

# Observations from the U.S. Federal Income Tax to Distinguish Between Measures of Progressivity and Redistributive Capacity

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## ABSTRACT

This study provides insights on the attributes of a tax that are measured by two different classes of progressivity indices – those defined by Kakwani (1977), Suits (1977), Stroup (2005), and Mathews (2016) and those defined by Musgrave & Thin (1948) and Reynolds & Smolensky (1977). Index values are determined for the U.S. Federal Income Tax from 1929 through 2010. These values illustrate that the indices of Kakwani, Suits, Stroup, and Mathews gauge the progressivity of the tax, while those of Musgrave & Thin and Reynolds & Smolensky measure the redistributive capacity of the tax. In the early 1940s the progressivity of this tax significantly decreased at the same time when the redistributive capacity of the tax significantly increased. Since the mid-1970s this tax has (i) been more progressive than it was from the early 1950s through the mid-1970s and (ii) redistributed income to a greater degree than it did from the early 1950s through the mid-1970s.

*Keywords:* income taxation, progressivity measures, progressivity indices, income redistribution, U.S. tax policy

*JEL:* H20, H24, D31

## 1 Introduction

In order for governments to function, it is necessary for them to raise revenues. Thus, both scholars and practitioners of Public Administration must be concerned with government revenue generation. In most developed countries, the bulk of government revenues presently comes from income taxes. For example, in the U.S. in 2013, 91% of Federal Government revenues were attributed to income taxes and payroll taxes.<sup>1</sup> The primary importance of income taxation for government revenue holds even for countries

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<sup>1</sup> See Office of Management and Budget (2015; p. 7).

which have Value Added Taxes. In Slovenia as of 2013, 60% of government revenues resulted from income taxes and social security contributions.<sup>2</sup>

In recent decades, the levels and structures of taxation in many countries have changed dramatically. Focusing on income taxes, the common trend has been for countries to reduce Marginal Tax Rates (MTR, defined as the percentage of the next dollar earned that must be paid in taxes) while broadening the tax base. As argued by Lazović-Pita (2015), this change in policy reflects a shift toward efficiency (over equity) in income taxation. A reduction of MTRs, particularly at the high end of the income scale, makes a tax less progressive and ultimately results in a distribution of income with greater inequality.

A tax is progressive if the Average Tax Rate (ATR, defined as the amount paid in taxes divided by income) increases as income increases. While there has long been agreement on this basic definition of progressivity, scholars have yet to settle on an accepted measure of the degree of progressivity of a tax. Consider the U.S. Federal Income Tax. From an inspection of either MTRs or the resulting ATRs of different segments of taxpayers, this tax has always been a progressive tax.<sup>3</sup> However, it is not clear when this tax was “most progressive.” Further, different measures of progressivity yield conflicting insights, often because they are measuring different attributes of the impact of a tax. The present study contributes to this ongoing discussion by arguing that two well established and widely used indices of progressivity are in fact better thought of as measures of the redistributive capacity of a tax.

Kiefer (2005) offers an insightful discussion of the numerous approaches used to measure the degree of progressivity of a tax. The present study focuses on indices which Kiefer calls “distributional” indices, the value of which depends on both the tax rate structure and the distribution of income within the population subject to the tax.<sup>4</sup> More precisely, the present study considers distributional indices defined in terms of “concentration curves” (such as the well-known Lorenz Curve).

Two of the earliest measures of this type were developed by Musgrave and Thin (1948) – the index of “effective progression” – and Reynolds and Smolensky (1977). These two distinct measures are each defined as a function of the pre-tax and post-tax values of the Gini-Coefficient. Thus, the dependence of each index on the pre-tax and post-tax Lorenz Curves is clear. Subsequently, several other tax progressivity indices based on the relation between

2 This figure is exactly equal to the OECD average, although the breakdown between these three revenue categories differs between Slovenia and the OECD as a whole. See OECD (2014).

3 Tax Foundation (2009a) reports relevant MTRs for each year over the entire history of this tax; the final table in Tax Foundation (2009b) summarizes realized ATRs for different income groups for each year from 1980 to 2008.

4 In contrast, the value of a “structural” index depends upon only the tax structure but not upon the distribution of income. Musgrave & Thin (1948) examine common structural indices, including measures of “average rate progression”, “marginal rate progression”, “liability progression”, and “residual income progression.”

an “income concentration curve” and a “tax concentration curve” were defined by Kakwani (1977), Suits (1977), Stroup (2005), and Mathews (2016).<sup>5,6</sup>

Recognize that a progressive tax (i) places a disproportionate amount of the burden of paying the tax on high income individuals, thereby (ii) making the final distribution of income more equal. Any distributional progressivity index essentially gauges the impact of the tax with respect to these two closely related outcomes. As noted by de Sarralde, Garcimartin, and Ruiz-Huerta (2013), Kakwani’s index and Reynolds & Smolensky’s index measure fundamentally different attributes of a tax: Kakwani’s index quantifies the “progressivity” of the tax by computing the “disproportionality of tax payments relative to pre-tax incomes”, whereas Reynolds & Smolensky’s index quantifies the “redistributive capacity” of the tax by measuring “the difference between pre- and post-tax income distributions” (p. 326).

Using this observation by de Sarralde et al. (2013) as motivation, the aim of the present study is to clearly illustrate how different progressivity indices measure distinct characteristics of a tax. Numerical values of various indices are computed for the U.S. Federal Income Tax from 1929 through 2010. Observing index values over such a long period of time (during which there were significant changes in both the fraction of the population subject to paying the tax and total taxes paid as a percentage of societal income) allows us to gain insight into what is actually being measured by each index. Based upon observed values, it is argued that while the indices of Kakwani, Suits, Stroup, and Mathews gauge “progressivity”, the indices of Musgrave/Thin and Reynolds/Smolensky are better thought of as measures of “redistributive capacity”.

This is not to say that the indices of Musgrave/Thin and Reynolds/Smolensky are not useful. On the contrary, which class of indices is more insightful depends upon what questions one would like to address (i.e., what aspects of policy one is trying to assess). For example, someone who wants to gauge how the burden of financing government spending is spread over different segments of the population could look at the values of the measures of Kakwani, Suits, Stroup, and Mathews to make this assessment. Alternatively, someone who thinks that tax policy should reduce income inequality

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5 Two other measures of this type were developed by Khetan and Poddar (1976). But, as explained within Mathews (2016), one of Khetan and Poddar’s measures can be expressed as a monotonic transformation of Suits’ index while the other can be expressed as a monotonic transformation of Stroup’s index.

6 Additional alternative approaches for assessing progressivity have been offered by: Baum (1987) who develops the notion of “relative share adjustment” to measure how a tax alters the share of income realized by different segments of society; Allen & Campbell (1994) who examine the difference in average tax rate between very high income households and moderate income households; and Piketty & Saez (2007) who examine and compare levels of average tax rate across groups of taxpayers with different levels of income, paying particular attention to individuals at the high end of the income scale. In contrast to the indices examined in the present study, these alternative approaches do not make any attempt to construct a single dimensional progressivity measure.

could look to the measures of Musgrave/Thin and Reynolds/Smolensky to see if the tax is indeed helping to achieve their desired objective.

The remainder of the paper is structured as follows. A brief overview of the six indices which serve as our focus is presented in Section 2. A discussion of the computation of numerical values of these indices is offered in Section 3. Index values for the U.S. Federal Income Tax from 1929 through 2010 are examined in Section 4. The observations made within this discussion support the claim that while the indices of Kakwani, Suits, Stroup, and Mathews gauge “progressivity”, the indices of Musgrave/Thin and Reynolds/Smolensky are better thought of as measures of “redistributive capacity”. Section 5 briefly concludes.

## 2 Definitions and Previously Observed Values of Indices

A detailed discussion of the definitions and relations between the four indices of Kakwani ( $K$ ), Suits ( $S$ ), Stroup ( $St$ ), and Mathews ( $M$ ) is provided within Mathews (2016). Each of these four indices is defined as a ratio of areas in relation to plots of an “income concentration curve” (which summarizes how incomes are allocated over the population, ordered from lowest income earners to highest income earners) and a “tax concentration curve” (which summarizes how tax payments are allocated over the population, ordered from lowest income earners to highest income earners). The antecedent in each index (i.e., the first term in the ratio) is a weighted difference between income and taxes paid over the population being taxed. For  $K$  and  $St$  different segments of the population are weighted equally, while for  $S$  and  $M$  different segments of the population are weighted by their marginal contribution to cumulative income. For  $S$  and  $St$  the consequent (i.e., the second term in the ratio) is a similarly weighted value of income, while for  $K$  and  $M$  the consequent is a similarly weighted value of population.<sup>7</sup> As defined, each index can range in value between 0 and 1, with a larger value corresponding to taxation outcomes that are more progressive.

