*Acknowledgements: This workshop was made possible by financial support from NSF Grant Number 1752431.
Agenda

1. Overview (1-2pm)
   - Introductions
   - Overview of U.S. business tax policy and the TCJA
   - Simple framework and classic research questions

2. Firm location decisions and corporate tax incidence (2:15-3:15pm)

3. User Cost, Impact of TCJA, Open questions (3:30 - 4:15pm)

4. Taxes, Financial Policy, and Investment (**Poterba**, 4:30pm)

5. International taxation (**Hines**, 5 - 630pm)
Introductions: who am I / who are you?

1 My background
- Ph.D. from UC Berkeley, BA from Dartmouth
- Staff Economist at Council of Economic Advisers
- Previously an Assistant Professor at Chicago Booth

2 Research fiscal policy topics
- Incidence and efficiency costs of corporate taxation
- Economic impacts of taxing high-income earners
- Effect of state tax system on U.S. economy
- The structure of state corporate taxation
- Business taxation and ownership in the U.S.
- Who profits from patents? Rent sharing at innovative firms
- Business Income and U.S. income inequality
I. Overview of U.S. Business Taxation
Overview of Business Taxes

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
   - Fundamental reform and apportionment
     - Tax base: source, residence, destination
     - Apportionment and State Corporate Taxation

3 Economics: Simple Framework and Research Questions
   - Simplest possible framework
   - Research Questions
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

Organizational Form
- S corp or C corp
- Where to Locate

Raise Capital
- Debt or Equity

Production
- Investment Decisions

Payouts
- Report Profits
- Pay Dividends
- Pay Interest
Corporate Decisions and Tax Policies

Firm’s Decision

- Organizational Form
- Raise Capital
- Production
- Payouts

Policy Instruments

- S corp or C corp
- Where to Locate
- Indiv. vs. Corp. tax, Intl. tax
- Deduction of interest
- Accelerated Depreciation
- Div. tax, Corp. profit tax
- Debt or Equity
- Investment Decisions
- Report Profits Pay Dividends Pay Interest
- Pay Interest

Owen Zidar
Business Tax Graduate Workshop
October 11, 2018
Overview of Business Taxes

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
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     - Apportionment and State Corporate Taxation

3. Economics: Simple Framework and Research Questions
   - Simplest possible framework
   - Research Questions
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

Tax Rate by Entity Type

<table>
<thead>
<tr>
<th>Entity Type</th>
<th>Average Tax Rate</th>
<th>Payout Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sole Proprietorships</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>Partnerships</td>
<td>15.9</td>
<td></td>
</tr>
<tr>
<td>S-corps</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>C-corps</td>
<td>22.7</td>
<td>31.6</td>
</tr>
</tbody>
</table>

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

Corporate tax revenues, percent of GDP and of federal revenues

Source: Auerbach (2010).

Source: Congressional Budget Office.
Context #3: US had highest corp tax rate in the world

Figure 1. G-7 Corporate Tax Rates Since 1990

Source: Auerbach (2017 BPEA).

Source: OECD Tax Database

Year


Statutory Rate, Combined

0 10 20 30 40 50 60 70

Canada France Germany Ireland Italy Japan United Kingdom United States
Context #3: Declining Corporate Tax Rates


Statutory Corporate Tax Rates in the U.S. and OECD

---

The share of tax havens in U.S. corporate profits made abroad

Source: G. Zucman.
After a Tax Crackdown, Apple Found a New Shelter for Its Profits

The tech giant has found a tax haven in the island of Jersey, leaving billions of dollars untouched by the United States, leaked documents reveal.

By JESSE DRUCKER and SIMON BOWERS  NOV. 6, 2017

Source: NYTIMES.
## Context #4: Substantial Tax Avoidance and Evasion

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

Source: IRS and United Nations; CEA Calculations.

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

Effective US rates were thus closer to other G7 countries.

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
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
### Table 2—Recovery Periods and Depreciation Methods by Type of Capital

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

*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 Shapiro (AER, 2008).
Bonus depreciation

Source: Zwick and Mahon (AER, 2017).

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

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\(\times\) 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).
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

\[
\begin{align*}
    z_T^0 &= D_0 + \sum_{t=1}^{T} \frac{1}{(1+r)^t} D_t \\
    z_T &= \theta + (1 - \theta) z_T^0
\end{align*}
\]

with \( \sum D_i = 1 \) and \( \theta \in (0, 1] \)

Source: Zwick and Mahon (AER, 2017).
Bonus depreciation

\[ z_T(\theta) \equiv \theta z_T^0 + (1 - \theta) z_T^0 \text{ with } \theta \in (0, 1] \]

**Normal times:**

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductions</td>
<td>200</td>
<td>320</td>
<td>192</td>
<td>115</td>
<td>115</td>
<td>58</td>
<td>1000</td>
</tr>
<tr>
<td>( z(0) )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.890</td>
</tr>
</tbody>
</table>

**Bonus times (50%):**

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductions</td>
<td>600</td>
<td>160</td>
<td>96</td>
<td>57.5</td>
<td>57.5</td>
<td>29</td>
<td>1000</td>
</tr>
<tr>
<td>( z(0.5) )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.945</td>
</tr>
</tbody>
</table>

Source: Zwick and Mahon (AER, 2017).
1. Bonus allowance is more valuable for longer lived items.

2. Industries differ in relative intensity of longer lived investment.

<table>
<thead>
<tr>
<th>Short Duration (NAICS)</th>
<th>Long Duration (NAICS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rental and Leasing (532)</td>
<td>Utilities (221)</td>
</tr>
<tr>
<td>Publishing (511)</td>
<td>Pipeline Transport (486)</td>
</tr>
<tr>
<td>Data Processing (518)</td>
<td>Railroads (482)</td>
</tr>
<tr>
<td>Ground Transit (485)</td>
<td>Accommodations (721)</td>
</tr>
<tr>
<td>Professional Services (541)</td>
<td>Food Manufacturing (311)</td>
</tr>
</tbody>
</table>

Source: Zwick and Mahon (AER, 2017).
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)

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

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


- 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).
Calendar Diff-in-Diffs: Bonus I

Extensive Margin

Source: Zwick and Mahon (AER, 2017).
Bonus depreciation

**Calendar Diff-in-Diffs: Bonus II**

Intensive Margin

Source: Zwick and Mahon (AER, 2017).
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
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

Source: Yagan Zidar Zwick.
### Table 1: Section 179 and Bonus Depreciation Policy Changes

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

*Note: 2008 was retroactive.*

Source: Yagan Zidar Zwick.
Loss provisions

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

<table>
<thead>
<tr>
<th>Ending fiscal period</th>
<th>Carryback</th>
<th>Carryforward</th>
<th>Enacting legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998-12 to 2000-12</td>
<td>2 years</td>
<td>20 years</td>
<td>TRA 1997 (permanent)c</td>
</tr>
<tr>
<td>2001-01 to 2002-12</td>
<td>5 years</td>
<td>20 years</td>
<td>JCWAA 2002 (temporary)d</td>
</tr>
<tr>
<td>2003-01 to 2007-12</td>
<td>2 years</td>
<td>20 years</td>
<td>TRA 1997 (permanent)</td>
</tr>
<tr>
<td>2008-01 to 2010-11</td>
<td>5 years</td>
<td>20 years</td>
<td>ARRA 2009 (temporary)b,e</td>
</tr>
<tr>
<td>2010-12 to 2012-11</td>
<td>2 years</td>
<td>20 years</td>
<td>WHBAA 2009 (temporary)b,f</td>
</tr>
</tbody>
</table>

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

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.

Effective Marginal Tax Rate on Investment in 7-Year Equipment under the Tax Cuts and Jobs Act

Percent

- 35% rate + 50% bonus depreciation
- 21% rate + normal depreciation
- 21% rate + expensing

Baseline

Applies to ~$800b 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 structures investment falls

Effective Marginal Tax Rate on Investment in 39-Year Structures under the Tax Cuts and Jobs Act

Percent

35% rate + normal depreciation

21% rate + normal depreciation

Baseline


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

Effective Marginal Tax Rate on Investment in R&D under the Tax Cuts and Jobs Act

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.

Source: Jason Furman.
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.
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.

