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A SENSITIVITY ANALYSIS OF THE ELASTICITY OF TAXABLE INCOME

by Seth H. Giertz*

Abstract

This paper applies the methods of Gruber and Saez (2002) to a panel of tax returns spanning years 1979 through 2001 in order to examine the sensitivity of the elasticities of taxable and broad income to an array of factors. The paper finds that Gruber and Saez's approach yields an estimated elasticity of taxable income (ETI) for the 1990s that is about half the size of my corresponding estimate for the 1980s. The paper finds that weighting regression results by income not only has a substantial impact on the estimates, but also results in overall estimates that are influenced by a small number of predominately high-income filers. For example, excluding 100 of the most influential observations (just 0.2 percent of the sample) lowers the estimated ETI for the 1980s from 0.37 to 0.08. Estimating the elasticities on the large SOI sample does not change the elasticities much, but does appear to yield results that are more robust to other specification changes.

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I. Introduction

The degree to which taxes alter economic activity and tax reporting behavior is a subject of debate. Estimates of the effect range from extremely large to almost none. For even modest changes to tax rates, the range of estimates implies differences in deadweight loss and income tax revenue of many tens of billions of dollars. One of the key variables at the center of recent research is the elasticity of taxable income (ETI), which measures the responsiveness of reported taxable income to changes in marginal tax rates.[1] The ETI, if accurately estimated, can be used to calculate both the change in deadweight loss[2] and the change in income tax revenues resulting from a change in tax rates.[3] However, in practice, assessing both the efficiency and revenue implications of tax rate changes is more complex than the formulas suggest. For example, if the ETI differs by income, an accurate assessment of either efficiency or revenue implications requires a breakdown of the responses by the level of income.[4]

Despite a great deal of variation in ETI estimates, both across papers and within studies that explore different specifications, several recent papers have reported an overall ETI of about 0.40. An often-cited study by Gruber and Saez (2002) examines responses to the tax cuts of 1981 and 1986, and finds an overall estimated ETI of 0.40. However, Kopczuk (2003) finds similarly estimated results to be quite sensitive to sample selection and model specification. It may also be the case that the results are not robust to the time-period examined or to the addition of a richer set of demographic variables.

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[1] Specifically, the ETI equals the percentage change in reported taxable income associated with a one percent increase in the net-of-tax rate, where the net-of-tax rate equals one minus the marginal tax rate.

[2] Feldstein (1999) shows that $deadweight\ loss = -0.5 \cdot tax\_rate^2 \cdot (1 - tax\_rate)^{-1} \cdot ETI \cdot taxable\_income$.

[3] Income tax revenue equals: $ETI \cdot net\text{-}of\text{-}tax\text{-}rate \cdot taxable\_income \cdot tax\_rate$.

[4] Additionally, when external costs or benefits are present, assessing efficiency implications is also more complex. For example, suppose tax rates rise and, in response, taxable income falls, but a portion of that drop in taxable income comes from increased charitable contributions (and suppose those charities produce positive externalities). Or, suppose that a tax increase is used to finance an under-provided public good. In such instances, the standard deadweight loss formula will overstate the efficiency cost of an increase in tax rates.

This paper replicates Gruber and Saez's techniques using similar data. My results for the 1980s closely parallel theirs. Applying the same methodology to 1990s data and to data from both the 1980s and 1990s combined, however, yields estimated ETIs for the 1990s that are much smaller than corresponding estimates for the 1980s. In fact, using Gruber and Saez's preferred specification yields an estimated ETI that is a little over half the corresponding estimate for the 1980s. Weighting regression results by income not only has an enormous impact on the estimates, but also results in overall estimates that are driven by a tiny fraction of high income filers. For example, excluding the 100 most influential observations (just 0.2 percent of the sample) as measured by a *dfbeta* test lowers the estimated ETI for the 1980s from 0.37 to 0.08.

Employing the same methodology on a much larger dataset generates similar results – albeit somewhat more robust. The larger dataset still yields ETIs that generally differ for the 1980s and 1990s. The model with the richest set of controls produces an estimated ETI of 0.43 for the 1980s and one of 0.20 for the 1990s. Turning to a more encompassing income measure, broad income, generally results in smaller elasticities, with again estimates for the 1990s that are smaller than those for the 1980s. With the richest set of controls, the estimated elasticity for broad income is 0.21 for the 1980s and 0.13 for the 1990s.

II. Issues in the Analysis

Tax changes take place in a changing economic environment in which changes to that environment affect income growth. Controlling for those non-tax-induced trends in taxable income is a major obstacle to accurately estimating elasticities. The issue of non-tax-related trends in income is given the most attention in this section because the approach used to control for those trends represents the most novel aspect of the model employed in this study – a model developed by Gruber and Saez (2002). Although, the approach does also take into account other factors such as mean reversion, tax rate endogeneity, institutional changes (which often coincide with changes in the rate structure), and differences between transitory (or temporary fluctuations) and permanent (or longer-term) responses.[5]

Controlling for Exogenous Trends in Income

The centerpiece of Gruber and Saez's approach is its controls for non-tax-related heterogeneous shifts in the income distribution and mean reversion. Over the past thirty years the distribution of reported income has widened. In fact, that trend accelerated in the 1980s, especially at the very top of the distribution.[6] Because people with the highest income pay a disproportionate share of taxes – the top 1 percent pay approximately one-third of all federal income taxes – their behavior is especially important.[7] Not fully accounting for the portion of that income growth that was unrelated to tax policy can result in large biases. For example, the 1980s cuts in marginal tax rates were greatest at the top of the income distribution and thus inversely correlated with the great income growth at the very top of the distribution. If the exogenous (non-tax related) portion of that income growth is not fully accounted for, that trend will bias ETI estimates upward. While changes to the income distribution are widely documented and theories such as shifts in the returns to education and the market for superstars[8] help explain the phenomenon, the underlying driving factors are not well understood, nor are the year-to-year deviations from that trend. The fact that the exogenous income trend has persisted through periods of both increases and decreases in the level and progressivity of tax rates suggests that it is, in large part, not a direct response to tax changes. Additionally, because the trend has been irregular, distributional changes in years without tax changes may not provide useful measures of exogenous shifts that occur during periods with tax changes.

[5] See Giertz (2004), <www.cbo.gov/ftpdoc.cfm?index=6028&type=1>.

[6] According to Piketty and Saez (2003), the share of income reported by the top 10 percent of filers rose by more than a third from 32.9 percent in 1979 to 41.4 percent in 1998; two-thirds of that increase went to the top 1 percent of taxpayers. The share of income reported by the top one-half of one percent more than doubled, the share reported by the top one-tenth of one percent nearly tripled, and the share reported by the top one hundredth of one percent more than quadrupled.

[7] See www.irs.ustreas.gov/pub/irs-soi/01in01ts.xls.

[8] See Rosen (1981).

Controlling for Mean Reversion

Mean reversion also complicates estimation. Over a person's lifetime, income often follows a general path with many fluctuations. After income has been particularly high or low it will often revert to a more normal path. That reversion is especially pronounced at the tails of the distribution. People at the high end of the income distribution are often not there for long, and will likely have a substantial drop in income that is unrelated to tax policy. At the other extreme, students will often have large increases in income when they enter the workforce. Estimating the ETI without fully controlling for mean reversion will erroneously count non-tax-related increases (by people below their lifetime path) and decreases in taxable income (by those above their lifetime path) as responses to changes in tax rates. Those factors bias ETI estimates in opposite directions, depending on whether tax rates are raised or lowered, but there is no reason to believe the biases will cancel each other out.

