How the Rich Respond to Tax Rate Increases: Evidence from High-Income Taxpayer Responses to the 1993 Tax Act [1]

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Abstract

In this paper, we re-examine the responses of high income taxpayers to the increases in the top income tax rates under the Omnibus Budget Reconciliation Act of 1993 (OBRA93). We use a large panel of tax returns spanning 1987 to 1996 to estimate the elasticity of taxable income using a difference-in-difference methodology. In addition, we attempt to disentangle the well-documented income shifting responses to OBRA93 from longer run responses. Using the identification strategy proposed by Weber (2012), we estimate that the ETI is between 0.78 and 1.25. Accounting for the income shifting that occurred in anticipation of the higher tax rates reduces the estimated ETI to between 0.57 and 0.82. While higher than many estimates in the literature, these apply to the highest income taxpayers who might be expected to be the most sensitive to tax rate changes. We also consider the heterogeneity in behavioral responses to tax rate increases, both on the types of income that can potentially be manipulated and types of high-income taxpayers. We find evidence that the contemporaneous taxable income response may be driven by non-executives, while the income shifting responses are detected only for executives.

[1] The views expressed in this paper are those of the authors and do not necessarily reflect the policy of the U.S. Department of Treasury. We are grateful to David Albouy, Ivan Vandangos, Caroline Weber and participants at the 2011 National Tax Association Meetings and the 2011 International Institute for Public Finance Annual Conference for helpful comments.
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A central parameter in tax policy analysis is the elasticity of taxable income (ETI), which measures the responsiveness of the tax base to the rate of tax applied. The ETI captures a wide variety of responses to taxes, such as adjustments to labor supply, reallocations of investment portfolios, and changes in tax avoidance or tax evasion strategies. Moreover, under certain conditions, the ETI has been shown to summarize the marginal efficiency cost of raising tax revenue.[3] Because the ETI has important implications for the optimal structure of the tax system and the optimal size of the public sector, estimating it has been the focus of a large and growing literature in public finance.[4] Despite its centrality to the evaluation of tax policy, there remains no consensus over the magnitude of the ETI.[5]

In this debate, the behavioral responses of the affluent to taxes are of particular interest. This focus is motivated by the notion that high income taxpayers may be more responsive to taxes both because they face higher marginal tax rates and may have more opportunities to respond to changes in tax policy. As a result, changes in marginal tax rates at the top of the income distribution can have large implications for tax revenues and economic activity. Moreover, because the recent debates over future tax policy in the U.S. have focused predominantly on the taxation of the high end of the income distribution, these behavioral responses of the rich have received increased attention.

In this paper, we provide new estimates of the ETI of high-income taxpayers using a panel of tax return data that spans a period of increased tax rates on the affluent. We exploit the variation in tax rates that were generated under the Omnibus Reconciliation Act of 1993 (OBRA93), which increased ordinary tax rates on high-income taxpayers while leaving the tax

[3] See Feldstein (1999) and Chetty (2009).
[4] See Saez, E., J. Slemrod and S. Giertz (2012) for a critical review of this literature.
[5] Kopczuk (2005) and Giertz (2008) conduct analyses that examine several model specifications for estimating the ETI using U.S. data. They find, as in the literature, that estimates of the ETI lie between -1 and 1 depending on the set of assumption used.

schedule at lower levels of income essentially unchanged. Using a large panel of individual tax returns from 1987-1996, we estimate the ETI of high income taxpayers to increases in marginal tax rates. We employ several methodological techniques to account for the endogeneity of taxes to reported taxable income and heterogeneous trends in income growth. Because these tax rate increases could be anticipated, we separately estimate temporary (intertemporal) shifts in income from longer run responses to the change in tax policy.

We estimate that the standard difference-in-differences estimate of the ETI for high-income taxpayers is between 0.78 and 1.25, depending on the controls used and sample selection criterion used. We confirm previous studies that have shown that it is important to account for behavioral responses to future tax rate changes that taxpayers were able to anticipate. We estimate that the ETI is between 0.57 and 0.82 after account for this intertemporal shifting of taxable income.

In addition to estimating the ETI of the rich, we explore the potential for heterogeneity in high-income taxpayers' responses to taxes along two dimensions. First, we examine which sources of income drive these behavioral responses. Second, we consider whether taxpayers with similar incomes respond to taxes differentially based on their composition of income. Specifically, we classify taxpayers as executives using their self-reported occupations on their Form 1040s and separately estimate responses for executives and non-executives. In earlier work, Auten and Kawano (2012) use the same panel of tax returns and provide descriptive evidence of considerable heterogeneity in taxpayer responses to OBRA93 along both of these dimensions. This paper builds on our prior research to empirically estimate these heterogeneous responses. In future work, we plan to also classify taxpayers according to whether their incomes

are largely received in the form of wages and salaries, self-employment income, or from pass-through income sources.

