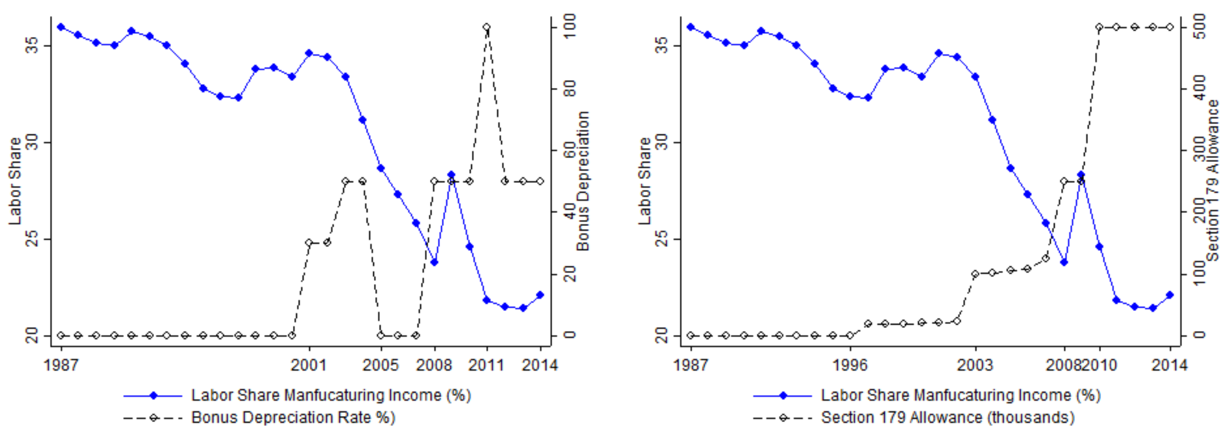
In addition to the investment responses, I find that state bonus adoption increases employee compensation; adoption of 50% bonus increases compensation per employee by 1.25%. While Section 179 allowances do not increase compensation, they again mitigate the bonus effect. Surprisingly, I find no short-run effects of the policies on either employment or total production.

Motivated by these null results, I estimate impulse response functions to detect dynamic responses to the policies. I find that while investment and compensation only respond to the policies contemporaneously, employment and total production increase substantially three, four, and five years after state bonus adoption. Five years out, state adoption of 50% bonus increases employment by 3.85% and increases total production by 5.25%. Again, these effects are muted at higher Section 179 allowance levels.

The results of this study provide new insights into the effects of the policies, the optimal use of accelerated depreciation incentives, and the nature of manufacturing in the 21st century. First, the magnitudes of the estimated elasticities suggest small incentives can have large impacts in a competitive environment, such as an environment where U.S. states vie for business activity. Second, the delayed employment and production responses suggest that bonus depreciation, enacted during an economic downturn, may actually constitute a pro – as opposed to a counter– -cyclical policy. Third, that investment responses to the policies were not accompanied by immediate increases in labor suggests that federal bonus depreciation and Section 179 allowances may have accelerated the automation of the U.S. manufacturing sector.

Figure 1: Manufacturing Labor Share

(A) vs. Bonus Depreciation (B) vs. Section 179 Allowance



Notes: Panel (A) compares the Labor's Share of manufacturing income from BLS (left axis) against the federal bonus depreciation rate (right axis). Panel (B) compares the Labor's Share of manufacturing income (left axis) against the federal Section 179 allowances level in thousands (right axis).

This third finding, which speaks directly to the macroeconomic trends explored in David, Dorn and Hanson (2013) and Piketty (2014), is corroborated by the timing of the recent decline in the labor share of manufacturing income. Figure 1, which plots manufacturing labor share against the level of bonus depreciation in Panel (A) and Section 179 expensing in Panel (B), shows that the percentage of total manufacturing profits going to labor begins a precipitous decline in 2001, the same year that bonus depreciation was first enacted. The labor share continues its decline as the generosity of bonus depreciation and Section 179 allowances increases over the next 16 years. While this simple illustration does not constitute causal evidence, the coincident timing combined with the results of this study suggest that both policies increased the capital intensity of the manufacturing sector by inducing investment that was a substitute for – and not a complement to – labor.

The key threat to this study's empirical design is that other time-varying, state-level shocks may coincide with the implementation and scaling of the two policies. Throughout the paper I work to address this concern, providing several reasons that this threat is unjustified. First, a semiparametric graphical implementation of the research design shows that the parallel trend assumption holds in the four years prior to the bonus depreciation implementation and in the years prior to the largest increases in Section 179 allowances. Second, using a series of 2000 block permutation tests for each of the four outcomes, I confirm that when the the policies are implemented in an alternative year or treatment is assigned to different states, the headline results do not hold. The block permutation tests allay concerns that differences across states in response to business cycles and/or budgetary situations are responsible for the estimated effects and simultaneously demonstrate that the clustering procedure used throughout the analysis produces standard errors that are not artificially small as a result of serially correlated data. Third, I validate the empirical design by estimating heterogeneous responses to the policies across a proxy for investment levels. Consistent with the incentives created by the policies, I find that the response to bonus depreciation increases with the investment level proxy while the response to Section 179 allowances decreases. Finally, I address section concerns by (1) preforming a battery of balancing tests to determine whether adopting states systematically differed from non-adopters and then (2) reestimating the headline responses after eliminating states that were the least likely to adopt the polices. The selection-controlled results are consistent with the full sample findings.

This paper is the first to estimate how state-level differences in tax depreciation affect investment, employment, wages, and production and constitutes a significant contribution to several literatures that fall under the general heading of the effects of taxation on business activity. This paper's use of state-level variation represents an alternative empirical methodology by which the effect of depreciation allowances can be evaluated.[1] The only other paper to use an alternative approach to explore this topic is Maffini, Xing and Devereux (2017), which uses variation in depreciation generosity based on changes in government firm size definitions. The investment elasticities produced by this study are similar to those in Zwick and Mahon (2017) and Maffini et al. (2017) and reinforce the latest, state-of-the-art estimates of the effect of depreciation allowances on investment.

This paper also adds to the corporate tax incidence literature.[2] Because bonus depreciation and

[1]Hall and Jorgenson (1967) and Summers (1981) provide the theoretical foundation for this literature. Nearly all of the empirical work in the field has exploited industry-level differences in investment composition to explore whether depreciation affects investment. This technique was pioneered in Cummins, Hassett, Hubbard et al. (1994) and later used in Chirinko, Fazzari and Meyer (1999), and Goolsbee (1998). More recently, the same identification strategy has been adopted to estimate the effect of bonus depreciation (see House and Shapiro (2008), Edgerton (2012), Zwick and Mahon (2017), Ohrn (2017)).

[2]Harberger (1962) was the first to explore how corporate taxation affects wages. Kotlikoff and Summers (1987) extended the Harberger (1962) model to an open economy and theorized that with perfectly mobile capital, labor suffers 100% or more of the burden of capital taxation. Using cross-country data, Hassett, Mathur et al. (2006), Felix (2007), and Desai and Foley (2007) all find that, indeed, corporate taxation has large and negative effects on wages. Using state-level variation in taxes, Felix (2009) and Carroll (2009) find that labor bears more than 100% of the burden of the corporate income tax.[3]

Section 179 alter corporate tax bases as opposed to corporate tax rates, this paper suggests that the corporate tax base, in addition to the corporate tax rate and/or apportionment rules, depress wages. Finally, by examining delayed responses to state depreciation allowances, this paper adds to the extensive literature examining the effects of both federal and state taxation on employment and growth.[4]

2 Bonus Depreciation and Section 179 Policies

2.1 Bonus Depreciation

Typically, businesses cannot deduct the full purchase price of newly installed assets from their taxable income in the year the assets are purchased and placed into service. Instead, businesses may deduct the value of the assets over time according to the Modified Accelerated Cost Recovery System (MACRS) (detailed in IRS Publication 946). MACRS specifies the life and depreciation method for each type of potential investment (asset class). For equipment, lives can be 5, 7, 10, 15, or 20 years and the method is called the "declining balance switching to straight line deduction method." Bonus depreciation allows for an additional "bonus" percentage of the total cost of new equipment purchases to be deducted in the first year. Because firms benefit from the tax savings earlier, the present value of a given investment's tax shield increases, and the after-tax present value of the investment decreases. Bonus depreciation decreases the after-tax present value of new investments more when firms invest in assets with longer lives, when firms face higher tax rates, and when firms more heavily discount future profits. Appendix A provides an example illustrating the effect of bonus depreciation on the present value of tax shields.

Bonus depreciation was first enacted in 2001 at a rate of 30%. It was originally intended to be a temporary and counter-cyclical policy. In 2003, the additional first year deduction was increased to 50%. The bonus was eliminated during years 2005, 2006, and 2007, but was reinstated in 2008 at the 50% rate. After 3 years at 50%, the bonus rate was increased to 100% in 2011 (100% is often called expensing or immediate expensing). Since 2011, bonus has held steady at 50% but was only enacted retroactively for 2014 in December of that year. Zwick and Mahon (2017) estimates that 50% federal bonus depreciation decreases the purchase price of new investments by 2.73%.

Because state corporate tax bases are intimately tied to the federal base definition, when bonus was enacted, states were forced to respond to the policy in one of three ways. First, states could fully adopt the policy. States that chose this option also allowed businesses to deduct the additional bonus percentage of newly purchased assets in the first year from their state taxable income. Second, states could completely ignore or reject bonus depreciation. Finally, states could choose to allow

[4] Recent federal estimates are provided by Romer and Romer (2010) and Mertens and Ravn (2013). Studies that estimate the effect of state taxes on growth are highlighted by Helms (1985), Wasylenko and McGuire (1985), Papke (1991), Bania, Gray and Stone (2007), Reed (2008), Wilson (2009), Ljungqvist and Smolyansky (2016), and Giroud and Rauh (2017).

for some additional first year write off of new equipment expenditures but not the full federal bonus percentage.[5]

The choices that states made (with respect to both bonus and Section 179) balanced the benefits of conforming to the federal tax base, such as lower tax compliance costs and counter-cyclical stimulus effects, against the tax revenue that would be lost due to the narrower base. Balancing tests in Appendix I suggest that, on net, states that adopted bonus, especially during the first episode, were not systematically different than those that did not. Analysis presented in Section 7.4.3 shows that when the sample is limited to states most likely to alter their tax bases to conform to federal definitions based on observables, the headline results hold, suggesting that while the variation in adoption is not random, it is also not systematic in a way that undermines the validity of the empirical results.

State bonus depreciation is inherently less valuable to firms than federal bonus because all state corporate tax rates are significantly lower than the 35% federal rate in place during the analysis period. Among adopting states, the average state corporate income tax rate during the sample period was 7.0%. Because the state tax rate is only 20% as high as the federal rate, state bonus adoption is estimated to decrease the purchase price of new investments by 0.546% (=2.73% $\times$ 0.2).

Panel (A) of Table 1 records the number of full or partial bonus adopting states in each year and Panels (A) and (B) of Figure 2 map adopting states in 2001 and in 2008. A significant number of states adopted the policy. Between 16 and 20 states adopted bonus – at least partially – in each year bonus was turned on. In 2001, there were 15 full adopters and 21 rejecters. These states were spread geographically across the Northeast, South, Midwest, Mountain, and Northwestern States. During the second bonus episode there were only 10 full adopters and 27 rejecters. In sum, there is significant cross-state variation in adoption during each bonus episode and within-state variation in the bonus adoption over time.

2.2 Section 179

Section 179 of the United States Internal Revenue Code allows businesses to elect to deduct the cost of a new investment asset from their taxable income upon purchase instead of depreciating the asset according to MACRS rules. Thus, for qualifying investments, Section 179 provides immediate expensing and is equivalent to 100% bonus depreciation.

[5]Several states did not have a corporate income tax during bonus depreciation years and therefore could not respond to the federal policy in any way. These states are eliminated from the analysis.

Table 1: State Bonus Adoption and Section 179 Conformity

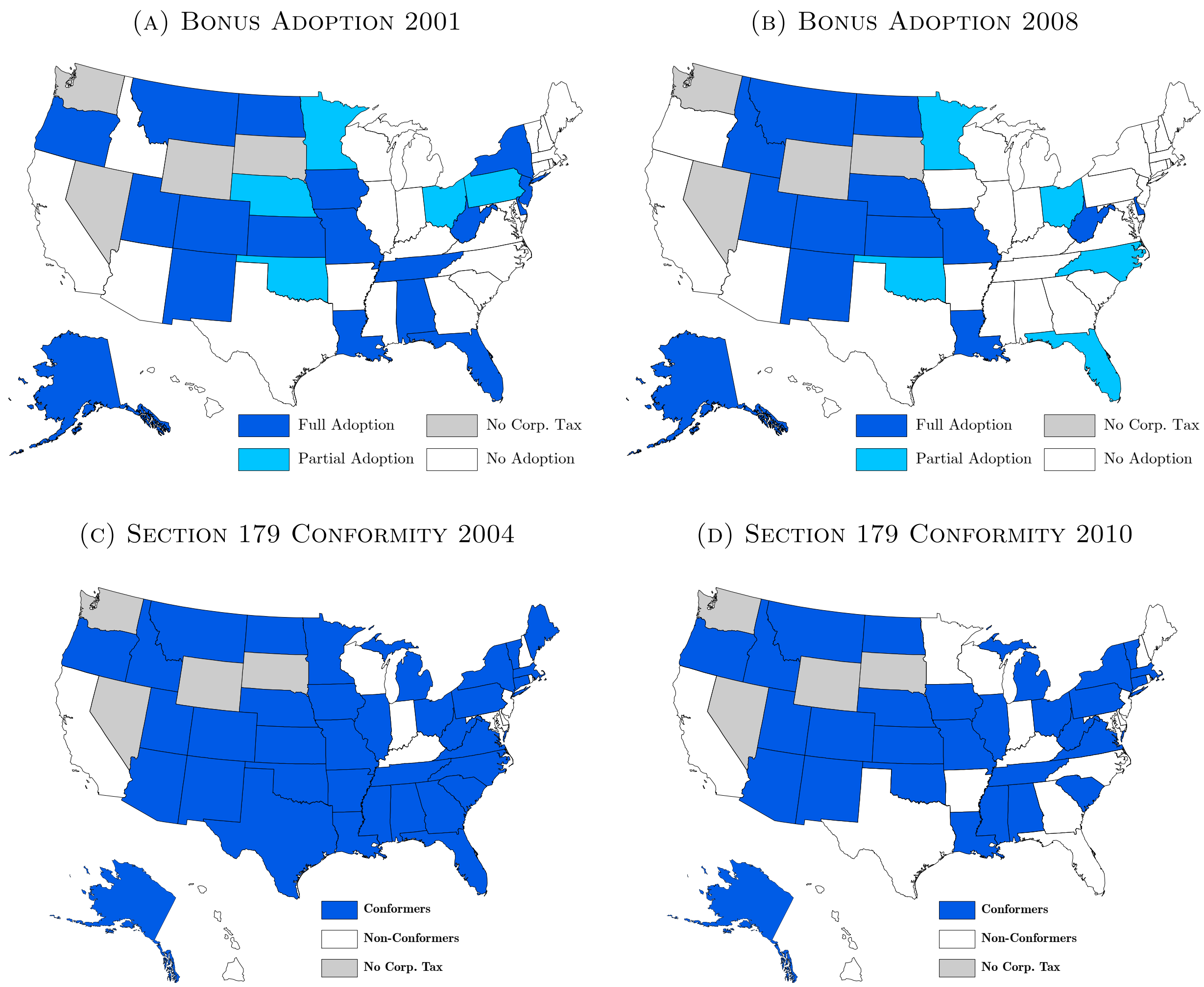
Year	(A) Bonus Depreciation			(B) Section 179		
	Bonus Rate	Adopters	%	Limit($1,000)	Conformers	Percent
1997–2000	0	–	–	20	45	100
2001	30	20	44.4	24	45	100
2002	30	18	40.0	24	45	100
2003	50	19	42.2	100	34	75.6
2004	50	20	44.4	102	35	77.8
2005	0	–	–	105	35	77.8
2006	0	–	–	108	35	77.8
2007	0	–	–	125	34	75.6
2008	50	16	35.6	250	31	68.8
2009	50	17	37.8	250	30	66.7
2010	50	16	35.6	500	28	62.2
2011	100	19	42.2	500	29	64.4
2012	50	18	40.0	500	29	64.4
2013	50	18	40.0	500	29	64.4
2014	50	17	37.8	500	30	66.6

Notes: Table 1 describes state adoption of federal bonus depreciation and state conformity federal Section 179 allowances during the years 1997–2014. Bonus depreciation rates and Section 179 allowances are taken from IRS Form 4562 1997–2014. Adopters are the number of states that fully or partially adopted federal bonus from Bloomberg BNA. Section 179 conformity data were hand collected from state revenue department resources. The bonus adoption rate and Section 179 conformity rates are calculated only for states with positive corporate tax rates.

