The Effect of the Domestic Production Activities Deduction on Corporate Investment and Financial Policy

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Introduction

Corporate tax reform is on the horizon.

Most serious proposals

- are designed to be revenue neutral
- combine a lower rate and base broadening measures

Despite widespread support for such proposals

- relatively little is known about the effects of a reduced corporate tax rate
- tax expenditures that would need to be eliminated to achieve the lower rate have been shown to significantly increase business activity

This study

- uses variation in effective tax rates generated by the the Domestic Production Activities Deduction (DPAD) and a novel identification strategy
- to estimate how corporate investment, financing, and payout activities respond to decreased tax rates in the U.S.
- uses the results to compare rate reducing and base narrowing reforms

Introduction

This study finds that the DPAD, and reduced tax rates more generally, have a large and significant effect on corporate behavior.

A one percentage point reduction in corporate rates via the DPAD

1. increases investment by 4.3% of installed capital
2. increases payouts by 0.3% of revenues
3. decreases debt usage by 5.1% of total assets
4. but does not increase taxable income as % of assets

.

These responses and their magnitudes suggest

- a one ppt reduction in the corporate tax rate is 46% more effective at stimulating corporate investment than a one percentage point reduction in investment costs via accelerated depreciation policies
- but a one ppt reduction in the corporate rate is 50% more expensive
- a dollar spent on either rate reduction or base narrowing has the same effect
- a revenue neutral tax reform will not affect corporate investment

A revenue neutral reform, however, will increase payouts and debt usage but will not increase taxable income

Outline of the talk from here

1. DPAD Historical Context
2. Policy Basics and Related Literature
3. Model joint investment and financing responses to the DPAD
4. Data Sources and Variable Construction
5. Empirical Design and Results
6. Comparison of Results to Past Work, Address Threats to Identification
7. Discussion and Conclusion (and Future Work)

Historical Context

During the years 1971–2004, the U.S. utilized three successive tax incentives

1. Domestic International Sales Corporation (DISC) rules (in place 1971–1984)
2. Foreign Sales Corporation (FSC) rules (1984–2000)
3. Extraterritorial Income Exclusion (ETI) (2000–2004)

to promote the worldwide competitiveness of domestic U.S exporters.

- These incentives allowed firms to defer, exempt, or deduct a percentage of export income from U.S. taxation.
- The World Trade Organization (WTO) iteratively ruled that all three were illegal export incentives and in 2004, began levying retaliatory customs penalties on U.S exports.
- In an effort to stop the penalties and introduce a revenue neutral and legal alternative to the ETI, the American Jobs Creation Act of 2004 repealed the ETI and introduced the DPAD.
- AJCA 2004 also introduced the 2004 tax holiday on repatriated earnings.

DPAD

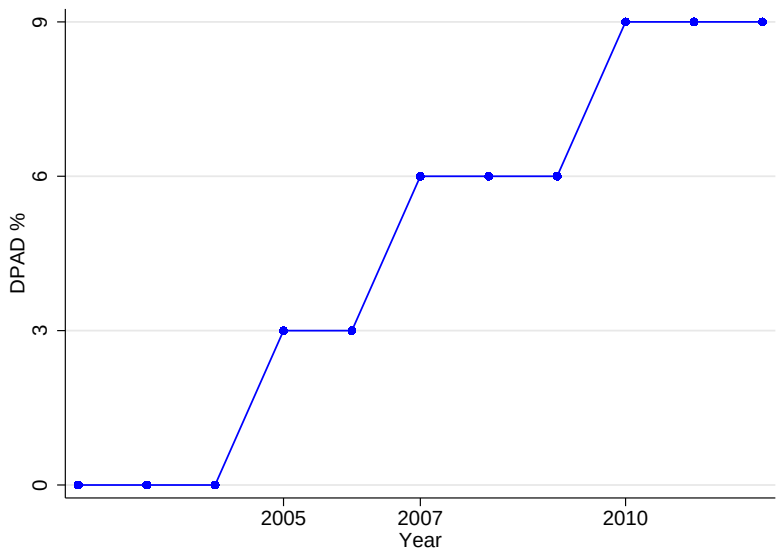
Domestic Production Activities Deduction (DPAD)

- DPAD allows a percentage of **Qualified Production Activities Income** (QPAI) to be deducted from taxable income
- QPAI is income (revenue minus costs) derived from US domestic production
- DPAD phased in during years 2005-2010

DPAD Phase-In

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

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



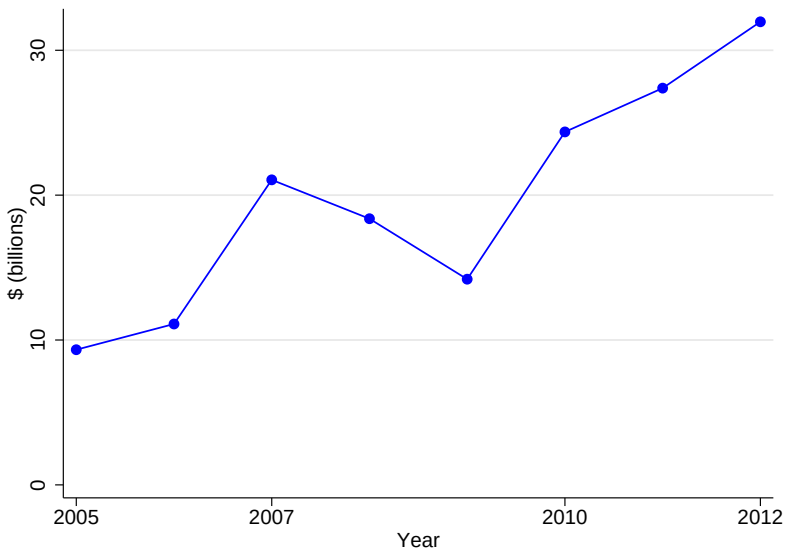
DPAD Cost

- 9% deduction at a 35% tax rate $\rightarrow$ 3.15% rate reduction for 100% QPAI firms
- DPAD reached maximum rate of 9% in 2010
  - total DPAD deduction was $32 billion in 2012
  - cost of more than $11 billion to the federal government

DPAD Deduction

Year	$ (billions)	$(billions) $\times\tau$
2005	9.332	3.266
2006	11.106	3.887
2007	21.058	7.370
2008	18.374	6.320
2009	14.198	4.970
2010	24.365	8.528
2011	27.388	9.586
2012	31.966	11.188

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



Related DPAD Literature

Blouin, Krull, Schwab (2016)

- payout responses to DPAD and repatriation holiday
- 77 firms that state whether they benefit from ETI to DPAD transition or not and repatriated earnings in response to the tax holiday
- firms that benefit are less likely to increase payouts

Lester (2015)

- uses financial statement data to identify 767 firms that report DPAD
- finds firms shift income across time in response to DPAD
- finds firms increase investment in response to DPAD

This study differs in that it

- uses plausibly exogenous variation in the DPAD from administrative tax data
- studies investment *and* financial policy response response
- studies response of *all* corporations listed on U.S. stock exchanges

Modeling Investment & Financing Responses

Two-Period representative firm model in which the firm starts the period 1 with R_0, must decide how much to invest in period 1 to maximize PV of period 1 and 2 dividends net of equity issuances:

$$\max_I \ (1-\tau_d)\left[D_1 + \frac{D_2}{1+r}\right] - E.$$

Three ways to finance new investment, I:

