Firm Investment and the User Cost of Capital: New U.S. Corporate Tax Reform Evidence

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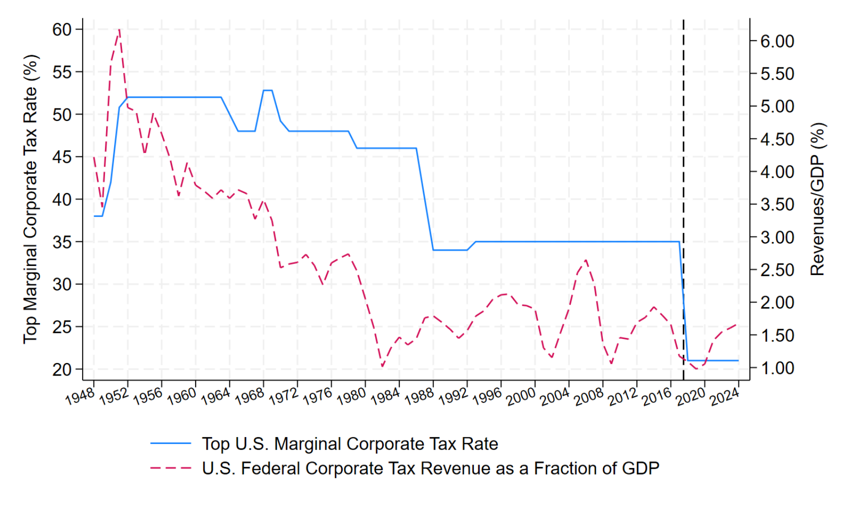
Corporate Income Tax Rate and Federal Corporate Tax Revenues



The 2017 Tax Cuts and Jobs Act

- The Tax Cuts and Jobs Act of 2017 (TCJA) marked the first time in three decades (since the Tax Reform Act of 1986) that material changes were made to the corporate tax code of the United States.
  - Top marginal corporate tax rate 35% $\Rightarrow$ 21%
  - Certain capital expenditures received automatic full expensing through 2023 (with a scheduled phase-out through 2027)
  - Top marginal individual tax rate 39.6% $\Rightarrow$ 37% and the Section 199A deduction on qualified business income (QBI) benefitted pass-through entities (PTEs)
- Together, these changes reduced the user cost of capital for investment in the US

TCJA Projections

- CBO estimated that the TCJA would reduce revenues by \$2.3 trillion on a static basis and \$1.9 trillion on a dynamic basis from 2018-2027
- Corporate tax revenues were projected to decline, but revenues surged from 1% of GDP in the 2018-2020 period to 1.8% in 2024
- Could the investment response have been larger than scoring agencies expected?

Our Approach

Research Question: How did the TCJA's changes to user cost of capital affect fixed asset investment rates?

- Following the method of Auerbach and Hassett (1991), we use the TCJA as a natural experiment
- We leverage cross-sectional variation in treatment at the BEA asset class level
- We estimate changes in investment rates as a function of changes in user cost *relative to 2016* on each annual time horizon from 2018-2023

Main Results

- BEA asset classes with greater reductions in UCC following the 2017 TCJA had greater increases in investment rates
- A 1ppt $\downarrow$ in UCC is associated with a 1.68 - 3.05ppt $\uparrow$ in the investment rate
- Results are larger than prior estimates and last for several years after the reform

Elasticity

- Elasticities vary across the literature and in practice:
  - Hassett and Hubbard (2002) review the literature and find an investment-user cost elasticity ranging from -0.5 to -1.0
  - CBO uses an investment *level*-user cost elasticity of -0.7
  - Our results (when converted) imply an investment-user cost elasticity ranging from -1.91 to -3.45, and an investment level-user cost range of -1.80 to -3.26
  - Our findings suggest the CBO should be using higher elasticities in their modeling

