Firm Responses to Book Income Alternative Minimum Taxes *

Jordan Richmond, February 12, 2021

Abstract

Policy-makers have recently suggested implementing book income alternative minimum taxes (AMTs) to ensure profitable firms face some tax liability. However, research exploring the economic implications of these policies is scarce. In this paper, I use a differences-in-differences approach to study firm responses to the AMT book income adjustment in 1987. Firms manage their earnings to avoid the tax, corresponding to a three-year book income elasticity of 3.62 and six-year elasticity of 3.21, but do not exhibit significant real production or investment responses. Simulations applying firm avoidance responses suggest modern book income AMT proposals would raise substantial tax revenue.

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> "You cannot go to a mill where somebody is making $20,000 a year and attempt to explain to them why a major American corporation can have over $1 billion in profits and pay no taxes." – Senator Bob Packwood on alternative minimum taxes[1]

In 2017, Amazon reported $5.6 billion in profit but paid $0 in taxes (Gardner, 2020). Profitable firms like Amazon with very small tax bills often face public ire, and their existence undermines public perceptions of a fair tax code. Over the last forty years in the United States, tax policymakers have attempted to eliminate the divergence of some firms' incomes and tax liabilities by imposing alternative minimum taxes (AMTs). Profitable firms can owe small tax bills because the tax code includes deductions and credits meant to incentivize productive economic behavior, but substantial use of these incentives can eliminate all tax liabilities. AMTs assign a lower tax rate to a broader tax base that excludes many deductions and credits, implicitly limiting economic incentives in an effort to raise revenue from profitable firms and bolster public perceptions of tax code fairness.

In both the United States and OECD talks, recent tax proposals have included an AMT based on *book income*, the income firms report on their financial statements. These proposals may be appealing because book income provides a broad tax base, suggesting a book income AMT could effectively raise revenue from profitable firms that pay few taxes. However, a book income AMT's capacity to raise revenue may be limited by tax avoidance because firms have substantial discretion to determine their own book incomes (Manzon and Plesko, 2002), while broadening the tax base could lead firms to make inefficient changes to their production and investment policies.

In this paper, I estimate firm responses to a book income AMT by exploiting variation in the minimum tax rate on book income introduced by the alternative minimum tax book income adjustment (AMTBIA87) in 1987. AMTBIA87 is the only U.S. AMT that has ever incorporated book income into the tax base. I use a differences-in-differences empirical strategy that compares firms more likely to be subject to the AMT on book income (treatment) to firms less likely to face the tax (control), dividing firms into treatment and control groups based on their effective tax rates in 1986. This empirical approach identifies firm responses off the difference in the evolution of outcomes for firms that are more or less likely to face the book income AMT, assuming that their outcomes would have evolved similarly in the

[1] U.S. Senate Finance Committee Hearing. May 3, 1995. "Alternative Minimum Tax".

absence of the policy.

Using Compustat data, I find strong evidence that firms manage their earnings to avoid AMTBIA87. My preferred point estimates suggest that over a three-year time horizon the elasticity of book income with respect to the net of tax rate is 3.62, while over a six-year time horizon the elasticity of book income is 3.21. I measure firms' earnings management responses using book tax differences, which reflect discretionary changes firms can make to their book incomes while holding fixed investment and production responses. These avoidance elasticities are roughly ten times larger than estimates of the elasticity of corporate taxable income in the U.S. and U.K. (Gruber and Rauh, 2007; Devereux, Liu and Loretz, 2014), reinforcing that they are unlikely to reflect real economic responses to AMTBIA87.

Robustness checks indicate that my estimates of tax avoidance are unlikely to be driven by mean reversion or simultaneous tax policy changes included in the Tax Reform Act of 1986 (TRA86). Placebo differences-in-differences series that split firms into treatment and control groups based on effective tax rates in earlier tax years exhibit book tax difference spikes in the year of the split that revert to 1985 levels in the subsequent year, suggesting mean reversion is unlikely to drive the results. Meanwhile, TRA86 included concurrent tax policy changes that reduced the corporate rate and increased the cost of capital - reforms that *a priori* might have differential impacts across firms in the treatment and control groups based on different industry, firm size and effective tax rate compositions. However, various differences-in-differences specifications that flexibly control for these firm characteristics all yield similar estimates of tax avoidance.

This paper adds to a substantial literature that uses financial statement or tax data to estimate earnings management responses to AMTBIA87 (Gramlich, 1991; Dhaliwal and Wang, 1992; Boynton, Dobbins and Plesko, 1992; Manzon, 1992; Wang, 1994; Choi, Gramlich and Thomas, 2001). AMTBIA87 was announced in 1986 but not implemented until 1987, creating an opportunity for firms to shift book income out of the period the tax was in effect and into 1986. Therefore, earlier work focused on measuring strategic shifting of book income out of 1987 and into 1986 to avoid the tax altogether, and book income decreases in 1987 to reduce tax liability. While the earlier literature established a consensus that firms decreased their book incomes in 1987, substantial debate persisted over the presence and

magnitude of book income increases in 1986.

This paper builds on the earlier AMTBIA87 literature in four ways. First, I show that previous studies underestimate book income elasticities by not accounting for pre-trends. Second, I estimate firm responses over a longer time frame from 1986-1992, finding that avoidance responses stabilize over a four- to six-year time horizon. Third, I show that any perceived book income shifting into 1986 can be attributed to selection in the treatment definition rather than tax avoidance. Finally, I explore heterogeneity across firm sizes, industries, and tax exposure intensities to shed light on mechanisms underlying firm responses.

Additional differences-in-differences estimates show that firms are unlikely to respond to a book income AMT by modifying their production or investment policies. Using revenues, costs of inputs, investment and debt as outcomes, I fail to reject the null hypothesis of zero response to AMTBIA87 in any year from 1987-1992 for all four outcomes. Complementary instrumental variables analysis suggests that increases in total tax liability stemming from AMTBIA87 increase tax revenues, but have no detectable impact on firm revenue, costs of inputs, investment or debt.

The estimates of tax avoidance and lack of evidence for investment and production changes in this paper are consistent with economic models of firm responses to taxation suggesting that, if possible, firms will evade or avoid taxes before making real economic changes. Existing research on minimum tax schemes in Pakistan, Hungary, Guatemala and Honduras emphasizes that firms evade minimum taxes by overreporting costs rather than by making changes to production or investment (Best, Brockmeyer, Kleven, Spinnewijn and Waseem, 2015; Mosberger, 2016; Alejos, 2018; Lobel, Scot and Zuniga, 2020). In Costa Rica, firms over-report costs to escape higher tax rates, and in Spain, firms under-report revenues to escape increased government scrutiny (Bachas and Soto, Forthcoming; Almunia and Lopez-Rodriguez, 2018). While the U.S. is generally thought to have higher tax enforcement capacity than these other countries, flexible accounting standards allow firms to avoid AMTBIA87 just as they might evade a minimum tax in a lower-enforcement environment.

In light of firm responses to AMTBIA87, contemporary proposals to implement a book income AMT will accomplish their goals if they successfully raise revenue from profitable firms with low tax bills despite firms' tax avoidance responses. To evaluate the implications

of the earnings management that I estimate in response to AMTBIA87 for contemporary policies, I develop a ten-year revenue score for the book income AMT included in Joe Biden's 2020 tax plan. My revenue scoring methodology simulates the evolution of book incomes over the scoring time frame, incorporating estimates of firm tax avoidance into the simulation.

In my preferred revenue score that directly applies point estimates of avoidance responses to AMTBIA87, I estimate that the proposed Biden book income AMT would raise $286 billion over a decade. Roughly three-quarters of the tax revenue comes from utilities, finance, manufacturing and transportation firms, and close to one-third of the revenue comes from the ten firms facing the largest tax liability increases. Hewlett Packard, Berkshire Hathaway Energy and Delta Air Lines are among the firms facing the largest tax liability increases. However, Amazon only faces the 22$^{\text{nd}}$ largest tax liability increase because foreign tax credits and net operating losses reduce their book income AMT liability. These results suggest that, even after accounting for tax avoidance, a book income AMT could raise revenue from profitable firms, but that the specific design of any book income AMT may leave leeway for profitable firms like Amazon to mitigate increases in tax liability.

By varying elasticity assumptions in revenue simulations, I also show that revenue scores of the proposed Biden book income AMT by third parties are often inconsistent with the avoidance responses I estimate to AMTBIA87. For example, to match the Biden campaign's revenue estimate, I need to assume close to zero avoidance responses to the policy, while to match the American Enterprise Institute estimate, I need to assume avoidance responses more than four times as large as firm responses to AMTBIA87.

The rest of the paper is organized as follows. Section I describes tax policy details. Section II describes the data and section III describes the empirical strategy. Sections IV and V estimate firm tax avoidance and production and investment responses to AMTBIA87. Section VI incorporates estimates of firm tax avoidance into revenue scores of the proposed Biden book income AMT. Section VII concludes.

I Tax Policy Details

Alternative minimum tax liability in the U.S. is calculated as the excess of potential AMT liability over normal tax payments. Potential AMT liability is the AMT rate applied to a broad income base called alternative minimum taxable income (AMTI), defined as taxable income (TI) plus tax preferences and adjustments (TPA) that add deductions and credits back to taxable income. TRA86 set the AMT rate at 20%, and introduced AMTBIA87, which broadened the AMT base with a book income adjustment (BIA) by adding 50% of the difference between $AMTI$ and book income (BI) to the tax base. In equations,

$$\begin{aligned} BIA &= 0.5\Big(BI - (TI + TPA)\Big), \\ AMT &= \max\Big\{0.2\Big(TI + TPA + BIA\Big) - \tau TI, 0\Big\}. \end{aligned} \tag{1}$$

In short, AMTBIA87 imposed a 10% marginal tax rate on book income in excess of $AMTI$ for any firms subject to the AMT.

Congress voted to adopt TRA86 in 1986, so that firms were aware of AMTBIA87 while filing their 1986 financial statements. AMTBIA87 went into effect the next year, in 1987. This window provided an opportunity for firms to respond to AMTBIA87 through advanced accounting planning before the policy went into effect.

During the legislative debate over TRA86 Congress considered multiple AMT reforms. Congress was unsure whether they should implement AMTBIA87, or the adjusted current earnings adjustment (ACEA90), which aimed to construct a measure of income as broad as book income using tax principles (Redmond Soneff, 1986). In the final version of TRA86, Congress chose to implement AMTBIA87 from 1987-1989 and replace it with ACEA90 in 1990, but also commissioned a Treasury study due before the 1990 switch to explore the impacts of both AMT policies (Redmond Soneff, 1986). While this congressional hedging likely caused some uncertainty about whether AMTBIA87 would be replaced with ACEA90, the policy switch occurred in 1990 as originally specified.

ACEA90 imposed a 20% tax on three-quarters of the difference between a corporation's

adjusted current earnings (ACE) and their $AMTI$. In equations,

$$
\begin{aligned}
ACEA &= 0.75\Big(ACE - (TI + TPA)\Big), \\
AMT &= \max\{0.2\Big(TI + TPA + ACEA\Big) - \tau TI, 0\}.
\end{aligned} \tag{2}
$$

ACE attempted to construct a measure of income as broad as book income using tax principles by eliminating deductions that restricted the breadth of $AMTI$ and broadening the $AMTI$ base (Janiga, 1988).[2] Finally, both AMTBIA87 and ACEA90 generated minimum tax credits that could be used to reduce normal tax liability down to minimum tax liability in future years where firms did not pay the AMT.[3]

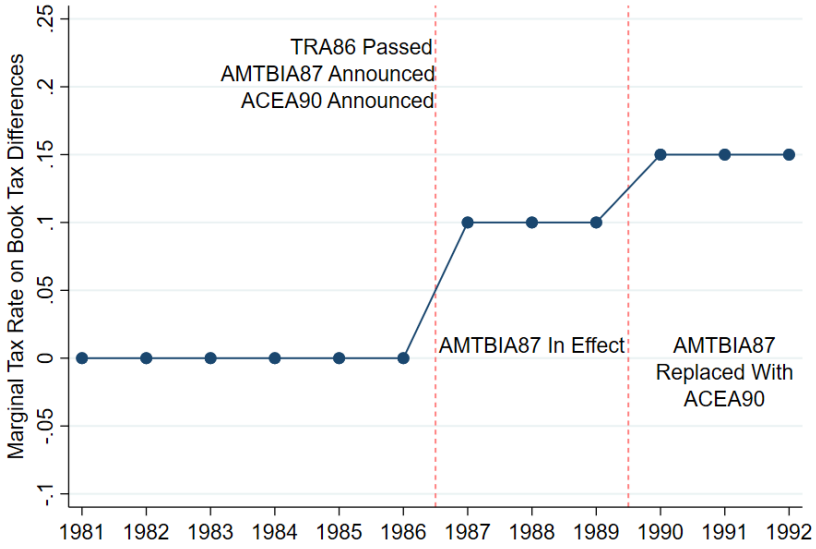


Figure 1: Marginal Tax Rates on Book Tax Differences

Notes: This figure presents the evolution of marginal tax rates on book tax differences due to the alternative minimum tax book income adjustment (AMTBIA87) and the adjusted current earnings adjustment (ACEA90). Tax rates assume proper controls for tax preferences and adjustments, and after 1990 assume adjusted current earnings (ACE) are equivalent to book income.

