Graduate Public Finance

Business Taxation Part I: Corporate Tax Policy and Firm Location

Owen Zidar
Princeton
Spring 2020

Lecture 6a

Outline

1. Brief overview of firm decisions and tax policies
2. Policy: business tax base (before and after Tax cuts and Jobs Act)
   - Business entity types, tax rates, and context for TCJA
   - Business tax base (before and after TCJA)
     - TCJA Business Tax Reform Summary
     - Key Corporate Deductions before TCJA
     - TCJA: Corporate Tax Base Reforms
     - TCJA: Pass-through Provisions
     - TCJA: International Provisions
   - Fundamental reform and apportionment
     - Tax base: source, residence, destination
     - Apportionment and State Corporate Taxation
3. Firm Location Decisions
   - Model of firm location
   - Empirical implementation: taxes and firm location
   - Hines (AER, 1996)
   - Giroud and Rauh (JPE, forthcoming)

Outline

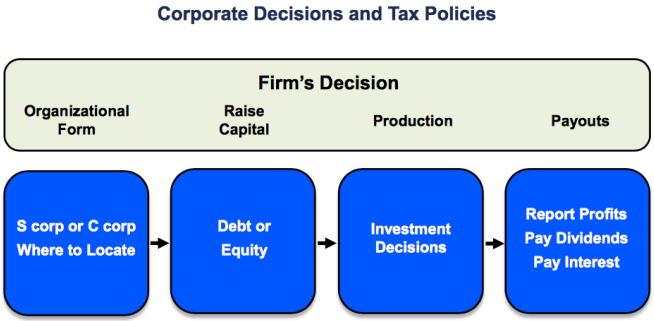
1. Brief overview of firm decisions and tax policies
2. Policy: business tax base (before and after Tax cuts and Jobs Act)
   - Business entity types, tax rates, and context for TCJA
   - Business tax base (before and after TCJA)
     - TCJA Business Tax Reform Summary
     - Key Corporate Deductions before TCJA
     - TCJA: Corporate Tax Base Reforms
     - TCJA: Pass-through Provisions
     - TCJA: International Provisions
   - Fundamental reform and apportionment
     - Tax base: source, residence, destination
     - Apportionment and State Corporate Taxation
3. Firm Location Decisions
   - Model of firm location
   - Empirical implementation: taxes and firm location
   - Hines (AER, 1996)
   - Giroud and Rauh (JPE, forthcoming)

U.S. Business Tax Structure

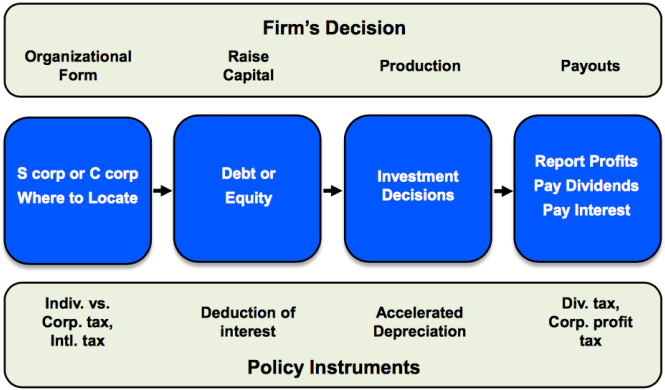
- Taxes on firms in the US consist of several elements
  1. Tax corporate profits (earnings - expenses) at approx flat rate of 21%
     - Expenses include wages+materials, depreciation, and interest payments
     - Acceleration of depreciation used to stimulate investment
  2. Individual-level taxes on payouts (capital gains, dividends, interest income)
  3. International tax provisions (transfer pricing, tax havens, FTC)
  4. Pass-throughs: most privately-owned firms (S corporations and partnerships) subject to individual income tax system

- **Goal**: characterize the consequences of this tax system and optimal design of business taxation

Corporate Decisions and Tax Policies



Corporate Decisions and Tax Policies



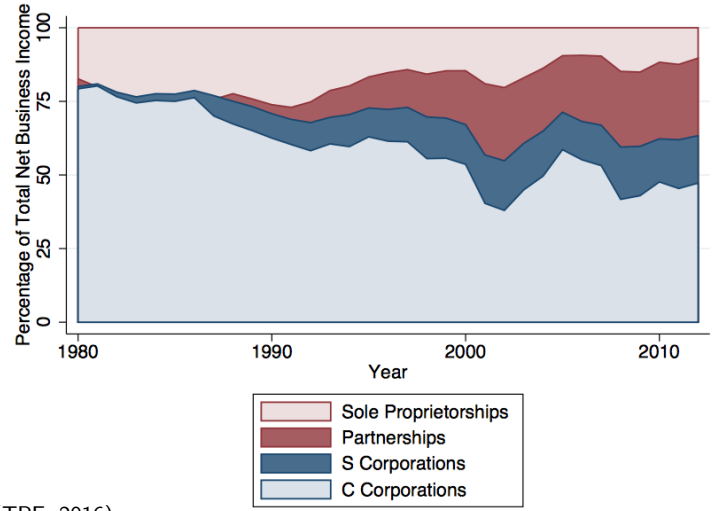
Outline

1. Brief overview of firm decisions and tax policies
2. Policy: business tax base (before and after Tax cuts and Jobs Act)
   - Business entity types, tax rates, and context for TCJA
   - Business tax base (before and after TCJA)
     - TCJA Business Tax Reform Summary
     - Key Corporate Deductions before TCJA
     - TCJA: Corporate Tax Base Reforms
     - TCJA: Pass-through Provisions
     - TCJA: International Provisions
   - Fundamental reform and apportionment
     - Tax base: source, residence, destination
     - Apportionment and State Corporate Taxation
3. Firm Location Decisions
   - Model of firm location
   - Empirical implementation: taxes and firm location
   - Hines (AER, 1996)
   - Giroud and Rauh (JPE, forthcoming)

Context for tax reform

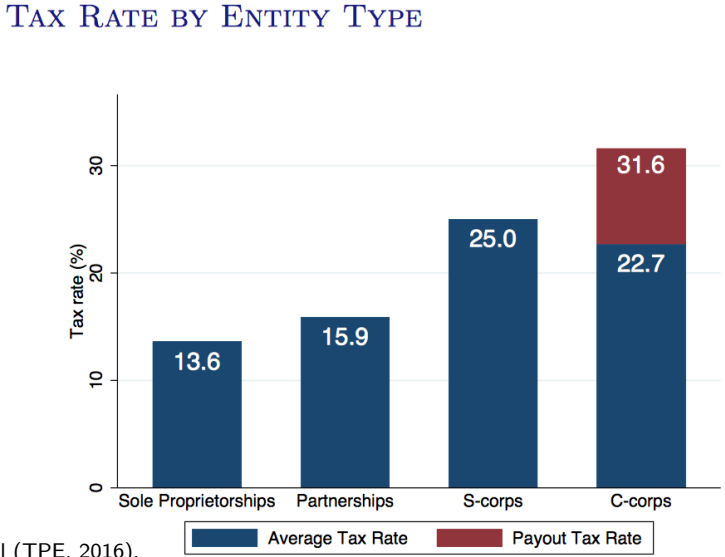
1. Rise of pass-throughs
2. Declining corporate tax revenue
3. Declining corporate tax rates
4. Substantial Tax Avoidance and Evasion

Context #1: The Rise of Pass-throughs



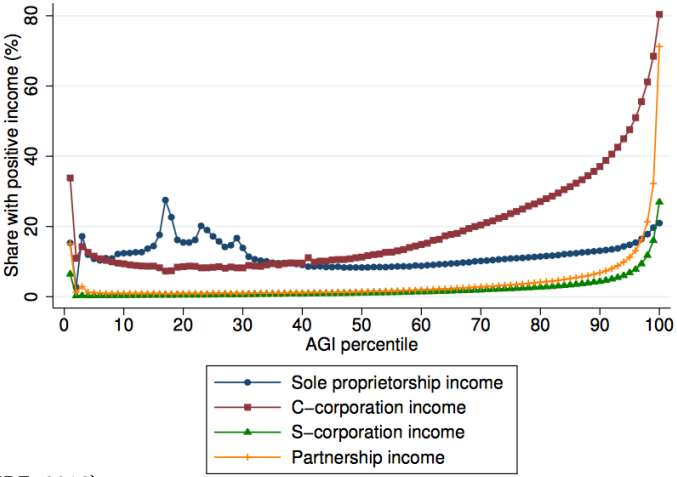
Source: Cooper et al (TPE, 2016).

Business Entity Types and Average Tax Rates in 2011



Source: Cooper et al (TPE, 2016).