Federal Deficit as a Percent of GDP

Percent of GDP

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax Extenders to Continue Current Tax Policy</th>
<th>Sequester Adjustment/Disaster Relief</th>
<th>Current Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>3.6</td>
<td>0.7</td>
<td>4.3</td>
</tr>
<tr>
<td>2019</td>
<td>4.7</td>
<td>0.8</td>
<td>5.5</td>
</tr>
<tr>
<td>2020</td>
<td>4.9</td>
<td>0.9</td>
<td>5.8</td>
</tr>
<tr>
<td>2021</td>
<td>5.1</td>
<td>0.9</td>
<td>6.0</td>
</tr>
<tr>
<td>2022</td>
<td>5.4</td>
<td>0.9</td>
<td>6.4</td>
</tr>
<tr>
<td>2023</td>
<td>5.2</td>
<td>0.9</td>
<td>6.3</td>
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<tr>
<td>2024</td>
<td>5.0</td>
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</tr>
<tr>
<td>2025</td>
<td>5.4</td>
<td>0.9</td>
<td>6.6</td>
</tr>
<tr>
<td>2026</td>
<td>5.4</td>
<td>0.9</td>
<td>7.0</td>
</tr>
<tr>
<td>2027</td>
<td>5.3</td>
<td>0.9</td>
<td>7.5</td>
</tr>
</tbody>
</table>

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

Source: Jason Furman.
Fall in Corporate Tax → Rise in Value-Added Tax

Corporate Rates

Value-Added Tax Rates

Source: Brookings, OECD.
Fundamental reform and apportionment
Reforming how we tax corporate income

Corporate tax base

- 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: $\tau^{INC}$ personal income tax rate
   - Synthetic changes as in Zidar (2013) using NBER’s TAXSIM

2. Single-state C-corps: $\tau^C$ corporate income tax rate
   - Digitized corporate tax rates from “Book of the States”

3. Multi-state C-corps: $\tau^A$ apportioned corporate income tax rate
   - Depends on corporate rate, apportionment, and activity weights

\[ \tau^A_i = \sum_s \tau^c_s \omega_{is} \]

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

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

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

Source: Suárez Serrato and Zidar (AER, 2016).
Suppose Nike earns $2 M of profit in every state
Their tax liability differs based on how profits are apportioned

<table>
<thead>
<tr>
<th>State</th>
<th>I. Using Payroll</th>
<th>II. Using Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apportioned Profit ($M)</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>(80% of 6) = 4.8</td>
<td>2</td>
</tr>
<tr>
<td>IL</td>
<td>(10% of 6) = .6</td>
<td>2</td>
</tr>
<tr>
<td>AL</td>
<td>(10% of 6) = .6</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Corporate Tax Liability ($M)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
<td>with $\tau_{OR} = 50%$</td>
<td>2.4</td>
</tr>
<tr>
<td>IL</td>
<td>with $\tau_{IL} = 10%$</td>
<td>.06</td>
</tr>
<tr>
<td>AL</td>
<td>with $\tau_{AL} = 0%$</td>
<td>0</td>
</tr>
</tbody>
</table>

Total Tax Liability ($M)

<p>| | |</p>
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<tbody>
<tr>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Suárez Serrato and Zidar (AER, 2016).
Evolution of apportionment weights

Panel A. 1980

Panel B. 1990

Panel C. 2000

Panel D. 2010

Sales apportionment weight

Number of states

Source: Suárez Serrato and Zidar (AER, 2016).
State corporate tax rates

Source: Suárez Serrato and Zidar (JPUBE, 2018).
State corporate tax base

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

A. R&D

B. Sales Apportionment

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:

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

- $R_{st}$ = state corporate tax revenue as a share of GDP
- $\tau_{st}^c$ = statutory corporate tax rate in state $s$ and year $t$
- $\mathbf{X}_{st}$ = vectors of tax base determinants
- $\alpha_s$ = state fixed effect
- $\varepsilon_{it}$ 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 ($\gamma, \psi$) and on variation in policies over time

Source: Suárez Serrato and Zidar (JPUBE, 2018).
Tax structure explains \( \approx 60\% \) of variance

- \( \approx 60\% \) of explained variance is due to tax base rules

ANOVA: base and credit rule provisions

- Contribution to the variance from base provision $j$: $\text{Var}(\chi_{st}^j \Psi_{st}^j)$

### B. Share of Explained Variance by Base Rule

Source: Suárez Serrato and Zidar (JPUBE, 2018).
Overview of Business Taxes

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
   - Fundamental reform and apportionment
     - Tax base: source, residence, destination
     - Apportionment and State Corporate Taxation

3. Economics: Simple Framework and Research Questions
   - Simplest possible framework
   - Research Questions
Neoclassical Benchmark: corporate tax is a capital tax

Equity-efficiency tradeoffs of corporate taxation seem especially stark

1 **Efficiency**
   - Capital taxes reduce scale of economic activity
   - Capital accumulation, which may be highly responsive to rates of return, is key driver of economic growth
   - Capital mobility: taxes can lead to misallocation

2 **Equity**
   - Distribution of capital income is much more unequal than labor income
   - Capital mobility: burden may be shifted to labor

3 **Evidence**
   - Empirical evidence/our understanding of capital taxation is less well developed than labor income taxation

4 **Policy Relevance**
   - Future of fiscal policy (taxing robots, driverless cars, corp tax reform)
   - Destination-based cash flow taxes, international reforms
The real price of capital will be determined in the use market

- Price is the user cost of capital (i.e., the price of using capital services for one period)
- Quantity is the stock of capital

A tax on capital will increase the pre-tax return to capital and decrease the after-tax return

A key question is how the capital tax is split between a decline in the after-tax return and a rise in the pre-tax return

- Short run: supply of capital is likely to be quite inelastic so that a tax on capital will mostly reduce the after-tax return with little increase in the pre-tax return
- Long run: supply of capital is likely more elastic (net returns tend to be about 6 to 7% and independent of level of capital taxes, but there’s little evidence on long-run capital supply elasticities).
Simple Framework: Impact of a Capital Tax
Simple Framework: Impact of a Capital Tax (in Long Run)

\[ R_t \]

\[ R^* \]

\[ R_{-pre-tax} \]

\[ R_{-post-tax} \]

Long-Run \( S(R) \)

\[ D(R_t) \]

\[ K^* \]
Simple Framework: Impact of a Capital Tax

Who bears the capital tax in the long run? What are growth and tax revenue effects?

- Who gets the triangle above R-pre-tax (i.e., consumer surplus in the typical S and D graph)?
- If firms don’t earn profits, this all goes to workers in terms of higher wages or lower prices
- A key object is the **elasticity of capital supply**, is likely larger (and some think infinite) in the LR
- Note that the distortion in the capital market reduces surplus more than it increases tax revenues (as with most taxes)
- Finally, distortions due to capital taxation are often considered in a dynamic context in which the distortion compounds overtime (See Ivan Werning’s recent paper on the classic Chamley-Judd results)
Some Classic Research Questions

What is the effect of cutting $\tau$ (or a tax base change) on:

1. **Supply of corporate capital**
   - Extensive margin: firm location, entrepreneurship, innovation
   - Intensive margin: domestic investment, FDI, innovation

2. **Labor market**
   - Wage and employment effects

3. **Product markets**
   - Effects on consumer prices

4. **Tax revenues**
   - Effect on corporate tax revenue
   - Fiscal externalities on personal and sales tax base

5. **Asset markets**
   - Effect on price of investment goods
   - Old versus new capital
What does the classic framework miss?

What is the effect of cutting \( \tau \) (or a tax base change) on:

1. **Supply of corporate capital**
   - Real versus reporting location responses; firm location shaped by worker pref, productivity, market access, factor prices, etc
   - Decisions of multinationals and multi-product firms are more complex
   - Spillovers of foreign investment on domestic markets
   - Heterogeneous impacts of base and rate provisions across different firms

2. **Labor market**
   - Heterogeneous impacts by skill type
   - When owners also workers; agency issues between owners and managers

3. **Profits/rents/product markets**
   - Marshall’s view of corporate tax as falling on pure profits?

4. **Tax revenues**
   - Interactions with other policy (e.g., tariffs and trade policy)
   - Interactions with other distortions (financial frictions, product market and labor market power, etc)
   - Endogenous responses of other locations and tax competition

5. **Asset markets**
   - Expectations, risk, etc. Impacts on other capital markets (e.g., land)
II. Firm Location and Corp Tax Incidence
Firm Location and Corporate Tax Incidence

1 Firm Location Decisions

- Model of firm location
- Empirical implementation: taxes and firm location
- Hines (AER, 1996)
- Giroud and Rauh (JPE, forthcoming)

2 Corporate Tax Incidence

- Motivation
- Local Labor Market Approach of Suárez Serrato and Zidar (AER, 2016)
- Brief discussion of Local vs National/Global Effects
- Fuest, Peichl, Siegloch (AER, 2018)
How do taxes affect firm location?

