
The Impact of Tax Reform Legislation on the Elasticity of the Federal Income Tax

Steven D. Grossman

Department of Accounting
Texas A & M University
TAMU 4353
College Station, TX 77843

•••

A. Craig Keller

School of Accountancy
Missouri State University
901 S. National Avenue
Springfield, MO 65897

•••

Dennis R. Lassila

Department of Accounting
Texas A & M University
TAMU 4353
College Station, TX 77843

•••

Casper E. Wiggins

Department of Accounting
University of North Carolina
at Charlotte
Charlotte, NC 28223

We examine the impact of tax reforms from 1984 to 1995 using tax elasticity as a measure. Using a proven method developed and applied by Tanzi (1969 and 1976) and Tanzi and Hart (1972) for measuring tax elasticity and controlling for income distribution (Ram 1991) we provide a timeline of tax elasticities (rate, base and overall) for the period, test for significant changes and discuss the relationship of elasticity changes to tax law changes in the period. We find that the TRA of 1986 brought about significant changes in both tax base and tax rate elasticities but were mostly neutral overall. The results are offered as a contribution to the ongoing debate over recent tax changes enacted and proposed by the federal government.

Should the United States enact comprehensive tax reform such as was proposed by President George W. Bush in 2005? We shed some light on this issue by focusing on the Tax Reform Act of 1986 (TRA 1986), the result of the last major tax reform effort 20 years ago. Specifically, we analyze the impact of TRA 1986 and succeeding tax acts on the elasticity of the federal income tax adapting a method first developed by Tanzi (1969, 1976).

There are certain similarities between the current tax reform effort and economic climate and that in the 1980s (Elmore, *et al.*, 2004). President Bush proposed an ambitious tax-related agenda early in his second term including (1) making permanent certain tax cuts enacted during his first term, (2) reforming the social security system, and (3) enacting comprehensive tax reform. At the same time, the United States has been experiencing large budget and trade deficits. The cost of making the 2001 and 2003 tax cuts permanent is, by one estimate, \$990 billion over the next 10 years (Cooper and Cruickshank, 2004). The budget deficit for 2004 reached an all-time high of \$413 billion, but has decreased since then (in part, due to economic growth) to \$248 billion in 2006 and an estimated \$158 billion in 2007 (Congressional Budget Office, 2007).

President Bush's Federal Tax Reform Advisory Panel released its tax reform proposals in November of 2005 (President's Advisory Panel, 2005). The Panel recommended two options to reform the tax code: (1) the Simplified Income Tax Plan which would lower rates and eliminate most tax breaks and (2) the Growth and Investment Plan which would build on the simplified plan by allowing businesses to immediately expense investments in plant and equipment and instituting one tax rate to apply to dividends, interest and capital gains. In many ways, these proposals are similar to the ones advanced prior to enactment of the Tax Reform Act of 1986. While it is not likely that major tax reform will be enacted during the remaining months of the Bush Administration, the next Congress may consider at least some aspects of the proposals as it tackles the problems of the deficit and the alternative minimum tax.

In the mid-1980s, federal budget deficits ranged from \$185 to \$221 billion, and the economy was growing slowly but steadily after years of stagflation. The deficit was a concern but the promise was that economic growth would close the gap. The major goal of TRA 1986 was to simplify taxes by eliminating loopholes, reducing the number of tax brackets, and lowering tax rates. The result was a broadening of the tax base and a reversal of a trend toward a less progressive income tax structure (Pechman 1990). The year, 1986, marked the beginning of, "a wave of tax reform, sweeping the world..." (Pechman, 1990, 1) so it is reasonable to say that the changes that began with the 1986 Act mark a turning point in tax policy.

Because of the similarities underlying the two tax reform efforts, we examine the impact of the last period of reform. Our objective is to measure the elasticity of the individual income tax over the period of 1984 through 1995 to determine the impact of TRA 1986 and subsequent legislation during 1987 through 1993 on tax elasticity (1995 is chosen as the last year of the period examined since legislation subsequent to 1995 began a series of tax reductions reversing some of the effects of TRA 1986 and other acts through 1993). Measuring the changes in tax elasticity

from 1984 through 1995 will help to develop a picture of the shifts in progressivity and the widening or shrinking of the tax base during that time. We determine three elasticity measures (tax rate elasticity, tax base elasticity, and overall tax elasticity) yearly for the period of 1984 through 1995 using procedures developed and applied by Tanzi (1969, 1976) and Tanzi and Hart (1972). Briefly, tax rate elasticity is a measure of the relative change in income tax associated with a one percent change in taxable income. Tax base elasticity is a measure of the relative change in taxable income produced by a one percent change in federal adjusted gross income. Finally, overall elasticity, which combines the two previous measures, is a measure of the change in income tax resulting from a one percent change in federal adjusted gross income.

Our study is the first to analyze the impact of TRA 1986 on tax elasticity using the Tanzi methodology as modified in subsequent studies. We find that tax rate elasticity sharply decreased in 1987 compared to 1984 and 1985 and then remained fairly stable through 1995. That decrease was likely associated with the decrease in tax rates under TRA 1986. Tax base elasticity sharply increased in 1987, compared to 1984 and 1985 and then remained fairly stable through 1995. The increase was likely due to the base broadening provisions of TRA 1986 such as the reduction in various itemized deductions. Finally, the overall tax elasticity was about the same in 1987 as it was in 1984 and 1985 and remained fairly stable after that through 1995, suggesting that the changes in tax rate and tax base elasticities under TRA 1986 roughly canceled each other out resulting in little change to overall elasticity. The tax laws passed during this period subsequent to TRA 1986 did little to change the elasticity measures.

An interesting one-time behaviorally instituted result was found for the year 1986. The tax rate and overall tax elasticity numbers for 1986 were substantially higher for 1986 than for 1985 and 1987. Likely, the relatively high 1986 numbers are due to high income taxpayers selling relatively large amounts of capital assets at a profit during the last two months of 1986 in order to take advantage of the relatively low effective tax rates on long-term capital gains that were slated to be increased as of January 1, 1987 (Burman and Clausing, 1994).

Fries, *et al.* (1982) and Ram (1991) criticized the analysis in Tanzi (1969 and 1976) by stating that his computations understated the elasticity numbers because he failed to control for the inequality in income of taxpayers across the United States. To determine whether inclusion of an income inequality control measure would affect our analysis, we made additional computations (using procedures suggested by Ram (1991)) of the 1984 through 1995 elasticity measures including the Gini coefficient as an income inequality control variable. While the inclusion of the Gini income inequality control variable increased the magnitude of all of the elasticity measures in all of the years, it did not alter the trends in the three elasticity measures over 1984 through 1995.

Finally, we extend the tax elasticity analyses in the studies described above by using the Chow test (Kennedy, 1998) to determine the statistical significance of changes in the elasticity numbers over time. Not surprisingly, the tax rate elasticity numbers in the years prior to 1987 are significantly different than those in all of

the following years, and starting with 1987, none of the elasticity numbers in the following years is significantly different. The same pattern holds for Chow tests involving tax base elasticity numbers. Finally, few significant differences are found in overall elasticity numbers. In sum, the Chow test results confirm that TRA 1986 made significant offsetting changes to tax rate and tax base elasticities and that elasticity numbers were not significantly changed by laws passed during that period subsequent to 1986.

Our analysis is distinguishable from a series of studies including Feldstein (1995), Gruber and Saez (2002) and Giertz (2005) because we measure three elements of tax elasticity year-by-year to determine the impact of TRA 1986 and subsequent tax legislation on important aspects of tax elasticity. Those studies focus on a different elasticity measure, referred to as taxable income elasticity, which relates a measure of taxable income that may differ in various ways from the statutory definition to the net-of-tax rates of various classes of individuals over a period of years. In addition, those studies cover different time periods and rely on panel data which are not publicly available for the 1984 through 1995 period covered by our study. For a comprehensive review of that line of research, see Giertz (2004 (2)).

Overall, we contribute to the literature by analyzing the impact of the last major tax reform effort and law, TRA 1986, on the elasticity of the federal tax system on a year-by-year basis for a twelve-year period using a method based on large samples of publicly available data. The lesson for lawmakers in considering tax reform legislation is that if the reform is largely revenue neutral with offsetting impacts on tax rate and tax base elasticities, tax reform may not lessen federal budget deficits in the years to come.

