**Calculations of Average Marginal Income-Tax Rates in Robert Barro and Charles Redlick, "Macroeconomic Effects of Government Purchases and Taxes," Harvard University, November 2009.**

Our time series of average marginal tax rates from the federal income tax and social-security payroll (FICA) tax comes from two sources. The first source is work previously done by Barro and Sahasakul (1983, 1986), using the annual IRS publication *Statistics of Income (SOI), Individual Income Taxes*. The IRS publications provide a breakdown of the number of returns and amounts of income and taxes reported in various income brackets. Details of the calculations of average marginal income-tax rates for various time periods are in the Barro-Sahasakul papers. In some years, the data are organized by the highest marginal income-tax rate applying to the return. In these cases, it is straightforward to compute average marginal income-tax rates when weighted by adjusted gross income (AGI). For other years, information on taxable income or adjusted gross income were combined with knowledge of the tax-rate schedule that applied in each year to compute income-weighted average marginal income-tax rates. Before 1944, the income concept differed slightly from adjusted gross income. The computations take into account the impact of non-filers (who do not show up in the SOI data but should be treated as zero-marginal-rate filers) and differences in the tax treatment of joint filers over time. Estimation of the amount of income not reported in IRS tax filings is important prior to World War II, when a large proportion of Americans were not required to file a tax return.

The marginal-tax-rate series reported in Barro and Sahasakul (1983) begins in 1916, but we added estimates for 1913-15 based on information from the 1916 edition of *Statistics of Income*. (Although the federal income tax went into effect in 1913, the first statistical volume

produced by the IRS applies mainly to 1916.[1]) The marginal-tax-rate structure remained

constant from 1913 to 1915, except that the 1913 tax was prorated to apply for only ten months.

Then the rate structure roughly doubled in 1916. The 1916 IRS publication provides sufficient

data on the distribution of incomes across returns filed in 1914 and 1915 to compute good

estimates of the average marginal income-tax rate. The key table that works for 1914 and 1915

is missing for 1913, so our estimate for that year is based on the change in total tax collections

from 1913 to 1914. While the estimates for 1913-15 are likely not as precise as those for the

remainder of the original series (1916-83), they should be adequate.

Barro and Sahasakul (1986) include a computation of the average marginal tax rate from

the social-security (FICA) payroll tax. The computations consider that the marginal tax rate

from the social-security portion of the FICA tax is zero above a specified earnings ceiling, which

increases through time. (The ceiling does not apply to the Medicare tax, in effect since 1966.)

The calculations depend on estimates of the amount of income above the FICA ceiling in each

year. The procedure also considers that the employer portion of the tax does not enter into the

employee's taxable income. For years prior to the implementation of the FICA tax in 1937, the

average marginal rate from the social-security tax is zero.

Our second data source is the NBER's TAXSIM program, administered by Dan

Feenberg. Given the information on a standard tax filing, this program can calculate the tax

liability for the associated filer under the tax code in effect for that year. TAXSIM can therefore

determine the marginal tax rate faced by an individual taxpayer by adding a small increment (one

dollar) to the relevant source of income and then observing how the tax liability changes. It is

then straightforward to compute an average marginal tax rate by weighting the marginal rates

calculated for each filing by the amount of income of various types reported on the filing.

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[1] As part of these new computations, we updated the average marginal income-tax rate for 1916 from 1.2% to 1.3%

TAXSIM is equipped with a stratified random sample of 100,000 to 200,000 actual tax filings for each year 1960-2006 (except for 1961, 1963, and 1965).  Since people in the upper end of the income distribution are sampled disproportionately, sample weights are used in the calculations.  Because the TAXSIM program incorporates many nuances of the tax code, such as the Alternative Minimum Tax (AMT) and "clawbacks" such as the declining portion of the Earned Income Tax Credit (EITC) and phase-outs of exemptions and deductions, the calculated marginal tax rates account for these features.  We used the program to calculate a series of average marginal income-tax rates from 1966 (when the data are first consistently available) to 2006.  The Barro-Sahasakul series was based on the IRS concept of "adjusted gross income" (AGI).   In TAXSIM, we use a concept of income that approximates labor income—the sum of four income components: wages, self-employment income, partnership income, and S-corporation[2] income.

TAXSIM handles the division of income between spouses (important for assessing FICA liabilities) with a formula for imputing the division of wage and salary income between the two earners.  The program assumes that all other forms of income (interest, capital gains, etc.) are split equally between the two earners.  Using these estimates, the program can compute marginal tax rates from the FICA tax (while taking into account the social-security income ceiling for each year).

