

Firm Responses to Book Income Alternative Minimum Taxes

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Introduction

- In 2018 Amazon had \$10 billion in income, paid 0 taxes
- Deductions and credits mean to incentivize productive economic behavior reduce tax bills, sometimes all the way to 0
- Alternative minimum taxes (AMTs) assign lower rate to broader base excluding many deductions and credits
 - ▶ Raise revenue from profitable firms
 - ▶ Limit economic incentives
- Renewed interest in using book income as AMT base (Biden tax plan, OECD negotiations for global minimum tax)

Research Question

- How do firms respond to an AMT on book income?
 - ▶ How elastic is a book income tax base?
 - ▶ Do firms manage their earnings to avoid an AMT on book income?
 - ▶ Does an AMT on book income distort production or investment?

This Paper

- Event study exploiting 1987 introduction of AMT book income adjustment (AMTBIA87)
 - ▶ Use balanced Compustat panel 1981-1992 [▶ Summ Stats](#)
 - ▶ Compare firms with low pre-period effective tax rates (ETRs) facing AMTBIA87 to firms with higher pre-period ETRs that do not
 - ▶ Treatment: $ETR < 23\%$, Control: $ETR \geq 23\%$ [▶ Derivation](#)
 - ▶ Average ETR over 1984-86 for firms with persistently low ETRs

Findings

- Book income tax base is not responsive to AMTBIA87, firms do not manage their earnings
 - ▶ $\varepsilon^{BI,TB} \in [-0.73, 0.46]$ and $\varepsilon^{BI,EM} \in [-0.87, 0.50]$ over 3 years
- No evidence of production or investment distortions
 - ▶ Investment response per 1% increase in tax rate $\in [-0.48\%, 0.21\%]$
- Tax increase is salient
 - ▶ Tax liabilities increase by 0.29% of lagged assets over 3 years

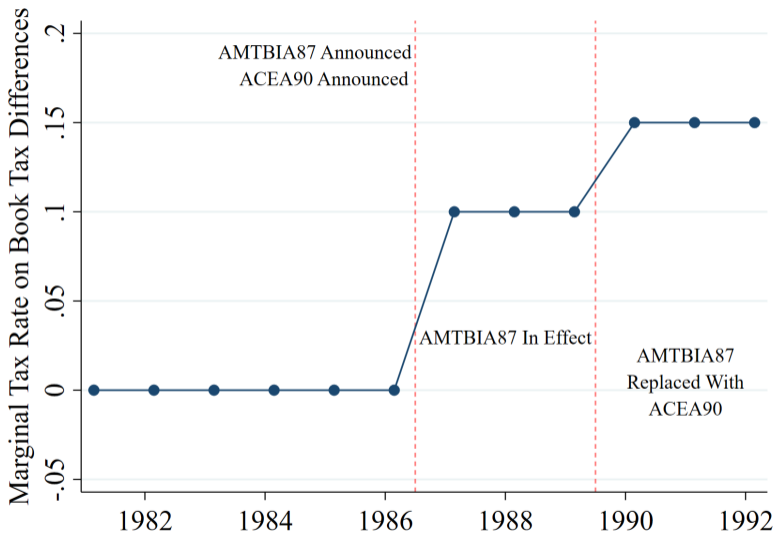
Literature Review

- **Firm responses to AMTBIA87** Gramlich 1991, Dhaliwal and Wang 1992, Boynton Dobbins and Plesko 1992, Manzon 1992, Wang 1994, Choi et al. 2001, Dharmapala 2020
 - ▶ Zero avoidance responses because I account for mean reversion
- **Mitigating incentives in corporate taxation** Burgstahler and Dichev 1997, Graham et al. 2005, Desai and Dharmapala 2006, Bergstresser and Phillipon 2006, Yu 2008, Terry 2017, Terry et al. 2021
 - ▶ Non-tax incentives to report high book incomes mitigate avoidance responses
- **Broad-based taxes, evasion and avoidance** Diamond and Mirrlees 1971, Best et al. 2015, Mosberger 2016, Alejos 2018, Almunia and Lopez-Rodriguez 2018, Lobel et al. 2020, Bachas and Soto 2021
 - ▶ Taxes on book income can raise revenue while mitigating avoidance

Outline

- ① Policy
- ② Avoidance Responses
 - ▶ Model
- ③ Production and Investment Responses
- ④ Revenue Simulations
- ⑤ Conclusion

Minimum Tax Policy Timeline



Book Tax Differences

<i>Permanent BTDs</i>	Book Income	Taxable Income
State & Local Taxes	No	Yes
Tax Exempt Income	Yes	No
Fines	Yes	No
Meals & Entertainment	100%	50%
Interest on Govt Bonds	Yes	No

<i>Temporary BTDs</i>	Book Income	Taxable Income
Depreciation	Straight Line	Accelerated
Mark to Market	Yes	No
Rental Income	Smooth	Year of Contract
Bad Debts	Estimated on Issue	When Realized

Quasi-Experimental Set Up

- Event study where treatment firms have $ETR_{84-86} < 23\%$
- ETR mechanically and negatively related to BTD tax base
- Mean reversion: expect some increase in ETR , and decrease in BTD , for low ETR treatment firms
 - ▶ Isolate mean reversion due to treatment definition from tax avoidance responses to AMTBIA87

Placebo-In-Time Approach

- Compare BTD response to treatment based on ETR_{84-86} to BTD response based on ETR in earlier years
 - ▶ Assumption: the time series process of ETR , and its impact on BTD , is stable
 - ★ Cannot reject null that ETR autocovariances are same before and after AMTBIA87 at 1, 2 and 3 lags [▶ Autocovariance Tests](#)
 - ★ Distributed lag regressions of ΔBTD on ΔETR yield same coefficients for treatment firms before and after AMTBIA87 [▶ Dist Lag Regs](#)
 - ★ ETR mean reversion is stable before and after policy

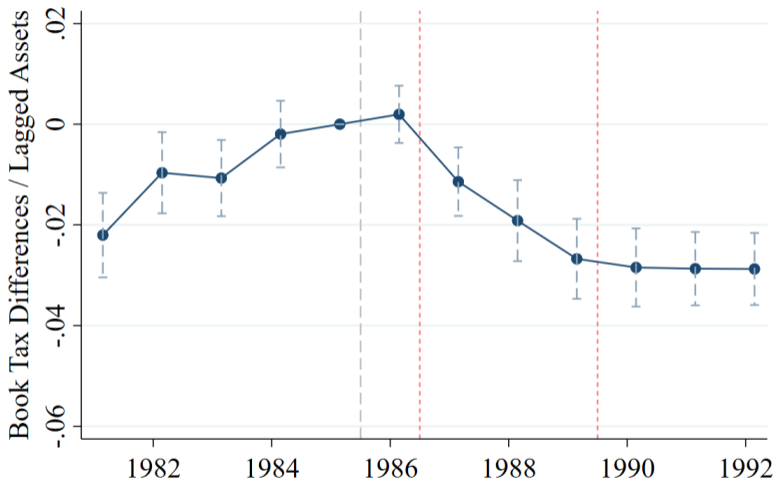
Placebo-in-Time Approach: Standard Event Study