Both Musgrave & Thin’s index ( $MT$ ) and Reynolds & Smolensky’s index ( $RS$ ) are direct functions of the pre-tax and post-tax values of the Gini coefficient.<sup>8</sup> Letting  $G_I$  denote the initial (i.e., pre-tax) value of the Gini coefficient and  $G_F$  denote the final (i.e., post tax) value of the Gini coefficient, Reynolds & Smolensky’s index is simply  $RS = G_I - G_F$  and Musgrave & Thin’s index is simply  $MT = (1 - G_I)/(1 - G_F)$ . Under a progressive tax individuals with higher incomes have higher Average Tax Rates. This results in a reduction in income

7 For a graphical depiction of these curves and a more detailed discussion of these definitions, see Mathews (2016).

8 The Gini coefficient is the most widely used measure of income inequality. It is defined in relation to the income concentration curve with respect to population (i.e., a curve which illustrates the relation between cumulative fraction of population and their corresponding cumulative fraction of societal income) as the ration of the area between this concentration curve and the 45°-line to the entire area below the 45°-line. The value of the Gini coefficient ranges between 0 and 1, with a smaller value revealing less income inequality.

inequality and is reflected by a decrease in the value of the Gini coefficient. Consequently, for a progressive tax:  $G_F < G_I$ , implying  $RS > 0$  and  $MT > 1$ . In order to have values of these two indices which are on a comparable scale, consider a simple additive transformation of Musgrave & Thin's index:  $\overline{MT} = MT - 1$ . Note that  $\overline{MT} = RS/(1 - G_I)$ , from which it is apparent that the value of both  $RS$  and  $\overline{MT}$  is positive for a progressive tax.

Numerical values of  $St$ ,  $S$ ,  $K$ , and  $M$  for the U.S. Federal Income Tax have previously been determined by numerous researchers, including: Kakwani (1977) using his measure for 1968, 1969, and 1970; Suits (1977) using his measure for 1966 and 1970; Stroup (2005) using his measure for 1980 through 2000; Mathews (2016) using all four measures for 1987 through 2010; and Mathews (2014) using all four measures for 1929 through 2009.<sup>9</sup> The Congressional Budget Office (2012) reports values of  $K$  and  $RS$  for both the U.S. Federal Income Tax and all federal taxes from 1979 through 2009. Stroup (2005), the Congressional Budget Office (2012), and Mathews (2014 and 2016) each present evidence to support a claim that the U.S. Federal Income Tax has become more progressive in recent decades. But while the Congressional Budget Office analysis does suggest that the U.S. Federal Income Tax became more progressive between 1979 and 2009, it also reveals that the progressivity of all federal taxes has either increased less substantially (based upon Kakwani's index) or not changed much at all (based upon Reynolds & Smolensky's index) over this time (see Congressional Budget Office (2012), Supplemental Table 9). This final observation is important because it begins to reveal how the distinct measures of Kakwani and of Reynolds & Smolensky can yield observations on changes in the degree of progressivity over time which appear to be at odds with one another.

In addition to determining values of his index for the U.S., Kakwani (1977) computes values for Australia (for 1968 through 1972), Canada (for 1968 through 1970), and the United Kingdom (for 1964 through 1967). His results suggest that during these years income taxation in these four countries was least progressive in the U.S. and most progressive in the U.K. Khetan and Poddar (1976) determine numeric values of two different indices (one is a monotonic transformation of Suits' index and the other is a monotonic transformation of Stroup's index) for Canada from 1961 through 1971. Their results suggest that federal income taxation in Canada became less progressive during these years. More recently, Verbist and Figari (2013)

<sup>9</sup> It is important to stress that the present study focuses solely on the U.S. Federal Income Tax and does not encompass other federal taxes (e.g., payroll, estate, and corporate taxes). Clearly, the overall progressivity of all federal taxes could differ from that of the Federal Income Tax. Piketty and Saez (2007) argue that the U.S. Federal tax system as a whole became less progressive between 1960 and 2004, due to an increased significance of fairly regressive payroll taxes and a diminished significance of highly progressive corporate and estate taxes. But, it is important to recognize that Piketty and Saez do not consider any of the four income/tax concentration based distributional indices which are the primary focus here. Rather, they present a broad, general discussion of trends over time in average tax rates and the after tax position of different segments of the population (with an emphasis on subsets at the high end of the income scale, such as the "top 1%", "top 0.1%" and "top 0.01%").

compute values of Kakwani's index for the EU15 in 1998 and 2008. Their analysis reveals tremendous variation in tax progressivity across these 15 countries, with the most progressive outcomes found in Ireland and the least progressive outcomes found in Denmark and Sweden.

### 3 Computations of Index Values

Focusing on the U.S. Federal Income Tax, numerical values of  $S_t$ ,  $S$ ,  $K$ ,  $M$ ,  $\overline{MT}$ , and  $RS$  are determined for every year between 1929 and 2010. In order to compute these values, it is necessary to construct various concentration curves.<sup>10</sup> The bulk of the data used to construct these curves was obtained from the Internal Revenue Service's "Statistics of Income" report for each relevant year.<sup>11</sup> Each report summarizes the number of tax returns filed, the amount of income represented on the filed tax returns, and the amount of taxes paid (broken down by taxpayer income levels). For example, the data reported in Table 3 on Pages 68–70 of the "Statistics of Income for 1932" show that in this year 3,877,430 returns were filed, and that the people filing these returns collectively had a combined net income of \$11,655,756,678 and collectively had to pay \$329,962,311 in Federal Income Taxes.<sup>12</sup> As an example of how this data is further broken down by taxpayer income levels, Table 3 of the "Statistics of Income for 1932" further reveals that in this year people with net incomes of \$2,000 or less collectively filed a total of 1,849,277 returns, had a combined net income of \$2,376,974,549 and had a combined tax obligation of \$12,357,186.

When constructing the relevant concentration curves, it is necessary to define (either explicitly or implicitly) the population over which the index values are to be determined. If the population of interest is simply those people filing tax returns, then the curves can be constructed and the index values determined from solely the data in the "Statistics of Income" reports. This is the approach taken by Kakwani (1977), Suits (1977), Stroup (2005), Congressional Budget Office (2012), and Mathews (2016). However, if the true desire is a measure of the degree of progressivity over the entire population, then focusing on only those individuals filing returns has shortcomings. First, if individuals with incomes below a certain level are not even required to file a return (as has always been the case for the U.S. Federal Income Tax), then this approach ultimately understates the degree of progressivity at each point in time. Second, if the fraction of adults required to file a return changes dramatically,

<sup>10</sup> To compute  $K$ ,  $S$ ,  $S_t$ , and  $M$  it is necessary to construct a "tax concentration curve with respect to population", an "income concentration curve with respect to population", a "tax concentration curve with respect to income", and a "population concentration curve with respect to income" for each year. Similarly, to compute  $RS$ , and  $\overline{MT}$  it is necessary to additionally construct a "post tax income concentration curve with respect to population".

<sup>11</sup> All reports can be accessed through <http://www.irs.gov/uac/Tax-Stats-2>. For example, "Statistics of Income for 1932" is available at <http://www.irs.gov/pub/irs-soi/32soirepar.pdf>.

<sup>12</sup> Table 1 (presented in the Appendix of the paper) provides a summary of these values (along with the values of several other variables of interest) for the time period under consideration. In the interest of brevity, these values are reported for only every other year between 1929 and 2010.

then focusing only on this restricted population could give misleading results when examining how the degree of progressivity has evolved over time.

Using additional data from the Bureau of Economic Analysis and the U.S. Census Bureau, Mathews (2014) constructed concentration curves and computed index values over the entire adult population. This is the first study to truly gauge the progressivity of the U.S. Federal Income Tax over the *entire* population, and not over just *people filing tax returns*. A similar approach is used in the present study.

For each year from 1929 through 2010, data on total Personal Income for the U.S. were obtained from the Bureau of Economic Analysis and estimates of the total adult population in the U.S. were obtained from the U.S. Census Bureau.<sup>13</sup> These figures are reported for every other year between 1930 and 2010 in the columns labeled "Total Societal Income" and "Total Adult Population" in Table 1 (presented in the Appendix of the paper). It is worth noting that the present study uses data on Personal Income collected after the comprehensive revision of national income accounts which was undertaken by the Bureau of Economic Analysis in 2013, whereas Mathews (2014) used data on Personal Income collected before this comprehensive revision. As a consequence, the numerical values of  $St$ ,  $S$ ,  $K$ , and  $M$  which are obtained differ between the two studies.

