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Abstract

This paper examines alternative methodologies for measuring responses to the 1990 and 1993 federal tax increases. The methodologies build on those employed by Gruber and Saez (2002), Carroll (1998), and Auten and Carroll (1999). Internal Revenue Service tax return data for the project are from the Statistics of Income, which heavily oversamples high-income filers. Special attention is paid to the importance of sample income restrictions and methodology. Estimates are broken down by income group to measure how responses to tax changes vary by income. In general, estimates are quite sensitive to a number of different factors. Using an approach similar to Carroll's yields elasticity of taxable income (ETI) estimates as high as 0.54 and as low as 0.03, depending on the income threshold for inclusion into the sample. Gruber and Saez's preferred specification yields estimates for the 1990s of between 0.20 and 0.30. Yet another approach compares behavior in a year before a tax change to behavior in a year after the tax change. That approach yields estimated ETIs ranging from 0 to 0.71. The results suggest tremendous variation across income groups, with people at the top of the income distribution showing the greatest responsiveness. In fact, the estimates suggest that the ETI could be as high as 1.2 for those at the very top of the income distribution. The major conclusion, however, is that isolating the true taxable income responses to tax changes is extremely complicated by a myriad of other factors and thus little confidence should be placed on any single estimate. Additionally, focusing on particular components of taxable income might yield more insight.

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I. Introduction

In recent years, the elasticity of taxable income (ETI) has come to be considered the single most important parameter for measuring the implications of a change in tax rates on both efficiency and tax revenue. However, the economic magnitude of the ETI, the best method for measuring it, and the composition of the responses underlying the ETI are far from settled issues. In fact, as Kopczuk (2005) and Slemrod and Kopczuk (2002) posit, the ETI is not itself a structural parameter but is a function of many factors, including the institutional features of a tax system, which establish rules for deductions and credits, as well as policies toward evasion.

This paper examines alternative methodologies for measuring responses to the 1990 and 1993 federal tax increases. The methodologies build on those employed by Gruber and Saez (2002), Carroll (1998), and Auten and Carroll (1999). Internal Revenue Service tax return data for the project are from the Statistics of Income, which heavily oversamples high-income filers. Those data are very similar to data used by Carroll and Auten and Carroll and are a more extensive version of data used by Gruber and Saez. The paper pays special attention to the importance of sample income restrictions and methodology and breaks responses down by income group to measure how responses to tax changes vary by income.

In general, estimates are quite sensitive to a number of different factors. Using an approach similar to Carroll's yields ETI estimates as high as 0.54 and as low as 0.03, depending on the income threshold for inclusion into the sample. Gruber and Saez's preferred specification yields estimates for the 1990s of between 0.20 and 0.30. Yet another approach compares behavior in a single pair of years, before and after tax changes. That approach yields estimated ETIs ranging from 0 to 0.71. Those widely differing results suggest tremendous variation across income groups, with people at the top of the income distribution showing the greatest responsiveness. In fact, the estimates suggest that the ETI could be as high as 1.2 for those at the very top of the income distribution. The major conclusion is that isolating the true taxable income responses to tax changes is extremely complicated by a myriad of other factors and thus little confidence should be placed on any single estimate. Additionally, focusing on particular components of taxable income might yield more insight.

II. Issues

Although taxes affect income, so do many other economic factors. Controlling for non-tax-induced trends in taxable income is a major obstacle to accurately estimating elasticities. The more rapid growth of income at the top of the income distribution has been especially pronounced over the 1990s. The underlying causes of that rapid growth are not well understood and the choice of methods to control for it has a great impact on estimated responses.[1] One approach explored in this paper, and developed by Gruber and Saez (2002), uses first differences (where the base, or initial year, and the subsequent year are generally three years apart) and includes a variable that is a piece-wise function of income in order to control for non-tax-related income trends.[2] A second approach, used by Carroll (1998), uses

[1] For example, see Kopczuk (2005).
[2] See Giertz (2004).

year-to-year differences (or changes) and includes more extensive demographic information – such as geographic and occupational information – in an attempt to capture the non-tax-related income trends. A third approach uses control variables similar to those used by Gruber and Saez but compares years before and after a tax change (for the 1990s, that involves differencing observations that are six years apart) in order to focus on long-term behavioral responses to tax changes.

Controlling for Exogenous Trends in Income

Over the past 30 years, the distribution of reported income has widened. That trend accelerated in the 1980s and early 1990s, especially at the top of the distribution.[3] 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 for tax revenue.[4] Not fully accounting for the portion of that income growth that is unrelated to tax policy can result in large biases. For example, increases in marginal tax rates during the 1990s were targeted at taxpayers at the top of the income distribution and thus directly correlated with the rapid growth of their incomes. Not fully accounting for the exogenous (non-tax-related) portion of that income growth will bias ETI estimates downward. Although changes to the income distribution are widely documented and theories such as shifts in the returns to education and the market for superstars help explain the phenomenon,[5] 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. In addition, 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.

Controlling for Mean Reversion

Mean reversion also complicates estimation. Over a person's lifetime, income often follows a general path (for example, age-earnings profiles are well-known), with many fluctuations. After income has been particularly high or low, it will often revert to that general 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 probably 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 result in a spurious correlation between non-tax-related increases (by people below their lifetime path) and decreases (by those above their lifetime path) in taxable income as responses to changes in tax rates. Those factors bias ETI estimates in opposite directions. Because the 1990s tax increases only targeted upper-income groups, mean reversion at the bottom of the distribution will not directly contaminate the elasticity

[3] 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 1 percent more than doubled; the share reported by the top one-tenth of 1 percent nearly tripled; and the share reported by the top one-hundredth of 1 percent more than quadrupled.

[4] See Internal Revenue Service (2004).

[5] See Rosen (1981).

estimate. It could, however, indirectly affect the coefficients on the control variables in the estimation. Mean reversion at the top of the distribution is still important for the 1990s and, in the absence of adequate controls, will result in an upward bias for the estimated elasticities.

Research into the ETI is also complicated by the fact that the ETI appears to rise with income.[6] 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. In addition, a meaningful average overall 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 subsequent years the net-of-tax rates rise by 10 percent for all filers.[7] Now, suppose that 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 subsequent-year taxable income of $10,100, while those in the second group have a base-year taxable income of $1,000,000 and a subsequent-year taxable income of $1,090,000. In that instance, the low-income filers have an ETI of 0.1 and the high-income filers have an ETI of 0.9.[8] Under that scenario, the average individual ETI equals 0.5. But the ETI that accurately reflects the change in overall taxable income is 0.892 because the 0.9 applies to a base that is 100 times as large as the base for the group with the ETI of 0.1. That 0.892 is the *dollar-weighted* ETI.