- Estimate standard event study

$$Y_{it} = \sum_{\tau=-5, \tau \neq -1}^6 (\beta_{\tau} \cdot Treat_{i\tau}) + \rho X_{it} + \delta_t + \gamma_i + \varepsilon_{it}$$

- $Treat_i = 1$ in post-period if $ETR_{84-86} < 23\%$, 0 otherwise
- $Treat_{i\tau}$ is interaction of $Treat_i$ with event time dummies
- $\tau = 0$ is 1986

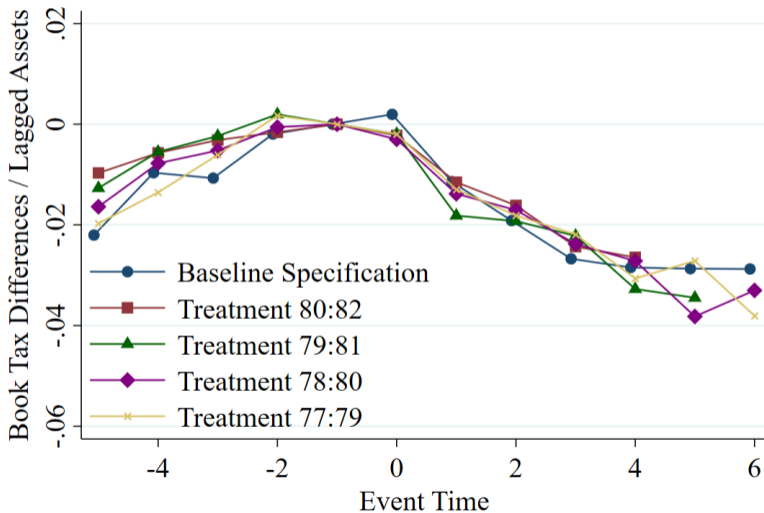
Book Tax Differences Response to Baseline Treatment



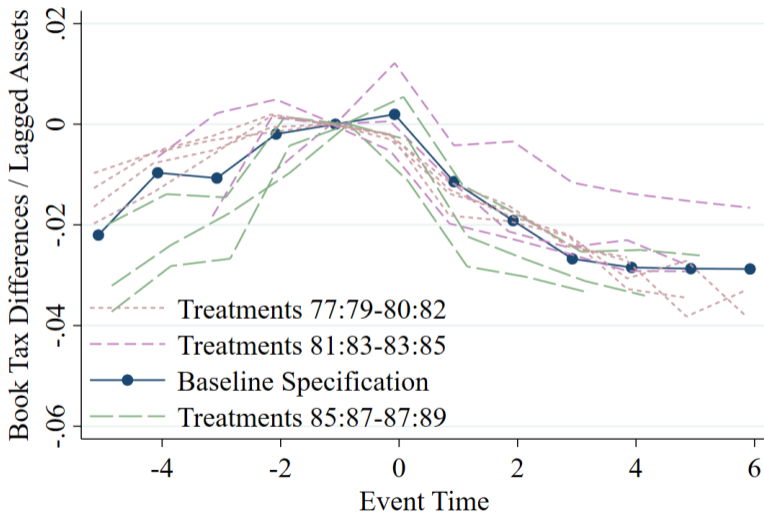
Placebo-in-Time Approach: Counterfactuals

- Estimate same event study specification using treatment definitions based on earlier years
 - ▶ Use balanced Compustat panel 1974-1986
 - ▶ Use treatment definitions based on *ETR* in 77-79, 78-80, 79-81, 80-82
 - ▶ Event time $\tau = 0$ is last year in treatment definition

Book Tax Differences Response to Baseline and Placebo Treatments



Book Tax Differences Response to Baseline and Placebo Treatments



Placebo-in-Time Approach: Stacked Event Study

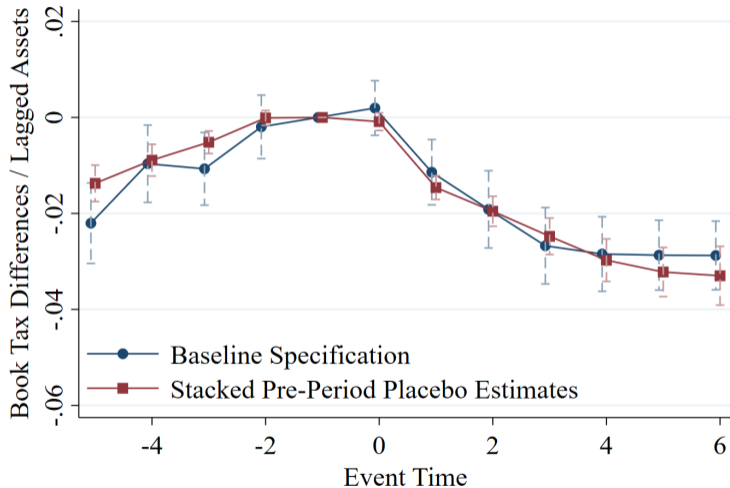
- Average over treatment definitions based on *ETR* in 77-79, 78-80, 79-81, 80-82, 81-83, 82-84, 83-85
 - ▶ Event time $\tau = 0$ is last year in treatment definition
 - ▶ Append 1 data set for each treatment, estimate stacked event study in pre-reform years

$$Y_{itd} = \sum_{\tau=-5, \tau \neq -1}^6 (\eta_{\tau} \cdot Treat_{i\tau d}) + \psi Treat_{id} + \rho X_{itd} + \delta_t + \gamma_i + \varepsilon_{itd}$$

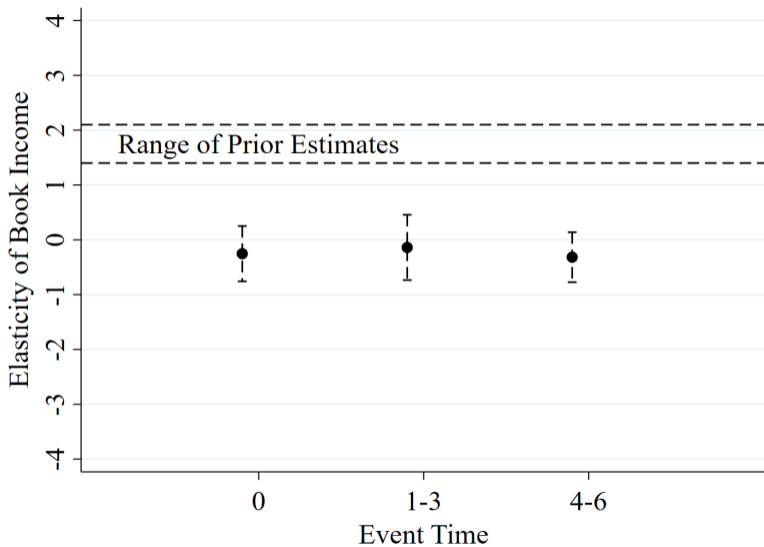
- *BTD* response of interest is $\beta_{\tau} - \eta_{\tau}$, rescale to elasticity and bootstrap standard errors

$$\varepsilon_t^{BI} = \left(\frac{\beta_t}{\overline{BI}_{\beta}} - \frac{\eta_t}{\overline{BI}_{\eta}} \right) \cdot \frac{1 - \tau}{\Delta(1 - \tau)}$$