Research into the ETI is also complicated by the fact that, the ETI appears to vary with income, rising as income increases.[9] If so, a single overall elasticity will not be applicable when considering the impact of rate changes that target only part of the income distribution or that differ across the distribution. Additionally, a meaningful average overall estimated ETI must take into account the correlation between income and the elasticities. The average response of all filers may poorly assess how taxable income or tax revenue as a whole will respond. For example, suppose there are two types of people, that tax rates are the sole determinant of income, and that between the base and future year net-of-tax rates rise by 10 percent for all filers. Now, suppose half of the population is in the first group and that each filer in that group has a base-year taxable income of $10,000 and a future-year taxable income of $10,100, while those in the second group have a base-year taxable income of $1,000,000 and a future-year taxable income of $1,090,000. In that instance, the low-income filers have an ETI of 0.1, while the high-income

[9] People with higher incomes generally have more opportunities to respond to tax changes. See Saez (2004). They generally itemize their tax returns, rely less on wage and salary income and have more control over the timing and source of their income than do other groups. People with more modest incomes can alter their labor supply, but may have few other alternatives altering their taxable income.

filers have an ETI of 0.9.[10] Under that hypothetical scenario, the average person's elasticity equals 0.5. But the ETI that accurately reflects the change in overall taxable income equals 0.82 because the 0.9 applies to a base that is one-hundred times as large as the base for the group with the ETI of 0.1.

III. Data and Methods

This paper uses data from both the Statistics of Income's (SOI) Continuous Work History Survey (CWHS) and from the full SOI for years 1979 through 2001. The full SOI is a stratified random sample of taxfilers compiled by the Internal Revenue Service and includes all information reported on the filers' tax returns, plus some additional demographic information. The full SOI heavily oversamples high-income filers. The CWHS, by contrast, is a subset of filers from the SOI who are followed from year-to-year. While the CWHS contains detailed and accurate information, it is deficient in two important respects. First, while the overall sample is quite large (for some years, over 20,000), relatively few returns come from the top of the income distribution. If high-income taxpayers dominate an estimate, that estimate using the CWHS will depend heavily on just a handful of filers. Second, the CWHS includes only people who file returns and are listed as the primary filer. Thus, attrition is an issue.

As with Gruber and Saez (2002), behavior here is compared over three-year intervals, using only people who filed tax returns in both the base (or initial) year and the third subsequent year. The overall CWHS sample includes close to194,000 paired observations, whereas the SOI sample includes nearly 700,000 paired observations. As with Gruber and Saez, income measures are adjusted by the growth in broad income, total income minus realized capital gains and Social Security benefits, using 1990 as the base.[11] The other income measure, *taxable income*, equals broad income less exemptions and standard and itemized deductions. Both measures are based

[10] The low-income filers' ETI is calculated by dividing their one-percent increase in taxable income by the ten percent increase in the net-of-tax rate. The high-income filers' ETI is calculated by dividing their nine-percent increase in taxable income by the ten percent increase in the net-of-tax rate.

[11] The adjustment for broad income growth is analogous to adjustments that transform nominal dollars into real dollars. Thus here, each individual's reported income is divided by the ratio of average broad income in 1990 over average broad income in the year of the observation.

on a 1990 constant-law definition of income and the sample includes only those with broad income greater than $10,000 in the base year and positive income in the future year (see Table 1). Without those restrictions, the sample is nearly twice as large. For the CWHS sample, mean reported taxable income equals $28,311 (in 1992 dollars), while the corresponding means for broad income is $45,065. For the full SOI, the corresponding means are $26,961 for taxable income and $43,581 for broad income. (The SOI means are weighted so as to reflect the overall population of filers, subject to the income restrictions discusses earlier.) Individual marginal tax rates (both state and federal) are imputed using the Congressional Budget Office's internal tax calculators.[12]

The CWHS data just described are very similar to those used by Gruber and Saez, but differ in several respects. First, Gruber and Saez use a publicly-available version of the CWHS, which is slightly modified in order to protect the identity of taxpayers in the sample. Second, Gruber and Saez's sample ends in 1990, whereas my sample extends to 2001. Third, Gruber and Saez impute their federal and state marginal tax rates using the National Bureau of Economic Research's (NBER) TAXSIM model, whereas this analysis uses CBO's internal tax calculators.

The methodology follows directly from Gruber and Saez (2002) and the model can be written such that the *income growth rate*

$$= \log\left(\frac{income_{t+3}}{income_t}\right) = \xi \cdot \log\left(\frac{1-taxrate_{t+3}}{1-taxrate_t}\right) + mars \cdot \beta_1 + year \cdot \beta_2 + spline(income_t) \cdot \beta_3 + demog \cdot \beta_4 + \varepsilon .$$ [13]

The left-hand side variable is log of income in the future year ($income_{t+3}$) divided by income in the base year ($income_t$), where the future year is three years after the base. The key independent variable equals the log of the net-of-tax rate in the future year divided by the net-of-tax rate in the base year. To avoid endogeneity between the tax rate and income, an instrument is used in

[12] Jon Bakija of Williams College designed the state tax calculator used by CBO. See Bakija (2006).
[13] Note that for simplicity, subscripts denoting the individual are omitted here.

place of the actual log change in the net-of-tax rate.[14] The coefficient on that variable, ξ, represents the ETI. Control variables include year fixed effects, dummies for marital status (*mars*), and a ten-piece spline of the log of base-year income. The spline is intended to control for mean reversion and for non-tax-related income trends that have differed across the reported income distribution in recent decades. Alternative specifications explored by Gruber and Saez and also here include a model with the log of base year income in place of the spline and a specification that excludes the income control altogether. Additionally, specifications that include separate controls for mean reversions and non-tax-related income trends are explored. This is done by including explanatory variables base on one year lagged income and the difference between base year income and the one year lag as separate controls. Gruber and Saez also include a variable to separate the income effect from the substitution effect. They conclude that the income effect is not important and thus exclude it from most of their analysis. The only addition to the model from Gruber and Saez (besides extending the years of data) is the addition of richer demographic information (*demog*), including age, gender, itemization status and state fixed effects.

The results from Gruber and Saez are weighted by income. Weighting is intended to produce estimates reflective of the change in total reported taxable (or broad) income, which relates directly to the change in income tax revenues. If responses were homogeneous throughout the reported income distribution, weighting would not affect the results. But, as a number of studies, including Gruber and Saez, have found, the ETI varies by income and is generally much larger

[14] The instrument is constructed by inflating base-year income by the growth in mean broad income over the three-year interval. Next, the tax calculator computes counterfactual tax rates based on the inflated income measure. Finally, two-stage least squares (2SLS) is employed, where, in the first stage, the log change in actual income is regressed against the counterfactual log change, along with the other independent variables.

for the highest income filers. Weighting should produce estimates that are more indicative of overall responses, but at the same time, the importance of weighting suggests that the model fit may be poor. Additionally, although overall sample sizes are quite large, weighting could potentially result in a small number of observations having a substantial impact on the overall results.

With the full SOI, another time of regression weighting is also requireed. Note that while selection into the CWHS is designed to be random, selection into the full SOI, as mentioned earlier, is conditional on several factors, including income. More specifically, each individual is assigned a number at random, which does not change from year to year. For each year, tax returns are separated into strata based on AGI and the forms and schedules used by the filers. Sampling probabilities vary by strata and reach 100 percent for very high income filers. The returns in each stratum are sorted by the randomly assigned values and the strata sampling probability is used to determine the cut point for inclusion into the SOI. Because the individual maintains the same random value over time and because the stratum sampling probability simply determines the cut point for inclusion in the sample, once included in the SOI, an individual is automatically included in future years if his income remains the same or if his income increases because this would either put him in the same stratum or in a stratum with a higher sampling probability – thus maintaining or lowering the cut-point for inclusion. Therefore, an individual observed in the base year is much more likely to be observed in the future year if his income rises than if it falls. In fact, the probability that one is observed in two different years is simply the minimum of the strata sampling probabilities for the two years. This raises the potential for spurious correlation between the dependent variable (ln(*incomet/incomet*+1)) and the independent variables, including the tax variable. To avoid this possibility, (paired) observations from the full SOI are weighted by the reciprocal of their probability of appearing in the sample. This same strategy is employed by Auten and Carroll (1999), who use similar data.

