PANEL DATA TECHNIQUES AND THE ELASTICITY OF TAXABLE INCOME

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INTRODUCTION

THE ELASTICITY OF TAXABLE INCOME (ETI), which measures the responsiveness of taxable income to changes in the net-of-tax rate (NTR),[1] has emerged as the key parameter in assessing the efficiency and revenue implications of tax rate changes (Feldstein, 1999). A major conclusion from extensive research into the ETI is that isolating income responses due to tax rate changes from the myriad of other factors that also influence income is incredibly complex. And, the range of estimates found from employing variations of what appear to be sound techniques is large.[2] Where the true ETI falls within the wide range reported in the literature has tremendous implications for tax policy. For example, in examining the potential expiration of the Bush tax cuts, Giertz (2009) reports that the deadweight loss per dollar of additional revenue from the federal income tax could range from $0.18 at an ETI of 0.2 to $1.25 at an ETI of 0.8.

DATA

Individual tax return data are from the Statistics of Income and spans years 1991 to 1997. The SOI heavily oversamples high-income filers, who are responsible for a very large and, for more than three decades, a growing share of both overall income and tax payments (see CBO, 2001, and Piketty and Saez, 2003). Marginal tax rates are imputed using CBO's federal tax model. Income, denoted z_{it}, is a constant-law measure of AGI (adjusted gross income for individual i at time t), excluding capital gains and including all Social Security benefits. Dollar values are adjusted by the IRS's inflation adjustment factors, using 1991 as the base (U.S. Department of the Treasury, 2007). A distributional breakdown of changes in MTRs and AGI is presented in Tables 1-4. For greater detail, see Giertz (2008).

METHODOLOGY

Both panel and cross-section regressions are run on data for pairs of years in order to capture the short-run, medium-run and long-run responses to the increase in top MTRs occurring in 1993. The short-run is defined as responses from 1992 to 1993; the medium run, from 1991 to 1994; and, the long-run, 1991 to 1997. Additionally, each of the panel specifications is followed by a pooled panel, which focuses on short-run responses and includes all years 1991 to 1997. Likewise, the cross-section analysis is followed by a repeated cross-section that includes all years in the sample.

Standard Panel

Throughout this paper, z_{it} (as defined in the previous section) is the income reported by filer i in year t; τ_{it} the marginal tax rate (on ordinary income); and, k is the interval (one, three, or six years) over which behavior is examined. The estimating equation for the standard panel is

$$\textbf{(1)} \quad \log[z_{i,t+K}/z_{it}] = \alpha + \psi \cdot \log[(1 - \tau_{i,t+K})/(1 - \tau_{it})] + X_{it}\beta + \varepsilon_{it}.$$

The key coefficient (ψ) is the elasticity, which measures the percent change in income associated with a 1 percent change in the NTR. The equation is estimated via two-stage least squares (2SLS) and all regressions are weighted by z_{it}.

All of the panel regressions are estimated using two different instruments for the tax variable. The first instrument is the log change in the NTR applying to the last dollar of income from year t to $t + K$, where imputed income in year $t + K$ equals income in year t inflated to year $t + K$. Regressions are re-run using a second instrument that targets the top 1 percent of the income distribution (i.e., those who are affected by the tax change). This instrument is simply a dummy for those in the top 1 percent of the reported distribution of z_{it} (i.e., the instrument equals one where $p_{it} > 0.99$ and zero otherwise, where p is the taxfiler's place in the income distribution, as measured in percentiles. The latter approach (that uses a dummy variable as the instrument) is similar in spirit to Feldstein's (1995) tabulated differences-in-differences approach, but put into a regression framework (Moffitt and Wilhelm, 2000).

Table 1

Average Federal Marginal Tax Rates by Income Fractile

Cross Section	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
P50-80	18.5	18.3	18.2	18.4	18.5	18.8	19.1
P80-90	24.2	23.6	23.5	24.4	24.8	25.1	25.5
P90-95	27.8	27.7	27.8	28.1	28.0	28.2	28.2
P95-99	30.1	30.3	30.4	30.7	31.1	31.5	31.9
P99-100	32.4	32.3	39.3	39.5	39.6	39.6	39.5