The organization of the remainder of the paper is as follows. Section 2 provides a review of pertinent literature concerning elasticity of the Federal income tax and a summary of TRA 1986 and other pertinent tax laws enacted through 1995. In Section 3, we review the methodology and data collection procedures. Section 4 reviews the results, including the impact of tax reform legislation on income tax elasticity in 1986. Finally, in Section 5, we present our conclusions.

Literature Review and Background

A major concern for tax researchers in the 1960s and 1970s was the potential fiscal drag that progressive taxes can cause. This drag is presented as an automatic stabilizer in macroeconomic models. Studying the 1964 Revenue Act, an act that broadened the taxable income base and lowered both the bottom and top tax rates,¹ Tanzi (1969) found that the 1964 tax law changes resulted in an increase in the overall elasticity of tax revenue (TR) to adjusted gross income (AGI), and that this increase was caused by an increase in the elasticity of the rate structure. By separating the overall elasticity into rate and base components Tanzi was able to focus the impact of changes in specific provisions of the tax code.

Progressivity is reflected in the elasticity of per capita taxes to per capita taxable income (the Rate Structure elasticity). The broadening or narrowing of the tax base

can be measured by the elasticity of per capita taxable income to per capita AGI (the tax base elasticity). A reduction of tax loopholes would result in broadening of the tax base and should increase the tax base elasticity, and, therefore, overall tax elasticity. Thus, an increase in the income measure, AGI, should result in a larger increase in taxable income and income tax following the reduction of tax loopholes. On the other hand, a decrease in the progressivity of tax rates would be expected to reduce tax rate elasticity and overall elasticity. Thus, after progressivity is reduced, an increase in the income measure AGI would result in a lower increase in tax revenue per capita and overall than otherwise would occur.

An assumption of the Tanzi papers is that the different distributions of income as represented in the fifty states would mirror the distribution of incomes that would be obtained in the United States as a whole as incomes changed over time. Thus, Tanzi assumed that there was a constant distribution of income across the states and did not take into account any inequalities that might exist in income distributions among the states.

Various authors including Fries, *et al.* (1982) and Ram (1991) devised means to control for income distribution inequality in calculating tax elasticity measures. Fries, *et al.* suggested that Tanzi had underestimated the tax elasticity numbers in his articles because his models did not include a means of reflecting income distribution inequalities. They found that the log of per capita income was negatively related to the Gini coefficient,² indicating that Tanzi's estimates are "...conditional upon faster growth of low incomes than of high ones." (Fries *et al.* 1982, 150) Therefore, they concluded that Tanzi's results underestimated tax elasticity. This is an obvious problem in the current economic atmosphere in which the income distribution is exhibiting just the opposite trend in growth, i.e. high incomes are growing faster than low incomes.

Ram (1991) tested overall elasticity, and included the Gini coefficient as a control variable in a formula that was otherwise similar to the one used by Tanzi. Ram found that for all of the years he examined (1949, 1959, 1969, 1979, and estimated figures for the 1980s), the overall elasticity measure was understated when the income inequality term was not included in the elasticity calculation. Ram's inclusion of the Gini coefficient stabilizes Tanzi's elasticity measures and closely approximates the elasticity values that Fries, *et al.* determined using much more complex procedures.

Grossman, *et al.* (2002) tested for regional differences in tax elasticity using all three elasticity measures and found that the tax base elasticity and consequently the overall tax elasticity for New England in the years examined was the largest in the eight regions the authors analyzed.

Our analysis differs from a line of studies including Feldstein (1995), Gruber and Saez (2002), and Giertz (2004) (1) in two important ways. First, those studies focus on a different elasticity measure, determined over multiple year periods and referred to as the elasticity of taxable income. Their measure of elasticity relates taxable income, calculated differently than statutory taxable income, to the net-of-tax rate (one minus the marginal tax rate) of classes of taxpayers. In contrast, our three measures of tax elasticity are determined on a year-by-year basis to obtain the yearly

impact of tax provisions on tax elasticity. Second, the analysis in those studies is based on panel data which is not publicly available for the 1984 through 1995 period covered in our study. Our method is based on publicly available data from large samples available over a multi-year period. No previous study has analyzed the impact of the Tax Reform Act of 1986 and subsequent legislation on the elasticity of the Federal income tax using the Tanzi methods as modified by Fries, *et al.* (1982) and Ram (1991).

Tax Legislation Affecting Taxable Income and Tax Rates

The period of 1986 through 1995 was a time during which significant tax legislation was enacted including the Tax Reform Act of 1986 (TRA 1986), the Omnibus Budget Reconciliation Act of 1987 (OBRA 1987), the Revenue Reconciliation Act of 1990 (RRA 1990), and the Revenue Reconciliation Act of 1993 (RRA 1993). The major characteristic of the legislation in the early years of this period was a broadening of the tax base and a significant flattening of the rates applicable to individual taxpayers. Details of the tax law changes contained in the acts listed above are contained in Appendix A.

Data and Methodology

Development of Elasticity Measures.

The cross-sectional approach suggested by Tanzi (1969) is employed in this study to measure the sensitivity of the federal individual income tax to the tax reform acts. The cross-sectional approach is appropriate because the limited number of years each reform act was in effect does not permit a traditional time-series analysis. Tanzi's method hypothesizes that for a given federal individual income tax a time series can be simulated based on corresponding state level data from all fifty states for a single year. Since all states are subject to the same federal tax law, each state is viewed as an observation at a specific time and income level in a time series for the United States as a whole. Thus, the broad range of per capita income represented by the fifty states provides a means for analyzing the sensitivity of the U.S. individual income tax over a comparable range.

The method assumes that the relationship between per capita income tax and per capita adjusted gross income across all fifty states in a given year is equivalent to that for fifty years of historical U.S. data. In other words, the method presumes that a state with a given per capita income, on the average, will have the same characteristics as the overall U.S. economy at the same level of per capita income. Another assumption underlying Tanzi's cross-sectional approach is that each state has a distribution of income that closely approximates the income distribution for the nation as a whole. Tanzi's 1969 measures resulted in elasticities comparable to other less parsimonious methods that used longitudinal measures.

Following the analysis in Tanzi (1969), three different functional relationships will be considered, as indicated in equations 1, 2 and 3 below.

-
1. Tax Revenue per Capita = f (Taxable Income per Capita)
 2. Taxable Income per Capita = g (Adjusted Gross Income per Capita)
 3. Tax Revenue per Capita = h (Adjusted Gross Income per Capita)

Or:

1. $\text{LogTR}_i = f(\text{LogTI}_i)$
2. $\text{LogTI}_i = g(\text{LogAGI}_i)$
3. $\text{LogTR}_i = h(\text{LogAGI}_i)$

Where:

TR_i = the federal individual income tax revenue of an individual state in a given year/population

TI_i = per capita taxable income for the same state/population

AGI_i = per capita adjusted gross income/population

i = 1 ... 51 is used as the index for the fifty states and Washington, D.C.

Tanzi in a later article defined elasticity as, "... a ratio that is defined as the percentage change in tax yield (t) that is brought about by a change of one percent in AGI" (Tanzi 1976).

The formulas used to derive the elasticity are:

$$\text{Log TR}_i = a + b \text{Log TI}_i$$

$$\text{Log TI}_i = _ + _ \text{Log AGI}_i$$

$$\text{Log TR}_i = _ + _ \text{Log AGI}_i$$

Where: $i = 1, 2, 3, \dots, 51$ referring to the individual states plus Washington, D.C. Since the slopes in the equations are in natural logs, they represent elasticities.

Data Used in the Elasticity Analysis.

Data were collected for TR (tax liability by state) and AGI (adjusted gross income by state) for the years 1984 through 1995 from various issues of the Internal Revenue Service (IRS) Statistics of Income (SOI) Bulletins Selected Historical Data Series presented on a state-by-state basis. Data for TI (taxable income by state) were collected for the years 1989 through 1995 from the same source. Data for TI for the

earlier years are not available in the SOI Bulletins; however, data for TI for the years 1985 and 1988 were obtained directly from the IRS for an earlier study and are used in the analysis. Data for TI for the years 1984, 1986, and 1987 were extrapolated based on the 1985 and 1988 data that were obtained from the IRS.³

Population figures used to determine per capita amounts were gathered from the Bureau of the Census website. Regression models for the log form of each of the three equations were then estimated for each year. Use of the log form produced individual estimates of the elasticity of the rate structure (equation 1a), the elasticity of the tax base (equation 2a), and of the overall tax elasticity (equation 3a), for each year; the coefficients generated allow the partitioning of the overall elasticity into its rate structure and tax base components [Tanzi and Hart (1972, p. 327)]. The regression results for rate structure, tax base, and overall elasticity are presented in Table 1, and discussed below.