Section 179 eligibility is governed by three limitations. First, there is a dollar limitation, referred to throughout this paper as the "Section 179 allowance." The allowance is the maximum deduction that a taxpayer may elect to take in a year.[6] The allowance was increased significantly in 2003, 2008, and again in 2010. The second limitation is the "Section 179 limit." If a business places into service more Section 179 property than the limit allows, the Section 179 deduction is reduced, dollar for dollar, by the amount exceeding the limit. The final limitation is that a taxpayer's Section 179 deduction may not exceed the taxpayer's aggregate income for that year.

[6]The value of large vehicles beyond $25,000 could not be immediately expensed under Section 179. Buildings were also not eligible prior to 2010.

Figure 2: Mapping State Bonus Adoption & Section 179 Conformity



(a) Bonus Adoption 2001

(b) Bonus Adoption 2008

(c) Section 179 Conformity 2004

(d) Section 179 Conformity 2010

Notes: Panels (A) and (B) map bonus depreciation adoption maps during years 2001 and 2008. Panels (C) and (D) map Section 179 conformity during the years 2004 and 2010.

Panel (B) of Table 1 describes the Section 179 allowances and the number of conforming states during the years 1997 to 2014. In 2000, when the federal Section 179 limit was $20,000, nearly every state also allowed for full expensing of investments up to the federal limit for state tax purposes. As the Section 179 allowance increased during the years 2000–2011, most but not all states also increased their state Section 179 limits in step. The largest drops in the percentage of conformers are in 2003, when the federal allowance jumped from 24 to 100 thousand dollars, and in 2010, when the allowance increased from $250,000 to $500,000. Despite these large drops, in 2011 more than 60% of states still conformed to the federal allowance.

Like bonus depreciation, the benefit of state Section 179 deduction is much lower than that of the federal deduction. At the average state tax rate of 7.0% and assuming a discount rate of 7%, Section 179 provides a 0.546% discount on new investment purchases.

2.3 Policy Overlap

Appendix Table A3 describes the overlap of the two policies during the years 2004 and 2010. In both years, there is significant variation in bonus adoption among Section 179 conforming states. This overlap allows the empirical methodology to estimate the effect of bonus at different Section 179 levels. In contrast to the variation among Section 179 conformers, in both years, all states that did not conform to Section 179 allowances also did not adopt bonus depreciation.

3 Predicting Responses

The key to predicting the effects of state bonus adoption and state Section 179 conformity is to realize that the effect of one policy is blunted as the other is made more generous. To explore the effects of the policies and their interaction, consider a stylized two period investment model.

A firm starts Period 1 with retained earnings, X, and must decide how much to invest, I, and how much to pay out as a dividend, $D = X - I$. I generates net profits according to the concave production function $f(I)$. Profits are taxed at rate τ_c.[7] The investment economically depreciates at rate δ but can only be depreciated for tax purposes and deducted from taxable income at rate z. Investors can also purchase a government bond that pays fixed rate r and therefore discount period 2 dividends by $1 + r$. The firm's maximization problem can be written as

$$\max_I V = (X - I) + \frac{(1 - \tau_c)f(I) + \tau_c z I(1 - \delta)I}{1 + r}.$$

Both bonus depreciation and Section 179 expensing affect z.

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

where b is the bonus rate (i.e. 0.3, 0.5, 1) and

$$z_0 = \begin{cases} 1 & \text{if } I \leq \text{Section 179 allowance and} \\ z_{MACRS} & \text{if } I > \text{Section 179 allowance.} \end{cases}$$

When the investment level is less than the Section 179 allowance, then the full cost of the investment can be depreciated in the first year and $z = 1$. When the investment level is greater than the Section 179 allowance, z_0 is equal to the MACRS depreciation rate, z_{MACRS}.[8]

[7] τ_c is a generic corporate tax rate that can be construed to represent the federal, state, or a combined rate.

[8] For simplicity, this specification ignores the Section 179 phase-out that occurs after I reaches the Section 179

The firm's first order condition with respect to I is

$$f'(I) = \frac{r + \delta - \tau_c z}{1 - \tau_c}$$

and $\partial I/\partial z > 0$, meaning that the profit maximizing level of investment increases as a larger portion of the investment can be depreciated in the first year. How bonus depreciation, b, and Section 179, z_0, affect I is slightly more complicated because each policy affects the other.

$$\partial I/\partial b \begin{cases} = 0 \text{ if } z_0 = 1 \text{ (i.e.} I \leq \text{ Section 179 allowance), but} \\ > 0 \text{ if } z_0 < 1 \text{ (i.e.} I > \text{ Section 179 allowance).} \end{cases}$$

When the investment level is less than the Section 179 allowance, bonus depreciation does not increase z and does not incentivize investment. On the other hand, for marginal investments over the Section 179 allowance, bonus increases z and incentivizes investment. Put simply, investments under the Section 179 allowance are already immediately expensed and therefore cannot benefit from bonus.

The effect of Section 179 on investment also depends on the level of bonus. When Section 179 is increased, z_0 is now equal to 1 for the newly eligible investments. For these newly eligible investments, $\partial I/\partial z_0 > 0$, but $\partial^2 I/\partial z_0 \partial b < 0$, meaning the effect of Section 179 decreases at higher bonus rates; Section 179 simply isn't worth as much to newly eligible investments when a bonus percentage is already deducted in the first year.

These results suggest two symmetric, empirically testable hypotheses that motivate the study's empirical design. First, state adoption of bonus depreciation will increase investment and the effect will be concentrated among states that have low Section 179 allowances. Second, state conformity to Section 179 allowances will increase investment and the effect will be concentrated among states that do not adopt bonus depreciation.[9]

Before moving on, I note one extension and three short-comings of the simple model. The extension: if labor is a complement to capital investments, then the investment predictions above will also hold for labor. If, however, labor is not a complement, then investment may be responsive, and labor may not. Shortcoming (1): The simple model predicts that the effect of each policy increases in τ_c. However, this will not be the case if firms are choosing to reallocate investments across states. Generous depreciation rules do not overcome the effects of high tax rates. Thus, I

limit. Because ASM data on firm-level investment is not very precise, any additional empirical predictions that could be made by adding the phase-out cannot be tested empirically.

[9] These hypotheses may be restated in terms of investment levels: First, state adoption of bonus depreciation will increase investment, and the effect will be concentrated among firms that invest at levels beyond the Section 179 allowance. Second, state conformity to Section 179 allowances will increase investment, and the effect will be concentrated among among firms that invest at levels below the Section 179 allowances. Section tests these corollary hypotheses by exploring heterogeneous effects across investment levels.

do not directly test this prediction. Shortcoming (2): The model abstracts from cash flow effects. Higher z, via either bonus or Section 179, increases X itself and may affect other firm behaviors. Shortcoming (3): The model does not consider the dynamic aspects of the policies; investments in response to the policies may have delayed and even long-run effects on business activity.

4 Data Sources

To estimate the effects of state bonus adoption and Section 179 conformity, I will rely on business activity data from The Annual Survey of Manufacturers (ASM), bonus adoption data from Lechuga (2014), hand collected state Section 179 data, and state control variables from various sources.

4.1 Manufacturing Data

Measures of business activity come from the ASM and the Economic Census – both products of the US Census Bureau – for the years 1997-2013. The ASM is conducted annually in all years except for years ending in 2 and 7. In those years, corresponding data are available from the Economic Census. The ASM provides sample estimates and statistics for all manufacturing establishments with one or more paid employees – which is the entire Economic Census sample; thus statistics in all years are comparable.

The observational unit in the empirical analysis is the 3-digit North American Classification System (NAICS) industry within in each state. There are 21 3-digit NAICS manufacturing industries and approximately 900 observational units.[10] The NAICS x State business activity outcomes constructed from the ASM are **Investment** = log (real capital expenditure), **Compensation** = log (salaries / employees), **Employment** = log (employees), and **Production** = log (real total shipments).

From ASM data, I also construct **Invest Level**. Invest Level is equal to the NAICS x State capital expenditure divided by the number of firms in the NAICS x State cell in 2002. The number of firms is only available via the Economic Census. 2002 count data is used to eliminate the effects of either policy on the number of firms.

4.2 State Policy Variables

State bonus conformity data is taken from Lechuga (2014), which listed whether states allowed, did not allow, or partially allowed the full federal bonus depreciation in years 2001 through 2014. **State Bonus** is the state bonus rate and can be thought of as an interaction between **Fed Bonus**, the federal bonus rate, and **State Adoption** which takes on values between 0 and 1 and describes the extent to which a state adopts the federal bonus rate. State Adoption is equal to 0 if an

[10] If each NAICS x State unit was represented there would be 1050 observation. Some industries are either not represented in some states or there are too few establishments to report confidential statistics.

observational unit is located in a state that fully rejects the policy in a given year. State Adoption is set equal to 1 for states that fully adopted the policy. When state bonus is adopted at X% of the federal rate, State Adoption is set to X/100.

Table 2: Descriptive Statistics

	MEAN	MEDIAN	STD DEV	MIN	MAX	COUNT
Policy Variables						
State Bonus	0.0768	0	0.185	0	1	12,592
State 179	1.336	0.250	1.695	0.200	5	12,592
Outcomes						
Investment (millions)	165.6	66.57	337.1	0	6828.5	12,592
Compensation (thousands)	44,60	43,30	12.55	0	121.69	12,465
Employment	16,454.4	8,755	23,884.8	0	39,6422	12,592
Production (millions)	0.660	0.293	1.255	0	21.74	12,496
Heterogeneity Variables & State Controls						
Invest Level	610.9	272.9	1,099.7	4	14,247.1	11,300
Dem Legislature %	51.98	51.08	15.27	11.43	115.0	12,592
Dem Governor	0.455	0	0.498	0	1	12,592
Corp Tax Rate	0.0720	0.0700	0.0195	0.00260	0.120	12,592
Corp Tax %	0.0599	0.0525	0.0339	0	0.329	12,592
Budget Gap	0.000550	-0.0543	0.434	-0.394	8.249	12,592
Gross State Product (billns)	290.9	195.7	328.5	15.53	2215.7	12,592
Population (millions)	3.708	1.299	5.576	0.0449	38.41	12,592
Sales Factor	0.541	0.500	0.201	0.333	1	10,064
Deductibility	0.108	0	0.310	0	1	12592

Notes: Table 2 provides descriptive statistics for each variable used in the analysis. The unit of observation is a NAICS x State manufacturing industry averages. State Bonus is the state bonus depreciation rate. State 179 is the state Section 179 allowance. Investment is the total value of capital expenditure. Compensation is total salary divided by the number of employees. Employment is the total number of employees, Production is the total value of shipments (sales). Investment Level is total capital expenditure divided by the number of establishments.

State 179, the state-level Section 179 allowance was hand collected for each state in each year 2000–2014 from department of revenue documents, web pages, and personal contacts. Like State Bonus, State 179 can be expressed as an interaction between **Fed 179**, the federal Section 179 Allowance, and **State Conformity**, which describes the extent to which a state's Section 179 allowance matches the federal allowance. Each unit of State 179 is equal to a $100,000 allowance.

4.3 Time-varying State Controls

Time-varying state level data is used to explore any systematic differences between states that do and do not adopt bonus depreciation and conform to federal Section 179 allowances. From The Book of States data, I construct **Corp Rev %** (the percentage of total state revenue derived from state corporate income taxes), **State Budget Gap** (total state deficit as a fraction of total state revenue), **Democratic Legislator %** (percentage of democratic state legislators that identify as Democrats), and **Democratic Governor** (an indicator equal to 1 if the governor is a Democrat). I take **Corp Tax Rate** (the top marginal corporate income tax rate in each state) from The Tax Foundation. I take **State Population** from Census and **Gross State Product** from the BEA. I use state apportionment **Sales Factor**s and federal **Deductibility** collected for use in Serrato and Zidar (2016).

4.4 Descriptive Statistics

Table 2 provides descriptive statistics for each variable used in the analysis.

5 Empirical Design

Because state bonus depreciation and state Section 179 allowances are correlated, and both are designed to spur investment and business activity more generally, estimating either policy separately will lead to biased estimates. Furthermore, following the logic laid out in Section 3, because the effect of one policy is predicted to decline as the other is enhanced, the empirical specification must also estimate the interaction between the two policies in order to produce unbiased estimates. To account for these concerns, I estimate the effect of both policies simultaneously using the following regression framework

$$\begin{aligned} \ln(\text{Outcome})_{jst} = \beta_0 + \beta_1[\text{State Bonus}_{st}] + \beta_2[\text{State } 179_{st}] \\ + \beta_3\big[[\text{State Bonus}_{st}] \times [\text{State } 179_{st}]\big] + \mathbf{X'_{st}}\boldsymbol{\gamma} + \sigma_t + \nu_{js} + \zeta_{jt} + \psi_s + \epsilon_{jst} \end{aligned} \tag{1}$$

where j denotes NAICS 3-digit industries, s denotes state, and t denotes time. In addition to the policy variables, Specification (1) includes includes an interaction between the two policies to account for their interconnectedness, industry-state fixed effects (ν_{js}) to control for time invariant determinants of business activity, year fixed effects (σ_t) to control for aggregate trends, time-varying state-level controls ($\mathbf{X'_{st}}$) and state linear time trends (ψ_s) to account for state-level changes in the business environment and trends, and finally, industry-by-year fixed effects (ζ_{jt}) to control for changes in business activity that occur at the industry-level. Because State Bonus is equal to State

Adoption interacted with the federal rate and State 179 is equal to State Conformity interacted with federal Section 179 allowances, β_1 and β_2 can both be interpreted as difference-in-differences (DD) estimates and Specification (1), which contains State Bonus, States 179, and their interaction represents a modified DD methodology.