[2]For example, ACE includes depreciation that is allowed as a deduction for $AMTI$ purposes. ACE also includes forms of income excluded from $AMTI$ like interest on tax-exempt bonds and income on annuity contracts. Janiga (1988) provides additional details.

[3]AMT credits have historically been awarded for deferral items that cause temporary differences between AMTI and taxable income over time like depreciation, but not exclusion items that cause permanent differences over time like exclusions for small business stock gains. These credits therefore reduce tax burdens over the long-run particularly in capital intensive industries.

After controlling for TPA and assuming ACE is equivalent to book income, both AMTBIA87 and ACEA90 imposed marginal taxes on book tax differences. I summarize variation in the marginal tax rate on book tax differences over time in Figure 1. There was no tax on book tax differences before 1987. From 1987-1989 AMTBIA87 imposed a 10% marginal tax rate on book tax differences. Starting in 1990, the replacement of AMTBIA87 with ACEA90 increased the marginal tax rate on book tax differences to 15%.

II Data

To evaluate how firms respond to AMTBIA87, I construct a balanced panel of large, persistent Compustat firms that were the target of AMTBIA87, and are also likely to be the type of firms targeted by any contemporary book income AMTs. To construct this panel, I restrict to firms that appear in every year from 1981-1992 with positive, non-missing assets, sales and pretax income that are incorporated in the U.S. and have 1986 EBITD over $100 million.[4] I end the panel in 1992 because the Omnibus Budget Reconciliation Act of 1993 changed the ACEA90 tax base.[5]

Table 1 provides summary statistics for a 1985 cross section of my sample, with all variables rescaled into 2018 dollars.[6] Means far exceed medians for most variables across the whole sample, reflecting the skewed firm size distribution. The sample only includes 8% of all firms in Compustat in 1985, but these firms hold 32% of all assets and take in 33% of all revenues. While these firms are not representitive of the economy as a whole, they reflect the set of firms targeted by AMTs.

They key variable I use to categorize firms into treatment and control groups is the effective tax rate, because firms with lower effective tax rates are more likely to face AMTBIA87. I measure effective tax rates as tax liability divided by book income, following Collins and Shackleford (2004) to define tax liability as total income taxes minus deferred income taxes

[4] I calculate earnings before interest, taxes, and depreciation as income before extraordinary items plus extraordinary items and discontinued operations plus interest expense plus taxes plus depreciation and amortization.

[5] OBRA eliminated the adjusted current earnings depreciation adjustment for property placed in service after 1993, effectively narrowing ACE by allowing depreciation deductions.

[6] I inflate to 2018 dollars using the GDP price deflator from NIPA table 1.1.9, "Implicit Price Deflators for Gross Domestic Product" from the BEA.

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

	Observations	Mean	P10	Median	P90
Assets	615	7545	569	2627	17621
Book Income	615	556	77	228	1220
Taxable Income	615	379	17	146	756
Book Tax Differences	615	167	−6	69	518
Sales	615	4291	598	1995	9917
Costs of Goods Sold	615	2874	309	1265	6649
Investment	567	0.23	0.07	0.17	0.46
Debt	614	0.29	0.17	0.29	0.41
Depreciation	615	237	2	72	468
Depletion	615	52	0	0	162
Interest Expense	615	215	1	51	465
Employment	615	33	3	12	81

Notes: This table reports summary statistics for a 1985 cross section from the sample of firms used to estimate firm responses to the alternative minimum tax book income adjustment. Statistics are in millions of USD, expect for counts, thousands of employees, investment (capital expenditure per dollar of lagged net property plant and equipment) and debt (total liabilities per dollar of total assets).

minus other taxes.

The key outcomes to measure firm tax avoidance, production, and investment responses are book tax differences, sales, costs of goods sold, investment, and debt. Book tax differences, defined as the difference between book income and taxable income, is a common measure of earnings management and tax sheltering that captures discretionary changes firms make to their book incomes rather than production or investment responses (Hanlon, 2005; Wilson, 2009).[7] By construction, this variable captures the portions of book income not included in taxable income, explicitly excluding firm taxable income changes that could arise in response to changes in the corporate tax rate.[8] I define investment as capital expenditure per dollar of lagged net property plant and equipment (Cummins, Hasset and Hubbard, 1994; Desai and Goolsbee, 2004; Edgerton, 2010; Ohrn, 2018) and debt as total

[7]Following Collins and Shackleford (2004) I define taxable income as total tax liability divided by the marginal tax rate.

[8]A few important differences between book and taxable income are that book income includes all majority-owned foreign and domestic subsidiaries while taxable income does not, and that firms have significantly more discretion to modify book income than taxable income because generally accepted accounting principles that define book income give managers discretion to choose different methods of income measurement.

liabilities per dollar of lagged assets (Edgerton, 2010; Ohrn, 2018). A substantial fraction of finance firms in the sample are missing information required to construct the investment variable. I also winsorize all outcome variables at the 1st and 99th percentile.

III Empirical Strategy

AMTBIA87 was more likely to apply to firms with lower effective tax rates that report fewer taxes paid on their financial statements. Building on previous analyses of AMTBIA87 (Dhaliwal and Wang, 1992), I assess firm responses to the policy by comparing two groups of firms, a treatment and control group, that are more and less likely to be subject to the AMT based on their effective tax rate (ETR).[9] I compare firms with ETRs $< 23\%$ (treatment) to firms with ETRs $\geq 23\%$ (control) in 1986. The 23% ETR cutoff represents the ETR at which firms are likely to no longer have to pay alternative minimum tax. I discuss the details of this calculation in Appendix A. To execute the comparison between my treatment and control groups, I estimate

$$Y_{it} = \sum_{\tau=1981, \tau \neq 1985}^{1992} \left(\beta_\tau \cdot Treat_{i\tau}\right) + \beta_1 X_{it} + \beta_2 Treat_i \cdot X_{it} + \delta_t + \gamma_i + \varepsilon_{it}, \tag{3}$$

where $Treat_i$ is an indicator equal to 1 if ETR $< 23\%$ in 1986 and 0 if ETR $\geq 23\%$ in 1986. $Treat_{i\tau}$ is the interaction of $Treat_i$ and a year indicator ($year = \tau$), X_{it} are time varying firm-level covariates, δ_t are year fixed effects, and γ_i are firm fixed effects.

I can interpret the β_τ coefficients in equation (3) as the causal impacts of AMTBIA87 on outcome variables under the assumption that the outcome variables in the treatment and control group would have evolved similarly in the absence of the policy. However, I also relax this assumption to allow for linear pre-trends[10] by estimating

$$Y_{it} = \alpha \cdot Treat_i \cdot t + \sum_{\tau=1986}^{1992} \left(\beta_\tau \cdot Treat_{i\tau}\right) + \beta_1 X_{it} + \beta_2 Treat_i \cdot X_{it} + \delta_t + \gamma_i + \varepsilon_{it}. \tag{4}$$

In equation (4), the β_τ coefficients can be interpreted as the causal effect of AMTBIA87 on

[9] I measure effective tax rates as tax liability divided by book income in each year.

[10] For another example of this approach, see Dobkin, Finklestein, Kluender and Notowidigdo (2018).

firm outcomes under the assumption that any linear outcome trend for treatment relative to control firms in the pre-period would have continued in the absence of AMTBIA87.

Equations (3) and (4) estimate firm responses to AMTBIA87 using a binary treatment approach, identifying the average treatment effect of the policy before and after allowing for linear pre-trends. However, firms subject to AMTBIA87 faced different levels of tax liability increases, and therefore may be subject to different treatment intensities. To account for the possibility that firms respond to AMTBIA87 heterogeneously depending on the level of tax liability increase they face, I also estimate

$$(5) \qquad Y_{it} = \sum_{\tau=1981, \tau \neq 1985}^{1992} \left(\beta_\tau \cdot Liab_{i\tau}\right) + \beta_1 X_{it} + \beta_2 Liab_i \cdot X_{it} + \delta_t + \gamma_i + \varepsilon_{it},$$

$$(6) \qquad Y_{it} = \alpha \cdot Liab_i \cdot t + \sum_{\tau=1986}^{1992} \left(\beta_\tau \cdot Liab_{i\tau}\right) + \beta_1 X_{it} + \beta_2 Liab_i \cdot X_{it} + \delta_t + \gamma_i + \varepsilon_{it},$$

where $Liab_i$ is the interaction of an indicator for the treatment group and 10% of 1986 book tax differences, and $Liab_{i\tau}$ is the interaction of $Liab_i$ and a year indicator. Equation (5) parametrically controls for treatment intensity, and equation (6) modifies (5) to allow for linear pre-trends.

IV Tax Avoidance Responses

I use book tax differences as the outcome Y_{it} in equations (3) - (6) to measure tax avoidance responses to AMTBIA87 for two reasons. First, book tax differences capture discretionary changes firms can make to their book incomes, holding fixed production and investment behavior captured by taxable income by measuring the portion of book income that is by definition not part of taxable income. Second, as displayed in equation (1), AMTBIA87 levied a tax on $BTD - TPA$. TPA account for an average of 39% of book tax differences across 1987-1989, but 88% of these TPA can be attributed to depreciation and depletion (Gill and Treubert, 1992). Therefore, after controlling for depreciation and depletion, using book tax differences as an outcome focuses estimation directly on the portion of income

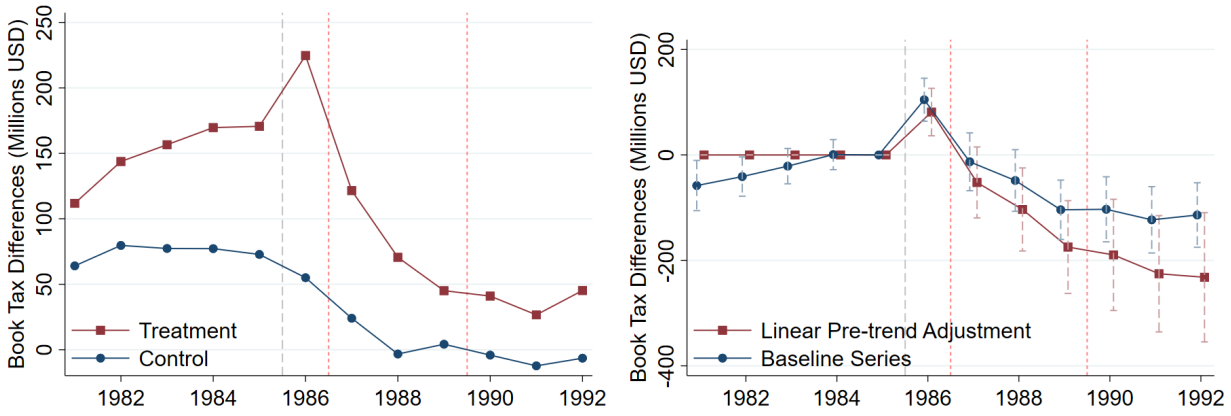
taxed by AMTBIA87 without capturing taxable income responses.[11]

To portray the raw data over time, Figure 2, panel (a) plots the progression of book tax difference means by year for treatment and control firms. Three important points arise from panel (a). First, book tax differences appear to increase for treatment relative to control firms in the pre-period. Second, treatment firms exhibit a sharp increase in book tax differences in 1986, providing suggestive evidence that firms responded to AMTBIA87 by shifting book income into 1986. Finally, book tax differences decline for treatment firms relative to control firms in the periods while AMTBIA87 and ACEA90 are in effect.