Testing for Significant Changes in the Tax Elasticity Measures.

To test for significant changes in tax elasticities that occurred as the result of the tax law changes made in TRA 1986 and subsequent tax acts through 1995, a linear regression was run on all years with each year being assigned a separate intercept and separate Beta coefficient. This is effectively like running separate regression for each year but with the capability to test various linear combinations of the Beta coefficients (elasticities). The betas were then tested using all possible linear combinations of b_i 's:

$$B_t - b_{t+1} = 0$$

as well as a test of all b_i 's at once. This procedure, referred to as a Chow test (Kennedy, 1998), is used to identify changes in tax elasticities that are statistically significant and can then be associated with changes in the tax laws for those years.

Results

As detailed in Appendix A, the TRA 1986 made changes that both broadened the tax base and reduced the overall progressivity of the tax system. Subsequent tax acts in 1987 through 1990 did little to change the impact of the TRA 1986. Finally, the RRA 1993 moderately increased progressivity, but did not have a substantial effect on the tax base. Table 1 lists the three elasticities, rate structure, base, and overall, measured using Tanzi's method over a twelve-year period, 1984 to 1995.

The results indicate that the changes brought about by the TRA 1986 (which took effect primarily in 1987) decreased tax rate elasticity from 1.295 in 1985 to 1.073 in 1987 and 1.105 in 1988 (there was a one-time spike in rate elasticity in 1986 because of a behavioral response of taxpayers in anticipation of the 1986 Act as discussed below). Thereafter, the rate elasticity remained relatively stable until it increased slightly in 1993 and 1994 as a result of the RRA 1993. On the

Table 1
United States Income Tax Elasticities 1984-1995

Year	Rate Structure		Tax Base		Overall	
	Intercept	TR/TI	Intercept	TI/AGI	Intercept	TR/AGI
1984	-4.180	1.279	-0.584	1.039	-5.102	1.349
T test	-12.61	34.03	-2.12	34.23	-11.93	28.52
1985	-4.330	1.295	0.167	0.956	-4.007	1.227
T test	-14.87	39.42	0.75	38.98	-11.53	32.10
1986	-6.417	1.524	1.023	0.866	-5.736	1.416
T test	-18.22	38.77	4.09	31.75	-14.73	33.33
1987	-2.232	1.073	-2.692	1.244	-5.192	1.342
T test	-9.30	39.56	-11.10	47.60	-13.75	32.98
1988	-2.524	1.105	-2.168	1.187	-4.907	1.310
T test	-9.99	39.11	-8.85	45.33	-12.85	32.13
1989	-2.537	1.106	-2.144	1.184	-4.873	1.305
T test	-9.38	36.75	-8.29	43.08	-12.11	30.50
1990	-2.15	1.130	-2.046	1.173	-4.690	1.285
T test	-8.79	34.79	-7.38	39.97	-10.86	28.11
1991	-2.566	1.108	-2.281	1.196	-5.048	1.321
T test	-8.39	32.77	-7.71	38.28	-10.96	27.14
1992	-2.643	1.118	-2.362	1.204	-5.222	1.339
T test	-8.47	32.52	-7.77	37.63	-11.02	26.88
1993	-2.802	1.138	-2.417	1.209	-5.495	1.369
T test	-8.75	32.33	-7.71	36.75	-11.26	26.73
1994	-2.819	1.139	-2.395	1.206	-5.512	1.371
T test	-8.47	31.32	-7.37	35.54	-10.89	25.93
1995	-2.261	1.080	-2.548	1.221	-5.541	1.373
T test	-7.10	31.21	-7.89	36.43	-11.02	26.31

Variable definitions:

TR= LN of income tax liability per capita.

AGI= LN adjusted gross income per capita.

TI= LN taxable income per capita.

TR/TI= coefficient of the regression of TR as defined above on TI.

TI/AGI= coefficient of the variable TI regressed on the variable AGI both defined.

TR/AGI= coefficient of the variable TR regressed on the variable AGI both defined.

Definitions for income tax liability*, adjusted gross income** and taxable income*** are those used by the U.S. Treasury department as reported in the Statistics of Income Bulletins (1987-1997).

* SOI, 1991, Footnotes to Selected Historical Data Table 2:2(c), Summer p. 134.

** SOI 1987-1997, Selected Historical Data Table 2.

*** SOI 1987-1997 Selected Historical Data Table 2.

Table 2

Chow Test Results For Rate Structure Elasticities (LN TR/LN TD)*

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
F	0.10	20.30	19.86	13.74	12.96	12.78	11.42	10.05	7.53	7.15	15.25
p	0.7493	<.0001	<.0001	0.0002	0.0002	0.0004	0.0008	0.0016	0.0062	0.0077	0.0001
F		19.99	27.28	19.28	18.06	17.64	15.70	13.92	10.67	10.11	20.39
p		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0002	0.0011	0.0016	<.0001
F		89.40	89.40	75.02	71.42	69.43	64.31	60.59	53.62	51.65	72.05
p		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
F			0.68	0.4106	0.67	0.54	1.06	2.15	2.16	0.03	0.00
p			0.4106	0.4130	0.462	0.3034	0.3034	0.1428	0.1423	0.873	0.9819
F			0.00	0.00	0.00	0.01	0.08	0.09	0.53	0.56	0.32
p			0.9712	0.9379	0.7728	0.7667	0.7667	0.4657	0.4657	0.4552	0.5726
F			0.00	0.00	0.00	0.00	0.00	0.07	0.48	0.53	0.33
p			0.9549	0.9561	0.7944	0.7944	0.7944	0.4896	0.4896	0.4784	0.5686
F			0.01	0.01	0.09	0.09	0.09	0.53	0.53	0.56	0.25
p			0.9147	0.9147	0.7585	0.7585	0.467	0.467	0.4565	0.4565	0.6141
F			0.04	0.37	0.39	0.37	0.37	0.37	0.37	0.39	0.35
p			0.8452	0.5456	0.533	0.533	0.533	0.533	0.533	0.533	0.5540
F			0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.19	0.61
p			0.683	0.683	0.683	0.683	0.683	0.683	0.683	0.6666	0.4354
F			1.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39
p			0.9768	0.2391	0.2391	0.2391	0.2391	0.2391	0.2391	0.2391	0.2391
F			0.2353	0.2353	0.2353	0.2353	0.2353	0.2353	0.2353	0.2353	0.2353
p			0.2353	0.2353	0.2353	0.2353	0.2353	0.2353	0.2353	0.2353	0.2353

* The Chow test compares the beta coefficients of linear regressions testing for statistically significant differences in sizes using a two-tailed F statistic with the null hypothesis that the difference between the coefficients equals zero. The procedure was run using the Test statement with Proc. Reg. in SAS on all possible comparisons of different year's betas (Freund and Littell, 1991, pp. 38-9). Statistically significant differences (at the .05 level) are highlighted. Numbers in the table are F values and p values. All results of comparisons of years following 1987 to 1995 are statistically non-significant at the .05 value. Variables definitions are provided in Table 1.