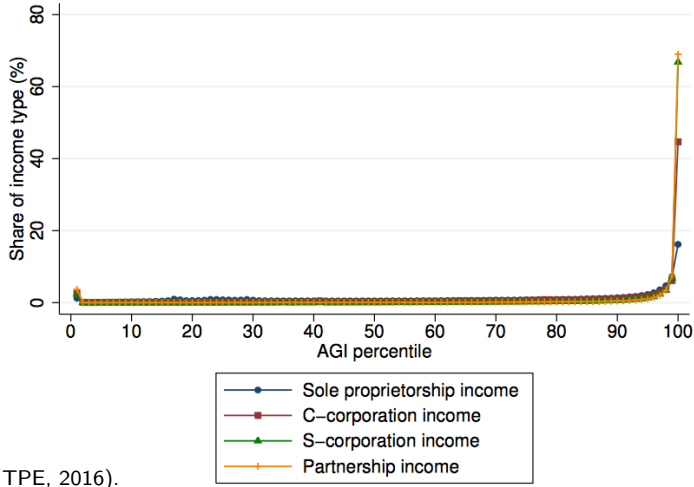
Tax rate depends on ownership, which is concentrated



Source: Cooper et al (TPE, 2016).

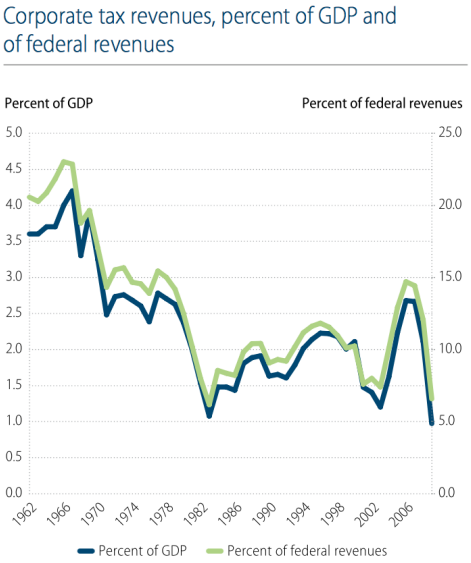
Private business income is very concentrated

Roughly 70% of pass-through income goes to top 1%

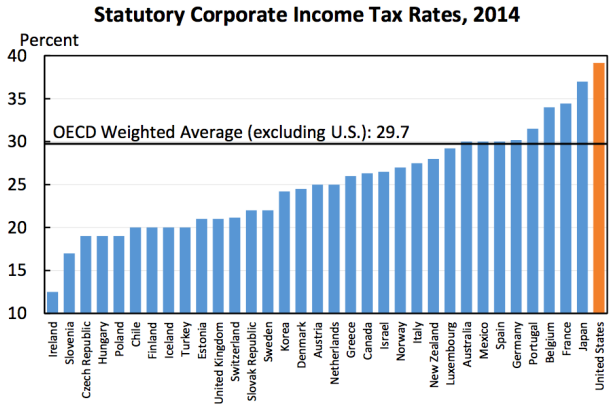


Source: Cooper et al (TPE, 2016).

Context #2: Declining Corporate Tax Revenues

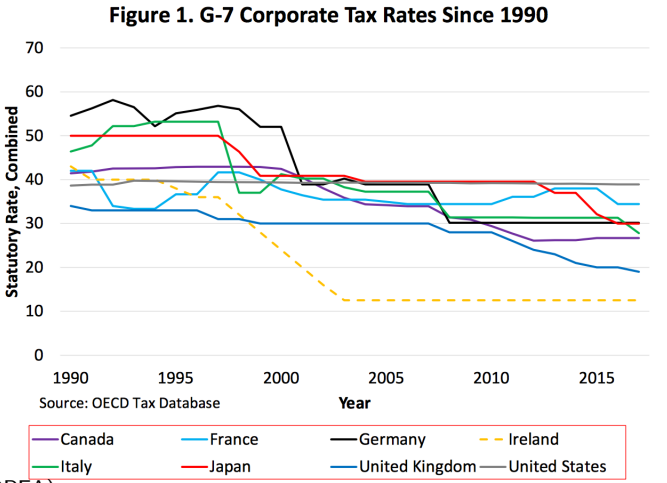


Context #3: US had highest corp tax rate in the world



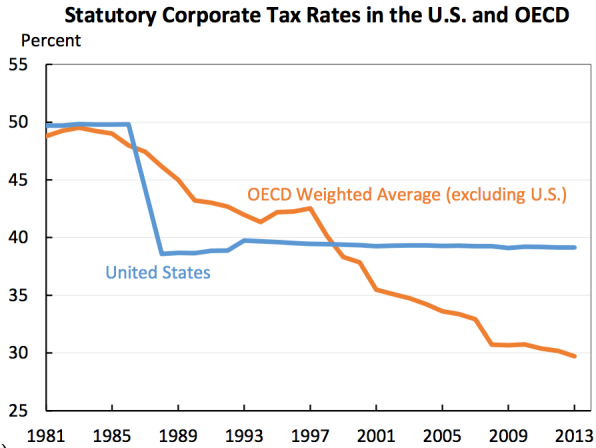
Source: Furman/CEA (2014).

Context #3: Declining Corporate Tax Rates



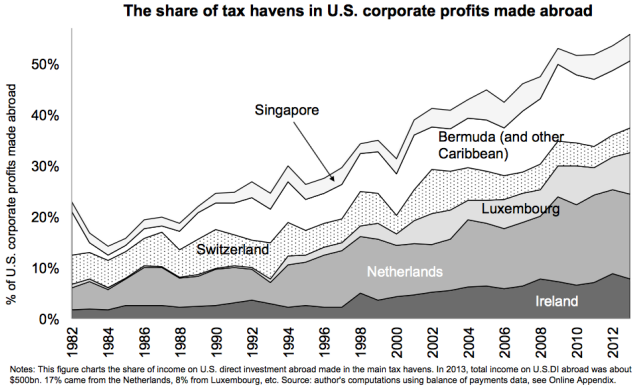
Source: Auerbach (2017 BPEA).

Context #3: Declining Corporate Tax Rates



Source: Furman/CEA (2014).

Context #4: Substantial Tax Avoidance and Evasion



Source: G. Zucman.

Context #4: Substantial Tax Avoidance and Evasion

Source: NYTIMES

Context #4: Substantial Tax Avoidance and Evasion

Country	U.S. Controlled Foreign Corporation Profits Relative to GDP (2010)
Bahamas	104%
Bermuda	1,578%
British Virgin Islands	1,009%
Cayman Islands	1,430%
Cyprus	13%
Ireland	38%
Luxembourg	103%
Netherlands	15%
Netherlands Antilles	25%

Source: IRS and United Nations; CEA Calculations.

Source: Furman/CEA (2014).

The 2017 Tax Reform (a.k.a., "Tax Cuts and Jobs Act")

1. Summary of TCJA changes to business tax
2. Key base provisions (expensing, interest, DPAD, R&E, losses, etc)
3. Pass-through provisions
4. International provisions

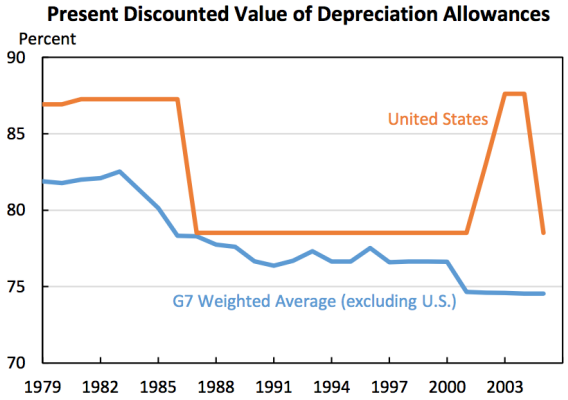
Note: The 2017 Tax Reform is Public Law 115-97, "An Act to provide for reconciliation pursuant to titles II and V of the concurrent resolution on the budget for fiscal year 2018," which was originally named the "Tax Cuts and Jobs Act" before the title had to be changed b/c of procedural rules related to budget reconciliation.

Summary of the 2017 Tax Reform (TCJA)

Overall Revenue Score and Major Business Provisions

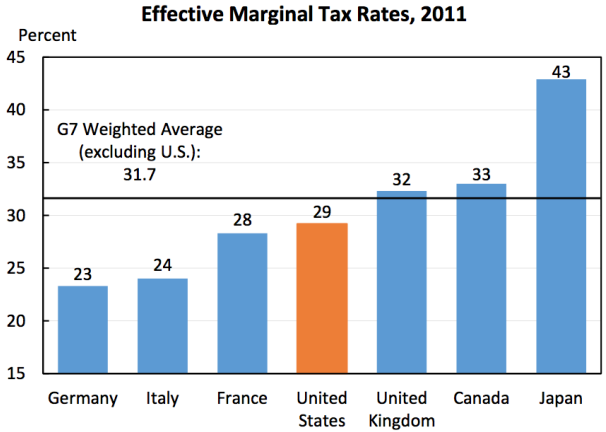
1. Static cost of 1.5T in federal revenue over ten years (JCT 2017)
2. Corporate Tax Changes
   1. Lowered corporate rate from 35% to 21% (-150B/yr, -1.4T 2018-27)
   2. Full expensing for next 5 years (-30B/yr in 2018-20, -86B/yr 2018-27)
   3. To offset, repeal/limit DPAD, interest deductibility, R&E, losses
3. Pass-through provisions (sunset 12/31/2025)
   1. New 20% deduction for certain pass-through income (-45B/yr)
   2. Lowered top rate from 39% to 37%
   3. To offset, disallow active losses in excess of $500K (15B/yr)
4. International provisions
   1. Establish territorial system and reduce rate on foreign intangibles associated with income derived in US
   2. To offset, minimum tax on global intangibles (GILTI) of 10.5% through 2025 and 13.125% thereafter and (BEAT) which is like a minimum tax on inbound investment. Also one-time payment on existing overseas earnings and free repatriation thereafter

Pre TCJA: US had more generous tax base provisions



Source: Furman/CEA (2014).