Amazon narrows HQ2 cities list to 19 American cities, 1 Canadian

SOURCE Amazon
George Petras/USA TODAY
**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

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.

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

$$y_{jc} = B_{jc} l_{jc}^{\gamma} k_{jc}^{\delta} M_{jc}^{1-\gamma-\delta} \equiv \bar{B}_c + \zeta_{jc}$$
Demand for variety \( j \) is \( y_{jc} = l \left( \frac{p_{jc}}{P} \right)^{\varepsilon_{PD}} \)

Establishment \( j \) produces its variety with the following technology:

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

Firm Value Function:

\[
V_{jc}^F = \ln \left( \frac{1 - \tau_s}{\varepsilon_{PD} + 1} \right) - \gamma \ln w_c - \delta \ln \rho + \bar{B}_c + \zeta_{jc}.
\]

\[\equiv v_c\]

Source: Suárez Serrato and Zidar (AER, 2016)
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 \( \sigma^F \)
- Larger \( \sigma^F \) 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:

\[
\Delta \ln E_{c,t} = \left( \frac{1}{-\sigma^F (\varepsilon^{PD} + 1)} - \frac{\gamma}{\sigma^F} \dot{w}(\theta) \right) \Delta \ln (1 - \tau_{c,t}^b) + \phi_t + u_{c,t}
\]

Regression

- **LHS**: Log change in the number of establishments \( \Delta \ln E_{c,t} \)
- **RHS**: Log change in the keep rate \( \Delta \ln (1 - \tau_{c,t}^b) \)
- **Estimate**: \( \beta^E \) 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):

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

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
- \( \psi_t^M \) 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?

Panel B. Cumulative annual effects with leads

$F$-test all lags are 0 has $p$-value = 0.92

$F$-test all lags are 0 has $p$-value = 0.036

Figure 4. Cumulative Effects of Business Tax Cuts on Establishment Growth

Source: Suárez Serrato and Zidar (AER, 2016)

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.
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
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%.
Main Findings:

- 1% higher state corp tax rate ↔ 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)

- Question: How does state-level business taxation impact business activity and location decisions?
Firm data

- U.S. Census Bureaus Longitudinal Business Database (LBD) → 27.6 million establishment-year observations, or 647,000 firm-year 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

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.
Firm Location and Corporate Tax Incidence

1. Firm Location Decisions
   - Model of firm location
   - Empirical implementation: taxes and firm location
   - Hines (AER, 1996)
   - Giroud and Rauh (JPE, forthcoming)

2. Corporate Tax Incidence
   - Motivation
   - Local Labor Market Approach of Suárez Serrato and Zidar (AER, 2016)
   - Brief discussion of Local vs National/Global Effects
   - Fuest, Peichl, Siegloch (AER, 2018)
I, like many economists, suspect that our corporate income tax is economically self-defeating – hurting workers, not capitalists

What can workers do to mitigate their plight? One useful step would be to lobby to eliminate the corporate income tax. That might sound like a giveaway to the rich. It’s not. The rich, including Boeing’s stockholders, can take their companies & run
Who will benefit from corporate tax cuts?

Corporate Tax Reform and Wages: Theory and Evidence
Who will benefit from corporate tax cuts?

Figure 2. Estimated Increases in Average Household Income under the Corporate Tax Proposal of the Unified Framework ($2016)

Source: Census Current Population Survey; CEA calculations

Who will benefit from corporate tax cuts?
“This is about creating jobs” Treasury Secretary Steven Mnuchin said on CBS in April, because many surveys show that 70% or more of the tax burden is borne by the American worker. This is about putting money back in the American worker’s pocket.”

Last month, Mr. Mnuchin offered an increased estimate, saying 80% of business taxes are paid by workers.

“There’s a pretty wide band of possible outcomes that are plausible,” said Alan Auerbach

1. **Local Labor Market Approach**
   - Framework from Suárez Serrato and Zidar (AER, 2016)

2. **Brief discussion of Local vs National Effects**
   - State vs federal impacts
   - Harberger-type general equilibrium models

3. **Recent Estimates**
   - Fuest, Peichl, Siegloch (AER, 2018)
   - Other considerations when measuring labor market impacts of corporate tax cuts (e.g., Auerbach, 2005 & forthcoming JEP paper)
**Question:** What are the welfare effects of cutting *corporate taxes* in an open economy on *workers, firm owners, and landowners*?

**Contributions**

1. New *evidence* on business location
2. New *framework* for evaluating welfare effects
3. New *assessment* of corporate taxation in an open economy

Source: Suárez Serrato and Zidar (AER, 2016)
Relax two crucial assumptions

1. Firms are **perfectly competitive**
   - If firm owners earn zero profits, they cannot bear incidence

2. Firms are **perfectly mobile**
   - Every firm is marginal in their location decisions
Relax two crucial assumptions

1. Firms are **perfectly competitive**
   - If firm owners earn zero profits, they cannot bear incidence

2. Firms are **perfectly mobile**
   - Every firm is marginal in their location decisions

Allow for **monopolistically competitive & heterogeneously productive firms**
Who Benefits from State Corporate Tax Cuts?

Our Estimate

- Workers
- Firm Owners
- Landowners
Who Benefits from State Corporate Tax Cuts?

Our Estimate

- Workers
- Firm Owners
- Landowners

Standard Model

- Workers
Context and Challenges

- **Empirical:** Desai et al. 2007, Gravelle 2011, Clausing 2013
  - Insufficient time series variation in US corporate rates
  - Cross-country variation compares countries with dissimilar institutions

- **Theoretical:**
  - Harberger-type general equilibrium with focus on open economy (Gravelle 2010)
  - Computable General Equilibrium Models (Kotlikoff & Summers 1987, Kotlikoff et al. 2013)
Suárez Serrato and Zidar (AER, 2016) Outline: 3 Parts

1. **Develop spatial equilibrium model with firms**
   - Allow workers, firm owners, landowners to bear incidence
   - Map reduced-form effects to parameters governing welfare

2. **Reduced-form effects of corporate tax cuts** (skip for time)
   - Implement state apportionment system using establishment data
   - Number of establishments increases by roughly 3.5% following a 1% corporate tax cut

3. **Estimate incidence and structural elasticities** (skip for time)
   - Implement reduced-form incidence expressions
   - Minimize distance between reduced-form expressions and estimates to estimate structural elasticities
   - Evaluate consequences for equity & efficiency of corporate tax policy
Local Labor Markets Approach
You have to start this conversation with the philosophy that businesses have more choices than they ever have before. And if you don’t believe that, you say taxes don’t matter. But if you do believe that, which I do, it’s one of those things, along with quality of life, quality of education, quality of infrastructure, cost of labor, it’s one of those things that matter.

—Delaware Governor Jack Markell (11/3/2013) ¹
A Spatial Equilibrium Model with Firms: Outline

1. **Setup**

2. **Worker Location, Labor Supply**

3. **Housing Market**
   Kline (2010), Notowidigdo (2012)

4. **Firm Location and Labor Demand**

5. **Results:** Incidence $\dot{w}(\theta), \dot{\pi}(\theta), \dot{r}(\theta)$
   - $\varepsilon^{LS}(\theta)$ and $\varepsilon^{LD}(\theta)$, and $b(\theta)$
Equilibrium in the Local Labor Market

\[ w \]

\[ w_0 \]

\[ L_0 \]

\[ S_0(w) \]

\[ D_0(w) \]
Equilibrium in the Local Labor Market

\[ w = \frac{\partial \ln D}{\partial \ln (1 - \tau)} \left( \frac{1}{\varepsilon^L - \varepsilon^H} \right) \]

\[ D_0(w) \quad D_1(w) \]

\[ L_0 \quad L^* \quad L_1 \]

\[ w \quad w^* \quad w_0 \]

\( \tau \) cut
Model Setup

1. **Geography:** Small open economy \( c \in C \)

2. **Agents:** \( N_c \) households, \( E_c \) establishments, representative landowner in each location \( c \)

3. **Market Structure:**
   - Monopolistically competitive traded goods market for each variety \( j \)
   - Global capital market
   - Local labor market
   - Local housing market

4. **Timing:** Steady state, exogenous tax shock, new steady state
Household Problem

\[
\max_{h, X} \begin{cases} \ln A \text{ amenitites} \quad \alpha \ln h \quad (1 - \alpha) \ln X \end{cases} \text{ housing \ composite \ good} \quad \text{s.t.} \quad rh + \int_{j \in J} p_j x_j \, dj = w
\]