Formalizing the comparison of raw means in Figure 2, panel (a), I plot the β_τ coefficients from equation (3) bracketed by their 95% confidence intervals in the baseline series of Figure 2, panel (b). Standard errors are clustered at the firm level. I include firm assets, sales, interest expense, depreciation, depletion and number of employees in X_{it} to control for changes in firm size, the possibility that tax incentives differentially impact firms with low versus high ETRs, and the vast majority of tax preferences and adjustments to isolate variation in the outcome independent of non-AMTBIA87 tax incentives.

The baseline series in panel (b) exhibits clear pre-trends, suggesting that estimates of equation (3) are likely to understate firm tax avoidance in response to AMTBIA87. Guided by the data, I also estimate equation (4) and plot the β_τ coefficients in the pre-trend adjustment series of panel (b). The pre-trend adjustment series displays two important results. First, there appears to be a clear increase in book tax differences in 1986 for firms more likely to be subject to AMTBIA87 the next year, suggesting firms more likely to face AMTBIA87 strategically concentrated book income independent of taxable income into 1986 before book income was subject to a tax. Second, firms more likely to be subject to AMTBIA87 exhibit a clear decline in book tax differences relative to the 1986 spike throughout 1987-1992, suggesting firms more likely to face AMTBIA87 reduced their book tax differences relative to control firms while AMTBIA87 and ACEA90 were in effect.

[11] With administrative tax data, I could simply subtract TPA from the outcome. However, depreciation and depletion in Compustat do not exactly measure the depreciation and depletion components of TPA. For example, TPA includes depreciation of property placed in service after 1986, not all depreciation. Therefore, controlling for variation in Compustat depreciation over time captures changes to depreciation included in TPA without introducing substantial measurement error in the outcome based on previous depreciation levels which are likely to covary with treatment status.



(a) Raw Book Tax Difference Means

(b) Baseline Specification

Figure 2: Differences-in-Differences Estimates

Notes: This figure presents the evolution of mean book tax differences for treatment and control firms in panel (a), and baseline differences-in-differences estimates from equations (3) and (4) in panel (b). 95% confidence intervals are constructed from standard errors clustered at the firm level. The vertical gray dashed line indicates the time frame when firms were aware AMTBIA87 would go into effect the following year, while red lines demarcate the time period when AMTBIA87 was in effect. The treatment group is defined as firms with 1986 effective tax rates <23%.

IV.A Tax Avoidance Robustness

Two primary confounders could bias the estimates of β_τ plotted in Figure 2, panel (b). First, if book tax differences exhibit mean reversion and covary with ETRs, systematic year-to-year changes in book tax differences could correlate with the expected impacts of AMTBIA87. Second, other policies in TRA86 could introduce non-AMTBIA87 related changes in book tax differences around the implementation of AMTBIA87 that covary with ETRs.[12]

To evaluate whether mean reversion impacts the estimates in Figure 2, panel (b), I plot placebo differences-in-differences (DiD) estimates alongside my baseline results in Figure 3, panel (a). The placebo series exactly replicate the baseline estimates of equation (3) in Figure 2, panel (b), but define treatment and control groups based on ETRs in 1982, 1983, 1984 and 1985 rather than 1986. These placebo series make two important points. First, placebos exhibit book tax difference declines similar to the baseline series, but the declines

[12]These potential confounders are identical to the two mentioned by Saez, Slemrod and Giertz (2012) in their review of the elasticity of taxable income literature. They are a common feature (or bug) of empirical designs attempting to evaluate the impact of a tax change while constructing treatment and control groups based on pre-reform information.

diminish in magnitude for the earlier treatment control splits. This pattern is consistent with the estimated treatment effects representing firm responses to AMTBIA87, where splitting into treatment and control firms in earlier years captures fewer firms likely to be subject to AMTBIA87.

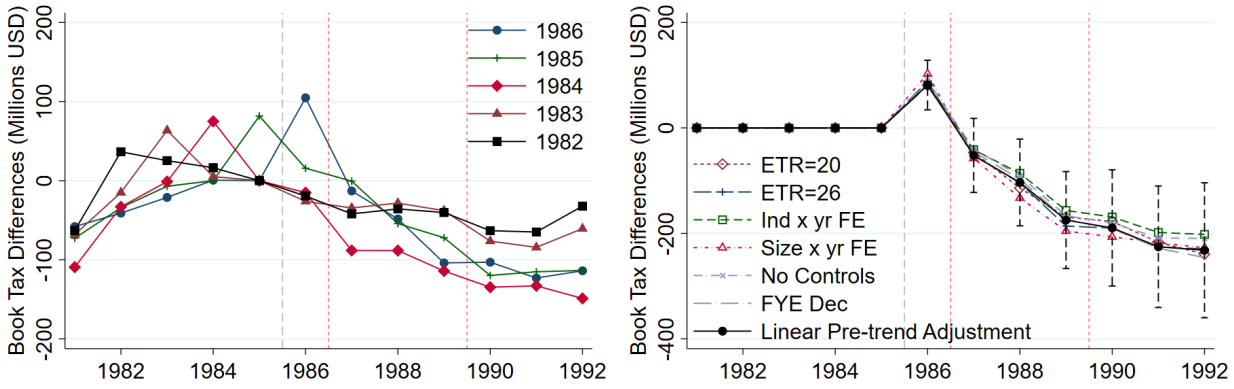
Second, despite no policy incentive to do so, treatment firms exhibit a spike in book tax differences in the year I split firms into treatment and control groups based on ETRs that diminishes in the following year or two. Therefore, *selection* of high book tax difference firms for the treatment group appears to bias β_{86} upward, while mean reversion does not appear to have a significant impact on my estimates because book tax differences largely revert in the year after the treatment designation.

The finding that a significant portion of the 1986 book tax difference spike can be attributed to selection rather than a real avoidance response clarifies the lack of consensus over firm responses in 1986 in the existing literature.[13] The placebo series in Figure 3, panel (a) make clear that this disagreement stems from different treatment and control definitions across studies, not real avoidance responses. To formally test that the observed 1986 spike is not a real avoidance response I stack the 1982-1985 placebo series and estimate an event study defining event-time zero to be the year I split each placebo series into treatment and control groups. The event-time zero coefficient in this specification aggregates observed book tax difference spikes in the year I split into treatment and control groups, effectively averaging over the spikes in each placebo series. A Wald test for the equality of the event-time zero estimate and the 1986 coefficient from equation (4) fails to reject the null hypothesis at the 10% level.[14]

While I correct parametrically for the clear book tax difference trend exhibited by treatment relative to control firms in the pre-period, it is difficult to systematically evaluate whether TRA86 included non-AMTBIA87 changes to book tax differences that vary system-

[13]Gramlich (1991); Dhaliwal and Wang (1992); Wang (1994) all find evidence that firms shift large amounts of book income into 1986 to avoid AMTBIA87, while Boynton, Dobbins and Plesko (1992); Choi, Gramlich and Thomas (2001) find no evidence of this behavior.

[14]I append versions of my estimation sample with treatment groups defined in each placebo year, define event time relative to treatment-control split as k, and estimate $BTD_{ik} = \sum_{k=-4}^{10} \beta_k Treat_{ik} + \beta_1 X_{ik} + \beta_2 X_{ik} \cdot Treat_i + \delta_t + \gamma_i + \nu_{ik}$. I then test $H_0 : \beta_{k=0} = \beta_{86}$ where β_{86} comes from equation (4). An analogous test using the baseline series without the pre-trend adjustment fails to reject the null of equal coefficients at the 5% level.



(a) Placebo Series

(b) Confounding Trend Tests

Figure 3: Differences-in-Differences Robustness

Notes: This figure presents placebo series testing for mean reversion by splitting into treatment and control groups based on effective tax rates in different years in panel (a), and robustness tests varying the baseline specification in panel (b). 95% confidence intervals are constructed from standard errors clustered at the firm level. The vertical gray dashed line indicates the time frame when firms were aware AMTBIA87 would go into effect the following year, while red lines demarcate the time period when AMTBIA87 was in effect. The placebo series in panel (a) reestimate equation (3) splitting firms into treatment and control groups based on ETRs in each year from 1982-1986. Panel (b) reestimates equation (4) using different ETRs to split firms intro treatment and control groups, including interactions of industry (two-digit SIC code) and size (1985 EBITD tercile) fixed effects with year fixed effects, excluding controls, and restricting to only firms with fiscal year ends in December.

atically with ETRs without administrative tax data. While selecting book tax differences as an outcome mitigates concerns that statutory tax rate changes bias results, TRA86 included many other tax changes that could impact book tax differences.

However, a variety of robustness checks show that non-AMTBIA87 changes to book tax differences that vary systematically with ETRs appear unlikely to drive my results. I display these checks in Figure 3, panel (b) alongside my estimates of β_τ from equation (4).[15] The figure plots six robustness checks: reestimates of equation (4) using ETR cutoffs of 20% and 26%, reestimates of equation (4) with ETR cutoffs of 23% that separately include the interaction of size (1985 EBITD tercile) and year fixed effects, and industry (two-digit SIC code)[16] and year fixed effects, and reestimates of equation (4) without controls and restricting

[15]The outcome of these tests are similar for the baseline series.

[16]To standardize SIC codes within firms I use the mode SIC code within firms across years, breaking ties arbitrarily with the smaller SIC code. I impute two digit SIC codes manually based on financial statement

to only firms with fiscal year-ends in December. Estimates are remarkably similar across these specifications. In every case, book tax difference responses of treatment relative to control firms exhibit a near-identical pattern. Therefore, if bias of the magnitude necessary to cast doubt on my baseline estimates exists, the bias cannot depend explicitly on the ETR cutoff, cannot be driven by any industry specific or firm-size specific time trends, is not driven by the inclusion or exclusion of controls, and is not specific to firms with fiscal year-ends in months other than December.

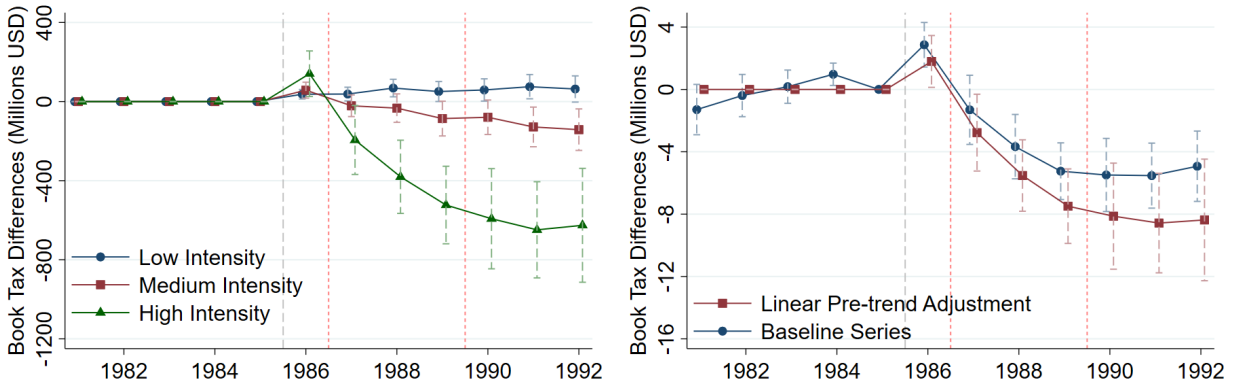
IV.B Scaling Tax Avoidance Responses

Figure 2, panel (b) displays average treatment effects of AMTBIA87 over different time horizons for my entire sample. To better understand whether these estimates are quantitatively large, I scale these average treatment effects in two ways. First, I estimate the continuous DiD specifications from equations (5) and (6) to identify the book tax difference response of treatment firms per dollar of expected new tax liability due to AMTBIA87. Second, I rescale the β_τ coefficients into an elasticity to quantify the scale of tax avoidance responses relative to firm book incomes and marginal tax rate changes.