IV. Results

This section begins by replicating Gruber and Saez's approach for the 1980s and comparing the results. Next the same methodology is applied to the 1990s and to the full sample, spanning years 1979 to 2001. This is followed by a similar analysis applied to the full SOI sample. After a discussion of those results, the importance of including demographics in the model and the importance of state rates (as opposed to using only federal tax rates) is examined, as are the ramifications of weighting regressions by income are explored.

Replicating Gruber and Saez

Table 2 compares the results of Gruber and Saez (for broad income and taxable income respectively) for the 1980s with my comparable estimates. Each pair of the first six columns reports Gruber and Saez's results under these specifications: with no controls for exogenous income trends; with the log of base year income as a control; and with a 10-piece spline of log income (Gruber and Saez's most-preferred specification). The next six columns report comparable results from my analysis of that same time-period. Despite using a slightly different core dataset and different marginal tax rate calculators, the two sets of results are quite similar. Estimated with no control for base-year income, the elasticities are negative, which is inconsistent with theoretical predictions. Adding the log of base year income to model results in an estimated ETI of just above 0.6 and a substantially smaller broad income elasticity of 0.17. Replacing the log of base year income with the 10-piece spline yields an estimated ETI in the neighborhood of 0.4 and a corresponding estimated elasticity of broad income of 0.12. The fact that the estimated elasticities for broad income are so much lower than the corresponding ETI estimates suggests that a substantial portion of the taxable income response may come via deductions and exemptions. Another contributing factor may be that the denominator for the broad income calculation is larger, by definition; thus, for an identical dollar change, the estimated broad income elasticity will be smaller than the corresponding ETI estimate. Smaller broad income elasticities are consistent with Kopczuk's (2003) finding that income responses are a function of the tax base and that the greater the availability of exemptions and deductions, the lower the cost of responding to tax changes, and hence the larger the response.

Results for the 1990s

Employing the same methodology using data from the 1990s generates estimated ETIs for the 1990s that are much smaller than those for the 1980s and not statistically significant, despite a sample size of nearly 140,000 (see Panel 1 of Table 3). Gruber and Saez's preferred specification, which includes a 10-piece spline, yields an estimated ETI of 0.20, or slightly more than half the size of my estimate for the 1980s. Likewise, the specification using the log of reported taxable income, in place of the spline, yields an estimated ETI of about 0.18, less than a third the size of the corresponding estimate for the 1980s. Replacing the log of base-year income with the spline has little impact on the estimated ETI for the 1990s, whereas it reduces the estimated ETI by over one third for the 1980s.

Another interesting difference between the results from the 1980s and 1990s is that, without income controls, estimates for the 1980s are much smaller – in fact, well below zero – than with controls, while for the 1990s, the estimates without income controls are much larger than those with controls. Those observations suggest that mean reversion at the top of the income distribution is important, even during a period of increasing concentration of income at the top of the distribution. People at the very top of the income distribution have a relatively high probability of experiencing a substantial drop in income, while people with moderate incomes have only a small probability of experiencing tremendous income gains needed to push them to the top of the distribution. Thus, in the 1980s an inverse relationship exists between the mean reversion at the top of the distribution and changes to the net-of-tax rate. Without income controls, that relationship biases estimates downward. By contrast, during the 1990s, a direct relationship exists between mean reversion at the top of the distribution and changes to the net-of-tax rate, which is falling. Thus, without income controls, mean reversion at the top of the income distribution biases upward elasticity estimates for the 1990s.

While the ETI estimates are much smaller for the 1990s than for the 1980s, the corresponding estimated broad income elasticities are slightly larger. Including the spline yields an estimated broad income elasticity for the 1990s of about 0.15 compared to 0.12 for the 1980s (see Panel 1 of Table 3). The specification using the log of base-year income yields estimated broad income elasticities that are slightly larger.

Results for the 1980s and 1990s Combined

Not surprisingly, the same techniques applied to the full panel (from 1979 through 2001) generally result in estimated ETIs that are smaller than those for the 1980s and larger than those for the 1990s. The specification with the 10-piece spline yields an estimated ETI of 0.30, or slightly higher than the average of the estimates for the 1980s and 1990s. The specification with the log of base-year income produces an estimated ETI of 0.31, which is higher than the 1990s estimate of 0.18, but only half the 1980s estimate of 0.63. One again, estimated broad income elasticities are stable: 0.15 with the spline and 0.17 with the log of income control.

Why Do Estimates for the 1980s and 1990s Differ?

Three competing interpretations might explain the differences between the results from the 1980s and the 1990s:

1. The model does a good job of explaining overall behavior for both the 1980s and the 1990s, but differences in policy and economic factors caused the ETI to fall between the two periods. That hypothesis is consistent with the view of Slemrod and Kopczuk (2002), who argue that the ETI is not a structural parameter and is a function of more

than preferences. Additionally, the fact that the estimates of the ETI differ substantially, while the estimates of the broad income elasticity remain stable is also consistent with Kopczuk (2003), which shows that the availability of deductions and exemptions matters in determining the ETI. Broad income, which includes deductions and exemptions, should be smaller because filers have fewer opportunities to alter that base, and more stable because the opportunities to alter that base are less likely to change over time.[15]

2. The model is misspecified and does a poor job of isolating the response of taxable income to tax rate changes in either period. During the 1980s, for example, reported taxable incomes were rising and the share of taxable income reported by very top of the income distribution was growing rapidly. At that same time, marginal tax rates were falling with the largest reductions at the high end of the income distribution. Thus, the larger estimated ETIs for the 1980s might occur not because the true response was greater, but because the model fails to fully control for the correlation between non-tax-related growth in income (especially at the top of the distribution) and falling tax rates. In the 1990s, the correlation between tax rates and income was reversed: the trend in income at the high-end continued, while marginal tax rates were increasing as a result of the Omnibus Budget Reconciliation Acts of 1990 and 1993. For the 1990s, the failure to fully control for that correlation biases estimated ETIs downward, the opposite of the upward bias for the 1980s. Lending credence to that interpretation is the fact that the rate cuts of the 1990s only applied to upper-income groups, who are usually found to be more responsive to tax rates than other groups. Thus, it is somewhat surprising the estimated ETI is lower for the 1990s, instead of higher.

[15] Yet another interpretation in support of the model is that people simply respond differently to rate cuts than they do to rate increases.

3. The model works well for the 1980s, but breaks down in the 1990s (or vice-versa). It is possible that the spline, for example, does a good job of tracking non-tax-related trends during one of the periods, but, for whatever reason, fails to do so in the other period.

The model can also be criticized in other respects. For example, measuring changes in behavior over three-year intervals is done in order to focus on permanent responses to tax rate changes, as opposed to transitory fluctuations. But, that comparison may not remove transitory influences from the elasticity estimates. Nearly every year of the 1980s (and much of the 1990s) is likely to include some transitory behavior, in part because of multi-year phase-in periods. Thus, comparing observations three years apart is unlikely to avoid transitory fluctuations. If those transitory fluctuations severely contaminate measurement of the permanent responses, differences in ETI estimates for the two periods may result simply from noise.

Weighting and Sensitivity to Sample Selection

A small number of outliers can dominate coefficients estimated using least squares, resulting in estimated coefficients that are not indicative of the behavior of much of the sample. That possibility seems remote when regressions are unweighted and include well over 50,000 observations. With income-weighting, however, that is not necessarily the case.[16] With income weighting, large numbers of taxpayers with lower reported incomes may exert much less influence on the overall results than a handful of very high-income filers. Also, the many paired observations that have no variation in marginal tax rates may do little to identify the model.

Two approaches are used to test the importance of those factors:

[16] Table 4 reports both dollar-weighted and unweighted elasticity estimates. The unweighted estimates are often much smaller for the 1980s and much larger for the 1990s than the corresponding weighted estimates.