Other Literature

- Using tax reform years as natural experiments (Auerbach and Hassett (1991); Cummins et al. (1994, 1995, 1996)):
  - Cummins et al. (1994) find an investment rate-user cost coefficient of about -0.65
- Recent studies have leveraged cross-sectional variation from the TCJA:
  - Kennedy et al. (2024) study the differential effects of C-Corps versus S-Corps
  - Chodorow-Reich et al. (2024) estimate capital effects in the context of a global model
- Our approach extends the method of using tax reform years as natural experiments to the TCJA, finding greater effects than prior studies

Data

- We gather data on investment and capital stock from the Bureau of Economic Analysis' (BEA) Fixed Asset Tables
- The BEA classifies each of the 96 asset classes into three broad categories:
  - Private equipment
  - Private structures
  - Intellectual property products
- Cost of capital, user cost of capital, and METR calculated using the Cost of Capital Calculator (DeBacker and Kasher (2018))

Calculating Cost of Capital

- First, we calculate cost of capital separately for C-Corps and PTEs and for each BEA asset class as follows:

$$\rho_{i,t,j} = \frac{r_{t,j} + \delta_i - \pi_t}{1 - \tau_{t,j}}(1 - \tau_{t,j} z_{i,t}) - \delta_i \quad (1)$$

  - $r_{t,j}$ is the discount rate in period t and tax treatment $j \in (C, PTE)$
  - δ_i is the depreciation rate for asset class i
  - π_t is the inflation rate
  - $\tau_{t,j}$ is the statutory income tax rate at the first level of taxation (the corporate tax rate for C-Corps and the individual tax rate for PTEs)
  - $z_{i,t}$ is the net present value of depreciation deductions from a dollar of new investment

Calculating Cost of Capital for PTEs

- To account for QBI deductions for PTEs introduced in the 2017 tax bill, we calculate cost of capital for PTEs as follows:

$$\rho_{i,t,PTE} = 0.76 * \rho_{i,t,PTE}(\tau_{t,I}) + 0.24 * \rho_{i,t,PTE}(\tau_{t,QBI}) \quad (2)$$

  - $\tau_{t,I} = 37\%$, the top marginal individual tax rate
  - $\tau_{t,QBI} = 0.8 * \tau_{t,I} = 29.6\%$, a QBI-reduced tax rate (Kennedy et al. 2024)
  - Weights based on findings from the Congressional Research Service

Calculating Weighted Cost of Capital and User Cost

- We construct a weighted cost of capital which combines the cost of capital faced by C-Corps and PTEs as follows:

$$\rho_{i,t} = \alpha_i * \rho_{i,t,C} + (1 - \alpha_i) * \rho_{i,t,PTE} \quad (3)$$

  - α_i is the proportion of the total asset stock held by C-Corps (from the 2011 SOI)
- Finally, we calculate user cost of capital, or $c_{i,t}$, by adding back in depreciation rates to $\rho_{i,t}$:

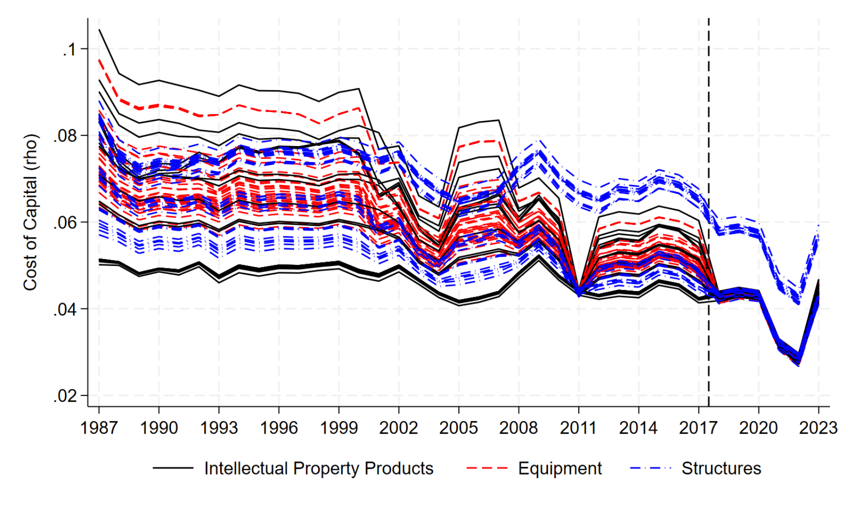
$$c_{i,t} = \rho_{i,t} + \delta_i \quad (4)$$