Table 3
Chow Test Results For Tax Base Elasticities (LN T/ LN AGI)*

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
F	4.52	18.04	26.19	13.61	12.44	10.00	12.96	13.91	14.35	13.46	16.20
p	0.0338	<.0001	<.0001	0.0002	0.0005	0.0016	0.0003	0.0002	0.0002	0.0003	<.0001
F	6.06	64.56	64.56	41.42	38.13	32.05	36.46	37.70	37.90	35.66	40.71
p	0.0141	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0001	<.0001
F	100.32	67.37	72.19	58.67	63.38	64.58	64.41	61.12	67.61	61.12	67.61
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
F	2.38	2.55	3.31	1.40	0.96	0.71	0.79	0.29	0.5888	0.376	0.5888
p	0.1233	0.1108	0.0693	0.2374	0.3269	0.3991	0.376	0.5888	0.376	0.5888	0.5888
F	0.01	0.13	0.05	0.16	0.27	0.20	0.20	0.64	0.27	0.20	0.64
p	0.9270	0.7143	0.8269	0.6888	0.6069	0.6555	0.4231	0.64	0.6069	0.6555	0.4231
F	0.07	0.34	0.23	0.34	0.75	0.34	0.75	0.34	0.75	0.34	0.75
p	0.7858	0.7659	0.6348	0.5580	0.6047	0.3863	0.6047	0.3863	0.6047	0.3863	0.6047
F	0.30	0.51	0.67	0.56	1.19	0.56	1.19	0.56	1.19	0.56	1.19
p	0.5865	0.4759	0.4138	0.4550	0.2767	0.4550	0.2767	0.4550	0.2767	0.4550	0.2767
F	0.03	0.08	0.08	0.08	0.30	0.08	0.30	0.08	0.30	0.08	0.30
p	0.8643	0.7792	0.8248	0.5828	0.5828	0.8248	0.5828	0.5828	0.8248	0.5828	0.5828
F	0.01	0.14	0.01	0.14	0.14	0.01	0.14	0.01	0.14	0.01	0.14
p	0.9119	0.9560	0.7052	0.9560	0.7052	0.9560	0.7052	0.9560	0.7052	0.9560	0.7052
F	0.00	0.07	0.00	0.07	0.07	0.00	0.07	0.00	0.07	0.00	0.07
p	0.9577	0.7909	0.9577	0.7909	0.7909	0.9577	0.7909	0.9577	0.7909	0.9577	0.7909
F	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
p	0.7539	0.7539	0.7539	0.7539	0.7539	0.7539	0.7539	0.7539	0.7539	0.7539	0.7539

*See Table 2 for Chow test procedure. Statistically significant differences (at the .05 level) are highlighted. Numbers in the table are F values and p values. All results of comparisons of years following 1987 to 1995 are statistically non-significant at the .05 level. Variables definitions are provided in Table 1.

other hand, the base elasticity increased from 0.956 in 1985 (in 1986 there was a one-time taxpayer behavioral related decrease as covered below) to 1.244 in 1987. Subsequently, the base elasticity remained fairly stable through 1995.

The overall tax elasticity did not substantially change throughout the period with the exception of the one-time spike in 1986. Overall, the results shown in Table 1 suggest that the TRA 1986 initiated a long-lasting decrease in tax rate elasticity, and a lasting increase in base elasticity, but had little impact on overall elasticity.

Testing for Significance.

We extend the elasticity analysis in the Tanzi (1969, 1976), Fries, *et al.* (1982) and Ram (1991) studies by using the Chow test (Kennedy, 1998). This test is used to determine the statistical significance in changes in the elasticity measures over the years in the 1984 through 1995 period examined. The Chow test results of the year-to-year comparisons of the rate structure elasticity estimates are displayed in Table 2. The results indicate a consistent statistically significant difference (at the .05 level) in the rate structure elasticity (shown in bold), beginning in 1987 when compared to the period 1984-1986. The significant Chow test results further confirm that TRA 1986 significantly decreased tax rate elasticity by reducing the number of rate brackets and lowering the top tax rate. Interestingly, the elasticity figure for the rate structure for 1963, 1.078 estimated by Tanzi (1976), is very close to the 1987 figure from this study (1.073).

Table 3 shows the results of Chow tests conducted to test for significant differences in tax base elasticities. The results in Table 3 confirm that the tax base elasticity was increased by the broadening of the tax base achieved through the closing of loopholes by TRA 1986 compared to the pre-TRA years of 1984 through 1986. No statistically significant changes were measured for the years following the enactment of TRA 1986, confirming that the tax acts in the 1987 through 1993 period did little to change the relationship between the level of taxable income relative to the level of adjusted gross income.

Total elasticity is the combination of the rate and base elasticities. The results, shown in Table 4, confirm that TRA 1986 changed the tax rates and tax base but overall the changes were neutral. The results indicate that the two changes have largely cancelled each other out with significant changes in the total elasticity occurring only from 1985 when compared to 1986 and 1987, and then again when comparing 1985 to the years 1993-1995. One other significant difference appears between 1986 and 1990. In general this result supports the idea that the changes in the tax law for 1986 were revenue neutral.

The results for 1993-1995 indicate that RRA 1993 did change the tax rate structure enough to impact the overall structure of elasticity. Careful examination of the Chow test results and the elasticity measures in Table 1 for the rate structure finds reductions in the F statistic and some increase in rate structure elasticity during that time, indicating that the rate structure became more progressive pushing the

Table 4
Chow Test Results For Overall Elasticities (LN T/LN AGI)**

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
F	4.03	1.11	0.01	0.38	0.46	0.94	0.17	0.02	0.09	0.10	0.12
<i>p</i>	0.0453	0.2927	0.9210	0.5392	0.4963	0.3323	0.6815	0.8879	0.7669	0.7565	0.7247
F	4.30	10.94	4.30	2.24	1.88	0.95	2.31	3.20	4.98	4.87	5.15
<i>p</i>	0.385	0.001	0.385	0.1352	0.1714	0.3292	0.1287	0.0742	0.026	0.0277	0.0236
F	1.55	3.20	3.35	1.37	2.15	4.39	0.48	0.48	0.44	0.39	0.39
<i>p</i>	0.2144	0.0742	0.0677	0.2423	0.1427	0.0365	0.4872	0.5317	0.3078	0.5317	0.5317
F	0.40	0.31	0.40	0.89	0.89	0.12	0.00	0.17	0.18	0.22	0.22
<i>p</i>	0.5767	0.5288	0.3468	0.7328	0.9567	0.6815	0.6728	0.6397	0.6728	0.6397	0.6397
F	0.01	0.17	0.03	0.20	0.81	0.82	0.81	0.82	0.82	0.91	0.91
<i>p</i>	0.932	0.678	0.8686	0.6561	0.3675	0.3662	0.3406	0.3406	0.3406	0.3406	0.3406
F	0.11	0.06	0.26	0.92	0.93	1.02	1.02	1.02	1.02	1.02	1.02
<i>p</i>	0.7447	0.8104	0.6077	0.3374	0.3365	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125
F	0.29	0.64	0.64	1.51	1.51	1.63	1.63	1.63	1.63	1.63	1.63
<i>p</i>	0.5904	0.4237	0.2189	0.47	0.47	0.2020	0.2020	0.2020	0.2020	0.2020	0.2020
F	0.07	0.48	0.48	0.48	0.48	0.54	0.54	0.54	0.54	0.54	0.54
<i>p</i>	0.7942	0.4607	0.4607	0.4607	0.4607	0.4607	0.4607	0.4607	0.4607	0.4607	0.4607
F	0.18	0.19	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
<i>p</i>	0.6711	0.6628	0.6327	0.6327	0.6327	0.6327	0.6327	0.6327	0.6327	0.6327	0.6327
F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>p</i>	0.9856	0.9548	0.9548	0.9548	0.9548	0.9548	0.9548	0.9548	0.9548	0.9548	0.9548
F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>p</i>	0.9698	0.9698	0.9698	0.9698	0.9698	0.9698	0.9698	0.9698	0.9698	0.9698	0.9698

*See Table 2 for Chow test procedure.

Statistically significant differences (at the .05 level) are highlighted. Numbers in the table are F values and *p* values. All results of comparisons of years following 1987 to 1995 are statistically non-significant at the .05 level. Variables definitions are provided in Table 1.

overall elasticity somewhat upward as well. This is an important result because RRA 1993 was enacted primarily to reduce the budget deficits at that time.

Results Including The Gini Coefficient as an Income Inequality Control Variable.

To determine whether the inclusion of an income inequality control variable will affect the elasticity numbers presented in Table 1, we use a Gini coefficient constructed from federal income tax data separated by septile for individual states for the year 1989, which is near the midpoint of our data set.⁴ The formula used to calculate each state’s Gini coefficient was:

$$G_i = 0.5 \sum_{i=1}^n |Exp_i - TI_i|$$

Where $n = 7$ and TI_i and Exp_i are relative frequencies for Taxable Income by septile, and Exemptions by septile, respectively.⁵ Exemptions are used as a proxy for population. While exemptions do not exactly match population, as long as the distribution of the population over 65 years old and the blind is reasonably close to the distribution of the population in general, the proxy is reasonable. The 1989 Gini coefficients were then used for all years 1984 through 1995 as an independent control variable in a manner similar to Ram who used Gini coefficients from 1979 in his 1991 paper. Data were not available to construct Gini coefficients for all of the years included in the sample.