β_1 is interpreted as the percentage increase in the outcome variable experienced by a state that fully adopts 100% federal bonus depreciation relative to the increase that a fully rejecting state experiences when neither state allows for any Section 179 expensing. Similarly β_2 is the impact of an additional \$100,000 in Section 179 allowances when neither the treatment nor control group adopt federal bonus. The β_3 coefficient is then used to consider how much β_1 or β_2 change as Section 179 and bonus are ramped up respectively. More precisely β_3 is equal to the increase in the effect of bonus adoption (β_1) that occurs when state Section 179 allowances increase by \$100,000 and $\beta_2 + \beta_3$ is the impact of a \$100,000 increase in Section 179 allowances when 100% federal bonus has been fully adopted by all states. Because bonus is predicted to be less effective when Section 179 allowances are high and Section 179 allowances are predicted to be meaningless when bonus is fully adopted at a 100% federal level, the interaction term is predicted to be negative. [11]

When the fixed effects, trends, and controls are included, the State Bonus and State 179 coefficients are identified like difference-in-differences parameters: by comparing the business activity by the same industries in adopting/conforming states relative to non-adopting/non-conforming states as the federal policies are implemented and/or increased. Under these conditions, the identifying assumption is that the state-level policies are independent of other state-by-year shocks that are unrelated to the robust set of state-by-year control variables that describe each state's political climate, productivity, population, and finances and that do not follow a linear-trend. A battery of tests presented after Section 6 confirms this assumption and, by extension, the validity of the research design and its estimates.

6 The Effect of State Accelerated Depreciation Policies

Table 3 presents coefficient estimates from Specification (1) for each of the four primary outcomes: Investment, Compensation, Employment, and Production. All standard errors in this table and throughout the paper, unless noted otherwise, are clustered at the state-level.[12] Overall, the results indicate that both policies affect investment, but, as hypothesized, the effect of either is diminished as the other is scaled. State bonus adoption increases Compensation and does so more when state Section 179 allowances are low. Interestingly, neither policy affects contemporaneous measures of

[11] In order to jointly estimate β_1, β_2, and β_3, state bonus adoption and state Section 179 conformity cannot be perfectly collinear. Table A3 describes the overlap of the two policies during the first and second episodes of bonus. Because, there is significant variation in bonus adoption among Section 179 conforming states, all three coefficient can be estimated.

[12] Following Cameron and Miller (2015), because both State Bonus and State 179 vary at the state level and over time, standard errors are clustered at the state level.

employment or production.

TABLE 3: CONTEMPORANEOUS EFFECTS OF STATE BONUS AND SECTION 179

SPECIFICATION	(1)	(2)	(3)	(4)
DEPENDENT VAR:	INVESTMENT	COMPENSATION	EMPLOYMENT	PRODUCTION
STATE BONUS	0.175**	0.025**	0.006	0.017
	(0.073)	(0.009)	(0.025)	(0.028)
STATE 179	0.022***	0.001	0.005	0.006
	(0.008)	(0.002)	(0.005)	(0.005)
BONUS 179 INTERACTION	-0.050***	-0.007***	-0.003	-0.012
	(0.017)	(0.002)	(0.006)	(0.009)
YEAR FE	✓	✓	✓	✓
STATE CONTROLS, TRENDS	✓	✓	✓	✓
NAICS x YEAR FE	✓	✓	✓	✓
STATE x NAICS GROUPS	883	915	933	890
OBSERVATIONS	11,987	12,774	12,864	12,391

Notes: Table 1 presents coefficient estimates from the log-linear regression model (1) for the four primary outcomes, Investment, Salary, Employees, and Production. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set if time-varying state level controls to capture the effect of changes in state politics, productivity, population, and finances. Standard errors are at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

Specification (1) focuses on the investment effects of the policies. The coefficient on State Bonus is 0.175 and statistically significant at the 95% level. The 0.175 parameter indicates that state adoption of 100% federal bonus increases investment by 17.5% when state Section 179 allowances are set to $0. The State 179 coefficient of 0.022 is smaller, but significant at the 99% level, indicating that an increase in state Section 179 allowances of $100,000 increases manufacturing investment by 2.2% when state bonus rates are set to 0%. While this effect is smaller, consider that the federal Section 179 allowance has been set at $500,000 since 2010. As a result, fully conforming to federal Section 179 levels after 2010 increases manufacturing investment by 11% if federal bonus is not adopted.

The coefficient on the interaction term is also statistically significant but now negative in sign, meaning that, as hypothesized, an increase in the intensity of one policy undermines the effect of the other. The -0.05 magnitude means that for every $100,000 that Section 179 allowances are increased, adoption of 100% bonus stimulates 5% less investment. Put differently, if State 179 is set to $350,000 (.175/.05 x $100,000), then 100% bonus adoption has no impact. The interaction coefficient can also be interpreted as the decrease in the effect of State 179 when 100% bonus is increased from 0 to 100%. Thus, the interaction term suggests that the effect of $100,000 in Section 179 allowances decreases by 5% when 100% bonus is fully adopted by a state.

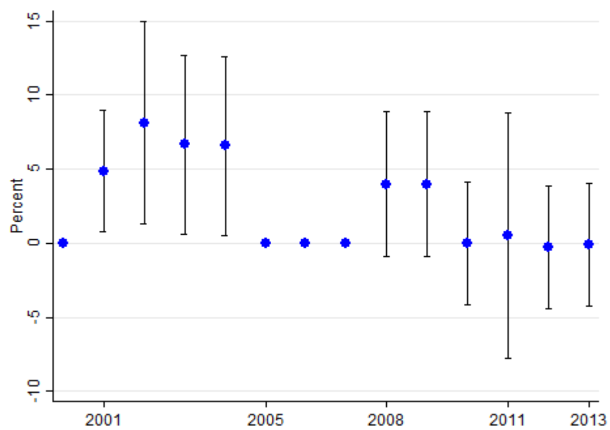
To better understand the interaction between the two policies and their effect on Investment, Figure 3 presents estimates of the effect of both policies during each of the years 2000–2013 while controlling for the effect of the other policy. Panel (A) plots the predicted impact of state adoption of bonus depreciation at the federal level (see Table 1) assuming that the state has the average observed state Section 179 allowances during that year. Therefore, the estimate of the bonus impact is large when bonus is high but is tempered as state Section 179 allowances become more generous. As one might expect, for the average state, the impact of bonus was the largest in 2003, when the federal bonus level was high – 50% – but federal Section 179 allowances were still small – only $24,000. According to the estimates, bonus depreciation had a statistically significant impact on state investment in years 2001–2004 and a nearly significant impact in years 2008–2009. After federal Section 179 allowances increased to $500,000 in 2010, state adoption of bonus depreciation had no marginal effect on investment.

Panel (B) presents estimates of the impact of state Section 179 allowances. Here, the estimates are interpreted as the impact of conforming to federal Section 179 allowances assuming that the state has adopted federal bonus at the average observed level in each year. These estimates are much less affected by bonus than the bonus estimates are by Section 179 conformity because fewer states adopt bonus than conform to section 179 allowances. Therefore, these estimates closely mirror the rise in federal Section 179 allowances. However, bonus significantly reduces the State 179 effect in 2011 when bonus was set to 100% and a larger proportion of states than usual adopted federal bonus depreciation.

The Table 3, Specification (2) results suggest that state adoption of 100% bonus increases Compensation by 2.5% while the effect of State 179 on salaries is not statistically different than zero. Again, the interaction term is negative and statistically significant indicating that, although state Section 179 allowances do not increase compensation themselves, they undermine the effectiveness of bonus. A $100,000 increase in State 179 decreases the bonus compensation effect by 0.007 or 27%. Interestingly, the interaction coefficient again indicates that bonus has no effect when State 179 allowances are set at approximately $350,000 (really $357,142 = 0.025/0.007 x $100,000).

While the Table 3, Specification (1) and (2) results indicate that State Bonus affects both manufacturing investment and compensation and State 179 affects investment, Specifications (3) and (4) indicate that neither policy affects Employment or Production. The null employment effect is unexpected and suggests that investments incentivized by the policies may be substitutes for – as opposed to – complements to labor. That both policies affect Investment but not Production is also surprising. New capital may take time to become productive or may be installed towards year end. Regardless of the explanation, that Investment should lead to more Production but does not in the year of implementation suggests a dynamic response of Production – and perhaps Employment –

Figure 3: Estimated Impact of Bonus Adoption and Section 179 Conformity



Notes: Figure 3(A) uses the estimates presented in Table **??** Specification (1) to predict the investment impact of adopting bonus depreciation at the federal level during the years 2000-2011 assuming the state has adopted the average Section 179 allowances in each year. Figure 3(B) uses the same estimates to predict the investment impact of conforming to the federal Section 179 allowance level (relative to no allowances) during the years 2000-2011 assuming the state has adopted federal bonus depreciation at the average state rate. Standard errors are computed using the delta method.

to state bonus and state Section 179.

6.1 Dynamic Effects

To explore the dynamic effects of the policies, I estimate impulse response functions of all four outcome variables using a modified Jordà (2005) local projection approach. To construct the response functions, I estimate a series of regressions in which the outcome variable is projected h periods into the future. More precisely, I estimate

$$\begin{aligned}\text{Outcome}_{j,s,t+h} = \beta_0 + \beta_{1,h}[\text{State Bonus}_{st}] + \beta_{2,h}[\text{State } 179_{st}] + \beta_{3,h}\big[[\text{State Bonus}_{st}] \times [\text{State } 179_{st}]\big] \\ + \mathbf{X}'_{\mathbf{st}}\gamma + \sigma_t + \nu_{js} + \zeta_{jt} + \psi_s + \epsilon_{jst}. \qquad (2)\end{aligned}$$

for $h = -1, 0, 1, 2, 3, ...7$. $\beta_{1,h}$ is the effect of state bonus adoption on the outcome h periods after the policy treatment is delivered, and $\beta_{1,0}$ is the state bonus response presented in Table 3. The coefficient series $\beta_{1,-1}$ through $\beta_{1,7}$ define the dynamic response of the outcome variable to State Bonus -1 through 7 periods into the future. The $\beta_{2,h}$ and $\beta_{3,h}$ series define the impulse response functions for State 179 and the interaction term respectively.

Figure 4 presents the State Bonus impulse response functions for all four outcomes. The dots in each panel represent coefficient estimates $\beta_{1,-1}$ through $\beta_{1,7}$. The vertical bars represent 95% confidence intervals. Panel (A) shows that State Bonus has a statistically significant effect on

Investment only in the impact period corresponding to the Table 3 estimates, at period $h = 0$. [13] While the overall trend in the $\beta_{1,2}$ through $\beta_{1,7}$ coefficients is negative, there is a spike three years after impact, indicating that – consistent with evidence presented in House and Shapiro (2008) – contemporary, year 0 investments may require future capital expenditures.

Panel (B) suggests that the effect of State Bonus on compensation is only statistically different from zero with 95% confidence in the impact year, again indicating that state bonus adoption only has a immediate effect on compensation. There are several channels by which bonus may affect compensation. The first is the *indirect* channel; under the assumption that capital and labor are complements and each is paid its marginal product, increased levels of capital should drive up the wage. The second, *indirect* channel, hypothesized in Arulampalam, Devereux and Maffini (2012), results from bargaining over corporate profits. That compensation is only affected contemporaneously while the level of capital has increased suggests that the Compensation effect is due primarily to the direct effect.

In contrast to the dynamic Investment and Compensation estimates, Panels (C) and (D) show that State Bonus has a delayed impact on both Employment and Production. Panel (C) shows that the effect of state bonus adoption on Employment increases over time from year 0 to year 5 before tailing off in years 6 and 7. State bonus adoption has a statistically significant ($p < 0.05$), positive effect on Employment 2–6 years after policy impact. Panel (D) indicates that the effect of State Bonus on Production increases during years 0 through 5 and has a statistically significant positive effect three, four, and five years after policy impact. In sum, while the contemporaneous results indicate state adoption of bonus depreciation does not have a direct impact on Employment or Production, its effects – likely through the investment response – seem to have a delayed, positive impact on the manufacturing sector.

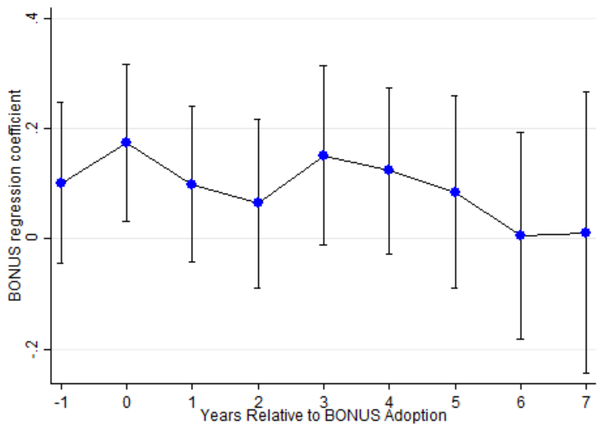
In contrast to the the delayed effects of state bonus adoption. State Section 179 allowances do not affect any of the four outcomes in the longer run. Appendix Figure C displays the State 179 impulse response functions. State 179 has a statistically significant effect on Investment in periods $h = 0$ and $h = 1$. No other coefficients across all four outcomes differ from 0 at the 5% level. These results suggest that while state conformity to federal Section 179 allowances affects investment in the near term, it has no contemporaneous or delayed effect on other business activity.

To explore the magnitude of the effects, Table 4 presents estimates of the five-year ahead ($h = 5$) responses of all four outcomes to the policies. The Specification (3) estimates suggest that state adoption of 100% bonus increases employment by 7.7%. The State 179 and Bonus 179 Interaction terms indicate that while State 179 does not increase employment five years out, it does undermine the state bonus effect; each $100,000 increase in state Section 179 allowances decreases the bonus effect by 4.8 percentage points or by 62%.

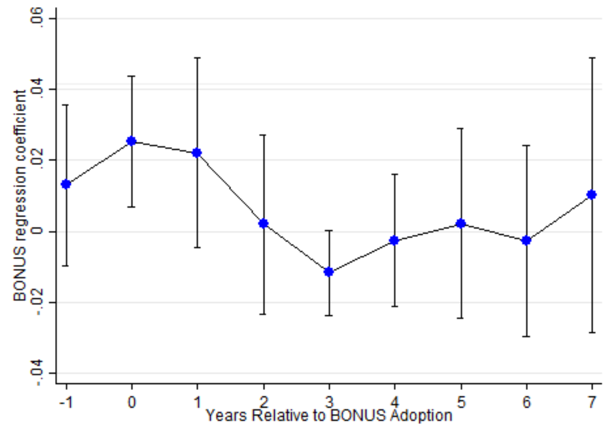
[13] As the local projection is just equal to the original estimating equation, the results from Table 3 present the magnitude of these contemporaneous effects.