1. Excluding as many as 100 observations that most affect the income-weighted estimates; and,
2. Estimating an unweighted specification that includes quantile dummies interacted with the log change in the net-of-tax rate. That specification includes the 10-piece spline and other independent variables, but replaces the log change in the net-of-tax rate with eleven interacted variables, each representing a portion of the reported taxable income distribution. If the ETI is uncorrelated with taxable income within each quantile and the model is otherwise properly identified, then person-weighted estimated ETIs, by quantile, would represent a viable alternative to income-weighted 2SLS.

A *dfbeta* test run on the reduced 1980s sample measures the influence of each observation on the overall ETI estimate. For each observation, the dfbeta test calculates the difference between the estimated coefficient with and without that observation. Taxable income elasticities for the 1980s are re-estimated based on the specification with the 10-piece spline and excluding the observations with the largest *dfbetas* (in absolute value). (Those observations are excluded not to improve the overall ETI estimate, but rather to test the model's robustness.) Dropping the 10 most influential observations reduces the estimated ETI by 35 percent, from 0.37 to 0.24 (see Table 4). Dropping the 25 most influential observations further lowers the estimated ETI to 0.17, less than half of the initial estimate. Excluding the 100 most influential observations (0.2 percent of the sample) lowers the estimated ETI to 0.08, 77 percent lower than the initial estimate. Thus, despite the large sample size, income weighting makes the results highly sensitive to just a few observations. For the most part, the most influential observations are taxpayers with very high taxable incomes who also report large changes in taxable income between the base year and the future year.

Finally, as an alternative to income-weighted 2SLS, person-weighted ETIs were estimated by quantile within a single equation framework, using the specification that includes the 10-piece spline. In addition, the log change in the net-of-tax rate was interacted with quantile dummies, using quantiles based on base-year taxable income.[17] The resulting estimated ETIs vary greatly (see Table 5 and Figure 1). For the first nine deciles, the coefficients are either not statistically different from zero or are the wrong sign (negative). Despite the lack of statistical significance, the coefficients are often quite different from zero (in terms of their economic importance). That lack of statistical significance is surprising given that most quantiles have well over 5,000 observations. Especially surprising is the estimate of -1.0 for decile three. That estimate has the wrong sign and is strongly significant and very large in absolute magnitude. The lack of statistical significance is consistent with studies that found minimal responses for the bulk of the distribution, but these results are inconclusive with estimated coefficients that are often much larger or smaller than zero. Those estimates (for the first nine deciles) suggest that the model is poorly identified.

Estimates for the top decile are both positive and statistically significant. The estimated ETI for those in the 90th percentile to the 99.5th percentile is 0.21 and statistically significant at the ten percent level. The estimated ETI for the top one-half of one percent is 0.57 – well over twice the size of the estimates for any other quantile – and strongly significant. That finding is also consistent with other research, which suggests that the ETI is largest at the top of the income distribution. Gruber and Saez, for example, estimated an ETI of 0.57 for taxpayers with base-year broad income exceeding $100,000. (Their estimate is weighted by income, whereas that for this analysis is person-weighted.[18])

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[17] The first nine dummies represent the first nine deciles. The tenth dummy, applies to those between the 90th and 99.5th percentiles. The final quantile dummy applies to filers between the 99.5th and 100th percentiles.
[18] For comparison purposes, reported *taxable income* at the 99.5th percentile in this analysis is about $203,000; the minimum level of reported *broad income* in the top one-half of one percent of the reported taxable income distribution is about $218,300.

Although ETI variation within quantile is likely lower than the variation within the entire distribution, it still may be substantial. If within quantile ETI variation were negligible, income-weighting would have little impact on the estimates. Using the same specification, but weighting by taxable income raises the estimated ETI for the top half of one percent from 0.57 to 0.72. Similarly income weighting raises the estimated ETI for those between the 90 to 99.5th percentiles from 0.21 to 0.36.)

Results from the Full SOI

The analysis thus far calls into question the level of precision with which the CWHS-based taxable income responses are estimated. Despite a sample size of well over 50,000 for the 1980s, estimated ETIs are extremely sensitive to a tiny number of the most influential observations. Furthermore, despite a sample size of close to 140,000, estimated ETIs for the 1990s are far from statistically significant. Although sample sizes are quite large, the number of really high-income filers is very small. This, plus income-weighting the regressions, results in coefficients that are driven by a small number of observations. Additionally, for the 1990s a large fraction of the observations experience no change in tax rates because the 1990 and 1993 tax acts only changed tax rates for those in the upper tax brackets. Fortunately, this shortcoming of the CWHS can be overcome by turning to the full SOI, which, as discussed in the previous section, heavily over-samples high-income filers.

Given the sensitivity of the CWHS estimates, it is surprising that, for the most part, estimated ETIs from the full SOI are quite similar to the CWHS estimates. For the 1980s, the estimate ETI is 0.43 (versus 0.37 with the CWHS) with a t-value of over 5.2. (See Table 6.) For the 1990s, the estimated ETI is 0.20, almost exactly the same as the CWHS estimate, but with a t-value of 3.3 (versus 1.35 with the CWHS). (See Table 7.) For both decades combined, the estimated ETI is 0.34 (versus 0.30 with the CWHS) with a t-value of 7.5. (See Table 8.)

For broad income, the SOI-based elasticity estimate for the 1980s is much larger than the estimate from the CWHS (0.21 versus 0.12). For the 1990s, the estimates are much closer (0.13 with the full SOI and 0.15 with the CWHS). For both decades combined, the estimated broad income elasticity is 0.23 (versus 0.15 with the CWHS), but still smaller than the corresponding ETI estimate. While the estimates (for broad income) from the CWHS are never statistically significant at the 5-percent level, the SOI-based estimates are all statistically significant at well above the 1 percent level.

Adding Demographics to the Model

Recall that the analysis based on the CWHS sample excluded all demographic variables except marital status. When turning to the full SOI, potentially important variables such as gender, age (as well as age squared and age cubed) and itemization status are added. As Table 9 shows, including demographics results in larger estimated elasticities (when using the model that includes a 10-piece spline) for the 1980s. The affect on the estimated elasticities for the 1990s is mixed; here the estimated broad income elasticity falls, while the corresponding measure for taxable income remains essentially unchanged.

For the 1980s additional demographic variables raise the estimated ETI from 0.37 to 0.43 and the corresponding estimated elasticity for broad income from 0.18 to 0.21. For the 1990s, however, the added variables have almost no affect on the estimated ETI. For broad income, the corresponding estimated elasticity falls from 0.17 to 0.13. For the full period, the pattern of the 1980s tends to dominate. Additional demographics raise the estimated ETI, for the full period, from 0.28 to 0.34 and the estimated broad income elasticity from 0.20 to 0.23.

In most cases, the added demographics show strong statistical significance. See Table 6, Table 6, and Table 8. Age, included as a third-order polynomial, shows strong statistical significance (as measured by F-tests) for both time-periods for both broad and taxable income. Itemizer status is negative and strongly significant. The effect of (the primary filer's) gender, on the other hand, is close to zero and not statistically significant. The effect of demographics on the estimates implies that those new variables are somewhat correlated with unobserved (and non-tax-related) factors that determine income changes and thus may help isolate the tax-related portion of changes in income.

Separate Controls for Mean Reversion and Divergence in the Income Distribution

Kopczuk (2005) makes a compelling argument that mean reversion and non-tax-related divergence in the income distribution are two separate phenomena and that it is unlikely that one variable will capture both effects. To address this, Kopczuk includes separate variables to control for each of the two different phenomena. To account for mean reversion, Kopczuk includes a function of income in the year preceding the base year. To control for divergence in the income distribution, he includes a function of the difference between current (or base year) income and income in the preceding year.