1. Overview of the Ominbus Reconciliation Act of 1993

The Omnibus Reconciliation Act of 1993 was enacted in August 1993 and increased ordinary income tax rates for high-income taxpayers. Under this legislation, a new 36 percent tax rate was created and was imposed on taxable income over $140,000 for married taxpayers filing jointly ($115,000 for single tax filers). In addition, a 10-percent surtax was imposed on taxable incomes over $250,000. Together, the top statutory marginal tax rate increased from 31 percent to 39.6 percent, and the statutory rates for those with incomes between $140,000 and $250,000 were increased from 31 to 36 percent. The remainder of the tax rate schedule was unchanged.[6]

In addition to these changes in ordinary income tax rates, OBRA93 included other provisions that increased the effective marginal tax rates of high income taxpayers. First, the cap on income subject to the 2.9 percent Medicare tax, previously set at $135,000, was removed beginning in 1994. Second, under the Alternative Minimum Tax (AMT) the rate was increased from a flat 24 percent to a two-bracket system with 26 and 28 percent rates. Additional provisions targeted at high income taxpayers included capping the deductible portion of compensation for top executives of publicly traded firms at $1 million (unindexed) unless certain conditions were met, reducing the maximum compensation taken into account for pension benefits and contributions from $235,840 to $150,000, eliminating the deduction for club dues and reinstating the 53 and 55 percent top rates for the estate and gift tax. The top corporate rate was increased from 34 percent

[6] In provisions affecting lower and middle income taxpayers, the bill included a significant expansion of the earned income tax credit and some base broadening. Under the EITC, the maximum credits were increased and made available to more households by lengthening the phase-out range. Base broadening included reducing the deductible percentage of business meals from 80 percent to 50 percent and a new two-tier system that increased the taxable portion of Social Security to 85 percent above the second threshold.

to 35 percent, and some capital cost recovery rules were made slightly more generous for both corporate and non-corporate businesses.

A key element of OBRA93 that is important for interpreting estimates of the ETI coming from this period are the incentives and opportunities for individuals to shift income across tax years in order to reduce their total tax payments. The opportunity to shift income across tax years came in two waves. First, the tax increases of OBRA93 could have been anticipated in 1992 when Bill Clinton, who had made promises during his campaign to increase the taxes on the rich, was elected president.[7] Opportunities for advanced tax planning allowed high income taxpayers to shift their incomes from 1993 to 1992 to avoid future tax increases. A second tax incentive to shift income came in 1994 with the uncapping of the Medicare tax. This second opportunity for income shifting was perhaps particularly salient to self-employed individuals who would have seen the full increase in payroll taxes.[8]

2. **Related Literature**

This paper is related to the literature that aims to estimate the ETI, which is reviewed in Saez, Slemrod, and Giertz (2012). The most common methodology employed for estimating the ETI is to examine taxable income responses to changes in tax rates due to a tax policy change in a difference-in-differences framework. As in this paper, these studies exploit the fact that most tax policy changes have resulted in larger changes in tax rates for high income individuals

[7] See Auten and Kawano (2012) for more details on the key events that led to the passage of OBRA93 that are relevant to this study.

[8] Employees would have observed an increase in their remitted payroll tax equivalent to half the percentage amount of that observed by self-employed individuals. However, the incidence of the payroll tax may lead to different allocations of the tax burden.

relative to those lower in the income distribution.[9] In this section, we review several prior studies that examine taxpayer responses to the tax rate increases of OBRA 93.

Feldstein and Feenberg (1996) provide the earliest evidence of taxpayer responses to OBRA 93. Using a sample of 1991 tax returns and published tabulations of 1993 tax return data[10], they compare changes in taxable incomes between those with AGI of at least $200,000, the group of high income taxpayers who faced large changes in their tax rates, and those with AGI between $50,000 and $200,000. Attributing differential changes to the tax rate change, they conclude that taxpayers responded to the 1993 tax increases by decreasing their taxable income, with an implied ETI of 0.74. Due to the nature of the data used, this estimate is necessarily a short-term response that is unable to distinguish permanent responses from income shifting responses.

As additional years of data became available, it was possible to consider what portion of the tax response was due to intertemporal shifting of income in response to the anticipated future tax rate increases, and what constituted a longer run response. Sammartino and Weiner (1997) examine tabulations of tax returns through 1995. As Feldstein and Feenberg (1996), they find that reported incomes for high-income taxpayers, especially wages and salaries, fell from 1992 to 1993 following the 1993 tax increase, but concluded the changes may reflect a shift of income into 1992 in anticipation of the 1993 rate increases rather than a permanent response.

Carroll (1998) uses a panel of tax returns constructed from the Statistics of Income Individual Income Tax files from 1989 through 1995. To obtain an estimate of ETI that captures

[9] Many papers have exploited the changes in tax rates due to the Tax Reform Act of 1986, which reduced tax rates for most individuals, but more dramatically for high income individuals. These include Feldstein (1995), Auten and Carroll (1994, 1999), Moffitt and Wilhelm (2000), Gruber and Saez (2002), Kopczuk (2005), and Weber (2012).
[10] At the time of their study, individual tax return data were not yet available and1993 was the latest available data tabulations. The 1991data was aged to 1993 levels assuming that with no-behavior response, the reported incomes of taxpayers with AGI over $200,000 would have increased at the same rate as taxpayers with incomes between $50,000 and $200,000 who were not affected by the rate increase.

permanent responses, rather than timing responses, he uses a proxy for actual changes in tax rates based on an estimate of permanent income. Based on this methodology, the estimated ETI from this period is approximately 0.4.[11]

Goolsbee (2000) concluded that the response of executive salaries was almost entirely a short-run shift in the timing of compensation rather than a permanent change and came almost entirely from a large increase in the exercise of stock options by the highest-income executives in anticipation of the rate increases. He estimated that the short-run ETI with respect to the net-of-tax share exceeded one, but concluded that the elasticity after one year was at most 0.4 and probably closer to zero.

Giertz (2007, 2008) uses a stratified sample of individual tax returns from 1979 to 2001 to estimate the ETI for the 1980s and 1990s. He estimated an ETI around 0.3 for the 1990s , which was lower than his estimate of 0.4 for the 1980s. He presented evidence that estimates of ETI are sensitive to the weighting scheme, the time horizon considered, and the measurement of behavior. While he estimated ETI for different income classes (Giertz 2008), he did not focus on heterogeneity in ETI across individuals with different sources of income as is done here.