Figure 4: State Bonus Impulse Response Functions

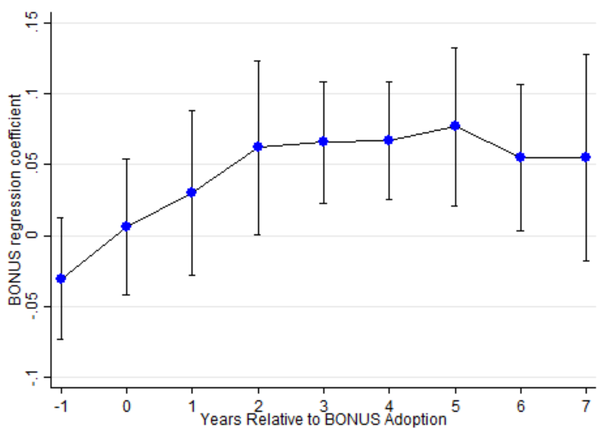
(a) Investment



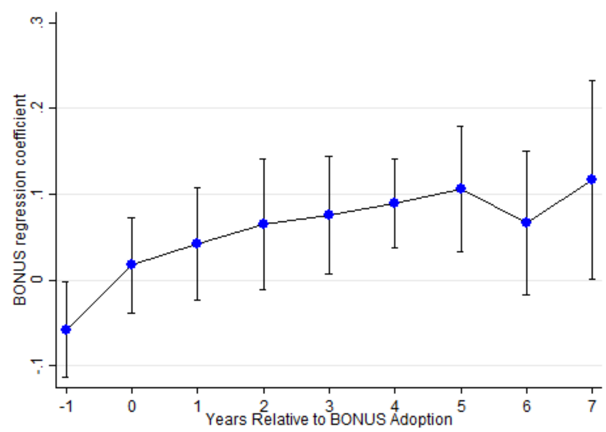
(b) Compensation



(c) Employment



(d) Production



Notes: Panels (A)–(D) of Figure 4 plots impulse response functions of investment, salary, employment, and value added to State Bonus as constructed using the modified Jordà (2005) method described in Subsection 6.1. Each point represents the a State Bonus coefficient. Vertical bars represent 95% confidence intervals.

The Specification (4) results suggest that 100% state bonus adoption increases Production five years out by 10.5%. As was the case for Employment, although State 179 does not affect future production, it does mitigate the effects of state bonus adoption. Increasing Section 179 allowances by $100,000 decreases the bonus effect by 5.6 percentage points or by 53%.

Overall, the empirical results presented thus far show that state accelerated depreciation policies have substantial effects on business activity. State adoption of 100% bonus depreciation increases short-run Investment by 17.5%, short-run compensation by 2.5%, delayed employment by 7.7% and delayed production by 10.5%. While state Section 179 allowances only directly increase short-run

Table 4: Delayed Effects of State Bonus and Section 179

Specification	(1)	(2)	(3)	(4)
		($h = 5$)		
Dependent Var:	Investment	Compensation	Employment	Production
State Bonus	0.085	0.002	0.077***	0.105***
	(0.089)	(0.014)	(0.028)	(0.037)
State 179	-0.026	0.005	0.006	-0.016
	(0.028)	(0.004)	(0.011)	(0.013)
Bonus 179 Interaction	-0.057	0.000	-0.048***	-0.056**
	(0.063)	(0.008)	(0.017)	(0.026)
State x NAICS Groups	784	801	804	800
Observations	8,689	9,260	9,277	8,973

Notes: Table 4 presents coefficient estimates from the log-linear regression model (1) for the four primary outcomes, Investment, Compensation, Employment, and Production where, following Jordà (2005), the outcomes are advanced five years relative to the policy and other independent variables. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set if time-varying state level controls to capture the effect of changes in state politics, productivity, population, and finances. Standard errors are at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

investment (a $100,000 in state allowances increases investment by 2.2%), as hypothesized, state allowances reduce the base on which bonus operates and mitigate bonus' stimulant effect. In the following section, these striking results are subjected to empirical scrutiny via a series of robustness tests, semiparametric graphical analyses, placebo tests, and estimation of heterogeneous effects.

7 Empirical Results Scrutiny

7.1 Robustness

Appendix E presents several robustness checks. Table A4 reproduces the headline empirical estimates (short-run Investment and Compensation, delayed Employment and Production) with an alternative or a more sparse series of covariates and fixed effects. Specifications (1a)–(4a) include only year-fixed effects, Specifications (1b)–(4b) include year-fixed effects and the series of time-varying state-level controls described in Section 4. Specifications (1c)–(4c) include year-fixed effects, state-level controls, and NAICS $\times$ Year-fixed effects and differ from the baseline specifications only because they omit state time trends. Across all specifications, the State Bonus, Section 179, and Interaction magnitudes are similar to baseline estimates once state-level controls are added. With the addition of NAICS $\times$ Year-fixed effects, all State Bonus and three of the four Interaction estimates have p-values of 0.10 or lower. Without state linear time trends, the effect of State 179 on investment is not statistically different from zero. This is unsurprising as the rise of Section 179 allowances for fully conforming states follows a nearly linear pattern over the year 2000–2014.

Following recommendations set forth in Cameron and Miller (2015), Table A5 provides standard errors for headline coefficient estimates when standard errors are not clustered and when standard errors are clustered at the NAICS 3-digit industry level. Clustering the standard errors at these alternative levels has little effect on the standard error estimates.

7.2 Semiparametric Difference-in-Differences Graphical Analysis

The following semiparametric DD analysis estimates the difference in each outcome variable between adopting and non-adopting states in each year. Due to separate year estimates, these results can be used to test the validity of the research design. Ideally, the estimated differences are negligible in non-bonus and low Section 179 years then large in bonus years and high Section 179 years. Estimated coefficients that follow this pattern would suggest that pretrends between adopting and non-adopting states are not driving the results and would certify the fully parametric results presented in the prior section.

Starting with Investment and Compensation, I estimate the impact of state adoption of bonus depreciation by replacing the State Bonus variable in Specification (1) with

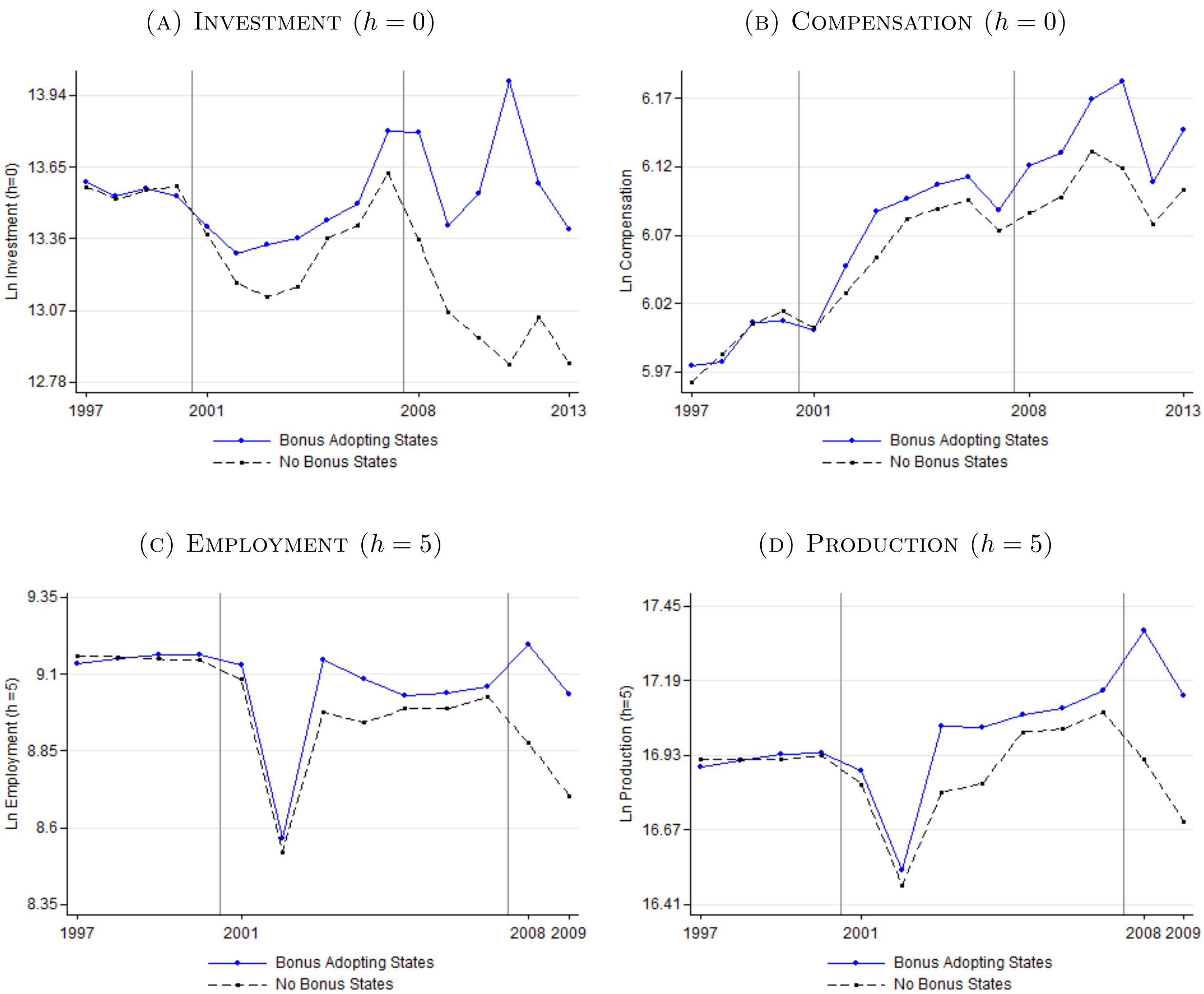
$$\sum_{k=1997}^{2014} \beta_1^k \left[\text{State Adoption}_{s,t} \times \mathbb{1}[\text{Year}_k]\right].$$

The coefficients β_1^{1997}–β_1^{2014} are semiparametric estimates of the effect of adopting bonus depreciation at the federal level in each year.[14] I follow the same procedure for Employment and Production, but, following the results presented in Figure 4, I advance the outcomes five years to test the effect of state bonus adoption five years on. I then create a separate series for adopting and non-adopting states. For adopting states, I add 0.5 times the coefficient in each year to an aggregate trend in the outcome. For non-conforming states, I subtract 0.5 times the coefficient from the aggregate trends. Finally, I equalize the levels of the series in the pre-period by subtracting the difference in the average of the 1997–2000 coefficients from the treated series. The results of this procedure are Panels (A)–(D) of Figure 5. Comparing the vertical distance between the two series when bonus is turned on relative to the vertical distances when bonus is turned off provides a graphical approximation of the modified DD empirical approach.[15]

[14] To create comparable pretrends, State Adoption in years 1997–2000 and 2005 is set equal to the average State Adoption observed in years 2001–2004 and State Adoption in years 2006–2007 is set equal to the average State Adoption observed in years 2008–2010.

[15] Notice, these estimates differ from those in Figure 3 in two ways. First, they are not marginal effects. That is they represent the impact of each policy assuming the other is set to zero. Second, a single estimate is not used to predict responsiveness in each year. Instead, the responsiveness of the outcome to each policy in each year is

Figure 5: Effects of State Bonus Adoption on U.S. Manufacturing



Notes: Figure 5 presents a visual implementation of the differences-in-differences (DD) research design described in Section 5 for each of the four outcome variables investigated in the primary empirical analysis. To create each plot, Specification (1) is reestimated replacing State Bonus with $\sum_{k=1997}^{2014} \beta_1^k \left[\text{State Adoption}_{s,t} \times \mathbb{1}[\text{Year}_k]\right]$. For adopting states, 0.5 times the coefficient in each year to an aggregate trend in the outcome in each year. For non-conforming states, 0.5 times the coefficient is subtracted from the aggregate trends. Differences in levels prior to policy implementation are eliminated by subtracting the average difference in the outcome variable in years 1997–2000 from the treated series. For Employment and Production outcomes, the outcome variable is advanced five years and the coefficients are added five years forward following following the results presented in Figure 4. The result of this procedure are Panels (A)–(D) of Figure . Comparing the vertical distance between the two series when bonus is turned on relative to the vertical distances when bonus is turned off provides a graphical approximation of the modified DD empirical approach.

Panel (A) shows how investment by adopting states differed from non-adopting states over

estimated separately.

the years 1997–2013.[16] In years 1997–2000, before federal bonus depreciation existed, there is no difference in investment behavior between like-industries in adopting and non-adopting states. In 2001, investment begins to increase for adopting states. The divergence is even stronger in years 2002–2004 when bonus is increased to 50%. When bonus is turned off in 2005–2007, investment trends come back together but not all the way suggesting investment may be path dependent. While adopting-state investment is slightly higher during these years it closely tracked investment by non adopting states. In 2008, when federal bonus is reinstated, the trends again diverge. The largest divergence between adopting and non-adopting states is in 2011, when bonus is set at its highest rate. When bonus is scaled back in 2012, the trends converge somewhat.

Panels (B), (C) and (D) show similar results for Compensation, Employment five years out, and Production five years out. Overall, the State Bonus graphical analysis indicates that prior to bonus, trends in outcomes between adopting and non-adopting states are similar. Upon bonus impact in 2001, trends in all four outcomes diverge and the divergence grows in years 2003 and 2004 before collapsing in 2005, 2006, and 2007, when bonus was turned off. After 2008, all four outcomes in adopting states increase relative to non-adopting states.

I alter the semiparametric estimation procedure in two ways to examine the effects of state Section 179 conformity. First, instead of replacing State Bonus in Specification (1), I now replace State 179 with

$$\sum_{k=2003}^{2014} \beta_1^k \left[\text{State Conformity}_{s,t} \times \mathbb{1}[\text{Year}_k]\right].$$

Second, I limit the analysis to years after 2003 because prior to 2003 nearly all states fully conformed to the federal Section 179 allowances level. Comparing the vertical difference before 2008 to the vertical distance after 2008 and after 2010 provides a graphical approximation of the modified DD empirical approach.