To examine the implications of using one variable to control for both income divergence and mean reversion, two specifications employed by Kopczuk are explored. Using his richest set of controls has a modest and negative affect on the estimated ETI for the 1980s, but a larger and positive affect on the estimate for the 1990s. One specification includes both of the control variables (lagged income and the change in income from the previous to the current year) in log form; the other includes the same variables as 10-piece splines. When including the two variables in log form, the biggest change is observed for the 1980s, where the estimated ETI rises by almost 0.05 (when compared to results from the model that includes the log of base year income). See Table 10. When including the two logged variables as 10-piece splines, in place of a 10-piece spline of log income, the estimated ETI falls from 0.43 to 0.40, when compared to the corresponding estimate for the 1980s, and for the full period, the estimate is virtually unchanged. For the 1990s the impact is greater, raising the estimate from 0.20 to 0.26.

Are State Tax Rates Important? Separately Estimated Responses For State and Federal Tax Rates

The inclusion of state tax rates in the marginal rate calculation adds a source of cross-sectional variation across individuals who may be very similar in other respects (such as income). Including this cross-sectional variation may be important in identifying taxable income responses because exogenous income trends, which are known to fluctuate from year-to-year and to vary greatly across the taxable income distribution, pose problems for other identification strategies. Furthermore, excluding changes to state rates would likely bias the net-of-tax rate variable, thus contaminating the ETI estimates.

Elasticities are estimated for models that exclude variation resulting from federal rates, and for models that exclude variation resulting from state tax rates. Simply excluding one component of the overall marginal rate will likely add little insight because doing so presumes that one component of the overall marginal rate is responsible for the entire tax effect. Thus, the log change in the overall tax rate is still used as the key dependent variable, but in one specification the predicted log change in the state rate is used as an instrument (instead of the corresponding change resulting from changes to both federal and state law) and in the other the predicted log change for only the federal rate is used as an instrument. Therefore, on average the key dependent variable will be the same as before, but the variation in this variable will now be based on only one of the two components of the overall marginal tax rate.

The model that includes a 10-piece spline and uses just the federal rate as an instrument yields estimates that are very similar to those from the corresponding model that includes variation from the combination of federal and state tax rates. This is true for both broad and taxable income. See Panel 1 of Table 11.

Including only variation from state net-of-tax rates yields ETI estimates that are somewhat smaller than when both federal and state or only federal rate changes are included. See Panel 2 of Table 11. The estimated ETI with only variation from state rates is 0.34 for the 1980s. The estimated ETI is just 0.11 for the 1990s and 0.23 for the full period. For broad income, the estimated elasticity is much larger for the 1980s when including only variation in state rates (0.37 versus 0.21 when both state and federal rates are included). For 1990s, the estimated broad income elasticity (0.08) is slightly smaller than the earlier estimate and much smaller than the estimate for the 1980s. For the full period, the estimated broad income elasticity is about the same as when only variation in federal rates are included or when both state and federal rates are included.

Estimates for High-Income Filers from the Full SOI

A number of studies have found that estimated ETIs vary greatly by income, and that overall responses may be driven by high-income filers. While comparing dollar-weighted and person-weighted estimates (which are generally much smaller) also suggests this, the possibility is explored further by using the full SOI to generate ETI estimates that apply specifically to high-income filers.

Table 12 presents income-weighted ETI estimates for the 1980s, 1990s, and for both decades combined after excluding those with less than $100,000 of base-year broad income. With that income restriction, the 1980s and 1990s estimates are very similar to the full-sample SOI estimates for the respective periods. For both decades combined, though, the estimated ETI is 0.44 (versus 0.34 for the sample without the higher income restriction), which is actually larger than either the 1980s or 1990s estimate. Note that restricting the sample to those with incomes over $100,000 alters a potentially important source for identification. I.e., the exclusion reduces degree of cross-sectional variation in tax rate changes and thus, the behavior of those with less than $100,000 of income is no longer used to help explain counterfactual income trends. Whether this hampers or improves the identification process depends partly on whether the non-tax-related behavior of the excluded group is similar to that of the included higher-income group.

Permanent versus Transitory Responses

While the model is designed to capture permanent rather than transitory responses, the degree to which is does this is open to question. Focusing on changes in behavior over three-year intervals is intended to isolate permanent responses. But that comparison may not remove transitory influences from the elasticity estimates. Many of the years in both the 1980s and1990s are likely to include some transitory behavior, in part because of multiyear phase-in periods. Thus, comparing observations three years apart is unlikely to avoid transitory fluctuations. If those transitory fluctuations severely contaminate measurement of the permanent responses, differences in ETI estimates for the two periods may result simply from noise. To test this possibility, the ETI is re-estimated after excluding all paired observations that include years 1981, 1982, 1986, 1987, 1993, 1994 and 2001. For the full time period, the overall estimated ETI is 0.30 (versus 0.34 when no years are dropped) and strongly significant. The corresponding estimated ETI is 0.36 for the 1980s and 0.15 for the 1990s. (See Table 13.) The fact that the estimates are all a little smaller than the corresponding estimates that do not exclude any years suggests that the overall estimates may contain both a permanent plus a small transitory component. However, this is far from conclusive – especially since the 1980s estimate is no longer statistically significant.

V. Summary and Conclusion

Replicating the methodology of Gruber and Saez (2002) using different data and different marginal tax rate calculators yields estimated elasticities for the 1980s that are similar to those Gruber and Saez report. Corresponding ETI estimates for the tax cuts of the 1990s are much smaller, a little over half the size of the 1980s estimate for the model with the 10-piece spline. Broad income elasticities vary less between the two decades and are almost always smaller than the corresponding estimated ETIs. Broad income elasticities are likely smaller than ETIs because taxfilers have fewer opportunities to alter their broad income base. Furthermore, because broad income is larger than taxable income, the denominator used to calculate the broad income elasticities is larger than the corresponding denominator used in the ETI calculations. Thus for a given numerator, a larger denominator necessarily yields a lower estimated elasticity.

Despite the large sample used in this analysis, a dfbeta test for the 1980s shows that results depend heavily on a handful of primarily very high-income observations, likely a product of weighting observations by income in the regression.) In fact, eliminating just 0.2 percent of the most influential observations lowers the estimated ETI for the 1980s from 0.37 to 0.08, a drop of 77 percent.

However, moving to the full SOI results in estimated ETIs that are generally similar in magnitude to the CWHS estimates, but with much smaller standard errors. Additionally, using separate control variables for mean reversion and divergence within the income distribution has a modest and negative affect on estimated ETIs for the 1980s and a positive and larger affect on estimates for the 1990s (when compared to results from analogous models that include just one variable to account for both phenomena). While the much larger SOI sample substantially lowers standard errors, estimates remain sensitive to an array of factors. This belies the fact that underlying income changes are tremendously complex and there remains variation across specifications and across time-periods that is not well understood.

This sensitivity is observed when examining responses by income quantile. The log change in the net-of-tax rate is interacted with quantile dummies for the 1980s (using the CWHS sample). For the first nine deciles, estimates vary greatly and have large standard errors. For the tenth decile, the person-weighted estimated ETI is positive and significant. For the top one half of one percent, the person-weighted estimated ETI is over twice as large as for any other quantile. Even within the top quantiles, however, estimated ETIs appear to vary with taxable income.

The findings in this paper suggest a need for more research to understand why responses differ so much between the 1980s and the 1990s. Additionally, the sensitivity of the results to just a few observations suggests that more can be learned by focusing on the high end of the distribution and by employing datasets that include many observations for that group.