1. Internally generated funds, G (costs period 1 dividends)
2. New equity issuances, E (costs period 1 equity inflow)
3. Borrowing, B (costs tax deductible borrowing costs)

$$\rightarrow \ I = G + E + B$$

Investment

- generates returns, $\Pi(I)$ where $\Pi'(I) > 0$ and $\Pi''(I) < 0$
- depreciates at rate δ
- return net of depreciation and borrowing costs taxed at rate $\tau_c(1-\rho d)$
  where ρ is QPAI Percent and d is the DPAD rate

Modeling Investment & Financing Responses

- Period 1 dividends: $R_0 - G$
- Period 2 dividends: $(1 - \tau_c(1 - \rho d))[\Pi(I) - \delta(I) - cB] + G + E$

Maximand rewritten as

$$\max_I (1 - \tau_d) \left[R_0 - G + \frac{1 - \tau_c(1 - \rho d))[\Pi(I) - \delta(I) - cB] + G + E}{1 + r} \right] - E.$$

Regime 1: Internal Finance

$$\Pi'(G) = \frac{r}{1 - \tau_c(1 - \rho d)} + \delta$$

- $\partial^2 G / \partial \rho \partial d > 0$; I is increasing in ρd
- τ_d does not affect investment when G is marginal source of finance
- "New view" or "trapped equity view" of dividend taxation
- King(1977), Auerbach(1979), Bradford(1981)

Modeling Investment & Financing Responses

Regime 2: Equity Finance

$$\Pi'(E) = \frac{r}{(1-\tau_d)(1-\tau_c(1-\rho d))} + \delta$$

- $\partial^2 E/\partial\rho\partial d > 0$; I is increasing in ρd
- τ_d now affects investment when E is marginal source of finance
- "traditional view" of dividend taxation
- Harberger(1962), Feldstein(1970), Poterba and Summers(1985)

Regime 3: Debt Finance

$$\Pi'(B) = c + \delta$$

- $\partial^2 B/\partial\rho\partial d = 0$; I is unaffected by ρd
- borrowing costs are deductible at DPAD adjusted corporate tax rate

Model Extension: tax depreciation $\neq$ economic depreciation ▸ Depreciation Extension

Empirically Testable Hypotheses

From the model, several testable hypotheses are suggested.

Hypothesis 1. *Investment responds more strongly to the DPAD for firms that derive a larger percentage of income from domestic production activities.*

Hypothesis 2. *Firms that derive a larger percentage of income from domestic production activities will respond to the DPAD by increasing new equity issuances and reinvestment of internally generated funds relative to the use of debt financing.*

$$\frac{\partial I}{\partial d} > 0 \text{ and } \frac{\partial^2 I}{\partial d \partial \rho} > 0 \text{ but only if investment is not debt financed}$$

Corollary 1. *All else equal, Hypothesis 1 and Hypothesis 2 are stronger for firms facing higher marginal tax rates.*

$$\frac{\partial^2 I}{\partial \rho d \partial \tau_c} > 0$$

Data

Industry-Varying QPAI Percent (ρ)

- SOI Tax Stats: total deduction, taxable income for 75 IRS industries 2005–2012
- QPAI = (deduction / rate)
- QPAI Percent = QPAI / (taxable income + deduction)

Industry-and-Size-Varying QPAI Percent (ρ)

- SOI Corporate Source Book: deduction, taxable income for 13 asset-classes
- ρ constructed for each asset-class
- asset-class ρ divided by mean $\rho \rightarrow$ asset-class multipliers
- **QPAI percent**: industry ρ scaled by asset-class multipliers (approx. 900)

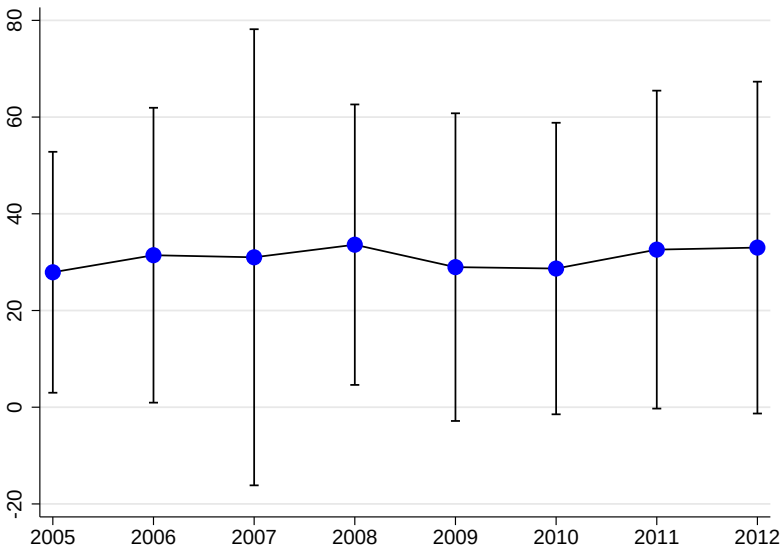
DPAD Treatment

- DPAD = QPAI Percent $\times$ DPAD rate $\times$ Corp Tax Rate (35%)
- **DPAD**: the percentage point decrease in the corporate tax rate due to deduction

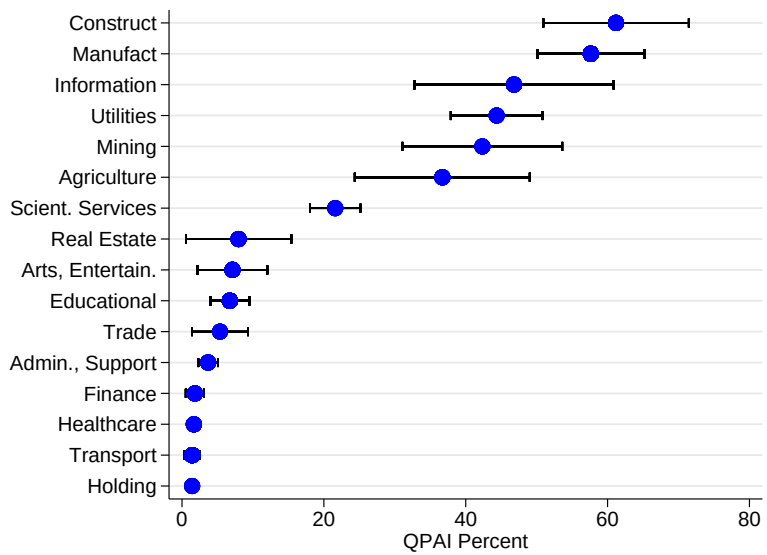
Variation in QPAI Percent

- QPAI Percent generally stable over time
- QPAI Percent moves cyclically
- Significant Variation in QPAI Percent by industry and sector