Effective US rates were thus closer to other G7 countries



Source: Furman/CEA (2014).

Pre TJCA: What are some key tax base provisions?

- **Accelerated depreciation** (House and Shapiro, AER 2008)
- Bonus depreciation and Section 179 (Zwick and Mahon, AER 2017)
- Business net interest deduction
- Loss carry forwards and carrybacks (Zwick and Mahon, AEJ: Policy)
- DPAD (Eric Ohrn, AEJ: Policy 2018 or Rebecca Lester's work)
- R & E credit (Nirupama Rao, JPUBE 2016)
- Many others

Tax Incentives for investment: accelerated depreciation

- Most common policies to directly change level of investment: changes in depreciation rules and tax credits for investment
- Frequently used in recessions to attempt to stimulate investment by firms
- Begin with a simple example to understand why depreciation rules matter
    - Suppose a firm buys a machine for $1000, which wears down by $100 a year

Tax Incentives for investment: accelerated depreciation

- Consider two tax treatments of the machine
  1. Expensing: subtract the full \$1000 from profits in the year you buy machine
  2. Economic depreciation: subtract \$100 per year from your profits
- Expensing reduces effective tax rate for firm given interest rate $r > 0$
- Current policy in U.S.: approximate economic depreciation using linear or exponential rules by asset class

Recovery periods & depreciation methods by type of K

TABLE 2—RECOVERY PERIODS AND DEPRECIATION METHODS BY TYPE OF CAPITAL

Type of capital	Recovery period, R (years)	Tax depreciation rate, δ (percent)	Method
Tractor units for over-the-road use, horses over 12 years of age or racehorses with over 2 years in service	3	66.7	200 DB
Computers and office equipment; light vehicles, buses and trucks	5	40.0	200 DB
Miscellaneous equipment, office furniture, agricultural equiment	7	28.6 or 21.4	200 DB or 150 DB
Water transportation equipment (vessels and barges); single-purpose agricultural structures	10	20.0 or 15.0	200 DB or 150 DB
Radio towers, cable lines, pipelines, electricity generation and distribution systems, "land improvements," e.g., sidewalks, roads, canals, drainage systems, sewers, docks, bridges, engines and turbines	15	10.0	150 DB
Farm buildings (other than single purpose structures), railroad structures, telephone communications, electric utilities, water utilities structures including dams, and canals	20	7.5	150 DB
Nonresidential real property (office buildings, storehouses, warehouses, etc.)	39	2.6	SL

Note: Tax depreciation methods are 200 percent declining balance (200 DB), 150 percent declining balance (150 DB), and straight line (SL).

Source: IRS Publication 946.

Source: House and Shaprio (AER, 2008).

Bonus depreciation

TABLE 1—REGULAR AND BONUS DEPRECIATION SCHEDULES FOR FIVE-YEAR ITEMS

Year:	0	1	2	3	4	5	Total
Normal depreciation							
Deductions (000s)	200	320	192	115	115	58	1,000
Tax benefit ($\tau = 35$ percent)	70	112	67.2	40.3	40.3	20.2	350
Bonus depreciation (50 percent)							
Deductions (000s)	600	160	96	57.5	57.5	29	1,000
Tax benefit ($\tau = 35$ percent)	210	56	33.6	20.2	20.2	10	350

Notes: This table displays year-by-year deductions and tax benefits for a $1 million investment in computers, a five-year item, depreciable according to the Modified Accelerated Cost Recovery System (MACRS). The top schedule applies during normal times. It reflects a half-year convention for the purchase year and a 200 percent declining balance method (2× straight line until straight line is greater). The bottom schedule applies when 50 percent bonus depreciation is available.

Source: Authors' calculations. See IRS publication 946 for the recovery periods and schedules applying to other class lives (https://www.irs.gov/uac/about-publication-946).

Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

- Allows additional first-year deductions for new equipment.
- Bonus I: 30% in 2001, 2002; 50% in 2003, 2004
- Bonus II: 50% in 2008-09, 12-13; 100% in 2010-11

$$\underbrace{z_T^0}_{\substack{\text{PV of \$1} \\ \text{Normal times}}} \equiv \underbrace{D_0}_{\substack{\text{Year 0} \\ \text{Deduction}}} + \underbrace{\sum_{t=1}^{T} \frac{1}{(1+r)^t} D_t}_{\substack{\text{PV of Year 1 to T} \\ \text{Deductions}}} \quad \text{with} \quad \sum D_i = 1$$

$$\underbrace{z_T(\theta)}_{\substack{\text{PV of \$1} \\ \text{Bonus times}}} \equiv \underbrace{\theta}_{\text{Bonus}} + (1-\theta) z_T^0 \quad \text{with} \quad \theta \in (0,1]$$

Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

$$\underbrace{z_T(\theta)}_{\substack{\text{PV of \$1} \\ \text{Bonus times}}} \equiv \underbrace{\theta}_{\text{Bonus}} + (1-\theta) z_T^0 \quad \text{with} \quad \theta \in (0,1]$$

Normal times:

Year	0	1	2	3	4	5	Total
Deductions	200	320	192	115	115	58	1000
$z_5(0)$							0.890

Bonus times (50%):

Year	0	1	2	3	4	5	Total
Deductions	600	160	96	57.5	57.5	29	1000
$z_5(0.5)$							**0.945**

Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

1. Bonus allowance is more valuable for longer lived items.
2. Industries differ in relative intensity of longer lived investment.

Short Duration (NAICS)	Long Duration (NAICS)
Rental and Leasing (532)	Utilities (221)
Publishing (511)	Pipeline Transport (486)
Data Processing (518)	Railroads (482)
Ground Transit (485)	Accommodations (721)
Professional Services (541)	Food Manufacturing (311)

Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

1. Bonus allowance is more valuable for longer lived items.
2. Industries differ in relative intensity of longer lived investment.
3. Use tax data to compute weighted average present value of deductions, z_N, at four-digit NAICS level
4. Use cross-sectional variation in bonus generosity to identify the effect of bonus (diff-in-diffs)

$$\Delta I_{\text{Rental and Leasing}} \quad \text{vs.} \quad \Delta I_{\text{Utilities}}$$

$$\log(I_{it}) = \alpha_i + \delta_t + \beta z_{N,t} + \gamma X_{it} + \varepsilon_{it}$$

Approach of Cummins, Hassett and Hubbard (1994, 1996), Desai and Goolsbee (2004), Edgerton (2010).