Returning attention to the "Statistics of Income Reports," the total number of adults represented on all filed tax returns was determined in each year (see "Adults Represented on Returns" in Table 1). From here, the percentage of all adults represented on a filed tax return was computed for each year (see "Percentage of Adults on Returns" in Table 1).

Following an approach first used by Suits (1977), each of the five relevant concentration curves for each year is constructed as a piecewise linear function passing through each relevant pair of values and the implicit endpoints of (0,0) and (1,1). For the resulting piecewise linear concentration curves, the relevant areas between the various curves each consist of a collection of triangles and trapezoids.

As was done in Mathews (2014), when constructing the concentration curves which depend upon income the income not represented on filed tax returns (i.e., the residual income of society) is allocated equally across the total adult population. As an example, in 1944 a total of 46,919,590 tax returns were filed for 71,270,340 adults. The total adult population in this year, based upon U.S. Census Bureau estimates, was 97,153,352. Thus, roughly 26.64% of the adult population was not represented on a filed tax return and, therefore,

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<sup>13</sup> The former figures were obtained from [http://www.bea.gov/iTable/index\\_nipa.cfm](http://www.bea.gov/iTable/index_nipa.cfm), and the latter figures were obtained from <http://www.census.gov/popest/data/historical/index.html>.

did not pay any income taxes.<sup>14</sup> Consequently, the starting point for the tax concentration curve with respect to population is the point (0.2664, 0). Those individuals filing tax returns had a combined net income of \$116,714,736,000, whereas total societal income was \$169,700,000,000. Thus, the residual income of society was \$52,985,264,000, roughly 31.22% of total societal income. Allocating this residual income equally over the entire adult population, it follows that the 26.64% of the population not represented on a filed tax return accounted for approximately  $0.2664 \times 0.3122 \approx 0.0832$  of total societal income. Consequently, the first segment of the income concentration curve with respect to population extends from the origin through the point (0.2664, 0.0832). Following this approach, each relevant concentration curve is constructed for each year. From here, it is straightforward to determine numerical values of  $St$ ,  $S$ ,  $K$ ,  $M$ ,  $\overline{MT}$ , and  $RS$  in each year from 1929 to 2010.

## 4 An Examination of Index Values

For each year from 1929 through 2010, the resulting values (determined using the data and approach described in Section 3) of  $St$ ,  $S$ ,  $K$ , and  $M$  are reported in Table 2 and plotted in Figure 1. Similarly, values of  $\overline{MT}$  and  $RS$  are reported in Table 3 and plotted in Figure 2<sup>15</sup>.

### 4.1 Observations on $St$ , $S$ , $K$ , and $M$

Focusing first on  $St$ ,  $S$ ,  $K$ , and  $M$ , an inspection of Table 2 and Figure 1 reveals general trends in the degree of progressivity which are very similar to those discussed in Mathews (2014).<sup>16</sup> For example, just as in Mathews (2014),  $St$  identifies 1929 and  $S$ ,  $K$ , and  $M$  each identify 1931 as the year of most progressive taxation outcomes, while all four indices identify 1969 as the year of least progressive taxation outcomes over this period. Additionally, there is a consistent trend toward taxation outcomes that are increasingly more progressive from the late 1960s up to the present day. As a consequence, taxation outcomes in recent years are more progressive than at any point in time post World War II. In 2009 the value of:  $St$  was greater than in every year from 1942 onward;  $S$  was greater than in every year from 1943 onward;  $K$  was greater than in every year from 1943 onward; and  $M$  was greater than in every year from 1944 onward. Furthermore, for each index, the second largest value over this same time period was realized in 2010.

<sup>14</sup> Since some people who file a tax return but do not ultimately have a positive tax burden, the percentage of the total population that paid no income tax would be greater than 26.64%. That is, this figure of 26.64% represents the minimum percentage of the population that paid no income taxes.

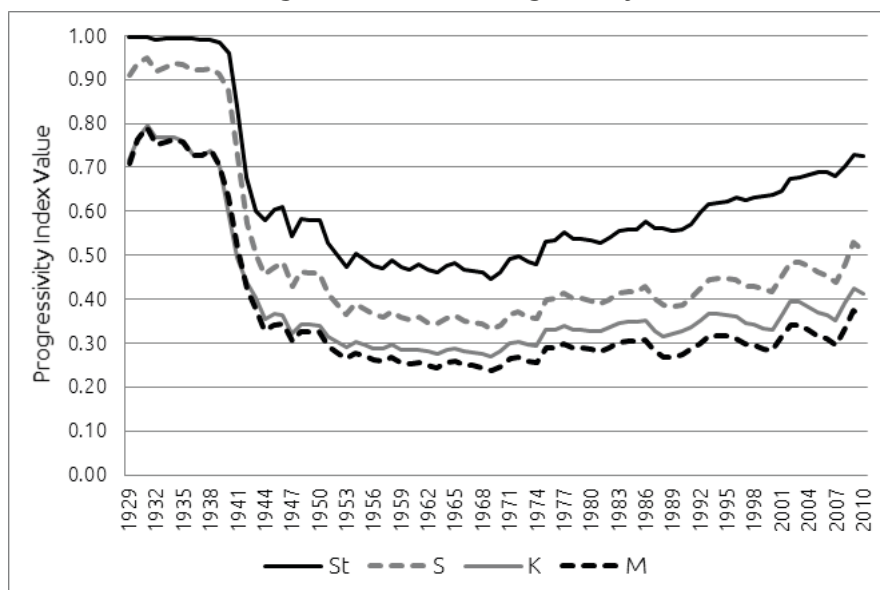
<sup>15</sup> Tables are presented in the Appendix of the paper.

<sup>16</sup> This should not be surprising, since the only difference between the values of  $St$ ,  $S$ ,  $K$ , and  $M$  in Mathews (2014) and the present study is that the latter were computed using data on Personal Income collected after the Bureau of Economic Analysis' most recent comprehensive revision of national income accounts. As a result, while the obtained numerical values of  $St$ ,  $S$ ,  $K$ , and  $M$  differ between the two studies, for the most part the differences are minimal.



These results are qualitatively consistent with Mathews (2016) which finds that over the period from 1987 through 2010, the U.S. Federal Income Tax was most progressive in 2009 (according to each of these four indices). Recall, however, that Mathews (2016) – as well as all other studies cited, with the exception of Mathews (2014) – effectively computes index values over only taxpayers (as opposed to over the entire population). Consequently, the index values reported in Mathews (2016) are numerically smaller than those reported here.<sup>17</sup> Similarly, the results reported here are qualitatively consistent with those of Stroup (2005), where values of  $St$  were computed for each year from 1980 through 2000. Over this time period, both the present study and Stroup identify 1981 as the year of least progressive taxation and 2000 as the year of most progressive taxation. Furthermore, according to the findings of both studies, there was a sizable jump in the degree of progressivity between 1992 and 1993, causing all outcomes from 1993 through 2000 to be more progressive than all outcomes between 1980 and 1992. Finally, the present results are broadly consistent with those of the Congressional Budget Office (2012) study, which, based upon computed values of  $K$ , finds that taxation outcomes became more progressive between 1979 and 2009.

**Figure 1: Indices of Progressivity**



Source: Author's calculations (as reported in Table 2).

While taxation outcomes in recent years appear to be the most progressive in several decades, they are by no means the most progressive over the entire history of the U.S. Federal Income Tax. As noted above,  $St$  identifies

<sup>17</sup> Since index values are computed over different populations in the present study and the bulk of the existing literature, comparisons of numeric values across studies are difficult to make. This is particularly true for the studies such as Kakwani (1977) and Suits (1977), which only report index values for the U.S. Federal Income Tax for three and two years respectively.

1929 and *S*, *K*, and *M* each identify 1931 as the year of most progressive taxation outcomes. As can be seen from an inspection of Figure 1, during the early 1940s there was a dramatic transformation in the degree of progressivity. Each of these four indices decreased considerably in 1941, 1942, and 1943. Consequently, for each index, the largest realized value from 1942 onward is less than the smallest realized value between 1929 and 1941.<sup>18</sup> These observations reveal that the early 1940s was a point of demarcation between an initial period of very progressive taxation and a subsequent period of relatively less progressive taxation.