Base Year:	*1991*		*1992*		*1993*		*1994*		*1995*		*1996*		*1997*	
Standard Panel	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*		
P50-80	18.2	18.0	18.0	17.9	18.0	18.0	18.0	18.3	18.2	18.4	18.4	18.7		
P80-90	24.0	22.9	23.5	22.8	23.2	23.6	24.2	23.7	24.6	24.1	24.8	24.3		
P90-95	27.7	26.4	27.7	26.5	27.8	26.9	28.0	27.0	28.0	27.4	28.2	27.6		
P95-99	29.8	28.9	30.0	29.1	30.0	29.5	30.2	30.1	30.6	30.3	30.9	30.6		
P99-100	32.9	31.6	32.8	36.8	39.2	37.0	39.1	37.5	39.3	37.4	39.3	37.3		

Inverted Panel	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*
P50-80	18.0	18.5	17.9	18.2	18.0	18.1	18.1	17.8	18.4	18.0	18.6	18.3
P80-90	23.4	23.3	23.2	22.8	24.1	22.6	24.6	23.4	24.9	23.5	25.3	23.9
P90-95	27.7	26.8	27.8	26.9	28.0	26.9	28.0	27.5	28.2	27.4	28.2	27.4
P95-99	29.8	29.2	29.9	29.3	30.1	29.6	30.5	29.9	30.8	30.2	31.2	30.6
P99-100	32.9	32.1	39.2	32.4	39.1	37.8	39.3	37.8	39.3	38.1	39.3	38.3

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

Table 2
Average Percent Change in Federal Marginal Tax Rates by Income Fractile

Cross Section	*1991 to 1992*	*1992 to 1993*	*1993 to 1994*	*1994 to 1995*	*1995 to 1996*	*1996 to 1997*
P50-80	-1.17	-0.16	0.86	0.88	1.57	1.14
P80-90	-2.50	-0.66	4.08	1.59	1.12	1.56
P90-95	-0.03	0.36	0.79	-0.17	0.71	0.08
P95-99	0.45	0.51	0.75	1.50	1.21	1.42
P99-100	-0.15	21.66	-0.64	0.27	-0.13	-0.05
Standard Panel	*1991 to 1992*	*1992 to 1993*	*1993 to 1994*	*1994 to 1995*	*1995 to 1996*	*1996 to 1997*
P50-80	-1.26	-0.17	0.44	1.30	1.28	1.49
P80-90	-4.68	-2.76	1.76	-2.20	-1.91	-2.00
P90-95	-4.85	-4.55	-3.33	-3.53	-2.05	-2.10
P95-99	-2.84	-2.74	-1.73	-0.45	-1.02	-1.15
P99-100	-3.86	12.20	-5.56	-4.16	-4.65	-5.02
Inverted Panel	*1992 to 1991*	*1993 to 1992*	*1994 to 1993*	*1995 to 1994*	*1996 to 1995*	*1997 to 1996*
P50-80	2.74	1.56	0.40	-1.85	-2.05	-1.95
P80-90	-0.17	-1.57	-6.30	-5.07	-5.37	-5.51
P90-95	-3.17	-3.23	-3.96	-1.79	-2.98	-2.91
P95-99	-1.88	-2.09	-1.42	-2.11	-2.07	-1.90
P99-100	-2.49	-17.32	-3.29	-3.66	-3.08	-2.66

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

Table 3

Average Incomes by Income Fractile

Cross Section	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
P50-80	36,677	36,815	36,148	36,255	36,918	37,191	38,272
P80-90	61,201	61,404	60,668	60,980	62,549	62,987	64,724
P90-95	81,421	82,021	80,941	81,690	84,667	85,608	88,353
P95-99	121,036	123,414	122,565	123,897	129,432	132,610	138,572
P99-100	411,733	460,016	429,921	434,023	466,321	496,219	538,084

Base Year:	*1991*		*1992*		*1993*		*1994*		*1995*		*1996*		*1997*
Standard Panel	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	*base year*	*year t+1*	
P50-80	36,804	36,776	36,858	36,417	36,207	36,770	36,350	37,686	37,033	37,784	37,254	38,785	
P80-90	61,241	60,107	61,419	59,755	60,679	60,629	60,984	61,915	62,522	62,215	62,952	64,094	
P90-95	81,482	79,909	81,987	78,743	80,963	80,072	81,740	83,302	84,659	85,157	85,651	87,930	
P95-99	120,934	120,227	123,675	117,917	122,845	120,182	123,934	128,088	129,672	130,155	132,918	136,711	
P99-100	413,888	426,366	460,503	399,066	432,308	407,074	433,717	448,600	468,296	463,556	495,598	498,917	