Book Tax Differences Baseline and Stacked Event Study



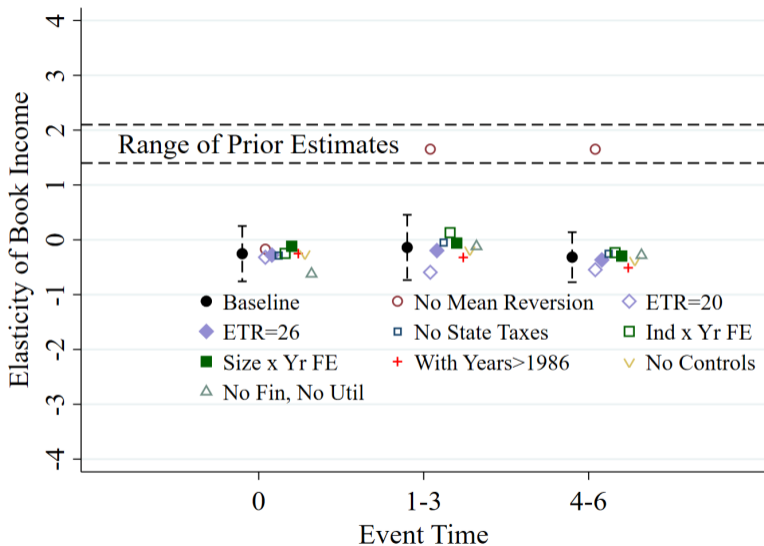
Tax Base Elasticity Estimates



Book Tax Differences Mean Reversion

- $\varepsilon^{BI, TB} \in [-0.73, 0.46]$ over 1987-1989
- Difference with prior estimates explained by mean reversion
- Difference not driven by controls, tax base measurement error, size or industry time trends, choice of placebo, finance or utility firms

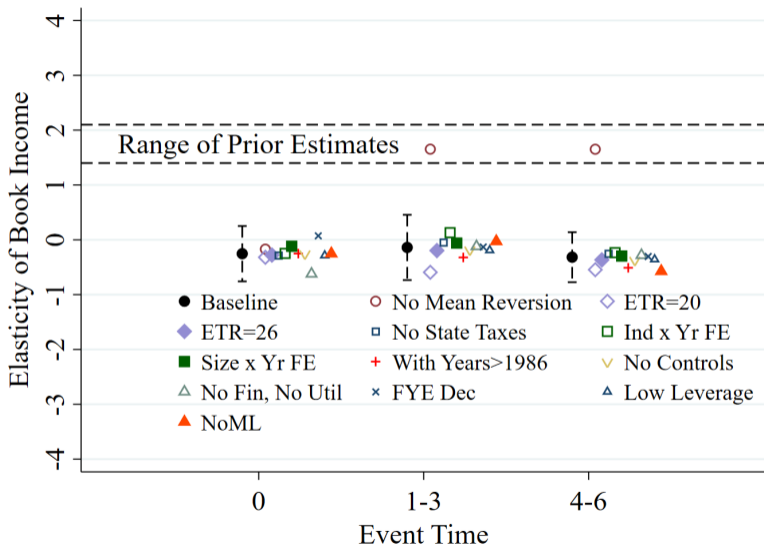
Tax Base Elasticity Estimates



Why are there no avoidance responses to AMTBIA87?

- Tax liability increases by 0.29% of lagged assets [▶ Tax Liab](#) [▶ Tax Liab NoML](#)
- No permanent BTD avoidance [▶ Perm BTD](#)
- Little heterogeneity across industry or firm sizes [▶ BTD Heterogeneity](#)
- No avoidance dropping multinationals and loss firms
- No avoidance restricting to firms with December fiscal year-ends
- No avoidance restricting to low leverage firms

Tax Base Elasticity Estimates



Model of Firm Behavior

- Firms choose output y with convex costs $c(y)$
- Fraction of costs deductible for book and tax purposes (μ_b, μ_t) imply book income $y - \mu_b c(y)$ and taxable income $y - \mu_t c(y)$
- Firms can lie about costs $\hat{c}_t \neq c(y), \hat{c}_b \neq c(y)$, and pay convex penalties for misreporting $g(\hat{c}_t - c(y)), h(\hat{c}_b - c(y))$
- Firms can manipulate stock price $s(\hat{c}_b - c(y))$ with $s'(\cdot) < 0$

Model of Firm Behavior

- Firm problem taxing taxable income:

$$\max_{y, \hat{c}_t, \hat{c}_b} (1 - \tau)y - c(y) + \tau\mu_t\hat{c}_t - g(\hat{c}_t - c(y)) - h(\hat{c}_b - c(y)) + s(\hat{c}_b - c(y))$$

$$g'(\hat{c}_t - c(y)) = \tau\mu_t$$

$$h'(\hat{c}_b - c(y)) = s'(\hat{c}_b - c(y))$$

$$c'(y) = 1 - \tau \frac{1 - \mu_t}{1 - \tau\mu_t} \equiv 1 - \tau_{E,t}$$

- Firm problem taxing book income:

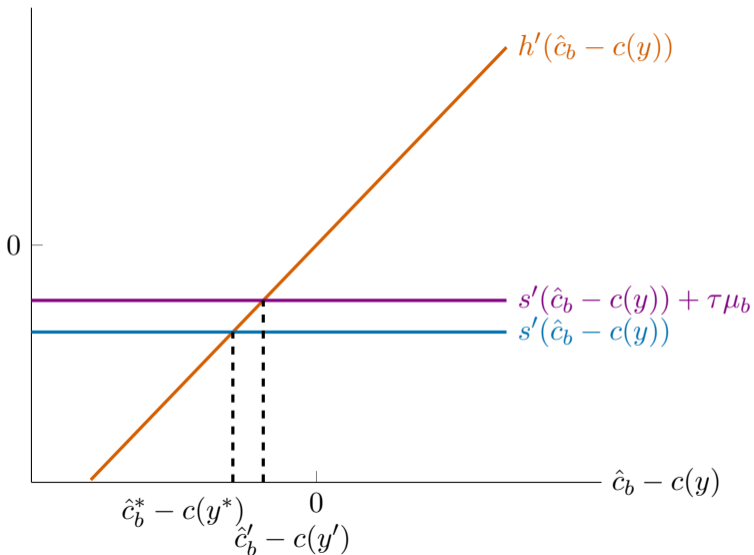
$$\max_{y, \hat{c}_t, \hat{c}_b} (1 - \tau)y - c(y) + \tau\mu_b\hat{c}_b - g(\hat{c}_t - c(y)) - h(\hat{c}_b - c(y)) + s(\hat{c}_b - c(y))$$