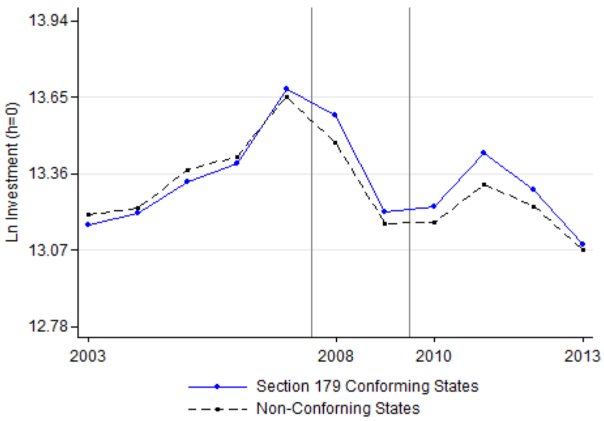
Panel (A) of Table 6 shows the impact of State 179 conformity on Investment during the years 2003–2013. The graph shows that investment patterns in conforming and non-conforming states track one another prior to 2008 when the federal allowance was set at $100,000. After 2008, when federal 179 was increased to $250,000, the trends begin to diverge and diverge even further after 2010 when federal 179 was raised to $500,000. Overall, the panel shows that increasing state Section 179 allowances to $250,000 and then $500,000 had a observable impact on Investment.

Panel (B) in contrast, shows only a slight divergence between the two Compensation trends in 2010 through 2013. However, the difference between the series in not statistically different from zero in any years. Panels (C) and (D) show the increased state Section 179 allowances in 2008 had no effect on Employment or Production five years out.

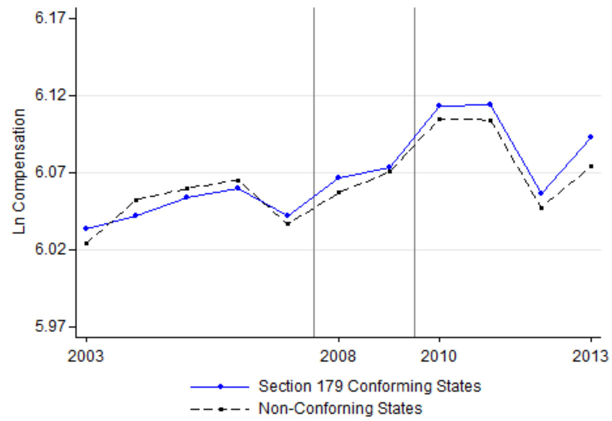
[16]The 2014 coefficient is dropped due to collinearity.

Figure 6: Effects of State Section 179 Conformity on U.S. Manufacturing

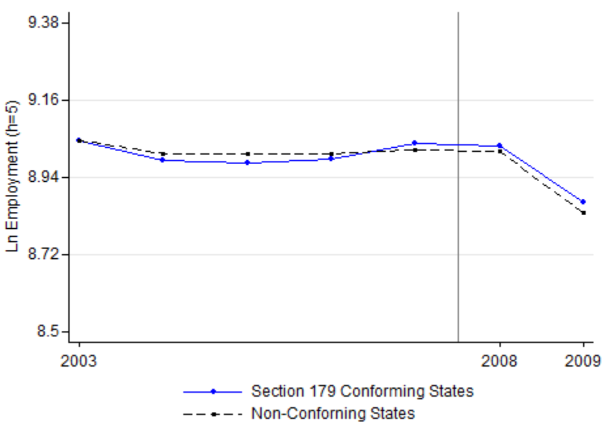
(a) Investment ($h = 0$)



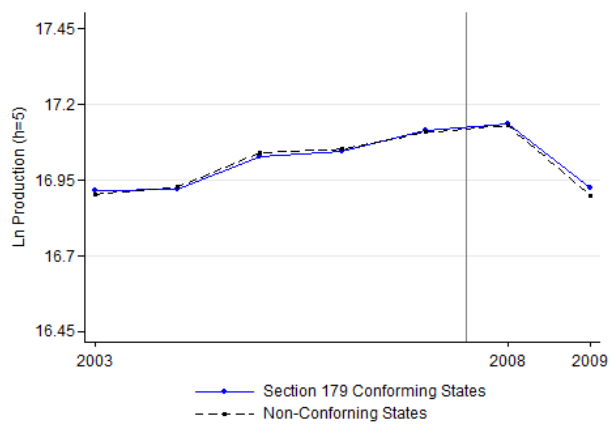
(b) Compensation ($h = 0$)



(c) Employment ($h = 5$)



(d) Production ($h = 5$)



Notes: Figure 6 presents a visual implementation of the differences-in-differences (DD) research design described in Section 5 for each of the four outcome variables investigated in the primary empirical analysis. To create each plot, Specification (1) is reestimated replacing State 179 with $\sum_{k=2003}^{2014} \beta_1^k \left[\text{State Conformity}_{s,t} \times \mathbb{1}[\text{Year}_k]\right]$. For adopting states, 0.5 times the coefficient in each year to an aggregate trend in the outcome in each year. For non-conforming states, 0.5 times the coefficient is subtracted from the aggregate trends. Differences in levels prior to policy implementation are eliminated by subtracting the average difference in the outcome variable in years 2003–2007 from the treated series. For Employment and Production outcomes, the outcome variable is advanced five years and the coefficients are added five years forward following following the results presented in Figure 4. The result of this procedure are Panels (A)–(D) of Figure . Comparing the vertical distance between the two series as Section 179 is increased to $250,000 in 2008 and $500,000 in 2010 relative to the vertical distances when prior to 2008 provides a graphical approximation of the modified DD empirical approach.

In sum, the semiparametric graphical analysis supports the headline regression results. Prior to the inception of federal bonus in 2001, Investment and Compensation patterns are nearly identical between adopting and non-adopting states. Critically, across all four outcome variables, there is no divergence in corporate behavior between adopting/conforming and non-adopting/non-conforming states prior to bonus implementation in 2001 and Section 179 scaling in 2008. This visual evidence (1) suggests that differential trends across groups in the pre-period are not responsible for the estimated effects of the policy, and (2) provides a visual placebo that indicates no false positives.

7.3 Block Permutation Tests

To provide a comprehensive series of placebo tests and to simultaneously allay concerns that the modified DD estimation strategy may overreject the null hypothesis due to serially correlated error terms (Bertrand, Duflo and Mullainathan (2004)), I implement a series of block permutation tests similar to those used in Chetty, Looney and Kroft (2009) and Zidar (2015). For each of the four headline outcomes, I perform 2000 placebo regressions then use the results to construct nonparametric $p-$values that represent the probability that a placebo coefficient is larger than the headline estimates presented in Tables 3 and 4.

Each permutation is performed by randomly selecting a placebo implementation year between 1997 and 2001. Then, I randomly assign – without replacement – another state's State Bonus, State 179, and Bonus 179 Interaction treatments from the years 2001–2014 to begin in the placebo implementation year.[17] The baseline regression, Specification (1), is then re-estimated for each of the four primary outcomes of interest using the placebo treatment. State Bonus, State 179, and Bonus 179 Interaction placebo coefficients are recorded and the procedure is repeated another 1,999 times to produce the plots in Figure 7.

Each of the 12 panels in Figure 7 displays an empirical CDF of the 2,000 placebo coefficients. No parametric smoothing is applied; the CDFs look smooth because of the large number of points used to construct them. The vertical black lines represent baseline effect sizes. Row 1 present results for Investment; Row 2 Compensation; Row 3 Employment; Row 4 Production.

For Investment ($h = 0$), 3 out of the 2,000 State Bonus coefficients are larger than the estimated effect suggesting a non-parametric p-value of 0.0015. 64 out of the 2,000 State 179 coefficients are larger suggesting $p = 0.032$. 2 out of the 2,000 Interaction coefficients are larger in magnitude and negative suggesting $p = 0.001$.

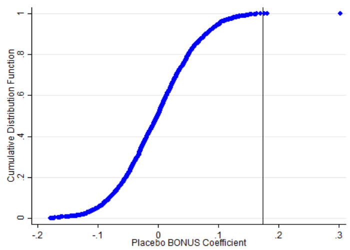
For Compensation ($h = 0$), 56 out of the 2,000 State Bonus coefficients are larger suggesting $p = 0.0265$. 480 out of the 2,000 State 179 coefficients are larger, suggesting $p = 0.24$. 33 out of the 2,000 Interaction coefficients are larger in magnitude and negative, suggesting $p = 0.0165$.

[17] When the placebo implementation year is earlier than 2001, this procedure leaves later years with missing treatments. I replace the missing treatments with the assigned treatment in the latest non-missing year.

Figure 7: Placebo Coefficient CDFs from Block Permutation Tests

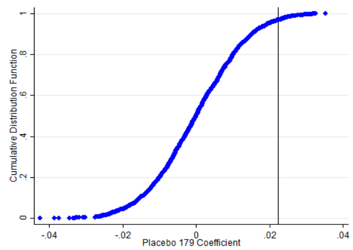
(a) Investment Bonus

$p = 0.0015^{***}$



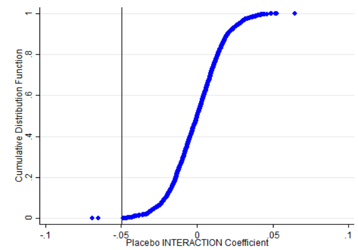
(b) Investment Sec. 179

$p = 0.0320^{**}$



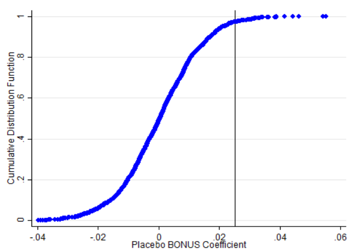
(c) Investment Interaction

$p = 0.0010^{***}$



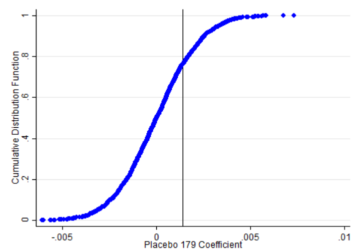
(d) Compensation Bonus

$p = 0.0265^{**}$



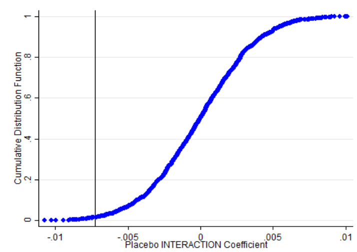
(e) Compensation Sec. 179

$p = 0.2400$



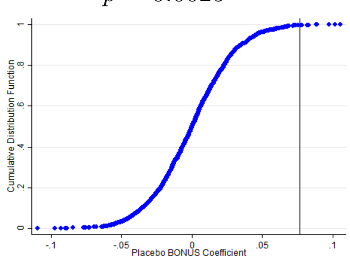
(f) Compensation Interact

$p = 0.0165^{***}$



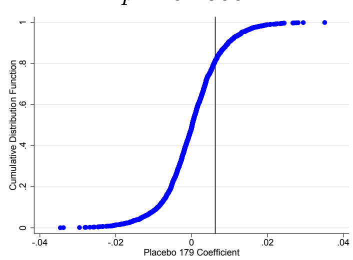
(g) Employment Bonus

$p = 0.0025^{***}$



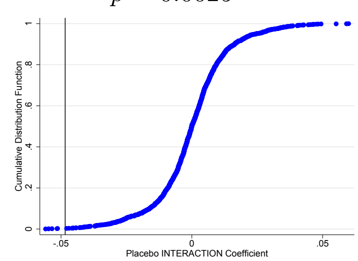
(h) Employment Sec. 179

$p = 0.1860$



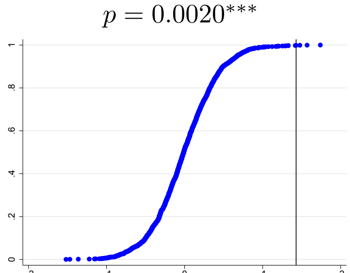
(i) Employment Interaction

$p = 0.0025^{***}$



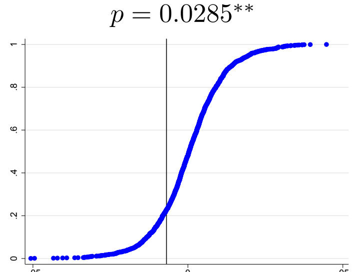
(j) Production Bonus

$p = 0.0020^{***}$



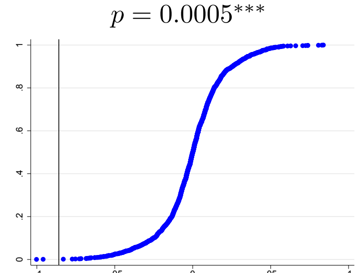
(k) Production Sec. 179

$p = 0.0285^{**}$



(l) Production Interaction

$p = 0.0005^{***}$



Notes: Each panel of Figure 7 plots an empirical distributions of placebo coefficients from regressions in which the outcome is regressed on randomly assigned State Bonus, State 179, and Bonus 179 Interaction treatments. The vertical lines show the treatment effect estimate reported in Table 3 for Investment and Compensation or Table 4 for Employment and Production. Non-parametric p-values represent the probability an observation is greater in magnitude than the effect estimates. *** and ** denote statistical significance at 1 and 5%.

For Employment ($h = 5$), 10 out of the 2,000 State Bonus coefficients are larger suggesting $p = 0.005$. 372 out of the 2,000 State 179 coefficients are larger, suggesting $p = 0.186$. 5 out of the 2,000 Interaction coefficients are larger in magnitude and negative, suggesting $p = 0.0025$.

For Production ($h = 5$), 4 out of the 2,000 State Bonus coefficients are larger suggesting $p = 0.002$. 57 out of the 2,000 State 179 coefficients are larger, suggesting $p = 0.0285$. 1 out of the 2,000 Interaction coefficients are larger in magnitude and negative, suggesting $p = 0.0005$.

In sum, except for the State 179 Production coefficient, the block permutation tests produced standard errors that were very close to the state clustered standard errors estimated in the baseline analysis. The results suggest that (1) clustering at the state-level nicely addresses serial correlation concerns and (2) that random differences in the evolution of state-level outcomes are unlikely to generate the estimated accelerated depreciation policy effects.

7.4 Heterogenous Effects

7.4.1 Heterogeneity by Investment Level

The simple model presented in Section 3 demonstrates that bonus depreciation only affects firms that invest beyond the Section 179 allowance level. Additionally, Section 179 should only affect marginal investment decisions for firms that investment below the Section 179 allowance. To implement a simple test of these predictions, I reestimate Specification (1) for the four primary outcomes (Investment ($h = 0$), Compensation ($h = 0$), Employment ($h = 5$), and Production ($h = 5$)) while including interactions between State Bonus, State 179, and the Bonus 179 Interaction terms and Invest Level, a proxy for the level of investment undertaken by each firm, that is equal to the 2002 per firm level of investment for each NAICS x State observation. Invest Level is scaled so each unit translates to a $100,000 increase in investment per firm.

Table 5 presents the Investment Level heterogeneity results. Focusing on the Specification (1) Investment results, the State Bonus x Investment Level coefficient is equal to 0.151, indicating that, consistent with the model's prediction, a $100,000 increase in Investment Level increases the effect of state bonus adoption by 15.1%. Considering State Bonus increased investment by 17.5% for the full sample, the interaction coefficient suggests almost all of the State Bonus effect comes from firms' investment of more than $100,000. The State 179 x Investment Level coefficient is -0.008, indicating that firms that invest $100,000 less are 0.8% less affected by state Section 179 allowances firms that invest more. The Interaction x Investment Level coefficient is equal to -0.26 ($p < 0.10$) indicating that (1) the interaction effect is larger at higher investment levels and that (2) the effects of state bonus adoption are most mitigated when Section 179 allowances are raised to $250,000 and $500,000 levels.