Inverted Panel	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*	*base year*	*year t-1*
P50-80	37,056	36,975	36,213	36,393	36,337	35,528	37,016	35,570	37,206	36,285	38,307	36,628
P80-90	61,311	60,349	60,543	60,435	60,860	59,654	62,636	59,772	63,025	61,037	64,717	61,794
P90-95	82,061	80,020	80,970	80,327	81,731	79,418	84,679	80,909	85,628	82,385	88,354	84,054
P95-99	122,192	119,682	121,271	121,774	122,674	119,467	128,613	120,981	131,780	127,807	137,598	133,599
P99-100	439,292	407,559	422,050	453,989	424,318	423,415	456,327	431,619	485,969	466,860	523,686	500,346

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

Table 4

Average Percent Change in Income by Income Fractile

Cross Section	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
P50-80		0.38	-1.81	0.30	1.83	0.74	2.91
P80-90		0.33	-1.20	0.51	2.57	0.70	2.76
P90-95		0.74	-1.32	0.93	3.64	1.11	3.21
P95-99		1.96	-0.69	1.09	4.47	2.46	4.50
P99-100		11.73	-6.54	0.95	7.44	6.41	8.44
Standard Panel	*1991 to 1992*	*1992 to 1993*	*1993 to 1994*	*1994 to 1995*	*1995 to 1996*	*1996 to 1997*	
P50-80	-0.08	-1.20	1.56	3.67	2.03	4.11	
P80-90	-1.85	-2.71	-0.08	1.53	-0.49	1.81	
P90-95	-1.93	-3.96	-1.10	1.91	0.59	2.66	
P95-99	-0.58	-4.66	-2.17	3.35	0.37	2.85	
P99-100	3.01	-13.34	-5.84	3.43	-1.01	0.67	
Inverted Panel	*1992 to 1991*	*1993 to 1992*	*1994 to 1993*	*1995 to 1994*	*1996 to 1995*	*1997 to 1996*	
P50-80	-0.22	0.50	-2.23	-3.90	-2.47	-4.38	
P80-90	-1.57	-0.18	-1.98	-4.57	-3.16	-4.52	
P90-95	-2.49	-0.79	-2.83	-4.45	-3.79	-4.87	
P95-99	-2.05	0.41	-2.61	-5.93	-3.01	-2.91	
P99-100	-7.22	7.57	-0.21	-5.41	-3.93	-4.46	

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

INVERTED PANEL

One of the problems in identifying an ETI is that changes in tax rates can be spuriously correlated with mean reversion at the top of the income distribution. For tax rate increases, the NTR will be positively correlated with mean-reverting changes. For rate decreases, the reverse is true. Researchers often include control variables to account for mean reversion at the top, but the effectiveness of these controls is not known. A potential solution to this problem is to focus on samples that include both tax increases and tax decreases (see Giertz, 2007), in the hope that mean reversion from the two tax changes will cancel out each other (i.e., will have a net effect of zero). However, mean reversion at the top of the income distribution may vary across the two time periods because of different macroeconomic conditions or other unobserved factors.

Another alternative is to "construct" a tax change by inverting the panel. For example, instead of starting in 1991 and continuing to 1997 (with a tax increase in 1993), suppose that one starts in 1997 and continues to 1991 (with a tax *decrease* in 1993). Thus, OBRA 93 would represent a *cut* in top MTRs. If the model is correctly identified, then the estimated elasticity should be the same for both the standard and the inverted panel.[3]

For the inverted panel approach, the estimating equation is identical to equation (1) with t and $t+K$ inverted throughout, such that

$$\textbf{(2)} \quad \log[z_{i,t}/z_{i,t+K}] = \alpha + \psi \cdot \log[(1-\tau_{it})/(1-\tau_{i,t+K})] + X_{i,t+k}\,\beta + \varepsilon_{it}.$$

The imputed rate instrument is now the log change in the MTR from year $t + K$ to t, where year t income equals income in year $t + K$ deflated to year t. For the approach that targets the top 1 percent of income distribution, the instrument equals one where $p_{it+1} > 0.99$; i.e., for the top 1 percent of z_{it+k}.

