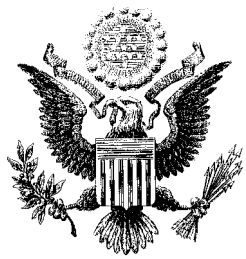
THE MISLEADING EFFECTS OF AVERAGES IN TAX DISTRIBUTION ANALYSIS

A JOINT ECONOMIC COMMITTEE STUDY



Vice Chairman Jim Saxton (R-NJ)
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United States Congress

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Abstract

This study examines how tax distribution tables often can provide misleading results about the impact of pending tax legislation. These tables rely excessively on comparisons of *average* tax liabilities of various income groups, and are typically used to oppose broad income tax relief and foster class warfare notions in tax policy. However, tax distribution tables typically are defective in several ways that once recognized undermine their statistical validity and raise serious questions about their value to policymakers and the public.

This study analyzes tax data to examine whether the use of averages in the typical distribution table is statistically sound. These tables usually rank tax filers from lowest to highest incomes, and subdivide them into income groups, such as fifths (quintiles). Then the average tax liabilities of each fifth can be calculated, as can average projected benefits from pending tax relief legislation. Finally, the average tax benefits provided to the various groups can be compared and contrasted. The underlying assumption is that these averages are representative of each income group.

However, this Joint Economic Committee analysis of Internal Revenue Service data for individual income tax returns finds that the use of averages does not accurately reflect the tax payments or potential tax changes of most taxpayers in each income group. In fact, most taxpayers in each income group have tax liabilities considerably different from the group averages. This fact is not surprising given the different characteristics of tax filers at similar income levels.

For example, in the middle fifth, only 23.9 percent of taxpayers had income tax liabilities that were within 25 percent of the group average. In other words, over three quarters had tax liabilities that were greater or less than 25 percent of the average tax liability of $1,780 in 1999. Therefore, 43.8 percent of taxpayers had income tax liabilities more than $2,230, while 32.3 percent paid less than $1,340. Although these taxpayers fall into the same income group typically used in distribution tables, their taxes vary greatly. Thus the average tax liability for this group substantially misrepresents the tax burden of most of its taxpayers. Therefore, unqualified comparisons of average tax liabilities and average tax changes would be misleading. Yet this is the usual procedure employed in the construction of distribution tables.

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EXECUTIVE SUMMARY

This study examines how tax distribution tables often can provide misleading results about the impact of pending tax legislation. These tables rely excessively on comparisons of average taxes of various income groups, and are typically used to oppose broad income tax relief and foster class warfare notions in tax policy. However, tax distribution tables typically are defective in several ways that once recognized undermine their statistical validity and raise serious questions about their value to policymakers and the public.

This study analyzes tax data to examine whether the use of averages in the typical distribution table is statistically sound. The underlying assumption is that these averages are representative of each income group. However, this Joint Economic Committee analysis of Internal Revenue Service data for individual income tax returns finds that the use of averages does not accurately reflect the tax payments or potential tax changes of most taxpayers in each income group. In fact, most taxpayers in each income group have tax liabilities considerably different from the group averages. This fact is not surprising given the different characteristics of tax filers at similar income levels.

Specifically, this report finds:

- The use of averages in tax distribution tables often obscures the simplest facts about proposed tax policy initiatives to the public.
- The grouping of taxpayers into income categories can provide a false sense of precision and misleadingly suggests that taxpayers within the same groups necessarily have similar federal income tax liability.
- The use of averages alone is inappropriate because averages cannot accurately show the impact on most taxpayers within the same income classification.
- Approximately 25.6 percent of all tax returns filed in 1999 claimed zero or negative federal income tax liability.
- The Joint Committee on Taxation estimated that for calendar year 2001, there were 50.6 million filers and non-filers out of 142.0 million units overall, or 35.6 percent, with zero or negative federal income tax liability.
- For all income tax returns in 1999, over 16 million tax returns (12.6%) received a net transfer from the government and 11.1 million returns, or 8.8 percent, received a check of $1,000 or more.
- In all five income groups (quintiles) examined, a majority of taxpayers had tax liabilities that were either 25 percent greater than the average or 25 percent less than the average tax liability for each income group.
- In comparing federal income tax liabilities, distribution tables often misclassify millions of taxpayers into quintiles in which they have little tax liability in common.
  - Under one analysis, approximately 4.6 million taxpayers in the third quintile pay more in federal income taxes than 5.6 million taxpayers classified in the fourth quintile.
  - Under another analysis, approximately 3.3 million taxpayers in the fourth quintile pay more in federal income taxes than over 4 million taxpayers classified in the fifth quintile.

THE MISLEADING EFFECTS OF AVERAGES IN TAX DISTRIBUTION ANALYSIS

I. Introduction

> The current practice of fashioning tax legislation to achieve a particular result in a distribution table creates the illusion of precision when such precision is impossible.
>
> *Michael J. Graetz, Yale University law professor and former Treasury Deputy Assistant Secretary for Tax Policy*[1]

> [B]efore representing the central tendency by any single number, evaluators need to look at the distribution and decide whether the indicator would be misleading.
>
> *United States General Accounting Office*[2]

The taxation of individual income is a central aspect of the current tax system. Legislators evaluating the fundamental components of tax legislation face decisions that often attempt to redistribute after-tax income and wealth among different members of society and, on a larger scale, can affect the performance of the economy. Large amounts of data are available to policymakers to help them make informed decisions relating to the costs and benefits of proposed tax legislation as well as distributional income and wealth effects. However, the quantity and mixed quality of these data can lead to confusion about the effects of proposed tax legislation. This confusion is especially compounded when competing or contradictory information is presented.

Tax distribution tables have become the predominant tool for analyzing the distributive effects of tax burdens and benefits from proposed changes to tax law. However, the use of tax data for tax policy analysis is a time intensive and complicated process that can be more art than science. The different economic assumptions and presentations of data used by the various groups that release distribution tables have the inherent consequence of providing the public with numerous tables showing different results that are then used as political ammunition to influence debate. Further, the current practice or use of distribution tables typically provides a misleading sense of accuracy and an incomplete picture of the actual nature of a change in tax distribution as a result of a change in tax policy.

Many of these tables detailing the projected distribution of burdens associated with proposed tax legislation are presented in ways that distort the data, present a false sense of precision by misusing averages, or fail to disclose information regarding the limitations inherent

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[1] Michael J. Graetz. "Distributional Tables, Tax Legislation, and the Illusion of Precision." In David F. Bradford (Editor). *Distributional Analysis of Tax Policy.* AEI Press. Washington, DC. 1995, page 18.