- where \( X = \left( \int_{j \in J} x_j \, dj \right)^{\frac{\epsilon_{PD}}{\epsilon_{PD} + 1}} \left( \int_{j \in J} x_j \, dj \right)^{\frac{\epsilon_{PD},1}{\epsilon_{PD} + 1}} \)
- \( rh \) is housing expenditures
- \( p_j x_j \) is expenditure on variety \( j \)
Household Problem

\[
\max_{h,X} \begin{cases} \ln A \text{ amenities} + \alpha \ln h + (1 - \alpha) \ln X \text{ housing} \end{cases} \quad \text{s.t.} \quad rh + \int_{j \in J} p_j x_j dj = w
\]

- where \( X = \left( \int_{j \in J} x_j \frac{\varepsilon^{PD+1}}{\varepsilon^{PD}} dj \right)^{\frac{\varepsilon^{PD}}{\varepsilon^{PD}+1}} \)
- \( rh \) is housing expenditures
- \( p_j x_j \) is expenditure on variety \( j \)

Indirect Utility of a Worker:

\[
V_{nc}^{W} = a_0 + \ln w_c - \alpha \ln r_c + \ln A_{nc} \text{ Disposable income Amenities } \equiv \bar{A}_c + \xi_{nc}
\]
**Location choice:** Workers choose location with max utility:

$$\max_c \left( a_0 + \ln w_c - \alpha \ln r_c + \bar{A}_c + \xi_{nc} \right) \equiv u_c$$

**Key Parameter:** $\sigma_W$, dispersion of idiosyncratic preferences
Local Labor Supply

Location choice: Workers choose location with max utility:

$$\max_c \left( a_0 + \ln w_c - \alpha \ln r_c + \bar{A}_c + \xi_{nc} \right) \equiv u_c$$

Local Population:

$$N_c = P \left( V_{nc}^W = \max_{c'} \{ V_{nc'}^W \} \right) = \frac{\exp \frac{u_c}{\sigma W}}{\sum_{c'} \exp \frac{u_{c'}}{\sigma W}}$$
**Local Labor Supply**

**Location choice:** Workers choose location with max utility:

$$\max_c a_0 + \ln w_c - \alpha \ln r_c + \bar{A}_c + \xi_{nc} \equiv u_c$$

**Local Population:**

$$N_c = P \left( V_{nc}^{W} = \max_{c'} \{ V_{nc'}^{W} \} \right) = \frac{\exp \frac{u_c}{\sigma^W}}{\sum_{c'} \exp \frac{u_{c'}}{\sigma^W}}$$

(Log) Local Labor Supply:

$$\ln N_c(w_c, r_c; \bar{A}_c) = \frac{1}{\sigma^W} (\ln w_c - \alpha \ln r_c + \bar{A}_c) + C_0$$

**Key Parameter:** $\sigma^W$, dispersion of idiosyncratic preferences $\xi_{nc}$
Housing Market: Upward-sloping supply of housing:

\[ H_c^S = (B_c^H r_c)^{\eta_c} \]

- \( B_c^H \) is housing productivity
- \( r_c \) is price of housing

With Cobb-Douglas \( H_c^D \), HM equilibrium given by:

\[
\ln r_c = \frac{1}{1 + \eta_c} \left( \ln N_c + \ln w_c \right) + C_1
\]

Key Parameter: \( \eta_c \) elasticity of housing supply

Housing Demand
Local Labor Supply: Key points

- People move into a local area when wages increase

- How many people move in depends on:

  1. **Dispersion of Idiosyncratic Preferences** $\sigma^W$
     Higher $\sigma^W$ means smaller inflows of people following wage increases

  2. **Housing Supply Elasticity** $\eta_c$
     Lower $\eta_c$ means rents get bid up more when people move in

Higher $\sigma^W$ and lower $\eta_c$ make $\varepsilon^{LS}$ smaller, so LS is more vertical
Local Labor Demand

Aggregate labor demand for firms in location $c$:

$$L^D_c = \underbrace{E_c}_{\text{Extensive margin}} \times \underbrace{\mathbb{E}_\zeta[l^*(\zeta_{jc})|c]}_{\text{Intensive margin}}$$

Elasticity of labor demand:

$$\frac{\partial \ln L^D_c}{\partial \ln w_c} = \gamma - 1 + \gamma \varepsilon^{PD} - \frac{\gamma}{\sigma^F} \equiv \varepsilon^{LD}$$

More elastic $\varepsilon^{LD}$ when:

- Higher output elasticity of labor $\gamma$
- Higher product demand elasticity $\varepsilon^{PD}$
- Lower productivity dispersion $\sigma^F$ (i.e. firms more mobile)
Let $\dot{w}_c(\theta) \equiv \frac{\partial \ln w_c}{\partial \ln (1 - \tau^b)}$. Incidence on wages is:

$$\dot{w}_c(\theta) = \frac{1}{(\epsilon^{PD} + 1)\sigma^F} \left( \frac{1 + \eta_c - \alpha}{\sigma^W (1 + \eta_c) + \alpha} \right)_{\epsilon^{LS}} - \gamma \left( \epsilon^{PD} + 1 - \frac{1}{\sigma^F} \right)_{\epsilon^{LD}} + 1$$

**Smaller wage increase if:**

1. **Productivity Dispersion** $\sigma^F$ is large (i.e. immobile firms)
2. **Preferences Dispersion** $\sigma^W$ is small (i.e. mobile people)
3. Any other reason why $\epsilon^{LS}$ and $|\epsilon^{LD}|$ are large
Rental Costs: $\dot{r}_c(\theta) = \left( \frac{1 + \varepsilon^{LS}}{1 + \eta_c} \right) \dot{w}_c$

- Smaller rent increases if housing supply is very elastic

Firm Profits:

$$\dot{\pi}_c(\theta) = 1 - \delta(\varepsilon^{PD} + 1) + \gamma(\varepsilon^{PD} + 1)\dot{w}_c$$

- Reducing Capital Wedge
- Higher Labor Costs

- Mechanical effects vs. higher production costs
<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Benefit</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td>Disposable Income</td>
<td>$\dot{w}_c - \alpha \dot{r}_c$</td>
</tr>
<tr>
<td>Landowners</td>
<td>Housing Costs</td>
<td>$\dot{r}_c$</td>
</tr>
<tr>
<td>Firm Owners</td>
<td>After-tax Profit</td>
<td>$1 - \delta (\varepsilon^{PD} + 1) + \gamma (\varepsilon^{PD} + 1) \dot{w}_c$</td>
</tr>
</tbody>
</table>
## Welfare Effects of Corporate Tax Cut

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Benefit</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>$\dot{w}_c - \alpha \dot{r}_c$</td>
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<td>$\dot{r}_c$</td>
</tr>
<tr>
<td>Firm Owners</td>
<td>After-tax Profit</td>
<td>$1 - \delta (\varepsilon^{PD} + 1) + \gamma (\varepsilon^{PD} + 1) \dot{w}_c$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 1 + \gamma (\varepsilon^{PD} + 1) \times \left( \dot{w}_c - \frac{\delta}{\gamma} \right)$</td>
</tr>
</tbody>
</table>

- Labor cost factor
- Net Markup
Empirical Implementation and Identification
Structural Form of the Model

\[ \mathbf{A} \mathbf{Y}_{c,t} = \mathbf{B} \mathbf{Z}_{c,t} + \mathbf{e}_{c,t} \]

where

\[ \mathbf{A} = \begin{bmatrix} -\frac{1}{\sigma_W} & 1 & \frac{\alpha}{\sigma_W} & 0 \\ 1 & -\frac{1}{\varepsilon_{LD}} & 0 & 0 \\ -\frac{1}{1+\eta} & -\frac{1}{1+\eta} & 1 & 0 \\ \frac{\gamma}{\sigma_F} & 0 & 0 & 1 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 0 \\ \frac{1}{\varepsilon_{LD}\sigma_F(\varepsilon_{PD}+1)} \\ 0 \\ \frac{1}{-\sigma_F(\varepsilon_{PD}+1)} \end{bmatrix} \]

\[ \mathbf{Y}_{c,t} = \begin{bmatrix} \Delta \ln w_{c,t} \\ \Delta \ln N_{c,t} \\ \Delta \ln r_{c,t} \\ \Delta \ln E_{c,t} \end{bmatrix}', \quad \mathbf{Z}_{c,t} = \begin{bmatrix} \Delta \ln(1 - \tau_{c,t}^b) \end{bmatrix} \]

\[ \mathbf{e}_{c,t} \text{ is a structural error term} \]
Exact Reduced Form of the Model

\[ Y_{c,t} = A^{-1}B Z_{c,t} + A^{-1}e_{c,t} \equiv \beta^{\text{Business Tax}} \]

where \( \beta^{\text{Business Tax}} \) is a vector of reduced-form effects of business tax changes:

\[
\begin{bmatrix}
\beta^W \\
\beta^N \\
\beta^R \\
\beta^E
\end{bmatrix} =
\begin{bmatrix}
\dot{\bar{w}} \\
\dot{\bar{w}}^{LS} \\
\frac{1+\varepsilon^{LS}}{1+\eta} \dot{\bar{w}} \\
\frac{\mu-1}{\sigma^F} - \frac{\gamma}{\sigma^F} \dot{w}
\end{bmatrix}.
\]
4 Reduced-Form Equations of the Model