Pooled Panel

In addition to estimating equation (2) for three different pairs of years (using the different income cutoffs and control variables), the equation is estimated using 1-year differences and including all years 1991 to 1997. The estimating equation can be expressed such that

$$\textbf{(3)} \quad \log[z_{i,t+1}/z_{it}] = \alpha + \zeta_t + \psi \cdot \log[(1-\tau_{i,t+1})/(1-\tau_{it})] + X_{it}\beta + \varepsilon_{it},$$

where ζ_t are year dummies. The same income cutoffs and income controls (X_{it}) used for the panel analysis that relied on a single set of paired years are also used here. The imputed rate instrument for the pooled regressions is constructed identically to that for the 2-year panel regressions. The instrument for the approach that targets the top 1 percent of the income distribution is again a dummy variable that equals one for the top 1 percent of filers for paired observations where t equals 1992 (and $t + 1$ equals 1993) and equals zero for all other paired observations; thus, the instrument is turned on only for the reform year at the top 1 percent of the distribution.

Paired Cross-Sections

A solution to the problem of mean reversion is to use pooled cross-section data instead of a panel. The cross-section sample is constructed such that years t and $t + k$ are stacked. The estimating equation takes the form

$$\textbf{(4)} \quad \log z_{i,s} = \alpha + \psi \cdot \log(1-\tau_{i,s}) + \gamma_1 \cdot \textit{post-obra\_dummy}_{is} + \gamma_2 \cdot \textit{high-income\_dummy}_{is} + \varepsilon_{is},$$

where s is the year. The post-OBRA dummy equals one for observations for years 1993 to 1997 and zero otherwise. The treatment dummy equals one for taxpayers in the top 1 percent of the distribution (i.e., those affected by the reform) and zero otherwise. The instrument for the NTR equals the product of the NTR and a dummy that equals one only for the top 1 percent of the income distribution in the end year ($s = t + k$). For each set of years, regressions are weighted by z_{is} and estimated for the following segments of the income distribution: (1) $p_{is} > 0.5$; (2) $p_{is} > 0.8$; (3) $p_{is} > 0.9$; (4) $p_{is} > 0.95$; and (5) $z_{is} > \$20{,}000$.

Pooled Cross-Sections

The cross-section analysis is repeated when including all years 1991 to 1997. The estimating equation for the repeated cross-section is

$$\textbf{(5)} \quad \log z_{i,s} = \alpha + \psi \cdot \log(1-\tau_{i,s}) + \gamma_1 \cdot \textit{post-obra\_dummy}_{is} + \gamma_2 \cdot \textit{high-income\_dummy}_{is} + \varepsilon_{is}.$$

The post-reform dummy equals one for years 1993 to 1997 and zero otherwise. The treatment

dummy equals one for observations in the top 1 percent of the distribution in years 1993 to 1997 and zero otherwise. This model is then re-estimated after adding two time trend variables, one of the form *s* and one in which *s* is interacted with a dummy for those in the top 1 percent of the income distribution (i.e., $p_{is} > 0.99$).

RESULTS

Findings from the Panel and Inverted Panel Analysis

Without income controls, mean reversion (at the top) appears to dominate. In the standard panel, mean reversion appears to be positively correlated with a falling NTR, leading to large positive elasticity estimates. With the inverted panel, a rising NTR is negatively correlated with mean reversion resulting in negative estimated elasticities (see the panel estimates for specification *a* for each of the income cutoffs in Table 5). These results are consistent with those reported by Auten and Carroll (1999) for the Tax Reform Act of 1986.

Including splines of $\log(z_{it})$ has a substantial impact on the estimates, yielding positive, but smaller, elasticity estimates for the standard panel that, when imposing a $20,000 income cutoff, range from 0.62 to 1.1 depending on the two years compared. For the inverted panel, the controls raise the estimated elasticity in some cases, but in many instances, estimates are still negative (see Table 5, specification *c*). When imposing a $20,000 income cutoff, estimates from the inverted panel range from -0.83 to (a statistically insignificant) 0.22 depending on the two years compared. While including the richest set of controls brings the estimates for the inverted and standard panels closer together (when comparing results over the same time interval), however, the differences that do remain are still substantial. This suggests that, while including the richest set of income controls may improve identification, mean reversion still appears to severely contaminate elasticity estimates.