$$g'(\hat{c}_t - c(y)) = 0$$

$$h'(\hat{c}_b - c(y)) = s'(\hat{c}_b - c(y)) + \tau\mu_b$$

$$c'(y) = 1 - \tau \frac{1 - \mu_b}{1 - \tau\mu_b} \equiv 1 - \tau_{E,b}$$

Model of Marginal Firm Behavior



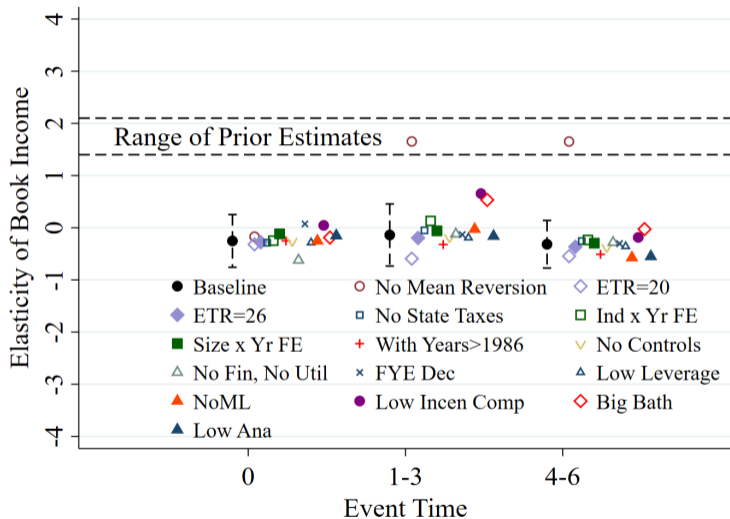
Model Takeaways

- Large avoidance responses if tax incentive dominates stock incentive
 - Large literature suggests stock incentive is strong:
 - ▶ Managers focus on reporting high earnings
 - ▶ Bunching at past earnings, 0 earnings, and analyst targets
 - ▶ Firms willing to pay additional tax on fraudulently high earnings
- Graham et al. 2005, Burgstahler and Dichev 1997, Terry 2017, Erickson et al. 2004
- Suggests we should observe more avoidance among firms with fewer incentives to report high earnings

Firms With Weaker Incentives to Report High Book Income

- Less incentive-based compensation
- Missing past earnings by large margins
- Less analyst coverage

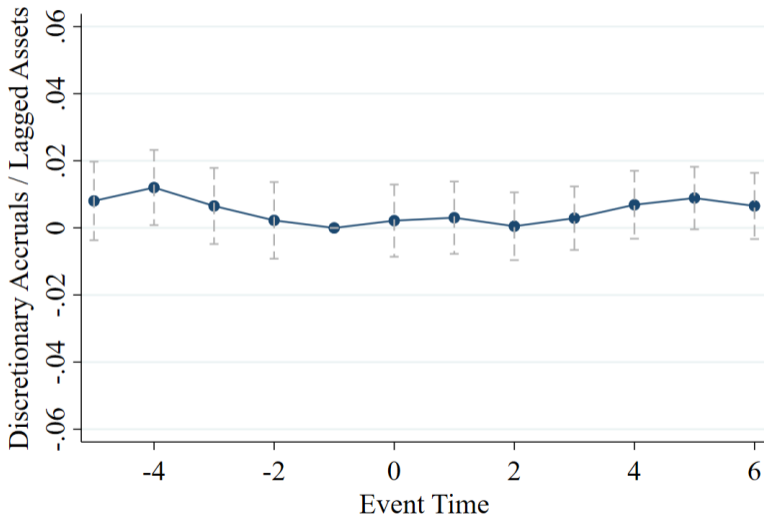
Tax Base Elasticity Estimates



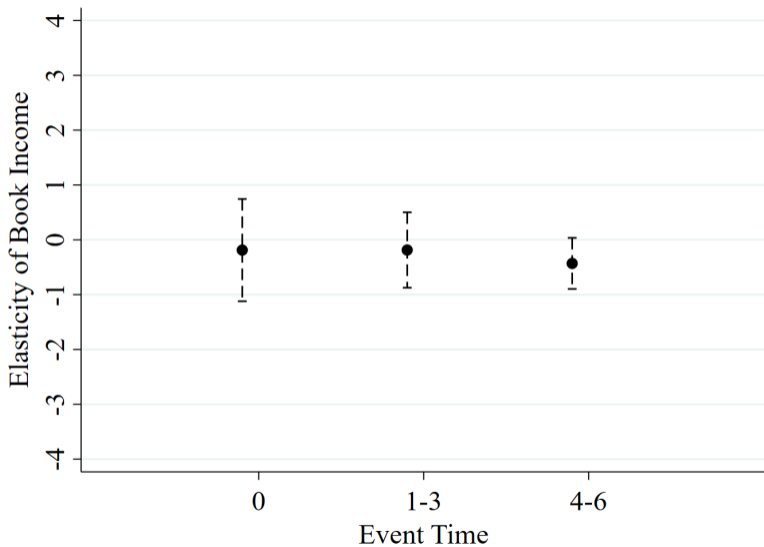
Earnings Management Responses

- *BTD* measure earnings management **and** tax planning behavior ▶ Single Year Treatment
- Do firms manage their earnings? Use discretionary accruals
 - ▶ Accruals: income for which cash has not yet been exchanged
 - ▶ Residualize on current economic conditions ▶ Construction
- No mechanical relationship with treatment definition ▶ Mean Reversion

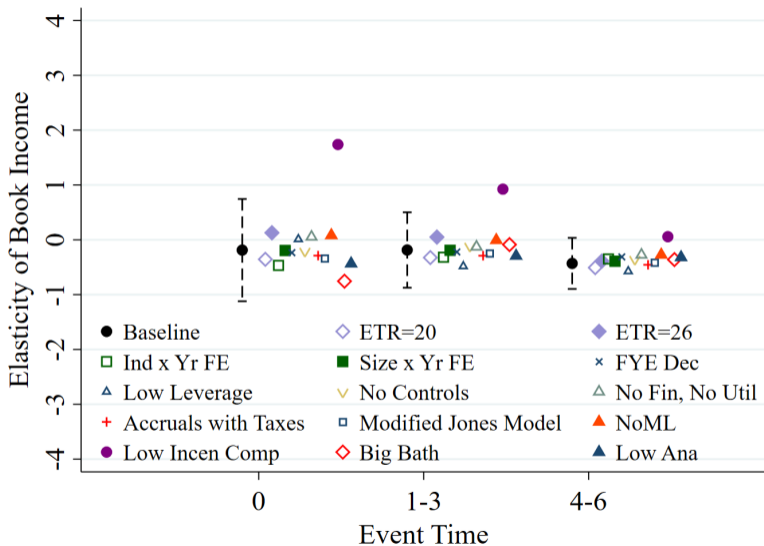
Earnings Management Responses



Earnings Management Elasticity Estimates



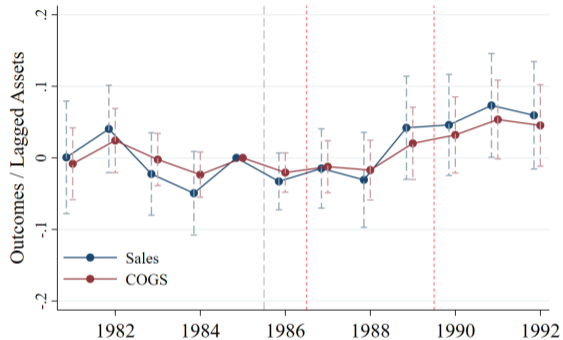
Earnings Management Elasticity Estimates