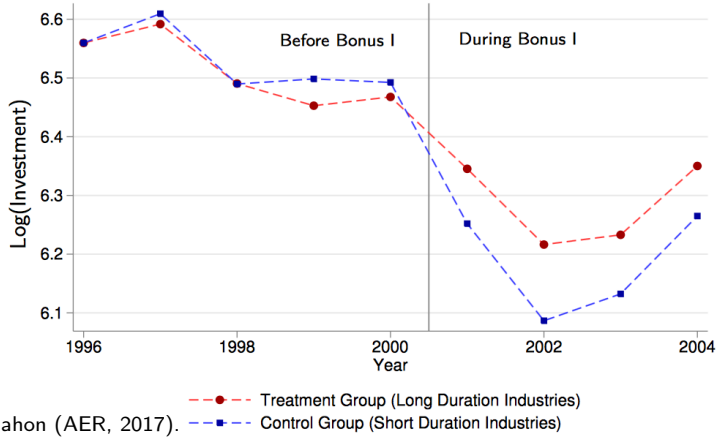
- Larger sample, one policy change

Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

Calendar Diff-in-Diffs: Bonus I

Intensive Margin

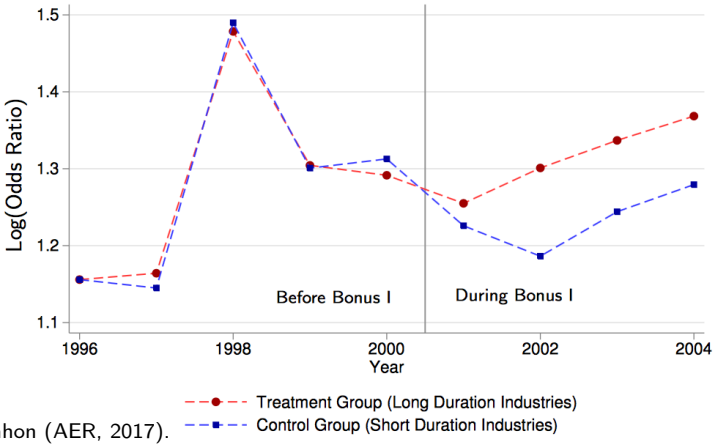


Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

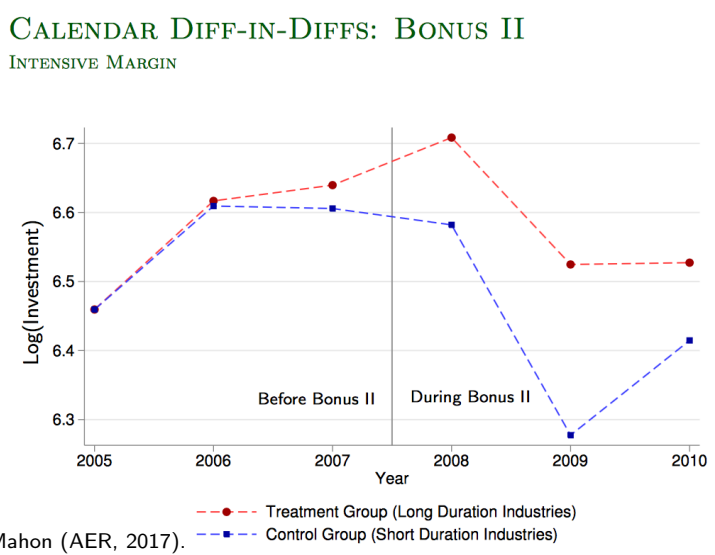
Calendar Diff-in-Diffs: Bonus I

Extensive Margin



Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

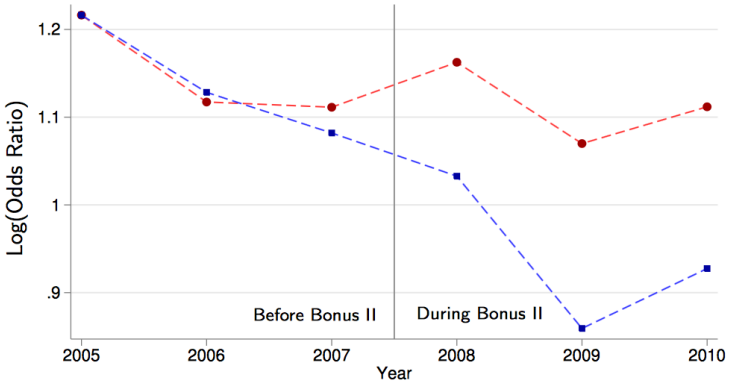


Source: Zwick and Mahon (AER, 2017).

Bonus depreciation

Calendar Diff-in-Diffs: Bonus II

Extensive Margin



Source: Zwick and Mahon (AER, 2017)

What are some key tax base provisions?

- Accelerated depreciation and bonus (House and Shaprio, AER 2008)
- **Section 179**
- Business net interest deduction
- Loss carry forwards and carrybacks (Zwick and Mahon, AEJ: Policy)
- DPAD (Eric Ohrn, AEJ: Policy 2018 or Rebecca Lester's work)
- R & E credit (Nirupama Rao, JPUBE 2016)
- Many others

Section 179

- S179 is a component of the depreciation schedule which applies mainly to smaller firms.
- Under Section 179, taxpayers may elect to expense qualifying investment up to a specified limit.
- With the exception of used equipment, all investment eligible for Section 179 expensing is eligible for bonus depreciation.
- Each tax year, there is a maximum deduction and a threshold over which Section 179 expensing is phased out dollar for dollar.
- The kink and phase-out regions have increased incrementally since 1993.
- TCJA raises the top threshold to $2.5 M

Section 179 example

Table 1: Section 179 and Bonus Depreciation Policy Changes

Year	S179 Max Value	S179 Phase-out Region	Bonus
1993-96	$17,500	$200,000-$217,500	
1997	$18,000	$200,000-$218,000	
1998	$18,500	$200,000-$218,500	
1999	$19,000	$200,000-$219,000	
2000	$20,000	$200,000-$220,000	
2001-02	$24,000	$200,000-$224,000	30% Tax years ending after 9/10/01
2003	$100,000	$400,000-$500,000	50% Tax years ending after 5/3/03
2004	$102,000	$410,000-$512,000	50%
2005	$105,000	$420,000-$525,000	
2006	$108,000	$430,000-$538,000	
2007	$125,000	$500,000-$625,000	
2008-09	$250,000	$800,000-$1,050,000	50% Tax years ending after 12/31/07
2010-11	$500,000	$2,000,000-$2,500,000	100% Tax years ending after 9/8/10

a. 2008 was retroactive.

Source: Yagan Zidar Zwick.

Section 179 policy changes

Table 1: Section 179 and Bonus Depreciation Policy Changes

Year	S179 Max Value	S179 Phase-out Region	Bonus
1993-96	$17,500	$200,000-$217,500	
1997	$18,000	$200,000-$218,000	
1998	$18,500	$200,000-$218,500	
1999	$19,000	$200,000-$219,000	
2000	$20,000	$200,000-$220,000	
2001-02	$24,000	$200,000-$224,000	30% Tax years ending after 9/10/01
2003	$100,000	$400,000-$500,000	50% Tax years ending after 5/3/03
2004	$102,000	$410,000-$512,000	50%
2005	$105,000	$420,000-$525,000	
2006	$108,000	$430,000-$538,000	
2007	$125,000	$500,000-$625,000	
2008-09	$250,000	$800,000-$1,050,000	50% Tax years ending after 12/31/07
2010-11	$500,000	$2,000,000-$2,500,000	100% Tax years ending after 9/8/10

a. 2008 was retroactive.

Source: Yagan Zidar Zwick.

Loss provisions

Table 1: Legislative Background on Tax Loss Carrybacks and Carryforwards, 1998-2011

Ending fiscal period[a]	Carryback	Carryforward	Enacting legislation
1998-12 to 2000-12	2 years	20 years	TRA 1997 (permanent)[c]
2001-01 to 2002-12	5 years	20 years	JCWAA 2002 (temporary)[d]
2003-01 to 2007-12	2 years	20 years	TRA 1997 (permanent)
2008-01 to 2010-11	5 years	20 years	ARRA 2009 (temporary)[b,e] WHBAA 2009 (temporary)[b,f]
2010-12 to 2012-11	2 years	20 years	TRA 1997 (permanent)

Notes: This table summarizes the statutory window for eligible carrybacks and carryforwards between 1998 and 2011. The policy rules apply to corporate tax returns with ending fiscal periods that fall within the range detailed in the first column of the table. The last column lists the legislation that enacted the policy changes. In this period, the carryback window was twice expanded temporarily as part of fiscal stimulus legislation. The information for this table was pulled from bulletins and revenue procedures released by the Internal Revenue Service.

a. Corporations file income taxes for the fiscal year instead of the calendar year
b. ARRA 2009 and WHBAA 2009 limited deductions against the fifth fiscal year preceding a firm's current tax loss to 50 percent of taxable income
c. TRA: Taxpayer Relief Act of 1997
d. JCWAA: Job Creation and Worker Assistance Act of 2002
e. ARRA: American Recovery and Reinvestment Act of 2009
f. WHBAA: Worker, Homeowner, and Business Assistance Act of 2009

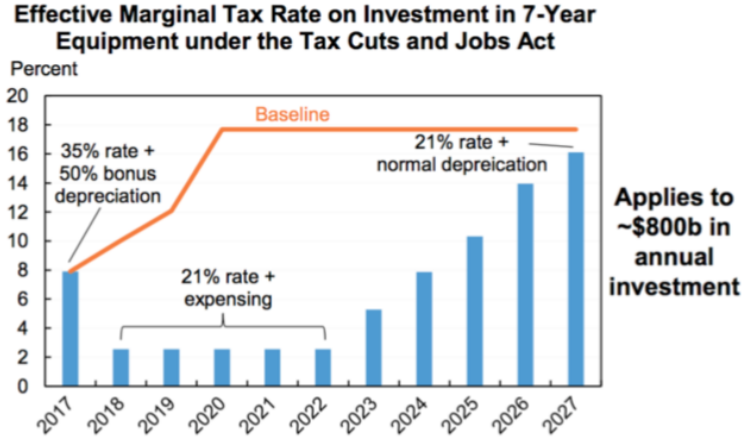
Source: Mahon and Zwick (2017).

TCJA: Corporate Tax Base Reforms

TCJA Bucket 1: Key "old school" Base Provisions

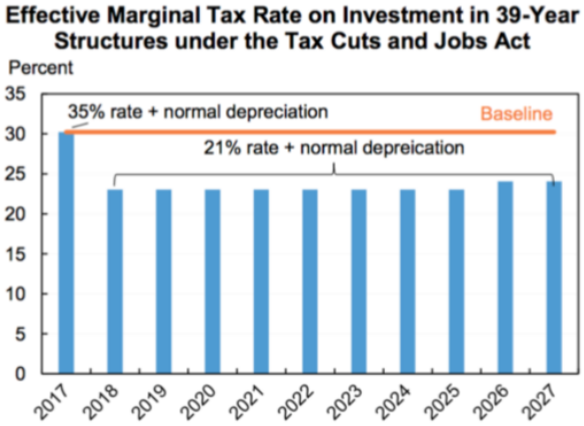
1. **Equipment investment deductions:**
   - Increase section 179 expensing max value to $1M (with $2.5M phase-out threshold)
   - Extends bonus depreciation and expands to expensing with phase-out
2. **R&D deductions:** shifts from expensing to amortization in 2022
3. **Interest deductions:**
   - Limit net interest to 30% of adjusted taxable income (EBITDA until 2022 and EBIT after); firms with receipts$<$ $25M are exempt
   - Does not apply to investment interest/interest income from financials
4. **Net operating losses (NOLs):** Repeals carrybacks. Carryforwards are indefinite, but NOL deduction is capped at 80% of income
5. **Other:** Repeals Corporate AMT and Domestic Production Activities Deduction (DPAD)

The effective marginal tax rate on equipment investment falls somewhat, then rises sharply



Note: Assumes 32 percent debt financing and 68 percent equity financing. After 2017, assumes that 15 percent of firms are constrained by the interest cap.
Source: Author's calculations based on Mathur and Kallen (2017).