While the opportunities for income shifting have been examined in this previous literature, there are several other interesting potential taxpayer responses that can be explored. Auten and Kawano (2012) document a wide array of heterogeneous responses by high-income taxpayers to the 1993 tax act. The short-run response of highly paid executives was to get their companies to accelerate the payment of bonuses into December 1992 and over several years they shifted more of their investments into tax exempt bonds and realized a larger share of income as capital gains. Taxpayers with large amounts of partnership income apparently had less ability to

[11] To account for the effect of differential income growth trends, he included a set of industry and occupation controls in his estimations but did not find evidence that these factors affect the estimated ETI.

accelerate income ahead of the rate increases, but over several years reduced their income subject to the newly uncapped self-employment contributions act (SECA) tax and also increased their realizations of capital gains. In this paper, we expand on this previous work by empirically estimating these heterogeneous responses.

The broader literature on estimating the ETI has documented the many methodological challenges that must be overcome to obtain a consistent estimate of the ETI. It has long been acknowledged that the actual change in marginal tax rates that a taxpayer faces during a change in tax policy is endogenous to the change in taxable income. Moreover, it is well known that it is important to account for heterogeneous income growth rates across the income distribution in such analyses. In recent work, Weber (2012) shows that several methodologies proposed in the literature for addressing each of these econometric problems, and thus those used in the previous work on taxpayer responses to OBRA93, do not obtain consistent estimates of the ETI. As explained in the next section, we follow the methodology proposed in Weber (2012) to address these econometric problems.

3. Empirical Methodology

3.1 Basic Model of ETI: Difference-in-Differences

To estimate the elasticity of taxable income of high-income taxpayers, we begin with the standard difference-in-differences model found in the ETI literature, given by:

$$\Delta ln(Y_{it}) = \varepsilon \, \Delta ln(1-\tau_{it}) + \beta X_{it} + \eta_t + \Delta u_{it} \quad (1)$$

where Y_{it} is income, τ_{it} is the sum of that taxpayer's federal and state marginal tax rates, η_t are year fixed effects, and X_{it} is a vector of other controls for individual i in period t. The main parameter of interest is ε, the elasticity of taxable income with respect to the net-of-tax rate. Identification of ε comes from the tax changes brought about by OBRA93. In particular, because

OBRA93 increased tax rates for high income individuals while leaving the rest of the tax schedule essentially unchanged, identification is obtained by comparing the taxable income responses across the income distribution.

Because the net-of-tax rate is a function of taxable income, the log change in the net-of-tax rate is clearly endogenous to the log change in taxable income. To obtain a consistent estimate of ε, we correct for this endogeneity using instrumental variables. Several instruments have been proposed in the ETI literature, often computed as the predicted log change in the net-of-tax rate based on some function of lagged taxable income. The intuition behind such an instrument is that the tax rate instruments are computed using income prior to any behavioral responses to the tax policy change under examination.[12] Crucially, the income used to construct the instrument for marginal tax rates must be exogenous to the transitory component of contemporaneous income for the instrument itself to be exogenous. Weber (2012) shows that under relatively weak assumptions over the income generating process, the most commonly used tax instrument – the predicted change in tax rates obtained using base year income – is endogenous and thus estimates using this instrument are biased and inconsistent.

To select an exogenous instrument for the net-of-tax rate, we employ the method proposed by Weber (2012). This method involves constructing several tax instruments based on predicted tax rates obtained using different lags of income and testing the appropriate number of lags of income that should be used to obtain an exogenous instrument. This test, the difference-in-Sargan test, is an over-identifying restrictions test where the null hypothesis is that the included instruments are exogenous.[13] To conduct this test, we compute the standard instrument,

[12] The most commonly used instrument in the literature is the log change in the net-of-tax rate assuming that base-year income were earned in both years.
[13] For further details on this test see Arellano and Bond (1991) and for details on its application to the ETI, see Weber (2012).

which is the log change in the net-of-tax rate treating base year income as the level of income earned in both years. In addition, we compute similar measures using one, two and three year lags of income from the base year as the level of income that taxpayers are assumed to earn in each year computed in the difference. We assume that the change in after-tax rates based on two and three years of taxable income is exogenous to the contemporaneous change in after-tax rates and test whether the change in after-tax rates based on one lag of taxable income yields an exogenous instrument for tax rates. While in theory the tax instrument based on base year taxable income will be endogeneous, we also include specifications that use this instrument for comparison because it is among the most commonly used in the previous literature.

A common approach for accounting for potential endogeneity concerns that arise from mean reversion of income when using the base year income is used to construct a predicted change in marginal tax rates has been to include some smooth function of taxable income in the base year as a control (e.g., Gruber and Saez 2002). Weber (2012) shows that such controls are not necessary when an exogenous instrument is used. However, to compare our estimates to the previous literature, we also include base year income controls in some specifications. [14] These income controls are endogenous when included directly. Thus, we instrument for them using the same base year of income that are used to construct the net-of-tax rate instruments. These income controls are included using a five-piece spline to account for potential nonlinearities in the relationship between income growth trends and income.[15]

There are several other control variables that are included in *X*. As in most other studies using tax return data, we include an indicator variable for whether the tax filing unit is married

[14] Auten and Carroll (1999) were the first to account for potential heterogeneity in income growth trends in estimating ETI.
[15] Gruber and Saez (2002) were the first to use splines for this purpose. We check the robustness of our results to this choice.

filing jointly and number of children. Because we have social security records, we are also able to include age of the primary taxpayer and age squared,

3.2 Alternative Specification

While the difference-in-differences approach is the standard method for estimating the ETI, there are some potential drawbacks to this method. In particular, the use of year dummies effectively removes the effects of the change in the top rate. Identification of changes in tax rates thus depends primarily on the difference in the change in tax rates of the top income class as compared to the change in tax rates of a lower income group. But those in the lower income group may differ in unmeasured characteristics.[16] Furthermore, the need to control for income reversion by including income splines may confuse the estimated effects of tax rates as compared to income class.