This shift was driven in large part by the significant increase in the percentage of the population subject to paying the tax which occurred at this time. Because of the fact that some people must file a tax return even though they ultimately do not have to pay any taxes, the percentage of adults represented on tax returns is not the same as the percentage of adults who must pay the tax. But, the former provides an upper bound on the value of the latter (i.e., the percentage of adults who are subject to paying the tax must be less than the percentage of adults represented on tax returns). Between 1929 and 1936, less than 10% of the adult population was represented on filed tax returns, implying that less than 10% of the population was subject to paying the tax. During the years in which the degree of progressivity sharply increased, the percentage of adults represented on filed tax returns abruptly increased from 12.06% in 1939, to 24.03% in 1940, to 42.85% in 1941, to 59.99% in 1942, and to 68.59% in 1943. The percentage of adults represented on filed tax returns reached 73.36% in 1944 and has remained above this level in every year since. The dramatic transformation in the degree of progressivity which occurred in the early 1940s coincided with the conversion of the U.S. Federal Income Tax from a tax levied only on very high income earners to a tax levied on the masses.

From an inspection of the index values reported in Table 2 (and plotted in Figure 1), we can begin to make some casual insights on how the degree of progressivity is related to political leadership. For example, the dramatic decline in the degree of progressivity which occurred in the early 1940s took place when President Franklin Roosevelt, a Democrat, occupied the White House. More recently, we observe sizable increases in the value of each progressivity index in 1993, 2002, and 2009. In each of these years there was a significant change in the tax code. The “Omnibus Budget Reconciliation Act of 1993” (OBRA-93), signed into law by Democrat President William Clinton, created higher MTRs of 36.0% and 39.6% at the upper-end of the income distribution, while leaving MTRs on lower levels of income essentially unchanged. These changes should make outcomes more progressive. The “Economic Growth and Tax Relief Reconciliation Act of 2001” (EGTRRA-01), enacted by Republican President George W. Bush, decreased MTRs across

<sup>18</sup> For each index, a similar statement also holds with either 1940 or 1941 as the relevant cutoff (instead of 1942).

the board. Most significantly, it established a new 10% tax bracket at the lowest end of the income scale (on a portion of income which had previously been taxed at a MTR of 15%). Additionally, compared to the rates in place in 2000, EGTRRA-01 decreased the MTRs above the 15% bracket by one percentage point. Since the reduction of the initial MTR from 15% to 10% is more drastic than the reduction of the higher MTRs by one percentage point, the changes from EGTRRA-01 should likely make outcomes more progressive. Finally, the increase in progressivity which occurred in 2009 was due in part to the temporary Making Work Pay tax credit (signed into law by Democrat President Barack Obama) which was in place for low and middle income taxpayers in 2009 and 2010.

Over the entire time period from 1929 through 2010 higher degrees of progressivity were realized when Democrat presidents were in power than when Republican presidents were in power. To this point, the mean value of  $S$  was 19.03% higher in the years when a Democrat was President than in the years when a Republican was president (taking on a mean value of 0.44235 under Republican presidents versus 0.52654 under Democrat presidents). Based upon running a simple OLS regression with the value of  $S$  as the dependent variable and a dummy variable for "Democrat president" as the single independent variable, this difference in mean value is statistically significant at the 5% error level (the  $p$ -value for this regression is 0.03909).<sup>19</sup>

While these observations are worth making, they should not be interpreted to mean that there is a direct causal relation between political party of the current president and degree of tax progressivity. After all, a president is never able to enact his preferred policies unchecked. The results summarized above in no way account for when a president was working with a congress of his own party, a congress of the rival party, or a split congress. Further, as measured by  $St$ ,  $S$ ,  $K$ , and  $M$ , the degree of progressivity depends upon not just the tax code, but also upon both levels of and the distribution of income. The impact of public policy on these outcomes is less immediate and direct. To this point, changes in policy (both related and unrelated to the tax code) enacted in one year will likely impact economic outcomes for years to come.<sup>20</sup> The simple, preliminary insights offered above make no attempt to address these concerns.

<sup>19</sup> Similarly, the mean values of  $St$ ,  $M$ , and  $K$  were respectively 11.48%, 20.45%, and 14.39% higher under Democrat presidents than under Republican presidents. However, based upon similar OLS regressions, the difference in mean for  $St$  and  $M$  is statistically significant at only the 10% error level (the associated  $p$ -values are 0.06651 and 0.06057 respectively), while the difference in  $K$  is not statistically significant (the associated  $p$ -value is 0.10960).

<sup>20</sup> In fact, it could even be the case that people begin to alter their behavior prior to policies being enacted or a politician coming to power (based upon changed perceptions of the likelihood of different future events). For example, Halcoussis, Lowenberg, and Phillips (2009) conduct a detailed empirical analysis of stock market and public opinion data in advance of the 2008 U.S. Presidential election, providing evidence that changes in stock market outcomes were caused by (rather than causing) changes in the perceived likelihood of an electoral victory by President Obama.

A comparison of the degree of tax progressivity in the U.S. (based upon the findings of the present study) to other countries (based upon the findings of Kakwani (1977), Khetan and Poddar (1976), or Verbist and Figari (2013)) is somewhat difficult because of the facts that these other studies: (i) report index values for much shorter periods of time and (ii) compute index values over different segments of the population (i.e., over taxpayers, not all adults). However, as noted above, (insomuch as comparisons can be made) the present results are broadly consistent with previous studies. Recall that Kakwani observed that in the 1960s income taxation in the U.S. was less progressive than in Australia, Canada, and the U.K. For the EU15 countries, Verbist and Figari computed values of  $K$  that ranged from 0.0891 (Sweden) to 0.2676 (Ireland) in 1998 and from 0.0816 (Denmark) to 0.3205 (Ireland) in 2008. The values of  $K$  reported in Table 2 for the U.S. in these years are 0.34372 and 0.39121 respectively, which are higher than the values for Ireland in each year. However, due to the differences in segments of the population over which the index values are computed, the values of  $K$  reported in Mathews (2016) – values of 0.1575 in 1998 and 0.1995 in 2008 – are more comparable to those determined by Verbist and Figari. Based upon these values, in comparison to the EU15 countries, in terms of degree of progressivity the U.S. would have ranked 9<sup>th</sup> in 1998 and 5<sup>th</sup> in 2008.

Finally recognize that when considering tax structures across countries, there is the potential for “tax competition” between administrative jurisdictions. As defined by Klun (2006, p. 7), tax competition is “competition between national economies to increase their competitiveness and attract foreign investment by means of their tax policy”. Part of the shift toward lower MTRs – and, consequently, taxation outcomes that can be broadly described as less progressive – which has occurred in several countries (including the U.S.) in recent decades could be a result of tax competition, as countries vie for highly skilled workers and profitable corporations.

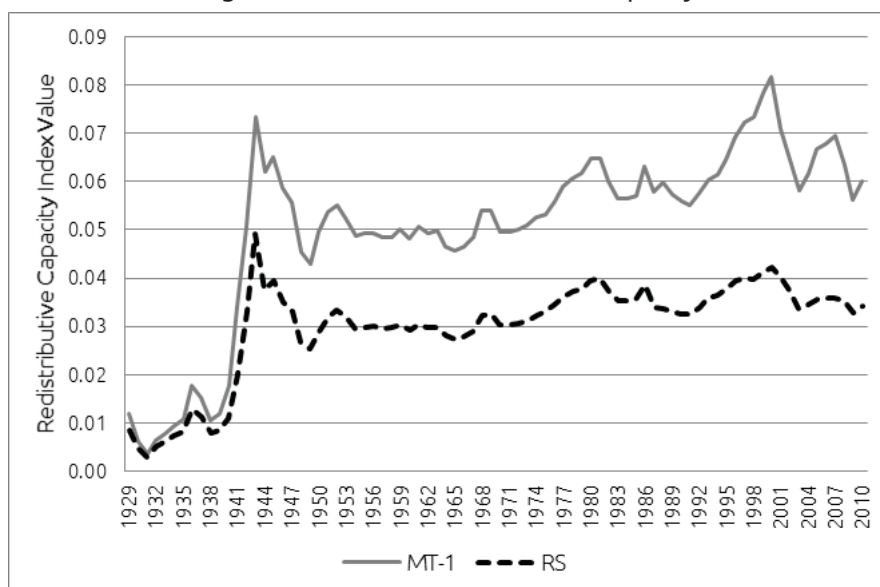
#### 4.2 Observations on $\overline{MT}$ and $RS$

Switching attention to  $\overline{MT}$  and  $RS$ , an inspection of Table 3 and Figure 2 immediately reveals that the values of these indices have varied greatly over time. Again, index values changed dramatically in the early 1940s. But, in stark contrast to the insights obtained within Subsection 4.1, numerical values for these two indices are much lower before the 1940s than at any time since.<sup>21</sup> As will be explained, this seemingly contradictory insight results because in the early 1940s there was a dramatic and sudden increase in the fraction of the total population subject to the income tax. The accompanying discussion will elucidate precisely what each class of indices primarily measures – the four indices examined in Subsection 4.1 quantify the progressivity of the tax burden (i.e., the degree to which the burden of paying the tax is borne

<sup>21</sup> However, these two additional indices reinforce the observation that the time-period from the early 1950s onward can be divided into an initial period of relatively low progressivity followed by a more recent period of relatively high progressivity.

by high income individuals), whereas those developed by Musgrave & Thin and Reynolds & Smolensky quantify the redistributive capacity of the tax (i.e., the degree to which the tax alters the distribution of income).