The effective marginal tax rate on structures investment falls

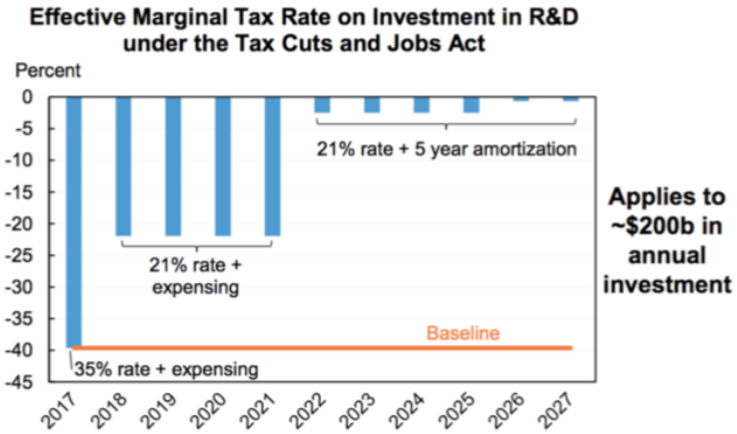


Applies to ~$400b in annual investment

Note: Assumes 32 percent debt financing and 68 percent equity financing. After 2017, assumes that 15 percent of firms are constrained by the interest cap.
Source: Author's calculations based on Mathur and Kallen (2017).

Source: Jason Furman.

The effective marginal tax rate on R&D investment rises substantially



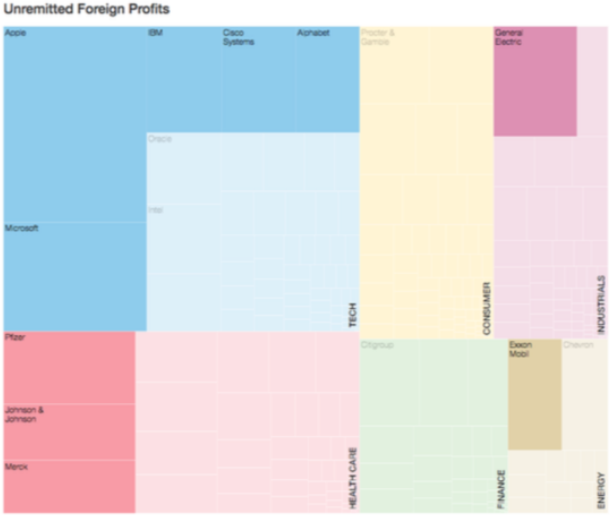
Note: Assumes 32 percent debt financing and 68 percent equity financing. After 2017, assumes that 15 percent of firms are constrained by the interest cap.
Source: Author's calculations based on Mathur and Kallen (2017) and Bureau of Economic Analysis.

TCJA Bucket 2: Pass-through Provisions

1. **Deductions:** Same as pertinent "old school" provisions
2. **Rate cut:**
   - Allows 20% deduction of qualified business income
   - Reduces top rate from 37% to 29.6%
3. **Phase-out of deduction:**
   - Specified service businesses – health, law, consulting, etc.
   - Businesses with low wages AND low capital. Cap on the deduction is greater of (a) 50% of W2 comp or (b) 25% of W2 comp and 2.5% of purchase of tangible assets
   - Phase-out begins at $157,500 for individuals, $315,000 for joint filers

$2.8T in Accumulated Deferred Foreign Income (2017)

Just a handful of the biggest companies are responsible for a disproportionate share of the accumulated foreign profits.

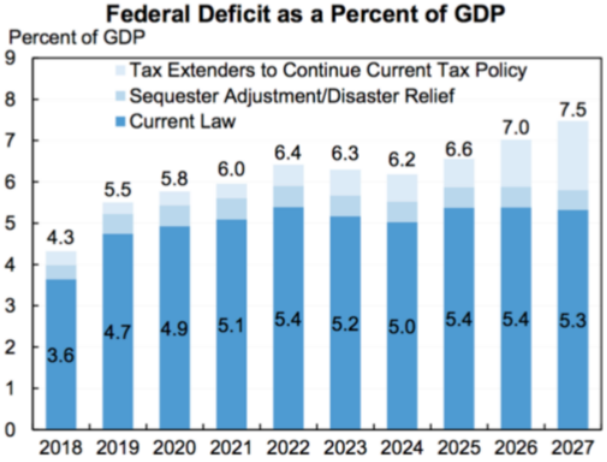


Source: WSJ.

TCJA Bucket 3: International Provisions

1. **Territorial?** territorial with minimum tax on certain foreign income
2. **Toll tax:** One-time tax on past earnings
   - Deemed repatriation of deferred foreign income with 8% rate on illiquid and 15.5% rate on liquid assets, payable over 8 years
   - Deferral system is repealed going forward
3. **Profit shifting with intangibles:**
   - Immediate taxation of global intangible low-taxed income (at least 10.5%) – GILTI provision
   - Deduction for domestic intangible income earned from unrelated foreign parties (implies a rate of at least 13%) – FDII
4. **Inbound profit shifting and anti-inversion measures:**
   - Min tax of 10% on income when payments to foreign related parties occur – BEAT provision
   - Could hit cross-border or sub to branch bank payments, as no netting
5. **Modification to Subpart F:** Broader CFC rules. Foreign corporations may be subject to immediate inclusion of foreign-earned income

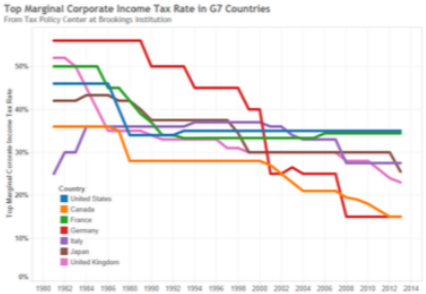
Deficits expected to rise to 5%+ of GDP—and much more if major provisions are extended



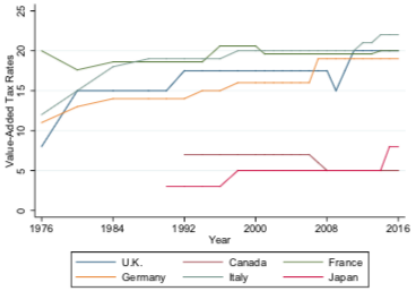
Source: Committee for a Responsible Federal Budget; Congressional Budget Office; author's calculations.

Fall in Corporate Tax → Rise in Value-Added Tax

Corporate Rates



Value-Added Tax Rates



Source: Brookings, OECD.

Fundamental reform and apportionment

- Tax base - what do we want to tax?
- Location of the tax base - where do we want income to be taxed?
  - Source-based: where goods or services are produced
  - Residence-based: where shareholders/corporate headquarters are located
  - Destination-based: where final consumers are located

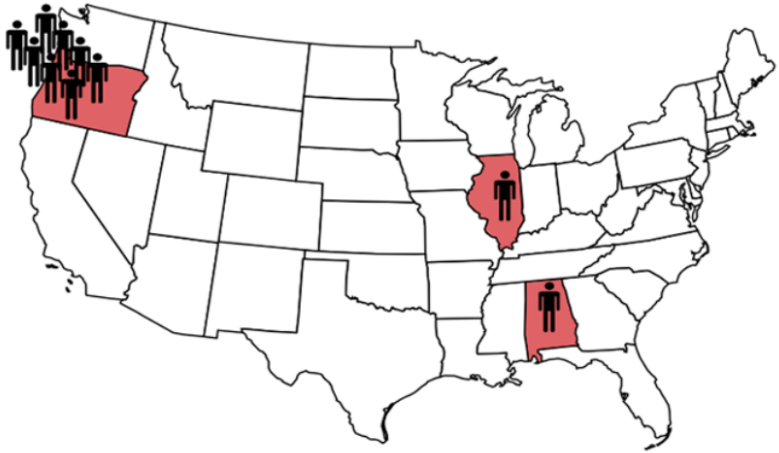
State business taxes: three types of firm taxes