Effects on establishments, pop., wages, & rental cost growth over 10 years

\[
\Delta \ln w_{c,t} = (\dot{w}(\theta)) \Delta \ln (1 - \tau^b_{c,t}) + \phi^1_t + u^1_{c,t}
\]

\[
\beta^W
\]

\[
\Delta \ln N_{c,t} = (\varepsilon^{LS} \dot{w}(\theta)) \Delta \ln (1 - \tau^b_{c,t}) + \phi^2_t + u^2_{c,t}
\]

\[
\beta^N
\]

\[
\Delta \ln r_{c,t} = \left(1 + \frac{\varepsilon^{LS}}{1 + \eta_c} \dot{w}(\theta)\right) \Delta \ln (1 - \tau^b_{c,t}) + \phi^3_t + u^3_{c,t}
\]

\[
\beta^R
\]

\[
\Delta \ln E_{c,t} = \left(\frac{1}{-\sigma^F(\varepsilon^{PD} + 1)} - \frac{\gamma}{\sigma^F} \dot{w}(\theta)\right) \Delta \ln (1 - \tau^b_{c,t}) + \phi^4_t + u^4_{c,t}
\]

\[
\beta^E
\]
### Identification of Local Welfare Effects

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Benefit</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td>Disposable Income</td>
<td>$\hat{\beta}_W - \alpha \hat{\beta}_R$</td>
</tr>
<tr>
<td>Landowners</td>
<td>Housing Costs</td>
<td>$\hat{\beta}_R$</td>
</tr>
<tr>
<td>Firm Owners</td>
<td>After-tax Profit</td>
<td>$1 + \left(\frac{\hat{\beta}_N - \hat{\beta}_E}{\hat{\beta}_W} + 1\right) \left(\hat{\beta}_W - \frac{\delta}{\gamma}\right)$</td>
</tr>
</tbody>
</table>
Benefits of the incidence formulae

This framework enables us to:

1. Accommodate the conventional view
2. Transparently evaluate the sensitivity of our incidence estimates
3. Use data to govern relative factor mobility
4. Conduct inference and compare results to existing estimates
Brief discussion of Local vs National/Global Effects
Brief discussion of Local vs National/Global Effects

A few considerations:

1. Local versus national labor supply and demand are different.
2. Key question is how elastic supply of capital is, and how that impacts labor market (both in short and long run).
3. At national level, other issues, like deficit financing’s impact on interest rates, and the effects of those higher interest rates on growth, capital accumulation, and labor demand matter more.
4. We have more variation and empirical evidence from changes at state and local level. National effects more uncertain.
Impact of Capital Tax: One factor, two locations

Setup

1. One factor (capital)
2. Two locations: east and west
3. Capital market in each location
4. Total $K$ fixed in economy overall
Initial equilibrium

\[ r_0 \]

\[ K_0 \]
Tax in west

Causes capital to flee to east
New allocation of capital

- $K$ flows to east, lowering net returns in both
- Flows continue until after tax return is equalized across markets

![Graph showing the allocation of capital](image)
Welfare changes in each location

- Welfare in west falls by red amount
- Welfare in east increases
Net welfare changes in aggregate

- Net welfare loss in red

\[ r \quad r_{\text{gross}} \quad r_0 \quad r_{\text{net}} \quad K_1 \quad K_0 \quad K \]

\[ K_0 \quad K_1 \]
What determines size of welfare loss in this toy example?

1. Size of tax change
2. Size of market being taxed (depends on fundamentals)
3. Elasticity of demand in both regions (quantity response more generally, which depends on S and D elasticities)
4. Strength of complementarities across markets (e.g., labor market)
5. Assumptions about effects/value of government spending (assumed to be zero here)
6. Presence of existing distortions

Could formalize these ideas more, but this example provides intuition for some key forces in the Harberger model.
Brief overview of (Harberger, JPE 1962)
Harberger, JPE 1962) brief overview of setup

1. **Goals**
   - Characterize effects of corporate tax change in a GE model
   - Who bears the burden of corporate taxes? (also capital, output taxes)

2. **Two sectors (or locations)**
   - Corporate sector produces output $X$
   - Non-corporate sector produces output $Y$

3. **Markets**
   - Capital: prices $r_i$, quantities $K_i$ where $i \in \{X, Y\}$
   - Labor: prices $w_i$, quantities $L_i$
   - Goods: prices $p_i$, quantities $X, Y$

4. **Agents**
   - Workers (representative, perfectly mobile, supply 1 unit of labor)
   - Firm (representative, perfectly competitive, CRS)

5. **Equilibrium Conditions**
   - Good and factor markets clear, factor price equalization
   - Consumers max utility, firms earn zero profits
Two Main Effects of Taxing $K_x$

1. **Substitution effects**: capital bears incidence

2. **Output effects**: capital may not bear all incidence
Substitution effects

- Tax on $K_X$ shifts production in $X$ away from $K$ so aggregate demand for $K$ goes down.

- Because total $K$ is fixed, $r$ falls $\rightarrow K$ bears some of the burden.

Another intuition for this is that capital is misallocated across sectors, which lowers $r$ and $rK$. 
Output effects

- Tax on $K_x$ makes $X$ more expensive
- Demand shifts to $Y$
- **Case 1:** $K_x/L_x > K_y/L_y$ (X: cars, Y: bikes)
  - $X$ more capital intensive → lower aggregate demand for $K$
  - Output + subst. effect: $K$ bears the burden of the tax
- **Case 2:** $K_x/L_x < K_y/L_y$ (X: bikes, Y: cars)
  - $X$ less capital intensive → higher aggregate demand for $K$
  - Subst. and output effects have opposite signs → labor may bear some of the tax
Harberger showed that under a variety of reasonable assumptions, capital bears exactly 100 percent of the tax. Note that this is the burden on all capital – as capital flees the corporate sector, it depresses returns in the noncorporate sector as well. Both the realism of the model and the characterization of the corporate income tax as an extra tax on capital in the corporate sector are subject to question, as discussed in considerable detail by the subsequent literature on the effects of the corporate tax. – Alan Auerbach

See Auerbach TPE paper on who bears the corporate tax for more details on what’s missing (e.g., dynamics, investor taxation, corporate financial policy, assumption that corporate and non-corporate sectors represent different industries, etc)
Harberger is workhorse analytical model: 2 sector and 2 factors

Fixed supply of capital and labor (short run, closed economy)

Key intuition is misallocation (magnitude depends on factor intensity, demand elasticities, etc)

Fullerton and Ta (2017) simplifies Harberger analysis (Cobb Douglas)

Similar to Hecksher-Ohlin model

When interpreting as locations not sectors, then implicitly assume no trade costs. Similarly, implicitly assumes no adjustment costs for capital and labor (so long run in that sense)

Abstracts from amenity or productivity effects of government spending (lump sum rebates or purchases in same share as consumers)

Don’t have time to fully cover it (but see appendix slides)
Empirical Estimates of Corporate Tax Incidence on Wages
Overview of Fuest, Peichl, Siegloch (AER, 2018)

- Question: What is the effect of corporate taxes on wages?
- Data: 20-year panel of German municipalities. Administrative linked employer-employee data
- Findings:
  - Workers bear roughly half the burden of corporate taxes
  - Low-skilled, young and female employees bear a larger share of the tax burden
Event Study: Effects of corp tax change on log real wages

Source: Fuest, Peichl, Siegloch.
Distributed lag: Effects of corp tax change on log real wages

Source: Fuest, Peichl, Siegloch.
Event Study: Effects of corp tax change on log GDP