QPAI Percent 2005–2012



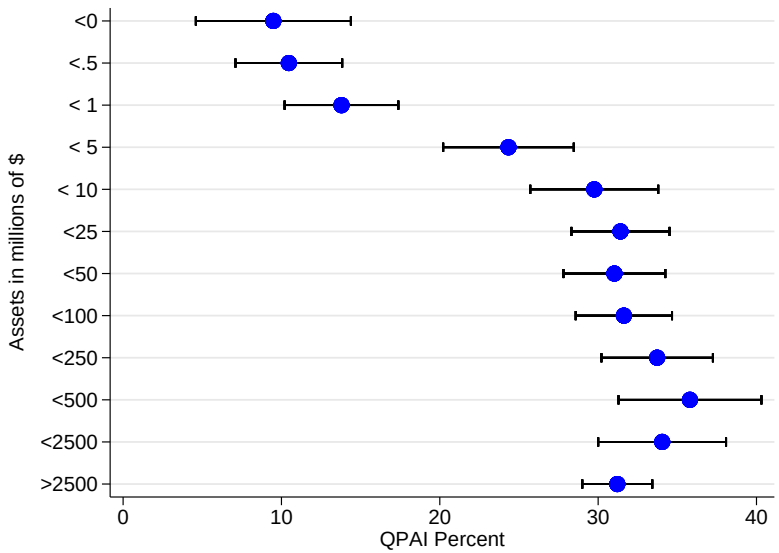
QPAI Percent by Sector



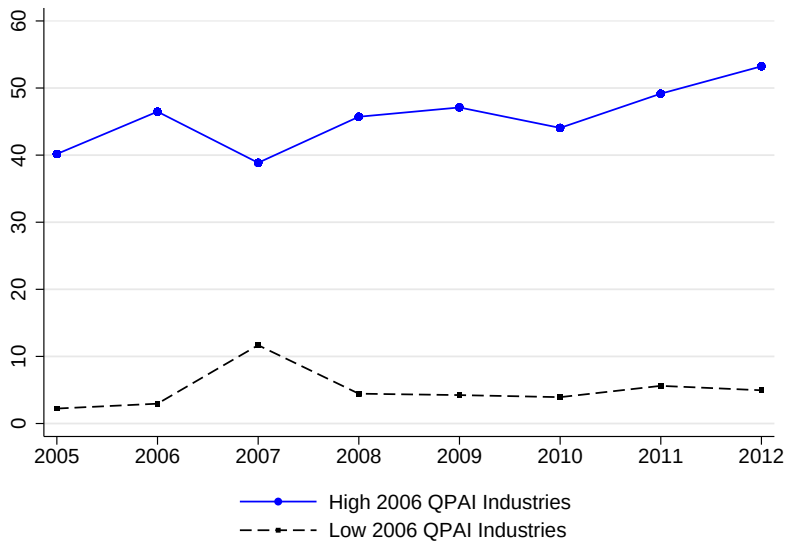
Variation in QPAI Percent

- QPAI Percent concentrated in large asset-classes
- High QPAI industries increase QPAI Percent
- Low QPAI industries do not increase QPAI Percent

QPAI Percent by Asset Class



High and Low QPAI Industries 2005–2012



Source: Statistics of Income corporate returns with net income, SOI corporate source book.

Other Tax Policy Variables

Other contemporaneous tax policies are a threat to the identification. To address this concern, I carefully construct variables capturing the two most concerning.

Extraterritorial Income Exclusion

- ETI allows firms to deduct 15% of income from exports, replaced by DPAD
- Industry-level **Export Percent** is constructed using industry-level gross export receipts from USA Trade Online matched to SOI industry-level total receipts
- **ETI**: Export Percent $\times$ 15% $\times$ corp tax rate (35%)

Bonus Depreciation

- Bonus allows additional percentage, b, of new investments to be deducted from tax bill in the first year $\rightarrow$ decreases the PV cost of new investment
- Bonus disproportionately benefits industries that invest in long-lived assets
- Following Cummins, Hassett, and Hubbard (1994), Desai and Goolsbee(2004), House and Shapiro (2008), Edgerton (2010), and Zwick and Mahon (2016)
  1. Using BEA data, construct industry-level z_0: average PV of tax depreciation allowances per dollar of investment w/ no bonus
  2. **BONUS** $= b(1 - z_0)\tau_c$ percentage point reduction in investment costs via bonus depreciation

Outcome, Control, Heterogeneity Variables

Outcome Variables from COMPUSTAT

1. **Investment**: CapEx / $ lagged ppent
   Cummins, et al. (1994), Desai and Goolsbee (2004), Edgerton (2010)
2. **Debt**: total liabilities / $ total assets "debt ratio" (Graham, Mills (2008))
3. **Payouts**: total dividends + share repurchases / $ lagged revenue (Yagan (2015))
   - share repurchases = non-negative annual dollar changes in treasury stock
4. **Taxable Income**: pretax income − (deferred tax expense/τ_c) / $ lagged assets (Gruber and Rauh (2007))

Control and Heterogeneity Variables

1. **HP Index** Financial Constraint Index (Hadlock and Pierce (2010))
2. **Cash Flows**: ib + dp /$ lagged ppent (Kaplan and Zingales (1997))
3. **Marg Q**: market value of equity / total assets
4. **Marginal Tax Rate**: similuated MTRs from Blouin, Core, and Guay (2010)
5. **Revenue**: sales from COMPUSTAT
6. **Repatriate**: dummy = 1 if repatriated in 2004 or 2005 (Bradley (2016))

Descriptive Statistics

	mean	std dev	25th Percentile	75th Percentile	obs
Tax Policy Variables					
DPAD	0.382	0.689	0.000	0.555	90,398
post 2010	1.441	0.981	0.613	2.294	12,680
ETI	0.151	0.396	0.000	0.000	90,398
2000–2004	0.468	0.583	0.000	0.970	29,100
BONUS	0.921	1.181	0.000	1.760	90,398
2008–2010	1.915	0.769	1.377	2.133	13,233
Outcome Variables					
Investment per $ lagged capital	0.444	0.746	0.105	0.448	90,398
Debt per $ total assets	0.604	0.600	0.285	0.694	90,398
Payouts per $ lagged revenue	0.023	0.064	0.000	0.014	86,949
Taxable Income / $ lag tot assets	0.040	0.198	-0.021	0.130	51,391
Control and Heterogeneity Variables					
HP Index	-4.029	1.925	-5.455	-2.753	90,398
Cash Flow	-6.000	35.184	-0.601	0.644	90,398
Marg Q	0.036	0.111	0.011	0.026	90,398
Marginal Tax Rate	0.209	0.105	0.105	0.310	75,387
Revenue	24.043	124.029	0.210	8.193	90,398
Age	12.689	11.481	4.000	18.000	90,398
Foreign Operations	0.538	0.499	0.000	1.000	90,398
2004 Repatriator	0.015	0.120	0.000	0.000	90,398

Design

Empirical Design

$$\text{Outcome}_{i,t} = \beta_0 + \beta_1 \textbf{DPAD}_{j,s,t} + \gamma X_{i,t} + \eta_i + \gamma_t + \epsilon_{it}$$

- DD empirical design: **DPAD** = DPAD rate $\times$ QPAI Percentage
- **DPAD** varies across across industry-asset-class groups and across time
- with firm and year FE, identification: how firms in low QPAI % versus high QPAI % industry-by-asset class cells respond to the DPAD implementation and scaling
- key assumption: policies are independent of industry-by-asset class shocks to outcome variables