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TABLE 1. Sample of Filers Used in the Regression Analysis

	CWHS	SOI
Paired Observations[a]	193,809	699,724
Paired Observations 1980s	54,136	250,140
Paired Observations 1990s	139,673	449,584
Returns with Base Year Taxable income Greater than:		
$1,000,000	113	113,673
$5,000,000	4	21,365
Mean Base Year Taxable Income[b]	$28,311	$26,961
Mean Baseyear Broad Income[b]	$45,065	$43,581
Mean Federal Tax Rate	21	21
Mean State Tax Rate	4	4
Mean Net-of-Tax Rate	75	75
Mean Federal Tax Liability[b]	6,246	5,720
Mean State Tax Liability[b]	1,361	1,241

Notes: Estimates are based on Statistics of Income data from 1979 to 2001. Filers with less than $10,000 of broad income are excluded.

a. Sample sizes are for the taxable income regressions.

b. Income and tax liabilities are expressed in 1992 dollars, as adjusted by the growth in broad income. Averages for the SOI are weighted to reflect the population of tax filers

TABLE 2. Income Weighted Estimates for the 1980s

	Panel 1: Gruber and Saez Results						Panel 2: Replicated Results					
Income Controls:	none		log income		10-piece spline		none		log income		10-piece spline	
	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income
Elasticity	-0.30	-0.462	0.17	0.611	0.12	0.40	-0.25	-0.37	0.17	0.63	0.12	0.37
	(0.120)	(0.194)	(0.106)	(0.144)	(0.106)	(0.144)	(0.113)	(0.111)	(0.113)	(0.146)	(0.110)	(0.160)
Married	-0.008	-0.062	0.045	0.049	0.05	0.055	0.00	-0.08	0.06	0.04	0.07	0.08
	(0.010)	(0.018)	(0.014)	(0.023)	(0.012)	(0.021)	(0.012)	(0.016)	(0.016)	(0.022)	(0.015)	(0.021)
single	-0.037	-0.053	-0.034	-0.032	-0.036	-0.027	-0.02	-0.07	-0.01	-0.06	-0.01	-0.05
	(0.012)	(0.019)	(0.013)	(0.022)	(0.013)	(0.021)	(0.013)	(0.017)	(0.014)	(0.021)	(0.014)	(0.021)
ln(income)			-0.083	-0.167					-0.10	-0.20		
			(0.015)	(0.021)					(0.018)	(0.018)		
spline												
decile 1					0.225	-0.884					0.00	-0.82
					(0.086)	(0.039)					(0.000)	(0.033)
decile 2					-2.74	-0.538					-0.89	-0.57
					(1.130)	(0.047)					(0.219)	(0.040)
decile 3					-0.317	-0.279					-0.21	-0.38
					(0.055)	(0.057)					(0.052)	(0.053)
decile 4					-0.071	-0.445					-0.14	-0.41
					(0.051)	(0.069)					(0.053)	(0.063)
decile 5					-0.197	-0.003					-0.22	-0.22
					(0.054)	(0.075)					(0.059)	(0.074)
decile 6					-0.074	-0.253					-0.07	-0.22
					(0.053)	(0.081)					(0.059)	(0.083)
decile 7					-0.127	-0.124					-0.12	-0.26
					(0.056)	(0.083)					(0.063)	(0.089)
decile 8					-0.061	-0.172					-0.13	-0.22
					(0.057)	(0.083)					(0.068)	(0.079)
decile 9					-0.027	-0.057					-0.02	-0.28
					(0.076)	(0.125)					(0.100)	(0.085)
decile 10					-0.072	-0.126					-0.09	-0.07
					(0.041)	(0.064)					(0.048)	(0.039)
constant							-0.09	0.01	0.94	1.98	0.66	7.42
							(0.014)	(0.018)	(0.187)	(0.180)	(0.139)	(0.257)
Observations:	69,129	59,199	69,129	59,199	69,129	59,199	60,092	54,313	60,092	54,136	60,092	54,136

Source: Panel 1, Gruber and Saez (2002) reproduction of Table 4. Panel 2, estimates based on Statistics of Income's Continuous Work History Survey data for years 1979 to 1990.

Notes: Estimates from 2SLS regressions. Income range is $10,000 and above. Regressions are weighted by income. All regressions include dummies for marital status and dummies for each base year. Robust standard errors are in parentheses.

TABLE 3. Estimates for the 1990s and for Both Decades

	Panel 1						Panel 2					
	1990s						1979-2001					
Income Controls:	none		log income		10-piece spline		none		log income		10-piece spline	
	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income
Elasticity	0.475	0.738	0.184	0.177	0.148	0.195	0.121	0.192	0.174	0.305	0.149	0.298
	(0.105)	(0.168)	(0.094)	(0.137)	(0.097)	(0.144)	(0.077)	(0.103)	(0.078)	(0.099)	(0.080)	(0.100)
Married	-0.015	-0.122	0.087	0.063	0.08	0.086	-0.01	-0.113	0.082	0.056	0.079	0.085
	(0.008)	(0.014)	(0.011)	(0.017)	(0.009)	(0.015)	(0.007)	(0.011)	(0.010)	(0.015)	(0.008)	(0.013)
single	-0.039	-0.09	-0.014	-0.042	-0.014	-0.027	-0.028	-0.083	-0.012	-0.047	-0.012	-0.032
	(0.010)	(0.016)	(0.010)	(0.017)	(0.010)	(0.017)	(0.008)	(0.012)	(0.009)	(0.014)	(0.009)	(0.014)
ln(income)			-0.099	-0.162					-0.099	-0.165		
			(0.010)	(0.013)					(0.009)	(0.013)		
spline												
decile 1						-0.827						-0.817
						(0.021)						(0.017)
decile 2						-0.504						-0.524
						(0.024)						(0.021)
decile 3					-0.243	-0.408					-0.266	-0.385
					(0.045)	(0.031)					(0.031)	(0.027)
decile 4					-0.186	-0.293					-0.167	-0.334
					(0.030)	(0.039)					(0.025)	(0.033)
decile 5					-0.109	-0.27					-0.122	-0.265
					(0.030)	(0.046)					(0.026)	(0.039)
decile 6					-0.135	-0.277					-0.131	-0.25
					(0.034)	(0.046)					(0.028)	(0.041)
decile 7					-0.039	-0.168					-0.069	-0.196
					(0.035)	(0.049)					(0.029)	(0.043)
decile 8					-0.172	-0.232					-0.151	-0.253
					(0.036)	(0.057)					(0.032)	(0.047)
decile 9					0.097	0.067					0.074	0.01
					(0.049)	(0.071)					(0.048)	(0.065)
decile 10					-0.122	-0.155					-0.116	-0.14
					(0.021)	(0.028)					(0.020)	(0.026)
constant	-0.067	-0.033	0.952	1.588	0.128	7.313	-(0.090)	(0.027)	(0.917)	(1.638)	0.094	7.301
	(0.011)	(0.019)	(0.103)	(0.134)	(0.019)	(0.156)	0.012	0.015	0.096	0.129	(0.015)	(0.133)
Observations:	158,679	139,673	158,679	139,673	158,679	139,673	218,771	193,809	218,771	193,809	218,771	193,809

Source: Estimates based on Statistics of Income's Continuous Work History Survey data for years 1979 to 2001.
Notes: Estimates from 2SLS regressions. Income range is $10,000 and above. Regressions are weighted by income. All regressions include dummies for marital status and dummies for each base year. Robust standard errors are in parentheses.

TABLE 4. The Effect of Excluding the Most Influential Observations
Income Weighted Estimates for the 1980s

Dropped Observations	Sample Size	Estimated ETI
0	54,136	0.373
10	54,126	0.235
25	54,111	0.174
50	54,086	0.116
100	54,036	0.084

Source: Estimates based on Statistics of Income's Continuous Work History Survey data for years 1979 to 1990.
Notes: Estimates are based on Continuous Work History Survey data for years 1979 to 1990.

a. Estimates are based on the specification with a 10-piece spline. Observations are dropped based on the size of their impact on the estimated ETI and as measured by a *dfbeta* test.