**Figure 2: Indices of Redistributive Capacity**



Source: Author's calculations (as reported in Table 3).

The values of  $\overline{MT}$  and  $RS$  provide insights which are similar to each other but in part contrast greatly with some of the results discussed in Subsection 4.1. For the period from 1929 through 2010, both  $\overline{MT}$  and  $RS$  achieved their minimum value in 1931. While  $\overline{MT}$  and  $RS$  did not achieve their maximum values over this time period in the same year (the largest value of  $\overline{MT}$  was 0.08169, which occurred in 2000; the largest value of  $RS$  was 0.04905, which occurred in 1943), they tended to realize relatively large values in common years. For example, for each index the realized value in the three years of 1943, 1999, and 2000 ranked among the four highest values over this 82 year time period.<sup>22</sup> This correlation between the values of  $\overline{MT}$  and  $RS$  should not be surprising, since, after all, there is a close relation between the definitions of the two measures:  $\overline{MT} = RS/(1 - G_T)$ .

Observe that the values of both  $\overline{MT}$  and  $RS$  increased abruptly in 1941, 1942, and 1943. Moreover, for each of these two indices every single realized value from 1942 onward is greater than every single realized value between 1929 and 1941.<sup>23</sup> Thus, each of these two measures also suggests that the early 1940s is a point in time of demarcation. Furthermore, if we think of each

<sup>22</sup> Similarly, for each index the realized value in the five years of 1943, 1997, 1999, 2000, and 2001 ranked among the six highest values over this 82 year time period.

<sup>23</sup> For each index a similar statement would also hold with 1941 as the cut-off year instead of 1942.

class of measures as indices of progressivity, then the observations seem to contradict one another – in Subsection 4.1 it was observed that taxation outcomes before this time were much more progressive than outcomes since, whereas the present observations appear to suggest that taxation outcomes before this time were much less progressive than outcomes since.

Finally, as was done for the previous class of indices, an attempt can be made to determine if there is any relation between the realized values of  $\overline{MT}$  and  $RS$  and political leadership. Between 1929 and 2010, the mean values of both  $\overline{MT}$  and  $RS$  were actually smaller under Democrat presidents than under Republican presidents (6.70% and 6.08% lower, respectively).<sup>24</sup> Again, if we think of each class of measures as indices of progressivity, then these observations seem to present a contradiction – in Subsection 4.1 we observed that taxation outcomes were more progressive when Democrat presidents were in office, whereas the present observations appear to suggest that taxation outcomes were less progressive when Democrat presidents were in office.

### 4.3 Disproportionality of Tax Payments Versus Redistributive Capacity

These apparently contradictory observations of Subsections 4.1 and 4.2 can be reconciled by scrutinizing the fundamental difference between what  $St$ ,  $S$ ,  $K$ , and  $M$  measure and what  $\overline{MT}$  and  $RS$  measure. Recognize that a progressive tax: (i) places a disproportionate amount of the burden of paying the tax on high income individuals and (ii) makes the final distribution of income more equal. Any distributional progressivity index essentially gauges the realized performance of the tax with respect to these two closely related (but distinct) outcomes. As noted by de Sarraalde et al. (2013), Kakwani's index and Reynolds & Smolensky's index measure fundamentally different attributes of a tax: Kakwani's index quantifies the "progressivity" of the tax by computing the "disproportionality of tax payments relative to pre-tax incomes," whereas Reynolds & Smolensky's index quantifies the "redistributive capacity" of the tax by measuring "the difference between pre- and post-tax income distributions" (p. 326). These characterizations carry over to the similarly defined indices, so that  $St$ ,  $S$ ,  $K$ , and  $M$  each quantify the progressivity of the burden of the tax (i.e., the degree to which high income individuals bear the burden of paying the tax) whereas  $\overline{MT}$  and  $RS$  each quantify the redistributive capacity of the tax (i.e., the degree to which the distribution of income is altered by the tax).

In order for a tax to substantially alter the distribution of income (i.e., to have a great redistributive capacity), two conditions must be met: (a) the burden

<sup>24</sup> However, neither difference in mean is statistically significant. The associated  $p$ -values for simple OLS regressions similar to those described in the previous sub-section are 0.38228 (for a regression with  $\overline{MT}$  as the dependent variable) and 0.39423 (for a regression with  $RS$  as the dependent variable).

of the tax must be disproportionately borne by one segment of the population (e.g., "high income individuals") and (b) the tax itself must be sizable (i.e., significantly large, perhaps measured as a percentage of income taken by the tax). The indices which focus on the progressivity of the burden of the tax (i.e.,  $St$ ,  $S$ ,  $K$ , and  $M$ ) are only influenced by "condition (a)," not "condition (b)." That is, for  $St$ ,  $S$ ,  $K$ , and  $M$  the size of the tax system does not matter. However, for  $\overline{MT}$  and  $RS$  the size of the tax system can matter quite a bit. This difference is encapsulated by a recent Congressional Budget Office study which observes that Kakwani's index measures who bears the burden of paying the tax based upon "the shares of taxes paid and the shares of income received by different income groups" and is therefore "indifferent to the size of the tax system" (CBO, 2011, p. 42). In contrast, Reynolds & Smolensky's index "measures the redistributive effect of the tax system" and is defined in a manner so as to be "a function of...the share of household income claimed by the tax system" (CBO, 2011, p. 42).

Thus, the seemingly contradictory observations made in Subsections 4.1. and 4.2 result because in the early 1940s (as reported in Table 1) there was a dramatic and sudden increase in both the "Percentage of Adults on Returns" (which provides an upper bound on the value of – and in some sense can also serve as a rough proxy measure for – the percentage of the population subject to the tax) and "Taxes Paid as a percentage of Societal Income" (which provides a measure of the size of the tax). As previously noted, the "Percentage of Adults on Returns" (which was below 10% in every year up through 1936) increased to 12.06% in 1939, 24.03% in 1940, 42.85% in 1941, 59.99% in 1942, 68.59% in 1943, and 73.36% in 1944.<sup>25</sup> This figure has been above 75% in every year since 1945 and above 80% in every year since 1950.

"Taxes Paid as a percentage of Societal Income" underwent a similarly dramatic change during these years. In 1939 this figure was 1.21% (and had been 1.75% or lower in every previous year). It then increased to 1.81% in 1940, 3.90% in 1941, 6.96% in 1942, 10.87% in 1943, and 9.56% in 1944 (and has been above 7% in all but one year since 1942, the one exception being 1949 when it was equal to 6.88%).<sup>26</sup>

When only a very small fraction of the population is subject to paying a progressive tax (as was the case for the U.S. Federal Income Tax before the early 1940s), the burden of the tax will clearly be borne disproportionately by high income individuals. The very high values of  $St$ ,  $S$ ,  $K$ , and  $M$  before the early 1940s are simply a reflection of this fact. As the fraction of the population

<sup>25</sup> Recall, for brevity Table 1 only reports values for every other year between 1929 and 2010.

<sup>26</sup> The initial climb in the early 1940s can be justified as a necessary means for financing the increased military spending by the government during World War II. National Defense Spending as a percentage of GDP in the U.S. increased from "less than 1 percent of GDP in 1929 up to 43 percent in 1944" (Walker 2012, p. 6). But, when military spending returned to lower levels after World War II, "Taxes Paid as a percentage of Societal Income" remained high. Post World War II, National Defense Spending as a percentage of GDP "has ranged from a high of 15 percent in 1952 (during the Korean War) to a low of 3.7 percent in 2000" (Walker 2012, p. 6).

subject to the tax greatly expanded in the early 1940s, the burden of the tax was spread over a much wider portion of the population, illustrated by the dramatic decrease in the values of  $St$ ,  $S$ ,  $K$ , and  $M$ .

In terms of redistributive capacity, recall that in order for a tax to substantially alter the distribution of income the tax must be sizable. A tax that is relatively small (as was the U.S. Federal Income Tax before the early 1940s) will not be able to substantially alter the distribution of income, regardless of how the burden of the tax is spread over different segments of the population. The very low values of  $\overline{MT}$  and  $RS$  prior to the early 1940s are a reflection of this fact. After the size of the tax was substantially increased in the early 1940s, the tax now had the potential to significantly alter the distribution of income. Since the burden of the tax was progressive (i.e., high income individuals bore a greater burden of paying the tax) both before and after this increase in the size of the tax, increasing the size of the tax resulted in a greater redistribution of income, illustrated by the dramatic increase in the values of  $\overline{MT}$  and  $RS$ .