[2] United States General Accounting Office. *Quantitative Data Analysis: An Introduction.* (GAO/PEMD-10.1.11), June 1992, page 36.

in the data.[3] Lacking such important information, informed debate over tax policy becomes difficult. Members of Congress, students of tax analysis, the media and ordinary citizens seeking to understand the effects of proposed tax legislation are inundated with distribution tables that often obscure the issues and muddle the policy debate. Policymakers and citizens need a better and complete understanding of what distribution tables show and their limitations.

This study examines how tax distribution tables often can provide misleading results about the impact of pending tax legislation. These tables rely excessively on comparisons of average taxes of various income groups, and are typically used to oppose broad income tax relief and foster class warfare notions in tax policy. However, tax distribution tables typically are defective in several ways that once recognized undermine their statistical validity and raise serious questions about their value to policymakers and the public.

This study analyzes tax data to examine whether the use of averages in the typical distribution table is statistically sound. The underlying assumption is that these averages are representative of each income group. However, this Joint Economic Committee analysis of Internal Revenue Service data for individual income tax returns finds that the use of averages does not accurately reflect the tax payments of most taxpayers in each income group. In fact, most taxpayers in each income group have tax liabilities considerably different from the group averages. This fact is not surprising given the different characteristics of tax filers at similar income levels. Yet the computation of average projected tax changes resulting from tax legislation is based on measures of average tax liability.

This study is organized as follows. Section II provides a brief discussion and orientation for the reader on what constitutes a tax distribution table. Section III deals with the statistical concept of central tendency, or how to best describe data using a single number such as the average. Section IV contains statistical analyses detailing how the use of averages in tax distribution analysis is misleading. Section V illustrates that many taxpayers are actually misclassified when categorized by income in tax distribution tables. Section VI provides a conclusion. Appendix I includes 10 useful guideline questions that users of distribution tables should ask when evaluating the presentation of distribution tables. Appendix II provides information on the 1999 Statistics of Income Public Use File data used in this study.

II. The Distribution Table

The official sources of tax distribution data are the Office of Tax Analysis (OTA) of the Department of Treasury, the Congressional Joint Committee on Taxation (JCT), and to a lesser extent, the Congressional Budget Office (CBO).[4] All of these organizations apply different assumptions and methodologies to the analysis of tax legislation. In addition, various interest

[3] Average tax liability figures expressed for very broad groupings of taxpayers can be helpful in some cases, but it should be evident that such figures are illustrative and cannot quantify the tax liabilities of all taxpayers in the group.
[4] For a more detailed discussion of their respective rolls, see: Michael J. Graetz, "Distributional Tables, Tax Legislation, and the Illusion of Precision," in David F. Bradford, ed., *Distributional Analysis of Tax Policy*. Washington, DC: AEI Press, 1995, page 20.

groups and think tanks release unofficial distribution tables to influence the policy process and the debate on particular aspects of tax legislation.

Distribution tables are constructed based on data sources that sample parts of the population to make inferences about the population at large, not data sources that count the entire population like a census. Furthermore, many economic and mathematical assumptions are relied upon in order to fashion distribution tables. The end results are tables that often purport to consist of absolute numbers but instead present a false sense of precision. Despite the appearance of precision conveyed by changes expressed down to one or even two decimal places, the reality is that significant problems usually are just below the surface.

It is well known to most taxpayers that tax liabilities often differ among families with the same income. Differences can occur due to family size, filing status, whether a taxpayer itemizes deductions or takes the standard deduction, whether a taxpayer pays a home mortgage and deducts the interest expense or rents, the nature of a family's income, number of children, and other factors. Additionally, some families are more aggressive in reducing their tax liabilities than others. For example, tax liability can be reduced legally by contributing to a 401(k) plan, an individual retirement account or a medical savings account. However, the concept that taxpayers with similar incomes can have different tax liabilities is not the image portrayed by distribution tables.

Much information is necessary to effectively evaluate the distributional change of proposed tax legislation, such as what items are included in income, what types of taxes are being included/excluded, and over what time horizon the effects are being measured, among others. Previous Joint Economic Committee studies have demonstrated that a lack of complete and necessary information is prevalent with virtually all of the actual distribution tables released into the public domain. For a more detailed analysis on what constitutes a tax distribution table and how distribution analysis is conducted at various organizations, please see previous JEC studies on this issue.[5]

III. Measures of Central Tendency

As stated in the epigraph to this study, Graetz argues that, "The current practice of fashioning tax legislation to achieve a particular result in a distribution table creates the illusion of precision when such precision is impossible."[6] It is statistically possible, based on averages, that some taxpayers would receive no tax cut or even face a tax increase regardless of the average tax change for their income group. Furthermore, not only is precision impossible but the use of averages misrepresents the central tendency of the data.

[5] See, for example: Jason Fichtner, "A Guide to Tax Policy Analysis: Problems with Distributional Tax Tables," Joint Economic Committee, January 2000; and "A Guide to Tax Policy Analysis: The Central Tendency of Federal Income Tax Liabilities in Distributional Analysis," May 2000.

[6] Michael J. Graetz. "Distributional Tables, Tax Legislation, and the Illusion of Precision." In David F. Bradford (Editor). *Distributional Analysis of Tax Policy.* AEI Press. Washington, DC. 1995, page 18.

It is often necessary to describe data using a single number. The central tendency of the distribution of data is a point estimate or single number that corresponds to a typical, representative or middle score for a given set of data. Examples of such measures are the mean, the median and the mode.

The mean, or commonly referred to as the average, is the most easily recognized and understood measure of central tendency. To calculate the average, the value for each observation in the data is added together and then the sum is divided by the total number of observations. Some common uses of averages are batting averages in baseball and student grade point averages. The use of averages is simple and easy for people to understand. However, the use of averages may not be appropriate if the data exhibit large variability, there are many outliers in the data or the data do not fit the pattern of a normal distribution. This is because the average as a measure of central tendency can be highly influenced by extreme values.

Unfortunately, many disseminators continue to use averages in their distribution tables despite the inherent problems with the use of averages. For example, authors in a *Tax Notes* article illustrated how the use of averages in tax distribution tables can be misleading.[7] Shortly thereafter, these authors released a tax distribution table in the same publication using the average as the sole measure of central tendency to characterize taxpayers.[8] Similarly, many advocacy groups consistently misuse the average in reporting the results of their distributional analyses.[9]

IV. The Central Tendency of Tax Data

Tax distribution tables ultimately focus on how much more or less in taxes income groups will pay under a change in tax law. As Graetz has also stated, "All that a distributional table can show is the total impact on all the families or couples within the same income classification. This rather obvious and important point often seems to be lost to policy makers."[10] In other words, the use of averages alone is inappropriate because averages cannot accurately show the impact on most taxpayers within the same income classification. Hence, the majority of distribution tables that are released focus on the average as a measure of central tendency and give the false impression that the average properly typifies each taxpayer.

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[7] William Gale and Peter Orszag, "The President's Tax Proposal: Second Thoughts," *Tax Notes*, January 27, 2003, page 607.