TABLE 5. Person-Weighted Taxable-Income Elasticities by Decile for the 1980s

	Estimated ETI
Decile 1	-0.101
	(0.295)
Decile 2	-0.259
	(0.342)
Decile 3	-1.009
	(0.337)
Decile 4	-0.149
	(0.297)
Decile 5	0.214
	(0.219)
Decile 6	0.252
	(0.200)
Decile 7	0.083
	(0.169)
Decile 8	-0.12
	(0.164)
Decile 9	0.192
	(0.132)
Decile 10	0.207
	(0.126)
99.5 to 100 percentile	0.572
	(0.289)
Observations	54,136
R-squared	0.28

Source: Estimates based on Statistics of Income's Continuous Work History Survey data for years 1979 to 1990.

Notes: Estimated quantile ETIs are generated by interacting quantile dummies with the net-of-tax rate.
Estimates are based on the specification with the 10-piece spline and with limited demographic information.
Standard errors are in parenthesis.
Decile 10 excludes the top half of one percent.

TABLE 6. Full SOI Taxable and Broad-Income Elasticities for the 1980s

	No Income Controls		Base-Year Income Controls		Spline Income Controls	
	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income
$\ln(mtr_{t+3}/mtr_t)$	-0.033	-0.001	0.309	0.648	0.210	0.425
	(0.036)	(0.059)	(0.048)	(0.081)	(0.048)	(0.081)
Married	0.079	0.011	0.118	0.069	0.140	0.096
	(0.008)	(0.011)	(0.008)	(0.012)	(0.009)	(0.012)
Single	0.014	-0.012	0.023	0.007	0.031	0.028
	(0.008)	(0.012)	(0.008)	(0.012)	(0.008)	(0.012)
Age	0.045	0.072	0.056	0.086	0.065	0.10
	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Age Squared/10	-0.011	-0.017	-0.013	-0.019	-0.015	-0.022
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age Cubed/100	0.008	0.011	0.009	0.012	0.010	0.014
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sex	0.007	0.007	0.006	0.004	0.005	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
itemzer_base	-0.004	-0.039	-0.055	-0.117	-0.069	-0.126
	(0.004)	(0.006)	(0.005)	(0.008)	(0.005)	(0.008)
ln(income)			-0.091	-0.145		
			(0.005)	(0.008)		
decile 1					-0.918	-0.610
					(0.186)	(0.016)
decile 2					-0.219	-0.235
					(0.017)	(0.018)
decile 3					-0.169	-0.213
					(0.018)	(0.025)
decile 4					-0.123	-0.168
					(0.022)	(0.030)
decile 5					-0.142	-0.176
					(0.022)	(0.033)
decile 6					-0.041	-0.021
					(0.027)	(0.034)
decile 7					-0.004	-0.069
					(0.024)	(0.031)
decile 8					-0.033	0.006
					(0.041)	(0.054)
decile 9					-0.066	-0.136
					(0.054)	(0.100)
decile 10					-0.137	-0.131
					(0.035)	(0.069)
Constant	-0.73	-1.12	0.049	0.111	7.738	4.119
	(0.054)	(0.073)	(0.070)	(0.098)	(1.732)	(0.157)
Observations	248,940	250,140	248,940	250,140	248,940	250,140

Notes: Estimates are based on Statistics of Income data for years 1979 to 1990.
Estimates are from 2SLS regressions. The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income (see Section III). Robust standard errors (clustered by individual) are in parentheses.

TABLE 7. Full SOI Taxable and Broad-Income Elasticities for the 1990s

	No Income Controls		Base-Year Income Controls		Spline Income Controls	
	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income
$\ln(mtr_{t+3}/mtr_t)$	0.478	0.745	0.133	0.144	0.125	0.198
	(0.044)	(0.071)	(0.038)	(0.058)	(0.037)	(0.060)
Married	0.091	0.013	0.139	0.082	0.137	0.092
	(0.010)	(0.011)	(0.009)	(0.010)	(0.010)	(0.011)
Single	0.017	-0.024	0.029	0.002	0.029	0.014
	(0.009)	(0.011)	(0.009)	(0.010)	(0.009)	(0.010)
Age	0.016	0.028	0.028	0.043	0.028	0.050
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Age Squared/10	-0.006	-0.008	-0.007	-0.010	-0.007	-0.011
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age Cubed/100	0.004	0.006	0.005	0.006	0.005	0.007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sex	0.004	0.002	0.001	-0.002	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
itemzer_base	0.012	-0.023	-0.096	-0.127	-0.083	-0.119
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
ln(income)			-0.107	-0.120		
			(0.004)	(0.004)		
decile 1					-0.025	-0.554
					(0.022)	(0.014)
decile 2					-0.19	-0.201
					(0.021)	(0.014)
decile 3					-0.102	-0.170
					(0.018)	(0.017)
decile 4					-0.153	-0.147
					(0.020)	(0.020)
decile 5					-0.075	-0.021
					(0.020)	(0.016)
decile 6					-0.033	-0.053
					(0.013)	(0.016)
decile 7					-0.094	-0.097
					(0.015)	(0.022)
decile 8					-0.139	-0.204
					(0.026)	(0.039)
decile 9					-0.311	-0.314
					(0.064)	(0.079)
decile 10					-0.095	-0.08
					(0.046)	(0.049)
Constant	-0.218	-0.304	0.776	0.720	0.080	4.472
	(0.096)	(0.104)	(0.100)	(0.103)	(0.100)	(0.150)
Observations	323,776	449,584	323,776	449,584	323,776	449,584

Notes: Estimates are based on Statistics of Income data for years 1988 to 2001.
Estimates are from 2SLS regressions. The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income (see Section III). Robust standard errors (clustered by individual) are in parentheses.

TABLE 8. Full SOI Taxable and Broad-Income Elasticities for the 1980s and 1990s

	No Income Controls		Base-Year Income Controls		Spline Income Controls	
	Broad Income	Taxable Income	Broad Income	Taxable Income	Broad Income	Taxable Income
$\ln(mtr_{t+3}/mtr_t)$	0.168	0.277	0.247	0.359	0.227	0.339
	(0.028)	(0.045)	(0.027)	(0.044)	(0.028)	(0.045)
Married	0.081	0.01	0.131	0.074	0.141	0.093
	(0.006)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)
Single	0.012	-0.019	0.029	0.002	0.034	0.017
	(0.006)	(0.008)	(0.006)	(0.008)	(0.006)	(0.008)
Age	0.031	0.046	0.041	0.057	0.045	0.068
	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)	(0.004)
Age Squared/10	-0.009	-0.012	-0.01	-0.013	-0.011	-0.015
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age Cubed/100	0.006	0.008	0.007	0.008	0.007	0.009
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sex	0.006	0.004	0.003	0.001	0.003	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
itemzer_base	0.009	-0.024	-0.076	-0.123	-0.079	-0.125
	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
ln(income)			-0.098	-0.121		
			(0.003)	(0.003)		
decile 1					-0.033	-0.573
					(0.122)	(0.011)
decile 2					-0.203	-0.218
					(0.013)	(0.011)
decile 3					-0.154	-0.182
					(0.012)	(0.014)
decile 4					-0.125	-0.175
					(0.014)	(0.017)
decile 5					-0.133	-0.062
					(0.014)	(0.015)
decile 6					-0.016	-0.031
					(0.013)	(0.015)
decile 7					-0.062	-0.065
					(0.013)	(0.018)
decile 8					-0.101	-0.143
					(0.021)	(0.030)
decile 9					-0.267	-0.296
					(0.047)	(0.058)
decile 10					-0.130	-0.120
					(0.038)	(0.037)
Constant	-0.529	-0.749	0.363	0.343	-0.217	4.249
	(0.056)	(0.070)	(0.062)	(0.075)	(0.112)	(0.114)
Observations	572,716	699,724	572,716	699,724	572,716	699,724

Notes: Estimates are based on Statistics of Income data for years 1979 to 2001.
Estimates are from 2SLS regressions. The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income (see Section III). Robust standard errors (clustered by individual) are in parentheses.