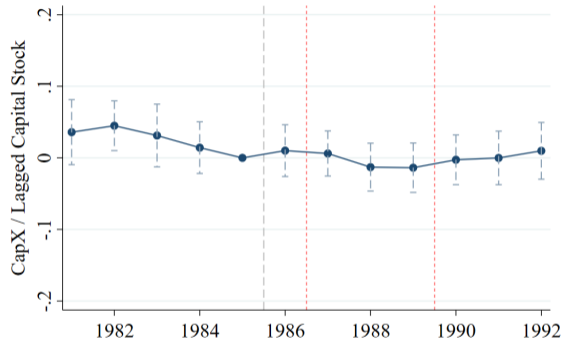
Discretionary Accrual Responses

- Focusing specifically on earnings management
- No mean reversion concerns, no taxable income shifting concerns
- $\varepsilon^{BI,EM} \in [-0.87, 0.50]$ over 1987-1989

Production and Investment Responses



(a) Output



(b) Investment

▶ Debt

▶ Employment

Output and Investment Responses

- Reject output declines $> 1\%$ per 1% change in the tax rate
- Reject investment declines $> 0.5\%$ per 1% change in the tax rate
- Consistent with model prediction that small change in effective tax rate τ_E leads to small change in output

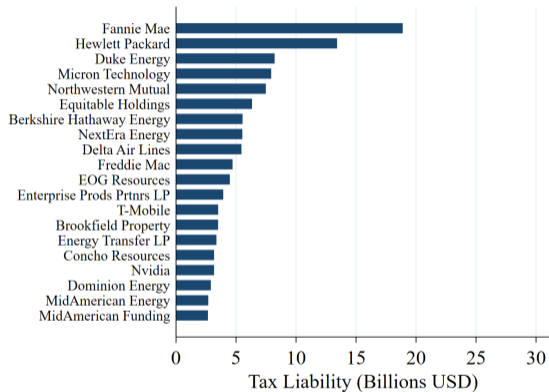
Policy

- Project revenue implications of proposed policy
 - ▶ 15% minimum tax on book income for firms with $> \$100\text{M}$ in income
 - ▶ Assume book income elasticities and project revenues over 10 year scoring window [▶ Details](#)
 - ▶ Assume 30% of tax liability recovered via credits
 - ▶ Firms can reduce tax liability with foreign tax credits and net operating loss deductions

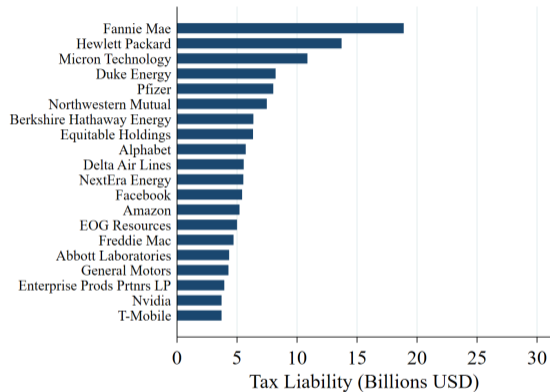
Revenue Scores

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: Baseline Scenarios</i>	Revenue	Top 10	Util	Manf	Fin	Tran
S1: $\varepsilon_t = \{0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0\}$	336	83	81	75	46	36
S2: $\varepsilon_t = \{0.0, 0.5, 0.5, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0\}$	294	76	73	64	40	32
S3: $\varepsilon_t = \{0.5, 0.5, 1.0, 1.0, 1.0, 1.5, 1.5, 1.5, 2.0, 2.0\}$	273	72	68	58	38	30
S4: $\varepsilon_t = \{1.0, 2.0, 3.5, 4.0, 4.5, 5.0, 5.0, 5.0, 5.0, 5.0\}$	167	51	43	32	28	17
<i>Panel B: No FTC Scenarios</i>	Revenue	Top 10	Util	Manf	Fin	Tran
S1: $\varepsilon_t = \{0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0\}$	416	91	82	86	81	39
S2: $\varepsilon_t = \{0.0, 0.5, 0.5, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0\}$	363	83	74	73	71	34
S3: $\varepsilon_t = \{0.5, 0.5, 1.0, 1.0, 1.0, 1.5, 1.5, 1.5, 2.0, 2.0\}$	335	80	69	66	65	31
S4: $\varepsilon_t = \{1.0, 2.0, 3.5, 4.0, 4.5, 5.0, 5.0, 5.0, 5.0, 5.0\}$	197	58	44	34	40	18

Largest Firm Liabilities



(a) Biden Book Income AMT



(b) Without Foreign Tax Credits

Revenue Scores

- Lots of firms have divergent book income and tax liabilities
- Breadth of tax base can restrict revenue, firms that pay
- Using prior elasticity estimates reduces revenue by $\approx 20\%$

Conclusion

- Estimate zero book income, earnings management and production/investment responses to AMTBIA87
 - ▶ Lower than previous work because I account for mean reversion
 - ▶ Non-tax motivations to report high book incomes mitigate avoidance
- Existing revenue scores of proposed book income AMTs underestimate revenues by using larger elasticities
- Is a book income AMT “good policy” ?
 - ▶ Depends on strength of incentives to report high book income
 - ▶ Should the FASB control the tax base? Impact of special interests? Stability of non-tax incentives?

Appendix

Relating ETRs to AMT Liability

$$BIA = 0.5(BI - (TI + TPA))$$

$$AMT = \max\{0.2(TI + TPA + BIA) - \tau TI, 0\}$$

$$\frac{AMT}{BI} = \max\left\{0.1 + 0.1f + [(0.1 - \tau) - 0.1f] \frac{TI}{BI}, 0\right\}$$

$$\frac{AMT}{BI} = \max\left\{0.1 + 0.1f - \left[\frac{\tau - 0.1}{\tau} + \frac{0.1f}{\tau}\right] ETR, 0\right\}$$

So a firm has positive AMT liability if

$$ETR_{87} < \frac{\tau_{87}(0.1 + 0.1f)}{(\tau_{87} - 0.1) + 0.1f} = 0.2 \implies ETR_{86} < 0.23$$

Summary Statistics

Table 1: Summary Statistics for 1985 Cross Section of Estimation Sample

	Observations	Mean	SD	P10	Median	P90
Lagged Assets	845	2854	5919	52	608	7365
Book Income	845	0.15	0.10	0.06	0.12	0.28
Taxable Income	845	0.11	0.10	0.01	0.09	0.25
Book Tax Differences	845	0.04	0.04	-0.01	0.03	0.08
Discretionary Accruals	845	0.00	0.06	-0.06	0.00	0.07
Sales	845	1.43	1.06	0.43	1.27	2.53
Costs of Goods Sold	845	0.97	0.85	0.23	0.80	1.86
Investment	840	0.23	0.17	0.07	0.19	0.46
Debt	844	0.27	0.10	0.14	0.29	0.39
Depreciation	845	0.05	0.03	0.02	0.04	0.08
Depletion	845	0.01	0.02	0.00	0.00	0.04
Employment	819	11.62	24.26	0.30	3.11	31.30