III. Data and Methods

This paper uses data on individual tax returns from the Statistics of Income (SOI) for 1985 and 1988 to 2001 – although the primary analysis focuses on the period from 1989 to 1995. The SOI is a stratified random sample of tax filers, compiled by the Internal Revenue Service, and includes all information reported on filers' tax returns, plus additional demographic information. The SOI data encompass the Continuous Work History Survey (CWHS), used by Gruber and Saez (2002).[9] The CWHS is a subset of filers from the SOI who are followed from year to year. Although the CWHS contains detailed and accurate information, it is deficient in two important respects. First, although the CWHS sample is quite large (for some years, more than 20,000 tax returns), relatively few returns are from the very top of the income distribution. If high-income taxpayers dominate an estimate, that estimate using the CWHS will depend heavily on just a few filers.[10] That shortcoming of the CWHS can be overcome by moving to the full SOI (as was done in Carroll [1998] and in Auten and Carroll [1999]), which heavily over-samples high-income filers. Second, the CWHS (and the full

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[6] 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 change their labor supply but may have few other alternatives for altering their taxable income.
[7] The net-of-tax rate equals one minus the marginal tax rate; i.e., the share of the next dollar of earnings that is not taxed.
[8] The low-income filers' ETI is calculated by dividing their 1 percent increase in taxable income by the 10 percent increase in the net-of-tax rate. The high-income filers' ETI is calculated by dividing their 9 percent increase in taxable income by the 10 percent increase in the net-of-tax rate.
[9] Gruber and Saez use a publicly released version of the CWHS and their data span the 1980s. Giertz (2005) also applies Gruber and Saez's methodology to a proprietary version of the CWHS data for both the 1980s and 1990s.
[10] See Giertz (2004).

SOI) includes only people who file returns and are listed as the primary filers. Thus, attrition is an issue. For example, suppose two individuals have identical incomes in year one, but in year two one person's income falls below the filing threshold while the other person experiences an increase in income. The data will only include the person whose income rose, thus providing a misleading picture of income growth between the two years.

The analysis relies on three core samples constructed from the SOI. Construction of each sample conformed to the three different methodologies explored in the next section (see Table 1).

- The sample used with Gruber and Saez's approach includes only observations paired over three-year intervals from 1988 to 2001 – although much of the analysis uses only years 1989 to 1995. For example, a paired observation from base year 1992 would contain the change in that variable between years 1992 and 1995. Additionally, only filers with more than $10,000 in total real income (in 1992 dollars) are included in the sample. Both federal and state tax rates are calculated using the Congressional Budget Office's (CBO's) internal tax calculators.
- For the approach followed by Carroll, each paired observation represents the one-year change in the particular variable. For inclusion into that sample, the filer must be married and appear (with the same spouse) in each year from 1989 to 1995 and have a minimum of $50,000 in total income in each (every) year. Thus, year-to-year changes are included only for those meeting the income criterion who also appear in each of the seven years. Federal tax rates are calculated on the basis of average taxable income. The portion of the payroll tax used to finance Medicare is also included in the analysis. As with Carroll, state tax rates are not included.
- The third approach examines behavior in only two periods: one well prior to the tax change and the other after taxpayers have had the opportunity to respond. That approach, of comparing a year prior to and after a tax change, has been employed by Auten and Carroll (1999). This paper uses that same general approach, but the analysis employs Gruber and Saez's variable construction and not Auten and Carroll's method. The base year is 1989 (before the 1990s tax changes have taken place) and the subsequent year is 1995 (by which time taxpayers are assumed to have adjusted to the tax changes). For comparison, the same technique is applied to the Tax Reform Act of 1986 (TRA-86) using years 1985 and 1989 – the years used by Auten and Carroll. Both federal and state tax rates are calculated using CBO's internal tax calculators.

Gruber and Saez's Approach

For base years 1989 to 1992, the sample constructed for Gruber and Saez's approach includes over 157,000 paired observations. The SOI sample is rich in high-income filers, containing 26,128 returns with taxable income greater than $1,000,000 (see Table 2). In contrast, the CWHS sample used by Gruber and Saez includes just 25 such returns.[11] For the SOI, 5,775 returns report taxable income over $5,000,000, compared to just two for the CWHS. Estimated elasticities are generated with respect to two different income measures. The first measure is gross income, which equals total income minus Social Security benefits and capital gains. The second income measure is taxable income, which equals gross income

[11] That is based on incomes in 1992 dollars, as adjusted by rates of growth in gross income.

minus exemptions and standard or itemized deductions. Both measures use a 1990 constant-law definition of income, meaning that income measures are constructed in an identical manner for all years. Following Gruber and Saez, income measures are adjusted by the growth in average gross income, using 1992 as the base.[12] The sample includes only returns with gross income greater than $10,000 in the base year and positive income in the subsequent year. Without those restrictions, the SOI sample would be about 20 percent larger. Mean taxable base-year income is $826,100 and gross income is $971,100 after adjusting by the growth rate in gross income (see Table 2). Individual marginal tax rates (both state and federal) are imputed using CBO's internal tax calculators.[13] The mean base-year net-of-tax rate is 69.6 percent when taking into account both federal and state taxes.

The methodology follows directly from Gruber and Saez (2002). The income growth rate equals

$$\ln\left(\frac{income_{t+3}}{income_t}\right) = \alpha + \xi \cdot \ln\left(\frac{1-taxrate_{t+3}}{1-taxrate_t}\right) + mars \cdot \beta_1 + year \cdot \beta_2 + spline(income_t) \cdot \beta_3 + demog \cdot \beta_4 + \varepsilon \cdot$$ [14]

The dependent variable is log of income in the subsequent year ($income_{t+3}$) divided by income in the base year ($income_t$), where the subsequent year is three years after the base year. The key independent variable equals the log of the net-of-tax rate in the subsequent 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 place of the actual log change in the net-of-tax rate.[15] The coefficient on that variable, ξ, represents the ETI. Control variables include year-fixed effects, dummies for marital status (*mars*), and a 10-piece spline of the log of individual 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 include a model with the log of base-year income in place of the spline and a specification that excludes the income control altogether.[16] Gruber and Saez also weight their regressions by income. That places much more emphasis on responses at the top of the income distribution and is designed to yield results that are more indicative of the overall income response (and tax revenue implications) resulting from a change in tax rates. Note that if responses do not vary by income, then weighting will not affect ETI estimates. In addition to extending the years of data and adding more high-income filers, this analysis also adds a richer set of demographic information (*demog*), including age, sex, itemization status, and state-fixed effects.

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[12] The adjustment for gross income growth is analogous to adjustments that transform nominal dollars into real dollars. Thus, for this paper, each individual's reported income is multiplied by the ratio of average gross income in 1990 over the average gross income in the year of the observation.

[13] Jon Bakija of Williams College designed the state tax calculator used by CBO. Gruber and Saez used the National Bureau of Economic Research's (NBER's) TAXSIM model to impute their federal and state marginal tax rates.

[14] Note that all variables are for individuals. For simplicity, though, the equation omits subscripts denoting the individual.

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

[16] In addition, Gruber and Saez 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.

Carroll's Approach

The data for Carroll's approach are composed of 5,143 filers (30,858 paired observations of successive years) who are followed from 1989 to 1995. Mean taxable income (in 1992 CPI-adjusted dollars) is $1,223,800, and mean gross income is $1,398,600. The mean net-of-tax rate is 64.7 percent.