As before, a linear regression was run on all years, with each year being assigned a separate intercept and separate Beta coefficient. The model is run as a no intercept regression with each year having a separate intercept and Beta coefficient.

$$\begin{aligned} \text{Log } TR_i &= a + b \text{ Log } TI_i + cG_{i1989} \\ \text{Log } TI_i &= _ + _ \text{ Log } AGI_i + _ G_{i1989} \\ \text{Log } TR_i &= _ + _ \text{ Log } AGI_i + _ G_{i1989} \end{aligned}$$

Where:

G_{i1989} = Gini coefficient of inequality for the year 1989 by state.

The results are contained in Table 5.

A comparison of the results with and without Gini coefficients reveals increases in all three elasticity measures for all of the years we examined, which is consistent with earlier results (see Table 6) reported by Fries, *et al.* (1982) and Ram (1991)⁶ for different periods. For instance, in 1987 the measures without and with the Gini coefficient control variable included for tax rate, tax base, and overall elasticity for 1987 were 1.073 and 1.118, 1.244 and 1.274, and 1.342 and 1.447, respectively.

Significance Tests of the Elasticity Measures including the Gini Coefficient Variable.

The Chow test results on the tax rate, tax base, and overall tax elasticity measures with the Gini coefficient as a control variable are shown in Tables 7, 8 and 9. Results are consistent with results obtained earlier.

Table 5
United States: Income Tax Elasticities 1984-1995
With Gini Coefficient

Year	Rate Structure		Tax Base		Overall	
	Intercept	TR/TI	Intercept	TI/AGI	Intercept	TR/AGI
1984	-4.874	1.328	-0.956	1.066	-6.393	1.441
T test	-15.14	37.07	-3.45	35.44	-16.51	34.30
1985	-4.941	1.335	-0.157	0.977	-5.133	1.300
T test	-17.46	42.70	-0.69	40.23	-16.25	38.32
1986	-7.155	1.577	0.623	0.895	-7.124	1.517
T test	-20.91	42.05	2.44	32.92	-19.98	39.94
1987	-2.891	1.118	-3.104	1.274	-6.622	1.447
T test	-12.14	42.91	-12.47	48.74	-19.05	39.63
1988	-3.197	1.151	-2.568	1.216	-6.296	1.410
T test	-12.79	42.45	-10.24	46.52	-17.97	38.62
1989	-3.234	1.154	-2.566	1.215	-6.337	1.412
T test	-12.12	39.99	-9.70	44.24	-17.16	36.83
1990	-3.225	1.153	-2.486	1.205	-6.218	1.398
T test	-11.45	37.94	-8.79	41.13	-15.73	34.16
1991	-3.303	1.161	-2.739	1.231	-6.638	1.440
T test	-11.01	35.83	-9.09	39.45	-15.78	33.06
1992	-3.392	1.172	-2.834	1.239	-6.859	1.463
T test	-11.08	35.57	-9.15	38.79	-15.85	32.78
1993	-3.564	1.193	-2.898	1.245	-7.163	1.496
T test	-11.35	35.37	-9.08	37.91	-16.07	32.62
1994	-3.598	1.196	-2.892	1.245	-7.240	1.503
T test	-11.04	34.32	-8.75	36.69	-15.68	31.74
1995	-2.991	1.131	-3.050	1.260	-7.284	1.507
T test	-9.60	34.17	-9.27	37.57	-15.86	32.18
GINI89		0.629		0.319		1.108
T		8.74		5.38		13.37

Variable definitions: See Table 1. GINI89 = coefficient of the Gini coefficient of income inequality by state for the year 1989. Income (AGI) septile as defined by the U.S. Department of Treasury in the 1991 SOI Bulletin, Table 2, Summer pp. 55-105. See paper p. 15 for formula used.

Table 6
Tax Elasticity Estimates With and Without
the Gini Coefficient as a Control Variable *

Year	RATE without Gini TR/TI	RATE with Gini TR/TI	BASE without Gini TI/AGI	BASE with Gini TI/AGI	OVERALL without Gini TR/AGI	OVERALL with Gini TR/AGI
1984	1.279	1.328	1.039	1.066	1.349	1.441
1985	1.295	1.335	0.956	0.977	1.227	1.300
1986	1.524	1.577	0.866	0.895	1.416	1.517
1987	1.073	1.118	1.244	1.274	1.342	1.447
1988	1.105	1.151	1.187	1.216	1.310	1.410
1989	1.106	1.154	1.184	1.215	1.305	1.412
1990	1.103	1.153	1.173	1.205	1.285	1.398
1991	1.108	1.161	1.196	1.231	1.321	1.440
1992	1.118	1.172	1.204	1.239	1.339	1.463
1993	1.138	1.193	1.209	1.245	1.369	1.496
1994	1.139	1.196	1.206	1.245	1.371	1.503
1995	1.080	1.131	1.221	1.260	1.373	1.507
GINI89		0.629		0.319		1.108

Vairable definitions: See Table 1 and Table 5

*All estimates are statistically significant at the .05 level of significance.

Table 7

Chow Test Results For Rate Structure Elasticities (LN TR/LN TI)* with the Gini Coefficient as a Control Variable

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
F	0.02	23.68	23.30	16.06	14.72	14.38	12.34	10.69	7.80	7.21	16.91
<i>p</i>	0.8938	<.0001	<.0001	<.0001	0.0001	0.0002	0.0005	0.0011	0.0054	0.0074	<.0001
F		25.34	29.25	20.27	18.45	17.88	15.26	13.26	9.75	9.00	20.62
<i>p</i>		<.0001	<.0001	<.0001	<.0001	<.0001	0.0001	0.0003	0.0019	0.0028	<.0001
F		104.54	87.57	82.40	79.78	72.75	68.20	59.93	57.23	82.17	
<i>p</i>		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
F			0.81	0.93	1.13	1.70	3.23	0.727	0.0673	0.10	
<i>p</i>			0.3677	0.3363	0.3726	0.2883	0.1923	0.0727	0.0673	0.756	
F				0.01	0.06	0.24	0.98	1.08	0.23		
<i>p</i>				0.929	0.9637	0.8068	0.6233	0.3234	0.2988	0.6284	
F					0.00	0.02	0.16	0.78	0.88	0.3	
<i>p</i>					0.9681	0.8754	0.6907	0.3771	0.3492	0.5811	
F						0.04	0.18	0.81	0.91	0.25	
<i>p</i>						0.8487	0.6701	0.368	0.3411	0.6158	
F							0.05	0.48	0.56	0.45	
<i>p</i>							0.8183	0.4885	0.455	0.5032	
F								0.21	0.27	0.37	
<i>p</i>								0.6440	0.6029	0.3704	
F									0.00	1.80	
<i>p</i>									0.9480	0.1800	
F										1.92	
<i>p</i>										0.1665	

*See Table 2 for Chow test procedure.

Statistically significant differences (at the .05 level) are highlighted. Numbers in the table are F values and *p* values. All results of comparisons of years following 1987 to 1995 are statistically non-significant at the .05 level. Variable definitions are provided in Table 1 and Table 5.