Deferred Tax Expense

- Firms report BI , current tax expense and deferred tax expense on their financial statements
- $BTD = BI - \widehat{TI}$. I estimate $\widehat{TI} = \text{current tax expense}/\tau$
- Temporary BTD reclassify tax expense from current to deferred
 - ▶ \$100 bonus depreciation in excess of straight line depreciation creates a \$100 BTD and reduces TI by \$100
 - ▶ For accounting purposes, the firm should have owed $\$100\tau$ in current tax expense based on its current period taxable book income
 - ▶ The $\$100\tau$ is recorded as deferred tax expense. It will “come due” in some future period when bonus is less than straight line depreciation

ETR Autocovariance Tests

- Under iid sampling and finite fourth moments, vector of variances and autocovariances of ETR , \hat{m} , follows $\sqrt{N}(\hat{m} - m) \rightarrow \mathcal{N}(0, V)$, where $\hat{V} = \frac{1}{N} \sum_i (m_i - \hat{m})(m_i - \hat{m})'$ is a consistent estimate of V
- Wald test for equality of ETR autocovariances at 1, 2 and 3 lags across all years 1981-1992

$$W = \sqrt{N} [R\hat{m} - g]' (R\hat{V}R)^{-1} [R\hat{m} - g]$$

Table: Autocovariance Tests

Hypothesis	DoF	Wald Stat
$Cov(ETR_{t+2}, ETR_{t+1}) = Cov(ETR_{t+1}, ETR_t) \forall t \in [1981, 1990]$	10	0.89
$Cov(ETR_{t+3}, ETR_{t+1}) = Cov(ETR_{t+2}, ETR_t) \forall t \in [1981, 1989]$	9	1.39
$Cov(ETR_{t+4}, ETR_{t+1}) = Cov(ETR_{t+3}, ETR_t) \forall t \in [1981, 1988]$	8	1.62

Distributed Lag Regressions

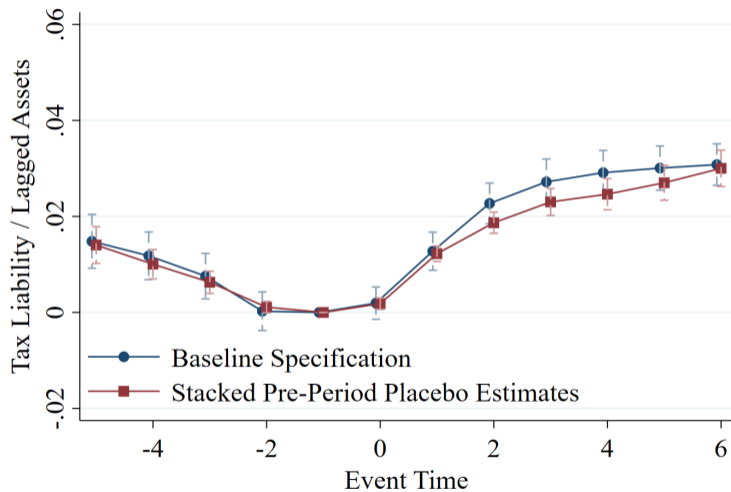
- Does relationship between ETR and BTD change around AMTBIA87?
 - ▶ Estimate $\Delta BTD_{it} = \beta_0 \Delta ETR_{it} + \beta_1 \Delta ETR_{it-1} + \Delta \varepsilon_{it}$
 - ▶ Coefficients same before and after AMTBIA87, using OLS and IV

▶ Quasi-Experimental Set Up

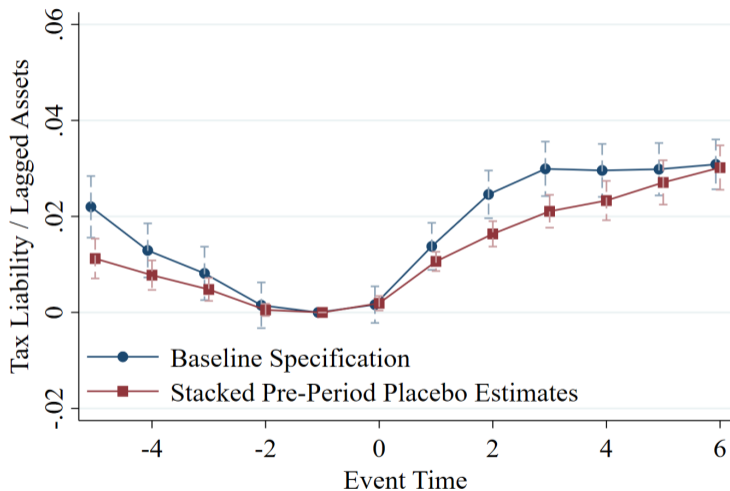
▶ Distributed Lag Table

Variable	OLS (1)	IV (2)
ΔETR_t	-0.12 (0.01)	-0.15 (0.04)
$\Delta ETR_t \times Post$	-0.01 (0.01)	-0.05 (0.08)
ΔETR_{t-1}	-0.00 (0.01)	
$\Delta ETR_{t-1} \times Post$	-0.00 (0.01)	
Observations	1261	1261
Clusters	343	343
F Stat		3.16
LM Stat		5.43

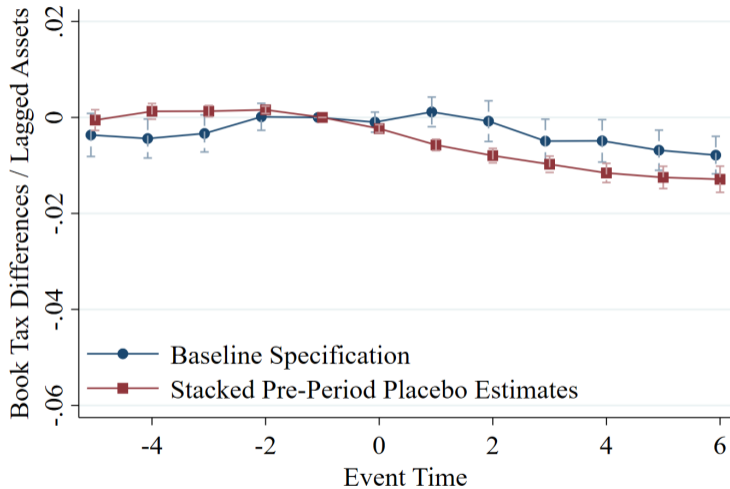
Tax Liability Estimates



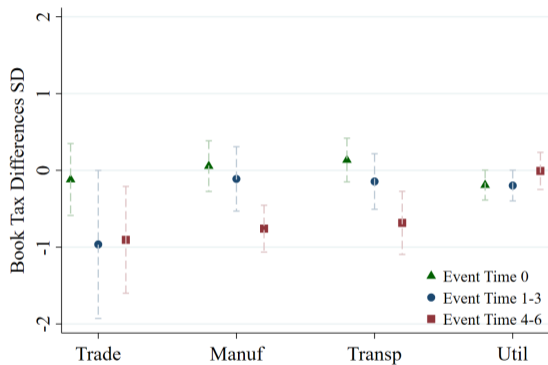
Tax Liability Estimates: No Multinationals No Losses



