The Changing Progressivity of U.S. Income Taxes: Evidence, Analysis, and Policy

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ABSTRACT

The standard description of the U.S. personal income tax system that is presented in the typical textbook is that the income tax is progressive. The primary objective of this paper is to analyze the changes in the degree of progression of the U.S. personal income tax, thus determining the degree of validity of the usual description of the U.S. tax system. We found that there has been increase in the degree of progression of the U.S. income tax system since 1979. This change has been significant. We can conclude that the U.S. income tax became more progressive from 1979 to 2001. This trend persisted despite numerous tax law changes, despite the cycles in both GDP growth and inflation, and despite changes the control by the major political parties.

INTRODUCTION

The standard description of the U.S. personal income tax system that is presented in the typical textbook is that the income tax is progressive, taxing additional income at progressively higher rates, so that higher income households should be paying a larger share of collected taxes. Because the structure of the U.S. income tax has not remained constant, and because distribution of income in the U.S. has not remained static, the actual degree of progression in the U.S. income tax has probably changed over time.

The primary objective of this paper is to analyze the changes in the degree of progression of the U.S. personal income tax, thus determining the degree of validity of the usual description of the U.S. tax system. Part of the analysis will be descriptive, presenting the changes that have occurred from 1979 through 2001. Another part of the analysis will be

an examination of the statistical significance of these changes in the tax burden. We will also suggest some possible explanations for these changes.

METHODOLOGY

Our data will consist mainly of cumulative distributions of the U.S. tax burden. We can use Lorenz curves to graphically analyze these distributions. From the same data we can calculate genii ratios to describe the degree of inequality in the tax burden. An example of a Lorenz curve is shown below.

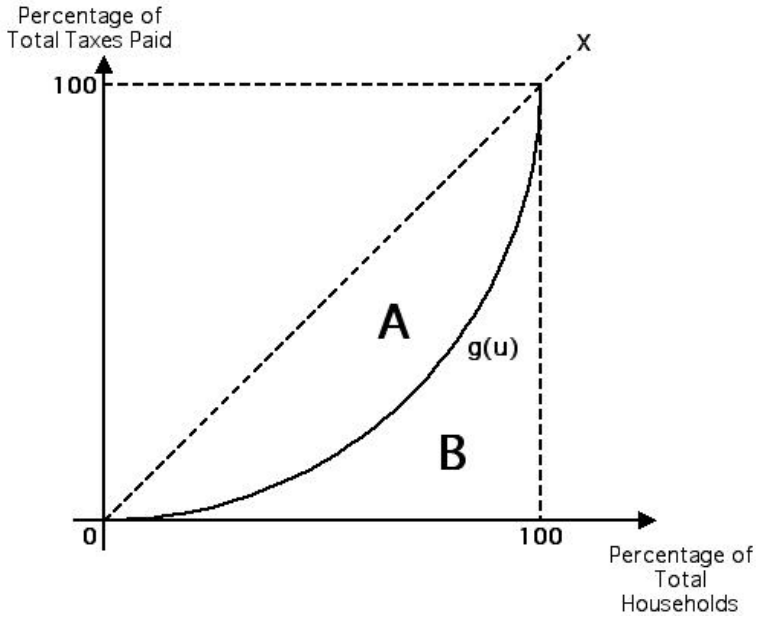

Figure 1

Suppose that g(u) is the cumulative probability function showing the percentage of total taxes paid versus the percentage of total households, where households are ranked from lowest incomes to highest. If the percentage of taxes paid were equal across all households, the cumulative distribution function would conform to the dashed line 0X, the line of complete equality. The genii ratio would be calculated to determine the deviation of the actual distribution g(u) from the line of complete equality. The genii ratio is literally:

$$G = A/(A+B) \tag{1}$$

where A and B correspond to the areas A an B shown above, and G is the genii ratio. The greater the deviation from complete equality, the larger will be area A relative to A+B. Therefore, the larger the genii ratio, the greater the degree of income inequality.

Given the distribution g(u), the genii ratio can be determined by evaluating the following expression:

$$G = 1 - 2\int_0^1 g(u)du \tag{2}$$

To determine the significance of the changes in the cumulative distributions over time, we will use the Kolmogorov-Smirnov test, a non-parametric method of testing for differences between cumulative distributions. Given two cumulative distributions F(X) and S(X), the test is applied by determining the value of D, the maximum deviation between these two functions, as given by the following:

$$D = \max\left|F(X) - S(X)\right| \tag{3}$$

If the number of observations n is greater than 35, the critical value of D for a two-tailed test (alpha=.05) is given by:

$$D^* = 1.36\sqrt{\frac{n_1 + n_2}{n_1 n_2}} \tag{4}$$

It is possible to perform a one-tailed version of this test; this version of the test would be applicable if we wanted to test that the values in one distribution were always greater than the values in another distribution. However, the one-tailed version of the test is not applicable in the case of intersecting distribution functions; the values in one distribution could not all be greater (or less than) the values in another distribution. We shall see below that we do have intersecting distributions when comparing the tax burdens over time, so we cannot use the one-tailed test.