One might expect estimates for 1992 versus 1993 to be larger than those covering longer intervals because the literature suggests substantial inter-temporal income shifting, even when longer-run estimated elasticities are small. A comparison of panel estimates while using the richest controls is not consistent with this hypothesis – for both the standard and inverted panels.

Using the cruder instrument, a dummy variable turned on for those in the top 1 percent of the income distribution when the reform hits (i.e., the instrument equals one when both $p_{it} > 0.99$ and $t = 1992$, and equals zero otherwise), results in elasticity estimates from the model without income controls that are qualitatively similar to those found from the standard panel analysis (i.e., mean reversion appears to dominate, see Table 6).

In contrast to the analysis with the imputed rate instrument, estimates when including the richest set of income controls appear to severely *over-correct* for mean reversion, resulting in large negative estimates for the regular panel and positive estimates for the inverted panel. Standard errors are also very large, so even large estimates are rarely statistically significant.

With the richest controls (and using the cruder instrument), estimates are generally much larger for 1992 versus 1993 than when comparing longer time intervals. This, in contrast to the standard panel analysis, is consistent with larger short-term responses and smaller long-term responses that are often reported in the literature.

Findings from the Pooled Panel Analysis

The pooled analysis confirms the results from the separate panels. Using either of the two instruments, mean reversion still seems to dominate regression estimates when excluding income controls (see Tables 5 and 6). With the richest set of income controls, comparing estimates from the standard and inverted panels suggests that mean reversion is still present and likely severe. Standard errors are much smaller than for the separate panels, so that estimates from applying the cruder instrument are now statistically significant. In contrast to the 2-year panels, the pooled panel analysis suggest that the approach using the cruder instrument still under-corrects for mean reversion. Estimated elasticities when using the standard panel are positive and estimates from the inverted panel are negative.

Findings from the Cross-Section Analysis

Cross-section estimates are large (and positive) when including just years 1992 and 1993. For the other pairs of years, estimated elasticities are negative. This suggests that short-term shifting is much larger than longer-term behavioral responses.

Table 5
Panel Elasticity Estimates Using the Imputed Rate Instrument

Income Cutoff:	$p_{it} > 0.5$			$p_{it} > 0.9$			$z_{it} > 20{,}000$		
specification:	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*
1992v1993	1.068	0.638	0.425	1.108	-0.097	-0.019	1.268	0.917	0.739
std. err.	(0.129)	(0.122)	(0.175)	(0.092)	(0.137)	(0.186)	(0.152)	(0.156)	(0.216)
obs.	52,236	52,236	52,236	32,315	32,315	32,315	55,313	55,313	55,313
1991v1994	2.248	1.819	1.941	1.323	0.403	0.133	1.284	1.028	1.090
std. err.	(0.224)	(0.213)	(0.257)	(0.154)	(0.213)	(0.230)	(0.101)	(0.102)	(0.115)
obs.	45,603	45,603	45,603	28,055	28,055	28,055	47,936	47,936	47,936
1991v1997	1.956	1.285	1.370	1.030	0.305	-0.101	1.174	0.659	0.617
std. err.	(0.254)	(0.224)	(0.261)	(0.184)	(0.241)	(0.225)	(0.120)	(0.113)	(0.124)
obs.	41,524	41,524	41,524	25,697	25,697	25,697	43,572	43,572	43,572
INVERTED PANEL dependent var: ln(z[it]/z[it+k])									
1992v1993	-0.651	-0.694	-0.703	-0.661	-0.579	-0.857	-0.738	-0.780	-0.827
std. err.	(0.079)	(0.098)	(0.122)	(0.048)	(0.073)	(0.090)	(0.079)	(0.087)	(0.112)
obs.	52,211	52,211	52,211	32,248	32,248	32,248	54,935	54,935	54,935
1991v1994	-0.144	-0.079	0.099	-0.828	-0.126	-0.086	-0.289	-0.273	-0.194
std. err.	(0.082)	(0.095)	(0.099)	(0.064)	(0.084)	(0.092)	(0.085)	(0.105)	(0.106)
obs.	45,593	45,593	45,593	27,813	27,813	27,813	47,859	47,859	47,859
1991v1997	-0.137	0.106	0.423	-2.207	-1.040	-1.178	-0.259	0.005	0.223
std. err.	(0.099)	(0.114)	(0.117)	(0.077)	(0.104)	(0.110)	(0.105)	(0.131)	(0.132)
obs.	42,350	42,350	42,350	25,752	25,752	25,752	44,895	44,895	44,895
POOLED REGULAR PANEL with YEAR DUMMIES dependent var: ln(z[it+1]/z[it])									
ln(z[*it*+1]/z[*it*])	0.289	0.255	0.237	0.330	0.145	0.143	0.288	0.241	0.238
std. err.	(0.077)	(0.076)	(0.077)	(0.201)	(0.201)	(0.200)	(0.063)	(0.062)	(0.063)
obs.	331,782	331,782	331,782	208,745	208,745	208,745	349,208	349,208	349,208
POOLED INVERTED PANEL with YEAR DUMMIES dependent var: ln(z[it]/z[it-1])									
ln(z[*it*]/z[*it*-1])	-0.211	-0.683	-0.606	-0.388	-1.008	-0.707	-0.180	-0.787	-0.729
std. err.	(0.058)	(0.046)	(0.035)	(0.106)	(0.083)	(0.054)	(0.056)	(0.043)	(0.034)
obs.	332,720	332,720	332,720	208,711	208,711	208,711	350,781	350,781	350,781