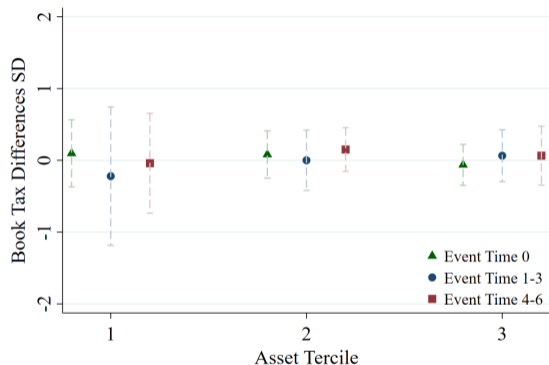
Permanent Book Tax Difference Responses



Book Tax Difference Response Heterogeneity



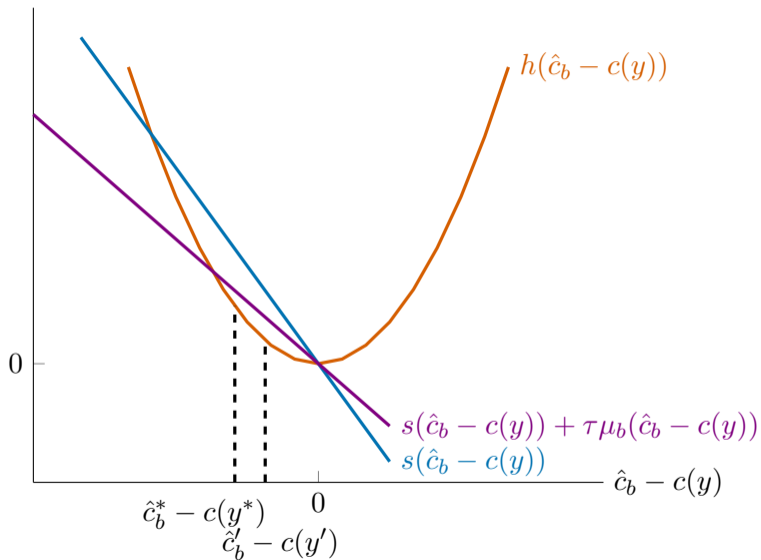
(a) BTD Industry Heterogeneity



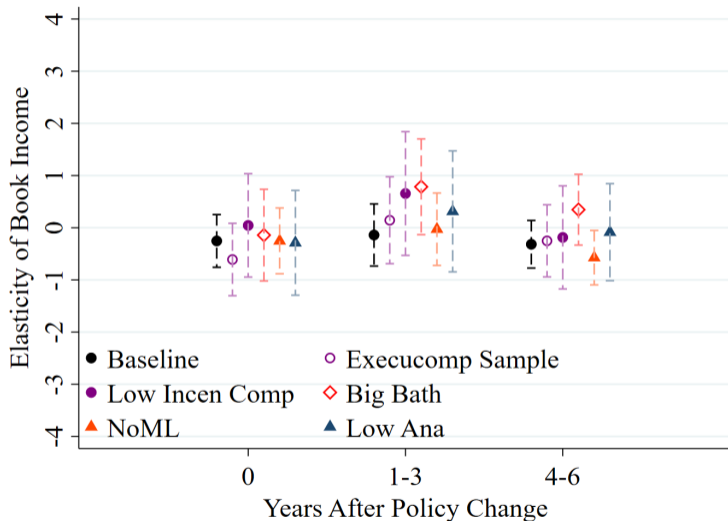
(b) BTD Size Heterogeneity

▶ No Avoidance

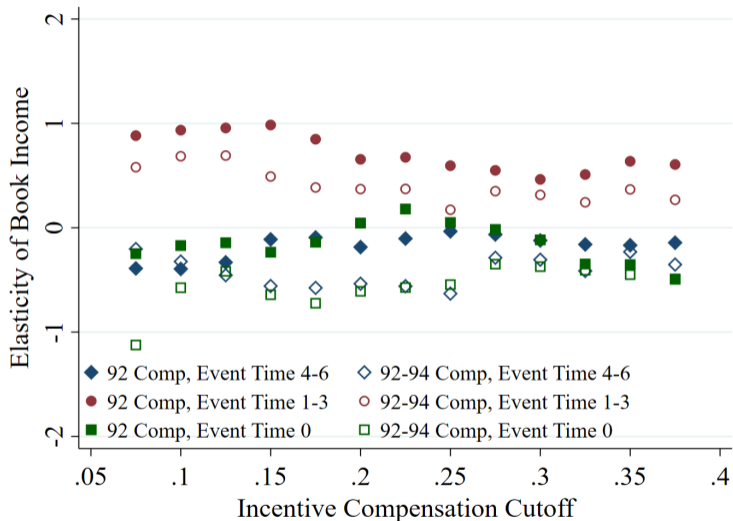
Model of Firm Behavior



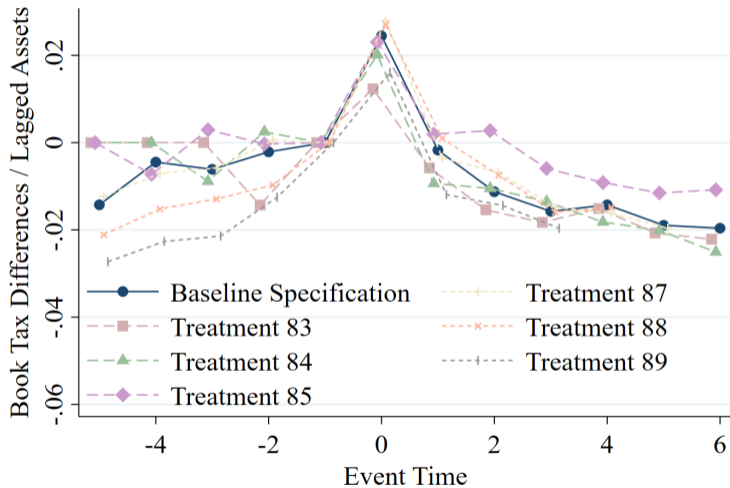
Robustness for Tax Base Elasticity Estimates



Varying Incentive-Based Compensation Cutoffs



Single Year Treatment Definition



Constructing Discretionary Accruals

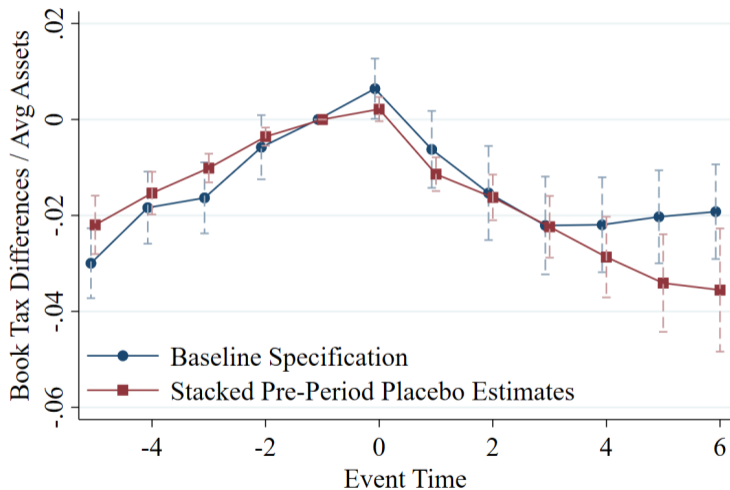
- Total accruals: $TA_t = \Delta A_t - \Delta Liab_t - \Delta Cash_t + \Delta Taxes_t - Dep_t$
- Discretionary accruals: residual of a regression of total accruals on assets, change in sales and PPE. “Jones (1991) Model”

$$\frac{TA_{i,t}}{A_{i,t-1}} = \sum_{j=1}^J \beta_{1,j} \frac{1}{A_{i,t-1}} + \beta_{2,j} \Delta \frac{Sales_{i,t}}{A_{i,t-1}} + \beta_{3,j} \frac{PPE_{i,t}}{A_{i,t-1}} + \psi_j + \varepsilon_{i,t}$$