Source: Fuest, Peichl, Siegloch.
Estimating equation:

$$\ln w_{f,t}^{p50} = \delta \ln(1 - \tau_{m,t}) + \mu_f + \mu_m + \psi_{s,t} + \varepsilon_{f,t},$$
### Effects of corp tax change on median wages

Table 1: Differences-in-differences estimates: baseline wage effects

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
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<tbody>
<tr>
<td>Log net-of-LBT rate</td>
<td>0.388</td>
<td>0.229</td>
<td>0.386</td>
<td>0.396</td>
<td>0.343</td>
<td>0.399</td>
</tr>
<tr>
<td></td>
<td>(0.127)</td>
<td>(0.110)</td>
<td>(0.127)</td>
<td>(0.128)</td>
<td>(0.164)</td>
<td>(0.118)</td>
</tr>
<tr>
<td>Incidence ($I^w$)</td>
<td>0.505</td>
<td>0.288</td>
<td>0.502</td>
<td>0.516</td>
<td>0.442</td>
<td>0.520</td>
</tr>
<tr>
<td></td>
<td>(0.170)</td>
<td>(0.140)</td>
<td>(0.170)</td>
<td>(0.172)</td>
<td>(0.217)</td>
<td>(0.159)</td>
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<tr>
<td>State × year FE</td>
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<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Year FE</td>
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<td>CZ × year FE</td>
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<tr>
<td>Municipal controls $t-2$</td>
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<td>Firm controls $t-2$</td>
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<td>Worker shares</td>
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<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

*Source*: LIAB and Statistical Offices of the Laender. *Notes*: This table presents the DiD estimates, $\hat{\delta}$, of regression model (3) at the firm level. Coefficients measure the wage elasticity with respect to the net-of-local-business-tax rate. The incidence effect $I^w$ is measured according to formula (4) as the share of the total tax burden borne by workers. All regression models include municipal and firm fixed effects. Additional control variables and fixed effects (year, “state × year” or “commuting zone (CZ) × year”) vary depending on the specification (as indicated at the bottom of the table). The estimation sample is restricted to all establishments liable to the LBT in non-merged municipalities. Standard errors are clustered at the municipal level. Corresponding standard errors for the incidence measure are obtained using the Delta method. Our preferred (baseline) specification is shown in column (1).

*Source*: Fuest, Peichl, Siegloch.
Table 4: Differences-in-differences estimates: wage effects by worker type

<table>
<thead>
<tr>
<th>Stratified by</th>
<th>Effect of log net-of-LBT rate by worker type</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill</td>
<td></td>
<td>9,295,488</td>
</tr>
<tr>
<td>High</td>
<td>0.013 (0.120)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>0.357 (0.115)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>0.377 (0.168)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>9,295,488</td>
</tr>
<tr>
<td>Female</td>
<td>0.530 (0.129)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.325 (0.119)</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td>9,295,442</td>
</tr>
<tr>
<td>Blue-collar</td>
<td>0.363 (0.132)</td>
<td></td>
</tr>
<tr>
<td>White-collar</td>
<td>0.250 (0.104)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>9,295,488</td>
</tr>
<tr>
<td>Young</td>
<td>0.507 (0.127)</td>
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<tr>
<td>Medium</td>
<td>0.317 (0.111)</td>
<td></td>
</tr>
<tr>
<td>Old</td>
<td>0.329 (0.106)</td>
<td></td>
</tr>
</tbody>
</table>

Source: LIAB and Statistical Offices of the Laender. Notes: This table presents the DiD estimates $\hat{\delta}$ of regression model (3) with the log individual wage as dependent variables for different worker types as indicated in the table. The heterogeneous effects are estimated by interacting the LBT rate with dummy variables for different firms types. Coefficients measure the wage elasticity with respect to the net-of-local-business-tax rate. All specifications include worker, firm and municipal fixed effects, as well as “state × year” and “worker type × year” fixed effects. The estimation sample comprises all establishments liable to the LBT in non-merged municipalities. Standard errors are clustered at the municipal level.

Source: Fuest, Peichl, Siegloch.
III. User Cost, Impact of TCJA, Open Questions
User Cost, Impact of TCJA, Open Research Questions

1. User Cost
   - User Cost and Capital Markets (before taxes)
   - User Cost expression with taxes

2. Impact of TCJA (Barro Furman, BPEA 2018)
   - Measuring User Cost in Practice
   - TCJA effect on User Costs
   - Economic Impacts
   - Open Questions inspired by Barro Furman

3. Additional Research Questions
Rental and asset markets are linked

Use the link between rental and asset markets to analyze capital markets

Rental Market

use the link between rental and asset markets to analyze capital markets

Asset Market

where $R_t$ is the **rental price** of using capital services $K_t$ and $P_t$ is the **purchase price**, which depends on the level of investment $I_t$. 
4 key equations

1. **Stock Adjustment:** \( K_t = (1 - \delta)K_{t-1} + I_t \)

2. **Asset pricing equilibrium** The rental cost of using an asset is simply the cost of buying the good and re-selling it after one period.

3. **Rental market equilibrium:** \( K = D(R) \)

4. **Investment market equilibrium:** \( I = S(P) \)
What is the relationship between rental and capital prices?

The rental cost of using an asset is simply the cost of buying the good and re-selling it after one period:

\[ R_t = P_t - \frac{(1 - \delta)P_{t+1}}{1 + r} \]

- \( r \) is the nominal rate of interest
- \( P_{t+1} \) is next year’s price for the good
2. Analyzing Rental Price

We can rearrange the expression to show rental prices depend on three things:

\[
R_t = \frac{rP_t + \delta P_{t+1} + P_t - P_{t+1}}{1 + r}
\]

1. Interest cost\(^2\): \(rP_t\)
2. Depreciation: \(\delta P_{t+1}\)
3. Market re-evaluation: \(P_t - P_{t+1}\)

Rental prices are higher, the higher is \(r\), the greater is the physical rate of depreciation, and the faster the price of the asset is declining
2. Analyzing Rental Price: Car example

\[ R_t = \frac{rP_t + \delta P_{t+1} + P_t - P_{t+1}}{1 + r} \]

- If cars lose their value quickly (i.e., \( P_t \gg P_{t+1} \)), then rental prices will be pretty high.
2. Analyzing Capital Prices

We can also use the rental price expression to calculate the implied capital price

\[ P_t = R_t + \frac{R_{t+1}(1 - \delta)}{(1 + r)} + \frac{R_{t+2}(1 - \delta)^2}{(1 + r)^2} + \ldots \]

- This equation can be obtained by recursively substituting for future prices in the rental price equation
- This equation should look familiar to you (prices are PV of cash flow stream)
- Capital prices are higher when rental payments to the owner are large and soon
The demand for housing services depends on the flow cost of housing services (i.e., the rental rate $R_t$). $R_t$ is what I pay to use the asset.

Housing services are provided by the stock of housing $K_t$.

The demand side of the market links the current rental price and the current stock.
3. Rental Market Equilibrium

The diagram illustrates the rental market equilibrium, where the demand function $D_t(R_t)$ intersects with the supply function $K_t = D_t(R_t)$ at point $K_t$. The diagram shows the relationship between rental price $R_t$ and quantity demanded $K_t$.
4. Investment Market Equilibrium

\[ I_t = S(P_t) \]

- The supply of new construction, investment depends on its current price.
- Think of this as a new car producer who decides how much to supply based on the current price.
- Alternatively, housing construction firms see high house prices and build. They build more when prices are high.
4. Investment Market Equilibrium

![Graph showing Investment Market Equilibrium]

- $P_t$: Price at time $t$
- $I_t$: Investment at time $t$
- $I_t = I_t(P_t)$

The equilibrium is represented by the point where the supply and demand curves intersect.
4 key equations

\[ K_t = (1 - \delta)K_{t-1} + I_t \quad (1) \]
\[ R_t = P_t - \frac{(1 - \delta)P_{t+1}}{1 + r} \quad (2) \]
\[ K_t = D(R_t) \quad (3) \]
\[ I_t = I(P_t) \quad (4) \]

4 equations and 4 unknowns, but depends on past and the future. Where do past and future come in?
When we look at a market equilibrium for the housing market at any one point in time, we must realize that today’s market is influenced by both the past and future.