The results for the other outcomes are understandably less striking as state accelerated depreciation policies are designed to affect investment directly. Specification (2) results suggest that while state Section 179 allowances do not have an effect on average (Specification (2), Table 3), state Section 179 allowances do increase salaries for firms that invest less. Specifications (3) and (4) show that the delayed effects of the policies do not differ by investment level. Overall, the Invest Level heterogeneity results support the corollary empirical hypotheses developed in Section 3 and reinforce the study's headline immediate and delayed response results.

Table 5: Investment Level Heterogeneity

Specification	(1)	(2)	(3)	(4)
	($h = 0$)		($h = 5$)	
Dependent Variable:	Investment	Compensation	Employment	Production
State Bonus	0.062	0.034***	0.076**	0.090
	(0.083)	(0.012)	(0.033)	(0.064)
State 179	0.026***	0.004*	0.031***	0.010
	(0.009)	(0.002)	(0.010)	(0.018)
Bonus 179 Interaction	-0.027*	-0.008**	-0.056**	-0.062
	(0.016)	(0.003)	(0.022)	(0.044)
Bonus x Invest Level	0.151***	-0.004	0.004	0.046
	(0.047)	(0.009)	(0.023)	(0.052)
Section 179 x Invest Level	-0.008**	-0.003***	-0.006	-0.014
	(0.004)	(0.001)	(0.005)	(0.008)
Interaction x Invest Level	-0.026*	0.000	-0.002	-0.022
	(0.015)	(0.003)	(0.013)	(0.041)
State x NAICS Groups	754	754	702	702
Observations	11,026	11,362	8,466	8,330

Notes: Table 5 presents coefficient estimates from regression model (1) including State Bonus, State 179 and Bonus 179 Interaction interacted with investment level for all four outcomes of interest. The outcome variables in columns (1)–(4) are Investment, Compensation, five year ahead Employment, and five year ahead Production. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set of state level controls. Standard errors are clustered at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

7.4.2 Heterogeneity by Tax Rates, Apportionment Factors, and Deductibility

As predicted in Section 3, assuming that firms cannot reallocate investment across state lines, the effect of state accelerated depreciation policies should be largest in states that have higher corporate income tax rates.[18] If however, firms can reallocate their business activities across states, then it is possible they would reallocate capital to take advantage of generous depreciation policies. However, firms would only on rare occasions reallocate capital to states with high corporate tax rates for such reasons because the high tax rate penalties would outweigh any depreciation benefits. If reallocation accounts for a significant portion of the response, then the effect of state accelerated depreciation policies may actually be smaller in high tax states.

Table 6 reestimates regression model (1) for all four primary outcomes but progressively limits the sample to the states with the highest corporate tax rates. Specifications (1a)–(4a) present estimates for the full sample. Specifications (1b)–(4b) limit the analysis to observations in states with tax rates above 5.7%, the 25th percentile tax rate. Specifications (1c)–(4c) limit the analysis to observations in states with tax rates above 8.2%, the the median tax rate.

Across all four outcomes, point estimates suggest the effect of State Bonus decreases as tax rates increase. The effect of State 179 on investment also decreases substantially as the sample is limited. These results suggest that reallocation is a significant part of the response to state accelerated depreciation policies.

To provide a rough estimate of the percentage of response that is due to reallocation, assume that no businesses will reallocate to top 50 % tax states to take advantage of state bonus of Section 179. Then the response for all states captures both within-plant increases in the outcomes *and* reallocation while the response for top 50% states represents only the within-plant increases. Subtracting the top 50% response from the all state response yields the reallocation response. Dividing the reallocation response by the all state response yields the percent of all state response due to reallocation across state lines. This analysis suggests that approximately 19% of the Investment response is due to reallocation.[19] Nearly all of the Section 179 response – 82% – is due to allocation/reallocation across states.

If a firm has a physical presence in more than one state, the firm must apportion its profits according to each state's apportionment weights for property, payroll, and sales. To test whether apportionment formulae affect responses to state accelerated deprecation policies, I reestimate Specification (1) for the four primary outcomes while including interactions between State Bonus, State 179, and the Bonus 179 Interaction terms with the sales factor (between 0 and 1).[20] Results are presented in Appendix Table A6. Consistent with the results reported in Giroud and Rauh (2017) and the general finding that sales factors induce substantial behavioral responses, I find the Compensation and Production responses to bonus are mitigated in states that place a greater weight on sales.

[18]Here, I use allocate to mean either "for a firm to place capital in a state in which it did not have a presence before" or "for a firm to choose to place an investment in one state as opposed to another."

[19]A similar analysis suggests reallocation accounts for 28%, 76%, and 20% of the Compensation, Employment, and Production response to state bonus adoption.

[20]In practice, states choose a sales weight and divide the remaining weight equally between property and payroll so interacting just the sales factor captures the effect of all three weights.

Table 6: Heterogeneity by State Corporate Tax Rates

Dep. Variable:	Investment ($h = 0$)			Compensation ($h = 0$)		
State Corp Tax Rate	$> 0\%$	$> 5.7\%$	$> 8.2\%$	$> 0\%$	$> 5.7\%$	$> 8.2\%$
Specification	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
State Bonus	0.175**	0.140	0.141	0.025**	0.019	0.018
	(0.073)	(0.083)	(0.089)	(0.009)	(0.011)	(0.016)
State 179	0.022***	0.016**	0.004	0.001	0.001	0.002
	(0.008)	(0.008)	(0.015)	(0.002)	(0.002)	(0.003)
Interaction	-0.050***	-0.036*	-0.029	-0.007***	-0.008**	-0.007
	(0.017)	(0.018)	(0.023)	(0.002)	(0.003)	(0.004)
Groups	883	759	400	915	790	419
Observations	11,987	9,502	4,066	12,774	10,181	4,391
Dep. Variable:	Employment ($h = 5$)			Production ($h = 5$)		
State Corp Tax Rate	$> 0\%$	$> 5.7\%$	$> 8.2\%$	$> 0\%$	$> 5.7\%$	$> 8.2\%$
Specification	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)
State Bonus	0.077***	0.063	0.032	0.105***	0.084	0.083
	(0.028)	(0.040)	(0.060)	(0.037)	(0.052)	(0.092)
State 179	0.006	0.002	0.006	-0.016	-0.019	-0.007
	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.017)
Interaction	-0.048***	-0.042*	-0.037	-0.056**	-0.045	-0.079
	(0.017)	(0.023)	(0.033)	(0.026)	(0.033)	(0.068)
Groups	804	665	344	800	661	341
Observations	9,277	7,239	3,190	8,973	6,983	3,078

Notes: Table 6 presents coefficient estimates from regression model (1). The outcome variables in series (1)–(4) are Investment, Compensation, five year ahead Employment, and five year ahead Production. Specifications (1b)–(4b) limit the analysis to states with corporate income tax rates above 5.7%.. Specifications (1c)–(4c) limit the analysis to states with corporate income tax rates aboe 8.3%. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set if time-varying state level controls. Standard errors are at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

Some states allow firms to deduct their federal taxes paid from their state taxable income. Table A7 repeats the Table 6 analysis but replaces Sales Factor with Deductible, an indicator equal to 1 if the states allows federal taxes to be deducted. While some of the interaction coefficients are statistically different from zero, their magnitudes are small indicating that federal tax deductibility is largely unimportant in determining responses to the policies.

7.4.3 Heterogeneity by Adoption Determinants

A primary concern in precisely identifying the effect of state adoption of federal investment incentives is that states that choose to adopt the policies may be systematically different than those that did not adopt the policies and that these differences are correlated with different growth investment, compensation, employment, and production trajectories. While these selection concerns can never be fully eliminated, I attempt to address them here by (1) identifying whether adopting states differ from non-adopting states in their observable characteristics and then (2) reestimating the headline results after limiting the sample to observations in states that are the most likely to adopt the policies. This procedure produces more similar "treatment" and "control" groups and mitigates the sample selection concerns detailed above.[21]

Appendix Table A8 explores potential determinants of state level bonus adoption during the first bonus episode in 2001 and during the second bonus episode in 2008. The table presents the mean and t statistics for five state-level variables across adopting and non-adopting states. In this table, adopters are defined as those states that offered any bonus depreciation during the year in question. In 2001, means are marginally statistically different for only one variable, Corp Tax Rate %, the state corporate income tax. In 2001, states were more likely to adopt bonus if they had higher state corporate income tax rates. In 2008, states that adopted bonus had a more Republican legislature, had smaller state budget gaps, and reported lower levels of gross state product per capita.

Appendix Table A9 performs the same balancing test for state Section 179 conformers and non-conformers in 2004 and in 2010. These years were chosen because they coincide with largest decreases in state 179 conformity. Overall, state characteristics are more similar between conforming and non-conforming states than between bonus-adopting and rejecting-states. The analysis suggests that conforming states had lower tax rates in both years and higher percentages of Republican legislators in 2010.

Based on the results presented in Appendix Tables A8 and A9, I now examine the impact of state accelerated depreciation after eliminating, in turn, observations in states that are less likely to be represented by Republican legislators, have larger state budget gaps, and reported higher GSP levels. The analysis presented in Table 6 already limited the analysis to states with progressively higher tax rates. While State Bonus and Interaction point estimates decline modestly as the sample was limited to states with higher rate (those more likely to adopt), the point estimates remained large and fairly similar to the full sample results. The effect of State 179 diminished more quickly, suggesting that in the states with low tax rates (those that were more likely to conform to Section

[21] Ideally, matching techniques might be used to achieve more similar treatment and controls groups. However, implementing matching procedures in a setting with three non-binary treatment variables is infeasible.

179) the effect of the policy was large.

Table 7: Subgroup Analysis by Adoption Determinants

Dep. Variable:	Investment ($h = 0$)			Compensation ($h = 0$)		
Subgroup	Low Dem	Low BG	Low GSP	Low Dem	Low BG	Low GSP
Specification	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
State Bonus	0.173**	0.195**	0.154**	0.025**	0.017	0.018*
	(0.077)	(0.083)	(0.075)	(0.012)	(0.011)	(0.010)
State 179	0.017*	0.020**	0.026**	-0.000	0.002	0.002
	(0.009)	(0.009)	(0.012)	(0.002)	(0.002)	(0.002)
Interaction	-0.044**	-0.046**	-0.046**	-0.006	-0.007**	-0.006**
	(0.020)	(0.021)	(0.018)	(0.004)	(0.003)	(0.003)
Groups	792	871	739	829	911	769
Observations	9,030	8,913	9,233	9,610	9,486	9,876

Dep. Variable:	Employment ($h = 5$)			Production ($h = 5$)		
Subgroup	Low Dem	Low BG	Low GSP	Low Dem	Low BG	Low GSP
Specification	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)
State Bonus	0.065*	0.051	0.087**	0.114**	0.084*	0.103**
	(0.033)	(0.033)	(0.033)	(0.048)	(0.042)	(0.045)
State 179	-0.006	-0.009	0.001	-0.024	-0.041***	-0.025
	(0.012)	(0.012)	(0.014)	(0.015)	(0.014)	(0.015)
Interaction	-0.041*	-0.031	-0.052**	-0.061*	-0.031	-0.043
	(0.021)	(0.019)	(0.021)	(0.034)	(0.027)	(0.031)
Groups	699	789	652	695	786	648
Observations	6,989	6,869	7,070	6,785	6,645	6,823

Notes: Table 6 presents coefficient estimates from regression model (1). The outcome variables in series (1)–(4) are Investment, Compensation, five year ahead Employment, and five year ahead Production. Specifications (1a)–(4a) limit the analysis to states in the bottom 3/4 of Democratic Legislature Percent. Specifications (1b)–(4b) limit the analysis to states in the bottom 3/4 of budget gaps. Specifications (1c)–(4c) limit the analysis to states in the bottom 3/4 of gross state product. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set if time-varying state level controls. Standard errors are at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

Specifications (1a)–(4a) of Table 7 limit the analysis to the top 3/4 of Republican represented states. Specifications (1b)–(4b) limit the analysis to states in the bottom 3/4 of budget gaps. Specifications (1c)–(4c) limit the analysis to states in the bottom 3/4 of gross state product. Point estimates suggest the headline results are stable across all three limited samples. In some specifications, the point estimates are no longer statistically different from 0 at conventional levels most likely owing to the reduced sample size. Overall, the estimates suggest that differences in state characteristics between states that do and do not enact the policies are not generating the headline empirical results.

8 Understanding the Empirical Results

8.1 Elasticity Estimates

A more comprehensive and (often) more comparable way to measure the effect of each policy is to calculate $\mathcal{E}_{\text{BONUS}}$ and $\mathcal{E}_{179}$, the elasticity of any of the four outcomes with respect to changes in the after-tax cost of investment induced by state adoption of bonus depreciation or state Section 179 allowances. Full expensing of investment due to either 100% state bonus depreciation or state Section 179 decreases the after-tax present value cost investment by 1.883%.[22],[23] Therefore, to calculate any of the elasticities, the estimated coefficient, which represents the percentage increase in the outcome due to the policy, is simply multiplied by 100 and then divided by 1.883.

Panel (A) of Table 8 presents estimates of $\mathcal{E}_{\text{BONUS}}$ and $\mathcal{E}_{179}$ based on the contemporaneous business response estimates presented in Table 3. Panel (B) presents elasticities based on the delayed business response estimates presented in Table 4. Elasticities based on statistically significant coefficients ($p < 0.05$) are presented in bold.

8.2 Comparisons to Past Work

8.2.1 Investment

For the Investment outcome, $\mathcal{E}_{\text{BONUS}} = 9.27$. This is the same elasticity estimated by several other papers based on different sources of variation in the after-tax cost of investment. Using industry-level variation created by federal bonus depreciation, Zwick and Mahon (2017) reports an elasticity of 7.2 for all U.S. firms. Ohrn (2017) uses the same estimation strategy but focuses on publicly traded firms and reports an elasticity of 3.98. Maffini et al. (2017) exploits changes in the definition of Small Medium Enterprises in the UK, which bestowed medium sized firms with more generous first year depreciation allowances, and finds an elasticity of 8.7. While the finding here is similar in

[22]Appendix D provides more detail on the calculation of $\mathcal{E}_{\text{BONUS}}$ and $\mathcal{E}_{179}$.

[23]This calculation assumes that a $100,000 increase Section 179 reduces the present value of after-tax investment cost by 1.883% for all firms. This is a reasonable assumption as 80% on firms in the ASM sample invested less than $100,000 per year.

magnitude to the Maffini et al. (2017), it is nearly 30% larger than the Zwick and Mahon (2017) estimate and more than twice as large as the Ohrn (2017) elasticity.