Carroll's approach involves estimating

$$\ln(Income_t / Income_{t-1}) = \alpha_0 + \alpha_1 \ln[(1-\tau_t)/(1-\tau_{t-1})] + \beta X + \gamma_t + \varepsilon_t\,,$$

where the dependent variable is the log change in income between year (t – 1) and t. The key independent variable is the log change in the net-of-tax rate. The model includes year (γ_t) and state-fixed effects, age, and children, as well as proxies for financial wealth and entrepreneurship. Carroll also included occupational information, which CBO does not have.

To control for tax-rate endogeneity, average income over the seven years is used to generate a "synthetic" tax rate that varies only with exogenous tax law changes. That is, the marginal tax rate is calculated for each year on the basis of the individual's average income. The Medicare portion of the FICA tax, the cap for which was increased in the early 1990s, is also included in the tax rate imputations. Earning splits are imputed on the basis of W-2 forms for 1995.[17] That synthetic tax rate is the key independent variable in the first-stage regression, which is used to produce the instrumented net-of-tax rates.

Approach Comparing End Years

Data for 1989 and 1995 are used to examine the tax changes of the early 1990s. For comparison, data from 1985 and 1989 are used to estimate ETIs for TRA-86. For the 1990s, the sample includes 31,940 filers with incomes greater than $10,000 in 1989. The sample used to evaluate TRA-86 includes 37,673 filers.

The model looks very similar to that used by Gruber and Saez and discussed above. The main difference is that this approach uses only one paired observation covering six years per individual, as opposed to a series of three-year time spans. Thus, the model can be written

$$\ln\left(\frac{income_{1995}}{income_{1989}}\right) = \alpha + \xi \cdot \ln\left(\frac{1-taxrate_{1995}}{1-taxrate_{1989}}\right) + mars \cdot \beta_1 + year \cdot \beta_2 + spline(income_{1989}) \cdot \beta_3 + demog \cdot \beta_4 + \varepsilon \cdot$$

The model for TRA-86 is identical, except the base year is 1985 (instead of 1989) and the subsequent year is 1989 (instead of 1995). As with Gruber and Saez's analysis, the equations are estimated via two-stage least squares, where the tax rate for the subsequent year is instrumented first by inflating base-year income by the growth in gross income between the base and subsequent year. That income measure is used to impute marginal tax rates on the basis of the law in the subsequent year. The imputed tax rate is the key independent variable in the first-stage regression.

[17] W-2 information was not available for other years. Given the size of the sample, imputing splits on the basis of one year should have little impact on the estimates, although if there was a shift in the distribution of earnings among households – or a change in the distribution of earnings within the household in response to changes in tax rates – then that approach could bias estimates.

Sample Weighting

While some of the regressions are weighted by income, all regressions are weighted to adjust for the SOI's non-random sampling properties. In contrast to the CWHS, which is designed to be random, selection into the full SOI is conditional on several factors, including income. Sampling probabilities reach 100 percent for very high-income filers. The sample is also constructed such that once a filer is sampled, he will continue to be sampled in all subsequent years, so long as his income increases (and his other characteristics, such as filing status, do not change). In fact, the probability that one is observed in two different years is simply the minimum of the sampling probabilities for the two years. Without weighting, that sampling strategy raises the potential for spurious correlation between the dependent variable [$\ln(income_t/income_{t-1})$] and the independent variables, including the tax variable. To avoid that possibility, (paired) observations from the full SOI are weighted by the reciprocal of their probability of appearing in the sample. That strategy is discussed in Imbens and Lancaster (1996) and in Auten and Carroll (1999), the latter of whom employ the strategy using SOI data.[18]

IV. Results

The three approaches yield a range of estimates of the ETI that are highly sensitive to a number of factors, including the choice of income cutoff for inclusion into the sample, the identification strategy, and the weights used in the regressions. Estimated responses are generally much stronger at the very top of the income distribution, but they are often not robust. The variation in responses by income and across time periods may truly reflect the fact that behavioral responses differed across those factors. But, the fact that estimates vary greatly both within and across methodologies cautions against placing too much emphasis on any particular result.

Results from Gruber and Saez's Approach

Using the CWHS, which contains few filers from the very top of the income distribution, Gruber and Saez (2002) report an overall estimated ETI of 0.40 for the 1980s. Applying the same methodology and similar data, Giertz (2005) obtains a similar result for the 1980s, but finds that his results are very sensitive to income-weighting the regressions and that just a few primarily very high-income filers drive the overall result. Employing the same approach to similar data from the CWHS, Giertz finds a much smaller estimated ETI of 0.20 for the 1990s and an estimated ETI of 0.30 for the full 1979-2001 period.

Here, using the full SOI for the same set of years (1989 to 1995) as Carroll, the methodology of Gruber and Saez (which compares behavior over three-year intervals) results in an income-weighted estimated ETI of 0.30 for Gruber and Saez's most preferred specification, which includes a 10-piece spline of logged base-year income (see Table 3). The corresponding gross income elasticity is 0.20. Both estimates show strong statistical significance. With no controls for base-year income, estimates are much larger – 1.4 for taxable income.

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[18] Additionally, income-weighted results for the full SOI are produced by simply multiplying income by the weights used to adjust for the SOI's sampling strategy.

Those estimated elasticities decline by about one-third when the period is extended to include 1988 and 1996 to 2001. The estimated ETI falls to 0.20 and the estimated gross income elasticity drops to 0.13, but both remain highly significant (see Table 4). Those estimates are very similar to the statistically insignificant estimates reported by Giertz (2005), examining the same years with the same methodology but using CWHS data rather than the full SOI. Because the added years do not include any federal tax changes, those additional years probably affect estimates by altering the estimated baseline income trend. For example, if the income growth for upper-income filers (relative to lower-income filers) moderated during those years, then the spline coefficients might be affected. That could result in a flatter baseline income trend, which would result in lower estimated responses.

The much larger estimates without income controls suggest that mean reversion dominates the secular increase in income at the top of the income distribution. In a period like the early 1990s, falling incomes (due to mean reversion) at the top of the income distribution are directly but spuriously correlated with the also falling net-of-tax rate. Without adequate controls, at least a portion of that spurious correlation will be reflected in the estimated ETI. By contrast, in a period in which the net-of-tax rate is rising, such as the 1980s, that spurious correlation may bias estimates downward because the falling incomes at the top are inversely correlated with the rise in the net-of-tax rate. That possibility is supported by Giertz (2005), who finds that excluding income controls greatly increases estimated responses for the 1990s, but substantially lowers them for the 1980s. Note that very few middle-income filers will move to the very top of the income distribution. But, incomes for most of those at the very top of the distribution will eventually fall to more moderate levels (independent of taxes). Thus, mean reversion at the top of the income distribution is an important phenomenon. Additionally, the fact that Gruber and Saez's approach weights regressions by base-year income makes mean reversion at the top of the income distribution potentially even more problematic.