Calculating Weighted METR

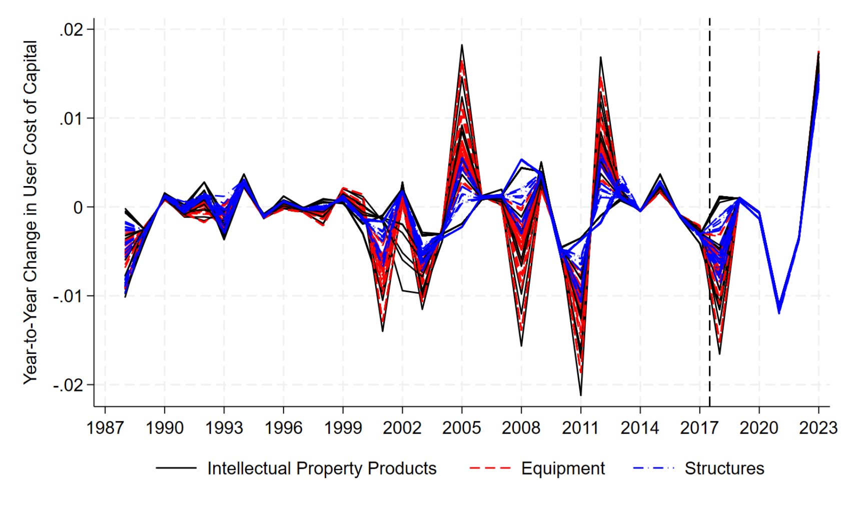
- Following the same steps, we calculate a weighted METR as follows:

$$METR_{i,t} = \frac{\rho_{i,t} - (r_{i,t} - \pi_t)}{\rho_{i,t}} \tag{5}$$

Cost of Capital by BEA Asset Type (1987-2023)



YOY Change in User Cost of Capital by BEA Asset Type (1988-2023)



Regression Specification

- We estimate the following on each annual time horizon from 2018 - 2023:

$$\frac{I_{i,t}}{K_{i,t-1}} - \frac{I_{i,2016}}{K_{i,2015}} = \alpha + \beta(x_{i,t} - x_{i,2016}) + \varepsilon_{i,t} \tag{6}$$

  - $\frac{I_{i,t}}{K_{i,t-1}}$ is the firm investment rate in time t
  - $x_{i,t}$ is the weighted outcome (either user cost or METR) for asset i in time t

- We calculate an elasticity of the investment rate w.r.t the user cost as follows:

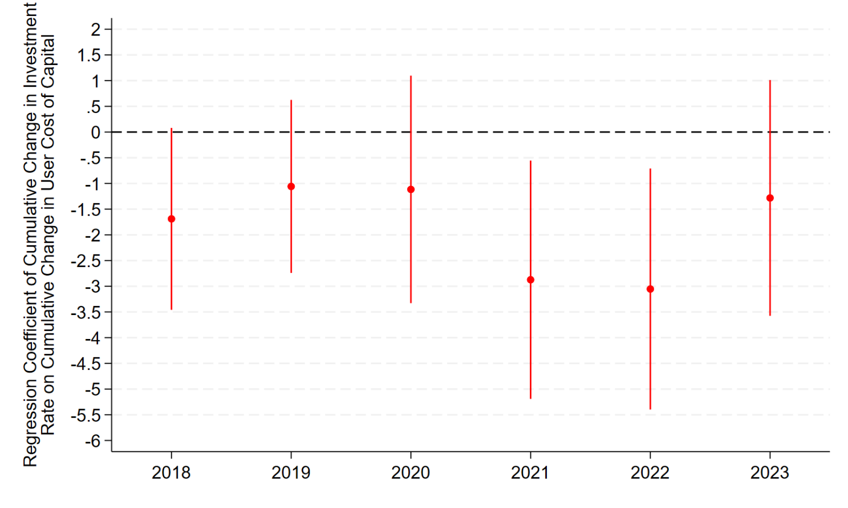
$$e(c) = \frac{\Delta(\frac{I}{K})}{\Delta c}\frac{c}{(\frac{I}{K})} = \beta\frac{c}{(\frac{I}{K})} \tag{7}$$