Table 8: Implied Accelerated Depreciation Policy Elasticities

	(A) Contemporaneous ($h = 0$) Elasticities			
Outcome:	Investment	Compensation	Employment	Production
Implied $\mathcal{E}_{\text{BONUS}}$	**9.27**	**1.34**	0.34	0.92
Implied $\mathcal{E}_{179}$	**1.18**	0.07	0.26	0.32
	(B) Delayed ($h = 5$) Elasticities			
Outcome:	Investment	Compensation	Employment	Production
Implied $\mathcal{E}_{\text{BONUS}}$	4.51	0.12	**4.08**	**5.60**
Implied $\mathcal{E}_{179}$	-1.36	0.29	0.33	-0.83

Notes: Table 8 presents estimates $\mathcal{E}_{\text{BONUS}}$ and $\mathcal{E}_{179}$, the elasticity of the outcome variable with respect to the net-of-tax present value of investment costs generated by variation in state bonus depreciation adoption and state Section 179 allowances based on the estimates presented in Tables 3 and 4. Elasticities in bold are based on estimated parameters that were statistically significant at the 5% level.

There are two reasons the estimated investment elasticity *should* be larger than in prior studies. First, the estimates presented herein are based on plant-level – as opposed to firm-level – data. As a result, the response estimates pick up both the within-plant increases in investment and the within-firm-across-plant allocation and reallocation of investment. Elasticities based on firm-level data pick up only within-firm responses. Analysis in Section 7.4.2 suggests approximately 19% of the estimated investment response is due to allocation or re-allocation across states.[24] Based on a sample of firms that have establishments in multiple states, Giroud and Rauh (2017) find that approximately 50% of the intensive margin employment response to corporate taxation is due to within-firm allocation across state borders. Scaling this paper's results by the Giroud and Rauh (2017) finding would suggest an elasticity half as large, $\mathcal{E}_{\text{BONUS}} = 4.635$.

The second reason the Investment $\mathcal{E}_{\text{BONUS}}$ *should* be larger is that whereas federal incentives operate on a largely immobile tax base, state accelerated depreciation incentives are implemented to vie for mobile capital. Because the ASM data is aggregated to the NAICS 3-digit x State level, it picks up extensive margin effects. That business location decisions respond to state incentives is a well-established empirical result (Bartik (1985), Papke (1991) Coughlin, Terza and Arromdee

[24] In the extreme, if estimates were based only on within-firm reallocation, then the estimates would be twice as large as the actual increase in state outcome due to the policy because each dollar increase in a "treated" state would be due a dollar decrease in a "control" state.

(1991), Hines Jr. (1996) Rathelot and Sillard (2008), Brülhart, Jametti and Schmidheiny (2012), Giroud and Rauh (2017)).

For the Investment outcome, $\mathcal{E}_{179} = 1.18$ suggesting that – as was the case with the raw coefficients – state bonus adoption was a much more effective investment stimulus. There are two key differences between bonus depreciation and Section 179 allowances. Bonus was designed – at least initially – to be temporary and decreased the cost of investments no matter the investment level. In contrast, changes in Section 179 were permanent and only increased the incentive to invest below the allowance level. The temporary nature of bonus could be driving some of the observed difference in responsiveness. Estimates of investment responsiveness to variation is the user cost of capital based on permanent changes to MACRS rules (Cummins and Hassett (1992), Cummins et al. (1994), Chirinko et al. (1999)) tended to find more subdued elasticity estimates. On the other hand, the large Maffini et al. (2017) estimate was also based on a permanent change.

As the heterogeneity analysis in Section 7.4 showed, firms that do more investment are more responsive to bonus. If firms that do more investment are less financially constrained, then the difference in access to financing across the targets of each policy could drive the observed response difference. Finally, Section 179 allowances could spur investment but only to a point. As Zwick and Mahon (2017) shows, firms tend to bunch their investment level just below or at the Section 179 allowance.

8.2.2 Compensation

A one percentage point decrease in the after-tax price of investment due to bonus depreciation increased compensation by 2.5%, resulting in a $\mathcal{E}_{\text{BONUS}} = 1.34$. An elasticity greater than unity in this context in not uncommon. Because capital can freely move across U.S. states, the more than 100% of the incidence of the effective tax rate on new investment may be born by labor. Most studies that have examined the effect of corporate taxation on wages, or simply the incidence of the corporate income tax, calculate how corporate profit taxes rather than effective tax rates on investment affect wages.[25] Two papers, Felix (2009) and Carroll (2009), use state-level panel data and variation in U.S. state corporate tax rates (due to marginal rates and apportionment) to estimate the effect of a one percentage point increase in the tax rate on the log of wages. Felix (2009) finds that a one percentage point increase in corporate income taxes decreases wages by between 14 and 36%. Carroll (2009) finds that a one percent increase in the statutory tax rate decreases wages by 13.8%. These findings are substantially smaller than the 2.4% increase that I find. The smaller estimate is most likely due to the apparent decoupling of labor and capital as evidenced by the labor-less investment response to the policies. If capital and labor are not

[25] Liu and Altshuler (2013) uses industry-level differences in effective tax rates generated by changes in the corporate tax rate, changes in MACRS rules, and changes in investment tax credits around TRA86 to estimate the incidence of the corporate income tax. But because movement of capital across industries is uncommon relative to movement across state borders, the estimated parameter is less relevant to the results presented herein.

complements in the production process, then classic channels of tax incidence break down, and the observed compensation response must be due exclusively to the direct incidence of the corporate income tax (Arulampalam et al. (2012)).

8.2.3 Short-run Employment and Production

The analysis presented here suggests Employment and Production did not immediately change in response to the state accelerated depreciation incentives. Wasylenko and McGuire (1985) used industry-by-state data and a pooled-cross section econometric specification to estimate the correlation between effective corporate tax rates and employment growth and found no correlation. More recently, using neighboring counties on opposite sides of state borders, Ljungqvist and Smolyansky (2016) found modest effects of corporate income taxation on employment suggesting that a one percentage point change in corporate income taxes decreases employment by 0.241%. The effect was asymmetric and all due to tax increases. Corporate tax cuts only affected employment during recessions. Again, the difference between the Ljungqvist and Smolyansky (2016) estimates and the short-term null employment response to accelerated deprecation policies is likely due to the fact that investment incentives may not create an incentive to increase labor if the capital investments are used to automate the production process.

8.2.4 Delayed Employment and Production

The longer-run analysis suggests that Employment and Production begin to respond to state bonus depreciation two and three years after policy enactment, respectively. The response for both variables increases three, four, and five years after enactment. For Employment, five year $\mathcal{E}_{\text{BONUS}} = 4.08$. For Production, five year $\mathcal{E}_{\text{BONUS}} = 5.60$, meaning a one percentage decrease in the present value after tax price of investment leads to a 4.08% increase in employment and a 5.60% increase in production five years after implementation. These effects are large. However, because they are decoupled from the investment response by two to three years, they are most likely an indirect effect of the policy and are likely the result of the immediate investment response; investment generates profits that allow businesses to grow. Under this assumption, these delayed results couple with the short-run investment response to produce macroeconomic parameters of import: a one percent increase in Investment leads to 0.44% increase in Employment and a 0.60% increase in Production five years later.

Some estimates of dynamic employment and production responses to corporate taxation are available for comparison. Giroud and Rauh (2017) find that large state corporate income tax cuts lead to employment growth one and two years later. Mertens and Ravn (2013) uses the Romer and Romer (2010) narrative approach and an SVAR empirical strategy to estimate the dynamic macroeconomic effects of U.S. federal tax rate cuts. Mertens and Ravn (2013) finds that a one percentage point cut in the corporate tax rate increases the corporate taxable income by up to 3.8% in the first six months.

8.3 Discussion

Based on the study's empirical results, I draw several additional conclusions that provide new insights into the effects of the policies, the nature of manufacturing activity in the 21st century, and optimal use of accelerated depreciation incentives.

8.3.1 Small Incentives, Big Effects

The lesson to be learned from this project for state governments is clear: adopting federal depreciation incentives leads to increased business investment, wages, and economic growth. In a competitive context such as the U.S. states that often vie for business activity, even small incentives that marginally decrease present value investment costs have large impacts. While this lesson is likely most true in terms of mobile capital, it may suggest that piggybacking onto other federal incentive policies such as the Earned Income Tax Credit and the Supplemental Nutritional Assistance Program may have large behavioral effects.

8.3.2 Counter-cyclical Incentives?

State adoption of bonus depreciation induces an immediate investment response. Several years later, Employment and Production increase. The most plausible explanation for this pattern is that bonus induced investments create profits that are used to expand production, necessitating additional employees. This pattern suggests that while the investment effect of accelerated depreciation policies may be counter-cyclical, the employment and growth effects are likely pro-cyclical. Therefore, policy makers should exercise caution in using accelerated depreciation to stimulate the economy as the bulk of the stimulus effects could take effect exactly when the economy is hot again.

8.3.3 Accelerating Automation in the Manufacturing Sector

Two pieces of evidence from this study suggest that bonus depreciation and Section 179 expensing accelerated the automation of the U.S. manufacturing sector. The first piece is the contemporaneous investment and employment effects of the policies. When investment incentives were available to manufacturing firms during the years 2001–2014, firms responded immediately by increasing capital expenditures but not by increasing labor. This labor-less contemporaneous response suggests that labor was not a complement to the types of capital investments that bonus and Section 179 incentivized firms to make. If capital investments were not a complement to labor then (at least in a two-factor production function) they were a substitute and the labor-less investment response suggests an automation acceleration effect.

The second piece of evidence is the longer-run response to the investment effect. Five-year ahead Employment increases by just less than 8% while five-year ahead production increases by more than 10% years after the policy while production increases by–while total production increases by more than 10%, meaning tax induced capital investments decreased the labor output ratio and increased automation.

These pieces of evidence are corroborated by the timing of the recent decline in the labor share of manufacturing income, a proxy for the automation of the manufacturing sector. As shown in Figure 1, the percentage of total manufacturing profits going to labor begins a precipitous decline in 2001, the same year that bonus depreciation was first enacted. The labor share continues its decline as the generosity of bonus depreciation and Section 179 allowances increase over the next 16 years.

9 Conclusion

This paper has used novel variation in state corporate income tax bases to estimate the effect of accelerated depreciation policies on business activity. To summarize the results of the study:

- Investment responds to both state bonus depreciation and state Section 179 allowances contemporaneously. Adoption of 100% bonus depreciation increases investment activity by 17.5%. Increasing state Section 179 allowances increases investment by 2.2%. However, the effect of each policy is mitigated as the generosity of the other increases. Increasing Section 179 allowances by $100,000 decreases the effect of bonus by 28.5%.
- Consistent with the nature of each incentive, the investment response to state bonus depreciation is concentrated in state-industry cells with higher levels of investment per establishment while the response to Section 179 is concentrated in cells with lower investment levels.
- Compensation per employee also increases in response to state bonus depreciation in the near-term. Adoption of 100% bonus increases compensation per employee by 2.5%. While Section 179 allowances do not encourage compensation, they do mitigate the bonus effect.
- Five years after 100% bonus is adopted, Employment increases by 7.7% and Production increases by 10.5% suggesting bonus depreciation substantially increases economic growth.
- Allocation or reallocation of business activity across state lines accounts for a substantial percentage of the response to each policy.

These results suggest that accelerated depreciation policies had and will continue to have substantial impacts on the U.S.manufacturing sector. On the one hand, polices that create business investment that leads to delayed increases in employment and production are a useful tool for both federal and state policy makers. On the other, if these policies accelerate the automation of U.S. economy, under certain social welfare function specifications their side-effects may outweigh their benefits.

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Appendix A Bonus Depreciation Example

Table A1 examines the impact of 50% bonus on the cost of a $100 investment that has a 7-year life. MACRS specifies that $25 of the total investment may be deducted in the first year, then $21.43 in the second, etc. With a federal tax rate of 35%, this leads to tax savings of $8.75 in the first year, then $7.50 in the second. Over the course of the 7 year life, all $100 of the investment cost are deducted from taxable income, generating $35 in total in *nominal* tax shields. However, because the entire cost is not deducted from taxable income in the first year, the present value of tax savings associated with the investment are only worth $28.79.[26] The after-tax present value cost of the investment is $71.21 (=100-28.79).

50% percent bonus depreciation allows 50 additional dollars to be deducted in the first year the investment is made. The remaining $50 of cost is then deducted according to the original 7 year MACRS schedule. With 50% bonus there are now tax savings associated with the investment of $21.88 in the first year, $3.75 in the second year, etc. Thus, bonus depreciation accelerates the deduction of the investment and tax savings. The 50% bonus increases the present-value of tax shields and symmetrically decreases the present-value after-tax cost of the investment by $3.10 or 3.1 percentage points.

Table A1: Example of Federal Tax Impact of 50% Bonus

Year	1	2	3	4	5	6	7	8	Total
MACRS Deduction	25	21.43	15.31	10.93	8.75	8.74	8.75	1.09	100
τ_f x Deduction	8.75	7.50	5.36	3.83	3.06	3.06	3.06	0.38	35
PV(τ_f x Deduction)									28.79
50% Bonus Ded.	62.5	10.72	7.65	5.47	4.37	4.37	4.37	0.545	100
τ_f x Deduction	21.88	3.75	2.68	1.91	1.53	1.53	1.53	0.19	35
PV(τ_f x Deduction)									31.89

Notes: This table calculates the present value of federal tax deductions for a $100 investment under both a traditional 7-year accelerated depreciation regime and under a 50% bonus regime. The federal corporate tax rate is assumed to be 35% and the state corporate tax rate is assumed to be 7.2% - the observed percentage for states that adopted the bonus depreciation policy during years 2001 - 2011. The discount rate is assumed to be 10%.

State bonus depreciation is inherently less valuable to firms than federal bonus because all state corporate tax rates are significantly lower than the 35% federal rate observed during the bonus episodes. Among all states, the average state income corporate tax rate during the sample period was 7.2%. Table A2 shows the impact of 50% bonus depreciation on the present value of tax depreciation allowances when the corporate income tax rate is 7.2%. The 50% bonus decreases the after tax cost of the $100 by 0.064% or $0.64.

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

Table A2: Example of State Tax Impact of 50% Bonus

Year	1	2	3	4	5	6	7	8	Total
MACRS Deduction	25	21.43	15.31	10.93	8.75	8.74	8.75	1.09	100
τ_f x Deduction	1.8	1.54	1.10	0.79	0.63	0.63	0.63	0.08	7.2
PV(τ_f x Deduction)									5.92
50% Bonus Ded.	62.5	10.72	7.65	5.47	4.37	4.37	4.37	0.545	100
τ_f x Deduction	4.5	0.77	0.55	0.39	0.32	0.32	0.32	0.04	7.2
PV(τ_f x Deduction)									6.56

Notes: This table calculates the present value of federal and state tax deductions for a $100 investment under both a traditional 7-year accelerated depreciation regime and under a 50% bonus regime. The federal corporate tax rate is assumed to be 35% and the state corporate tax rate is assumed to be 7.2% - the observed percentage for states that adopted the bonus depreciation policy during years 2001 - 2011. The discount rate is assumed to be 10%.