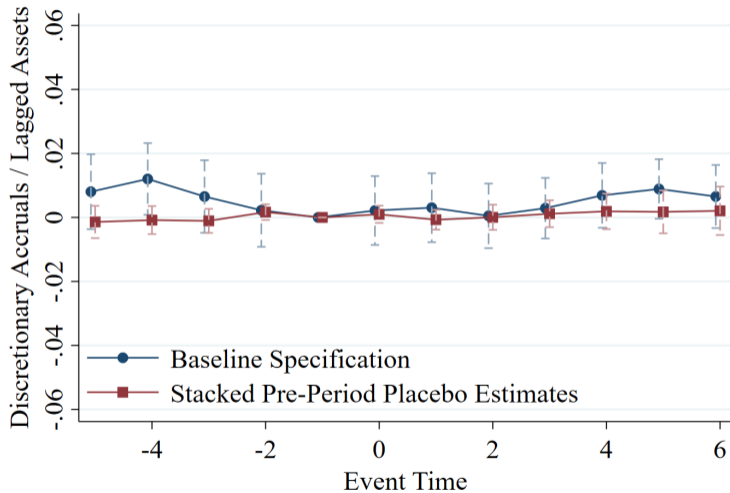
$$DA_{i,t} = TA_{i,t} - \widehat{TA}_{i,t}$$

- Run regression on all firms in pre-period, make predictions across full time series

Book Tax Differences Baseline and Stacked Event Study



Discretionary Accruals Mean Reversion Test



Incentives

- Stylized firm tax liability is $\max\{\tau_t(y - \mu_t \hat{c}_t), \tau_b(y - \mu_b \hat{c}_b)\}$
- Firms pay minimum tax on BI if $\frac{y - \mu_t \hat{c}_t}{y - \mu_b \hat{c}_b} < \frac{\tau_b}{\tau_t}$ (below cutoff)
- Marginal incentives around the minimum tax cutoff:

FOC	(1) Book Income	(2) Taxable Income
$c'(y)$	$1 - \tau_{E,b}$	$1 - \tau_{E,t}$
$g'(\hat{c}_t - c(y))$	0	$\tau_t \mu_t$
$h'(\hat{c}_b - c(y))$	$s'(\hat{c}_b - c_b(y)) + \tau_b \mu_b$	$s'(\hat{c}_b - c_b(y))$

- Book income tax decreases output, decreases tax evasion, brings book avoidance back towards 0

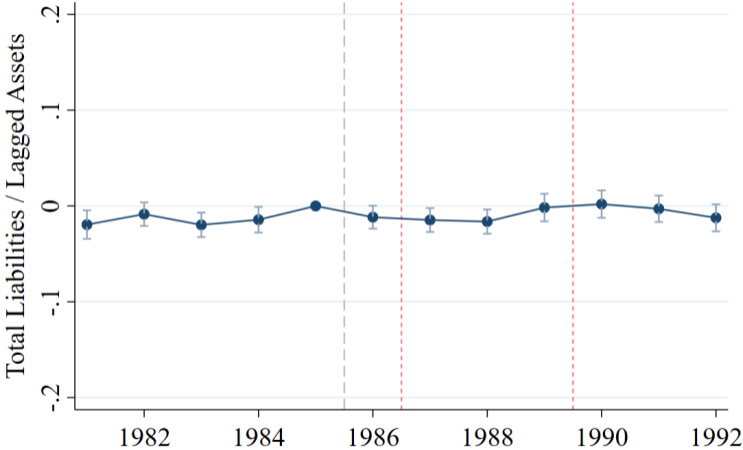
Model Calibration

- Requires firm heterogeneity in productivity, ease of tax and book evasion/avoidance, and fixed costs $\{A_i, T_i, B_i, F_i\}$ to rationalize profit and evasion dispersion
- Reasonable to assume constant elasticity production, tax evasion, and book avoidance costs
- Form of stock-based incentives $s()$ unclear Terry, Whited and Zakolyukina (2021)
- Potential weight on stock-based incentives unclear Desai and Dharmapala (2006)

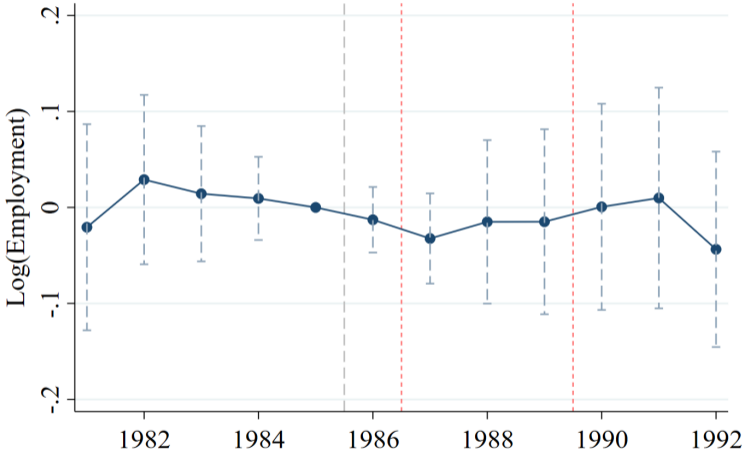
Challenges/Questions

- Empirical estimates inform elasticities $\varepsilon_y, \varepsilon_{\hat{c}_b - c_b}$
 - ▶ Challenge: Interested in level of book AND tax evasion/avoidance with and without BI min tax
 - ▶ I measure book avoidance with tax, can maybe use control firms to look at book avoidance without tax?
 - ▶ Very difficult to measure evasion/avoidance under TI system, $\varepsilon_{\hat{c}_t - c_t}(y)$
 - ▶ One possibility: split BTD into accrual component and tax avoidance component (Desai and Dharmapala 2005, 2009), doesn't identify levels
- Functional form for impact of earnings manipulation on stock price?

AMTBIA87 Debt Responses



AMTBIA87 Employment Responses



Scoring the Proposed Biden Book Income AMT

- Use 2018 cross section of Compustat firms present in 2017 and 2018, project income and tax variables over 10 year period using CBO GDP forecasts, incorporate behavioral response estimates into book income projections
- Revenue Scores depend on choice of ε_t

$$BI_t = BI_t^{mech} + \varepsilon_t \cdot BI_t^{mech} \cdot \frac{\Delta(1 - \tau)}{1 - \tau} \cdot \mathbb{1}(T = 1)$$

► Revenue Score

SOI Compustat Aggregates Comparison