While these two different sets of indices provide essentially opposite insights on the degree of progressivity (i.e., the disproportionality of tax payments relative to incomes) and the redistributive capacity (i.e., degree to which the distribution of income is altered by the tax) of the U.S. Federal Income Tax before/after the early 1940s, they reveal similar trends in these two attributes since the early 1950s. An inspection of Table 2 reveals that: for  $St$  the minimum value from 1975 onward (of 0.53166 in 1975) is greater than the maximum value between 1951 and 1974 (of .52650 in 1951); for  $K$  the minimum value from 1975 onward (of 0.31537 in 1988) is greater than the maximum value between 1951 and 1974 (of 0.31526 in 1951); for  $S$  the minimum value from 1975 onward (of 0.38296 in 1989) is greater than the maximum value between 1955 and 1974 (of 0.37738 in 1955); and for  $M$  the minimum value from 1975 onward (of 0.26794 in 1988) is greater than the maximum value between 1956 and 1974 (of 0.26756 in 1958). A similar inspection of Table 3 reveals that for  $\overline{MT}$  the minimum value from 1976 onward (of 0.05523 in 1991) is greater than the maximum value between 1948 and 1975 (of 0.05500 in 1952). As for  $RS$ , the minimum value from 1975 onward (of 0.03261 in 1991) is greater than all but one realized value between 1953 and 1974 (the one exception being a realized value of 0.03267 in 1969).

Thus, the period from the early 1950s through 2010 can be separated into two distinct periods with respect to both degree of progressivity and redistributive capacity. From the mid-1970s through 2010 the U.S. Federal Income Tax (i) has been more progressive than it was from the early 1950s through the mid-1970s (based upon the preceding observations from Table 2) and (ii) has redistributed income to a greater degree than it did from the early 1950s through the mid-1970s (based upon the preceding observations from Table 3). In contrast to the divergent observations which emerged for the early 1940s, we see that since the early 1950s the degree of progressivity and the redistributive capacity have broadly shifted in conjunction with one



another. This is because since the early 1950s there has not been a sea change in either the percentage of the population subject to the tax or the size of the tax.<sup>27</sup>

## **5 Conclusions and Directions for Future Research**

The present study provides insights on the specific attributes of a tax that are truly being measured by six different previously defined progressivity indices. A progressive tax (i) places a disproportionate amount of the burden of paying the tax on high income individuals, thereby (ii) making the final distribution of income more equal. Related to this distinction, de Sarralde et al. (2013) made an insightful observation regarding how some tax progressivity indices quantify the degree to which the burden of paying the tax is borne by different segments of the population, while others simply quantify the degree to which the tax alters the distribution of income. Using this as motivation, numerical values of two different classes of progressivity indices (those previously defined by Kakwani, Suits, Stroup, and Mathews and those previously defined by Musgrave & Thin and Reynolds & Smolensky) were determined over the entire adult population for the U.S. Federal Income Tax for each year from 1929 through 2010.

Because index values have been computed over a period of time during which there were significant changes in both the fraction of the population subject to paying the tax and total taxes paid as a percentage of societal income, it is possible to gain insight on what is revealed by each index. It is argued that while the indices of Kakwani, Suits, Stroup, and Mathews gauge the progressivity of the tax, those of Musgrave & Thin and Reynolds & Smolensky are actually measuring the redistributive capacity of the tax.

This does not imply that either class of indices is useless. Rather, it simply suggests that policy analysts must be thoughtful and aware of what the index is measuring. For example, to gain insight on how the burden of financing government spending is spread over different segments of the population, one should look at the values of the measures of Kakwani, Suits, Stroup, and Mathews. Alternatively, to determine if a tax is significantly reducing income inequality, one should instead look at the measures of Musgrave/Thin and Reynolds/Smolensky.

To this point, the computed numerical values revealed that in the early 1940s there was a dramatic and sudden shift in both the progressivity and redistributive capacity of the U.S. Federal Income Tax. As revealed by the measures of Kakwani, Suits, Stroup, and Mathews, the tax was much more progressive before this time than since. However, as revealed by the measures

<sup>27</sup> Recall, the "Percentage of Adults on Returns" (which recall, in some sense can serve as a rough proxy measure for the percentage of the population subject to the tax) has been above 80% in every year since 1950. Similarly, "Taxes Paid as a percentage of Societal Income" has been above 7% in all but one year since 1942 (the one exception being 1949 when it was equal to 6.88%).

of Musgrave/Thin and Reynolds/Smolensky, the redistributive capacity of the tax was much less before this time than since. Finally, it was noted that from the mid-1970s through 2010 the U.S. Federal Income Tax has (i) been more progressive than it was from the early 1950s through the mid-1970s and (ii) redistributed income to a greater degree than it did from the early 1950s through the mid-1970s. These observations can only be appreciated with a correct understanding of what is being measured by each class of indices. These distinctions are critical for policy analysts to recognize when using any such index as a “yardstick” for making normative assessments of policy outcomes.

Some preliminary insights were made on progressivity and redistributive capacity outcomes in relation to political leadership. The realized index values reveal that, on average, the U.S. Federal Income Tax was more progressive in years when a Democrat president was in office but redistributed income to a greater degree in years when a Republican president was in office. But, as noted within Subsection 4.1, these observations did not account for many important, complicating factors (e.g., whether a president was working with a congress of his own party, a congress of the rival party, or a split congress and also the relation between the timing of changes in policy/leadership and changes in behavior/outcomes). Further research into the relations between political leadership and policy outcomes would be useful.

Similarly, an attempt was made to compare the present empirical results for the U.S. Federal Income Tax to taxation outcomes in other countries (as measured by previous researchers). However, it was noted that doing so was somewhat problematic because other studies: (i) report index values for much shorter periods of time and (ii) compute index values over different segments of the population (i.e., over taxpayers, not all adults). These difficulties could be overcome by conducting more comprehensive and consistent analyses of taxation outcomes in other countries. This presents another ripe area for future research on these topics.

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## Appendix

**Table 1: Characteristics of Entire Population and Taxpayers**

Year	Number of Returns	Adults Represented on Returns	Total Adult Population	Percentage of Adults on Returns	Income Represented on Returns (millions of \$)	Total Societal Income (millions of \$)	Total Taxes Paid (millions of \$)	Taxes Paid as a Percentage of Societal Income
1930	3,707,509	5,467,413	80,068,980	6.83	18,118.63	76,500	476.71	0.62
1932	3,877,430	5,715,530	82,294,743	6.95	11,655.76	50,300	329.96	0.66
1934	4,094,420	6,041,895	84,552,935	7.15	12,796.80	54,100	511.40	0.95
1936	5,413,499	7,806,332	86,791,801	8.99	19,240.11	69,200	1,214.02	1.75
1938	6,150,776	9,016,802	89,072,692	10.12	18,660.93	69,100	726.12	1.05
1940	14,598,074	22,054,506	91,764,122	24.03	36,309.72	79,400	1,440.97	1.81
1942	36,456,110	56,687,002	94,486,828	59.99	78,589.73	126,700	8,823.04	6.96
1944	46,919,590	71,270,340	97,153,352	73.36	116,714.74	169,700	16,216.40	9.56
1946	52,600,470	79,284,465	99,500,869	79.68	134,330.01	182,700	16,075.91	8.80
1948	51,745,697	81,767,812	102,066,436	80.11	164,173.86	213,700	15,441.53	7.23
1950	52,655,564	84,646,188	104,994,301	80.62	179,874.48	233,900	18,374.92	7.86
1952	56,107,089	89,275,281	107,054,753	83.39	216,087.45	282,700	28,019.85	9.91
1954	56,306,704	90,565,754	109,122,793	82.99	230,235.86	302,600	26,665.75	8.81
1956	58,798,843	94,785,760	111,353,676	85.12	268,583.81	348,400	32,732.13	9.39
1958	58,700,924	95,240,441	113,558,478	83.87	282,166.42	379,500	34,335.65	9.05
1960	60,592,712	97,920,550	116,145,687	84.31	316,557.57	422,500	39,464.16	9.34
1962	62,290,595	99,113,994	119,412,390	83.00	349,860.99	469,100	44,902.84	9.57
1964	64,943,284	103,397,210	122,205,737	84.61	398,212.08	528,400	47,152.86	8.92
1966	69,786,185	109,486,582	126,664,717	86.44	470,271.72	620,600	56,087.08	9.04
1968	73,347,156	114,465,362	130,814,842	87.50	556,304.96	730,700	76,637.90	10.49
1970	73,862,448	115,982,827	135,290,289	85.73	634,250.26	864,600	83,900.71	9.70
1972	77,132,295	119,976,528	140,476,487	85.41	748,924.77	1,023,600	93,563.91	9.14
1974	82,794,391	126,681,708	145,867,315	86.85	910,803.19	1,249,300	123,591.23	9.89
1976	84,123,626	128,211,299	151,783,587	84.47	1,060,805.81	1,498,100	141,762.54	9.46
1978	89,247,480	133,471,142	157,810,346	84.58	1,309,918.74	1,859,500	188,169.09	10.12
1980	93,238,823	138,162,282	164,041,304	84.22	1,626,554.50	2,316,800	250,240.23	10.80
1982	94,426,498	140,036,782	169,374,534	82.68	1,875,871.71	2,778,800	277,470.22	9.99
1984	98,435,000	145,262,569	173,865,591	83.55	2,173,227.61	3,281,300	301,504.20	9.19
1986	102,087,623	149,426,316	177,785,002	84.05	2,524,123.61	3,725,100	366,978.73	9.85
1988	108,872,859	156,585,859	181,774,324	86.14	3,124,156.07	4,275,300	412,761.07	9.65
1990	112,812,262	160,790,937	185,916,304	86.49	3,451,237.01	4,904,500	447,061.15	9.12
1992	112,652,759	160,275,207	190,392,429	84.18	3,680,552.02	5,410,800	476,162.76	8.80
1994	114,989,920	162,968,892	194,804,126	83.66	3,961,146.46	5,934,700	534,754.49	9.01
1996	119,441,768	167,893,322	199,441,923	84.18	4,590,527.29	6,661,900	658,124.17	9.88
1998	123,775,831	173,021,980	204,686,760	84.53	5,469,211.17	7,587,700	788,451.91	10.39
2000	128,227,143	178,065,242	209,786,222	84.88	6,423,976.61	8,632,800	980,521.36	11.36
2002	128,323,986	179,066,260	214,688,736	83.41	6,113,778.28	9,149,500	796,861.89	8.71
2004	130,371,156	181,798,654	219,507,563	82.82	6,875,123.35	10,049,200	831,890.27	8.28
2006	135,719,160	188,216,198	224,622,198	83.79	8,122,039.56	11,389,800	1,023,738.93	8.99
2008	139,960,581	192,867,886	229,989,364	83.86	8,426,625.37	12,430,600	1,031,511.65	8.30
2010	140,337,881	193,171,890	235,153,929	82.15	8,277,946.52	12,435,200	951,423.49	7.65