Cumulative Investment Response to Tax Changes (UCC)

$\frac{I_{i,t}}{K_{i,t-1}} - \frac{I_{i,2016}}{K_{i,2015}}$	2018 (1)	2019 (2)	2020 (3)	2021 (4)	2022 (5)	2023 (6)
$c_{i,t} - c_{i,2016}$	-1.689*	-1.057	-1.115	-2.873**	-3.053**	-1.282
	(0.890)	(0.847)	(1.113)	(1.166)	(1.180)	(1.154)
R^2	0.050	0.022	0.016	0.087	0.096	0.021
N	93	93	93	93	93	93

Notes: Robust standard errors in parentheses. *** p<0.01 ** p<0.05 * p<0.10. Data for fixed investment from BEA Fixed Asset Tables. User cost of capital data from the OSPC Cost of Capital Calculator. We calculate change in asset investment rates by year then winsorize the top 5% and bottom 5% of observations in each year.

Cumulative Investment Response to Tax Changes (UCC)

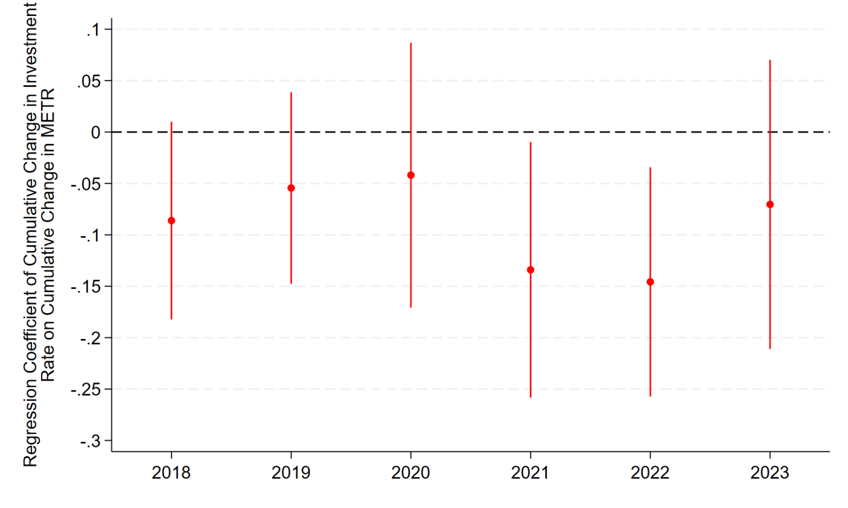


Cumulative Investment Response to Tax Changes (METR)

$\frac{I_{i,t}}{K_{i,t-1}} - \frac{I_{i,2016}}{K_{i,2015}}$	2018	2019	2020	2021	2022	2023
	(1)	(2)	(3)	(4)	(5)	(6)
$METR_{i,t} - METR_{i,2016}$	-0.086*	-0.054	-0.041	-0.134**	-0.145**	-0.070
	(-0.003)	(-0.001)	(-0.013)	(-0.012)	(-0.010)	(-0.005)
R^2	0.044	0.020	0.007	0.066	0.089	0.019
N	93	93	93	93	93	93

Notes: Robust standard errors in parentheses. *** $p<0.01$ ** $p<0.05$ * $p<0.10$. Data for fixed investment from BEA Fixed Asset Tables. METR data from OSPC Cost of Capital Calculator. We calculate change in asset investment rates by year then winsorize the top 5% and bottom 5% of observations in each year.

