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# Marginal income tax rates in the United States: a non-parametric approach <sup>☆</sup>

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## Abstract

The objective of this paper is to estimate both the U.S. federal marginal income tax rate and the state and local marginal income tax rates. We use the non-parametric regression method and data on income and tax extracted from U.S. Individual Tax Model Files for the period 1985–1995. The flexibility of the non-parametric approach and the information at the individual level enable us to construct a more reliable time series of the average federal marginal income tax rates and that of the average state and local marginal income tax rates. Our results suggest that the average federal marginal income tax rate varies from 18.2% to 21.8%, and the average state and local marginal income tax rate varies from 4.7% to 5.6%. We also find that the state and local income tax accounts for roughly 18% of the total income taxes paid during 1985–1995. Moreover, our analysis shows that Stephenson (*Journal of Monetary Economics* 41 (1998), pp. 389–409) provides the most consistent tax rate series for use in applications that require estimates of tax rates for years prior to 1985. © 2002 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

There is an extensive literature that studies how levels and changes of income taxes affect economic growth and fluctuations in economic activity. These studies highlight taxation policy as an effective policy instrument.<sup>1</sup> For instance, Rebelo (1991) and Jones et al. (1993) suggest that taxation policies have potentially large effects on long-run growth rates. Braun (1994) and McGrattan et al. (1997) show that a significant fraction of the variation in consumption, investment, output, capital stock, and hours of work can be explained by changes in effective marginal tax rates on factor incomes. Empirical study on the effects of taxation requires reliable knowledge of marginal tax rates. Lack of a widely accepted marginal tax rate series would hinder the quantitative analysis of the economic implications of alternative tax policies.

For the United States and Canada, several marginal tax rate series are presently available: Seater (1985), Barro and Sahasakul (1986), Easterly and Rebelo (1993), Gouveia and Strauss (1994), Mendoza et al. (1994), Davies and Zhang (1996) and Stephenson (1998). These studies differ in their estimation approaches and data sets. For example, Barro and Sahasakul (1986) and Davies and Zhang (1996) estimated the statutory tax function while Gouveia and Strauss (1994), and Stephenson (1998) estimated the effective tax function.<sup>2</sup> Moreover, Gouveia and Strauss (1994) used information extracted from the U.S. Individual Tax Model Files (ITF) to estimate a three-parameter nonlinear tax function implied by the principle of equal sacrifice.<sup>3</sup> By contrast, Stephenson (1998) estimated a stepwise linear tax function by using the information contained in the U.S. *Statistics of Income* (SOI) data. As such, it is not surprising that the estimated average marginal income tax rate series differ considerably. For instance, for the year 1986, the tax rate estimated by Stephenson (1998) is 17.3% higher than that estimated by Gouveia and Strauss (1994) but 28.8% lower than that estimated by Mendoza et al. (1994).

This paper attempts to provide a more reliable marginal income tax rate series that may be used as a benchmark to gauge the accuracy of other tax rate series estimated by previous studies. The method employed here differs from most of the previous

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<sup>1</sup>See Barro (1979), Trehan and Walsh (1990) and Serletis and Schorn (1999) on revenue smoothing; Easterly and Rebelo (1993), Hakkio et al. (1996), Smith (1996) and Kim (1998) on tax policies and long-run growth; and Braun (1994) and Lansing (1998) on taxes and business cycles.

<sup>2</sup>The effective tax function represents the relationship between tax liabilities and income. By contrast, the statutory tax function characterizes the relationship between taxes and income contained in the tax law. The effective tax function, an ex post concept, differs from the statutory tax function for two reasons. First, taxable income varies significantly from total income under most income tax laws. Taxable income is typically derived from total income by adjusting total income for a large number of exclusions, deductions and the provision of personal exemptions. In addition, total tax liabilities differ from taxes actually paid due to various credits. Second, taxpayers are likely to alter their behavior in response to the differential treatment of income sources as well as the provision of tax credits. The statutory tax function is therefore merely a benchmark for the empirical relationship between taxes actually paid and income. See Barro and Sahasakul (1983) and Seater (1985) for detailed discussion on which tax rate is more relevant for different types of studies.

<sup>3</sup>Young (1990) and Berliant and Gouveia (1993) provide further details.

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