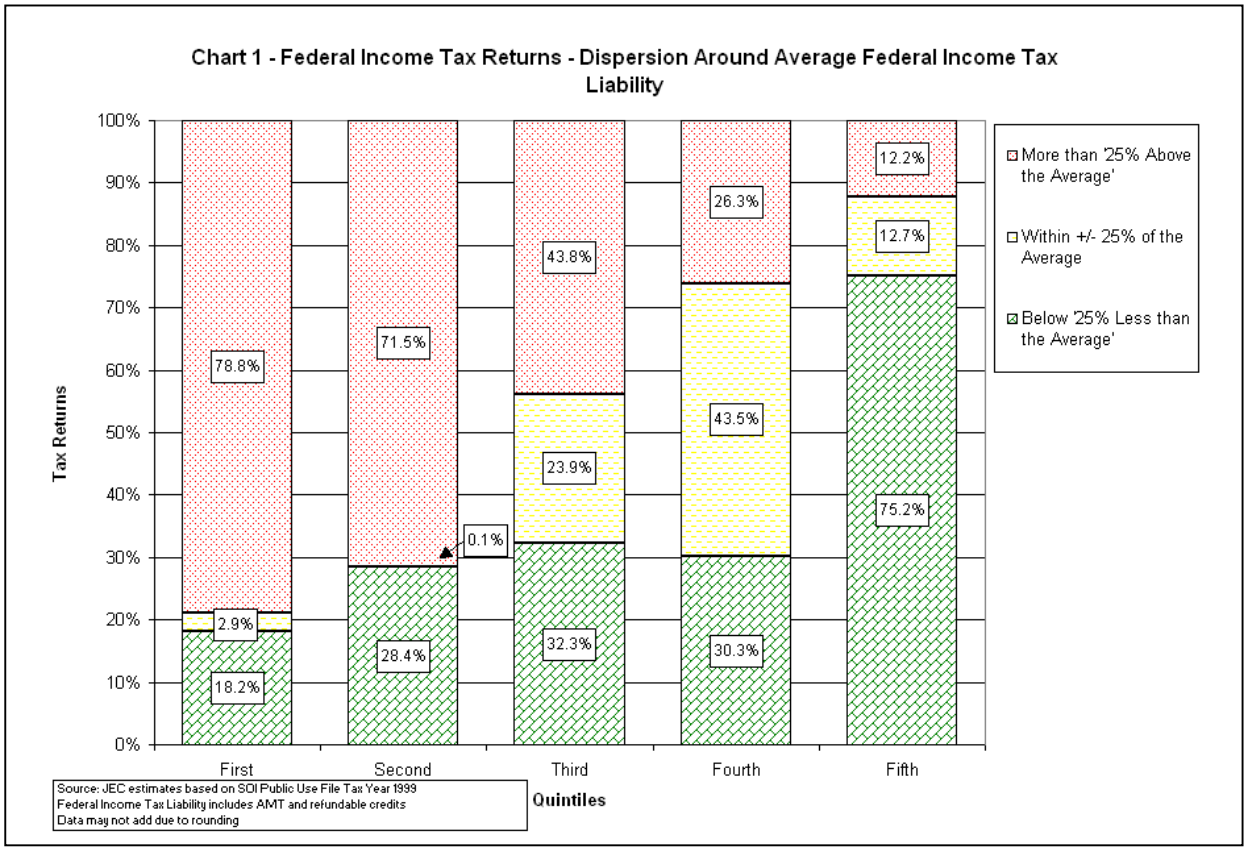
[8] William Gale, Matthew Hall, and Peter Orszag, "Future Income Tax Cuts From the 2001 Tax Legislation," *Tax Notes*, February 17, 2003.

[9] See, for example: Andrew Lee and Joel Friedman, "Administration Continues to Rely on Misleading Use of "Averages" to Describe Tax-Cut Benefits," Center on Budget and Policy Priorities, May 28, 2003; Bob McIntrye, "Final Tax Plan Tilts Even More Toward Richest," Citizens for Tax Justice, May 22, 2003; and Urban-Brookings Tax Policy Center, "Table 5.1 - Conference Agreement on the Jobs and Growth Tax Relief Reconciliation Act of 2003: Distribution of Income Tax Change by AGI Class, 2003," May 22, 2003, available online at: http://www.taxpolicycenter.org/commentary/congress/table5_1.pdf

[10] Michael J. Graetz. "Distributional Tables, Tax Legislation, and the Illusion of Precision." In David F. Bradford (Editor). *Distributional Analysis of Tax Policy.* AEI Press. Washington, DC. 1995, page 45.

In the context of tax distribution analysis the average is actually the *least* representative measure. Chart 1 details the dispersion of 1999 federal income tax returns around the average federal income tax liability. The unit of analysis is federal income tax returns for 1999, grouped into quintiles by adjusted gross income (AGI).[11] The data are further grouped into three categories: More than '25% Above the Average'; Within +/– 25% of the Average; and Below '25% Less than the Average'.[12]

The average federal income tax liability for the first quintile (the lowest ranked by AGI) is $-240 (see Table 1 below). The amount of tax liability is *negative* because so many taxpayers in the first quintile have either zero tax liability or receive a net transfer from the government due to the refundable portion of the Earned Income Tax Credit (EITC). Hence, many of the returns in the first quintile do not actually pay federal income taxes and, due to the refundable portion of the EITC, many do not effectively pay payroll taxes.



[11] The data used in this study are from the Internal Revenue Service – Statistics of Income Division Public Use File for tax year 1999, the most recently available public use file. For a full description of the IRS Public Use File, including sampling error and disclosure avoidance procedures, please see Appendix II.

[12] For example, if the average were $100 then "More than '25% Above the Average'" would include returns with tax liability greater than $125; "Within +/- 25% of the Average" would include $75 - $125; and "Below '25% Less than the Average'" would include returns with tax liability below $75.

Additionally, in the first quintile only 2.9 percent of all returns reported federal income tax liability within plus or minus 25 percent of the average. The most representative grouping in the first quintile is "More than '25% Above the Average'." At first glance, it might be surprising that 78.8 percent of returns in the first quintile report a tax liability that is greater than the average. However, as stated earlier in Section III of this study, the average as a measure of central tendency can be highly influenced by extreme values. Extreme values can be either positive or negative. For tax year 1999, the maximum refundable credit (or maximum transfer from the government) was $3,816 or a federal income tax liability of $-3,816.

Approximately 3.4 million tax returns in the first quintile received a net transfer of more than $1,000 from the government in 1999, while 12.2 million reported zero tax liability and 7.0 million reported positive tax liability. Though 78.8 percent of returns in the first quintile have tax liabilities more than 25 percent above the average, the 3.4 million tax returns with negative tax liability over $1,000 skews the average. Hence, the average is an inappropriate measure of central tendency in the first quintile.