DATA SOURCES

The data on effective federal tax rates by income quintiles is from the series of historical effective tax rates estimated by the Congressional Budget Office (CBO) and presented in a recent paper, ***Effective Federal Tax Rates: 1979 to 2001***. As of this writing, the actual data showing the effect of recent tax changes had not yet become available, although a report based on estimated data has become available, which we will refer to below.

We also make use of data on income distribution from **Historical Income Tables - Income Equality** published by the U.S. Census Bureau. The relative shares are given by income quintiles.

The historical data on U.S. marginal tax rates is from the Truth and Politics website. This information was originally downloaded from http://www.truthandpolitics.org/top-rates.php .

DESCRIPTIVE ANALYSIS

The first thing we need to consider is the nature of the changes to U.S. tax rates that have during our period of analysis. For our purposes, we will use the top marginal tax rate to illustrate the changes. A summary of these changes is presented below in Table 1.

Selected Top Marginal Tax Rates	
Year	Rate
1979	70
1981	69.13
1982	50
1987	38.5
1988	28
1992	31
1993	39.6
1999	39.6

Table 1

A plot of the complete data series is shown below in Figure 2:

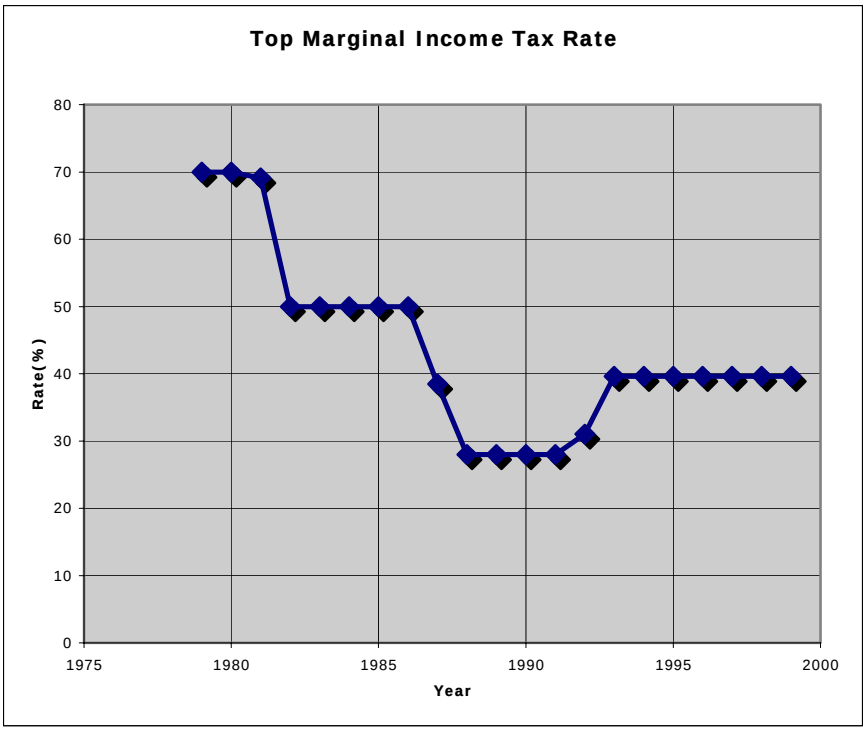

Figure 2

As is clearly indicated by table and chart, top marginal tax rates were changed several times, with the rates being lowered until 1993, when they were raised to the current level.

We will next consider the changes in the tax burden, as measured by the share of income tax liabilities. These are given in Table 2 below:

Share of Individual Income Tax Liabilities		
Quintile	1979	2001
1st	0	-2.3
2nd	4.1	0.3
3rd	10.7	5.2
4th	20.2	14.3
5th	64.9	82.5

Table 2

What is apparent from this table is that the share of income taxes paid by the four lowest income groups has decreased, and that paid by the highest income group has increased. This has happened despite the lowering of the top marginal tax rates that occurred during the period. A visual representation of the change from the beginning to the end of the period is shown below in Figure 3:

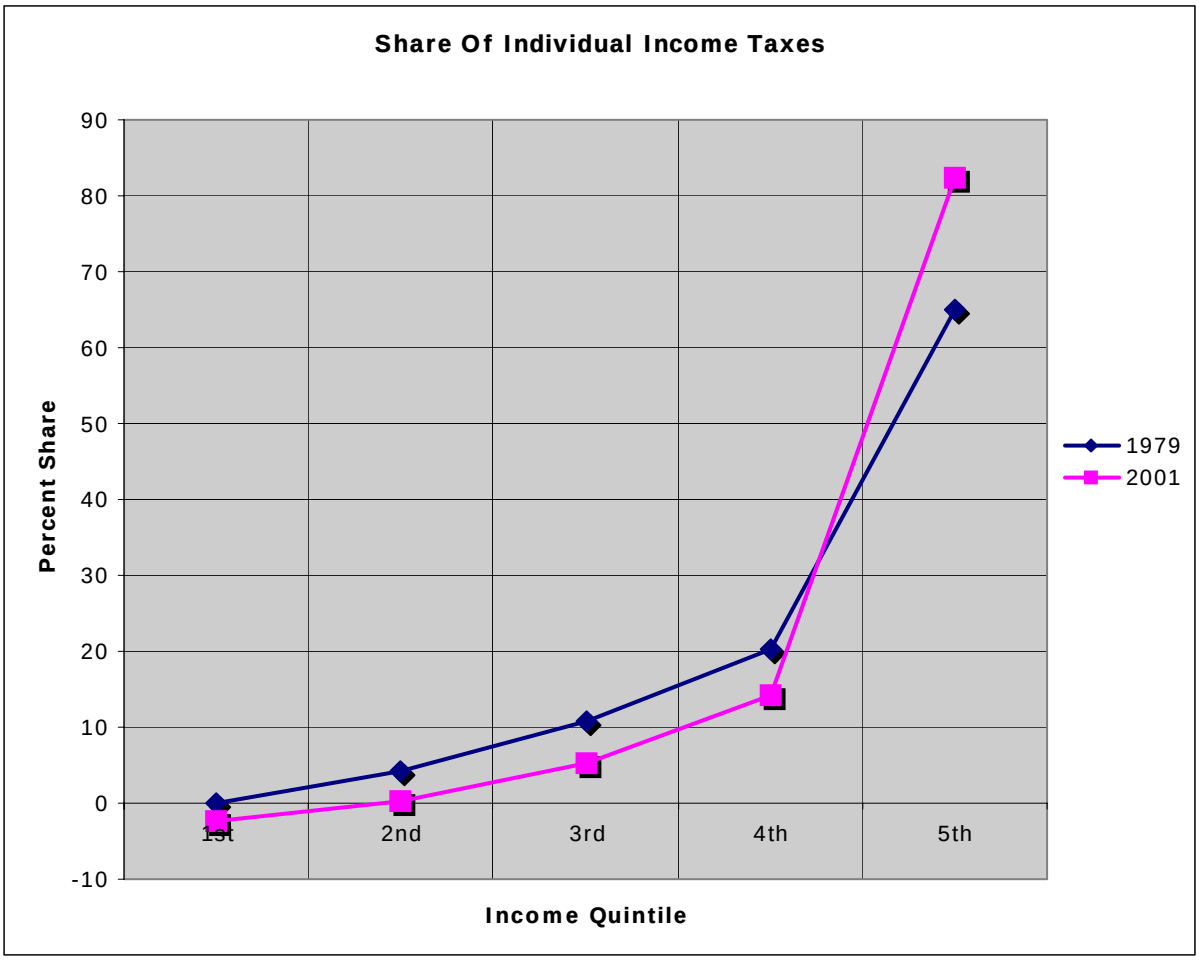

Figure 3

In Figure 3 one can see the analytical problem referred to earlier, the fact the cumulative distributions will cross, the restricting us to use a two-tailed test.

STATISTICAL ANALYSIS

Year	Genii Ratio
1979	0.7302
1984	0.7326
1989	0.7428
1994	0.7498
1999	0.7608
2001	0.765

Table 3

Table 3 shows the genii ratios at selected intervals. It is clear that the genii ratio has increased over the period, supporting the conclusion that the tax burden has become more unequal. Are these changes in the genii ratio significant?

For our samples, the critical value D*, according to equation 4 above is 0.00019928. The calculated value of D is 0.059. Since D exceeds D*, we can reject the null hypothesis of no difference between 1979 and 2001. It would appear that the change in income tax burden, with an increase in the share being paid by the top income quintile, is statistically significant. So the U.S. income tax has actually become more progressive over the period 1979 to 2001.

What can explain this change, given that the top marginal rate is lower in 2001 than in 1979? One of the answers probably is the underlying change in household income distribution that occurred during this period. In 1979, the share of household income going to the top quintile was 44 percent. In 2001, the share had increased to 50.1 percent. Apparently, the growth in the income received by this segment of households has grown enough to offset the reduction in marginal rates.

A recent CBO paper, Effective Federal Tax Rates Under Current Law, 2001 to 2014, published in August 2004, seems to show that this trend of greater progressivity may have been slightly reversed, in the period following the Bush tax law changes. However, this report is not based on actual data, but is instead based on estimated data. In this report, the 2001 data were taken as a baseline, and income was projected forward at a 4.5 percent rate of increase, and inflation was assumed to persist at a 2.5 percent annual rate. Based on this scenario, the share of the highest quintile would fall from 82.5 percent in 2001 to 82.1 percent in 2004, a change of 0.4 percent.

Even if we assume that estimates are valid, this does not justify the conclusion that the trend of greater progressivity has been reversed. There were a small number of years from 1979 to 2001 for which the share of the top quintile fell slightly, but not enough to reverse the trend. The same may prove to be true for 2004.

In summary, there has been a change on the degree of progression of the U.S. income tax system since 1979. This change has been significant. We can conclude that the U.S. income tax became more progressive from 1979 to 2001. This trend persisted despite numerous tax law changes, despite the cycles in both GDP growth and inflation, and despite changes the control by the major political parties.

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