Given the high correlation between the Barro-Sahasakul and TAXSIM series in their period of overlap (1966-1983), we are comfortable merging the two series.  In light of the increased importance of factors such as the AMT and EITC in recent years, we decided to begin using the TAXSIM values in the earliest possible year (1966).  Our final series therefore uses our

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[2]S Corporations are a special form of business organization that does not pay corporate income tax; instead, the equity holders pay individual income tax on the corporation's profit or loss (while maintaining the benefits of limited liability)

new estimates from the 1916 SOI publication for 1913-1916, the Barro-Sahasakul figures for 1917-1965, and the TAXSIM numbers for 1966-2006. (A preliminary calculation from the IRS publication for 2007 suggests little change in the average marginal income-tax rate from the federal individual income tax from 2006 to 2007. The TAXSIM information for 2007 will be available soon.)

The calculations for average marginal income-tax rates from state income taxes are more difficult. Beginning in 1979, the samples of tax returns provided to the NBER by the IRS include state identifiers, thereby allowing TAXSIM (which incorporates knowledge of the structure of state marginal income tax rates) to generate a series of average marginal tax rates from state income taxes from 1979 to 2006. Unfortunately, tax returns in the TAXSIM sample with AGI above $200,000 have the state identifier stripped for privacy reasons. While this truncation is not a serious problem in the early parts of the sample, by the 1990s it represents a significant fraction of the filings. To get around this limitation, the program assigns a random state to the filings stripped of their state identifier, in proportion to the number of rich filers in each state (which is known from SOI publications). The author of the program reports that while this approximation is unsatisfactory if one is interested in computing average marginal tax rates for a particular state, it should provide a good approximation for computing a national aggregate of average marginal state-income-tax rates. Another issue is that income tax paid to states is deductible on federal tax returns if an individual itemizes deductions. An increase in the state marginal tax rate therefore produces a smaller increase in the total marginal rate, since some of the increase is offset by the reduced federal liability. Both TAXSIM and IncTaxCalc (described below) account for this interaction by iteratively computing federal and state liabilities when an increment is added to income.

The period prior to 1979 thus presents the biggest challenge. For those years, we employed another tax calculator, IncTaxCalc, which incorporates the tax-rate structure of each state going back to 1900 (Bakija [2007]). IncTaxCalc operates by essentially the same mechanism as TAXSIM: it adds a small increment to the relevant type of income and computes the change in the overall tax liability in order to compute a marginal rate. The program can then calculate a weighted average marginal rate using the total income of each filing for the weights. As discussed above, however, there is unfortunately no sample of tax filings with state identifiers prior to 1979. We therefore provided a synthetic dataset of tax filings to IncTaxCalc based on deflating the 1979 sample of filings by the movements in state per capita personal income (from the BEA) going back to 1929.

Given the difficulty of estimating and sampling from joint distributions of different types of income across states and years, we opted for a straightforward approximation. National Income and Product Accounts (NIPA) data from the BEA give per capita personal income for each state in each year since 1929. Let $y_{i,t}$ be per capita personal income in state $i$ in year $t$, with $i = 1, 2, \ldots, 50$ and $t = 1929, 1930,\ldots 1978$. For each year $t$ and state $i$, a "scaling factor" $s_{i,t}$ can then be produced as $s_{i,t} = \dfrac{y_{i,t}}{y_{i,t+1}}$. As one would expect, these scaling factors are typically less than one, with the notable exception of some Great Depression years (particularly 1929–32). After producing these scaling factors for all $i = 1, 2, \ldots, 50$ and $t = 1929, 1930,\ldots 1978$, we take the sample of tax returns from 1979 from the *TAXSIM* database and convert it to the format used by IncTaxCalc. Our "synthetic" sample of tax returns for 1978 is then produced by multiplying all components of income on each 1979 tax return from state $i$ by $s_{i,1978}$, essentially "scaling" the 1979 tax returns back by the change in per capita income from 1978 to 1979. To produce the

sample of tax returns for 1977, the 1979 filings are each multiplied by $s_{i,1978} \cdot s_{i,1977}$, and so on for all the earlier years. In order to be consistent with the post-1979 series generated from TAXSIM, all matching assumptions are made (on division of income between spouses, assignment of states to high-income filers, etc.). While this approximation is imperfect, it has the advantage of being conceptually straightforward. It also bears a clear relation to the variable of interest—changes in the tax codes of the fifty states over time (which are "known" by IncTaxCalc).

Our series of average marginal tax rates from state income taxes is thus composed of IncTaxCalc's estimates for 1929-1978 and TAXSIM's estimates for 1979-2006. For 1913 to 1928, we used a linear interpolation between a value of zero in 1910 (before Wisconsin implemented the nation's first income tax in 1911) and the computed value of 0.0009 in 1929. Given the extremely small magnitude of state average marginal tax rates during this period, the effect of this interpolation on the sum of the three average marginal rates (federal income tax, FICA, and state income tax) is negligible.