Similar to the first quintile, the average tax liability for the second quintile is also negative ($-110) and the most representative grouping is returns with tax liability more than 25 percent above the average. The average is even less representative in the second quintile, where only 0.1 percent of tax returns reported tax liability within plus or minus 25 percent of the average. Such a small representation is partly due to the small magnitude of the average tax liability for the second quintile and that returns that report zero or very little positive tax liability will be just above the average.[13]

Though the most representative grouping in the third quintile is still "More than '25% Above the Average'," the dominance declines. Only 43.8 percent of returns fall into this category and those returns falling within plus or minus 25 percent of the average increases to 23.9 percent. The fourth quintile exhibits the most normal statistical distribution, with 43.5 percent of returns reporting tax liability within plus or minus 25 percent of the average.

However, the distribution around the average becomes skewed once again in the fifth quintile. The existence of extreme outliers in the fifth quintile raises the average tax liability to $27,310. The top 1 percent of returns alone reported an average tax liability over $250,000.[14] However, not surprisingly, many taxpayers in this quintile pay less than 25 percent below the average. In the fifth quintile, 75.2 percent fall into this category. Therefore, the average is an inappropriate measure of central tendency in the fifth quintile.

[13] The average for the second quintile is $-106. Thus equating to a range of plus or minus 25 percent around the average of $-132 to $-79. Under such a tight range, only 20,000 returns fall into this category.

[14] Michael Parisi and Dave Campbell. "Individual Income Tax Rates and Shares, 1999." Internal Revenue Service. Statistics of Income Division. *SOI Bulletin*. Winter 2001-2002. Pages 34 and 35. (Total income tax reported for top 1% equals $317.4 billion divided by 1.26 million returns in the top 1 percent.)

Table 1. Average Federal Income Tax Liability

	Average	Below '25% Less than the Average'	Greater than '25% More than the Average'	Maximum Transfer Payment
All Returns	$6,670	$5,000	$8,340	**-$3,820**
Quintile 1	**-$240**	**-$300**	**-$180**	**-$3,820**
Quintile 2	**-$110**	**-$130**	**-$80**	**-$3,820**
Quintile 3	$1,780	$1,340	$2,230	**-$2,300**
Quintile 4	$4,610	$3,460	$5,760	$0
Quintile 5	$27,310	$20,480	$34,140	$0

Notes: Data rounded to tens
Negative Amounts in **Bold**
Federal Income Tax Liability includes AMT and refundable credits
Maximum refundable credit in 1999 was -$3,816
Source: Joint Economic Committee estimates based on SOI Public Use File Tax Year 1999

Table 1 displays the average federal income tax liability for all returns and by quintile. The table also displays the corresponding dollar cutoff amount for the three groupings used in the analysis for Chart 1. It is interesting to note that many returns up through the third quintile received net transfers from the government (i.e., reported a negative income tax liability).

As shown in Table 2, for tax year 1999, 25.6 percent of all tax returns reported zero or negative federal income tax liability. This amounts to 32.5 million tax returns. The 32.5 million returns with no federal income tax liability is *less* than the 50.6 million (35.6%) with zero or negative federal income tax liability identified in calendar year 2001 by the JCT.[15] The difference is based on the different years under analysis but mostly because the JCT's estimated number of tax units (142.0 million) includes filing and *non-filing* units. Non-filers are generally individuals with income below the amount necessary to file a tax return. However, the data used for this Joint Economic Committee study are based only on taxpayers that file income tax returns and do not include "non-filers." Therefore, the estimated number of taxpayers with no federal income tax liability is lower than the JCT estimate of 50.6 million.[16]

It is also interesting to note that there are actually taxpayers in each quintile who reported zero tax liability on their federal tax returns in 1999. Table 2 further places into context how the use of averages in distribution analysis is an inappropriate measure to represent all taxpayers in a given group. Table 2 displays the number of federal income tax returns that reported zero or negative income tax liability in 1999. The data are categorized by quintile and show the number of returns as well as the percent of returns for each category.

Table 2. Returns With Negative or Zero Federal Income Tax Liability

	Returns with Negative or Zero Tax Liability		Returns with Negative Tax Liability		Returns Receiving Less than $500 in Refundable Credits		Returns Receiving $500 to $999 in Refundable Credits		Returns Receiving $1,000 or More in Refundable Credits	
	Returns	% of Returns In Category	Returns	% of Returns In Category	Returns	% of Returns In Category	Returns	% of Returns In Category	Returns	% of Returns In Category
All Returns	32,540,700	25.6%	16,051,200	12.6%	3,328,000	2.6%	1,589,900	1.3%	11,133,300	8.8%
Quintile 1	18,384,500	72.3%	6,157,000	24.2%	2,221,400	8.7%	553,600	2.2%	3,381,900	13.3%
Quintile 2	10,051,500	39.5%	7,318,400	28.8%	269,800	1.1%	494,600	1.9%	6,553,900	25.8%
Quintile 3	3,658,600	14.4%	2,575,800	10.1%	836,700	3.3%	541,600	2.1%	1,197,400	4.7%
Quintile 4	395,300	1.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Quintile 5	50,800	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Notes: Data may not add due to rounding (rounded to hundreds), weighting and disclosure requirements of IRS-SOI
Federal Income Tax Liability Includes AMT and Refundable Credits
Total Number of Returns = 127,075,200 with approximately 25.4 million returns per quintile
Source: Joint Economic Committee estimates based on SOI Public Use File Tax Year 1999

[15] United States Congress. Joint Committee on Taxation. "Updated Distribution of Certain Federal Tax Liabilities by Income Class for Calendar Year 2001." JCX-65-01. August 2, 2001.