Figure 4 displays firm tax avoidance responses to AMTBIA87 accounting for different treatment intensities. I measure treatment intensity as the expected tax liability under AMTBIA87 based on 1986 book incomes, calculating $Liab_i$ as the interaction of a treatment dummy with 10% of 1986 book tax differences. Panel (a) plots three series that reestimate equation (4), partitioning the treatment group into low, medium and high intensity groups by $Liab_i$ terciles and only including a single tercile of the treatment group in each series. The series show that firms have larger tax avoidance responses to AMTBIA87 if they face more tax liability. To parametrically quantify the impact of each additional dollar of expected AMTBIA87 tax liability on tax avoidance, I plot the β_τ coefficients from equations (5) and (6) in the baseline and linear pre-trend adjustment series in panel (b). The linear pre-trend adjustment series indicates that for every additional expected $1 million of AMTBIA87 tax liability firms reduce their book tax differences by approximately $8 million in 1989.

To quantify the magnitude of my estimates relative to firms' book incomes and marginal

information for firms missing an SIC code in every year.



(a) Coarse Treatment Intensity (b) Parametric Treatment Intensity

Figure 4: Differences-in-Differences Estimates by Treatment Intensity

Notes: This figure plots estimates of tax avoidance in response to the alternative minimum tax book income adjustment accounting for heterogeneous treatment intensities. Panel (a) plots estimates of β_τ from equation (4), partitioning the treatment group into low, medium and high intensity groups by $Liab_i$ terciles and only including a single tercile of the treatment group in each series. Panel (b) plots estimates of β_τ from equations (5) and (6) in the baseline and linear pre-trend adjustment series respectively.

tax changes, I express my estimates of tax avoidance in response to AMTBIA87 in terms of the elasticity of book income with respect to the net of tax rate, defined as

$$\varepsilon_t^{BI} = \frac{\Delta BTD_t}{\Delta(1-\tau)_t} \cdot \frac{1-\tau}{BI_{85}}, \tag{7}$$

where τ is the tax rate on book income, BTD are book tax differences, BI is book income, and t is the year. This elasticity can be interpreted as the percent change in book income in year t (measured via book tax differences to capture tax avoidance responses) when the net of tax rate increases by 1%. As displayed in Figure 1, τ is zero before 1987, increases to 0.1 for 1987-1989, and increases again to 0.15 in 1990.

Figure 5 displays ε_t^{BI} over 1987-1992, using β_τ coefficients from equations (3) and (4) for ΔBTD_t, constructing confidence intervals from non-parametrically bootstrapped standard errors clustering at the firm level to account for uncertainty in both average book income in 1985 and the DiD estimates of book income responses. Using my preferred estimates from the linear pre-trend adjusted series, the elasticity of book income peaks at 3.62 in 1989 and

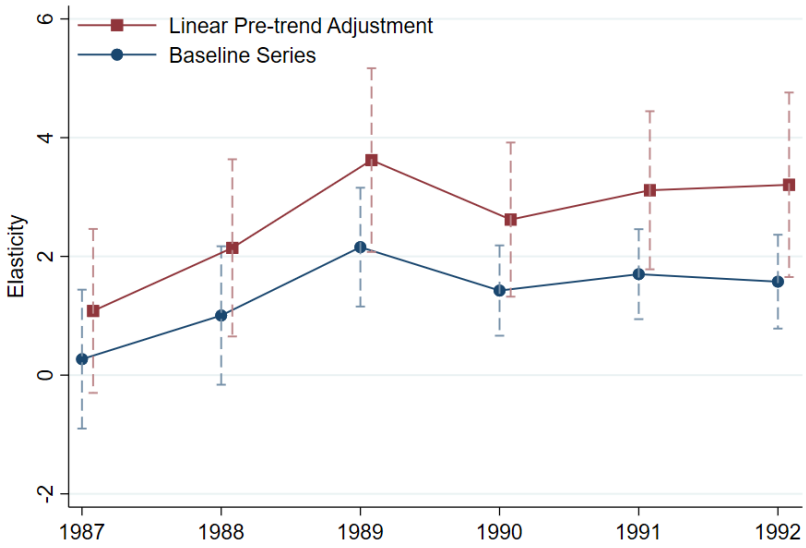


Figure 5: Book Income Elasticities

Notes: This figure plots ε_t^{BI}, the elasticity of book income with respect to the net of tax rate, with 95% confidence intervals constructed from non-parametrically bootstrapped standard errors clustering at the firm level using 1,000 iterations. $\varepsilon_t^{BI} = \frac{\Delta BTD_t}{\Delta(1-\tau)_t} \cdot \frac{1-\tau}{BI_{85}}$, where ΔBTD_t are the differences-in-differences estimates of firm responses to AMTBIA87 displayed in Figure 2, panel (b).

stabilizes around 3.21 by 1992. This figure makes clear that earlier studies underestimate book income elasticities by not correcting for pre-trends. Dharmapala (2020) aggregates estimates of the elasticity of book income, finding that results in Dhaliwal and Wang (1992) imply a book income elasticity of 1.7, while results in Manzon (1992) imply a range of elasticities from 1.4-2.1. Both estimates are directly in line with my estimates before correcting for pre-trends, but are lower than estimates after correcting for pre-trends.

IV.C Tax Avoidance Heterogeneity

The elasticities in the linear pre-trend adjusted series in Figure 5 represent my preferred estimates of the average avoidance responses of treatment firms relative to control firms. To check whether these averages mask heterogeneity across industries and firm sizes, I also estimate equations (4) and (6) across size and industry subgroups.

Figure 6, panel (a) displays elasticity estimates across firm size terciles based on the

1985 EBITD distribution. The figure displays no evidence that the largest firms exhibit larger responses to AMTBIA87. If anything, the smallest firms in my sample exhibit slightly larger responses. Furthermore, these results are not driven by underlying treatment intensity heterogeneity. Panel (c) plots estimates of β_τ from equation (6) and shows that per dollar of expected tax liability from AMTBIA87, tax avoidance is also similar across firm sizes.

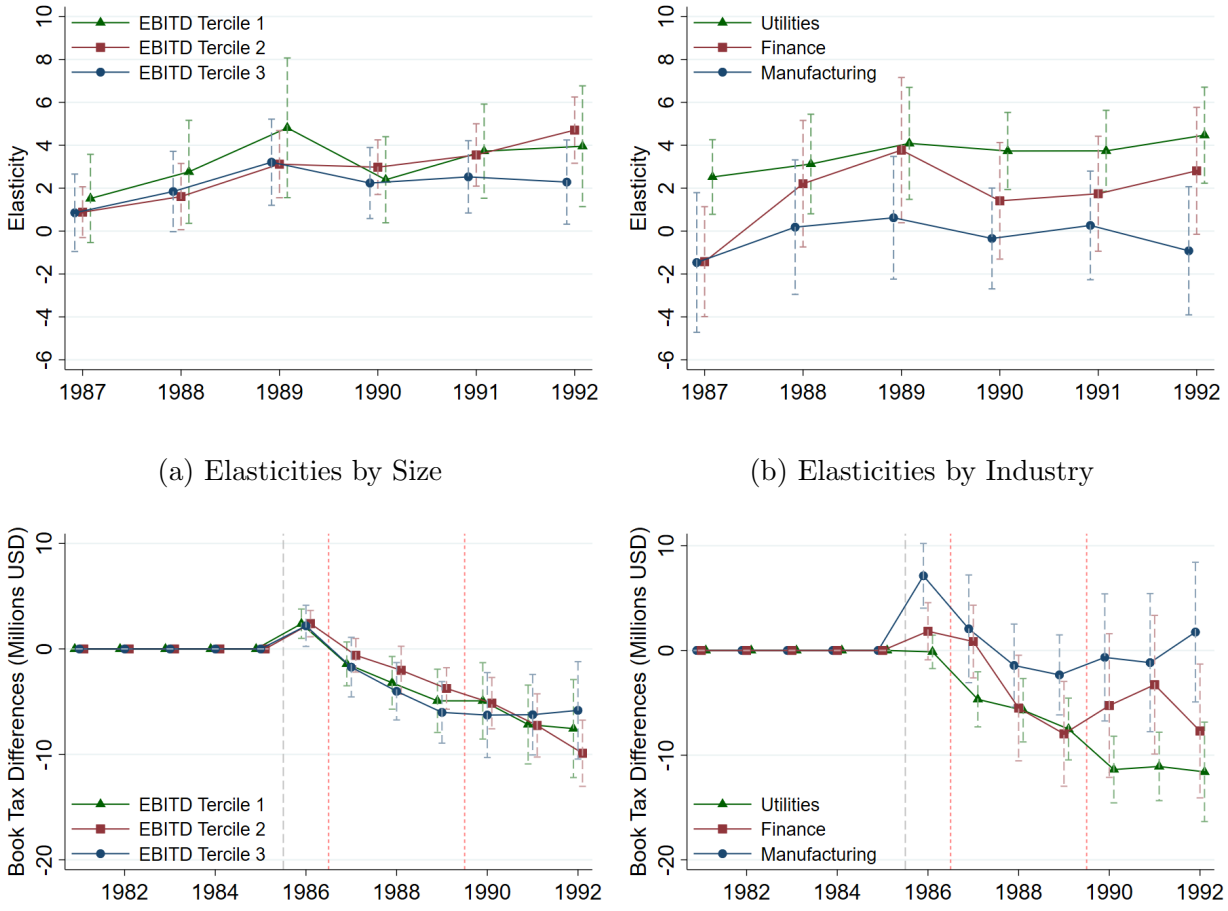
The lack of distinguishable difference in tax avoidance responses to AMTBIA87 across firm sizes has two important implications. First, this pattern suggests tax avoidance in response to a book income AMT does not require significant accounting or legal apparatuses that only the largest firms may be able to afford, and therefore is not costly. Second, if earnings management is cheap, firms should manage their earnings before making potentially costly changes to production and investment in response to a book income AMT.[17]

Figure 6, panels (b) and (d) display the same checks across industries. I only display estimates from the utilities, finance and manufacturing sectors because they make up 74% of the estimation sample. Point estimates in panel (b) indicate that utilities exhibit large responses with book income elasticities close to four, while manufacturing firms have an elasticity around zero and the book income elasticity of finance firms falls in between. Given the results in panels (a) and (c), this pattern is not driven by firm size composition across industries. Panel (d) shows that this industry heterogeneity is also not driven by compositional differences in treatment intensity across industries, plotting β_τ coefficients from equation (6). Per dollar of expected tax liability from AMTBIA87, tax avoidance is larger for utilities and finance firms and an imprecise null for manufacturing firms.

These industry heterogeneity results should be interpreted with caution because they rely on smaller sample sizes and have wide confidence intervals. However, the broad patterns displayed in Figure 6 are consistent with rate of return regulation for utilities that provides an incentive to keep book income low, and capital intensive firms with lots of depreciation having less scope to manage earnings because a large fraction of their book tax differences come from the different depreciation schedules mandated by GAAP and tax rules.

AMT credits do not appear to play a significant role in firm tax avoidance responses to

[17]The lack of heterogeneity in avoidance responses across firm sizes suggests a model capturing the tradeoff between avoidance and production/investment responses would feature low but escalating costs of avoidance in addition to adjustment costs for production or investment changes.