Cumulative Investment Response to Tax Changes (METR)



Robustness - Computer-Related Assets Combined

$\frac{I_{i,t}}{K_{i,t-1}} - \frac{I_{i,2016}}{K_{i,2015}}$	2018	2019	2020	2021	2022	2023
	(1)	(2)	(3)	(4)	(5)	(6)
$c_{i,t} - c_{i,2016}$	-1.554*	-0.864	-0.484	-2.188**	-2.660**	-0.638
	(0.881)	(0.800)	(0.900)	(0.935)	(1.076)	(0.947)
R^2	0.081	0.016	0.004	0.082	0.093	0.006
N	90	90	90	90	90	90

Notes: Robust standard errors in parentheses. *** p<0.01 ** p<0.05 * p<0.10. Data for fixed investment from BEA Fixed Asset Tables. User cost of capital data from OSPC Cost of Capital Calculator. User cost of capital and METR data from OSPC Cost of Capital Calculator. Computer-related asset types (RD21, RD22, RD24, RD25) are combined and weighted by capital stock to reduce volatility. We calculate change in asset investment rates by year then winsorize the top 5% and bottom 5% of observations in each year.

Elasticity Calculations

- To get an investment *rate*-user cost elasticity, we divide our coefficients by the mean 2016 investment rate and multiply by the mean 2016 UCC

Year	Coefficient	Mean I/K	Mean UCC	Elasticity
2018	-1.689*	0.1818	0.2058	-1.911
2019	-1.057	0.1818	0.2058	-1.196
2020	-1.115	0.1818	0.2058	-1.262
2021	-2.873**	0.1818	0.2058	-3.252
2022	-3.053**	0.1818	0.2058	-3.456
2023	-1.282	0.1818	0.2058	-1.451

Elasticity Calculations

- An alternative back-of-the-envelope calculation gives an investment *level*-user cost elasticity, more directly comparable to the CBO's measure
- Considering the mean investment rate across all years in our sample is 18.2%, we would multiply our coefficients by 5.49 to convert from investment rate to investment
- A 1 percentage point change taken at the mean UCC across all years in our sample (from 0.195 to 0.205) equates to a 5.13% change
- Multiplying our coefficients by 5.49/5.13 yields an elasticity range of -1.80 to -3.26
- Both methods yield is 2-3x the elasticity CBO uses in its static analysis
- Note: Our constant term picks up macroeconomic effects that increase output across all industries

Changes to Capital Expensing vs the Corporate Tax Rate

$\frac{I_{i,t}}{K_{i,t-1}} - \frac{I_{i,2016}}{K_{i,2015}}$	2018	2019	2020	2021	2022	2023
	(1)	(2)	(3)	(4)	(5)	(6)
$c_{i,t} - c_{i,2016}$	-2.083*	-1.154	-2.060*	-1.336	-0.195	-0.429
(τ changes; *bonus* fixed)	(1.213)	(1.114)	(1.201)	(1.061)	(0.490)	(0.542)
$c_{i,t} - c_{i,2016}$	-1.233*	-0.821	-1.144	-3.283**	-3.108***	-1.055
(bonus changes; τ fixed)	(0.694)	(0.692)	(1.029)	(1.241)	(0.965)	(0.961)
R^2	0.053	0.020	0.031	0.074	0.103	0.025
N	93	93	93	93	93	93

Conclusion

- BEA asset types with greater reductions in UCC following the 2017 TCJA had greater increases in investment rates
- A 1ppt $\downarrow$ in UCC is associated with a 1.68 - 3.05ppt $\uparrow$ in the investment rate
- Results are larger than prior estimates and last for several years after the reform