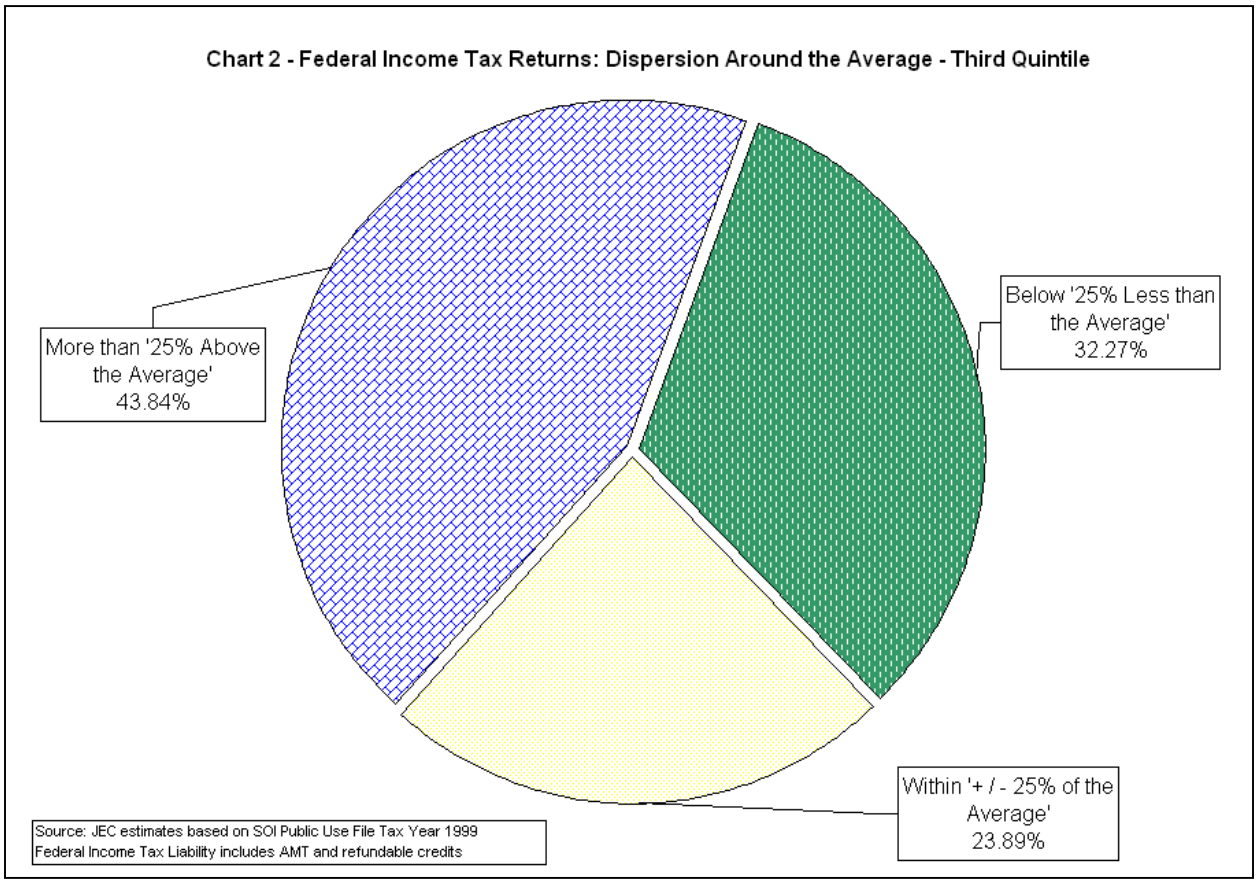
As previously stated and shown in Table 2, for 1999 there were over 32.5 million returns that reported zero or negative federal income tax liability, or 25.6 percent of all returns. In the first quintile, 18.4 million returns reported zero or negative income tax liability, or 72.3 percent of returns in the first quintile. The number of returns with zero or negative tax liability declines to 39.5 percent in the second quintile and 14.4 percent in the third quintile. In the fourth and fifth quintiles there are no returns with negative income tax liability but 1.6 percent of returns in the fourth quintile and 0.2 percent in the fifth quintile reported zero tax liability.

It is also interesting to note the number of returns that receive a net transfer from the government of $1,000 or more. The returns in this category not only pay zero federal income taxes, but many do not effectively pay payroll taxes, as the check from the government cancels the payroll tax liability for many. For all returns in 1999, 11.1 million returns received a net transfer from the government of $1,000 or more, or 8.8 percent of all returns. In the first quintile, almost 3.4 million returns, or 13.3 percent, received a check of $1,000 or more. What may be a surprise to many, over 6.5 million returns in the *second* quintile, or 25.8 percent of returns in the second quintile, received a net transfer from the government of $1,000 or more. The greater number of returns receiving $1,000 or more from the government in the second quintile over the first quintile is due to the many people in the second quintile with earned incomes that qualify for the Earned Income Tax Credit.

The existence of 32.5 million returns, or one-quarter of all federal income tax returns, that pay zero or negative income tax skews the average and makes the use of the average misleading. Further, since tax distribution tables predominantly focus on the "average tax cut" that each income group would expect to receive, the debate over the benefits of a tax cut are clouded when one-quarter of tax returns cannot receive a federal income tax cut because they do not pay federal income taxes.

[16] For a full description of the IRS Public Use File, including sampling error and disclosure avoidance procedures, please see Appendix II.

Using the same data that appears in Chart 1, Chart 2 presents a pie chart for the third, or middle, quintile. As Chart 2 demonstrates, when these categories are analyzed the category of "Within +/- 25% of the Average" is the least representative category.

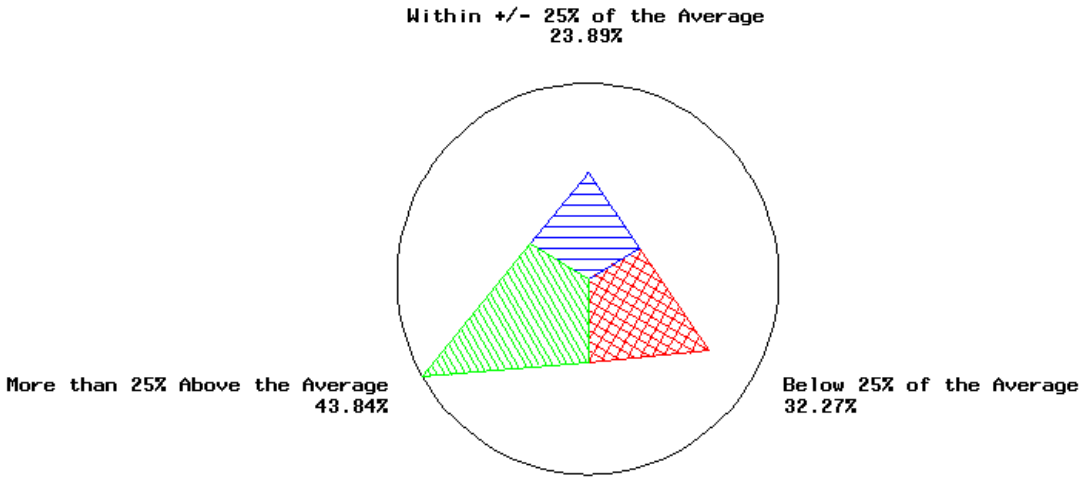


The data in Chart 2 can be represented in other graphical ways that help illustrate how the average is the least representative category and an inappropriate measure of central tendency in tax distribution analysis. One such graphical way is through the use of star charts. Star charts combine the benefits of a pie chart and a bar chart. Star charts are visually similar to pie charts and statistically similar to bar charts. In a pie chart, the magnitude of a slice is based on its value as a ratio to the total value of the variable under analysis. In a star chart the *length* of the star chart slice represents the magnitude of the statistic under analysis in much the same way as the bar on a bar chart displays magnitude.