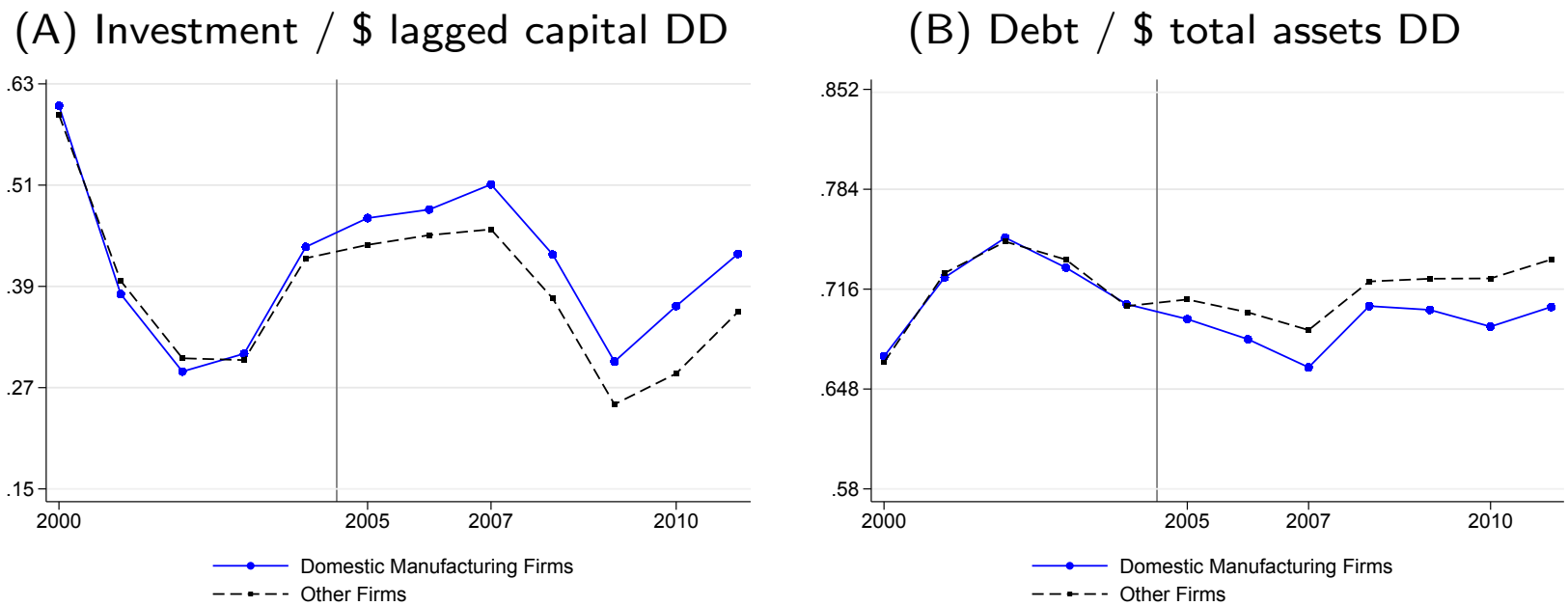
Graphical Implementation

- DD empirical design can be implemented graphically by interacting average **QPAI Percent** with year dummies

$$\text{Outcome}_{i,t} = \beta_0 + \sum_{t=2000}^{2012} \beta_t \left[\textbf{QPAI Percent}_{j,s} \times \mathbb{1}[\text{Year}_t]\right] + \gamma X_{i,t} + \eta_i + \gamma_t + \epsilon_{it},$$

- Comparing the interactions coefficients as the DPAD is implemented and scaled relative to the coefficients prior to 2005 provides a graphical approximation of the DD empirical approach

Graphical Difference-in-Differences

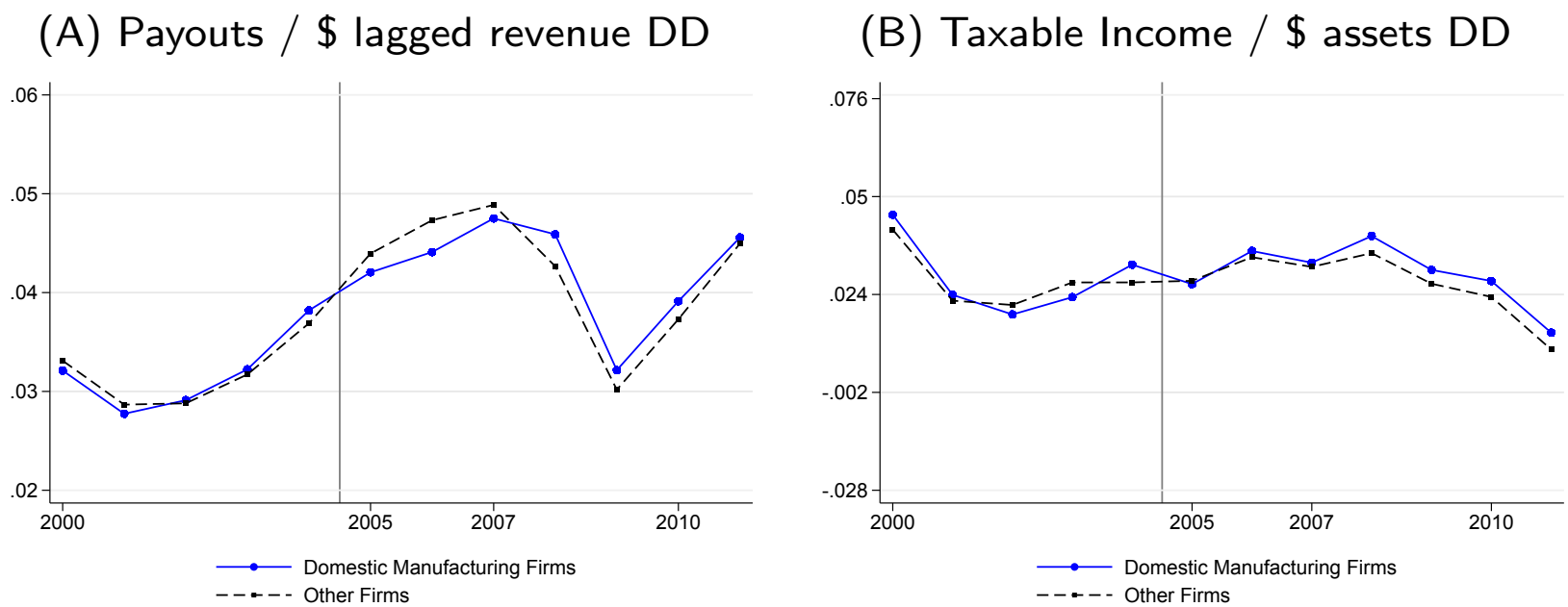


Notes: Panel (A) and (B) presents results from regressions of the form

$$\text{Outcome}_{i,t} = \beta_0 + \sum_{t=2000}^{2012} \beta_t \left[\text{QPAI Percent}_{j,s} \times \mathbb{1}[\text{Year}_t]\right] + \gamma X_{i,t} + \eta_i + \gamma_t + \epsilon_{it},$$

in which the outcome is regressed on firm-level average QPAI interacted with years 2001–2012. The coefficients are then grafted onto time-trends in the outcome variable. The difference between the blue line the black dashed line in each year is interpreted as the difference in the outcome between a 100% QPAI firm and a 0% QPAI firm.