(a) Elasticities by Size

(b) Elasticities by Industry

(c) Parametric Treatment Intensity by Size

(d) Parametric Treatment Intensity by Industry

Figure 6: Size and Industry Tax Avoidance Heterogeneity

Notes: This figure plots tax avoidance responses to AMTBIA87 across firm sizes and industries. Panels (a) and (b) plot ε_t^{BI}, the elasticity of book income with respect to the net of tax rate, with 95% confidence intervals constructed from non-parametrically bootstrapped standard errors clustering at the firm level using 1,000 iterations. $\varepsilon_t^{BI} = \frac{\Delta BTD_t}{\Delta(1-\tau)_t} \cdot \frac{1-\tau}{BI_{85}}$, where ΔBTD_t are the differences-in-differences estimates of firm responses to AMTBIA87 across 1985 EBITD terciles in panel (a) and industries in panel (b). Panels (c) and (d) display estimates of β_τ from equation (6) across 1985 EBITD terciles and industries. Industries include manufacturing (SIC codes 2000-3999), utilities (SIC codes 4900-4999) and finance and insurance (SIC codes 4000-4899).

AMTBIA87. Firms were awarded AMT credits for preferences that caused temporary differences between taxable income and alternative minimum taxable income like depreciation, but not "exclusion items" that caused permanent differences like depletion. However, in 1990, depletion became eligible to generate AMT credits (Gerardi, Milner and Silverstein, 1992). Utility firms have high depletion, and treatment utility firms have higher depletion than

control utility firms. Therefore, if AMT credits played a significant role in firm responses we would expect estimated avoidance responses for utility firms to decline in 1990-1992.[18] Instead, we see no decline in utility firms' tax avoidance from 1990-1992 in Figure 6, panel (b). This is not surprising in light of existing evidence that firms respond to tax policy when it impacts immediate but not future cash flows (Zwick and Mahon, 2017).

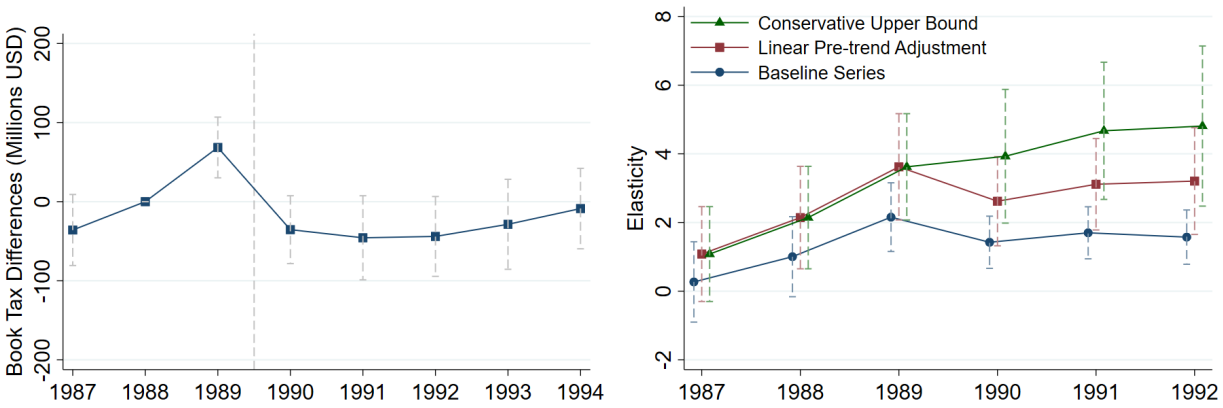
IV.D Interpreting Four- to Six-Year Elasiticities

One final concern about the estimates of tax avoidance throughout this section is that the interpretation of post-1989 coefficients is complicated by the replacement of AMTBIA87 with the adjusted current earnings adjustment (ACEA90) in 1990. Until this point, I have assumed the marginal tax rates displayed in Figure 1 are correct, or that adjusted current earnings (ACE) are equivalent to book income. However, this assumption is not exactly correct because ACE are based on tax principles, not accounting rules.

There are two different ways to view estimates of firm tax avoidance responses in 1990-1992. In the first view, ACEA90 taxes the same base as AMTBIA87 at a higher 15% marginal tax rate. In the second view, ACEA90 taxes a different base than AMTBIA87 at a higher rate, so that the elasticities calculated in accordance with the first view conflate firm responses to a tax on book income in excess of alternative minimum taxable income (AMTI) with a tax on a different base. To distinguish between these two alternative interpretations of elasticities over a four- to six-year horizon, I test whether firms respond to the transition from AMTBIA87 to ACEA90. A clear book tax difference decline in response to the transition would indicate firms face a higher tax rate on a similar tax base. On the other hand, no firm response to the transition would suggest firms do not face a higher tax rate on the same tax base, and that I subsequently underestimate elasticities over a four- to six-year horizon.

To execute this test, I reestimate equation (3) on a panel of Compustat firms that appear in every year from 1987-1994 with positive, non-missing assets, sales and pretax income that are incorporated in the United States. I start the sample in 1987 to hold minimum tax policy fixed in the pre-period. I also restrict to firms with 1989 EBITD above $100 million, and

[18] These differences would not be captured by the depletion controls in equations (3) - (6) because these controls assume the impact of depletion on book tax differences is fixed over time.



(a) Differences-in-Differences Estimates

(b) Elasticity Estimates

Figure 7: Tax Avoidance Responses: AMTBIA87 to ACEA90 Transition

Notes: Panel (a) presents estimates of firm tax avoidance responses to the transition from AMTBIA87 to ACEA90. Each point plotted is an estimated β_τ coefficient from equation (3), including assets, sales, interest expense, depreciation, depletion, and number of employees as controls. I split firms into treatment and control groups using a 17% effective tax rate in 1989. Standard errors are clustered at the firm level. The estimation sample includes all Compustat firms that appear in every year from 1987-1994 with positive, non-missing assets, sales and pretax income that are incorporated in the U.S. and have 1989 EBITD greater than $100 million. The vertical gray dashed line between 1989 and 1990 represents the transition from AMTBIA87 to ACEA90. Panel (b) presents elasticity estimates over a six-year horizon, including a conservative upper bound series using a 10% marginal tax rate for years 1990-1992. Standard errors come from a non-parametric bootstrap clustered at the firm level using 1,000 iterations.

identify the treatment group as firms with 1989 ETRs below 17% to ensure I focus on firms likely to be subject to AMTBIA87 in 1989.[19] I plot the β_τ coefficients from this estimation in Figure 7, panel (a). As expected, there is a book tax difference spike in 1989 reflecting selection in the year I split firms into treatment and control groups. Book tax differences appear to decline for treatment relative to control firms when ACEA90 is implemented and maintain a lower level in every year thereafter. This pattern is consistent with ACEA90 taxing a similar base as the BIA but at a higher rate because the ACE adjustment taxes three quarters rather than half the gap between a broader income measure and AMTI.

However, interpretation of the post-1989 coefficients is difficult for two reasons. First, all of the post-1989 coefficients do not reject the null hypothesis of zero at the 5% level.

[19]The 17% ETR represents the ETR at which firms are likely to no longer have to pay alternative minimum tax under the 34% top corporate rate in 1989.

Second, the post-1989 coefficients may be biased upwards if there is a pre-trend. While the 1987 coefficient indicates this may be the case, I view two pre-treatment periods as insufficient to estimate any reliable pre-trend correction.[20]

In summary, Figure 7 suggests that firms exhibit responses to the transition from AMTBIA87 to ACEA90 so that applying a 15% marginal tax rate change over a four- to six-year horizon in elasticity calculations is reasonable. Unfortunately, this evidence is not definitive. To account for this uncertainty conservatively, I calculate upper bounds on elasticities over a four- to six-year time horizon using a 10% marginal tax rate change in those years to proxy for ACEA90 applying a higher rate to a narrower base. This calculation yields $\{\varepsilon^{BI}_{t=90,91,92}\} = \{3.93,4.67,4.81\}$. I plot this elasticity series in Figure 7, panel (b).

V Production and Investment Responses

Firms have some freedom to manage their earnings to avoid AMTBIA87, but face adjustment costs if they want to make production and investment policy changes (Doms and Dunne, 1998; Cooper and Haltiwanger, 2006), suggesting that firms should avoid AMTBIA87 but not respond by making changes to production or investment. The lack of heterogeneity in tax avoidance responses across firm sizes in section IV reinforces this hypothesis.

To test whether firms exhibit real production and investment responses to AMTBIA87, Figure 8 plots elasticity estimates analogous to those presented in Figure 5, constructed from estimates of equations (3) and (4) using sales, costs of goods sold (COGS), investment, and debt as outcomes.[21] These elasticities can be interpreted as the percent decline in each outcome variable for each 1% increase in the marginal tax rate on book tax differences imposed by AMTBIA87.

None of the estimates from the pre-trend adjusted series can reject the null of zero in

[20] A third potential bias exists for the 1990 coefficient, but is second order. This possible bias stems from the fact that there was a small recession in 1990, and negative book tax differences increase in magnitude during recessions (Gaertner, Laplante and Lynch, 2016). Treatment firms in this exercise have ex-ante responsive book income because they maintain low ETRs even in the presence of AMTBIA87 for three years. Therefore, it is not unreasonable to expect the ex-ante responsive treatment group to also have larger negative book tax difference responses to the recession in 1990.

[21] I exclude finance firms from these estimates because capital stock and revenue variables can reflect different quantities for these firms.

any of the post-1986 years across all four outcomes, suggesting that firms did not exhibit significant production and investment responses to AMTBIA87. The sales and COGS estimates in panels (a) and (b) suggest that firms did not modify their production in response to AMTBIA87 because there are no clear changes in firm revenues or costs of inputs.

(a) Sales

(b) Costs of Goods Sold

(c) Investment

(d) Debt

Figure 8: Production and Investment Elasticity Estimates

Notes: This figure plots production and investment responses to AMTBIA87. Each panel plots elasticities of outcomes with respect to the net of tax rate following equation (7), constructed from β_τ coefficients from estimates of equations (5) and (6) in the baseline and pre-trend adjustment series using different outcomes. Standard errors are non-parametrically bootstrapped, clustering at the firm level using 1,000 iterations. Panel (a) uses sales as the outcome, panel (b) uses costs of goods sold, panel (c) uses investment, and panel (d) uses debt. All estimates exclude firms in the financial and insurance sector (SIC codes 4000-4899). Investment is defined as capital expenditure per dollar of lagged net PPE. Debt is defined as total liabilities per dollar of lagged assets. Full variable definitions are given in section II. Panel (a) necessarily omits sales as a control variable.

Firms also do not appear to make economically meaningful changes to their investment and debt in response to AMTBIA87. In panel (d), I reject 1989 increases in debt of more than 0.26% and decreases of more than 0.71% for every 1% increase in the marginal tax rate on book tax differences. In panel (c), the investment estimates yield an imprecise null. The 1989 coefficient cannot reject investment increases of more than 1.29% or decreases of more than 3.35% for every 1% change in the net of tax rate on book tax differences.

The estimates in Figure 8 should be interpreted with caution because TRA86 made other concurrent changes to tax policy that modified incentives for investment and production. However, one reassuring feature of these estimates is that potential biases from concurrent policy changes correspond with the signs of point estimates that diverge from zero. For example, lowering the corporate tax rate should provide a stronger incentive for high ETR firms in the control group to increase revenues, suggesting that the sales estimates for treatment firms in panel (a) may be biased upwards. In addition, low ETR treatment firms have low ETRs in part because they take advantage of tax incentives for investment. Raising the cost of capital may disproportionately reduce incentives for low ETR firms with more investment, suggesting the investment elasticities in panel (c) may also be biased upwards.

To summarize and complement the DiD production and investment responses presented in Figure 8, I also estimate the impact of expected total tax liability on outcomes, using expected AMTBIA87 liability as an instrument for total tax liability and estimating

$$Y_{it} = \phi TaxLiab_i + \beta X_{it} + \delta_t + \gamma_s + \varepsilon_{it}, \tag{8}$$

where $TaxLiab_i$ is a firm's expected tax liability based on 1987 policy and 1986 status, Y_{it} are outcomes, δ_t are year fixed effects, and γ_s are industry (SIC2) fixed effects. I instrument for $TaxLiab_i$ with $AMTBIA_i$, a firm's expected AMTBIA87 liability based on 1986 status calculated as 10% of BTD if the firm is in the treatment group and zero otherwise. I estimate this regression over all treatment and controls firms after exluding the financial sector, using all data from 1987-1992.