1) No controls. 2) log z[*it*] control. 3) log z[*it*] and additional splines in log z[*it*].
Regressions are weighted by income.

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

Table 6

More Panel Elasticity Estimates: Tabulated Differences-in-Differences within a Regression Framework

Income Cutoff:	$p_{it} > 0.5$			$p_{it} > 0.9$			$z_{it} > 20{,}000$		
specification:	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*
1992v1993	1.878	0.814	-1.669	1.395	-0.721	-1.866	1.858	1.002	-1.701
std. err.	(0.184)	(0.149)	(1.052)	(0.107)	(0.213)	(0.711)	(0.189)	(0.190)	(1.139)
obs.	52,236	52,236	52,236	32,315	32,315	32,315	55,313	55,313	55,313
1991v1994	3.352	1.347	-2.602	2.420	2.201	-12.494	3.137	2.233	-2.795
std. err.	(0.446)	(0.332)	(2.966)	(0.221)	(1.115)	(18.013)	(0.421)	(0.615)	(3.414)
obs.	45,603	45,603	45,603	28,055	28,055	28,055	47,936	47,936	47,936
1991v1997	4.955	0.498	-3.742	3.022	-26.805	-6.482	4.720	0.362	-3.818
std. err.	(0.963)	(0.432)	(1.528)	(0.382)	(22.439)	(1.809)	(0.885)	(0.751)	(1.687)
obs.	41,524	41,524	41,524	25,697	25,697	25,697	43,572	43,572	43,572
INVERTED PANEL dependent var: ln(z[it]/z[it+k])									
1992v1993	-0.488	-0.468	0.948	-0.430	0.314	0.948	-0.484	-0.504	0.949
std. err.	(0.093)	(0.155)	(0.707)	(0.058)	(0.129)	(0.375)	(0.103)	(0.133)	(0.766)
obs.	52,211	52,211	52,211	32,248	32,248	32,248	54,935	54,935	54,935
1991v1994	1.317	13.156	0.517	2.215	0.107	0.562	1.139	10.940	0.503
std. err.	(0.545)	(8.331)	(0.910)	(0.549)	(0.244)	(0.497)	(0.556)	(5.239)	(0.967)
obs.	48,764	48,764	48,764	30,573	30,573	30,573	51,129	51,129	51,129
1991v1997	-3.272	-9.561	0.154	-3.713	0.299	0.465	-3.135	-10.440	0.165
std. err.	(0.192)	(1.101)	(1.202)	(0.121)	(0.511)	(2.194)	(0.195)	(1.238)	(1.302)
obs.	42,350	42,350	42,350	25,752	25,752	25,752	44,895	44,895	44,895
POOLED REGULAR PANEL with YEAR DUMMIES dependent var: ln(z[it+1]/z[it])									
ln(z[*it*+1]/z[*it*])	1.878	0.955	0.723	1.395	0.537	0.564	1.858	1.115	0.736
std. err.	(0.338)	(0.247)	(0.260)	(0.296)	(0.264)	(0.259)	(0.325)	(0.276)	(0.257)
obs.	331,784	331,784	331,784	208,747	208,747	208,747	349,210	349,210	349,210
POOLED INVERTED PANEL with YEAR DUMMIES dependent var: ln(z[it]/z[it-1])									
ln(z[*it*]/z[*it*-1])	-0.488	-3.996	-1.874	-0.430	-3.003	-1.897	-0.484	-4.150	-1.913
std. err.	(0.099)	(0.064)	(0.083)	(0.115)	(0.097)	(0.079)	(0.101)	(0.063)	(0.085)
obs.	332,720	332,720	332,720	208,711	208,711	208,711	350,781	350,781	350,781