Results from Carroll's Approach

Carroll's model yields ETI estimates ranging from 0.54 to 0.03, depending on the income cutoff and whether his full model or only year-fixed effects are used (see Table 5). Using Carroll's income cutoff of $50,000, the estimated ETI is 0.46 when including only year-fixed effects and 0.54 for the full model. Those estimates are substantially higher than the 0.31 and 0.38 reported by Carroll. In contrast, the estimates for gross income are smaller than those found by Carroll: 0.18 (versus 0.26) with just year-fixed effects and 0.27 (versus 0.32) for the full model (see Table 6). Only one of the gross income elasticities shows strong statistical significance.

Those estimates are quite sensitive to the income cutoff used for inclusion into the sample. The $50,000 cutoff results in 5,143 filers – substantially more than the 4,233 in Carroll's sample, which used the same cutoff.[19] Raising the cutoff to $61,500 results in a sample size

[19] The income cutoffs are based on gross income. It is not clear which measure was used by Carroll, but assuming a cutoff based on gross income results in a sample that is substantially larger than Carroll's. Conversely, using a cutoff based on taxable income results in a sample of 3,716 individuals, substantially smaller than Carroll's sample of 4,233 individuals.

that is very close to Carroll's and somewhat smaller estimated ETIs: 0.48 for the full model. The estimated gross income elasticities are a little larger and closer to the core gross income elasticities reported by Carroll: 0.21 (versus 0.26) with just year-fixed effects and 0.29 (versus 0.32) for the full model.

Increasing the income cutoff further yields smaller estimated ETIs, a finding that contrasts with Carroll's substantially larger estimates when he raised the sample income cutoff from $50,000 to $75,000. As the income cutoff is raised to $75,000, gross income elasticity estimates are more stable than the corresponding ETI estimates. Once the income cutoff reaches $100,000 both taxable and gross income elasticities are small (often very close to zero and not statistically different from zero). While some of the samples yield statistically significant results, the sensitivity of the results to the sample cutoff makes it difficult to place very much confidence in any single estimate.

The same analysis was repeated using individuals' average (instead of annual) gross income over the 1989-1995 period as the criterion for inclusion into the sample. Using the $50,000 cutoff, the average income measure yields a sample size somewhat closer to Carroll's, although the resulting estimates are just as sensitive and exhibit similar patterns as the income cutoff is raised. For the $50,000 to $75,000 income cutoffs, the estimated ETIs for the full model are somewhat smaller than those reported in Table 5; for the $100,000 cutoff, the estimated ETI is larger than the corresponding estimate in Table 5.

Altering the income cutoff for inclusion into the sample primarily affects the counterfactual group (i.e., the group not facing a tax change). For a couple of the paired years (1991-92 and 1994-95), the tax schedule did not change, so observations for those years serve primarily to identify the non-tax-related trend in income. Additionally, the 1990 and 1993 tax increases were targeted at upper-income filers; many filers experienced no statutory change in tax rates over the entire period. Those lower-income filers also serve to identify the non-tax-related income trend, assuming trends are the same across incomes. Over that period, income growth has been slower for low-income groups than for higher-income groups. Thus, as the income cutoff for inclusion into the sample is raised, the estimated income trend, in the absence of any changes in tax law, may rise. If that phenomenon dominates, then estimated elasticities would be expected to rise (as found by Carroll) as the income cutoff increases over a period when tax rates were rising (i.e., where the net-of-tax rate is falling) as in the first half of the 1990s. In contrast, mean reversion may also be strong for lower-income filers. For the 1990s, the impact of mean reversion at the bottom of the distribution would have the opposite effect on estimated ETIs, raising the estimates. If that phenomenon dominates, then estimated elasticities would be expected to fall as the income cutoff is raised – which is what this paper found.

When the analysis is repeated with various subsets of years, substantial responses are generated when including only years 1991 and 1993, although statistical significance for most of those estimates is poor (see Table 7 and Table 8).[20] For some of the income cutoffs, estimated elasticities are extremely close to the estimates from the corresponding model that includes all of the years; for others, the estimates are different. Given that most of the dropped observations do not contain tax changes, it is not clear which estimates are more believable. On the one hand, including the other years may help to identify the control variables. On the other hand, they may bias the estimates if the income growth in those other years (when tax rates are not changing) is very different from the non-tax-related income growth in the years in which tax rates did change.

Results from the Approach Comparing End Years

A question, aside from the robustness of the estimates, is whether the estimates capture longer-term behavioral responses, as opposed to shorter-term income shifting. Comparing adjacent years, à la Carroll, may yield estimates that reflect transitory responses and not fundamental shifts in behavior. For example, Goolsbee (2000), examining the behavior of high-paid executives, finds very large transitory responses to the Omnibus Budget Reconciliation Act (OBRA) of 1993, but only modest longer-term responses. Although Gruber and Saez compare behavior over three-year intervals, many years that make up each paired observation probably contain transitory shifting. Thus, long-run estimated elasticities based on that approach may still be contaminated by short-run income shifting. One way to focus on longer term responses is to compare behavior a couple of years before a tax change to behavior a couple of years after the change. Auten and Carroll (1999) used that basic approach to examine responses to the Tax Reform Act of 1986.

The present analysis, in addition to estimating ETIs for the 1990s by comparing end years, also applies the same approach to generate ETI estimates for TRA-86 for purposes of comparison. The TRA-86 estimates are not intended to be a pure replication of Auten and Carroll's approach because, although the years used are the same, the identification strategy (including the variables used to control for non-tax-induced changes to income) and data construction are different. In any event, using years 1985 and 1989, Auten and Carroll's approach yields a person-weighted estimated ETI of 0.32 using the set of control variables from Gruber and Saez's most preferred specification (see Table 9). By contrast, Auten and Carroll report an estimated ETI of 0.51 to 0.75 depending on the set of control variables that they include. Note that Auten and Carroll restrict their sample to filers ages 25 to 55 in 1985 with at least $21,020 in taxable income if married and $15,610 in taxable income if single. This paper excludes from the sample only those filers with less than $10,000 in gross income in 1985 and with zero or negative gross or taxable income in 1989. (Those are the same sample restrictions imposed by Gruber and Saez.)

Applying the same approach using years 1989 and 1995 yields a slightly negative person-weighted estimated ETI (-0.08) that is not statistically different from zero. When including the log of base-year income, instead of a 10-piece spline, the estimated ETI falls to -0.57. The corresponding estimate for TRA-86 is 1.33. The difference in the two results suggests that the

[20] The 1991 observations measure changes from 1990 to 1991, and the 1993 observations measure changes from 1992 to 1993.

log of base-year income fails to fully control for the secular rise in income. That failure would bias the estimated ETI upward for TRA-86 and downward for the early 1990s. The 10-piece spline may control more effectively for the secular income trend. If the model is properly identified, it suggests that there was no response to the 1990s tax increases but a substantial (although at the low end of the range reported in the literature) response to TRA-86. Of course, with so many other factors moving simultaneously, it is quite possible that even the model with the 10-piece spline is poorly identified.