Appendix B Policy Overlap

Table A3: Overlapping Adoption of Bonus and Conformity to 179

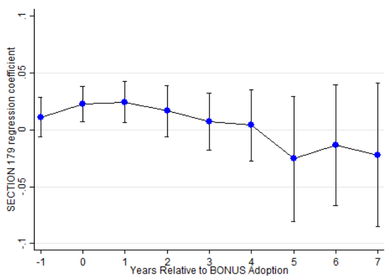
	2004		
	179 Non-Confs	179 Conformers	Total
Bonus Rejecter	10	21	31
Bonus Adopter	0	14	14
Total	10	35	45
	2010		
	179 Non-Confs	179 Conformers	Total
Bonus Rejecter	17	16	33
Bonus Adopter	0	12	12
Total	17	28	45

Notes: Table A3 presents a cross tab that describes the number of states according to their 100% bonus adoption and Section 179 full conformity in 2004 and in 2010.

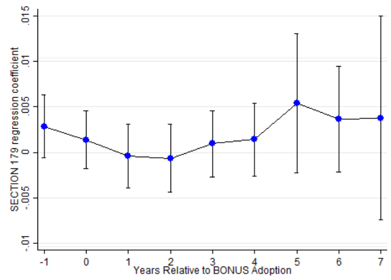
Appendix C Section 179 Impulse Response Functions

Figure A1: State 179 Impulse Response Functions

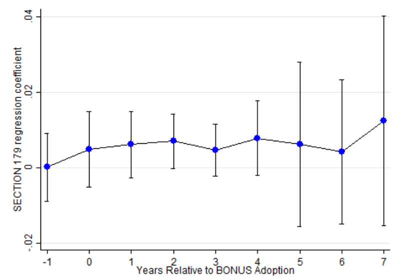
(A) Investment



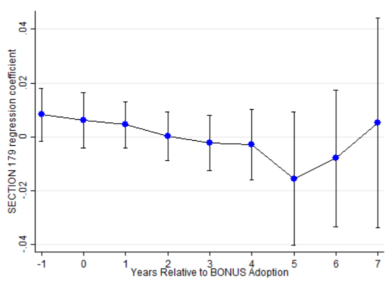
(B) Compensation



(C) Employment



(D) Production



Notes: Panels (A)–(D) of Figure A1 plots impulse response functions of investment, salary, employment, and value added to State Bonus as constructed using the modified Jordà (2005) method described in Subsection 6.1. Each point represents the a State Bonus coefficient. Vertical bars represent 95% confidence intervals.

Appendix D Elasticity Calculation Details

Precise estimates of Appendix $\mathcal{E}_{\text{BONUS}}$ and $\mathcal{E}_{179}$ depend on measuring how state bonus and state Section 179 adoption affect the present value of the after-tax cost of investment. Because the methodology utilized does not directly measure these policy effects, I rely on outside estimates for their measurement.

Assuming a discount rate of 7%, Zwick and Mahon (2017) estimates that 50% federal bonus reduced the present value of after-tax cost of $1 of investment 2.73 cents. Extrapolating this estimate, suggests that 100% bonus or Section 179 expensing decreases the present-value after-tax cost of $1 of investment by 5.46 cents.

The average state corporate income tax rate for states that adopt bonus / conform to Section 179 allowances is approximately 7%. Because state corporate tax rates are only 20% as high as the federal tax rate, 100% bonus or Section 179 expensing should decrease the present-value after-tax cost of $1 of investment by 1.092 cents.

The present-value after-tax cost of $1 of investment is equal to $(1-\tau_{\text{fed}}-\tau_{\text{state}})$ = 1 - 0.35 -0.07 = 0.58 or 58 cents when the investment is fully expensed and 58 + 1.092 = 59.092 cents under normal MACRS rules. State 100% bonus adoption / Section 179 conformity decreases the present value after-tax cost of investment from 59.092 to 58 cents or by 1.883%.

Appendix E Robustness to Exclusion of Controls, Fixed Effects

Table A4: Robustness to Exclusion of Controls, Fixed Effects

Dep. Variable:	Investment ($t = 0$)			Compensation ($t = 0$)		
Specification	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
State Bonus	0.161**	0.214***	0.179**	0.012	0.024***	0.026***
	(0.079)	(0.074)	(0.077)	(0.009)	(0.009)	(0.009)
State 179	0.012	0.014	0.014	0.003	0.003	0.003
	(0.013)	(0.011)	(0.010)	(0.002)	(0.002)	(0.002)
Interaction	-0.017	-0.045**	-0.047**	0.000	-0.005*	-0.006**
	(0.025)	(0.022)	(0.021)	(0.003)	(0.003)	(0.002)
Year FE	✓	✓	✓	✓	✓	✓
State Controls		✓	✓		✓	✓
NAICS x Year FE			✓			✓
Groups	961	929	929	989	962	962
Observations	13,544	12,455	12,455	14,520	13,251	13,251

Dep. Variable:	Employment ($t = 5$)			Production ($t = 5$)		
Specification	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)
State Bonus	0.083***	0.109***	0.096***	0.124***	0.147***	0.129***
	(0.028)	(0.031)	(0.029)	(0.040)	(0.040)	(0.036)
State 179	0.012	0.006	0.006	0.009	-0.000	0.010
	(0.016)	(0.016)	(0.014)	(0.017)	(0.016)	(0.014)
Interaction	-0.003	-0.025	-0.034*	0.002	-0.025	-0.033
	(0.024)	(0.021)	(0.020)	(0.029)	(0.024)	(0.023)
Year FE	✓	✓	✓	✓	✓	✓
State Controls		✓	✓		✓	✓
NAICS x Year FE			✓			✓
Groups	867	851	851	863	847	847
Observations	9,887	9,623	9,623	9,574	9,317	9,317

Notes: All specifications present estimates of regression model (1) and include time and NAICS x Year fixed effects, state-specific NAICS fixed effects, as well as state time-varying controls. The dependent variables in Specifications (1)–(3) is the log of capital expenditures. The dependent variable in Specifications (4)–(6) is the log of employees. Specifications (1)–(3) and (4)–(6) progressively limit the investment then employment analysis to states with higher corporate tax rates. Standard errors are clustered at the state-industry-state level. Statistical significance at the 1 percent level is denoted by ***, the 5 percent by **, and the 10 percent by *.

Appendix F Robustness to Alternative Clustering Levels

Table A5: Robustness to Alternative Clustering Levels

Dep. Variable:	Investment ($t = 0$)			Compensation ($t = 0$)		
Specification	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
State Bonus	0.175***	0.175**	0.175***	0.025**	0.025**	0.025**
	(0.068)	(0.073)	(0.054)	(0.011)	(0.009)	(0.009)
State 179	0.022**	0.022***	0.022**	0.001	0.001	0.001
	(0.009)	(0.008)	(0.010)	(0.002)	(0.002)	(0.002)
Interaction	-0.050***	-0.050***	-0.050***	-0.007**	-0.007***	-0.007**
	(0.017)	(0.017)	(0.015)	(0.003)	(0.002)	(0.003)
State x NAICS SE	✓			✓		
State SE		✓			✓	
NAICS SE			✓			✓
Groups	883	883	883	915	915	915
Observations	11,987	11,987	11,987	12,774	12,774	12,774

Dep. Variable:	Employment ($t = 5$)			Production ($t = 5$)		
Specification	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)
State Bonus	0.077***	0.077***	0.077***	0.105***	0.105***	0.105**
	(0.025)	(0.028)	(0.024)	(0.034)	(0.037)	(0.041)
State 179	0.006	0.006	0.006	-0.016	-0.016	-0.016
	(0.008)	(0.011)	(0.008)	(0.011)	(0.013)	(0.012)
Interaction	-0.048***	-0.048***	-0.048**	-0.056**	-0.056**	-0.056
	(0.017)	(0.017)	(0.018)	(0.024)	(0.026)	(0.033)
State x NAICS SE	✓			✓		
State SE		✓			✓	
NAICS SE			✓			✓
Groups	804	804	804	800	800	800
Observations	9,277	9,277	9,277	8,973	8,973	8,973

Notes: All specifications present estimates of regression model (1) and include time and NAICS x Year fixed effects, state-specific NAICS fixed effects, as well as state time-varying controls and linear state trends. Standard errors in Specifications (1a)–(4a) are clustered at the State x NAICS level. Standard errors in Specifications (1b)–(4b) are clustered at the State-level (the clustering choice in all other regressions in the paper). Standard errors in Specifications (1c)–(4c) are clustered at the NAICS level. Statistical significance at the 1 percent level is denoted by ***, the 5 percent by **, and the 10 percent by *.

Appendix G Sales Factor Heterogeneity

Table A6: Sales Factor Heterogeneity

Specification	(1)	(2)	(3)	(4)
	($h = 0$)		($h = 5$)	
Dependent Variable:	Investment	Compensation	Employment	Production
State Bonus	0.1241	0.0260**	0.0730**	0.1062***
	(0.0788)	(0.0108)	(0.0299)	(0.0380)
State 179	0.0177	0.0008	0.0012	-0.0234*
	(0.0127)	(0.0024)	(0.0119)	(0.0127)
Bonus 179 Interaction	-0.0389	-0.0105**	-0.0471**	-0.0483*
	(0.0307)	(0.0045)	(0.0186)	(0.0269)
Bonus x Sales Factor	0.0644	-0.0257***	0.0264	-0.0965**
	(0.0873)	(0.0094)	(0.0338)	(0.0454)
Section 179 x Sales Factor	0.0187	-0.0017	0.0100	0.0162
	(0.0122)	(0.0023)	(0.0089)	(0.0128)
Interaction x Sales Factor	-0.0117	0.0186***	0.0325	0.0428
	(0.0484)	(0.0064)	(0.0280)	(0.0412)
State x NAICS Groups	837	858	797	794
Observations	9,928	10,326	9,223	8,928

Notes: Table A6 presents coefficient estimates from regression model (1) including State Bonus, State 179 and Bonus 179 Interaction interacted with Sales Factor for all four outcomes of interest. The outcome variables in columns (1)–(4) are Investment, Compensation, five year ahead Employment, and five year ahead Production. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set if time-varying state level controls to capture the effect of changes in state politics, productivity, population, and finances. Standard errors are at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

Appendix H Federal Deductibility

Table A7: Federal Deductibility Heterogeneity

Specification	(1)	(2)	(3)	(4)
	($h = 0$)		($h = 5$)	
Dependent Variable:	Investment	Compensation	Employment	Production
State Bonus	0.1955**	0.0280**	0.0792**	0.1198***
	(0.0910)	(0.0110)	(0.0334)	(0.0387)
State 179	0.0245***	0.0008	0.0087	-0.0143
	(0.0081)	(0.0017)	(0.0116)	(0.0133)
Bonus 179 Interaction	-0.0539**	-0.0066**	-0.0623***	-0.0711**
	(0.0213)	(0.0029)	(0.0207)	(0.0294)
Bonus x Deductible	-0.0940	-0.0038	-0.0255	-0.0597
	(0.0830)	(0.0102)	(0.0424)	(0.0776)
State 179 x Deductible	-0.0257*	0.0066***	-0.0186**	-0.0110
	(0.0137)	(0.0022)	(0.0080)	(0.0141)
Interaction x Deductible	0.0266	-0.0064**	0.0568**	0.0566
	(0.0218)	(0.0028)	(0.0262)	(0.0509)
State x NAICS Groups	883	915	804	800
Observations	11,987	12,774	9,277	8,973

Notes: Table A6 presents coefficient estimates from regression model (1) including State Bonus, State 179 and Bonus 179 Interaction interacted with Federal Deductibility for all four outcomes of interest. The outcome variables in columns (1)–(4) are Investment, Compensation, five year ahead Employment, and five year ahead Production. All specifications include include year fixed effects, State x NAICS fixed effects, state linear time trends, NAICS x Year fixed effects, and a robust set if time-varying state level controls to capture the effect of changes in state politics, productivity, population, and finances. Standard errors are at the state level and are reported in parentheses. Statistical significance at the 1 percent level is denoted by ***, 5 percent by **, and 10 percent by *.

Appendix I Adoption and Conformity Determinants

Table A8: State Determinants of Bonus Depreciation Adoption

2001

	Political Determinants		
	Adopter Mean	Rejecter Mean	t stat
Dem Legislature %	47.18	55.17	(-1.482)
Dem Governor	0.467	0.400	(0.418)
	Financial Determinants		
	Adopter Mean	Rejecter Mean	t stat
Corp Tax Rate	7.395	5.791	(1.742)*
Corp Tax %	0.0710	0.0484	(1.506)
Budget Gap	0.00493	0.0203	(-1.110)
	Population/Productivity Determinants		
	Adopter Mean	Rejecter Mean	t stat
GSP per Capita	0.0349	0.0355	(-0.283)

2008

	Political Determinants		
	Adopter Mean	Rejecter Mean	t stat
Dem Legislature %	47.55	56.41	(-1.707)*
Dem Governor	0.545	0.559	(-0.0758)
	Financial Determinants		
	Adopter Mean	Rejecter Mean	t stat
Corp Tax Rate	7.395	6.393	(1.046)
Corp Tax %	0.0727	0.0594	(0.914)
Budget Gap	-0.0218	0.0962	(-2.433)**
	Population/Productivity Determinants		
	Adopter Mean	Rejecter Mean	t stat
GSP per Capita	0.548	0.805	(-3.039)***

Notes: Table A8 presents means of state level control variables for adopting and rejecting states. Adopting states are those that adopted federal bonus depreciation at any rate. t is the t statistic from the comparison of means. Statistical significance of the t-stat at the 1 percent level is denoted by ***, the 5 percent by **, and the 10 percent by *.

Table A9: State Determinants of Section 179 Conformity

2004

	Political Determinants		
	Conformer Mean	Non-Conf Mean	t stat
Dem Legislature %	48.87	56.56	(-1.476)
Dem Governor	0.457	0.400	(0.314)
	Financial Determinants		
	Conformer Mean	Non-Conf Mean	t stat
Corp Tax Rate	7.183	8.404	(-1.831)*
Corp Tax %	0.0513	0.0718	(-1.227)
Budget Gap	-0.0125	0.00495	(-1.052)
	Population/Productivity Determinants		
	Conformer Mean	Non-Conf Mean	t stat
GSP per Capita	0.677	0.746	(-0.868)

2010

	Political Determinants		
	Conformer Mean	Non-Conf Mean	t stat
Dem Legislature %	52.78	60.69	(-1.755)*
Dem Governor	0.536	0.529	(0.0402)
	Financial Determinants		
	Conformer Mean	Non-Conf Mean	t stat
Corp Tax Rate	6.860	7.877	(-1.798)*
Corp Tax %	0.0474	0.0637	(-1.479)
Budget Gap	-0.0346	-0.0432	(0.464)
	Population/Productivity Determinants		
	Conformer Mean	Non-Conf Mean	t stat
GSP per Capita	0.731	0.808	(-0.935)

Notes: Table A9 presents means of state level control variables for adopting and rejecting states. Adopting states are those that adopted federal bonus depreciation at any rate. t is the t statistic from the comparison of means. Statistical significance of the t-stat at the 1 percent level is denoted by ***, the 5 percent by **, and the 10 percent by *.