1) No controls. 2) log z[*it*] control. 3) log z[*it*] and additional splines in log z[*it*].
Regressions are weighted by income.

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

Table 7
Cross-Section-Based Elasticity Estimates

Income Cutoff: dependent var: ln(z_{it})	$p_{it} > 0.5$	$p_{it} > 0.8$	$p_{it} > 0.9$	$p_{it} > 0.95$	$z_{it} > \$20{,}000$
1992v1993	0.958	0.977	0.998	1.024	1.026
std. err.	(0.107)	(0.108)	(0.109)	(0.111)	(0.108)
obs.	133,825	100,446	86,869	78,193	140,634
1991v1994	-0.576	-0.536	-0.481	-0.409	-0.520
std. err.	(0.111)	(0.113)	(0.115)	(0.117)	(0.109)
obs.	145,751	111,310	96,930	86,550	152,349
1991v1997	-2.830	-2.768	-2.565	-2.587	-2.801
std. err.	(0.139)	(0.144)	(0.143)	(0.159)	(0.134)
obs.	159,046	123,170	108,482	98,169	166,708
Repeated CS	-0.570	-0.499	-0.404	-0.315	-0.542
std. err.	(0.087)	(0.089)	(0.089)	(0.093)	(0.086)
obs.	519,265	395,489	345,990	313,126	544,360
Repeated CS with Time Trends	1.342	1.326	1.329	1.280	1.460
std. err.	(0.104)	(0.104)	(0.107)	(0.106)	(0.105)
obs.	519,265	395,489	345,990	313,126	544,360

Regressions are weighted by income.

Repeated cross-section regressions include year fixed effects.

Source: Estimates are based on Statistics of Income data for years 1991 to 1997.

Findings from the Repeated Cross-Section Analysis

The simple repeated cross-section analysis, which excludes time trends, yields negative elasticity estimates (see Table 7).

Adding two time trends to the model (i.e., a standard time trend and a second time trend that only applies to those in the top 1 percent of the income distribution) fundamentally changes the elasticity estimates. Estimates are now very large, ranging from 1.28 to 1.46, depending on the income cutoff for inclusion into the sample. The time-trends, by allowing for separate secular income trend for those experiencing the tax change, counteracts the negative bias present in the first set of repeated cross-section estimates. While the time-trends have an enormous impact, the model may still not be identified. There are a host of unobservables between those experiencing the tax increase and the rest of the income distribution that likely influence income growth in complex ways that cannot be accurately modeled with simple time trends.

CONCLUSION

This paper examines behavioral responses to the 1993 tax increase that primarily affected the top 1 percent of the income distribution. Several different panel techniques are applied to tax return data for years 1991 to 1997, followed by a cross-section analysis covering the same period. For each panel regression, an inverted regression is also run to test the efficacy of the controls for mean reversion. Estimates from the panel analysis are sensitive to sample income cutoffs, income controls, and choice of instrument. Analysis of cross-section data circumvents the problem of mean reversion and results in estimates that are robust with respect to sample income cutoffs. However, in instances where vast differences likely exist between those who experience a specific change in tax rates and other filers, estimates relying on panel or cross-section data are likely to be poorly identified.

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Notes

[1] More precisely, the ETI measures the percent change in taxable income associated with a 1 percent change in the NTR, where the NTR equals one minus the marginal tax rate – or the share of marginal income that a taxpayer has after taxes.

[2] See Saez, Slemrod, and Giertz (2009) for a detailed discussion of these issues.

[3] This inverted methodology was suggested to me by Joel Slemrod, who, to my knowledge, was the first to come up with the idea (at least in the context of the tax responsiveness literature). The approach was used as a sensitivity check by Auten and Carroll (1999).

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