The center of a star chart represents the value zero and the circle surrounding the star chart provides a scale for judging the magnitude of the value of each slice. By default, the slice, or the category of the variable with the greatest magnitude will extend to the edge of the circle. The length of each other category in the star chart is then based on its value as a percent of the value of the slice with the greatest magnitude.

Chart 3 provides an example of a star chart using the data for the third quintile. Just as in Chart 2, the category of "More than '25% Above the Average'" represents 43.8 percent of returns in the third quintile. Since this category has the greatest magnitude of the three categories, the length of its slice extends out to the edge of the circle surrounding the star chart. Returns reporting tax liability "Below '25 percent of the Average'" comprise 32.3 percent of returns. The length of the slice for this category extends almost three-quarters of the way to the edge of the circle, since the value (32.3%) of this category is roughly three-quarters of the value (43.8%) of the category with the greatest magnitude.

Chart 3 – Federal Income Tax Returns: Dispersion Around the Average – Third Quintile



Source: JEC estimates based on SOI Public Use File Tax Year 1999
Federal Income Tax Liability includes AMT and refundable credits

While a star chart may not be as intuitive or as easy to understand as a pie or bar chart, it can more effectively highlight the dominance of one category over another. A star chart can also show how a category is misrepresentative of the variable under analysis, as the dominant category is more visually apparent. In the case of the third quintile, the "Within +/- 25% of the Average" category represents only 23.9 percent of returns in the third quintile. Hence, even under a vary broad range, not even a quarter of all returns in the third quintile have an average federal income tax liability that lies between plus or minus 25 percent of the average tax liability. The use of an actual "average" would be even less representative.

As the graphs in this study have demonstrated, using the average as the measure of central tendency when analyzing or discussing tax policy initiatives is quite misleading, but this is the basis for computing projected tax changes in distribution tables. The use of averages when displaying distribution data for income and tax liability can mislead the public and cloud the transparency necessary for the public to effectively evaluate the merits of any proposed tax plan. But the use of averages is only part of the story. Not only is the use of averages as a measure of central tendency misleading, but so is the use of quintiles or income categories based on AGI or any other measure of income. These arbitrary categories imply that the taxpayers grouped into these categories are necessarily similar in economic status and pay similar taxes. This assumption is far from the case.

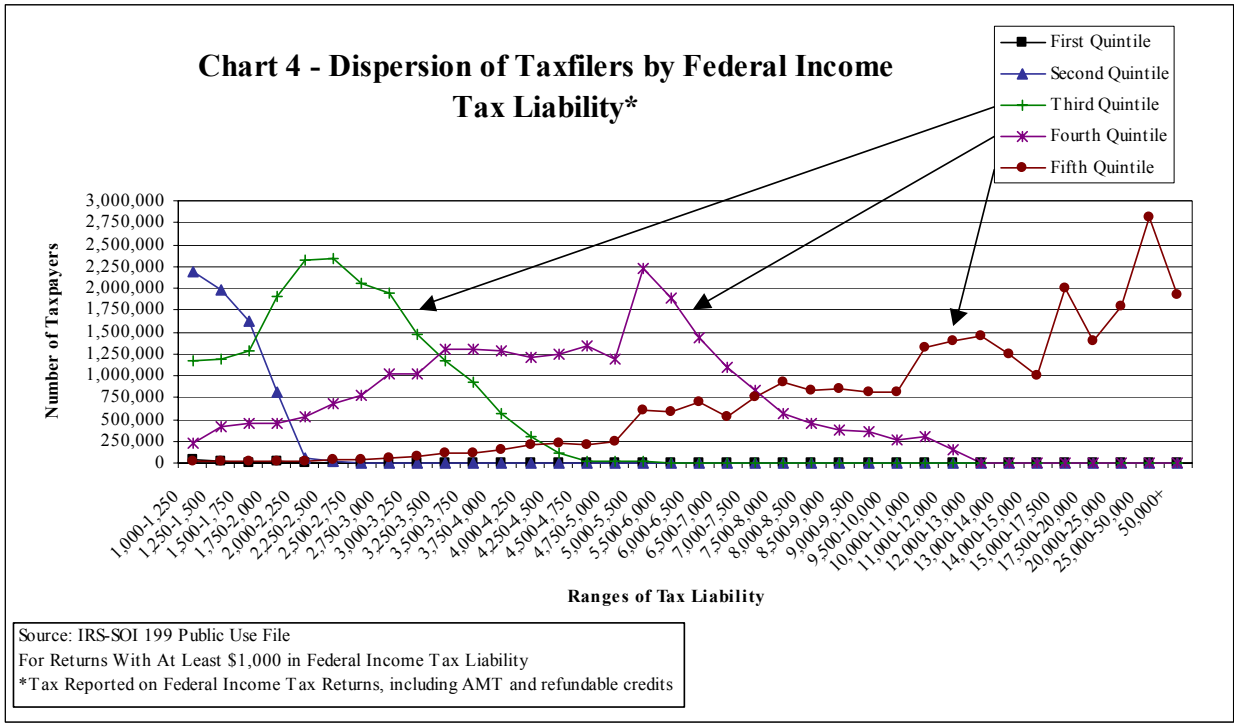
V. Misclassification of Taxpayers

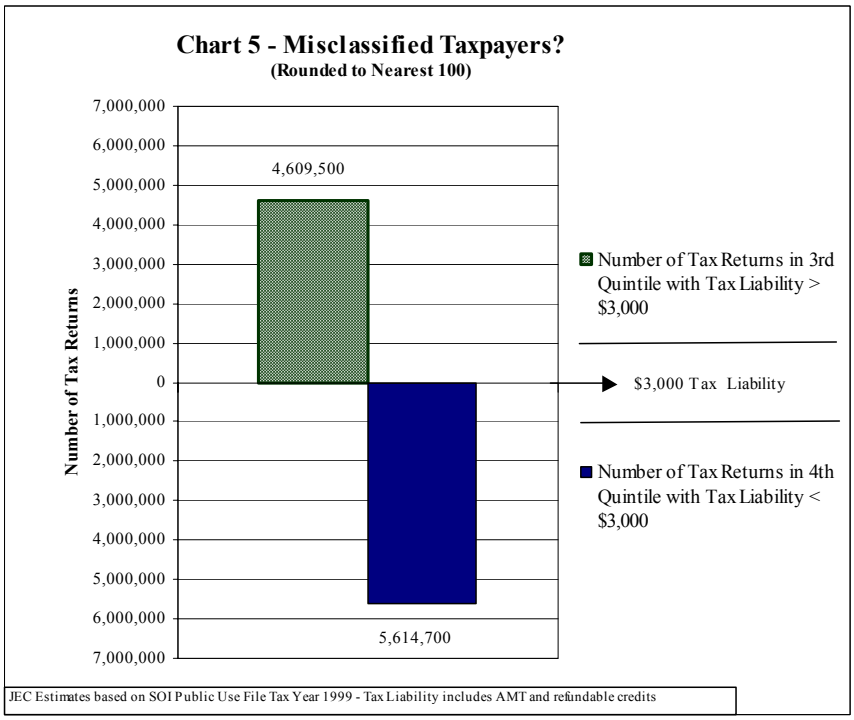
It is well known to most taxpayers that tax liabilities often differ among families with the same income. This can be because of family size, filing status, whether a family itemizes their deductions or elects to take the standard deduction, whether a family pays a mortgage on their home and deducts the interest expense or rents, the nature of a family's income, and many other factors. Additionally, some families are more aggressive in reducing their tax liabilities than others. For example, this can be done legally by contributing to a 401(k) plan, an individual retirement account or a medical savings account, and in many other ways as well.