TABLE 9. Inclusion of Additional Demographic Variables

	Broad Income		Taxable Income	
	(1)	**(2)**	**(3)**	**(4)**
Added Demographics	No	Yes	No	Yes
1979 to 1987	0.183	0.210	0.365	0.425
	(0.052)	(0.048)	(0.083)	(0.081)
1988 to 1998	0.174	0.125	0.192	0.198
	(0.038)	(0.037)	(0.060)	(0.060)
1979 to 1998	0.198	0.227	0.276	0.339
	(0.029)	(0.028)	(0.046)	(0.045)

Notes: Estimates are based on Statistics of Income data. Estimates are from 2SLS regressions. The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income. Robust standard errors (clustered by individual) are in parentheses.

TABLE 10. Separate Controls for Mean Reversion and Divergence in the Income Distribution

Income Controls	1980 to 1987	1988 to 1998	1980 to 1998
ln(taxable income$_{t-1}$) and ln(taxable income$_t$/taxable income$_{t-1}$)	0.666	0.191	0.334
	(0.116)	(0.059)	(0.053)
Spline of ln(taxable income$_{t-1}$) and spline of ln(taxable income$_t$/taxable income$_{t-1}$)	0.400	0.264	0.345
	(0.108)	(0.060)	(0.056)
Observations	148,837	350,030	498,867

Notes: Estimates are based on Statistics of Income data. Estimates are from 2SLS regressions. The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income. Robust standard errors (clustered by individual) are in parentheses.

TABLE 11. Comparing Dollar Weighted Estimates Using Federal and State Marginal Tax Rates

Comparison of Estimates Using Federal and State Marginal Tax Rates[a]

	Panel 1: Federal Rates Only			Panel 2: State Rates Only		
	1979 to 1987	1988 to 1998	1979 to 1998	1979 to 1987	1988 to 1998	1979 to 1998
Taxable Income	0.423	0.212	0.347	0.343	0.105	0.226
	(0.061)	(0.060)	(0.038)	(0.098)	(0.103)	(0.066)
Broad Income	0.205	0.11	0.192	0.365	0.081	0.215
	(0.046)	(0.037)	(0.026)	(0.070)	(0.059)	(0.041)

Notes: Estimates are based on Statistics of Income data. Estimates are from 2SLS regressions and include a 10-Piece Spline of ln(Income). The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income. Robust standard errors (clustered by individual) are in parentheses. Coefficients other than the elasticities are suppressed.

TABLE 12. Full SOI Dollar-Weighted
Taxable-Income Elasticities for Upper-Income Filers

	ETI
Time-Period	$100k and Up
1979 to 1998	0.441
	(0.089)
1979 to 1987	0.426
	(0.148)
1988 to 1998	0.232
	(0.098)

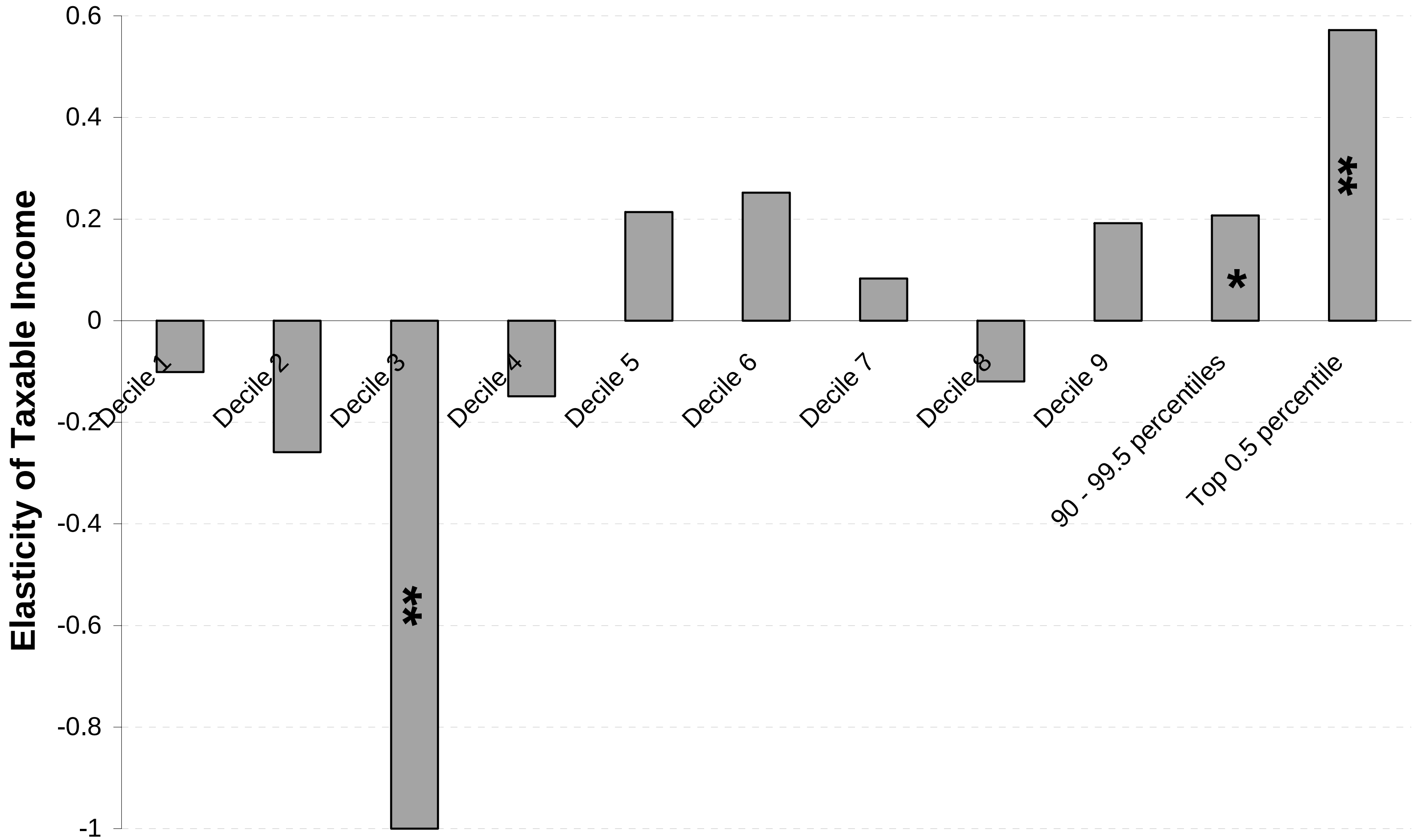
Notes: Estimates are based on Statistics of Income data for years 1979 to 2001. Estimates are based on the specification with a 10-piece spline. Regressions are weighted by the inverse of sampling probabilities and by income. Robust standard errors (clustered by individual) are in parenthesis.

TABLE 13. Full SOI Estimates after Excluding Years Most Likely Contain Transitory Behavior

	Broad Income	Taxable Income
1979 to 1987	0.102	0.356
	(0.113)	(0.255)
obs	64,769	57,709
1988 to 1998	0.076	0.149
	(0.048)	(0.074)
Obs	291,611	255,492
1979 to 1998	0.183	0.299
	(0.040)	(0.064)
obs	356,380	313,209

Notes: Estimates are based on Statistics of Income data. Estimates are from 2SLS regressions and include a 10-Piece Spline of ln(Income). The income range is $10,000 and above. Regressions are weighted by the inverse of sampling probabilities and by income. Robust standard errors (clustered by individual) are in parentheses. Coefficients other than the elasticities are suppressed.

FIGURE 1: Taxable Income Elasticities by Decile for the 1980s



***** Statistically significant at the 10% level.
****** Statistically significant at the 5% level.
Source: Estimates based on Statistics of Income's Continuous Work History Survey data for years 1979 to 1990.
Notes: Estimates are based on the specification with the 10-piece spline and with limited demographic information.
Deciles ETIs are estimated by interacting dummies for each quantile with the log change in the net-of-tax rate.