Reestimating the different specifications using income-weighted two-stage least squares, as used by Gruber and Saez, results in a modest increase in the estimated ETI for TRA-86 (using Gruber and Saez's most preferred set of control variables). The fact that the estimated ETIs for TRA-86 are almost identical with and without income weighting suggests that the ETI for the time period is relatively constant across the income distribution. That finding is not consistent with Giertz (2005), Gruber and Saez (2002), and others who report estimated ETIs for the 1980s that are much larger for upper-income filers. By contrast, the estimated ETI for the 1990s rises from slightly negative to 0.42 with income weighting. That estimate is still not statistically different from zero, however.

For TRA-86, raising the threshold for inclusion into the sample from $10,000 to $75,000 of base-year income lowers the person-weighted ETI to 0.08 but raises the income-weighted estimate to 0.40 (although still not statistically different from zero). It is possible that mean reversion at the bottom of the income distribution was positively correlated with the increase in net-of-tax rates after TRA-86 and that raising the cutoff for inclusion into the sample thus removes much of that mean reversion. By contrast, income weighting may more than offset that effect by placing greater weight on filers with more taxable income, who probably have larger ETIs.

For the 1990s, raising the income cutoff leads to much larger person-weighted and income-weighted ETI estimates. Because the 1990s tax increases affected primarily upper-income filers, raising the cutoff for inclusion into the sample may simply change the pool of filers who do not experience a tax change. Reducing the sample may eliminate much of the mean reversion at the bottom of the distribution – i.e., those with low income in 1989 who experienced a large non-tax-related increase in income between 1989 and 1995 – resulting in a slower estimated secular trend in taxable income.

Heterogeneous Responses by Income

A number of studies have found that estimated ETIs vary greatly by income, with the largest responses for very high-income filers. [For example, see Saez (2004).] This analysis of the 1990s tax changes, employing Gruber and Saez's methodology, finds that raising the sample cutoff from $10,000 to $100,000 has a positive but only a modest impact on the estimated ETI, raising it from 0.20 to 0.23. In contrast, raising the cutoff to $500,000 has an enormous effect, increasing the (income-weighted) estimated ETI to over 1.2.

Note that changing the income restriction for the sample also affects the identification strategy. With the unrestricted sample, identification is based at least partly on lower-income filers who experience a different (or no) change in tax rates. Restricting the sample to those filers with over $500,000 in income removes most differences in (instrumented) net-of-tax rates. Identification comes from comparing behavior over years in which tax rates change to behavior over years with the same tax rates. Whether that hampers or improves the identification process depends on how well the control variables, such as the spline, capture non-tax-related changes to income that vary across the income distribution.

Person-Weighted Estimates by Income Quantile

As an alternative to income-weighted two-stage least squares and to further explore how responses vary by income, the analysis employed two person-weighted approaches to estimate ETIs separately by income quantile: a single-equation least squares framework and an absolute deviation method with separate regressions for each quantile.

The first approach estimates separate ETIs by quantile within a single equation framework by interacting the log change in the net-of-tax rate with quantile dummies, defined using base-year taxable income.[21] All estimates use Gruber and Saez's most preferred specification, which includes a 10-piece spline. 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. If that supposition (that the ETI is uncorrelated with taxable income within each quantile) is correct, then unweighted and income-weighted quantile elasticity estimates would be identical because the elasticity, while varying by income, remains constant within each income quantile.

The person-weighted estimates vary greatly by quantile, with by far the largest elasticities for those at the very top of the income distribution (see Panel 1 of Table 10).[22] Estimates are positive for all quantiles above the 30th percentile and almost always show strong statistical significance above the 50th percentile. For the top one-half of 1 percent of filers, the estimated ETI is 0.99.[23] Interestingly, the estimated ETI is just 0.16 for the 95th percentile to the 99.5th percentile and just 0.21 for the 90th percentile to the 95th percentile. For deciles four to nine, estimated ETIs range from a high of 0.68 to a low of 0.05. For the bottom five deciles, estimates are either the wrong sign or not statistically different from zero. Little significance can be placed on the estimates for the lower quantiles because those filers generally experienced no change in (federal) tax rates.

The second alternative approach uses quantile regressions to estimate ETIs. The quantile regression is a more general form of the median regression (or least absolute deviations regression). Each regression uses the same data (and sample restrictions) as used with Gruber and Saez's approach applied to the 1990s. The quantile regression is based on minimizing the

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[21] While estimates are based on the full SOI, income cutoffs for the various quantiles are based on the CWHS sample, which represents a random sample of all tax filers.

[22] The first nine dummies represent the first nine deciles, or tenths, of the income distribution. The 10th dummy applies to filers between the 90th and 95th percentiles. The 11th dummy applies to those between the 95th and 99.5th percentiles. The final quantile dummy applies to filers in the top one-half of 1 percent.

[23] Reported taxable income at the 99.5th percentile (based on the sample used in the full regression analysis, which excludes filers with less than $10,000 in base-year gross income) is about $203,000; the minimum level of reported gross income in the top one-half of 1 percent of the reported taxable-income distribution is about $218,300. That is after incomes have been adjusted by growth in gross income (and expressed in 1992 dollars).

weighted absolute value of the residuals, where one weight applies to values with positive residuals and one minus that weight applies to values with negative residuals. The weight simply indicates the point in the income distribution around which the sum of absolute residuals is minimized. In the special case of the median regression, the weight equals 0.5.

Estimates from the person-weighted quantile regressions are substantially larger than those from the single-equation model for the 90th percentile to the 99.5th percentile but are somewhat smaller (than those from the single-equation model) for deciles six through nine (see Panel 2 of Table 10). Estimates from the quantile regressions also show strong statistical significance, as measured by Koenker-Bassett standard errors. For the top one-half of 1 percent of filers, the estimated ETI is 0.87. As the focal point moves down the income distribution, the estimated ETI falls but remains above 0.5 for the top three deciles and above 0.4 throughout the distribution.

V. Conclusion

This paper builds on Gruber and Saez (2002), Carroll (1998), and Auten and Carroll (1999) by applying their (or parts of their) methodologies to SOI data for the 1990s. Many of the estimates are in line with the recent literature, but estimates vary greatly depending on methodology, time period analyzed, income group, and sample income cutoffs.

Applying Gruber and Saez's approach to the 1990s yields an estimated ETI of between 0.2 and 0.3, depending on whether the sample extends to 1995 or to 2001. The additional years of data do not contain a federal tax change, so the difference between the estimates probably results from the impact that observations from the second half of the 1990s have on the estimated baseline income trend. When the sample is restricted to filers with more than $500,000 in income, the estimated ETI is quite large, 1.2. In addition to income-weighting estimates, as done by Gruber and Saez, the analysis used two person-weighted approaches to estimate ETIs for segments of the income distribution. For the top one-half of 1 percent, the estimated ETI is between 0.88 and 0.99. Estimates for the remainder of the distribution are substantially smaller and vary greatly depending on the methodology employed. Little stock can be placed in estimates outside the upper quantiles because, during the 1990s, only upper-income groups experienced a change in federal tax rates.