To ascertain the robustness of our baseline results to these potential critiques, we estimate an alternative specification where we replace year fixed effects in equation (1) with the state GSP to control for changes in key economic variables over time. In this specification, we continue to instrument for marginal tax rates and control for heterogeneous income growth as previously described.

3.3 Dynamic responses

As has been previously described and shown in earlier research, there were great incentives for intertemporal income shifts which complicate the interpretation of the ETI based off of one year differences. For example, if high income individuals shifted their taxable income from 1993 to 1992 and those lower in the income distribution did not change the timing of their income realizations, then estimates of the ETI would over-estimate this structural parameter.

[16] Note that this concern may be somewhat mitigated in our analysis because we restrict our attention to relatively high income households.

This is because the decrease in taxable income between 1992 and 1993 for high income individuals would be mechanically inflated. Such reallocations of income across time, while they do have implications for the collection of tax revenues, do not reflect a more permanent response to taxes.

We estimate dynamic responses to the 1993 tax act by including two measures of anticipated changes in tax rates. The first measure is the future log change in net-of-tax rates. The second measure is an average tax rate measure that captures anticipated future increases in tax liabilities, which may be particularly important in the context of the uncapping of the HI component of the SECA and FICA taxes.[17] High income taxpayers could face a very large increase in tax liabilities from the uncapping of HI tax, the magnitude of which would not be reflected in the change in the marginal tax rate. To capture the total effect of the tax change, including the income effect, this measure is defined as the log difference in predicted future tax payments based on current income and current actual tax payments if future payments are higher than current payments and zero otherwise.

Because taxpayers may choose the timing of their income receipt in anticipation of future tax changes, measures of future changes in tax rates based on current income are also endogenous. These future tax rate change measures are instrumented similarly to the contemporaneous tax rate variables. That is, we compute the predicted future rate change measures based on the same year of income that is used to construct the contemporaneous tax instrument.

If taxpayers respond to anticipated future increases in tax bills by shifting their income into the year prior to the tax increase, then the estimated ETI is expected to decrease when future tax rates are included in the regression. This would be consistent with an inflated log change in

[17] We use federal tax liabilities from TAXSIM. See Feenberg and Coutts (1993) and http://www.nber.org/taxsim/.

taxable income as tax rates increased in 1993 due to a shift of income into 1992 that would have otherwise been realized in 1993. The coefficient on the future log change in the net-of-tax rate variable is expected to be negative. As taxpayers anticipated that the future net-of-tax rate would fall under the 1993 tax act, they may have responded by increasing their current income realizations. The coefficient on the log increase between future tax liabilities and current tax liabilities is expected to be positive. That is, if tax payments are expected to increase in the future, then taxpayers may have responded by shifting their income into the current period.[18]

3.4 Heterogeneous responses

We examine two potential sources of heterogeneity in taxpayer responses to OBRA93. This analysis is motivated by the belief that high-income taxpayers may have more opportunities to manipulate their income in response to tax changes. First, because there was some anticipation of the tax rate increases to come, high-income taxpayers may have shifted different types of income across tax years. Second, the use of these different types of income shifting may have varied by people with different primary sources of income (Auten and Kawano, 2012). Estimates of ETI based on the full sample will produce a weighted average of ETI across these different types of individuals.

We examine the first potential source of heterogeneity by using different types of income as the basis for our dependent variable of interest. In particular, we use the log change in wage and salary income and the log change in business income as alternative dependent variables in equations (1) and (2). We further decompose business income into income from sole proprietorships, income from S corporations, and income from partnerships. We estimate these for the entire population of high-income taxpayers.

[18] Note that the difference in the expected signs in the effect of the two variables meant to capture future tax rates is a mechanical result. The former should decrease when tax rates are anticipated to increase, while the latter measure should increase when tax rates are anticipated to increase.

To explore the second potential source of heterogeneity, we identify subsamples of those that have large wage and salary income, those who have large self-employment income, those who have large partnership income, and those who are self-reported to be executives. For these different types of rich, we estimate the ETI, as well as the responses of different sources of income. We might expect that high income taxpayers responded to OBRA93 using the types of income that were the most easily manipulable. Moreover, because the uncapping of the Medicare tax cap may have been more salient to self-employed individuals, we might expect income shifting from 1994 to 1993 may have been stronger for the group with large self-employment income.

4. **Data**

We use the Office of Tax Analysis' Family Panel, a panel of tax returns spanning 1987 through 1996.[19] The panel contains approximately 87,000 non-dependent taxpayers whose returns were sampled for tax year 1987, along with a refreshment sample consisting of a one in 5,000 random sample of taxpayers whose first return appears after 1987. The 1987 sample of tax returns was a stratified random sample, which aids in the efficiency of our estimates because the 1993 act only changed tax rates at the higher end of the income distribution. In addition to tax return data, the panel includes information on age, family status and occupation and is supplemented with data from information returns filed with the IRS. We use these self-reported occupations to identify those who are executives as of tax year 1989.