- The effect of the past comes through the effect of past production decisions on the stock of housing.
- The effect of the future comes from the effect of future expected rental rates on the current price.
What does the system look like in steady state?

\[ \tilde{K} = (1 - \delta)\tilde{K} + \bar{I} \]
\[ \tilde{R} = \bar{P} - \frac{(1 - \delta)\bar{P}}{1 + r} \]
\[ \tilde{K} = D(\tilde{R}) \]
\[ \bar{I} = S(\bar{P}) \]
What does the system look like in steady state?

\[
\bar{I} = \delta \bar{K} \\
\bar{R} = \bar{P} \left(1 - \frac{(1 - \delta)}{1 + r}\right) \\
\bar{K} = D(\bar{R}) \\
\bar{I} = S(\bar{P})
\]
What does the system look like in steady state?

We can use the first two equations to plug into the second two equations and obtain the supply and demand in the use market.

\[ \bar{I} = \delta \bar{K} \]

\[ \frac{\bar{R}}{\left(1 - \frac{(1-\delta)}{1+r}\right)} = \bar{P} \]

\[ \bar{K} = D(\bar{R}) \]

\[ \underbrace{\bar{I}}_{\delta \bar{K}} = S\left(\underbrace{\bar{P}}_{\bar{R}/\left(1 - \frac{(1-\delta)}{1+r}\right)}\right) \]
What does the system look like in steady state?

\[ \bar{K} = D(\bar{R}) \]

\[ \bar{K} = \frac{1}{\delta} S \left( \frac{\bar{R}}{1 - \frac{(1-\delta)}{1+r}} \right) \]

This shows that we have a familiar supply and demand diagram where the quantity is \( K \) and the price is \( R \)
Capital Market Equilibrium

\[ R_t \]

\[ K_t \]

\[ K^* \]

\[ R^* \]

\[ S(R_t) \]

\[ D(R_t) \]

Owen Zidar

Business Tax Graduate Workshop

October 11, 2018

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Earthquake Destroys part of capital stock
The main impact is on the use market. Lower $K$ increases $R$.

Higher rental prices cause the asset price $P$ to increase.

However, since rental rates we decline as we rebuild capital stock, the increase in $P$ is smaller than increase in $R$.

Investment follows $P$, so it will jump and slowly decline as we rebuild the stock.
Earthquake Destroys part of capital stock

- $R$
- $P$
- $I$
- $K$

$t=0$
What determines the speed of convergence to the steady state?

1 **Elasticity of demand** in the rental market $\varepsilon^D$. For example, the more the rental price goes up following a destruction of the capital stock, the faster we will converge to steady state (since it will make the capital price go up more, and thereby also investments). With a higher elasticity (in absolute value), the rental price will go up more.

2 **Elasticity of supply** in the investment market $\varepsilon^S$. This will make investment go up more when the capital price goes up.

3 **The depreciation rate** $\delta$. This may be the most important aspect, since it puts a lower bound on the speed of convergence. The slowest rate at which the economy ever can return to the steady state is $\delta$. 
User Cost expression with taxes
User Cost expression with taxes

Jorgenson’s (1963) user cost of capital $R_t$ is the classic way to analyze the effect of taxation on investment

$$R = \frac{q(1 - \tau z)(r + \delta - \pi)}{1 - \tau}$$

- $q$ is the price of capital goods and $\pi$ is the corresponding inflation rate
- $\tau$ is the corporate tax rate
- $z$ is the present value of depreciation deductions per dollar of new capital
- Can also include an investment tax credit term (which would enter, e.g., $z = ITC/\tau$)
- $r$ is the firm’s nominal cost of funds (presumably a weighted avg of debt and equity costs)
- $\delta$ is the rate at which capital depreciates
With immediate expensing, $z = 1$ so the tax terms cancel, yielding:

$$R = q(r + \delta - \pi)$$

- This expression is the continuous time version of what we had before without taxes
- Dynamics/expectations re path of $q, \tau, z, ITC$ change the expression
- See Hall and Jorgenson (AER, 1967) for derivations or more recent notes by Poterba (MIT open course web 14.471 Fall 2012) or Auerbach (2005) paper “Taxation and Capital Spending”
- See Yagan (AER, 2015) appendix D for empirical implementation
User Cost, Impact of TCJA, Open Research Questions

1 User Cost
- User Cost and Capital Markets (before taxes)
- User Cost expression with taxes

2 Impact of TCJA (Barro Furman, BPEA 2018)
- Measuring User Cost in Practice
- TCJA effect on User Costs
- Economic Impacts
- Open Questions inspired by Barro Furman

3 Additional Research Questions
Start by ignoring debt financing and assume \( \tau \) and \( z \) are constant:

\[
R = \frac{(1 - \tau z)(r + \delta)}{1 - \tau}
\]

- \( \tau \) and \( z \) summarize the tax system (note \( \lambda \equiv z \) in BF)
- \( r \) is set to 8.2 (see paper for discussion); implicitly assumes horizontal supply of capital
- \( \delta \) is the rate at which capital depreciates
  - Equipment \( \delta = 8.8\% \)
  - Structures \( \delta = 2.0\% \)
  - Rental residential property \( \delta = 2.7\% \)
  - R&D intellectual property \( \delta = 12.3\% \)
  - Other intellectual property \( \delta = 19.5\% \)

BF then add debt financing tradeoff between tax advantage and cost of higher default probability
Adding this extra term for debt financing gives:

\[ R = \frac{(1 - \tau z)(r + \delta)}{1 - \tau} - \frac{1}{2} \left( \frac{\tau}{1 - \tau} \right) \text{debtshare} \times i \]

- $\frac{1}{2}$ is from calibrated marginal cost of debt financing (see eq 5; fn 14)
- \text{debtshare} is the share of financing from debt, which they set to 1/3
- \text{i} is the nominal interest rate on corporate bonds
TCJA effect on C-corp tax rates
Barro and Furman (BPEA, 2018)

BF consider three scenarios:

1. **Baseline in 2017:** \( \tau = 38\% 
   - \text{Federal} \left( \frac{2}{3} \right) 35\% + \left( \frac{1}{3} \right) 31.85\% \text{ (from DPAD)} = 34\%
   - \text{Add 4\% for state corporate tax}

2. **Law as written (applicable as of 2027):** \( \tau = 27\% 
   - \text{Federal} = 21\%
   - \text{Adjust to reflect NOL limitations and smaller offsets (1.5pp)}
   - \text{Add 4\% for state corporate tax}

3. **Provisions permanent (applicable as of 2019):** \( \tau = 26\% 
   - \text{Federal} = 21\%
   - \text{Adjust to reflect NOL limitations and smaller offsets (0.25pp)}
   - \text{Add 4\% for state corporate tax}
Table 5
Estimated Effects on C Corporations from 2017 Tax Law

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Scenario I Law as written</th>
<th>Scenario II Provisions permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate-profits tax rate, τ</td>
<td>38%</td>
<td>27%</td>
<td>26%</td>
</tr>
<tr>
<td>Effective expensing rate, χ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>0.812</td>
<td>0.812</td>
<td>1.000</td>
</tr>
<tr>
<td>Structures</td>
<td>0.338</td>
<td>0.338</td>
<td>0.338</td>
</tr>
<tr>
<td>Rental residential property</td>
<td>0.336</td>
<td>0.336</td>
<td>0.336</td>
</tr>
<tr>
<td>R&amp;D intellectual property</td>
<td>1.132</td>
<td>1.011</td>
<td>1.192</td>
</tr>
<tr>
<td>Other intellectual property</td>
<td>0.842</td>
<td>0.842</td>
<td>0.842</td>
</tr>
<tr>
<td>User cost of capital, Ω (% change from baseline)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>0.186</td>
<td>0.180 (-3%)</td>
<td>0.168 (-10%)</td>
</tr>
<tr>
<td>Structures</td>
<td>0.139</td>
<td>0.125 (-10%)</td>
<td>0.124 (-11%)</td>
</tr>
<tr>
<td>Rental residential property</td>
<td>0.149</td>
<td>0.134 (-10%)</td>
<td>0.132 (-11%)</td>
</tr>
<tr>
<td>R&amp;D intellectual property</td>
<td>0.185</td>
<td>0.202 (+10%)</td>
<td>0.189 (+2%)</td>
</tr>
<tr>
<td>Other intellectual property</td>
<td>0.300</td>
<td>0.291 (-3%)</td>
<td>0.290 (-3%)</td>
</tr>
<tr>
<td>Average</td>
<td>(-4%)</td>
<td>(-8%)</td>
<td></td>
</tr>
</tbody>
</table>
TCJA effect on pass-through tax rates
Barro and Furman (BPEA, 2018)

BF consider three scenarios:

1. **Baseline in 2017:** $\tau = 35.2\%$
   - Assumed value for average marginal tax rate for owners of non-C-corporate businesses