After replicating Carroll's approach using similar data, the analysis conducts a number of checks for robustness. Carroll's approach shows great sensitivity to the income cutoff for inclusion into the sample. It appears that estimated responses are driven by just a couple of years of the data. Additionally, it appears that the approach is probably picking up more of a transitory (as opposed to a permanent) response. Comparing behavioral changes several years apart, as Auten and Carrroll did for TRA-86, suggests that income-weighted responses to the 1990s tax changes were larger than the responses to TRA-86; although, for the person-weighted estimates, estimated responses are heavily dependent on the income cutoff for the sample. Additionally, those estimates are sensitive to factors such as income weighting and generally show very low levels of statistical significance.

The findings that very high-income filers respond more to tax changes than do those with lower incomes and that estimates for the 1990s are generally smaller than comparable elasticities for the 1980s are consistent with the previous literature. However, the estimates are highly sensitive to an array of factors, including sample income cutoffs, the methodological approach, and tweaks to each of the core methodologies. That sensitivity warrants caution against placing too much emphasis on any particular estimate. Additionally, the results reinforce the inherent complexities associated with identifying the ETI. Recent literature on the ETI highlights the factors that complicate estimation, including recognizing both the many ways that individuals can respond to tax changes and the many (often changing) non-tax factors that also affect taxable income. Employing a reduced-form approach that attempts to separate the tax from the non-tax factors has proven difficult. In particular, mean reversion and exogenous trends in income that fluctuate over time and affect different segments of the income distribution differently are especially problematic because the underlying causes for those phenomena are not well understood. Those observations suggest that a narrower focus, for example on particular sources of taxable income, may prove more fruitful to understanding what drives the overall ETI estimates. Additionally, a rigorous decomposition of the various sources may aid in understanding how the various complexities have hampered other ETI estimates.

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Table 1. Comparing the Three Samples

	Methodological Approaches		
	Gruber and Saez	**Carroll**	**End Years**
Years	1989-1995[a]	1989-1995	1989, 1995
Paired Observations	157,083	30,858	31,940
Differencing: Years from Base to Subsequent Observation	3	1	6
Sample Income Cutoff	$10,000	$50,000	$10,000

Source: Estimates are based on Statistics of Income data.
Note: Income and tax liabilities are expressed in 1992 dollars.
a. Gruber and Saez's approach is applied to observations paired over three-year intervals from 1988 to 2001, although much of the analysis focuses on the 1989-1995 period.

Table 2. SOI Summary Statistics

	SOI	Carroll
Paired Observations[a]	157,083	30,858
Returns with Base-Year Taxable Income Greater Than:		
$1,000,000	26,128	7,006
$5,000,000	5,775	1,822
Mean Taxable Income[b]	$826,100	$1,223,800
Mean Gross Income[b]	$971,100	$1,398,600
Mean Federal Tax Rate	25.6	35.3
Mean State Tax Rate	4.8	n.a.
Mean Net-of-Tax Rate	69.6	64.7
Mean Federal Tax Liability[b]	$114,400	
Mean State Tax Liability[b]	$56,700	n.a.

Source: Estimates are based on Statistics of Income data from 1989 to 1995. Filers with less than $10,000 of gross 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 gross income.
Note: n.a. = not applicable.

Table 3. Full SOI Taxable and Gross-Income Elasticities for the 1990s: Gruber and Saez's Approach for 1989 to 1995

	No Income Controls		Base-Year Income Controls		Spline Income Controls	
	Gross Income	Taxable Income	Gross Income	Taxable Income	Gross Income	Taxable Income
$\ln((1 - mtr_{t+3})/(1 - mtr_t))$	0.977	1.409	0.143	-0.025	0.201	0.30
	(0.085)	(0.130)	(0.066)	(0.097)	(0.070)	(0.131)
Married	0.111	0.003	0.138	0.059	0.139	0.073
	(0.018)	(0.020)	(0.015)	(0.017)	(0.016)	(0.018)
Single	0.017	-0.048	0.014	-0.022	0.017	-0.011
	(0.017)	(0.019)	(0.015)	(0.016)	(0.015)	(0.017)
Age	0.024	0.038	0.037	0.054	0.037	0.06
	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)	(0.006)
Age Squared/10	-0.007	-0.01	-0.009	-0.012	-0.009	-0.013
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age Cubed/100	0.005	0.006	0.006	0.007	0.006	0.008
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sex	0.004	0.001	0.001	-0.001	0.001	-0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Itemizer Dummy	-0.008	-0.053	-0.102	-0.134	-0.095	-0.133
	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)
ln(income)			-0.113	-0.127		
			(0.006)	(0.006)		
Decile 1					-0.015	-0.58
					(0.404)	(0.022)
Decile 2					-0.203	-0.168
					(0.032)	(0.024)
Decile 3					-0.07	-0.175
					(0.031)	(0.029)
Decile 4					-0.169	-0.174
					(0.040)	(0.036)
Decile 5					-0.111	-0.088
					(0.041)	(0.030)
Decile 6					-0.063	-0.06
					(0.028)	(0.025)
Decile 7					-0.078	-0.043
					(0.023)	(0.032)
Decile 8					-0.102	-0.155
					(0.031)	(0.050)
Decile 9					-0.288	-0.333
					(0.070)	(0.116)
Decile 10					-0.088	-0.006
					(0.069)	(0.092)
Constant	-0.366	-0.446	0.671	0.613	-0.184	4.519
	(0.095)	(0.108)	(0.101)	(0.108)	(0.370)	(0.212)
Observations	123,163	163,364	123,163	157,083	123,163	157,083

Source: Estimates are based on Statistics of Income data for years 1989 to 1995.
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 are in parentheses.

Table 4. Full SOI Taxable and Gross-Income Elasticities for the 1990s: Gruber and Saez's Approach for 1988 to 2001

	No Income Controls		Base-Year Income Controls		Spline Income Controls	
	Gross Income	Taxable Income	Gross Income	Taxable Income	Gross Income	Taxable Income
$\ln((1 - mtr_{t+3})/(1 - mtr_t))$	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	0.05
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Age Squared/10	-0.006	-0.008	-0.007	-0.01	-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)
Itemizer Dummy	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	-0.12		
			(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	-0.17
					(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	0.72	0.08	4.472
	(0.096)	(0.104)	(0.100)	(0.103)	(0.10)	(0.150)
Observations	323,776	449,584	323,776	449,584	323,776	449,584

Source: 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 are in parentheses.