Graphical Difference-in-Differences



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Empirical Results

Table: Effects of the DPAD 1

Dep Var.:	Panel A Investment (per $ lagged capital)			Panel B Debt (per $ total assets)		
	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
DPAD	0.0325**	0.0433**	0.0720***	-0.0481***	-0.0506***	-0.0244**
	(0.0159)	(0.0166)	(0.0241)	(0.0154)	(0.0161)	(0.0104)
BONUS, ETI		✓	✓		✓	✓
Ind, Size Trends			✓			✓
firm-years	90,398	90,398	90,398	90,398	90,398	90,398
firms	12,443	12,443	12,443	12,443	12,443	12,443
R^2	0.118	0.119	0.131	0.233	0.233	0.342
Dep.Var Mean	0.47	0.47	0.47	0.592	0.592	0.592
Implied $\mathcal{E}_{\text{DPAD}}$	4.500	5.993	9.963	-5.286	-5.556	-2.681

Notes: This table reports estimates of the effect of the DPAD on corporate behavior. All columns display the DPAD coefficient from a regression of the outcome on DPAD, year and firm fixed effects, as well as Cash Flow, Marginal Q, and HP Index controls. The second and third specifications in each panel include controls for bonus depreciation and the ETI. The third specification in each panel also includes industry and asset-class linear time trends. Implied $\mathcal{E}$ is the elasticity of the outcome variable with respect to one-minus-the-top-statutory-corporate-income-tax-rate on domestic manufacturing income. Implied $\mathcal{E}_{\text{DPAD}}$ is calculated as the estimated DPAD effect divided by the mean of the outcome prior to DPAD implementation, divided by the percentage change in the one-minus-the-top-statutory-corporate-income-tax-rate on domestic manufacturing income (The DPAD decreased the top rate from 35% to 31.85%). Standard errors are presented in parentheses and are clustered at the industry level.

Empirical Results

Table: Effects of the DPAD 2

Dep Var.:	Panel C Payouts (per $ lagged revenue)			Panel D Taxable Income (per $ total assets)		
	(1c)	(2c)	(3c)	(1d)	(2d)	(3d)
DPAD	0.0027*	0.0029**	0.0018	0.0008	-0.0001	0.0038
	(0.0014)	(0.0014)	(0.0012)	(0.0038)	(0.0036)	(0.0063)
BONUS, ETI		✓	✓		✓	✓
Ind, Size Trends			✓			✓
firm-years	86,949	86,949	86,949	51,368	51,368	51,368
firms	12,069	12,069	12,069	9,026	9,026	9,026
R^2	0.008	0.008	0.016	0.088	0.088	0.101
Dep.Var Mean	0.019	0.019	0.019	0.046	0.046	0.046
Implied $\mathcal{E}_{\text{DPAD}}$	9.332	9.959	6.227	1.092	-0.105	4.87

Notes: This table reports estimates of the effect of the DPAD on corporate behavior. All columns display the DPAD coefficient from a regression of the outcome on DPAD, year and firm fixed effects, as well as Cash Flow, Marginal Q, and HP Index controls. The second and third specifications in each panel include controls for bonus depreciation and the ETI. The third specification in each panel also includes industry and asset-class linear time trends. Implied $\mathcal{E}$ is the elasticity of the outcome variable with respect to one-minus-the-top-statutory-corporate-income-tax-rate on domestic manufacturing income. Implied $\mathcal{E}_{\text{DPAD}}$ is calculated as the estimated DPAD effect divided by the mean of the outcome prior to DPAD implementation, divided by the percentage change in the one-minus-the-top-statutory-corporate-income-tax-rate on domestic manufacturing income (The DPAD decreased the top rate from 35% to 31.85%). Standard errors are presented in parentheses and are clustered at the industry level.

Effects of the DPAD

The DPAD decreased effective marginal tax rates for the average firm by 1.44%

Investment

- Semi-elasticity of investment / $ lagged capital to DPAD: 0.0433
- Elasticity of investment w.r.t. net of corporate tax rate ($\mathcal{E}_{\text{DPAD}}$): 5.99
- DPAD increased investment activity by 13.26%

Debt

- Semi-elasticity of debt / $ total assets to DPAD: -0.0506
- Elasticity of debt w.r.t. net of corporate tax rate ($\mathcal{E}_{\text{DPAD}}$): -5.56
- DPAD decreased debt usage by 12.31%

Payouts

- Semi-elasticity of payouts / $ lagged revenue to DPAD: 0.0029
- Elasticity of apyouts w.r.t. net of corporate tax rate ($\mathcal{E}_{\text{DPAD}}$): 9.96
- DPAD increased payouts by usage decreased by 21.98%

Taxable Income

- DPAD did not affect taxable income

Comparing and Confirming Elasticities

Investment Results

- Lester (2015): firms increase investment by 3.18% of installed ppent
- Zwick and Mahon (2016): $\mathcal{E}_{\text{BONUS}} = 4.25$

Financing Response

- No quasi-experimental evidence
- Graham and Mills (2008): $\mathcal{E} = 13.8$
- endogeneity $\rightarrow$ larger estimates

Payouts Response

- Yagan (2015) calculates elasticities w.r.t cost of equity
- cost of equity $= \frac{r}{(1-\tau_c)[p(1-\tau_d)+((1-p)(1-\tau_{cg})]}$
- Yagan (2015) elasticities: between 3.2 and 6.3
- DPAD elasticities between 4.6 and 10

I will now spend some time addressing potential concerns in the estimation of the DPAD responses.

Robustness

to Alternatives Samples

Table: Robustness to Alternative Samples

DPAD Construction	Investment	Debt	Payouts	Taxable Income
(1) December FY Firms	0.0489***	-0.0489***	0.0032*	-0.0013
	(0.0169)	(0.0169)	(0.0016)	(0.0051)
	60,926	60,926	58,557	33,893
(2) Balanced Panel	0.0509***	-0.0367**	0.0023	0.0049
	(0.0139)	(0.0142)	(0.0015)	(0.0033)
	31,768	31,768	30,970	20,962
(3) Domestic Firms	0.0560***	-0.0730***	0.0016	0.0006
	(0.0147)	(0.0172)	(0.0016)	(0.0046)
	41,788	41,788	39,202	21,758

Notes: This table presents estimates of the effect of DPAD on the four primary outcomes of interest reports across different sample. Each coefficient- standard error - observation cell represents a separate regression. In Row (1) the sample is limited to December fiscal year firms. In Row (2), the sample is limited to a balanced panel of firms over the years 2000 to 2010. In Row (3),the sample is limited to firms reporting no foreign income. All regressions includes year and firm fixed effects, as well as controls for Cash Flow, Marginal Q, the HP Index, BONUS and ETI. Standard errors are presented in parentheses and are clustered at the industry level.

Robustness

to cyclical trends across industries:

Step 1: $\text{Outcome}_{i,t} = \alpha_j + \beta_j[\%\Delta\text{GDP}_t] + \gamma_j[\%\Delta\text{GDP}_t^2] + \epsilon_{it}$. 1980–2000

Step 2: $\text{Residual Outcome}_{it} = \text{Outcome}_{it} - \widehat{\text{Outcome}}_{jt}$ 2000–2012

Step 3: Repeat baseline analyses using residual outcomes.