1. Partnership and S-corps: τ^{INC} personal income tax rate
   - Synthetic changes as in Zidar (2013) using NBER's TAXSIM
2. Single-state C-corps: τ^{c} corporate income tax rate
   - Digitized corporate tax rates from "Book of the States"
3. Multi-state C-corps: τ^{A} apportioned corporate income tax rate
   - Depends on corporate rate, apportionment, and activity weights

$$\tau_i^A = \sum_s \tau_s^c \omega_{is}$$

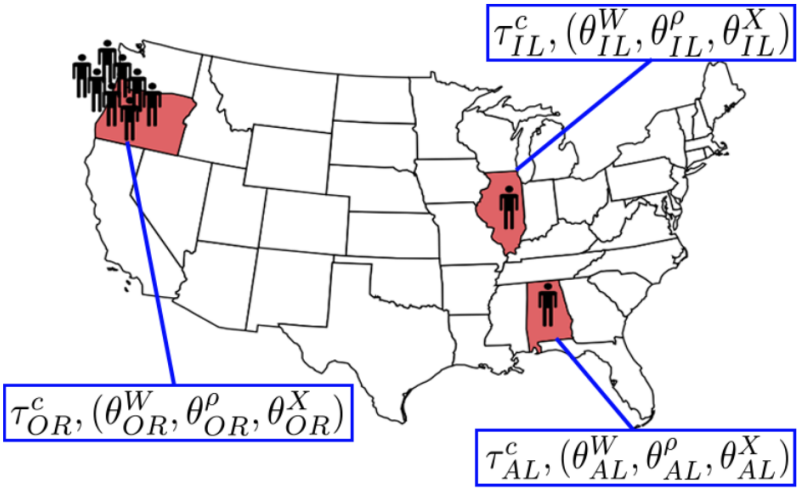
- where $\omega_{is} = \underbrace{\left(\theta_s^w \frac{W_{is}}{W}\right)}_{payroll} + \underbrace{\left(\theta_s^p \frac{R_{is}}{R}\right)}_{property} + \underbrace{\left(\theta_s^x \frac{X_{is}}{X}\right)}_{sales}$

Nike apportionment example



Source: Suárez Serrato and Zidar (AER, 2016)

Nike apportionment example



Source: Suárez Serrato and Zidar (AER, 2016).

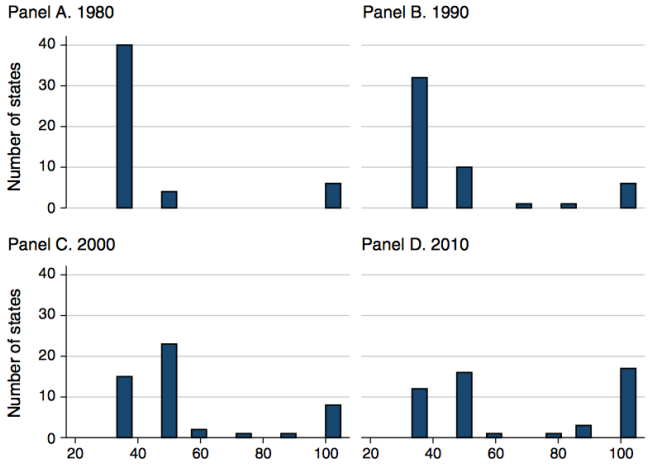
Nike apportionment example

- Suppose Nike earns $2 M of profit in every state
- Their tax liability differs based on how profits are apportioned

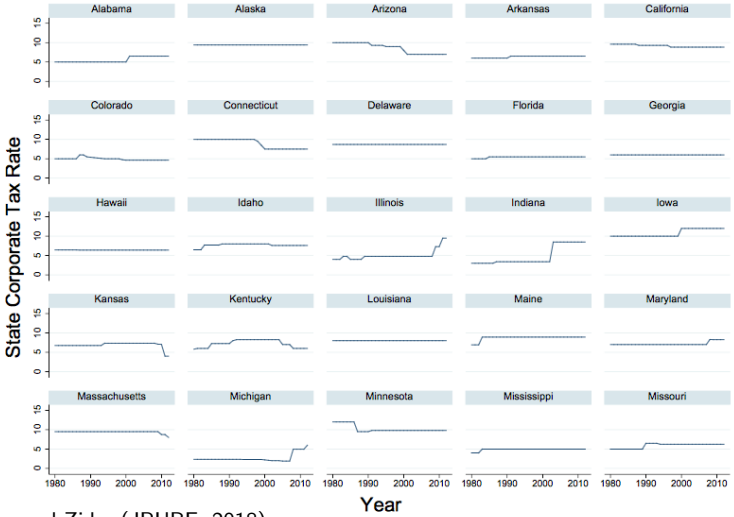
State	I. Using Payroll	II. Using Sales
	Apportioned Profit ($M)	
OR	(80% of 6) = 4.8	2
IL	(10% of 6) = .6	2
AL	(10% of 6) = .6	2
	Corporate Tax Liability ($M)	
OR with $\tau^c_{OR} = 50\%$	2.4	1
IL with $\tau^c_{IL} = 10\%$	.06	0.2
AL with $\tau^c_{AL} = 0\%$	0	0
Total Tax Liability ($M)	3	1.2

Source: Suárez Serrato and Zidar (AER, 2016).

Evolution of apportionment weights

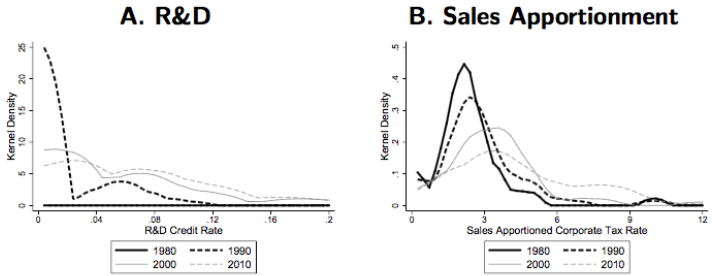


State corporate tax rates



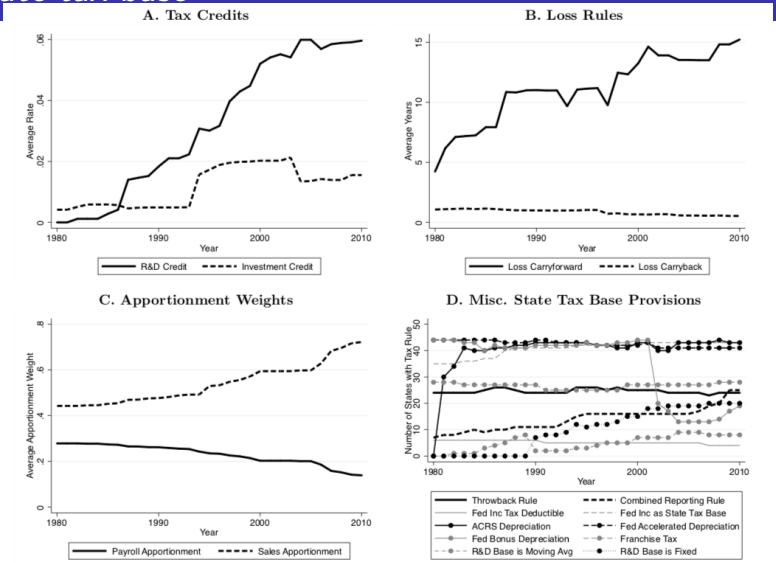
Source: Suárez Serrato and Zidar (JPUBE, 2018).

State corporate tax base



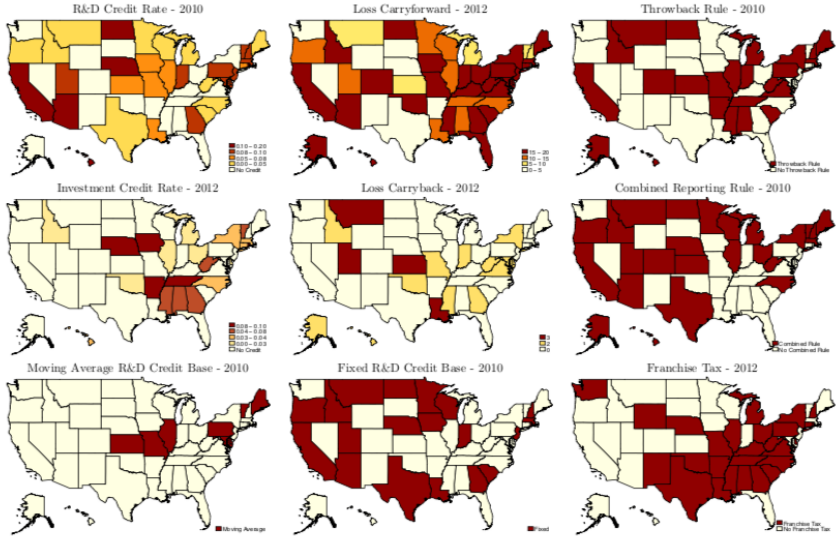
Source: Suárez Serrato and Zidar (JPUBE, 2018).

State corporate tax base



Source: Suárez Serrato and Zidar (JPUBE, 2018).