We make several sample restrictions for our analysis. First, because our identifying variation comes from a tax policy change concentrated at the upper tail of the income distribution, the question of which taxpayers are the appropriate control group for difference-in-

[19] These data are described in detail in Nunns, James, Deena Ackerman, James Cilke, Julie-Anne Cronin, Janet Holtzblatt, Gillian Hunter, Emily Lin, and Janet McCubbin. "Treasury's Panel Model for Tax Analysis." OTA Technical Working Paper 3, July 2008.

differences based comparisons is a concern. We choose to focus on the group of "relatively" high income individuals for our primary analysis using restrictions based on a taxable income measure prior to the 1993 act. Because tax filing units can change in composition throughout the panel, we construct a family size consistent measure of taxable income to account for economies of scale in consumption. Specifically, in each year, we construct an equivalence scale by dividing broad income by the square root of 2 for households that are married filing jointly.[20] We restrict households to those whose average equivalence scale adjusted taxable income over 1987-1991 is at least $50,000 (nearly $71,000 for households married filing jointly). We use other income restrictions, based both on alternative measures of income and different income cut-offs, to ascertain the robustness of our results to this choice.

Second, we restrict the age of those who are included in our sample. Because individuals who are relatively young may exhibit atypical income growth patterns as they complete their education, we restrict observations to those who are over 30 years of age. In addition, we restrict our sample to those who are younger than 59 in 1990 (and 65 in 1996) because retirees and those nearing retirement will also experience changes in their income. We also restrict observations to those who do not change marital status between the years examined (i.e., consecutive years when examining first differences), because such changes will lead to changes in taxable income at the tax filing unit level as incomes between spouses are either combined or disjoined. Lastly, we restrict observations to those who file their taxes in the 50 states or Washington, D.C.

[20] A common methodology for adjusting income to reflect a family's ability to pay is to divide family income by household size raised to the power of some family size elasticity. Several equivalence scales have been used in the literature. An elasticity of 0.5, as we use here, has been used in several previous studies and is used by the CBO.

The dependent variable of interest is the log change in taxable income.[21] We follow Gruber and Saez (2002) in dealing with outliers in both the dependent variable and independent variable of interest.[22] In addition to reported taxable income, we compute two other measures of income: positive income and broad income. Positive income is the sum of wages and the positive values of investment income, business income and other forms of income reported on tax returns, including tax exempt interest. Broad income starts with adjusted gross income and adds tax exempt interest, carryovers of prior year net operating losses, excluded foreign income, and certain AMT preferences. Both measures exclude state income tax refunds, which are included in AGI but reflect an adjustment for prior deductions. The goal of both measures is to provide a broader measure of economic income that adds back forms of income that are excluded from taxes and omits items that reflect prior year activities.[23]

We compute federal and state marginal tax rates on ordinary income using NBER's TAXSIM calculator.[24] To construct our potential tax rate instruments, we also compute the tax rates that a tax filing unit would have faced under a different tax year given that year's income and demographic characteristics. In these computations, we adjust all income components using the Consumer Price Index appropriately. State GDP is used in some specifications to control for macroeconomic factors that may affect a taxpayer's income.[25]

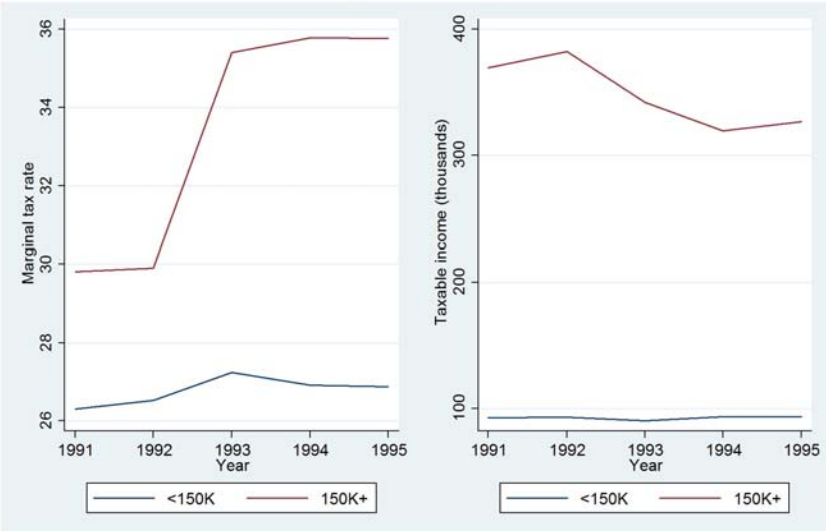
Table 1 contains summary statistics for our estimation sample. After our restrictions, our estimation is based off of a sample of 35,325 observations. The income variables reflect that we

[21] An important feature of examinations of responses to TRA86 is that it is imperative that the researcher define a policy-constant measure of taxable income because TRA86 made several adjustments to the tax base in addition to the tax rates. Failing to do so would generate variations in taxable income that were due to changes in the tax base definition rather than behavioral responses. Such an exercise is not necessary for OBRA93.
[22] These are defined as those where the sum of the actual log change in the net-of-tax rate and the predicted log change in the net-of-tax rate is greater than one. In addition, we censor the absolute value of the log change in taxable income at 7.
[23] These income measures should reduce the influence of some forms of tax avoidance behavior.
[24] See Feenberg and Couttis for details.
[25] State GDP data are available at www.bea.gov/regional.

focus on a sample of relatively higher income taxpayers for our analysis. Given the high income sample, it is not surprising that the majority of taxpayers are married, and that they are relatively older (average age of 48). Roughly 12% of the sample self-reports that they are executives in tax year 1989.

Before turning to our econometric analysis, Figure 1 depicts both the marginal tax rates that our sample of relatively high income taxpayers faced through the 1993 act as well as preliminary evidence that high income taxpayers responded to these tax rate increases. We restrict analysis to those observations included in the regression in column (7) of Table 2. We segment the sample into two AGI classes, those with AGI below $150,000 and those with AGI at or above $150,000, where AGI is adjusted for marital status as before. The left panel of Figure 1 clearly depicts the increase in marginal tax rates that individuals faced in 1993. The right panel of Figure 1 depicts a reduction in taxable income in both 1993, the year of the tax rate increases, and in 1994, the year of the HI tax uncapping. The acceleration of taxable income into tax year 1992 by high income taxpayers is also clear.