The two stage least squares estimates identify the causal effect of additional tax liability on outcomes under the assumption that expected AMTBIA87 liability impacts outcomes

only through changes in tax liability. The instrument is relevant because expected AMTBIA87 liability is mechanically related to expected total tax liability, and unlikely to violate exclusion unless firms respond to AMTBIA87 for reasons unrelated to tax liability changes.[22]

Estimates of the predicted tax liability coefficient ϕ are particularly useful because they can be interpreted as the impact of tax liability on outcomes, but are identified using only variation in expected AMTBIA87 liability. In addition, constructing the instrument from BTD eliminates concerns that DiD controls for TPA do not rid my estimates of bias from mismeasuring the tax base if tax base error is independent across firms.

Table 2: Production and Investment Instrumental Variable Estimates

Coefficient	(1) Tax Revenue	(2) Sales	(3) COGS	(4) Investment	(5) Debt
Predicted Liability Effect	1.04763	3.95585	−6.37969	0.00001	−0.00012
	(0.47276)	(6.53215)	(3.93969)	(0.00008)	(0.00008)
First Stage Coefficient	2.23374	2.19969	2.23374	2.23374	2.23374
	(1.09584)	(1.08398)	(1.09584)	(1.09584)	(1.09584)
Observations	3210	3210	3210	3197	3210
Clusters	535	535	535	534	535

Notes: This table reports instrumental variable regression coefficients from equation (8) across five outcome variables: tax revenues, sales, costs of goods sold, investment and debt. The predicted liability effect is the ϕ coefficient on predicted tax liability in equation (8), while the first stage coefficient is the coefficient on the expected AMTBIA87 liability instrument in the first stage. Standard errors are in parentheses and clustered at the firm level. Control variables are assets, sales, depreciation, depletion, interest expense and number of employees, except for the sales estimates which necessarily exclude sales as a control variable. The sample includes all firm-years from 1987-1992 not in the finance and insurance sectors.

Table 2 displays instrumental variable regression results. The first column uses tax revenue as an outcome. I reject the null hypothesis of zero tax revenue impact, suggesting AMTBIA87 increased tax revenue. The next four columns use sales, COGS, investment and debt as outcomes. None of the predicted liability effect coefficients reject the null hypothesis of zero. These estimates suggest that I cannot detect any impact of AMTBIA87 induced tax liability on firm revenues, costs of inputs, investment or debt that is statistically distinuguishable from zero at any conventional level of significance. The investment estimates

[22]For example, firms might face higher administrative burdens due to AMTBIA87 with significant costs that crowd out investment. However, this seems unlikely because firms already were required to calculate book and taxable income for their taxes and financial statements before TRA86.

in column 4 are particularly precise, rejecting changes in capital expenditures of more than approximately 0.016% of lagged capital stock for every $1 million increase in tax liability.

VI Revenue Scores

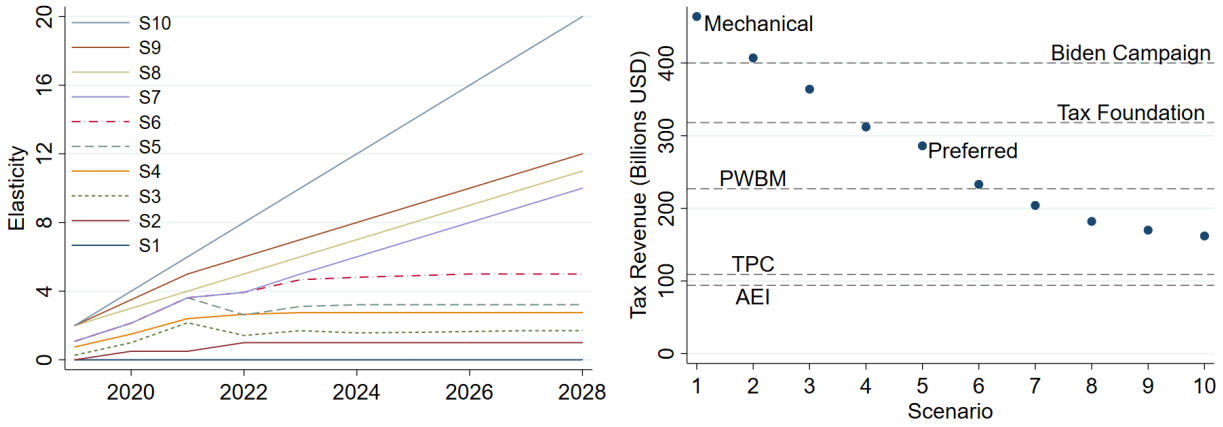
To understand the implications of firm tax avoidance responses to AMTBIA87 for contemporary policy, I develop a revenue score of Joe Biden's 2020 proposal to implement a book income AMT. The proposed Biden book income AMT would institute a 15% minimum tax on book income. The minimum tax would only apply to firms with at least $100 million in annual income. In addition, firms calculating minimum tax liability would still be allowed to claim deductions for loss carryforwards and foreign taxes.[23] To score the proposed Biden book income AMT I simulate the evolution of firm book incomes over a ten-year period in a 2018 cross section of Compustat firms, incorporating possible firm tax avoidance responses to the policy and applying the proposed book income AMT to the simulated data to estimate revenue. I explain the details of my scoring methodology in Appendix B.

This scoring methodology yields a range of estimates that depend on chosen values of the book income elasticity ε_t. I construct ten response scenarios that vary elasticity assumptions to account for uncertainty in firm tax avoidance responses, and to benchmark revenue scores consistent with avoidance responses to AMTBIA87 against scores from third parties.

Figure 9 presents ten year revenue scores based on the different response scenarios. Panel (a) displays the elasticity assumptions in each scenario. The assumed avoidance responses of firms increase with scenario numbers. Scenario 1 is a mechanical tax calculation that assumes zero avoidance responses to the policy. Scenario 5 contains my preferred estimates from the pre-trend adjusted series in Figure 5.[24] Scenario 6 replicates Scenario 5, but applies the conservative upper bound I place on elasticities over a four- to six-year time horizon displayed in Figure 7, panel (b). Higher scenario numbers include avoidance responses significantly

[23]Historically, when firms have paid an AMT, they have also generated AMT credits which could be used against normal tax liability in future years. However, the Biden book income AMT proposal does not specify whether it would include AMT credits. Therefore, I exclude AMT credits from my baseline revenue calculations, but show back of the envelope adjustments for credits do not materially impact my results.

[24]The pre-trend correction is conservative in the sense that if it overstates firm responses to AMTBIA87, I will understate revenue in this simulation.



(a) Simulation Scenarios

(b) Revenue Estimates

Figure 9: Revenue Simulation Scenarios and Estimates

Notes: This figure presents elasticities used in revenue score simulation scenarios and the resulting tax revenue estimates. Panel (a) plots elasticities for each scenario over the ten year simulation period. Panel (b) plots the tax revenue raised from Biden's book income AMT proposal in each scenario relative to third party revenue estimates represented by horizontal dashed lines (Committee for a Responsible Federal Budget, 2020; Pomerleau and Seiter, 2020; Mermin, Holtzblatt, Khitatrakun, Lu, Matheson and Rohaly, 2020). The AEI and TPC estimates may be lower in part because they incorporate other proposed simultaneous tax changes, in particular an increase in the corporate tax rate to 28% and the addition of foreign tax credits generated by Biden's proposal to implement a 21% country-by-country minimum tax on the profits of foreign subsidiaries of US firms.

larger than the responses I estimate to AMTBIA87.

Figure 9, panel (b) displays revenue scores for each scenario, in addition to revenue scores from third parties. In my preferred Scenario 5, the Biden book income AMT raises $286 billion over a decade. In this scenario, avoidance responses to the proposed Biden book income AMT reduce the $464 billion in mechanical tax revenue of Scenario 1 by 38%.

The other scenarios assess how sensitive revenue estimates are to different elasticity assumptions, and facilitate benchmarking against third party revenue scores. For example, even if Scenario 5 understates book income elasticities over a four- to six-year time horizon, when I apply the conservative upper bound I estimate on these elasticities in Scenario 6, the Biden book income AMT will still raise $233 billion over a decade.

Matching third party revenue scores with my scoring methodology requires diverging assumptions about the magnitude of tax avoidance. To achieve a revenue score as high as

the Biden campaign estimate, I have to assume close to zero avoidance response to the policy. Matching the Tax Policy Center (TPC) or American Enterprise Institute (AEI) estimates requires additional modifications because they include other concurrently proposed policy in the Biden tax plan, including an increase in the corporate tax rate to 28% and the introduction of a 21% country-by-country minimum tax on profits of the foreign subsidiaries of US firms that could generate additional foreign tax credits. I discuss my procedure for implementing these scoring modifications in Appendix B, but they only decrease the revenue raised by the Biden book income AMT in my preferred simulation to $263 billion. Therefore, even after corporate tax rate and FTC modifications due to a country-by-country minimum tax, to achieve a revenue score on par with the TPC or AEI estimates I need to assume avoidance responses more than four times larger than the responses I estimate to AMTBIA87.[25] Wald tests reject the null hypotheses at the 5% level that my baseline or upper bound elasticity estimates over a three- and six-year time horizon are equal to the elasticity assumptions in Scenario 2 and Scenario 10, the closest matches to the Biden campaign and AEI estimates.

I summarize the revenue raised by the proposed Biden book income AMT in each simulation scenario in Table 3, panel A, and external revenue estimates for the policy by third parties in panel B. The elasticity assumptions displayed in the table match those displayed in Figure 9, panel (a). Column 1 displays aggregate revenue scores from each scenario. Column 2 displays the revenue raised by the firms facing the ten largest tax liability increases in each simulation. Columns 3-6 display the revenue raised from firms in the utilities, manufacturing, finance and insurance, and transportation and warehousing sectors respectively.

[25]TPC or AEI may also calculate lower revenue scores by incorporating the offsetting value of minimum tax credits generated by past AMTs. I ignore minimum tax credits in simulations because the Biden book income AMT proposal does not mention the inclusion of an accompanying minimum tax credit. To evaluate how large of an impact these credits might have on revenues, I can adjust my revenue scores using a back of the envelope calculation. For example, if firms have a discount rate of 7% and reclaim half of their AMT payments as minimum tax credits over the ten years following the payments (10% of their yearly payment in the first, third, fifth, seventh and ninth year following each payment) it would reduce the revenue score by 36%. This calculation is consistent with data indicating only 57.1% of all minimum tax credits available in 1993, but originating back through 1987, were used by 1998, even though minimum tax credit use was above its 1988-2002 average in the years between 1993-1998 (Carlson, 2001, 2005). Even after including this minimum tax credit adjustment in addition to adjustments for a higher corporate tax rate and FTCs generated by a country-by-country minimum tax, the revenue score I estimate in my preferred specification far exceeds the revenue estimates from TPC or AEI.