State corporate tax base



Source: Suárez Serrato and Zidar (JPUBE, 2018)

Variance Decomposition of Tax revenue

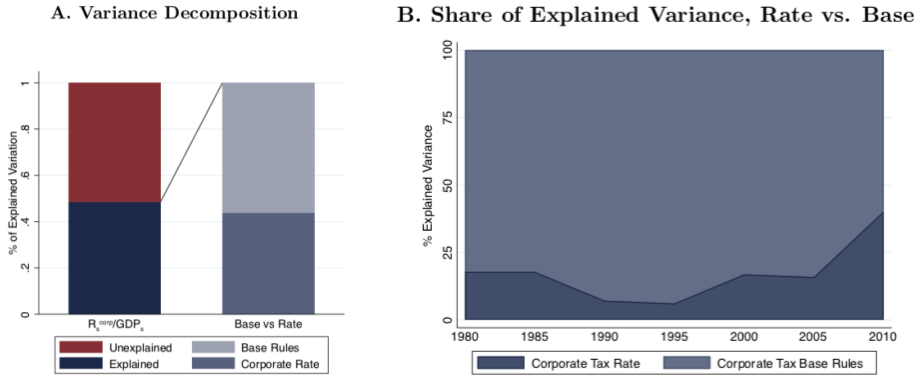
- Base rules change more than taxes, so we want to know if they matter for revenue
- Explore relationship through variance decomposition:

$$Var(R_{st}) = Var(\alpha + \gamma \tau^{c}_{st} + \mathbf{X}'_{st} \Psi^{BASE}_{st} + u_{st})$$

  - R_{st} = state corporate tax revenue as a share of GDP
  - τ^{c}_{st} = statutory corporate tax rate in state s and year t
  - $\mathbf{X}_{st}$ = vectors of tax base determinants
  - α_s = state fixed effect
  - ε_{it} clustered by state
- Decomposition is performed in 5 year intervals and data is weighted by mean GDP in sample
  - Contribution to variation depends on coefficients (γ, Ψ) and on variation in policies over time

Source: Suárez Serrato and Zidar (JPUBE, 2018).

Tax structure explains ≈ 60% of variance

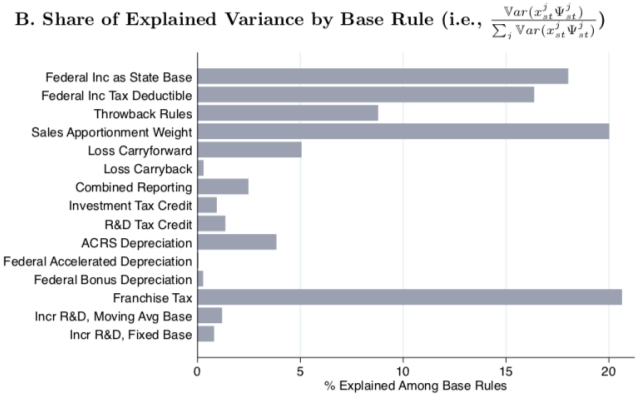


- ≈ 60% of explained variance is due to tax base rules

Source: Suárez Serrato and Zidar (JPubE, 2018).

ANOVA: base and credit rule provisions

- Contribution to the variance from base provision j: $Var(x^j_{st}\Psi^j_{st})$



Source: Suárez Serrato and Zidar (JPUBE, 2018).

Outline

1. Brief overview of firm decisions and tax policies
2. Policy: business tax base (before and after Tax cuts and Jobs Act)
   - Business entity types, tax rates, and context for TCJA
   - Business tax base (before and after TCJA)
     - TCJA Business Tax Reform Summary
     - Key Corporate Deductions before TCJA
     - TCJA: Corporate Tax Base Reforms
     - TCJA: Pass-through Provisions
     - TCJA: International Provisions
   - Fundamental reform and apportionment
     - Tax base: source, residence, destination
     - Apportionment and State Corporate Taxation
3. Firm Location Decisions
   - Model of firm location
   - Empirical implementation: taxes and firm location
   - Hines (AER, 1996)
   - Giroud and Rauh (JPE, forthcoming)

How do taxes affect firm location?

Overview

- **Question** What is the effect of business taxes and location subsidies on firm location and the supply of corporate capital?
- **Motivation:**
  - Capital stock is key for growth
  - At all levels of government, substantial resources deployed with goal of attracting firms
- **Roadmap:**
  - Simple model of firm location Suárez Serrato and Zidar (AER, 2016)
  - Empirical evidence from recent papers

Source: Zidar, in preparation for Journal of Economic Perspectives.

My take on this question

- **Location decisions are multidimensional**
  - Depend on more things than just taxes (e.g., factor prices, productivity, market access, amenities, existing plants and infrastructure)
  - Responsiveness of supply of corporate capital and thus overall economic growth depend on these other factors and how they relate to tax changes
- **Existing empirical estimates:**
  - Can inform some of these things at the state and local level
  - But there is a lot of uncertainty at the federal level or for really big subsides that are beyond what we have seen in the data (in which case we need to rely on models to make predictions)
- **Bottom line:**
  - Thus, in many cases, assessments of the effectiveness of corporate tax cuts depends on our assumptions about the economic environment.

Source: Zidar, in preparation for Journal of Economic Perspectives.

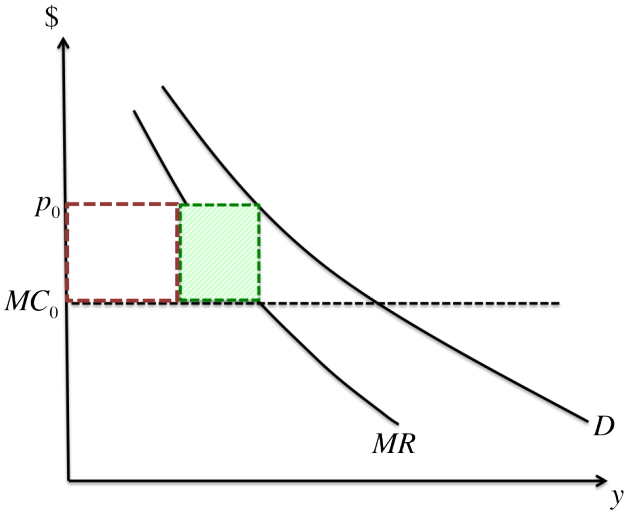
Model of Firm Location

Assumptions and economic environment:

- **Assume** firms make location decision to maximize after-tax profits
- **Geography:** Small open economy $c \in C$
- **Agents:** E_c establishments
- **Market Structure:**
  - Monopolistically competitive traded goods market for each variety j
  - Global capital market
  - Local labor market
  - Local housing market (only used by workers, not firms)

Source: Suárez Serrato and Zidar (AER, 2016)

Establishment Production



Source: Suárez Serrato and Zidar (AER, 2016)

Local Labor Demand: Establishment Production

- Demand for variety j is $y_{jc} = I \left(\frac{p_{jc}}{P}\right)^{\varepsilon^{PD}}$

Local Labor Demand: Establishment Production

- Demand for variety j is $y_{jc} = I \left(\frac{p_{jc}}{P}\right)^{\varepsilon^{PD}}$
- Establishment j produces its variety with the following technology

$$y_{jc} = \underbrace{B_{jc}}_{\equiv \bar{B}_c + \zeta_{jc}} l_{jc}^{\gamma} k_{jc}^{\delta} M_{jc}^{1-\gamma-\delta}$$

Local Labor Demand: Establishment Production

- Demand for variety j is $y_{jc} = I \left(\frac{p_{jc}}{P}\right)^{\varepsilon^{PD}}$
- Establishment j produces its variety with the following technology

$$y_{jc} = \underbrace{B_{jc}}_{\equiv \bar{B}_c + \zeta_{jc}} l_{jc}^{\gamma} k_{jc}^{\delta} M_{jc}^{1-\gamma-\delta}$$

- Firm Value Function

$$V_{jc}^{F} = \underbrace{\overbrace{\frac{\ln(1-\tau_s^b)}{-(\varepsilon^{PD}+1)}}^{\text{Taxes}} - \overbrace{\gamma \ln w_c - \delta \ln \rho}^{\text{Factor Prices}} + \bar{B}_c}_{\equiv v_c} + \zeta_{jc}.$$

Source: Suárez Serrato and Zidar (AER, 2016)

Location Choice & Local Establishment Shares

Fraction of Establishments:

$$E_c = P\left(V_{jc}^F = \max_{c'}\{V_{jc'}^F\}\right) = \frac{\exp\frac{v_c}{\sigma^F}}{\sum_{c'}\exp\frac{v_{c'}}{\sigma^F}}$$

Location Choice & Local Establishment Shares

Fraction of Establishments:

$$E_c = P\left(V_{jc}^F = \max_{c'}\{V_{jc'}^F\}\right) = \frac{\exp\frac{v_c}{\sigma^F}}{\sum_{c'}\exp\frac{v_{c'}}{\sigma^F}}$$

Establishment Growth:

$$\Delta \ln E_{c,t} = \frac{\Delta \ln(1-\tau_{c,t}^b)}{-\sigma^F(\varepsilon^{PD}+1)} - \frac{\gamma}{\sigma^F}\Delta \ln w_{c,t} + \phi_t + \frac{1}{\sigma^F}\Delta \bar{B}_{c,t}$$

Key Parameter:

- Dispersion of idiosyncratic productivity σ^F
- Larger σ^F means lower responsiveness to tax changes

Source: Suárez Serrato and Zidar (AER, 2016)

Empirical Implementation

Estimating Equation:

$$\Delta \ln E_{c,t} = \frac{\Delta \ln(1-\tau^b_{c,t})}{-\sigma^F(\varepsilon^{PD}+1)} - \frac{\gamma}{\sigma^F}\Delta \ln w_{c,t} + \phi_t + \frac{1}{\sigma^F}\Delta \bar{B}_{c,t}$$

Regression

- **LHS:** Log change in the number of establishments $\Delta \ln E_{c,t}$
- **RHS # 1:** Log change in the keep rate $\Delta \ln(1-\tau^b_{c,t})$
- **RHS # 2:** Log change in factor prices $\Delta \ln w_{c,t} + \phi_t$
- **Error term:** TFP shocks $\Delta \bar{B}_{c,t}$ and other factors outside the model

Source: Suárez Serrato and Zidar (AER, 2016)

Empirical Implementation

Reduced Form:

$$\Delta \ln E_{c,t} = \underbrace{\left(\frac{1}{-\sigma^F(\varepsilon^{PD}+1)} - \frac{\gamma}{\sigma^F}\dot{w}(\theta) \right)}_{\beta^E} \Delta \ln(1-\tau^b_{c,t}) + \phi_t + u_{c,t}$$

Regression

- **LHS:** Log change in the number of establishments $\Delta \ln E_{c,t}$
- **RHS:** Log change in the keep rate $\Delta \ln(1-\tau^b_{c,t})$
- **Estimate:** β^E will depend on direct effects plus indirect effects on factor prices (in this case, the incidence on wages)!