Figure 1: Marginal tax rates and taxable income by AGI Classes



5. **Results**

6.1 Baseline results

Table 2 provides regression results from several difference-in-differences specifications based on one-year differences. The regressions are estimated by two-stage least squares and are weighted by sampling weights. The estimating equation is given by equation (1). In addition to reported estimates, the regressions include an indicator variable for marital status, the age of the primary tax filer (level and square), and year fixed effects. Some specifications also include income controls. When income controls are used, these are included as a 5-piece spline because of its increased flexibility in functional form, as is standard in the ETI literature. The sample for these estimates is based on of the average taxable income from 1987 to 1989 adjusted for marital status, as previously described.[26] Standard errors are heteroskedasticity-robust and clustered at the tax filing unit level. The table also includes the p-values from the Difference-in-Sargan tests, which test for instrument exogeneity, and the F-statistic from the first-stage regression, which tests for weak instruments.[27]

For each specification, we assume that two and three lags of taxable income are exogenous to contemporaneous taxable income.[28] In columns (1)-(3), we test whether the predicted tax instrument based on base year taxable income, $\Delta(1-\tau^p)$, is exogenous. Column (2) includes splines of log taxable income in the base year, whereas column (3) includes splines of lagged values of the dependent variable. As expected, the p-values of the difference-in-Sargan test in columns (1) and (2) are well below 0.10, so we strongly reject that the tax rate instrument is exogenous as is theoretically predicted in Weber (2012). It is only in column (3) when we include a spline of the lagged values of the dependent variable that it appears that the tax

[26] Basing our sample selection criterion to those with a1987-1991 average of adjusted broad income above $50,000 provides very similar results.
[27] The reported F-statistic is the Kleibergen-Paap Wald rk F statistic, which is robust to non-i.i.d. residuals. This test is similar to the Cragg-Donald Wald statistic, which is valid only under the assumption of i.i.d. residuals.
[28] This is similar to the empirical analysis presented in Weber (2012).

instrument is exogenous. In this specification, the estimated ETI is 0.77, and statistically significant at the 5% level.

In columns (4)-(6), we test whether predicted tax rates based on one lag of base year taxable income is exogenous. The p-values of the difference-in-Sargan tests in these specifications are very close to 0.10, suggesting that there may be some endogeneity concerns that remain. The estimated ETI in these regressions range from 0.74 to 1.34, which are again higher than those found in the previous literature.

The most convincing estimates appear in columns (7)-(9), where we perform the same analyses as in columns (4)-(6) except that the sample selection criterion is based off of base year taxable income rather than the average of taxable income from 1987 to 1991. As before, taxable income has been adjusted for marital status. The tax instrument is the predicted change in tax rates based on the lag of base year income. The p-values of difference-in-Sargan tests in each specification are well above 0.10, so we fairly confidently fail to reject that the instruments are exogenous. Interestingly, the magnitudes of the ETI estimates are fairly similar to those found in (4)-(6). The F-statistics on the first stage regressions are relatively large, except for the specification that includes splines of taxable income. These regressions suggest a relatively large elasticity of taxable income, between 0.78 and 1.25. Because the income splines are meant to account for the potential endogeneity of the predicted tax instruments, and the difference-in-Sargan test suggest that the included instruments are indeed exogenous, specification (7) is our preferred specification. Here, the ETI is 1.25 and statistically significant at the 1% level.

6.2 Alternative specification

Table 3 provides results from regressions that are similar to the results presented in section 6.1 where we replace year fixed effects with the log change in state GDP. The same covariates

are included and sample selection criterion is employed as before. We assume that two and three lags of taxable income are exogenous and test whether tax instruments constructed using base year taxable income are valid in columns (1)-(3), and whether tax instruments constructed using one lag of taxable income are valid in columns (4)-(9).

In each specification, the estimated ETI is larger when we account for general macroeconomic trends in terms of state GDP rather than using year fixed effects. This suggests that the use of year dummies may capture some of the tax rate effects when marginal tax rate changes primarily affect the highest income taxpayers.

As before, the preferred specifications are those where the sample selection is based off of the lag of taxable income, adjusted for marital status. In columns (7)-(9), the p-values of the difference-in-Sargan test are well above 0.1, and the first stage F-statistics are fairly large. These specifications suggest an ETI between 1.02 and 1.47. From this point forward, we focus our attention to estimates that use one lag of taxable income to construct the tax instruments and base the sample selection on the lag of taxable income.

6.3 Dynamic responses

In Table 4, we provide parameter estimates when we include the future change in after-tax rates in our baseline specification. The estimation sample is based on taxable income in the previous year. We report only regressions that include splines of the lagged dependent variable because these specifications provided evidence that the instruments are exogenous based on the difference-in-Sargan test, and that the instruments are strong. In column (1), we include the future change in marginal tax rates and instrument for it with the future change in marginal tax rates based on one and two lags of income. In column (2), we include the log change in predicted

tax liabilities based on current income, and instrument for it using this variable computed using one, two and three lags of income.