Table: Business Cycle Corrected DPAD Effects

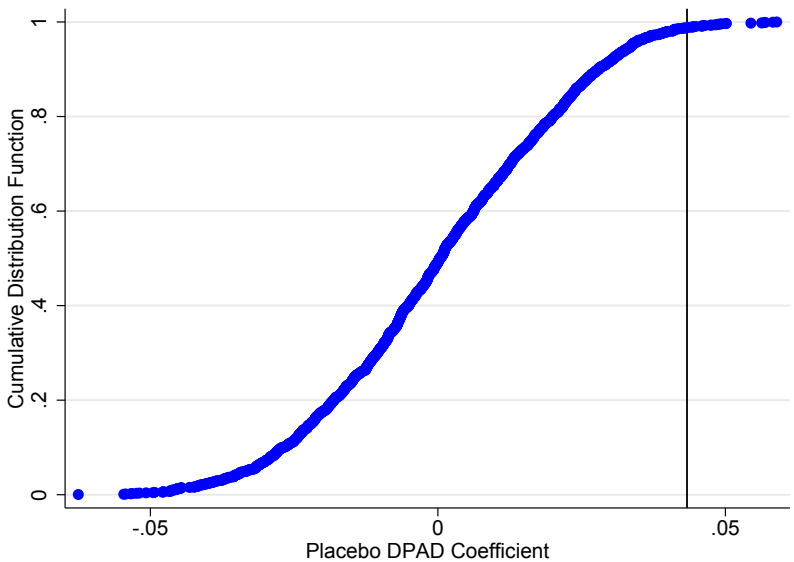
Residual Dep Var:	Investment/ $ lagged capital	Debt/ $ total assets	Payouts/ $ total assets	Taxable Income/ $ revenue
	(1)	(2)	(3)	(4)
DPAD	0.050***	-0.043***	0.003**	0.003
	(0.014)	(0.013)	(0.001)	(0.005)
firm-years	65,588	65,588	62,779	36,511
firms	9,972	9,972	9,617	6,899

Notes: The table reports estimates of the effect of the DPAD on corporate behavior after the outcome variables have been "corrected" to account for differential business cycle trends across industries. All regressions includes year and firm fixed effects and controls for Cash Flow, Marginal Q, the HP Index, BONUS and ETI. Standard errors are presented in parentheses and are clustered at the industry level.

Block Permutation Tests

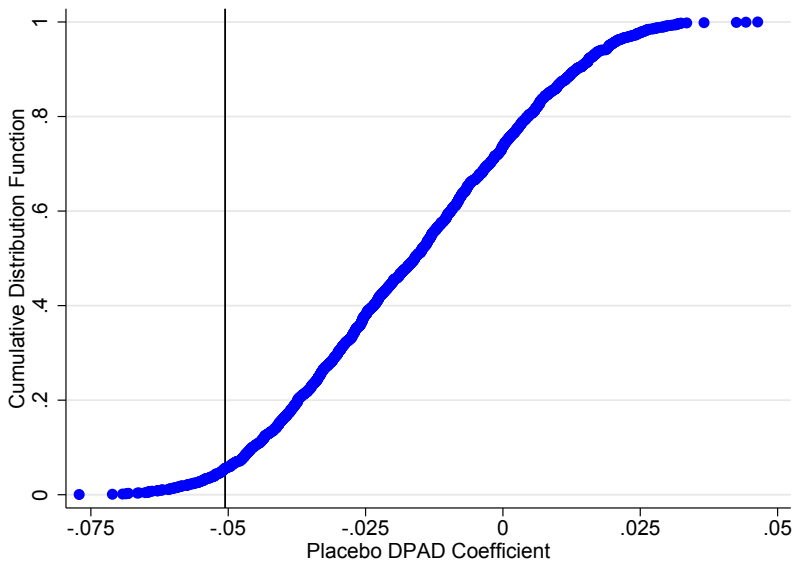
- randomize treatment, estimate effects of placebo policy on outcome
- repeat 2000 times
- use placebo DPAD treatment effects to recover non-parametric $p-$Values

(A) Investment / $ lagged capital DD



25/2000 larger $\rightarrow p = 0.0125$

(B) Debt / $ total assets DD



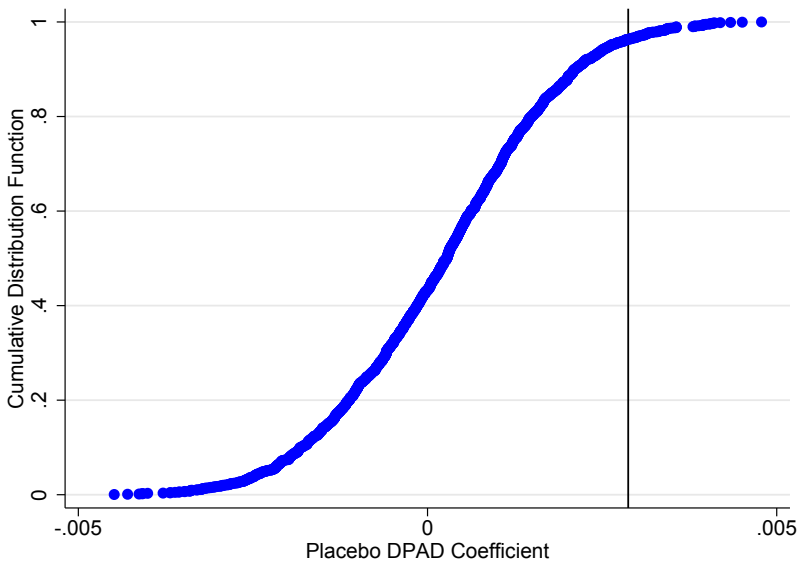
111/2000 smaller $\rightarrow p = 0.055$

Panels (A) and (B) plot the empirical distributions of placebo effects for each outcome interest. Each CDF is constructed by regressing the outcome variable on 2,000 randomly assigned DPAD treatments and controls as in Specifications (2a)–(2d) from baseline table.

Block Permutation Tests

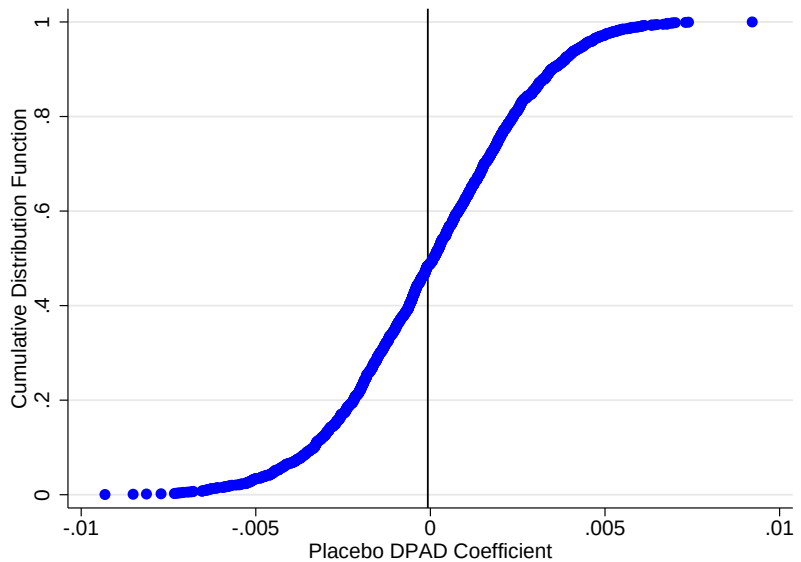
- randomize treatment, estimate effects of placebo policy on outcome
- repeat 2000 times
- use placebo DPAD treatment effects to recover non-parametric $p-$Values