Table 5: Estimated Taxable Income Elasticities

Gross Income	>50,000		>61,500		>75,000		>100,000		>150,000	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$\ln((1 - mtr_t)/(1 - mtr_{t-1}))$	0.458	0.539	0.412	0.477	0.366	0.412	0.107	0.101	0.035	0.031
	(0.203)	(0.213)	(0.165)	(0.173)	(0.174)	(0.183)	(0.183)	(0.195)	(0.320)	(0.350)
1991 Dummy	0.019	0.02	0.015	0.016	0.001	0.003	-0.024	-0.022	-0.081	-0.079
	(0.009)	(0.009)	(0.011)	(0.011)	(0.013)	(0.013)	(0.018)	(0.018)	(0.026)	(0.027)
1992 Dummy	0.023	0.024	0.034	0.038	0.041	0.045	0.044	0.048	0.042	0.045
	(0.008)	(0.008)	(0.010)	(0.010)	(0.011)	(0.011)	(0.015)	(0.015)	(0.022)	(0.022)
1993 Dummy	0.004	0.008	0.009	0.016	0.002	0.009	-0.049	-0.044	-0.104	-0.101
	(0.008)	(0.008)	(0.010)	(0.011)	(0.015)	(0.015)	(0.017)	(0.018)	(0.041)	(0.044)
1994 Dummy	0.016	0.02	0.017	0.024	0.001	0.009	-0.004	0.003	-0.065	-0.06
	(0.008)	(0.008)	(0.010)	(0.010)	(0.012)	(0.012)	(0.015)	(0.015)	(0.021)	(0.021)
1995 Dummy	0.025	0.031	0.04	0.048	0.047	0.057	0.02	0.028	0.002	0.009
	(0.008)	(0.008)	(0.011)	(0.011)	(0.014)	(0.014)	(0.016)	(0.016)	(0.022)	(0.022)
ln(financial asset income)		-0.001		0.001		0.001		-0.001		-0.004
		(0.001)		(0.001)		(0.002)		(0.002)		(0.002)
Age		0.002		0		-0.001		-0.011		-0.015
		(0.002)		(0.003)		(0.004)		(0.006)		(0.007)
Age Squared		0		0		0		0.001		0.001
		(0.000)		(0.000)		(0.000)		(0.001)		(0.001)
Entrepreneur Dummy		0.023		0.015		0.01		0.007		0.011
		(0.005)		(0.005)		(0.006)		(0.008)		(0.010)
Kids		0.003		0.002		0.002		-0.001		-0.007
		(0.002)		(0.002)		(0.003)		(0.003)		(0.003)
Children Away from Home		-0.005		0.008		0		-0.002		-0.014
		(0.010)		(0.012)		(0.013)		(0.015)		(0.033)
Children Away from Home										
Constant	0.015	-0.029	0.016	0.006	0.025	0.126	0.044	0.403	0.076	0.64
	(0.006)	(0.099)	(0.007)	(0.128)	(0.009)	(0.106)	(0.011)	(0.137)	(0.016)	(0.186)
Observations	30,858	30,858	25,356	25,356	21,936	21,936	18,606	18,606	15,252	15,252

Source: Estimates are based on Statistics of Income data for 1989 to 1995.
Estimates are from 2SLS regressions. Specification (1) refers to the model with only year dummies. Specification (2) refers to the full model. Regressions are weighted by the inverse of sampling probabilities (see Section III). Robust standard errors are in parentheses.

Table 6: Estimated Gross Income Elasticities

Gross Income	>50,000		>61,500		>75,000		>100,000		>150,000	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$\ln((1 - mtr_t)/(1 - mtr_{t-1}))$	0.176	0.273	0.205	0.292	0.181	0.255	-0.027	0.01	-0.015	0.025
	(0.152)	(0.159)	(0.135)	(0.142)	(0.144)	(0.152)	(0.153)	(0.164)	(0.249)	(0.274)
1991 Dummy	-0.003	-0.001	-0.004	-0.002	-0.016	-0.014	-0.031	-0.028	-0.077	-0.073
	(0.006)	(0.006)	(0.007)	(0.007)	(0.010)	(0.010)	(0.014)	(0.014)	(0.020)	(0.021)
1992 Dummy	0.016	0.019	0.021	0.025	0.022	0.026	0.025	0.03	0.02	0.024
	(0.005)	(0.005)	(0.007)	(0.007)	(0.009)	(0.009)	(0.012)	(0.012)	(0.019)	(0.019)
1993 Dummy	-0.012	-0.007	-0.01	-0.002	-0.02	-0.011	-0.064	-0.056	-0.107	-0.097
	(0.005)	(0.005)	(0.007)	(0.007)	(0.011)	(0.011)	(0.014)	(0.015)	(0.031)	(0.033)
1994 Dummy	0.003	0.008	0.003	0.011	-0.013	-0.004	-0.021	-0.013	-0.078	-0.072
	(0.005)	(0.005)	(0.007)	(0.007)	(0.009)	(0.010)	(0.012)	(0.012)	(0.018)	(0.018)
1995 Dummy	0.014	0.022	0.025	0.035	0.027	0.038	0.012	0.02	-0.009	-0.001
	(0.006)	(0.006)	(0.008)	(0.008)	(0.011)	(0.011)	(0.013)	(0.013)	(0.019)	(0.018)
ln(financial asset income)		0.001		0.002		0.003		0.001		-0.001
		(0.001)		(0.001)		(0.001)		(0.002)		(0.002)
Age		-0.002		-0.004		-0.008		-0.013		-0.016
		(0.002)		(0.002)		(0.003)		(0.005)		(0.006)
Age Squared		0		0		0.001		0.001		0.002
		(0.000)		(0.000)		(0.000)		(0.001)		(0.001)
Entrepreneur Dummy		0.02		0.014		0.011		0.008		0.009
		(0.003)		(0.004)		(0.005)		(0.006)		(0.009)
Kids		0.002		0.002		0.002		-0.002		-0.006
		(0.001)		(0.002)		(0.002)		(0.003)		(0.003)
Children Away from Home		-0.009		0.003		0.004		0.001		-0.014
		(0.006)		(0.007)		(0.009)		(0.011)		(0.034)
Constant	0.016	0.036	0.018	0.089	0.03	0.265	0.045	0.42	0.077	0.602
	(0.004)	(0.081)	(0.005)	(0.105)	(0.007)	(0.083)	(0.008)	(0.113)	(0.013)	(0.165)
Observations	30,858	30,858	25,356	25,356	21,936	21,936	18,606	18,606	15,252	15,252

Source: Estimates are based on Statistics of Income data for 1989 to 1995.
Estimates are from 2SLS regressions. Specification (1) refers to the model with only year dummies. Specification (2) refers to the full model. Regressions are weighted by the inverse of sampling probabilities (see Section III). Robust standard errors are in parentheses.

Table 7. Estimated Taxable Income Elasticities: Paired Years 1991 and 1993

Gross Income	>50,000		>61,500		>75,000		>100,000		>150,000	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$\ln((1 - mtr_t)/(1 - mtr_{t-1}))$	0.313	0.215	0.414	0.342	0.366	0.133	0.224	-0.085	0.158	-0.396
	(0.178)	(0.196)	(0.157)	(0.176)	(0.165)	(0.182)	(0.188)	(0.221)	(0.318)	(0.363)
1991 Dummy	0.016	0.017	0.005	0.008	0	0	0	0	0.015	0.066
	(0.008)	(0.008)	(0.010)	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)	(0.030)	(0.034)
ln(financial asset income)		-0.005		-0.006		-0.013		-0.015		-0.021
		(0.002)		(0.002)		(0.003)		(0.005)		(0.006)
Age		0.004		0.001		0.006		-0.024		-0.024
		(0.006)		(0.007)		(0.011)		(0.013)		(0.016)
Age Squared		-0.001		0		-0.001		0.003		0.003
		(0.001)		(0.001)		(0.001)		(0.001)		(0.002)
Entrepreneur Dummy		0.011		0.013		0.019		-0.015		-0.01
		(0.011)		(0.011)		(0.013)		(0.016)		(0.021)
Kids		0.001		0.002		-0.005		-0.001		-0.002
		(0.004)		(0.004)		(0.005)		(0.007)		(0.007)
Children Away from Home		-0.008		0.014		-0.016		-0.015		-0.069
		(0.032)		(0.021)		(0.020)		(0.020)		(0.035)
Constant	0.018	0.054	0.025	0.162	0.026	0.113	0.022	0.809	-0.014	0.835
	(0.006)	(0.147)	(0.007)	(0.182)	(0.008)	(0.269)	(0.011)	(0.316)	(0.038)	(0.455)
Observations	10,286	10,286	8,452	8,452	7,312	7,312	6,202	6,202	5,084	5,084

Source: Estimates are based on Statistics of Income data for 1989 to 1995.
Estimates are from 2SLS regressions. Specification (1) refers to the model with only the year dummy. Specification (2) refers to the full model. Regressions are weighted by the inverse of sampling probabilities (see Section III). Robust standard errors are in parentheses.