Not surprisingly, it appears to be important to control for income shifting when estimating the ETI around the 1993 act. We now estimate that the behavioral responses of high income taxpayers to the tax rate increases is smaller than in the specifications where we did not control for income shifting incentives. The estimated ETI is now between 0.57 and 0.82. As taxpayers foresaw tax rate increases (i.e., a reduction in their net-of-tax rates), they accelerated income forward, as indicated by the negative coefficients on the future change net-of-tax rate variable. However, this parameter estimate is not statistically significant. Similarly, the effect of a future increase in tax liabilities is an increase in taxable income and this effect is statistically significant at the 10% level.

6.4 Heterogeneous responses

Table 5 examines the responses of different components of income for all relatively high income taxpayers in our sample. We consider income from wages and salaries, long-term capital gains realizations, the ratio of tax preferred investment income to total investment income, Schedule C income, active partnership income, and active S corporation income. For the overall sample, we find that wage and salary income is sensitive to changes in marginal tax rates, and that these responses are statistically significant.

Table 6 presents estimates of the ETI for those who self-report that they are executives in tax year 1989, and those who are not executives. For executives, the future predicted increase in tax liability is positive and statistically significant at the 1 percent level, indicating income shifting ahead of the anticipated tax rate increases. The results for the current tax rate, which show the non-transitory response, are between 0.85 and 1.12, but are not statistically significant. In

contrast, the current tax rate variable for non-executives all imply large ETIS, ranging from 1.25 to 1.34, and all are statistically significant at the 1 percent level. The results suggest that overall, non-executives engaged in little or no income shifting. This does not necessarily rule out such shifting among some subgroups, however.

7 Conclusions

In this paper, we provide new estimates of the ETI for high income taxpayers using responses by the rich to the tax rate increases brought about by the Omnibus Reconciliation Act of 1993. By applying new methodologies that more credibly identify the behavioral responses of high income taxpayers to taxes, we estimate that the ETI is between 0.78 and 1.47 when we do not account for the income shifting that occurred in anticipation of the tax rate increases of 1993. When we control for potential income shifting that occurred in anticipation of these tax rate increases, we estimate that the ETI is between 0.57 and 0.82. While higher than many estimates in the literature, these estimates apply to the highest income taxpayers, who might be expected to be the most sensitive to tax rate changes. Building upon our previous work, we provide preliminary results that suggest heterogeneity in responses by different types of rich in the sources of income that they manipulated. In future versions of this paper, we will continue to explore this heterogeneity and income shifting in greater detail.

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Table 1: Summary Statistics

Variable	Mean	Std. Dev.
Age of primary	48.26	7.67
Number of children	1.04	1.13
Married	0.85	0.36
Executive	0.12	0.33
Taxable income	192,978	465,397
Adjusted gross income	200,665	486,298
Wage income	158,022	320,790
Number of observations	35325	

Notes: Summary statistics are for years 1990-1996 and match the sample restrictions imposed in Table 2, Column (7). Statistics are weighted by sampling weights.

Table 2: Baseline Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change in after-tax rate	1.684***	0.318	0.770**	1.337***	0.978**	0.742*	1.250***	0.867***	0.780**
	(0.346)	(0.296)	(0.335)	(0.434)	(0.438)	(0.439)	(0.361)	(0.325)	(0.338)
1st Quintile Spline		-0.277***	-0.480***		-0.098	-0.449***		-0.122	-0.162*
		(0.076)	(0.071)		(0.100)	(0.068)		(0.163)	(0.094)
2nd Quintile Spline		0.190*	0.491***		0.104	0.441***		0.074	-0.048
		(0.105)	(0.153)		(0.142)	(0.144)		(0.185)	(0.174)
3rd Quintile Spline		-0.011	0.102		-0.045	0.112		0.068	0.372*
		(0.084)	(0.210)		(0.162)	(0.206)		(0.122)	(0.225)
4th Quintile Spline		0.071	-0.718***		-0.006	-0.673***		-0.057	-0.567***
		(0.092)	(0.174)		(0.244)	(0.181)		(0.203)	(0.200)
5th Quintile Spline		-0.177**	0.450***		-0.001	0.360**		-0.029	-0.252*
		(0.082)	(0.126)		(0.179)	(0.153)		(0.162)	(0.152)
Instruments (lags)	0,2,3	0,2,3	0,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3
Sample selection	87-91	87-91	87-91	87-91	87-91	87-91	Lag	Lag	Lag
Observations	42,264	42,094	35,124	40,104	39,700	33,479	35,320	35,320	29,546
Individuals	11240	11206	10465	10281	10184	9563	9586	9586	8852
Diff-in-Sargan p-value	0.0630	0.0269	0.523	0.113	0.113	0.103	0.454	0.448	0.436
F-statistic	74.61	67.89	44.03	42.27	10.52	37.09	50.09	12.63	53.58

Notes: All regressions are estimated by 2SLS. Heteroskedasticity-robust standard errors clustered at the tax filing unit level are presented in parentheses. Indicator variables for marital status, age of the primary filer, number of children, and base years are also included in the estimation. In columns (2), (5), and (7), splines are a function of log base-year income. In columns (3), (6), and (9), splines are a function of the lagged dependent variable. The spline coefficients provide the marginal change from the previous spline coefficient.