(C) Payouts / \$ lagged revenue DD



74/2000 larger $\rightarrow p = 0.0370$

(D) Taxable Income / \$ assets DD



977/2000 smaller $\rightarrow p = 0.4885$

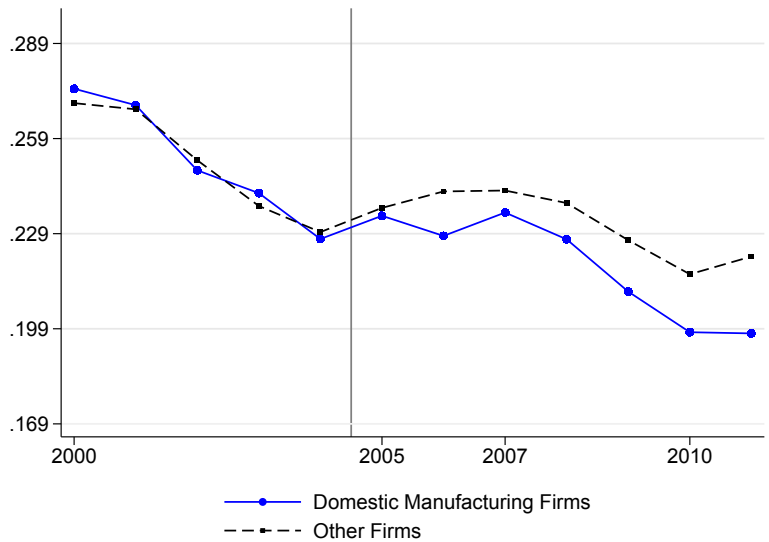
Panels (C) and (D) plot the empirical distributions of placebo effects for each outcome interest. Each CDF is constructed by regressing the outcome variable on 2,000 randomly assigned DPAD treatments and controls as in Specifications (2a)–(2d) from baseline table.

Direct Measurement of Treatment

Effect of the DPAD on Average Tax Rates

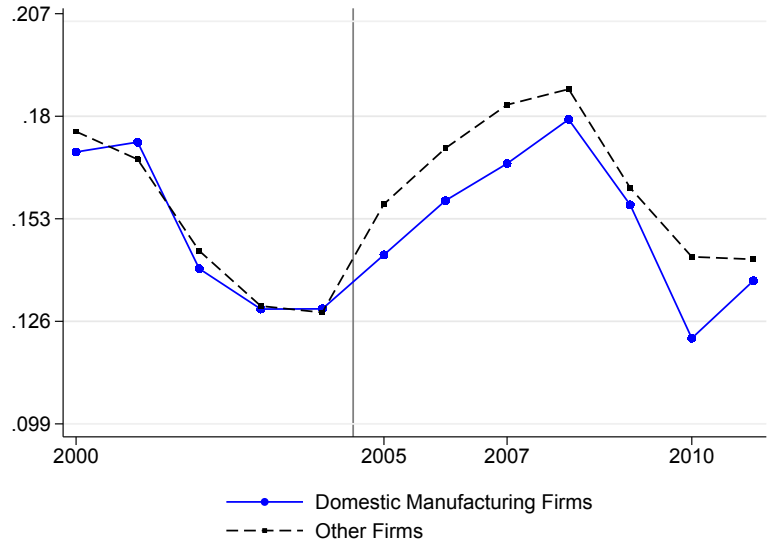
- GAAP Effective Tax Rate = Income Tax Expense / Pretax Book Income
- Cash Effective Tax Rate = Cash Taxes Paid / Pretax Book Income

(A) GAAP ETR DD



$\beta_{DPAD} = -0.0160^{***}$

(B) Cash ETR DD



$\beta_{DPAD} = -0.0112^{***}$

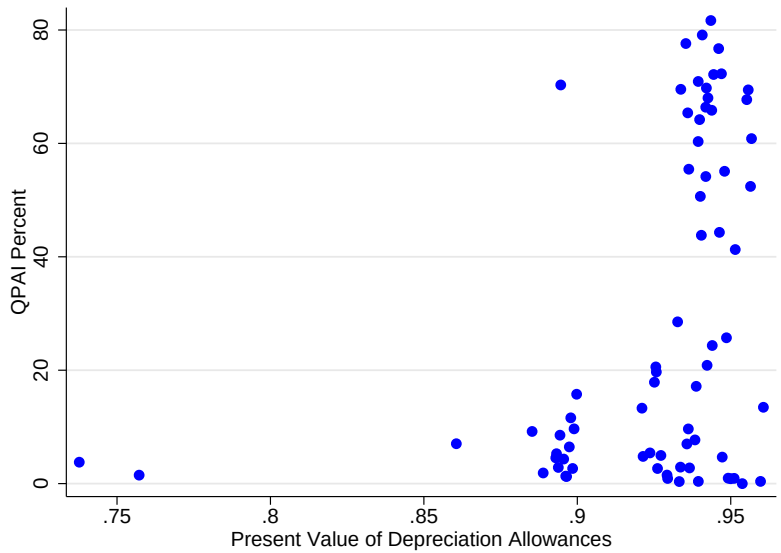
Notes: This figure presents a visual implementation of the differences-in-differences (DD) for two tax rate outcome variables: GAAP Effective Tax Rates and Cash Effective Tax Rates.

Effects of Contemporaneous Tax Policies

Policy Correlation

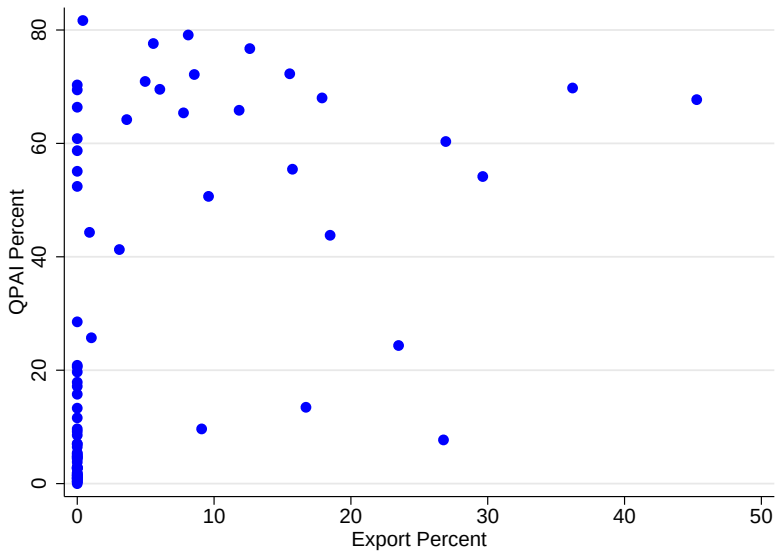
- Repeal of ETI in 2005 $\rightarrow$ overestimate DPAD
- Repeal of BONUS in 2005 $\rightarrow$ underestimate DPAD
- BONUS 2008+ $\rightarrow$ overestimate DPAD

(A) BONUS & DPAD



$\rho = 0.3688$

(B) ETI & DPAD



$\rho = 0.4531$

Notes: This presents scatterplots of QPAI Percent against Z_0, the present value of depreciation allowances in the absence of bonus depreciation, in Panel (A) and of QPAI Percent against Export Percent in Panel (B). The plots are presented at the IRS industry level and the values are averages over the sample period. QPAI Percent and Z_0 are positively correlated with a coefficient of 0.3688. QPAI Percent and Export Percent are positively correlated with a coefficient of 0.4531.