Table 8. Estimated Gross Income Elasticities: Paired Years 1991 and 1993

Gross Income	>50,000		>61,500		>75,000		>100,000		>150,000	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$\ln((1 - mtr_t)/(1 - mtr_{t-1}))$	0.159	0.183	0.207	0.23	0.185	0.089	0.058	-0.143	0.043	-0.418
	(0.137)	(0.148)	(0.130)	(0.144)	(0.138)	(0.153)	(0.156)	(0.183)	(0.240)	(0.288)
1991 Dummy	0.01	0.008	0.006	0.004	0	0	0	0	0.025	0.068
	(0.005)	(0.006)	(0.007)	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)	(0.024)	(0.027)
ln(financial asset income)		-0.001		-0.002		-0.007		-0.011		-0.017
		(0.001)		(0.002)		(0.003)		(0.004)		(0.005)
Age		0.003		0		-0.001		-0.024		-0.025
		(0.004)		(0.005)		(0.009)		(0.011)		(0.014)
Age Squared		0		0		0		0.002		0.003
		(0.000)		(0.001)		(0.001)		(0.001)		(0.002)
Entrepreneur Dummy		0.017		0.016		0.021		0.001		0.003
		(0.007)		(0.008)		(0.010)		(0.013)		(0.018)
Kids		0		0.002		-0.004		0		-0.001
		(0.002)		(0.003)		(0.004)		(0.005)		(0.006)
Children Away from Home		-0.018		0.002		-0.009		-0.008		-0.05
		(0.024)		(0.013)		(0.013)		(0.014)		(0.031)
Constant	0.004	-0.003	0.009	0.085	0.014	0.167	0.015	0.702	-0.023	0.752
	(0.004)	(0.104)	(0.005)	(0.131)	(0.006)	(0.211)	(0.009)	(0.261)	(0.028)	(0.375)
Observations	10,286	10,286	8,452	8,452	7,312	7,312	6,202	6,202	5,084	5,084

Source: Estimates are based on Statistics of Income data for 1989 to 1995.
Estimates are from 2SLS regressions. Specification (1) refers to the model with only the year dummy. Specification (2) refers to the full model. Regressions are weighted by the inverse of sampling probabilities (see Section III). Robust standard errors are in parentheses.

Table 9: SOI Taxable Income Elasticities for TRA-86 and for the 1990s Using Observations Pre and Post Reform

	Person-Weighted			Income-Weighted		
	No Income Controls	Base-Year Income Controls	Spline Income Controls	No Income Controls	Base-Year Income Controls	Spline Income Controls
TRA-86: All Filers with More than $10,000 in Base-Year Gross Income						
$\ln((1 - mtr_{1989})/(1 - mtr_{1985}))$	-2.099	1.328	0.318	-0.166	0.992	0.34
	(0.109)	(0.155)	(0.165)	(0.093)	(0.153)	(0.180)
Observations	38,676	37,673	37,673	38,676	37,673	37,673
TRA-86: All Filers with More than $75,000 in Base-Year Gross Income						
$\ln((1 - mtr_{1989})/(1 - mtr_{1985}))$	-0.432	0.077	0.081	-0.093	0.463	0.399
	(0.121)	(0.208)	(0.208)	(0.161)	(0.292)	(0.321)
Observations	17,392	17,238	17,238	17,392	17,238	17,238
OBRA-90 and OBRA-93: All Filers with More than $10,000 in Base-Year Gross Income						
$\ln((1 - mtr_{1995})/(1 - mtr_{1989}))$	1.408	-0.565	-0.084	1.803	-0.059	0.424
	(0.390)	(0.154)	(0.178)	(0.278)	(0.167)	(0.264)
Observations	33,023	31,940	31,940	33,023	31,940	31,940
OBRA-90 and OBRA-93: All Filers with More than $75,000 in Base-Year Gross Income						
$\ln((1 - mtr_{1995})/(1 - mtr_{1989}))$	1.244	-0.155	0.307	1.911	0.208	0.707
	(0.281)	(0.325)	(0.355)	(0.324)	(0.354)	(0.433)
Observations	15,785	15,646	15,646	15,785	15,646	15,646

Source: Estimates are based on Statistics of Income data for years 1985, 1989, and 1995.
Estimates are from 2SLS regressions. Regressions are weighted by the inverse of sampling probabilities and by income (see Section III). Robust standard errors are in parentheses.

Table 10. Full SOI Person-Weighted Taxable-Income Elasticities by Income Quantile

Panel 1[1] Quantile Dummies Interacted with Net-of-Tax Rates		Panel 2[2] Quantile Regressions	
Percentiles	1988 to 1998	Percentile	1988 to 1998
99.5 to 100	0.987	99.5th	0.871
	(0.245)		(0.031)
95 to 99.5	0.16	95th	0.693
	(0.098)		(0.027)
90 to 95	0.211	90th	0.644
	(0.167)		(0.028)
80 to 90	0.678	80th	0.581
	(0.175)		(0.030)
70 to 80	0.636	70th	0.522
	(0.112)		(0.029)
60 to 70	0.543	60th	0.482
	(0.108)		(0.034)
50 to 60	0.595	50th	0.457
	(0.127)		(0.040)
40 to 50	0.201	40th	0.457
	(0.143)		(0.048)
30 to 40	0.052	30th	0.470
	(0.256)		(0.058)
20 to 30	-0.502	20th	0.469
	(0.221)		(0.076)
10 to 20	-1.019	10th	0.411
	(0.233)		(0.102)
0 to 10	-2.608		
	(0.258)		
Observations	449,584		449,584

Source: Estimates are based on Statistics of Income data for 1979 to 2001.

1 Robust standard errors are in parentheses. 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 full demographic information, except for state dummies, which do not affect the estimates. Regressions are weighted by the inverse of observation sampling probabilities.

2 Koenker–Bassett standard errors are in parentheses. Each estimate represents a separate quantile regression. Estimates are based on the specification with the log of base-year income control and with full demographic information, except for state dummies, which do not affect the estimates. Regressions are not weighted by income but are weighted by the inverse of observation sampling probabilities.