Table 8

Chow Test Results for Tax Base Elasticities (LN T/LN AGI)* with the Gini Coefficient as a Control Variable

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
F	5.37	18.30	28.41	14.66	13.81	11.44	14.96	16.22	16.83	16.10	19.21
p	0.0208	<.0001	<.0001	0.0001	0.0002	0.0008	0.0001	<.0001	<.0001	<.0001	<.0001
F	5.25	5.25	71.77	46.17	43.29	37.11	42.37	44.06	44.47	42.37	48.09
p	0.0223	0.0223	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
F	105.60	75.33	105.60	75.33	71.26	62.81	68.46	70.21	70.31	67.34	74.42
p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
F	2.62	2.62	2.62	2.62	2.62	3.23	1.22	0.75	.050	0.51	0.13
p	0.1053	0.1061	0.1061	0.1061	0.1061	0.0727	0.2705	0.3865	0.4795	0.4756	0.7233
F	0.00	0.00	0.00	0.00	0.00	0.07	0.14	0.34	0.52	0.47	1.11
p	0.9715	0.9715	0.9715	0.9715	0.9715	0.7868	0.7117	0.5587	0.4719	0.4933	0.2916
F	0.05	0.05	0.16	0.16	0.16	0.05	0.16	0.37	0.54	0.50	1.14
p	0.8173	0.8173	0.6930	0.6930	0.6930	0.8173	0.6930	0.5448	0.4608	0.4816	0.2861
F	0.64	0.64	0.36	0.36	0.36	0.64	0.36	0.64	0.86	0.80	1.56
p	0.4224	0.4224	0.5486	0.5486	0.5486	0.4224	0.4224	0.4224	0.3536	0.3724	0.2127
F	0.04	0.04	0.11	0.11	0.11	0.04	0.11	0.04	0.11	0.10	0.42
p	0.8384	0.8384	0.7377	0.7377	0.7377	0.8384	0.7377	0.8384	0.7377	0.7562	0.5149
F	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.20
p	0.8947	0.8947	0.8947	0.8947	0.8947	0.8947	0.8947	0.8947	0.8947	0.9111	0.6545
F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1
p	0.9854	0.9854	0.9854	0.9854	0.9854	0.9854	0.9854	0.9854	0.9854	0.9854	0.7549
F	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
p	0.7448	0.7448	0.7448	0.7448	0.7448	0.7448	0.7448	0.7448	0.7448	0.7448	0.7448

*See Table 2 for Chow test procedure.

Statistically significant differences (at the .05 level) are highlighted. Numbers in the table are F values and p values. All results of comparisons of years following 1987 to 1995 are statistically non-significant at the .05 level. Variable definitions: See Table 1 and Table 5.

The results presented in Table 7 and Table 8 compared to the results in Tables 2 and 3 show that all years previously identified as differing significantly in the measure of tax rate and tax base elasticity remained significant with the Gini added as a control. This provides additional support for the notion that the TRA 1986 produced significant changes in both the tax rate and tax base elasticity numbers.

Table 9 shows the results of the addition of the Gini variable in the year-by-year Chow test significance of changes in the overall elasticity measure. We find significant results in year-by-year comparisons that were previously not significant: 85:88, 85:89, 85:91, 85:92, 86:88 and 86:89. Previously significant results were strengthened with higher F values. This result is especially interesting when examining the years 1993 through 1995. The change from marginally significant to much higher levels of significance is driven by a jump in the rate elasticity figure in 1993 that is accompanied by an increase in base elasticity that seems to be more consistent with a slow and continuous increase in base elasticity from 1991 through 1995. The result for 1991 is significant due to a one time jump in the base elasticity from 1.205 in 1990 to 1.231 in 1991. This jump and a smaller jump in the rate elasticity were the result of changes in tax laws designed to broaden the tax base and an increase in the top tax rate.

The with-Gini Chow test results strengthen the conclusion that the rate and base elasticities in 1984 and 1985 were significantly different from years following enactment of TRA 1986, and that the effects were a downward change in the rate elasticity, and an upward change in the base elasticity. The results with respect to overall elasticity are mixed. While the overall elasticity figure for 1985 was found to be significantly different than that for all of the following years through 1995 (as compared with only five of the following years when the income inequality variable was not included in the calculations), the overall elasticity amount for 1984 is still not significantly different compared to that in any following year except 1985.

Inclusion of the Gini coefficient in the elasticity calculations results in a consistent increase in the estimate of the elasticity when compared to elasticities estimated without the Gini coefficient. This result closely follows Tanzi (1969) in the degree of change he found when he truncated his dataset to remove the five poorest states from his sample and supports the conclusion by Ram (1991) that controlling for income inequality results in higher elasticity amounts.

Results of Chow tests, on the with-GINI elasticities support the conclusion that inclusion of an income distribution measure increases the elasticity measures, and this increase is not the result of a particular tax structure or set of economic conditions. The use of a single year's Gini coefficient weakens this conclusion somewhat, because it assumes income inequality is constant over the period examined and does not capture the possibility that the Gini coefficients may change in the short run. However, the approach is consistent with procedures employed by Ram (1991).

Explanation of the 1986 Results.

One of the most striking results obtained was the one time change in the elasticity estimates for the year 1986. Table 1 contains results that indicate a

Table 9
Chow Test Results For Overall Elasticities (LN TI/LN AGI)* with the Gini Coefficient as a Control Variable

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
F	6.97	1.88	0.01	0.32	0.26	0.55	0.00	0.14	0.83	1.01	1.15
p	0.0085	0.171	0.906	0.5702	0.6084	0.4599	0.9949	0.7125	0.364	0.3146	0.2846
F	18.76	18.76	9.02	5.00	4.95	3.52	6.67	8.72	12.21	12.58	13.23
p	<.0001	<.0001	0.0028	0.0257	0.0264	0.0613	0.0101	0.0033	0.0005	0.0004	0.0003
F			1.84	4.34	3.95	4.73	1.84	0.89	0.13	0.05	0.03
p			0.1757	0.0378	0.0473	0.0300	0.1758	0.3459	0.7215	0.8176	0.86834
F				0.55	0.46	0.84	0.02	0.08	0.73	0.92	1.06
p				0.4574	0.4978	0.3604	0.9021	0.7802	0.3925	0.3374	0.3040
F					0.00	0.05	0.30	0.89	2.28	2.56	2.80
p					0.9625	0.8299	0.5814	0.3455	0.1319	0.1100	0.0947
F						0.06	0.25	0.78	2.07	2.34	2.57
p						0.7991	0.6188	0.3773	0.1507	0.1263	0.1096
F							0.52	1.20	2.66	2.95	3.20
p							0.4705	0.2743	0.1033	0.0862	0.0741
F								0.14	0.82	1.00	1.13
p								0.7114	0.3668	0.3174	0.2877
F									0.28	0.40	0.48
p									0.5946	0.5256	0.4870
F										0.01	0.03
p										0.9125	0.8681
F											0.00
p											0.9564

*See Table 2 for Chow test procedure.

Statistically significant differences (at the .05 level) are highlighted. Numbers in the table are F values and p values. All results of comparisons of years following 1987 to 1995 are statistically non-significant at the .05 level. Variable definitions: See Table 1 and Table 5.

transitory change in 1986, and then a permanent change from 1987 onward. As can be seen in Table 1, the rate elasticity increased dramatically from 1.279 in 1984 and 1.295 in 1985, to 1.524 in 1986, and then declined even more dramatically to 1.073⁷ in 1987⁸ and 1.105 by 1988. At the same time, the tax base elasticity declined from 1.039 in 1984 and 0.956 in 1985, down to .866 by 1986. The base elasticity then rose dramatically to 1.244 in 1987, only to decline slightly to 1.187 by 1988.⁹

One possible explanation for the one-time change in the elasticity measures in 1986 is that the dramatic change in the capital gains tax rate built into TRA 1986, announced in 1986 but effective beginning in 1987, induced significant behavior changes in taxpayers. In 1986 and earlier years, taxpayers were permitted to take a 60 percent deduction in determining the amount of net long-term capital gains subject to tax. The TRA 1986, (signed into law on October 22, 1986) repealed the 60 percent deduction, effective January 1, 1987, and required 100 percent of net long-term capital gains to be included in AGI and subject to tax. This change increased the effective top rate of taxation for long term capital gains from 20 percent (40% of the 1986 top rate of 50%) to 28 percent after 1986.

Reported net long-term capital gains were extraordinarily high in 1986 at \$135.005 billion (net of the 60 percent net long-term capital gain deduction that could be taken in years before 1987) compared to \$67.694 billion in 1985, an increase of over 99 percent, and \$54.519 billion in 1984, an increase of 147 percent. For comparison to later years, net long-term capital gains before the 60 percent deduction must be used since that deduction was repealed beginning after December 31, 1986. That figure for 1986 is approximately \$337.513 billion compared to \$144.176 billion in 1987, a reduction of 57.3 percent, and \$151.875 billion in 1988, a reduction of just over 52 percent.