Effects of Contemporaneous Tax Policies

Reasons ETI and BONUS do not explain DPAD Effects

1. Visual evidence shows no divergence in any of the four outcome variable pre-trends during the years 2001–2003 when BONUS was enacted at 30% and scaled to 50%.

2. DPAD Effects are stable when BONUS and ETI variables are added to regression as controls.

3. Debt ratio response cannot be explained by BONUS as there is no theoretical reason that firms would alter their financing strategy in response to bonus. Zwick and Mahon (2016) find increased debt usage in response to BONUS.

4. Results are stable when time period is limited to years 2007–2012. Repeal of the ETI cannot explain these results.

5. Results are stable when the analysis is limited to firms that are least affected by BONUS depreciation.

Heterogeneity of Response

Table: Heterogeneity of Response

Dep Var.:	Investment/ $ lagged capital	Debt/ $ total assets	Payouts/ $ lagged revenue	Taxable Income/ $ total assets
	(1)	(2)	(3)	(4)
DPAD				
x High Tax	0.099**	-0.117***	0.006**	0.159***
	(0.043)	(0.040)	(0.002)	(0.010)
x Lag Rev	0.098*	-0.138***	0.004**	0.158***
	(0.050)	(0.031)	(0.002)	(0.013)
x High Age	0.335***	-0.131***	0.006*	0.219***
	(0.036)	(0.014)	(0.003)	(0.017)
x High CF	0.025	-0.078***	0.008***	0.176***
	(0.026)	(0.025)	(0.002)	(0.009)
x Repatriate	0.093***	-0.037**	0.004*	-0.005
	(0.013)	(0.015)	(0.002)	(0.008)

Notes: This table reports triple-difference estimates of the effect of the DPAD. Each coefficient-standard error cell represents a separate regression and reports the coefficient on the triple interaction of the QPAI treatment, the DPAD statutory tax rate, and a heterogeneity indicator for a firm being in the top quartile as opposed to the bottom quartile of the trait specified in the row heading (Repatriate is a simple indicator for whether the firm chose to repatriate dividends in response to the 2004 repatriation tax holiday). Each specification includes year and firm fixed effects, as well as controls for cash flow, financial constraint, BONUS, and ETI. Standard errors are presented in parentheses and are clustered at the industry level.

Discussion

Broaden the Base and Cut the Rate?

- $\mathcal{E}_{\text{DPAD}} = 5.99$, $\mathcal{E}_{\text{BONUS}} = 4.10$
- A one percentage point decrease in investment cost via DPAD stimulates 1.5 $\times$ more investment than a one percentage point cut via BONUS

Table: DPAD and BONUS Baseline Effects

Dep Var:	Investment / $ lagged capital	Debt / $ total assets	Payouts / $ total assets	Taxable Income / $ revenue
	(1)	(2)	(3)	(4)
DPAD	0.0433**	-0.0506***	0.0029**	-0.0001
	(0.0166)	(0.0161)	(0.0014)	(0.0036)
BONUS	0.0299**	-0.0061	-0.0003	0.0006
	(0.0120)	(0.0060)	(0.0008)	(0.0018)
firm-years	90,398	90,398	86,949	51,368
firms	12,443	12,443	12,069	9,026
R^2	0.119	0.233	0.008	0.088

Notes: Table 6 presents estimates the DPAD and BONUS coefficients from baseline regressions (Baseline specifications (2a)–(2d)). All regressions includes year and firm fixed effects and controls for Cash Flow, Marginal Q, HP Index, and ETI. Standard errors are presented in parentheses and are clustered at the industry level.

Broaden the Base and Cut the Rate?

- But, a one percentage point cut via the DPAD is approximate 1.5 $\times$ as expensive
- **A dollar for dollar rate cut at the expense of accelerated depreciation generates no additional investment**

Two Important Points

1. These estimates suggest both types of reforms are very successful at simulating investment.
   - \$1 spent either lowering the corporate income tax rate or accelerating depreciation generates approximately \$6 in additional capital expenditure.
2. Congressional Budget Office (CBO) must project the revenue baseline using current law and over a ten year window.
   - Accelerate depreciation has been implemented through temporary one year provisions and "extenders"
   - BONUS does not *seem* to have a significant effect on government revenues
   - A permanent rate reduction would *seem* to have significant revenue implications Gravell (2014), Altshuler (2012).

   Therefore, the *perceived* cost-benefit of bonus may be higher than that of a corporate rate reduction when in reality they are the same.

Conclusion

Summary of Results

Investment, Debt Usage, and Payouts are all responsive to the DPAD.

Empirical results suggest that a one percentage point reduction in the corporate income tax rate (in the neighborhood of 35%)

1. increases investment by 4.3% of installed capital
2. increases payouts by 0.3% of revenues
3. decreases debt usage by 5.1% of total assets
4. but does not increase taxable income as % of assets

.

These results suggest

- a one ppt reduction in the corporate tax rate is 46% more effective at stimulating corporate investment than a one percentage point reduction in investment costs via accelerated depreciation policies
- but a one ppt reduction in the corporate rate is 50% more expensive
- a dollar spent on either rate reduction or base broadening has the same effect
- corporate investment will be unaffected by a revenue neutral reform

Thank you for your comments and feedback.

Model Tax Depreciation Extension

- Investment depreciates at rate δ
- portion z of Investment is depreciated for tax purposes at DPAD adjusted rate

$$\max_I (1-\tau_d)\left[R_0 - G + \frac{1-\tau_c(1-\rho d))[\Pi(I) - cB] + G + E - \delta I + \tau_c(1-\rho d)zI}{1+r}\right] - E.$$

$$\Pi'(G) = \frac{r}{1-\tau_c(1-\rho d)} + \frac{\delta - \tau_c(1-\rho d)z}{1-\tau_c(1-\rho d)}$$

$$\Pi'(E) = \frac{r}{(1-\tau_d)(1-\tau_c(1-\rho d))} + \frac{\delta - \tau_c(1-\rho d)z}{1-\tau_c(1-\rho d)}$$

$$\Pi'(B) = c + \frac{\delta - \tau_c(1-\rho d)z}{1-\tau_c(1-\rho d)}$$

back

Model Tax Depreciation Extension

- Investment depreciates at rate δ
- portion z of Investment is depreciated for tax purposes at DPAD adjusted rate

$$\max_I (1-\tau_d)\left[R_0 - G + \frac{1-\tau_c(1-\rho d))[\Pi(I) - cB] + G + E - \delta I + \tau_c(1-\rho d)zI}{1+r}\right] - E.$$

$$\Pi'(G) = \frac{r}{1-\tau_c(1-\rho d)} + \frac{\delta - \tau_c(1-\rho d)z}{1-\tau_c(1-\rho d)}$$

$$\Pi'(E) = \frac{r}{(1-\tau_d)(1-\tau_c(1-\rho d))} + \frac{\delta - \tau_c(1-\rho d)z}{1-\tau_c(1-\rho d)}$$

$$\Pi'(B) = c + \frac{\delta - \tau_c(1-\rho d)z}{1-\tau_c(1-\rho d)}$$

back