Table 3: 10 Year Revenue Scores of the Biden Book Income AMT

Panel A: Scenarios	(1) Revenue	(2) Top 10	(3) Util	(4) Manf	(5) Fin	(6) Tran
S1: $\varepsilon_t = \{0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.00\}$	464	120	118	97	64	53
S2: $\varepsilon_t = \{0.00, 0.50, 0.50, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0\}$	407	109	106	83	57	47
S3: $\varepsilon_t = \{0.27, 1.0, 2.16, 1.42, 1.7, 1.57, 1.6, 1.65, 1.7, 1.7\}$	364	100	96	72	51	42
S4: $\varepsilon_t = \{0.75, 1.5, 2.4, 2.65, 2.75, 2.75, 2.75, 2.75, 2.75, 2.75\}$	312	88	83	59	46	36
S5: $\varepsilon_t = \{1.08, 2.14, 3.62, 2.62, 3.11, 3.21, 3.21, 3.21, 3.21, 3.21\}$	286	84	76	53	43	32
S6: $\varepsilon_t = \{1.08, 2.14, 3.62, 3.93, 4.67, 4.81, 4.9, 5.0, 5.0, 5.0\}$	233	73	62	40	41	25
S7: $\varepsilon_t = \{1.08, 2.14, 3.62, 3.93, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0\}$	204	66	53	34	40	20
S8: $\varepsilon_t = \{2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0\}$	182	62	48	28	39	17
S9: $\varepsilon_t = \{2.0, 3.5, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0\}$	170	60	44	25	38	15
S10: $\varepsilon_t = \{2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0\}$	162	59	43	23	38	14

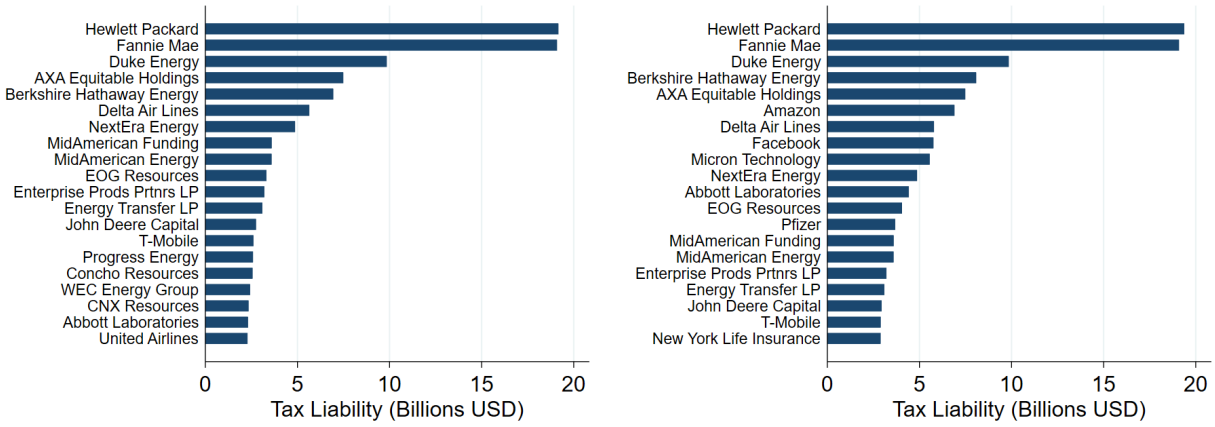
Panel B: Organizations	Revenue Estimate
Biden Campaign	400
Tax Foundation	318
Penn Wharton Budget Model	227
Tax Policy Center	109
American Enterprise Institute	94

Notes: This table reports ten year revenue scores of the proposed Biden book income AMT across a range of assumptions for ε_t, the elasticity of book income with respect to the net of tax rate at time horizon t, in Panel A. The elasticity assumptions in each scenario are displayed in Panel A, and are also plotted in Figure 9, panel (a). Column 1 displays the total revenue estimate. Column 2 displays the revenue raised from the ten firms contributing the most revenue. Columns 3-6 display the total revenue coming from the four most affected industries across simulations, Utilities (naics2=22), Manufacturing (naics2=31-33), Finance and Insurance (naics2=52) and Transportation and Warehousing (naics2=48-49) respectively. Panel B displays external ten year revenue scores from different organizations. The AEI and TPC estimates are lower in part because they incorporate foreign tax credits generated by Biden's proposal to implement a 21% country by country minimum tax on the profits of foreign subsidiaries of US firms. Revenue scores are in billions of USD.

I apply elasticities representing the average treatment effect of AMTBIA87 in my revenue scores because they are more precise than the heterogeneous estimates in Figure 6, and because significant industry composition changes over the last forty years make it impossible to estimate industry-level elasticities for all relevant sectors. Nonetheless, applying my estimates of average avoidance responses to AMTBIA87 to all firms still leads to substantial tax burden heterogeneity across firms and industries in revenue simulations. Column 2 of Table 3 shows that across scenarios, between 26-36% of the revenue raised by the proposed Biden book income AMT comes from the firms with the ten largest tax liability increases

due to the policy.[26] Columns 3-6 of Table 3 show that, across revenue simulations, most of the revenue raised by the proposed Biden book income AMT would come from the utilities, manufacturing, finance and insurance and transportation and warehousing sectors.

Figure 10, panel (a) identifies which firms face the largest tax liability increases from the proposed Biden book income AMT by plotting the tax revenue raised in my preferred simulation from the twenty firms facing the largest changes. The firms facing the very largest tax liability increases include Hewlett Packard, Fannie Mae, Berkshire Hathaway Energy and Delta Airlines.[27] One firm noticeably absent from the top twenty is Amazon.



(a) Biden Book Income AMT (b) Without Foreign Tax Credits

Figure 10: 20 Largest Tax Liability Increases Over a Decade

Notes: This figure plots the tax liability of the firms facing the 20 largest increases in tax liability as a result of the proposed Biden book income AMT in my preferred simulation, Scenario 5. Panel (a) displays tax liability increases for the baseline proposed policy. Panel (b) displays tax liability increases for a modified policy that does not allow firms to use foreign tax credits to reduce minimum tax liability.

Amazon faces a $2.2 billion increase in tax liability in my preferred ten-year revenue score, the 22nd largest among firms in the sample. Reassuringly, in my simulations the Biden book income AMT does appear to accomplish its stated aim to increase the tax liabilities of profitable firms like Amazon that pay very few taxes. However, the book income AMT captures significantly more revenue from a number of other firms who are either more profitable, pay fewer taxes, or both. Therefore, while criticism that Amazon is highly profitable

[26]This share increases in the scenarios incorporating larger avoidance responses to the policy.

[27]Fannie May is a government sponsored enterprise (GSE). While GSEs are exempt from state and local taxes, they are not exempt from federal taxes.

but pays few taxes is accurate, that criticism can also be levied at many other firms, some of whom are even more extreme examples of diverging profitability and tax liability.[28]

Amazon's tax liability under the Biden book income AMT is mitigated by substantial tax loss carryforwards and foreign tax credits the firm has accumulated. To demonstrate this sensitivity and to explore the type of AMT that would raise more revenue from Amazon, I also run revenue simulations for a modified version of the proposed Biden book income AMT that does not allow firms to reduce their minimum tax liability with foreign tax credits.[29] Figure 10, panel (b) plots the twenty largest tax liability increases in response to this modified book income AMT, using my preferred elasticity estimates from Scenario 5. After excluding FTCs, Amazon faces a $6.9 billion increase in tax liability, the 6$^{\text{th}}$ largest among all firms. The entire simulation without foreign tax credits raises $338 billion over a decade.

VII Conclusion

In this paper, I estimate firm responses to an AMT on book income. My differences-in-differences estimates suggest that firms respond to AMTBIA87 by managing their earnings to avoid the tax, but do not change their production or investment policies. Robustness checks show that my estimates of tax avoidance are unlikely to be driven by mean reversion, spurious sample selection or confounding trends, while a complementary instrumental variables regression confirms that tax liability increases driven by AMTBIA87 increase tax payments but have no impact on revenues, costs of inputs, investment or debt. In addition, I show that tax avoidance responses to AMTBIA87 do not vary across firm sizes, a pattern consistent with firms pursuing cheap earnings management to avoid AMTBIA87 before pursuing costly changes to production or investment.

The purpose of AMTs is to bolster public perceptions of tax code fairness by ensuring all firms with substantial income pay taxes. To evaluate the implications of the tax avoidance I

[28] Amazon's book income is not changed by avoidance assumptions I make in revenue simulations because Amazon would not pay the book income AMT based on their 2018 financial statements. If I applied avoidance estimates to the book income of Amazon the firm would contribute even less revenue.

[29] This policy would impose double taxation on earnings of foreign subsidiaries if implemented in conjunction with a country-by-country minimum tax, but in the absence of a country-by-country minimum tax would serve as a reasonable backstop in an attempt to capture additional tax revenue from profitable firms.

estimate in response to AMTBIA87 for contemporary policy, I develop revenue scores of the proposed Biden book income AMT. In my preferred simulation, the Biden book income AMT would raise $286 billion in revenue over a decade. These revenue scores make two important points. First, the Biden book income AMT would raise substantial revenue from firms with high income and low tax liability, but firms would still have some scope to escape larger tax payments because of net operating losses and foreign tax credits. Second, benchmarking my revenue scores against third party estimates reveals that matching third party scores of the Biden book income AMT requires making assumptions about firm tax avoidance that are inconsistent with the tax avoidance I estimate in response to AMTBIA87.

This paper considers firm responses to a book income AMT and the implications of those responses for the effectiveness of contemporary proposals to implement a book income AMT. However, any policy debate over implementing an AMT based on book income would be incomplete without also considering possible loss of information content for investors (Hanlon, Laplant and Shevlin, 2005), dead weight loss associated with a book income tax (Dharmapala, 2020), politicization of the accounting standards setting process (Shaviro, 2020), and the interaction of a book income AMT with all other business tax incentives. Ultimately, we have only incomplete historical evidence to guide the implementation of a tax based on book income, and any implementation of a book income AMT in the future will call for careful evaluation.

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A Relating Effective Tax Rates to AMT Liabilities

I relate effective tax rates to alternative minimum tax book income adjustment (AMTBIA87) payments building on derivations in Dhaliwal and Wang (1992). First, I define the book income adjustment (BIA) and alternative minimum tax payments (AMT) under AMTBIA87, with statutory corporate tax rate τ, taxable income TI, book income BI and tax preferences and adjustments TPA:

$$BIA = 0.5\Big(BI - (TI + TPA)\Big),$$
$$AMT = \max\Big\{0.2\Big(TI + TPA + BIA\Big) - \tau TI, 0\Big\}.$$

Next, I define book tax differences $BTD \equiv BI - TI$. AMTBIA87 is a direct tax on $BTD - TPA$, the portion of book tax differences that are not tax preferences and adjustments. Suppose some fraction f of BTD are TPA, so that $TPA = f(BI - TI)$. Then plugging the expressions for BIA and TPA into AMT, I obtain

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

Furthermore, because $ETR \equiv \tau\frac{TI}{BI}$, I can write

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

Therefore, a firm has positive AMT liability if

$$ETR < \frac{0.1 + 0.1f}{\frac{(\tau - 0.1) + 0.1f}{\tau}}.$$

Now suppose $f = 0$, so that there are no tax preferences and adjustments and AMTBIA87 is a direct tax on BTD. Then a firm faces positive AMT liability if $ETR < 0.2$. In 1987 $\tau = 0.4$, implying that to obtain an ETR of 0.2, a firm must have BI twice as large as TI. In 1986, when $\tau = 0.46$, a firm with BI twice as large as TI has an ETR of 0.23. Therefore, all firms with $ETR < 0.23$ in 1986 are likely to face positive AMT liability from AMTBIA87.

On the other hand, suppose $f = 0.5$, so that half of BTD are tax preferences and adjustments and AMTBIA87 is a direct tax on only half of BTD. Then, a firm has positive AMT liability if $ETR < \frac{0.15}{\frac{(0.4-0.05)}{0.4}} = 0.17$ in 1987. To obtain an ETR of 0.17 in 1987, a firm must have BI 2.33 times as large as TI, while in 1986 a firm must have an ETR of 0.20 to have BI 2.33 times as large as TI.

Aggregate data released by the IRS suggests that the TPA included in BTD are unlikely to lead to spurious results. Gill and Treubert (1992) indicates that, averaging across 1987-1989, $f = 0.39$, and depreciation of property placed in service after 1986 and depletion account for 88% of those tax preferences and adjustments. To be conservative, in my baseline specifications I choose an ETR cutoff of 23% to ensure a high probability that firms in the control group do not face positive tax liability from AMTBIA87, and include time varying controls for depreciation and depletion to eliminate variation in the outcome due to TPA changes. In robustness checks I also find that my results are not sensitive to modifying the ETR cutoff to 20% or 26%.

B Revenue Scoring Methodology

To develop a revenue score of the Biden book income AMT I simulate the evolution of a 2018 cross section of firms' book incomes over the scoring time frame while incorporating avoidance responses to the policy. To select a cross section of firms in 2018, I restrict the Compustat fundamentals annual data to firms with positive, non-missing assets, sales, and pretax income that are incorporated in the U.S. and exist in the data in both 2017 and 2018. I display summary stats for this sample of firms in Table B.1. Relative to the historical sample, firms are significantly larger in 2018 but exhibit the same type of skew with means of most variables exceeding medians by a large amount.