The use of averages is further misleading by the grouping of taxpayers by income measures into quintiles which could suggest that there exists horizontal equity, or close similarities, among these taxpayers with respect to the amount of federal tax liability. The suggested correlation that higher income taxpayers always have higher tax liabilities is not necessarily the case.

While it seems counterintuitive that a taxpayer in a lower income category can pay more in taxes than a taxpayer in a higher category this is possible because millions of taxpayers have more in common with each other based on tax liability than based on income. This important fact is ignored in typical tax distribution tables. It could be suggested that incidents of taxpayers in a lower income quintile paying more in taxes than taxpayers in a higher quintile are outliers and should be discarded from the sample. Not only would discarding these observations fail to highlight these cases in our tax system, but it would also fail to enlighten the public that taxpayer misclassification is actually a problem involving millions of taxpayers, not just a few extreme cases.

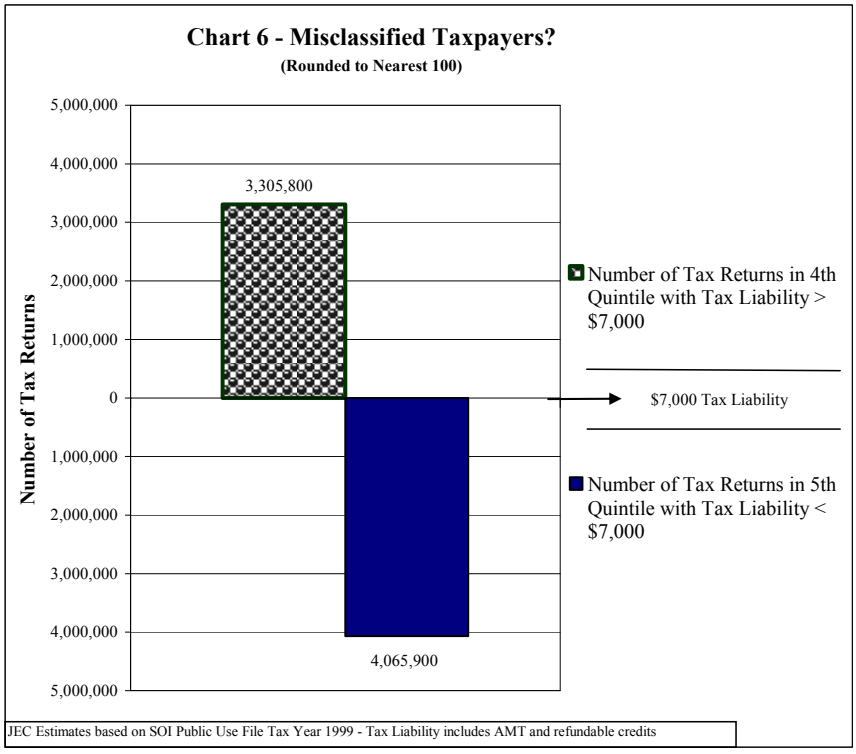
The focus of Chart 4 is on all tax returns that paid over $1,000 in federal income tax in 1999, ranked by AGI and grouped into quintiles. As the chart shows, there are millions of taxpayers in the third quintile who pay more in taxes than millions of taxpayers in the fourth quintile. Similarly, there are millions of taxpayers in the fourth quintile who pay more in taxes than millions of taxpayers in the fifth quintile.





Based on Chart 4, Chart 5 shows that there are 4.6 million tax returns in the third quintile that paid $3,000 or more in federal income taxes, compared with 5.6 million tax returns in the fourth quintile that paid less than $3,000, even though these taxpayers are in a higher income quintile.

Chart 6 sheds light on a similar story between the fourth and fifth quintiles. Even though they are in a lower income quintile, 3.3 million tax returns in the fourth quintile paid over $7,000 in federal income tax in 1999, compared with almost 4.1 million tax returns in the fifth and "richest" quintile that paid less than $7,000.



For tax year 1999, there were roughly 127.1 million federal tax returns. This amounts to about 25.4 million tax returns per quintile. Chart 5 suggests that based on a tax liability of $3,000, over 5.6 million taxpayers in the fourth quintile (approximately 22 percent of returns in the fourth quintile) might have more in common with 20.8 million taxpayers in the third quintile than they do with the other members of the fourth quintile. Similarly, Chart 6 suggests that 4.1 million taxpayers in the fifth quintile (approximately 16 percent

of returns in the fifth quintile) might have more in common with 22.1 million taxpayers in the fourth quintile than they do with the rest of the taxpayers in their own quintile.

Ultimately, since tax distribution tables are concerned with the amount of tax currently paid and the amount of tax that is to be paid after proposed tax legislation is enacted, it is questionable whether policymakers and the public are best served by classifying taxpayers into rigid income categories. It is especially questionable when, based on income measures alone, millions of taxpayers have less in common with taxpayers of their own income quintile because the amount of tax they pay is more similar to taxpayers in other income quintiles.

However, this study is not suggesting that distribution tables should be categorized by tax liabilities, for doing so would pose problems as equally challenging as categorizing tax returns based on income measures. The point is that focusing on income measures alone contributes to the illusion of precision and does not allow for a complete analysis of equity. Further, the use of rigid income categories along with the use of averages can suggest that there is similar ability to pay and similar tax liability within an income category. This approach is inaccurate. The use of income categories without detailed descriptions of the limitations of the data misleads the public by suggesting that tax distribution tables are accurate, precise and completely reflect a correct picture of the American taxpaying population.

VI. Conclusion

This study demonstrated how tax distribution tables often can provide misleading results about the impact of pending tax legislation. This study further showed that often distribution tables rely excessively on comparisons of average taxes of various income groups, and are typically used to oppose broad income tax relief and foster class warfare notions in tax policy. Tax distribution tables as typically used are defective in several ways that once recognized undermine their statistical validity and raise serious questions about their value to policymakers and the public.