Source: Suárez Serrato and Zidar (AER, 2016)

Empirical Implementation

Alternative Estimating Equation (from FMSZ, 2018):

$$\ln E_{nt} = b_0 \ln\left((1 - \bar{t}_n)\, MP_{nt}\right) + b_1 \ln c_{nt} + b_2 \ln \tilde{R}_{nt} + \psi_t^M + \xi_n^M + \nu_{nt}^M$$

where

- $c_{nt} = (w_{nt}^{1-\beta} r_{nt}^{\beta})^{\gamma} P_{nt}^{1-\gamma}$ are unit costs
- $\ln \tilde{R}_{nt}$ is government spending
- ψ_t^M is a time effect
- $\xi_n^M + \nu_{nt}^M$ accounts for state effects and deviations from state and year effects in log productivity, $\ln z_{nt}$
- MP_{nt} is the market potential of state n in year t,

$$MP_{nt} = \sum_{n'} E_{n't} \left(\frac{\tau_{n'nt}}{P_{n't}} \frac{\sigma}{\sigma - \tilde{t}_{n'nt}} \frac{\sigma}{\sigma - 1} \right)^{1-\sigma}$$

where $E_{n't} \equiv P_{n't} Q_{n't}$ denotes aggregate expenditures in state n'.

Source: Fajgelbaum, Morales, Suárez Serrato, and Zidar (Restud, 2018)

Empirical evidence on taxation and firm location

Three papers:

- Event study from Suárez Serrato and Zidar (AER, 2016), which uses apportioned tax rate which is approx $\tau^c/3$
- Hines (AER, 1996)
- Giroud and Rauh (JPE, forthcoming)

How do business tax cuts affect firm location?

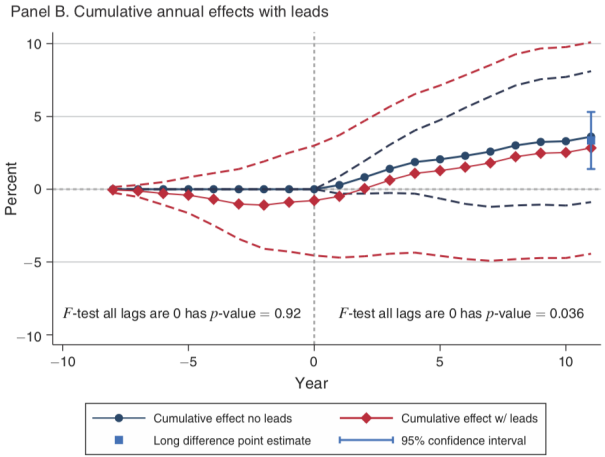


FIGURE 4. CUMULATIVE EFFECTS OF BUSINESS TAX CUTS ON ESTABLISHMENT GROWTH

Source: Suárez Serrato and Zidar (AER, 2016)

Hines (AER, 1996)

- Paper: Hines, James R. "Altered States: Taxes and the Location of Foreign Direct Investment in America." American Economic Review, Vol. 86, No. 5 (1996): 1076-1094.
- Question: How do international taxation on FDI and state taxation interact when affecting business location?
- Motivation: Effect of taxes on investment and firm location are key determinants of the incidence and efficiency consequences of business taxation

Institutional Background

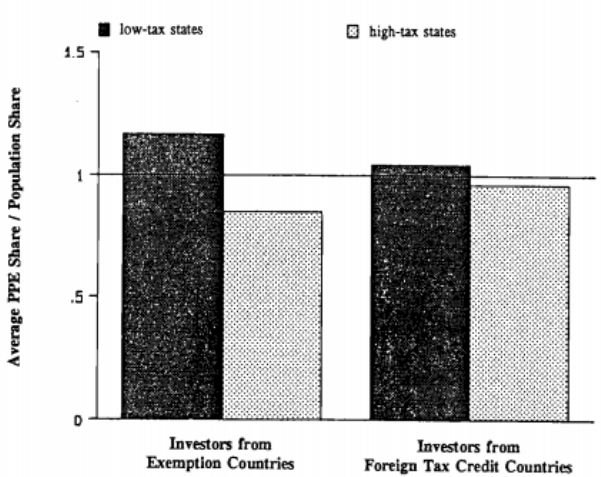
Countries have different policies on taxation of domestic firm income earned abroad.

- Foreign earnings of domestic firms effectively exempt from taxation
  - Ex: Australia, Canada, France, Germany, Switzerland
- Foreign Tax Credits (FTCs): firms pay taxes on profits earned abroad, claim credits against liabilities in the home country
  - Only corporate income taxes can be creditable in countries with FTC policies
  - Ex: United States, the United Kingdom, Japan
- Key idea: countries that can use FTCs are less sensitive to tax differences since they can write them off

Data and Estimation

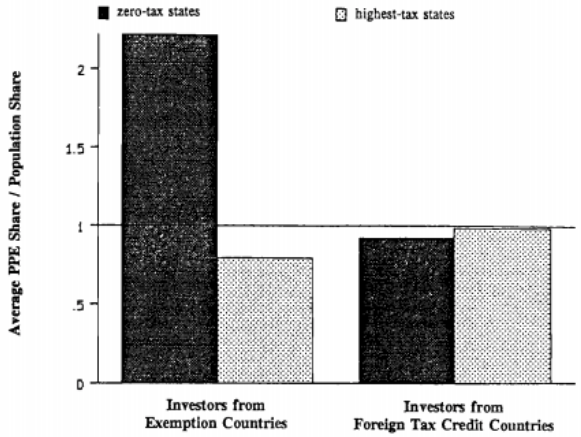
- Investment data: BEA 1987 Census of Manufactures
  - State-by-country FDI data
  - Investing countries: Australia, Canada, France, Germany, Japan, Switzerland, and the United Kingdom → "Together, the seven [...] countries account for 78% of the manufacturing PPE controlled by foreign investors in the United States in 1987" (p. 1083)
  - Dataset excludes the Netherlands, because of role of Dutch companies in international tax avoidance
- State corporate income tax rate: top statutory rate, correcting for depreciation rules and federal deductibility

Investors from Exemption Countries Less Likely to Invest in High-Tax States



NOTES: Figure plots investment-to-population ratios in 25 high-tax states and 25 low-tax states. High-tax states have tax rate that is 7% or higher.

Disparity in Investment Even Higher Across Highest- and Zero-Tax States



NOTES: Figure plots investment-to-population ratios in highest-tax states and zero-tax states. Highest-tax states have tax rate that is greater than 8.8%.

State Taxes Influence Allocation of FDI in the US

Main Findings:

- 1% higher state corp tax rate $\leftrightarrow$ 9-11% higher investment shares of firms from FTC countries relative to non-FTC countries
- State tax rate differences of 1% are correlated with diff of 3% in the likelihood of investors to establish affiliates

Key takeaway: results suggest that even small variations in local tax rates may have affect capital flows and on the economy as a whole

Overview of Giroud and Rauh (JPE, forthcoming)

- Paper: Giroud, Xavier and Joshua Rauh. "State Taxation and the Reallocation of Business Activity: Evidence from Establishment-Level Data." NBER Working Paper No. 21534 (2015).
- Question: How does state-level business taxation impact business activity and location decisions?

Data

1. Firm data
   - U.S. Census Bureaus Longitudinal Business Database (LBD) $\rightarrow$ 27.6 million establishment-year observations, or 647,000 firm-year observations observations
   - Sample: All multi-unit U.S. establishments from 1977-2011 belonging to firms with at least 100 employees and having operations in at least two states

2. Tax data
   - Type of state corporate taxation and the corporate tax rates: the University of Michigan Tax Database (1977-2002), the Tax Foundation (2000-2011) and the Book of States
   - Apportionment factors and throwback rules: the Commerce Clearing Houses State Tax Handbooks

Findings:

- For C corporations, employment and the number of establishments have short-run corporate tax elasticities of -0.4 to -0.5, and do not vary with changes in personal tax rates.
- Pass-through entity activities show tax elasticities of -0.2 to -0.4 with respect to personal tax rates, and are invariant with respect to corporate tax rates.
- Capital shows similar patterns.
- Reallocation of productive resources to other states drives around half the effect.
- The responses are strongest for firms in tradable and footloose industries.