Prior empirical research has shown that the suddenly temporary nature of the 20 percent tax rate encouraged taxpayers to accelerate the realization of long term capital gains with low transaction costs, resulting in a dramatic increase in taxable income resulting from capital gains (Burman and Clausing 1994). Capital gains increased 604 percent in December 1986 when compared to the previous December. Results strongly supported the hypothesis that the suddenly temporary nature of the old 20 percent rate encouraged the 1986 sell-off. Other results such as the reduced selling of capital assets with short term gains also support the idea that taxpayers responded to the unintended tax incentive by reduced selling of short term assets in anticipations of lower rates offered under TRA 1986. Burman and Clausing contend that this short run effect indicates: "... that the elasticity of response of taxpayers to transitory variations in capital gains tax rates is an order of magnitude greater than the response to permanent variations" (Burman and Clausing 1994, 10).

The question still remains, how does this impact the elasticity numbers for 1986? The answer is that net long-term capital gains income for 1986 was disproportionately earned by the three highest income groups of taxpayers categorized in the IRS Statistics of Income tables for that year (those with adjusted gross income of \$200,000 or more). Whereas those three groups of taxpayers filed only 2.9 percent of the 10.361 million federal income tax returns with net long-term capital gain income for 1986, those taxpayers reported roughly 56 percent of the net

long-term capital gains for 1986. Because (1) net long-term capital gains income was much higher in 1986 than in 1985 and 1987 and (2) the lion's share of that income was recognized by taxpayers with the highest marginal tax rates, income tax revenue for 1986 became higher relative to adjusted gross income and taxable income than it was in 1985 and 1987. That phenomenon was largely responsible for the one-time spike in tax rate elasticity and overall elasticity for 1986.

Burman and Clausing also reported that, "... the highest income people increased their realizations by a much larger percentage than the rest of the sample" (1994, 11), which they attributed to a difference in knowledge and incentive. The incentive difference indicates that a large percentage of the gains that were realized were taxed at the highest rate and would have been expected to face the highest 28% bracket in 1987. Estimates of the marginal tax rate for 1986 increased to 28%, from 24% in 1984 and 1985, only to decline to 22% for 1987 and 23% for 1988 through 1991. The implication of these results is that the gains taken in 1986 increased tax liabilities at the margin by a significant amount.

Additional evidence of the profound impact of the expected increase in the effective long-term capital gains rate was reported by Ayers *et al.* (2004), who state that acquisition structure is impacted by individual income taxes on capital gains. Their results show an increased relative incidence of taxable acquisitions (vs. tax-free) in the period 1982 to 1986 with an equally dramatic shift to more tax-free acquisitions in the subsequent periods. Taxable acquisitions were particularly high in December of 1986 just prior to the increase in the effective long-term capital gains rate. Individual taxpayers with shares in the target corporations were offered cash payments for their stock, resulting in an incentive to complete the acquisition prior to the new tax year, thereby adding to the flood of capital gains reported by individuals.

In summary, the sharp increase in the realization of capital gains primarily by high-bracket taxpayer in 1986 was an important factor leading to the one-time sharp increase in the tax rate elasticity for that year as well as the overall elasticity. Tax base elasticity was less impacted, chiefly because only 40% of net long-term capital gains were included in both adjusted gross income and taxable income. The accuracy of the Tanzi measures of elasticity are attested to by their ability to capture this transitory change in the elasticity measure while not explicitly separating out the capital gains amounts.

Conclusion

Our results suggest that TRA 1986 had a profound impact on tax rate elasticity and tax base elasticity, but the changes brought about by that Act were neutral with respect to overall tax elasticity. We found that tax rate elasticity sharply decreased and that tax base elasticity sharply increased in 1987 following passage of TRA 1986 compared to the values of those measures in 1984 and 1985. As a result, overall elasticity, which combines the tax rate and tax base elasticity measures remained relatively unchanged. Further, the values of all three elasticity measures remained relatively stable after 1987 and through 1995 indicating that tax acts after TRA 1986 generally did little to impact the elasticity of the federal income tax. Only the

Revenue Act of 1993 (RRA 1993), which added two higher tax brackets, led to moderate increases in tax rate and overall elasticity.

Taking into account the criticism by Fries, *et al.* (1982) and Ram (1991) that Tanzi's elasticity measures were understated because they failed to include a measure of income inequality, we recalculated our 1984 through 1995 elasticity measures including the Gini coefficient suggested by Ram as an income inequality control variable. While inclusion of the Gini coefficient increases all elasticity values, including this control variable does not alter the trends in the elasticity measures over the 1984 through 1995 period.

We also measure the statistical significance of changes in the elasticity measures from year to year. We employ the Chow test (Kennedy, 1998) to determine whether the changes in the elasticity measures from one year to others in the period are statistically significant. We find that the changes in the tax rate and tax base elasticity measures from 1984, 1985, and 1986 compared to all later years in the period are statistically significant at the .05 level or better, whereas the changes from 1987 onward compared to later years are not. This finding is consistent with the earlier observation that TRA 1986 substantially altered the tax rate and tax base elasticities whereas tax acts subsequent to TRA 1986 during the period through 1995 did little to affect the values of these tax elasticity measures when measured individually. However, the changes in overall elasticity when comparing 1985 to succeeding years show that combined changes in laws tended to allow overall elasticity to increase. This suggests that (1) the changes to the tax rate and tax base elasticity numbers under TRA 1986 were largely offsetting but (2) changes made by later tax acts did significantly affect changes in overall elasticity between 1993 and 1995.

Our results, which indicate that the previous major tax reform did little to change overall elasticity, should be important to lawmakers in deciding whether to make substantial changes to the tax code. The potential impact of comprehensive tax reform on tax elasticity has important implications for deficit reduction. TRA 1986 did little to reduce deficits at the time because its reduction in rate elasticity and increase in base elasticity largely balanced out resulting in little change in the overall elasticity. Our results indicate that starting in 1993 overall elasticity did increase somewhat which may have contributed to economic stability by acting as an automatic stabilizer in a time of economic growth when inflation was a danger that never materialized.

Our results and historical evidence indicate that if tax reform legislation is enacted and ends up doing little to change overall tax elasticity, that legislation may have little impact on the deficit. Lawmakers and others that propose to make the 2001 and 2003 tax cuts permanent and enact comprehensive tax reform should keep this in mind because there is evidence that the current fiscal policy is unsustainable (Gale and Orszag, 2004). An examination of the elasticity structure brought about by the current tax laws and the potential impact on elasticity of tax reform proposals would be useful to making new policy choices.

Our results also show that any tax reform effort could result in significant behavioral responses on the part of taxpayers. The one-time spike in tax rate and overall elasticity numbers in 1986 relative to 1985 and relative to later years was

shown to be largely the result of high tax bracket taxpayers selling appreciated capital assets in late 1986 to lock-in gains taxed at lower rates than would prevail after the 1986 Act took effect. Potential behavioral responses should be taken into account in the tax reform process and when setting effective dates of new provisions.

Footnotes

¹The objective of the 1964 Act was to reduce the fiscal drag of the previous tax structure, a structure that had been in place since 1954.

²A test of our data confirms Fries *et al.* findings for taxable income.

³Repeated requests for actual data for taxable income by state (TI) for 1984, 1986, and 1987 from the IRS did not meet with success.

⁴Data on income septiles were not available for the years prior to 1989 so the Gini coefficient for 1989 is used for all years 1984-1995 to maintain consistency. This is consistent with Ram (1991).

⁵n is the number of income classifications shown in Table 2. Individual Income and Tax Data by State and Size of Adjusted Gross Income, 1989. SOI Bulletin Summer 1991, pp 88-114.

⁶Our actual measures tend to be larger than Ram's preliminary estimates, with the Gini included for the period 1984-87.

⁷This number is very close to Tanzi's estimate for 1963. (Tanzi 1976 447)

⁸This number is very close to Tanzi's base estimates, 1,272, for 1963.

⁹Overall elasticity measures for 1987 are also reasonably close to results obtained by Ram, 1.336, in 1991.

References

- Ayers, B., C. Lefanowicz and J. Robinson. 2004. The effect of Shareholder-Level Capital Gains Taxes on Acquisition Structure. *The Accounting Review*, 79(4) 859-887.
- Burman, L. and K. Clausing. 1994. Tax Reform and Realizations of Capital Gains in 1986. *National Tax Journal*, 47(1) March 1.
- Carlson, J. and P. Cruickshank, White House Delays Tax Reform Panel Announcement. *News-Federal, 2004TAXDAY*, (Jan. 4, 2005) <http://tax.cchgroup.com>. (1/4/2005).
- Congressional Budget Office. 2007. *The Budget and Economic Outlook: An Update*. The Congress of the United States Congressional Budget Office. August, 2007.