Table 3: Alternative Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change in after-tax rate	1.883***	0.723***	1.115***	1.680***	1.357***	1.216***	1.473***	1.247***	1.024***
	(0.316)	(0.267)	(0.299)	(0.374)	(0.361)	(0.377)	(0.306)	(0.282)	(0.292)
1st Quintile Spline		-0.286***	-0.483***		-0.114	-0.453***		-0.117	-0.158
		(0.077)	(0.072)		(0.102)	(0.069)		(0.167)	(0.096)
2nd Quintile Spline		0.195*	0.486***		0.127	0.433***		0.077	-0.064
		(0.106)	(0.157)		(0.144)	(0.149)		(0.191)	(0.179)
3rd Quintile Spline		0.006	0.139		-0.043	0.159		0.058	0.413*
		(0.087)	(0.218)		(0.166)	(0.217)		(0.126)	(0.235)
4th Quintile Spline		0.058	-0.758***		-0.040	-0.729***		-0.052	-0.609***
		(0.095)	(0.179)		(0.256)	(0.189)		(0.208)	(0.206)
5th Quintile Spline		-0.181**	0.462***		0.039	0.383**		-0.034	-0.239
		(0.084)	(0.130)		(0.192)	(0.160)		(0.167)	(0.155)
Instruments (lags)	0,2,3	0,2,3	0,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3
Sample selection	87-91	87-91	87-91	87-91	87-91	87-91	Lag	Lag	Lag
Observations	42,315	42,145	35,150	40,154	39,750	33,505	35,320	35,320	29,546
Individuals	11251	11217	10471	10292	10195	9569	9586	9586	8852
Diff-in-Sargan p-value	0.0703	0.0374	0.580	0.0994	0.0948	0.0976	0.460	0.454	0.450
F-statistic	102.8	96.86	66.21	59.36	16.82	54.08	76.73	22.04	84.95

Notes: All regressions are estimated by 2SLS. Heteroskedasticity-robust standard errors clustered at the tax filing unit level are presented in parentheses. Indicator variables for marital status, age of the primary filer, number of children, and the log change in gross state product are also included in the estimation. In columns (2), (5), and (7), splines are a function of log base-year income. In columns (3), (6), and (9), splines are a function of the lagged dependent variable. The spline coefficients provide the marginal change from the previous spline coefficient.

Table 4: Dynamic Responses

	(1)	(2)
Change in after-tax rate	0.815**	0.567**
	(0.356)	(0.289)
Future change in after-tax rate	-0.219	
	(0.387)	
Future change in tax liability		0.538*
		(0.294)
1st Quintile Spline	-0.130	-0.156
	(0.120)	(0.123)
2nd Quintile Spline	-0.091	-0.036
	(0.214)	(0.212)
3rd Quintile Spline	0.314	0.390
	(0.265)	(0.256)
4th Quintile Spline	-0.457**	-0.579**
	(0.219)	(0.229)
5th Quintile Spline	-0.163	-0.260*
	(0.152)	(0.150)
Observations	21,456	19,553
Individuals	7276	7087
Diff-in-Sargan p-value	0.945	0.177
F-statistic	15.27	30.21

Notes: All regressions are estimated by 2SLS. Heteroskedasticity-robust standard errors clustered at the tax filing unit level are presented in parentheses. Indicator variables for marital status, age of the primary filer, number of children, and the log change in gross state product are also included in the estimation. Splines are a function of the lagged dependent variable. The spline coefficients provide the marginal change from the previous spline coefficient.

Table 5: Income Components

Dependent variable: log change in	(1) Wages	(2) LT gains	(3) Tax pref portfolio	(4) SE Earnings	(5) Active partnership	(6) Active S Corp
Change in after-tax rate	1.063***	-1.455	-0.777	-1.749	-0.786	-1.827
	(0.366)	(2.145)	(1.097)	(1.983)	(1.895)	(7.253)
Future change in after-tax rate	-0.523	2.850	-3.314**	4.641	7.763***	-11.898
	(0.790)	(2.672)	(1.552)	(7.379)	(2.092)	(10.242)
Observations	25,568	11,497	15,041	6,386	5,362	9,425
Individuals	7432	4747	4878	2790	2406	3345
Diff-in-Sargan p-value	0.314	0.276	0.964	0.790	0.934	0.291
F-statistic	8.346	3.966	13.57	0.435	4.776	1.188
	(7)	(8)	(9)	(10)	(11)	(12)
Change in after-tax rate	1.587***	0.484	-1.370	0.066	-3.406	3.283
	(0.565)	(1.941)	(0.999)	(3.705)	(3.093)	(6.533)
Future change in tax liability	2.324	-0.852	0.818	0.371	2.868	-12.048
	(1.640)	(1.942)	(0.702)	(2.562)	(3.978)	(9.097)
Observations	23,575	10,043	12,834	5,559	4,283	7,306
Individuals	7380	4413	4609	2649	2105	2874
Diff-in-Sargan p-value	0.481	0.338	0.771	0.767	0.228	0.419
F-statistic	6.932	10.74	33.79	0.897	7.612	1.834

Notes: All regressions are estimated by 2SLS. Heteroskedasticity-robust standard errors clustered at the tax filing unit level are presented in parentheses. Indicator variables for marital status, age of the primary filer, number of children, and base year fixed effects are also included in the estimation.

Table 6: Executive and Non-executive Responses

	Executives			Non-executives		
	(1)	(2)	(3)	(4)	(5)	(6)
Change in after-tax rate	0.849	0.851	1.119	1.290***	1.248***	1.326***
	(0.776)	(0.816)	(0.734)	(0.419)	(0.420)	(0.421)
Future change in after-tax rate		-1.026			0.180	
		(0.935)			(0.532)	
Future change in tax liability			1.317***			-0.410
			(0.479)			(0.335)
Observations	10,741	8,199	6,989	24,584	18,485	17,255
Individuals	2768	2333	2170	6818	5624	5665
Diff-in-Sargan p-value	0.549	0.895	0.622	0.590	0.666	0.0710
F-statistic	18.03	5.301	27.66	38.57	10.47	41.69

Notes: All regressions are estimated by 2SLS. Heteroskedasticity-robust standard errors clustered at the tax filing unit level are presented in parentheses. Indicator variables for marital status, age of the primary filer, number of children, and base year fixed effects are also included in the estimation.