In the 2018 cross section of firms, I construct measures of total tax liability, eligible carryforwards for net operating loss deductions, the tax amount potentially due because of the book income AMT, and new tax due under the book income AMT. I measure applicable tax loss carryforwards as the minimum of Compustat pretax income and tax loss carryforwards. I calculate potential tax due because of the book income AMT as 15% of the difference

between Compustat pretax income and applicable tax carryforwards, all less foreign taxes. Finally, I calculate the firm's new tax liability as the maximum of the firm's old tax liability or the potential tax due because of the book income AMT, only applying the AMT if the firm has over $100 million in EBITD. Summing across the new tax liabilities for firms in the 2018 cross section yields a one year mechanical tax revenue estimate of $38 billion.

To ensure my construction of tax status in the Compustat data is consistent with tax data, I compare aggregates of tax variables available in SOI line item reports to aggregate proxies in the Compustat data in Figure B.1 for available years spanning 2008-2015. While there are differences in aggregates in Compustat and the SOI line item reports, the magnitudes reasonably track each other across years.

Building on the 2018 cross section, I construct a panel by simulating ten years forward for each firm, taking into account possible avoidance responses to the proposed Biden book income AMT. To facilitate a direct mapping from the DiD estimates of avoidance in section IV into the simulated data, I use CBO's 2018 ten-year GDP forecast as a proxy for book income growth per year for all firms, inflating book income (as well as EBITD and all other tax variables) by the CBO projected growth rate, and calculating book income as the sum of projected book income and a possible avoidance response to the policy.[30]

To incorporate firm avoidance responses into the book income projection, I define book income for each firm in the simulation as the sum of projected mechanical book income, and a possible avoidance response to the proposed Biden book income AMT,

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

where BI_t^{mech} is projected book income over the ten-year window applying only CBO GDP forecasts to 2018 book income, ε_t is the elasticity of book income with respect to the net of tax rate over time horizon t that I estimate in section IV, and $\frac{\Delta(1-\tau)}{1-\tau} = \frac{0.85-1}{1} = -0.15$ is

[30]To account reasonably for firm losses, I calculate the share of firms with positive losses in 2018 and calculate the ratio of those firm's losses to their pretax income. In each subsequent simulation year I randomly select a fraction of firms that matches the share with positive losses in 2018, and within this sample subtract the fraction of pretax income that was removed via applicable losses in the 2018 calculation. In unreported results, I find that revenue estimates are similar when I instead calculate the observed fraction of tax loss carryforwards over book income in 2018, and reduce projected book income for every firm by that same fraction in each subsequent simulated year.

the change in the net of tax rate after the introduction of the proposed Biden book income AMT 15% marginal tax on book income.

I capture avoidance responses to the proposed Biden book income AMT with $\varepsilon_t \cdot BI_t^{mech} \cdot \frac{\Delta(1-\tau)}{1-\tau} \cdot \mathbb{1}(T=1)$. The first terms $\varepsilon_t \cdot BI_t^{mech} \cdot \frac{\Delta(1-\tau)}{1-\tau}$ unwind the elasticity into a change in book income for each firm. $\mathbb{1}(T=1)$ is an indicator for firms with over \$100 million in EBITD in 2018 that would pay the proposed Biden book income AMT in 2018. This ensures that I only apply avoidance responses in the revenue simulation to a group of firms analogous to the treatment group in the DiD in section IV.

The methodology described above calculates a revenue score for Biden's proposed book income AMT holding all other tax policies fixed. However, the American Enterprise Institute (AEI) and Tax Policy Center (TPC) scores of the Biden book income AMT include other proposed policies in the 2020 Biden tax plan. The most important of these policies for a revenue score of the Biden book income AMT are an increase in the corporate tax rate to 28%, and a 21% global country-by-country minimum tax on the profits of foreign subsidiaries of US firms that may generate additional foreign tax credits (FTCs).

To quantify the impacts of these additional policies on revenue raised by the Biden book income AMT, I modify the revenue scoring procedure outlined above. First, to adjust for the higher corporate tax rate, I increase all positive tax liabilities in revenue simulations by $\frac{4}{3} \cdot (0.985)$, representing the increase in the corporate tax rate from 21% to 28%, and incorporating an elasticity of corporate taxable income of 0.15, at the lower end of the range of existing estimates (Gruber and Rauh, 2007; Devereux, Liu and Loretz, 2014).[31] This adjustment changes scores of the Biden book income AMT because AMT liabilities must exceed normal tax liabilities for firms to face the AMT.

Second, I adjust for FTCs from a new country-by-country global minimum tax on the profits of foreign subsidiaries of US firms. Compustat data aggregates to the parent company level, and therefore does not provide a country-by-country breakdown of income and taxes, but does provide measures of foreign income and taxes paid. Blouin and Robinson (2020) argues that Compustat foreign income and tax payments are reasonable measures of the

[31]This is likely an underestimate of the elasticity because larger firms more likely to be subject to the book income AMT may have substantially higher elasticities. Devereux, Liu and Loretz (2014) discuss this point in more detail.

economic activity of foreign subsidiaries of US firms because they do not suffer from double counting issues and align closely with measures of income and taxes in BEA data. Therefore, as a rough check of the additional FTCs a 21% global country-by-country minimum tax may raise, I replace foreign tax payments for all firms in the Compustat data with the maximum of their foreign tax payments or 21% of their foreign income. Foreign income is often missing in the Compustat data, which could reflect zero foreign income or a reporting issue. To be conservative, I impute 2018 foreign income with previous foreign income dating back to 2015 if the data is missing in 2018 (inflating foreign income by 3% per year).[32]

Adjusting for both a higher corporate tax rate and additional FTCs generated by a country-by-country global minimum tax yields a revenue estimate of $263 billion, while only adjusting for FTCs generated by a country-by-country global minimum tax yields a revenue score of $275 billion. Even with an additional adjustment for possible AMT credits (see footnote 25), this revenue estimate substanially exceeds the AEI or TPC revenue scores.

However, I wish to stress that the FTC adjustment is a fundamentally uncertain procedure. The impacts of a global country-by-country minimum tax depend on how much income multinational firms locate in tax havens, how firms reallocate factors of production across nations in response to new minimum taxes, and the ability of the new tax to capture shifted profits, all of which are uncertain parameters and the topic of current debate in the literature.[33] The FTC adjustment may be too conservative because it does not adjust taxes on a country-by-country basis, and because the financial accounting data in Compustat may fail to capture substantial amounts of income located in tax havens (Tørsløv, Wier and Zucman, 2020; Clausing, 2020). The FTC adjustment could also overstate the amount of FTCs generated because it assumes the new country-by-country minimum tax will be able to capture all foreign income present in Compustat in the tax base. In addition, any upward adjustment to my procedure that attempts to account for tax haven income missing from Compustat would depend on the magnitude of shifted profits, and the share of those shifted profits that will be captured in the tax base of the country-by-country minimum tax. Ulti-

[32]I also impute missing foreign tax payments with a $0 foreign tax bill, providing a conservative upper bound on how much tax payments could increase in response to a global country-by-country minimum tax.

[33]Blouin and Robinson (2020), Clausing (2020) and Tørsløv, Wier and Zucman (2020) are a few recent examples of the debate over profit shifting. Suarez Serrato (2019) explores how multinationals modify their factors of production in response to tax changes.

mately, a more rigorous adjustment to the revenue scores in this paper that accounts for the potential impacts of a global country-by-country minimum tax will require more complete data on the tax and economic activity of multinational firms.

Table B.1: Summary Statistics for Revenue Simulation Sample

	Observations	Mean	P10	Median	P90
Assets	2572	19713	216	2299	27229
Book Income	2572	739	6	110	1360
Taxable Income	2572	730	0	47	1012
Book Tax Differences	2572	10	−98	6	447
Sales	2572	5881	44	956	11535
Depreciation	2572	297	0	30	566
Depletion	2572	39	0	0	0
Interest Expense	2572	197	0	16	274
Employment	2424	15	0	2	30

Notes: This table reports summary statistics for the sample of firms used in revenue simulations. Statistics are in millions of USD, expect for counts and thousands of employees.

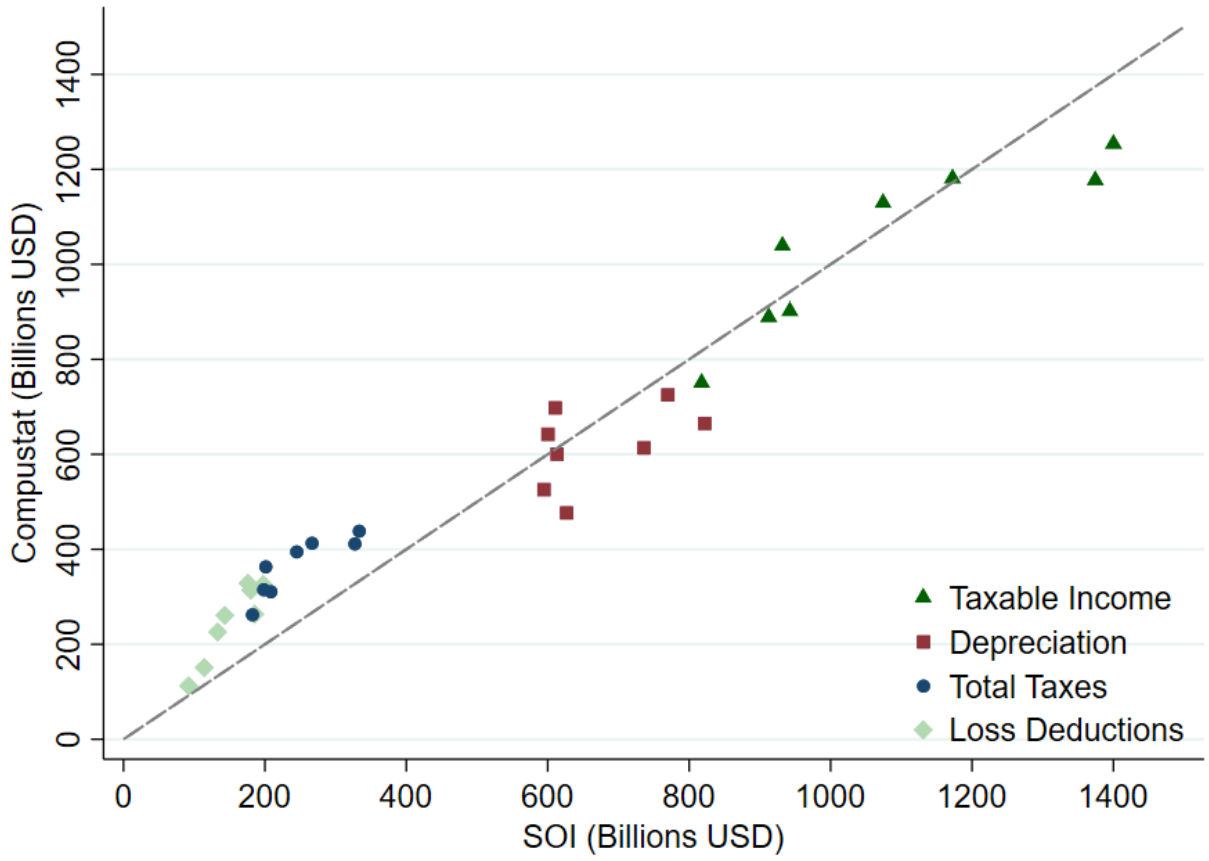

Figure B.1: Comparison of SOI Line Item Estimates to Compustat Aggregates 2008-2015

Notes: This figure compares aggregate sums of taxable income, depreciation, total taxes and net operating loss deductions in Statistics of Income line item reports and Compustat for years 2008 through 2015. The Compustat sample contains all firms with positive, non-missing assets, sales and pretax income that are incorporated in the U.S. in each year. Exact values for depreciation are available from both data sources. I construct a measure of total taxes in Compustat as total income taxes minus deferred income taxes minus other taxes, and my measure of taxable income in Compustat is total taxes divided by marginal tax rate. To construct a measure of net operating loss deductions in Compustat, I take the minimum of Compustat tax loss carryfowards and pretax income.