-
- Cooper, S. and P. Cruickshank. President Bush signs Debt-Limit Increase Bill. *News-Federal, 2004TAXDAY*, (Nov. 22, 2004) Item #W.1, <http://tax.cchgroup.com>. (1/4/2005).
- Creedy, John and Norman Gemmill. 2002. The Built-In Flexibility of Income and Consumption Taxes. *Journal of Economic Surveys*, 16 (4), 509-532.
- Cruickshank, P. President's Permanent Tax Cut and Social Security Retirement Savings Account Proposals Could Cost \$2.4 Trillion over Ten Years. *News-Federal, 2004TAXDAY*, (Sep.16, 2004)Item #W.1 <http://tax.cchgroup.com> (1/4/2005).
- Cruickshank, P. and D. Hansen. CEA Chairman Outlines Varied Approaches to Tax Reform. *News-Federal, 2004TAXDAY*, (Dec. 7, 2004) Item #W.1, <http://tax.cchgroup.com> (1/4/2005).
- Elmore, W., D. Stamper and K. Miller. Summit Yields Few Details on Tax, Social Security Reform Plans. *Tax Notes*, (Dec. 20, 2004).
- Feldstein, Martin. 1995. The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act. *The Journal of Political Economy*, 103 551-572.
- Freund, R. and R. Littell. 1991. *SAS System for Regression*, SAS Institute Inc, Cary, NC.
- Fries, A., J. Hutton and P. Lambert. 1982. The Elasticity of the U.S. Individual Income Tax: Its Calculation, Determinants and Behavior. *The Review of Economics and Statistics*, 64(1) 147-151.
- Gale, W. and P. Orszag. The U.S. Budget Deficit: On an Unsustainable Path. *New Economy* (Dec. 2004) <http://www.brookings.edu/views/articles/20041201orszaggale.htm> (1/6/2005).
- Giertz, Seth H. 2004(1). The Taxable Income Elasticity Over the 1980s and 1990s. *Proceedings of the Annual Conference on Taxation*, 2004, 236-244.
- Giertz, Seth H. 2004(2). *Recent Literature on Taxable-Income Elasticities*. Technical Paper Series, Congressional Budget Office, Washington, D.C., December 2004, 2004-16.
- Grossman, S., D. Lassila and C. Wiggins. 2002. Income Tax Elasticity- A Regional Analysis. *Journal of Business and Economic Studies* 8(2) 17-27.

-
- Gruber, Jon and Emmanuel Seaz. 2002. The Elasticity of Taxable Income: Evidence and Implications. *Journal of Political Economy*, 84 1-32.
- Internal Revenue Service, *Statistics of Income Bulletin*, various issues dated from 1986 through 1997.
- Joint Committee on Taxation. 1987, *General Explanation of the Tax Reform Act of 1986*, U.S. Government Printing Office, Washington, D.C.
- Kennedy, P. 1998. *A Guide to Econometrics*, Cambridge: MIT.
- Matthew Bender Tax Staff. 1990, *Bender's Federal Tax Service, Revenue Reconciliation Act of 1990, Analysis and Commentary*. Matthew Bender and Co., New York, NY.
- Pechman, J. 1990. "The Future of the Income Tax" *The American Economic Review*, 80(1) March. 1-20.
- Prentice Hall. 1987, *Prentice Hall's Complete Guide to the Tax Law of 1987*, Prentice Hall, Englewood Cliffs, NJ, 1987.
- Ram, R. 1991. Elasticity of Individual Income Tax in the United States: Further Evidence from Cross-Sectional Data. *National Tax Journal*, 44(1) 93-98.
- Research Institute of America. 1993. *Revenue Reconciliation Act of 1993, Conference Bill and Statement of Conference Managers*. New York, NY.
- Slemrod, J. 1998. Methodological Issues in Measuring and Interpreting Taxable Income Elasticities. *National Tax Journal*, 51(4).
- Stamper, D., K. Miller and W. Elmore. Treasury Tax Reform Proposal to Reach Bush Early 2005. Tax Analysts, *Tax Notes Today*, December 16, 2004 (Doc 2004-23782).
- Tanzi, V. 1969. Measuring the Sensitivity of the Federal Income Tax from Cross-Sectional Data: A New Approach. *The Review of Economics and Statistics*, 51(2) 209-209.
- Tanzi, V. 1976. The Sensitivity of the Yield of the U.S. Individual Income Tax and the Tax Reforms of the Past Decade. *International Monetary Fund Staff Papers*, 23(2) 441-454.

Tanzi, V. and T. Hart. 1972. The Effect of the 1964 Revenue Act on the Sensitivity of the Federal Income Tax. *The Review of Economics and Statistics*, 54 (3), 326-328.

The President's Advisory Panel on Tax Reform. 2005. *Simple, Fair, and Pro-Growth: Proposals to Fix America's Tax System*. November, 2005.

U. S. Bureau of the Census. 1995. 1981 to 1989 Intercensal Estimates of the resident Population of States, and Year-to Years Components of Change. Release Date: Sept. available in Table 2 of Current Population Reports series, P25-1106.

U. S. Bureau of the Census. 1997. ST-97-1 Estimates of the Population of States: Annual Time Series, July 1, 1990 to July 1, 1997. Source: Population Estimates Program, Population Division, Washington DC.

Appendix A

Tax Reform Act of 1986

The Tax Reform Act of 1986 (TRA 1986) was the most significant tax act since 1969. TRA 1986 had a number of objectives including (1) simplifying the tax code, (2) reducing breaks for tax shelters and the need for tax shelters, (3) broadening the tax base, and (4) reducing tax rates and the number of tax rate brackets. (Joint Committee on Taxation (JCT), 1987).

Among the changes that were made to accomplish the first three objectives were: (1) enactment of the passive loss rules under IRC Sec 469 to substantially limit deductions related to investments in tax shelters; (2) the elimination of a number of itemized deductions (such as the deduction for state and local sales taxes); (3) the reduction or limitation of other itemized deductions (such as mortgage interest); (4) replacing the zero-bracket amount with a larger equivalent standard deduction that had the impact of reducing taxable income and, therefore, of the tax beginning in 1987; (5) substantially increased the amount for personal exemptions; (6) decreased the number of tax brackets from 14 in 1986 (ranging from 11 to 50 percent) to a nominal two-bracket system of 15 and 28 percent in 1988; and (7) eliminated the 60 percent deduction for net long-term capital gains, so beginning in 1987, net long-term capital gains were taxed like other income subject to a maximum rate of 28 percent.

Tax Acts from 1987 – 1989

During 1987 through 1989, tax laws were passed each year that, among other things, enacted technical corrections to TRA 1986 and a few tax base-broadening provisions. The three Acts did nothing to substantially alter the provisions of TRA 1986.

Revenue Reconciliation Act of 1990

The Revenue Reconciliation Act of 1990 (RRA 1990) included a number of changes designed to increase the taxation of the wealthy by further broadening the tax base and increasing tax rates. RRA 1990 also enacted a third tax bracket of 31 percent (in addition to the 15 and 28 percent brackets from TRA 1986) effective starting in 1991. This change amounted to a moderate increase in the progressivity of the tax.

Revenue Reconciliation Act of 1993

With the election of President Clinton in 1992, more emphasis was placed on deficit reduction. As a result, the Revenue Reconciliation Act of 1993, (RRA 1993), the last of the deficit reduction based tax acts, was enacted. Instead of reducing government spending, Congress enacted a tax increase. While RRA 1993 included some modest base broadening provisions such as the increase in the amount of social security benefits subject to tax for higher income taxpayers, the major change was the abandonment of the flattening of tax rate philosophy of TRA 1986. RRA 1993 enacted two additional brackets starting in 1993, 36 and 39.6 percent, that were to apply to wealthier individual taxpayers. Much of the impact of this increase in the tax rate fell on individuals with incomes in excess of \$124,000, which accounts for a very small percentage of the population, but it is this income group that has the highest potential for engaging in tax avoidance activities.