Source: Internal Revenue Service; Bureau of Economic Analysis; U.S. Census Bureau

**Table 2: Indices of Progressivity**

Year	St	S	K	M	Year	St	S	K	M
1929	0.99796	0.91012	0.71733	0.71036	1970	0.46086	0.34217	0.28281	0.24681
1930	0.99634	0.93682	0.76853	0.76248	1971	0.49120	0.36630	0.30063	0.26391
1931	0.99667	0.95034	0.79632	0.79128	1972	0.49731	0.37132	0.30323	0.26709
1932	0.98971	0.91864	0.76940	0.75138	1973	0.48533	0.36044	0.29738	0.25982
1933	0.99280	0.92723	0.76964	0.75706	1974	0.48039	0.35613	0.29448	0.25676
1934	0.99387	0.93754	0.76813	0.76401	1975	0.53166	0.39824	0.32952	0.28854
1935	0.99355	0.93486	0.76037	0.75716	1976	0.53489	0.40153	0.32888	0.28988
1936	0.99295	0.92176	0.72988	0.72871	1977	0.55130	0.41353	0.33817	0.29823
1937	0.99063	0.92163	0.72507	0.72679	1978	0.53818	0.40145	0.33120	0.28995
1938	0.98924	0.92551	0.73786	0.73797	1979	0.53639	0.40038	0.32882	0.28867
1939	0.98486	0.91159	0.69992	0.70703	1980	0.53419	0.39575	0.32700	0.28515
1940	0.96137	0.87613	0.58896	0.63150	1981	0.52683	0.38842	0.32586	0.28116
1941	0.83709	0.72355	0.49463	0.51348	1982	0.54037	0.39969	0.33571	0.28989
1942	0.67653	0.57086	0.44077	0.42333	1983	0.55616	0.41388	0.34671	0.30065
1943	0.60100	0.49825	0.40234	0.37447	1984	0.55700	0.41703	0.34926	0.30374
1944	0.58056	0.45558	0.35449	0.32790	1985	0.55874	0.41674	0.34864	0.30286
1945	0.60517	0.47261	0.36748	0.33933	1986	0.57746	0.42903	0.35254	0.30877
1946	0.60944	0.48376	0.36373	0.34476	1987	0.56252	0.40236	0.32849	0.28414
1947	0.54299	0.43013	0.32215	0.30577	1988	0.56052	0.38513	0.31537	0.26794
1948	0.58175	0.46122	0.34239	0.32677	1989	0.55536	0.38296	0.31956	0.26882
1949	0.57999	0.45802	0.34170	0.32464	1990	0.55859	0.38781	0.32564	0.27368
1950	0.57983	0.45829	0.34067	0.32446	1991	0.56949	0.40205	0.33627	0.28524
1951	0.52650	0.41111	0.31526	0.29339	1992	0.59814	0.42306	0.35161	0.29958
1952	0.49994	0.38751	0.30315	0.27806	1993	0.61668	0.44563	0.36653	0.31703
1953	0.47446	0.36634	0.29081	0.26411	1994	0.61958	0.44707	0.36795	0.31795
1954	0.50321	0.38819	0.30405	0.27811	1995	0.62356	0.44654	0.36509	0.31569
1955	0.49014	0.37738	0.29612	0.27035	1996	0.63099	0.44458	0.36022	0.31108
1956	0.47650	0.36566	0.28882	0.26233	1997	0.62574	0.42963	0.34630	0.29700
1957	0.46993	0.36014	0.28711	0.25927	1998	0.63248	0.42929	0.34372	0.29473
1958	0.48754	0.37152	0.29813	0.26756	1999	0.63436	0.42273	0.33330	0.28668
1959	0.47374	0.35856	0.28512	0.25645	2000	0.63750	0.41740	0.33055	0.28174
1960	0.46784	0.35342	0.28468	0.25399	2001	0.64721	0.44893	0.36442	0.31242
1961	0.47812	0.35861	0.28553	0.25564	2002	0.67517	0.48513	0.39331	0.34225
1962	0.46664	0.34838	0.28026	0.24895	2003	0.67789	0.48356	0.39404	0.34084
1963	0.46041	0.34306	0.27577	0.24486	2004	0.68423	0.47414	0.38254	0.32906
1964	0.47591	0.35702	0.28597	0.25518	2005	0.68926	0.46224	0.36897	0.31559
1965	0.48092	0.36231	0.28814	0.25863	2006	0.68773	0.45433	0.36397	0.30890
1966	0.46741	0.35100	0.28050	0.25074	2007	0.67855	0.43905	0.35099	0.29611
1967	0.46511	0.34839	0.27785	0.24839	2008	0.70031	0.48156	0.39121	0.33409
1968	0.46046	0.34355	0.27488	0.24486	2009	0.72834	0.52895	0.42555	0.37363
1969	0.44523	0.33124	0.26933	0.23743	2010	0.72645	0.51233	0.41229	0.35766
Minimum					0.44523	0.33124	0.26933	0.23743	
(Year of Minimum)					(1969)	(1969)	(1969)	(1969)	
Maximum					0.99796	0.95034	0.79632	0.79128	
(Year of Maximum)					(1929)	(1931)	(1931)	(1931)	
Median					0.57347	0.42007	0.34118	0.29762	