2. **Law as written (applicable as of 2027):** $\tau = 35.5\%$
   - Reflects elimination of DPAD and some bracket creep due to shifting to chained CPI

3. **Provisions permanent (applicable as of 2019):** $\tau = 31.1\%$
   - Reflects reduction in individual tax rates and allowable part of the 20 percent pass-through deduction
   - Partially offset with higher marginal rates from capping SALT
## Table 9

### Estimated Effects on Pass-through Businesses from 2017 Tax Law

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Law as written</th>
<th>Provisions permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pass-through tax rate, ( \tau )</strong></td>
<td>35.2%</td>
<td>35.5%</td>
<td>31.1%</td>
</tr>
<tr>
<td><strong>Effective expensing rate, ( \lambda )</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>0.812</td>
<td>0.812</td>
<td>1.000</td>
</tr>
<tr>
<td>Structures</td>
<td>0.338</td>
<td>0.338</td>
<td>0.338</td>
</tr>
<tr>
<td>Rental residential property</td>
<td>0.336</td>
<td>0.336</td>
<td>0.336</td>
</tr>
<tr>
<td>R&amp;D intellectual property</td>
<td>1.000</td>
<td>0.785</td>
<td>1.000</td>
</tr>
<tr>
<td>Other intellectual property</td>
<td>0.842</td>
<td>0.842</td>
<td>0.842</td>
</tr>
<tr>
<td><strong>User cost of capital, ( \Omega ) (% change from baseline)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>0.184</td>
<td>0.185 (0)</td>
<td>0.167 (-9%)</td>
</tr>
<tr>
<td>Structures</td>
<td>0.135</td>
<td>0.136 (+1%)</td>
<td>0.130 (-4%)</td>
</tr>
<tr>
<td>Rental residential property</td>
<td>0.145</td>
<td>0.146 (+1%)</td>
<td>0.139 (-4%)</td>
</tr>
<tr>
<td>R&amp;D intellectual property</td>
<td>0.202</td>
<td>0.226 (+12%)</td>
<td>0.202 (0)</td>
</tr>
<tr>
<td>Other intellectual property</td>
<td>0.297</td>
<td>0.298 (0)</td>
<td>0.294 (-1%)</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>(+1%)</td>
<td></td>
<td>(-5%)</td>
</tr>
</tbody>
</table>
From user cost changes to impacts on economic activity
Barro and Furman (BPEA, 2018)

1 Production Function
   - $Y = AK^\alpha L^{1-\alpha}$ where $\alpha = .38$
   - $K^\alpha = K_1^{\alpha_1} K_2^{\alpha_2} K_3^{\alpha_3} K_4^{\alpha_4} K_5^{\alpha_5}$ for each type of capital

2 Elasticity of capital labor ratio (K/L) w.r.t user cost
   - $MPK = \alpha A \left(\frac{K}{L}\right)^{(1-\alpha)}$
   - Implies that the elasticity of (K/L) to user cost is $-1/(1-\alpha) \approx 1.6$

3 Output per worker
   - Elasticity of (Y/L) to user cost is $-\alpha/(1 - \alpha) \approx .6$
   - With 5 types of capital, numerator is $\alpha_k$-weighted average of user cost change
   - Also note that wages are proportional to $Y/L$ from labor FOC
TCJA effect on C-corp economic activity
Barro and Furman (BPEA, 2018)

<table>
<thead>
<tr>
<th>User cost of capital, $\Omega$ (% change from baseline)</th>
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<tr>
<td>R&amp;D intellectual property</td>
</tr>
<tr>
<td>Other intellectual property</td>
</tr>
</tbody>
</table>

**Average**

| (-4%) | (-8%) |

<table>
<thead>
<tr>
<th>Percent change in capital-labor ratio, $K/L$</th>
</tr>
</thead>
<tbody>
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<td>Equipment</td>
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</tr>
<tr>
<td>R&amp;D intellectual property</td>
</tr>
<tr>
<td>Other intellectual property</td>
</tr>
</tbody>
</table>

**Average**

| 6.6% | 12.5% |

| Percent change in output per worker, $Y/L$ | 2.5% | 4.7% |

Notes: The effective expensing rate, $\lambda$, is calculated as a present value, including tax credits. The economic and tax law parameters were listed in Tables 3 and 4 and are described in the text where appropriate. Averages reflect the average percent changes for each type of capital, weighted by the capital income shares.
TCJA effect on pass-through economic activity
Barro and Furman (BPEA, 2018)

<table>
<thead>
<tr>
<th>User cost of capital, $\Omega$ (% change from baseline)</th>
<th>0.184</th>
<th>0.185 (0)</th>
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<td>Other intellectual property</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>(+1%)</td>
<td>(-5%)</td>
</tr>
</tbody>
</table>

Percent change in capital-labor ratio, $K/L$

| Equipment                                            | -1.2% | 12.2%       |
| Structures                                           | -1.5% | 7.2%        |
| Rental residential property                          | -1.5% | 7.2%        |
| R&D intellectual property                            | -13.1%| 2.8%        |
| Other intellectual property                          | -1.0% | 4.2%        |
| Average                                              | -2.1% | 8.3%        |

Percent change in output per worker, $Y/L$

|                                                     | -0.8% | 3.1%        |

Note: Uses pass-through tax rates as shown. R&E credit assumed to be zero in all cases. See Tables 3, 4 and 5 on other aspects.
Table 10
Estimated Effects on Economy-wide Output per Worker

<table>
<thead>
<tr>
<th></th>
<th>Initial share</th>
<th>Law as written</th>
<th>Provisions permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td>C corporations</td>
<td>39%</td>
<td>2.5%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Pass-throughs</td>
<td>36%</td>
<td>-0.8%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Government, Households, and Institutions</td>
<td>25%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Percent change in overall output per worker

<table>
<thead>
<tr>
<th></th>
<th>Initial share</th>
<th>Law as written</th>
<th>Provisions permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.9%</td>
<td>3.1%</td>
<td></td>
</tr>
</tbody>
</table>

Sensitivity analysis when productivity rises by 10% for switchers

<table>
<thead>
<tr>
<th></th>
<th>Initial share</th>
<th>Law as written</th>
<th>Provisions permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1.6%</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Notes: The initial shares in value added are in Table 3. Values of change in output per worker for law-as-written and provisions-permanent scenarios are from Table 5 for C corporations and Table 9 for pass-through businesses. These values reflect changing capital-labor ratios within sectors. The change in output per worker is assumed to be zero for government, households, and institutions. The percent change in overall output per worker is the sum of the changes by sector weighted by the final shares, which are assumed, because of shifting across sectors.
Open Questions from Barro Furman

1. **Tax rate vs base**
   - Effects of expensing vs interest deductibility
   - How to model NOLs, etc, and their impacts on user cost and growth

2. **Actual Investment responses**
   - Do estimates line up with predictions? Heterogeneity by type of capital
   - Where does investment come from? Extensive, intensive, FDI?
   - More broadly, what are the effects on the international provisions?
   - Crowd-out from deficits? How do responses change w/ higher $r$?

3. **Output per worker and wages**
   - How do these changes impact $Y/L$ and wages? what are the distributional impacts?

4. **Others**
   - How much corporate form switching was there? Are there productivity gains from switching? Tax revenue impacts?
   - What do firms do with the windfalls to old capital?
   - How much reallocation of capital and labor is there?
User Cost, Impact of TCJA, Open Research Questions

1. User Cost
   - User Cost and Capital Markets (before taxes)
   - User Cost expression with taxes

2. Impact of TCJA (Barro Furman, BPEA 2018)
   - Measuring User Cost in Practice
   - TCJA effect on User Costs
   - Economic Impacts
   - Open Questions inspired by Barro Furman

3. Additional Research Questions
A few more open research questions

1. **Business Income, Taxation, and Inequality**
   - Who owns C-corporations? Important for top wealth & inequality
   - How much of business wealth is self-made versus inherited? How does this respond to taxation?

2. **Business Property Taxes**
   - Effect of prop taxes (expected prop tax/fiscal health) on firm location

3. **Reform**
   - How much would dollar depreciate if the DBCFT reform were enacted? Effects on wealth?
   - International Reforms related to tax evasion and avoidance

4. **Other topics**
   - Rents vs normal returns to capital
   - Size, causes, and consequences of business location subsidies
   - How do federal changes affect state revenues and economic activity (e.g., bonus)?
   - Repatriation: decision to send money back in 2003 holiday
   - Corporate financial policy
IV. Taxes, Financial Policy, and Investment (Poterba)
V. International Taxation (Hines)