Specifically, this report finds:

- The use of averages in tax distribution tables often obscures the simplest facts about proposed tax policy initiatives to the public.
- The grouping of taxpayers into income categories can provide a false sense of precision and misleadingly suggests that taxpayers within the same groups necessarily have similar federal income tax liability.
- The use of averages alone is inappropriate because averages cannot accurately show the impact on most taxpayers within the same income classification.
- Income and tax information based on tax returns filed with the IRS do not follow the pattern of a normal distribution. Hence, the use of averages is an inappropriate measure of central tendency.

- The dispersion of taxpayers within any income group is impossible to determine from the information presented in tax distribution tables, but as the charts in this study show they vary considerably.
- Approximately 25.6 percent of all tax returns filed in 1999 claimed zero or negative federal income tax liability.
- The Joint Committee on Taxation estimated that for calendar year 2001, there were 50.6 million filers and non-filers out of 142.0 million units overall, or 35.6 percent, with zero or negative federal income tax liability.
- For all income tax returns in 1999, over 16 million tax returns (12.6%) received a net transfer from the government and 11.1 million returns, or 8.8 percent, received a check of $1,000 or more.
- In all five income groups (quintiles) examined, a majority of taxpayers had tax liabilities that were either 25 percent greater than the average or 25 percent less than the average tax liability for each income group.
- In comparing federal income tax liabilities, distribution tables often misclassify millions of taxpayers into quintiles in which they have little tax liability in common.
  - Under one analysis, approximately 4.6 million taxpayers in the third quintile pay more in federal income taxes than 5.6 million taxpayers classified in the fourth quintile.
  - Under another analysis, approximately 3.3 million taxpayers in the fourth quintile pay more in federal income taxes than over 4 million taxpayers classified in the fifth quintile.

This Joint Economic Committee analysis of Internal Revenue Service data for individual income tax returns finds that the use of averages does not accurately reflect the tax payments of most taxpayers in each income group. In fact, most taxpayers in each income group have tax liabilities considerably different from the group averages. This fact is not surprising given the different characteristics of tax filers at similar income levels. Therefore, excessive reliance on the use of averages in distribution tables and unqualified comparisons of average tax liabilities and average tax changes can be misleading.

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Appendix I
Ten Questions to Evaluate Tax Distribution Tables

Previous research by the Joint Economic Committee demonstrate that the following 10 questions can assist readers in discovering misleading aspects of any distribution table.[17] Using these 10 questions as a guide will unveil information that is not always revealed in tax distribution tables and better illuminate the merits of proposed tax legislation. A reader unable to answer all 10 questions should ask the issuing group to provide the missing information.

Agencies or groups that release tax distribution tables that either withhold or omit the answers to these questions, misuse the average as the sole measure of central tendency, or are based on statistically compromised data sources, should be questioned on the issues of motive, transparency, accuracy and reliability. Only with the answers to all of the following questions can readers make informed decisions about the distributional merits of tax proposals.

1. Is the median presented as a measure of central tendency, or at least provided in addition to the average?
2. What measure of income is used (e.g., Adjusted Gross Income (AGI) or Family Economic Income (FEI)?
3. What taxes are included in the analysis (e.g., income taxes, payroll taxes, estate taxes, etc.) and are the taxes used in the analysis both before and after the effects of a proposed tax change identical?
4. How many taxpayers reside within the displayed income categories?
5. What is the range of income and tax liability associated with each category?
6. What are the current and proposed (after full enactment of the proposed tax legislation) levels of taxation (percent of total taxes paid to the government) for each income category?
7. What are the current and proposed (after full enactment of the proposed tax legislation) effective tax rates for each income category?
8. What are the ranges and medians of the amount of tax change that each income group is estimated to receive after full enactment of the tax legislation?
9. Are the estimates presented free of imputations? If not, what imputations have been made to arrive at the estimates presented in the tax distribution tables?
10. Are the accuracy and reliability of the estimates presented in the tax distribution tables, and are data limitations disclosed?

No distribution table can be perfect or present every nuance associated with estimated changes in the distribution of taxes. However, it is possible to include enough information so that the results are not presented in a biased or misleading manner. Until distribution tables are either abandoned or reformed, the best defense against misleading tables are education and full disclosure of information.

[17] See, for example: Jason Fichtner, "A Guide to Tax Policy Analysis: Problems with Distributional Tax Tables," Joint Economic Committee, January 2000; and "A Guide to Tax Policy Analysis: The Central Tendency of Federal Income Tax Liabilities in Distributional Analysis," May 2000.

Appendix II
1999 Statistics of Income Public Use Tax File

The Internal Revenue Service prepares a data file based on a sample of federal income tax returns that is made available to the public.

> The Internal Revenue Service 1999 Public Use Tax File, which contains 132,108 records, was selected as part of the Statistics of Income (SOI) program that was designed to tabulate and present statistical information for the 127.1 million Form 1040, Form 1040A, and Form 1040EZ Federal Individual Income Tax Returns filed for Tax Year 1999. The Individual Tax File is designed for making national level estimates.
>
> The Tax Files, which have been produced since 1960, consist of detailed information taken from SOI sample records. The public use versions of these sample files are sold in an unidentifiable form, with names, Social Security Numbers (SSN), and other similar information omitted. The primary uses made of these files have been to simulate the administrative and revenue impact of tax law changes, as well as to provide general statistical tabulations relating to sources of income and taxes paid by individuals.[18]

It is important to note that the public use file is adjusted to comply with IRS disclosure procedures. First, taxpayers in the sample with total income or loss of $5,000,000 or more; those with business plus farm receipts of $50,000,000 or more; and nontaxable returns with adjusted gross incomes or expanded incomes of $200,000 or more were subsampled at a 33 percent rate to project the identity of individual taxpayers. Second, those returns that remain in the public use file after the subsampling procedure are combined with other high-income returns in a blending process to further protect the identity of individual taxpayers. Third, all lower income returns have been blurred for alimony paid and alimony received and home mortgage interest paid to financial institutions. Finally, all fields in the returns have been rounded to the four most significant digits (e.g., $14,371 = $14,370 and $228,867 = $228,900). These are the main differences between the public use file and the non-public use file used by the Treasury Department's Office of Tax Analysis and the Congress' Joint Committee on Taxation.

However, all sample data are subject to further sampling and measurement error. To properly use the statistical data presented in distributional tax tables, the magnitude of the potential sampling error must be known; coefficients of variation (CVs) are used to measure that magnitude. For CVs and more information on SOI sampling methodology and data limitation with reference to the tax year 1999 data, please see Internal Revenue Service, Statistics of Income, *SOI Bulletin – Fall 2001*, pages 24 and 253.

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[18] Mike Weber. United States Internal Revenue Service, Statistics of Income Division. "General Description Booklet for the 1999 Public Use Tax File."

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