Source: Author's calculations

**Table 3: Indices of Redistributive Capacity**

Year	$\overline{MT} = MT - 1$	RS	Year	$\overline{MT} = MT - 1$	RS
1929	0.01186	0.00853	1970	0.04953	0.03039
1930	0.00625	0.00482	1971	0.04954	0.03032
1931	0.00375	0.00300	1972	0.05003	0.03051
1932	0.00654	0.00508	1973	0.05090	0.03119
1933	0.00793	0.00615	1974	0.05274	0.03233
1934	0.00948	0.00733	1975	0.05328	0.03302
1935	0.01086	0.00831	1976	0.05591	0.03437
1936	0.01773	0.01303	1977	0.05893	0.03615
1937	0.01537	0.01125	1978	0.06059	0.03729
1938	0.01051	0.00784	1979	0.06172	0.03784
1939	0.01207	0.00858	1980	0.06469	0.03960
1940	0.01777	0.01089	1981	0.06472	0.04003
1941	0.03395	0.02006	1982	0.05994	0.03724
1942	0.05064	0.03299	1983	0.05654	0.03525
1943	0.07327	0.04905	1984	0.05636	0.03534
1944	0.06190	0.03743	1985	0.05701	0.03557
1945	0.06500	0.03947	1986	0.06311	0.03853
1946	0.05880	0.03509	1987	0.05789	0.03380
1947	0.05560	0.03299	1988	0.05990	0.03370
1948	0.04531	0.02667	1989	0.05743	0.03305
1949	0.04288	0.02526	1990	0.05602	0.03266
1950	0.04943	0.02904	1991	0.05523	0.03261
1951	0.05360	0.03209	1992	0.05772	0.03393
1952	0.05500	0.03335	1993	0.06027	0.03582
1953	0.05213	0.03195	1994	0.06136	0.03644
1954	0.04863	0.02938	1995	0.06450	0.03776
1955	0.04921	0.02973	1996	0.06917	0.03949
1956	0.04941	0.02995	1997	0.07212	0.03992
1957	0.04838	0.02956	1998	0.07334	0.03986
1958	0.04850	0.02966	1999	0.07831	0.04115
1959	0.05022	0.03022	2000	0.08169	0.04235
1960	0.04820	0.02933	2001	0.07095	0.03995
1961	0.05061	0.03023	2002	0.06441	0.03752
1962	0.04940	0.02967	2003	0.05801	0.03372
1963	0.04992	0.02990	2004	0.06175	0.03453
1964	0.04663	0.02802	2005	0.06659	0.03564
1965	0.04570	0.02738	2006	0.06792	0.03594
1966	0.04644	0.02787	2007	0.06958	0.03599
1967	0.04855	0.02900	2008	0.06337	0.03540
1968	0.05395	0.03221	2009	0.05623	0.03285
1969	0.05400	0.03267	2010	0.06019	0.03416
			Minimum	0.00375	0.00300
			(Year of Minimum)	(1931)	(1931)
			Maximum	0.08169	0.04905
			(Year of Maximum)	(2000)	(1943)
			Median	0.05450	0.03276

Source: Author's calculations

## POVZETEK

### 1.01 Izvirni znanstveni članek

## **Ugotovitve glede ameriškega zveznega davka na dohodek za razlikovanje med merami progresivnosti in redistributivnosti**

Davek je »progresiven«, če se povprečna davčna stopnja povečuje s povečevanjem dohodka. Čeprav se že dolgo strinjajo glede te osnovne definicije progresivnosti, se strokovnjaki še niso dogovorili glede stopnje davčne progresivnosti. Na primer, ameriški zvezni davek na dohodek: iz pregleda povečevanja bodisi mejnih davčnih stopenj bodisi povprečnih davčnih stopenj je jasno, da je bil ta davek vedno progresiven. Ni pa jasno, kdaj je bil »najbolj progresiven«. Poleg tega je videti, da različne mere stopnje progresivnosti omogočajo nasprotujoča si razumevanja. Pričujoča študija prispeva k tej stalni razpravi z utemeljevanjem, da je o dveh dobro uveljavljenih in široko uporabljenih indeksih progresivnosti bolje razmišljati kot o merilih redistributivnosti.

Numerične vrednosti šestih različnih indeksov progresivnosti so bile za ameriški zvezni davek na dohodek določene od leta 1929 do leta 2010. Teh šest indeksov se uvršča v dva različna razreda. Dva indeksa, ki so ju definirali Musgrave in Thin (1948) ter Reynolds in Smolensky (1977), sta izračunana z Lorenzovo krivuljo, standardno »krivuljo koncentracije dohodka« pred obdavčitvijo in po njej. Štirje indeksi, ki so jih definirali Kakwani (1977), Suits (1977), Stroup (2005) in Mathews (2016), pa so izračunani na osnovi krivulje koncentracije dohodka pred obdavčitvijo in krivulje koncentracije davka.

Progresivni davek: (i) nalaga posameznikom z visokimi dohodki nesorazmerno davčno breme, tako da (ii) postane končna distribucija dohodka bolj enakovredna. Vseh teh šest indeksov meri učinek davka glede na ta dva tesno povezana izida. Širši namen pričujoče študije je jasno prikazati, kako različni indeksi progresivnosti merijo različne značilnosti davka. Z računanjem indeksnih vrednosti ameriškega zveznega davka na dohodek od leta 1929 do leta 2010 (v tem obdobju je prišlo do velikih sprememb tako pri deležu prebivalstva, zavezanega za plačilo tega davka, kot pri deležu davka glede na znesek dohodkov vseh državljanov) lahko ugotovimo, kaj se dejansko meri z vsakim indeksom. Na osnovi izračunanih vrednosti lahko potrdimo, da indeksi Kakwanija, Suitsa, Stroupa in Mathewsa merijo progresivnost, medtem ko indeksa Musgravea/Thina in Reynoldsa/Smolenskyja merita redistributivnost. Kateri indeks je najbolj uporaben, je odvisno od tega, na katera vprašanja želimo odgovoriti (tj. katere vidike politike si prizadevamo oceniti). Kdor želi oceniti, kako je breme financiranja vladnih izdatkov porazdeljeno med različnimi segmenti prebivalstva, mora npr. pogledati vrednosti mer Kakwanija, Suitsa, Stroupa in Mathewsa. Kdor pa želi potrdilo, da davčna politika zmanjša



neenakost dohodkov, mora za oceno, ali je ta cilj dosežen, pogledati meri Musgravea/Thina in Reynoldsa/Smolenskyja.

Izračunane indeksne vrednosti razkrivajo, da je v zgodnjih 1940. letih prišlo do dramatične in nenadne spremembe pri progresivnosti in redistributivnosti ameriškega zveznega davka na dohodek. Kot so pokazale meritve Kakwanija, Suitsa, Stroupa in Mathewsa, je bil ta davek prej veliko bolj progresiven. Meritve Musgravea/Thina in Reynoldsa/Smolenskyja pa so pokazale, da je bila njegova redistributivnost prej veliko manjša. Na prvi pogled so ti rezultati protislovnii, vendar to protislovje izgine ob skrbni proučitvi temeljne razlike med tem, kaj vsak razred indeksov resnično meri.

Davek je pomembno redistributiven, kadar sta izpolnjena dva pogoja: (a) en segment prebivalstva mora nositi nesorazmerno veliko davčno breme in (b) davek sam po sebi mora biti precej visok. Na indekse Kakwanija, Suitsa, Stroupa in Mathewsa – ki se osredotočajo na progresivnost obdavčitve – vpliva samo pogoj (a), ne pa tudi (b). Toda indeksa Musgravea/Thina in Reynoldsa/Smolenskyja sta odvisna od velikosti davčnega sistema. Ameriški zvezni davek na dohodek lahko pomembno redistribuira dohodek, ker se je v zgodnjih 1940. letih višina davka (merjena z odstotkom dohodkov vseh državljanov, plačanim v davčno blagajno) dramatično povečala. Ker je bil davek vedno progresiven, je njegovo drastično zvišanje v tem času vodilo do dramatičnega povečanja vrednosti indeksov Musgravea/Thina in Reynoldsa/Smolenskyja. Hkrati se je v istem času povečal tudi obseg davka (merjen z deležem prebivalstva, zavezanega za njegovo plačilo). To je bolj enakovredno razporedilo davčno breme med celotnim prebivalstvom, kar je vodilo do zmanjšanja vrednosti indeksov Kakwanija, Suitsa, Stroupa in Mathewsa. Razločevanje med vzroki teh dveh različnih izidov ponazarja različne attribute davka, merjenega z enim ali drugim razredom indeksov, kar razkriva, da indeksi Kakwanija, Suitsa, Stroupa in Mathewsa v resnici merijo progresivnost, medtem ko indeksa Musgravea/Thina in Reynoldsa/Smolenskyja merita redistributivnost.

Razen tega je bil od sredine 1970. let do leta 2010 ameriški zvezni davek na dohodek (i) bolj progresiven kot v obdobju od zgodnjih 1950. let do sredine 1970. let in je (ii) v večji meri redistribuiral dohodek kot v času od zgodnjih 1950. let do sredine 1970. let. Ob koncu članka avtor navaja nekatere preliminarne ugotovitve glede izidov progresivnosti in redistributivnosti odvisno od političnega vodstva. V povprečju je bil ameriški zvezni davek na dohodek bolj progresiven v letih, ko je bil na oblasti demokratski predsednik, medtem ko je bil dohodek v večji meri redistribuiran v letih, ko je bil na oblasti republikanski predsednik. Vse omenjene ugotovitve pa je mogoče oceniti samo ob pravilnem razumevanju, kaj meri posamezni razred indeksov.